THE EFFECTS OF DEPRESSIVE AND ANXIETY SYMPTOMS, PERCEIVED STRESS, BODY MASS INDEX, AND COPING PROCESSES ON THE HEALTH-RELATED QUALITY OF LIFE OF ADULT WOMEN WITH POLYCYSTIC OVARY SYNDROME

by

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The Effects of Depressive and Anxiety Symptoms, Perceived Stress, Body Mass Index, and Coping Processes on the Health-Related Quality of Life of Adult Women with Polycystic Ovary Syndrome

Thesis directed by Professor Emerita Roxie Foster.

ABSTRACT

Depression, anxiety, psychological stress, and decreased health-related quality of life (HRQL) are significant risks for the 5-6 million American women with polycystic ovary syndrome (PCOS). The purposes of this study were (1) to describe depressive symptoms, anxiety symptoms, perceived stress, body mass index (BMI), and HRQL in adult women with PCOS, (2) determine the types of coping processes that women with PCOS use to manage stressful life situations, (3) determine if depressive symptoms, anxiety symptoms, perceived stress, body mass index (BMI), and/or coping processes predict HRQL, and (4) determine if coping processes mediate the relationship between the independent variables (depressive symptoms, anxiety symptoms, perceived stress, BMI) and HRQL in women with PCOS.

This descriptive, correlational study, which was approved by the Colorado Multiple Institutional Review Board, used an online survey with five validated questionnaires. Descriptive, correlational, and multiple regression procedures were used to analyze the relationships among the variables. A sample of 72 women with PCOS clinically confirmed by the Rotterdam criteria, aged 18-40, not pregnant, and able to read and write in English were recruited from the Denver metro area. The study sample was adequate to show significance with a power of 0.8, an alpha of 0.05 and a 0.2 effect size.

Key results indicated that 30.6% of the sample had severe levels of depressive symptoms, anxiety symptoms, or suicide ideation. Depressive symptoms and BMI explained 43.6% of the variance in the emotions subscale score and 38.5% of the variance in the weight subscale. Coping
processes were not examined in the study due to low Cronbach’s alphas on five of the eight Ways of Coping Questionnaire subscales.

The results showed that women with PCOS are at risk for depression, anxiety, and suicide. Thus, regularly screening for depression and psychosocial distress is indicated in this population. Weight is also an area of concern to women with PCOS and should be discussed in relation to other areas of HRQL. Further research is indicated to better measure coping processes in women with PCOS.

The form and content of this abstract are approved. I recommend its publication.

Approved: Roxie Foster
DEDICATION

This dissertation is dedicated to the young adult women with PCOS who participated in this research study. This group of young women helped to teach me what it is like to live with PCOS. I am grateful for the time and effort they took to share their experiences of managing their lives in the context of PCOS.
ACKNOWLEDGEMENTS

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CHAPTER I
INTRODUCTION

Depression, anxiety, psychological stress, suicide, and decreased health-related quality of life (HRQL) are significant risks for the 5-6 million American women with polycystic ovary syndrome (PCOS) (Dokras, Clifton, Futterweit, & Wild, 2011, 2012; Futterweit, 2007; Janssen, Hahn, Tan, Benson, & Elsenbruch, 2008; Jones, Hall, Balen, & Ledger, 2008; Månsson, Holte, Landin-Wilhelmsen, Dahlgren, Johansson, & Landén, 2008). The determinants of these risks are complex, uncertain, and need further evaluation due to associated adverse health outcomes including death, cardiovascular disease (CVD), and poor psychosocial functioning (Barry, Kuczmiarczyk, & Hardiman, 2011; Dokras et al., 2011, 2012; Jones et al., 2008, Månsson et al., 2008). Successful use of adaptive coping processes may help alleviate risks for these psychosocial issues in women with PCOS (Benson, Hahn, Tan, Janssen, Schedlowski, and Elsenbruch, 2010; Lazarus & Folkman, 1984). Surprisingly, few research studies have focused on the coping processes that women with PCOS use to manage this chronic disease (Benson et al., 2010; Özenli, Haydardedoğlu, Micozkadioğlu, Şimşek, Bulgan Kilicdağ, & Bağış, 2008). In addition, levels of perceived stress, a measure of the degree to which a woman with PCOS appraises her life as controllable or uncontrollable, may also affect depressive and anxiety risk, HRQL, and coping processes in women with PCOS (Cohen, Kamarck, & Mermelstein, 1983; Kovačić and Kovačić, 2011; Lau & Yin, 2011; Sangon, 2004). There is a notable lack of research studies examining levels of perceived stress in women with PCOS. PCOS strikes at the heart of being a woman - her appearance and her fertility; it has been described as “the thief of womanhood” (Kitzinger & Willmot, 2002, p. 1).

The purposes of this research study were (1) Describe independent variables of depressive symptoms, anxiety symptoms, perceived stress, BMI, coping processes and the dependent variable of HRQL measured as the subscales of the PCOSQ in adult women with PCOS, (2) determine the types of coping processes that adult women with PCOS use to manage
their PCOS condition, and (3) determine if depressive symptoms, anxiety symptoms, perceived stress, BMI, or coping predict the HRQL of adult women with PCOS as measured by the PCOSQ subscales, and (4) determine if coping processes mediate the relationship between each independent variable (depressive symptoms anxiety symptoms, perceived stress, BMI) and HRQL in women with PCOS.

PCOS can affect the psychological health of women with the syndrome. Women with PCOS are at risk for the development of depression and anxiety (Dokras et al., 2011, 2012). The etiology of these risks are uncertain and independent of the clinical signs and symptoms of PCOS such as acne, androgenic alopecia, hirsutism, infertility, weight gain, or androgen levels (Dokras et al., 2011, 2012; Fauser et al. 2012). The degree of clinical PCOS symptom severity does not solely predict the degree of psychological stress or HRQL (Hahn et al., 2005; Trent et al., 2002).

Women with PCOS are also at risk for decreased HRQL (Fauser et al., 2012; Jones et al., 2008). Most of the common symptoms of PCOS including hirsutism, infertility, menstrual dysfunction, and weight gain are commonly associated with decreased HRQL in women with PCOS (Jones et al., 2008). However, the specific relationship of these symptoms with HRQL in women with PCOS is also complex (Jones et al., 2008). For example, Hahn et al. (2005) found that body mass index (BMI) and hirsutism scores significantly correlated with physical aspects of HRQL, but not the psychological aspects of HRQL as measured with the generic HRQL Short Form-36 (SF-36). In addition, BMI and hirsutism scores did not significantly correlate with psychological distress as measured by the Symptom Checklist-90-R (SCL-90-R) (Hahn et al., 2005). Knowledge regarding the psychosocial health of women with PCOS is still in the early stage of development. Himelein and Thatcher (2006b) reported that of 2100 Pub Med references to PCOS since 2000, only 3% were concerned with psychological issues.

This study addressed a woman’s risk for depressive and anxiety symptoms and reduced HRQL in the context of PCOS from a different perspective than commonly described in the literature. Research studies in women with PCOS commonly analyze the relationship between
clinical and/or biochemical parameters with psychosocial functioning. In addition to measuring levels of depressive and anxiety symptoms, this study measured and analyzed the coping processes that women with PCOS used to manage stressful life events. The use of processes by women with PCOS in relationship to depressive and anxiety symptoms, perceived stress, BMI, and HRQL provides new information about psychosocial risks for women with PCOS. Another important component of this study is measuring levels of perceived stress in women with PCOS. Knowledge of perceived stress levels in women with PCOS, which includes the appraisal of a stressful situation and the degree to which a situation is perceived as uncontrollable, unmanageable, and overloading, also provides additional new information about psychosocial distress in women with PCOS (Cohen et al., 1983). People can be stressed about a chronic disease without being depressed (Fechner-Bates, Coyne, & Schwenk, 1994; Fisher et al., 2007).

Perceived stress may be a predictor of depression in women and probably predates the onset of depressive symptoms (Lazarus & Folkman, 1984, Sangon, 2004). Depression and anxiety can be responses to a situation perceived as stressful or uncontrollable (Folkman, 1984, Lazarus & Folkman, 1984). The degree to which a situation is perceived as controllable or uncontrollable can also affect the choice of adaptive or maladaptive coping processes (Folkman, 1984). Therefore, it is essential to examine the relationship of perceived stress levels and use of coping processes in relation to depressive and anxiety symptoms and HRQL in women with PCOS for new insights into the cause of psychosocial distress and decreased HRQL in this group of women.

These variables have not previously been examined together in women with PCOS.

BMI is included in this study as a clinical parameter due to its complex role in determining psychosocial distress in women with PCOS. BMI has been suggested to contribute to decreased HRQL in women with PCOS (Benson et al., 2010, Jones et al., 2008) as well as depression and anxiety symptoms in women with PCOS (Dokras et al., 2012). However, the exact role of BMI in psychosocial distress in women with PCOS is unclear (Dokras et al., 2012).
This study was guided by the Transactional Model of Stress and Coping developed by Lazarus and Folkman (1984). The model consists of a source of psychological stress, the appraisal of the psychological stress by a person, the use of coping processes to manage the stress, and the adaptational outcomes or quality of life based on appraisal and coping processes. According to Lazarus and Folkman (1984), a person’s appraisal of a source of psychological stress, rather than simply the stressor itself, in large part determines a person’s coping and adaptational response.

This research study examined the effects of depressive and anxiety symptoms, perceived stress, BMI, and coping processes on the HRQL in women with PCOS. Examining the risk for depressive and anxiety symptoms and reduced HRQL in women with PCOS from the additional perspective of appraisal of perceived stress and coping processes provides new information regarding relationships among the variables (Cohen et al., 1983). Coping processes have the potential to change through reappraisal of a person-environment encounter (Lazarus & Folkman, 1984). Information gained from this study helps identify coping processes that are supportive or need modification to potentially enhance HRQL in women with PCOS and help decrease the risk for depression and anxiety. Measurement of perceived stress levels in women with PCOS provides new information to use in evaluating psychological stress in women with PCOS. Understanding the psychosocial factors that influence HRQL in women with PCOS is important due to the reproductive, metabolic, and emotional consequences of the syndrome that women experience and which have the potential to affect their HRQL (Jones et al., 2008). HRQL affects the complete well-being of a woman. This research approaches the psychosocial problems associated with PCOS from a biopsychosocial perspective (Sonino et al., 2004) and provides exciting new insights into significant PCOS health-related quality of life issues and concerns.
Overview of PCOS

Prevalence of PCOS

PCOS is the most common endocrine disorder among women of reproductive age (Futterweit, 2007). In 1935, physicians Stein and Leventhal published a paper describing the characteristics of seven women with amenorrhea, hirsutism, and polycystic ovaries which is now termed PCOS (Ehrmann, 2005; Stein & Leventhal, 1935). While the prevalence of PCOS depends on the diagnostic criteria used, general estimates are from 6.5-9% of reproductive aged women (Azziz, 2008). This means approximately 5-6 million women are affected by the disease in the U.S. alone (Futterweit, 2007). Unfortunately, it is estimated that 50-75% of women with PCOS are undiagnosed (Futterweit, 2007). PCOS occurs worldwide in all ethnic groups (Futterweit, 2007). While PCOS is often associated with obesity, prevalence studies indicate that PCOS occurs almost equally in all weight classes: underweight with a BMI less than or equal to 18.9 kg/m² (8.2%), normal-weight with a BMI 19.0-24.9 kg/m² (9.8%), overweight with a BMI 25.0-29.9 kg/m² (9.9%), and obese with a BMI greater than or equal to 30.0 kg/m² (9.0%) (Yildiz, Knochenhauer, & Azziz, 2008). While the BMI in women diagnosed with PCOS has been rising, the increase appears to parallel the general increase in BMI in the general population (Yildiz et al., 2008).

Etiology of PCOS

The etiology of PCOS is uncertain and may involve multiple factors (Chang & Azziz, 2008). The classic hallmarks of PCOS are hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology on ultrasound (Chang & Azziz, 2008).

In order to understand the etiology of PCOS, it is necessary to review the normal female ovarian cycle. In a normal ovarian cycle, the hypothalamus releases gonadotropin-releasing hormone (GnRH). Normal release of GnRH stimulates release of follicle stimulating hormone (FSH) by the anterior pituitary gland. FSH stimulates development of the small ovarian follicles (Thatcher, 2000). Some of the developing follicles begin to secrete estradiol (E₂). Under the
influence of FSH, a dominant Graafian follicle will emerge in the ovary (Thatcher, 2000). The developing follicles are surrounded by granulosa cells that in turn are surrounded by theca cells. The growing follicle continues to produce E₂ which is formed from androgens. Androgens are secreted by the theca cells surrounding the follicle. Androgens are converted to E₂ by the enzyme aromatase which is produced by the granulosa cells (Thatcher, 2000). When the follicle is ready for ovulation, there is a surge of luteinizing hormone (LH) from the anterior pituitary gland which causes the follicle to release its oocyte or egg (Thatcher, 2000). After ovulation, the follicle forms a corpus luteum and continues to secrete E₂ as well as large amounts of progesterone to support the uterine endometrium should fertilization of the oocyte occur (Thatcher, 2000). If fertilization does not occur, the corpus luteum deteriorates within about 14 days. Without the support of estrogen and progesterone, the endometrial lining of the uterus breaks down resulting in menstruation. The low levels of hormones stimulate the release of GnRH and the ovarian cycle begins again.

PCOS appears to involve dysfunction of the hypothalamic-pituitary-ovarian axis (Chang & Azziz, 2008; Futterweit, 2007). Women with PCOS appear to have an increased release frequency of GnRH by the hypothalamus which may result from an intrinsic abnormality in the hypothalamus (Ehrmann, 2005). The increased frequency of GnRH release favors the production of LH over FSH by the anterior pituitary gland (Chang & Azziz, 2008; Ehrmann, 2005; & Futterweit, 2007). Increased LH production leads to increased ovarian androgen production by the ovarian theca cells (Chang & Azziz, 2008; Ehrmann, 2005; & Futterweit, 2007). It is believed that the high androgen levels arrest the development of ovarian follicles and produce the clinical signs and symptoms of PCOS androgen excess such as hirsutism, acne, and menstrual disorders (Futterweit, 2007). Arrest in the follicle development by the androgens prevents the emergence of a dominant follicle, and, instead, multiple small undeveloped or partially developed follicles or cysts develop within the ovary and are visible on ultrasound, hence the name polycystic ovary syndrome (Futterweit, 2007; Thatcher, 2000). Ovulation does not occur in the absence of a
dominant follicle leading to irregular menstruation in many women with PCOS (Thatcher, 2000). An ultrasound image of the ovaries will often show multiple cysts as a “string of pearls” on the periphery of the ovary (Thatcher, 2000).

High levels of insulin can also disrupt a woman’s reproductive cycle. Women with PCOS are often hyperinsulinemic. The increased levels of insulin often seen in women with PCOS are believed to be caused by an insulin postbinding signaling defect on the insulin receptor substrate that differs from other insulin resistant states such as type 2 diabetes (T2DM) (Corbould et al., 2005). Increased insulin results in increased production of androgens by the ovarian theca cells, again leading to follicular arrest (Ehrmann, 2005; Futterweit, 2007). Insulin also causes decreased production of sex hormone-binding globulin (SHBG) by the liver. SHBG normally binds with testosterone to decrease its effects. Decreased levels of SHBG result in increased levels of testosterone and its androgenic effects (Ehrmann, 2005; Futterweit, 2007).

PCOS appears to cluster in families suggesting that the condition may be inheritable or have a genetic basis. A study by Kahsar-Miller, Nixon, Boots, Go, and Azziz (2001) indicated that 35% of mothers of women with PCOS and 40% of sisters had PCOS. The authors noted that a positive family history of PCOS was an important risk factor for PCOS. Identification of genes implicated in the pathogenesis of PCOS have been suggested, but not confirmed, that may be factors in the development of PCOS (Ehrmann, 2005). Most recently, it has been suggested that a male phenotype of PCOS may exist in sons of women with PCOS that includes increased body weight and insulin resistance (Recabaren et al., 2008). PCOS may not be exclusively a female condition.

**Clinical Signs and Symptoms of PCOS**

The clinical signs and symptoms of PCOS can vary from woman to woman. The most common clinical signs of PCOS are menstrual dysfunction, infertility, hirsutism, acne, alopecia, visceral obesity, sleep apnea, acanthosis nigricans, skin tags, and reactive hypoglycemia
(Futterweit, 2007). The signs and symptoms typically begin to appear in adolescence with menstrual dysfunction, hirsutism, and acne (Futterweit, 2007).

**Diagnostic Criteria for PCOS**

PCOS can be diagnosed with established diagnostic criteria. However, there are currently three sets of PCOS diagnostic criteria making the diagnosis of PCOS broad or narrow depending on the diagnostic criteria used. The National Institutes of Health (NIH) criteria for PCOS developed in 1990 include clinical and/or biochemical evidence of hyperandrogenism, oligo-ovulation, and exclusion of other related disorders (Zawadski & Dunaif, 1992). This is the narrowest definition and does not include polycystic ovarian morphology on ultrasound.

In 2003, a consensus workshop in Rotterdam sponsored by the European Society of Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM) (2004) established new and broader criteria for the diagnosis of PCOS known as the Rotterdam criteria. These criteria include 2 out of 3 of the following: clinical and/or biochemical signs of hyperandrogenism, oligo- and/or anovulation, or polycystic ovaries. Related conditions must also be excluded. This is the broadest of the diagnostic criteria and allows for the diagnosis of PCOS without clinical and/or biochemical evidence of hyperandrogenism. This set of diagnostic criteria was the most commonly used criteria to diagnose PCOS in the review of the literature.

Finally, the Androgen Excess and Polycystic Ovary Syndrome Society (AE-PCOS Society) reviewed the research and published a revised set of diagnostic criteria for PCOS in 2006 (Azziz et al., 2006). The AE-PCOS Society stated that PCOS was a hyperandrogenic condition and a diagnosis should not be considered without clinical or biochemical evidence of hyperandrogenism. The AE-PCOS Society criteria are: hyperandrogenism manifested as hirsutism and/or hyperandrogenemia, ovarian dysfunction manifested as oligo-anovulation and/or polycystic ovaries, and exclusion of other androgen excess or related disorders. This set of criteria is broader than the NIH criteria, but narrower than the Rotterdam criteria. For example,
ovarian morphology on ultrasound is included in the AE-PCOS criteria that are not included in the NIH criteria, but the AE-PCOS criteria require evidence of hyperandrogenism that is not exclusively required in the Rotterdam criteria.

In December 2012, a workshop at the National Institutes of Health (NIH) reviewed the current nomenclature and diagnostic criteria for PCOS. In an executive summary, the workshop panel recommended that PCOS be renamed with a name that reflected the interaction of metabolic, hypothalamic, ovarian, pituitary, and adrenal factors involved in the manifestation of the syndrome. Specifically, the workshop panel recommended that the name “PCOS” did not adequately describe the syndrome as polycystic ovarian morphology is neither a requirement nor needed to diagnose the syndrome. The workshop also recommended that the following criteria be used to diagnose PCOS:

1. Androgen excess + ovulatory dysfunction
2. Androgen excess + polycystic ovarian dysfunction
3. Ovulatory dysfunction + polycystic ovarian morphology
4. Androgen excess + ovulatory dysfunction + polycystic ovarian morphology

Several tests can help determine if a woman has PCOS, although there is not a consensus regarding the exact nature of the diagnostic workup for PCOS among researchers and clinicians (Futterweit, 2007). Biochemical hyperandrogenemia can be assessed with measurement of serum androgen levels. Serum androgen tests include total and free testosterone (principally ovarian in origin) and dehydroepiandrosterone sulfate (DHEA-S) (principally of adrenal origin) (Futterweit, 2007). Hyperandrogenism can be assessed by evaluation of hirsutism, acne, and alopecia. Hirsutism is very characteristic of PCOS and can be assessed with the Ferriman-Gallwey scale (F/G) which measures the growth of terminal hair in a male distribution in nine areas including the upper lip, chin, chest, upper back, lower back, upper and lower abdomen, upper arm, and thigh (Azziz et al. 2009). Each area is scored 0-4 based on the density of hair. A score of 6-8 defines hirsutism, although ethnic variations need to be considered (Azziz et al., 2009). Acne and androgenic alopecia (male pattern hair loss) are also suggestive of hyperandrogenism and are
often seen in women with PCOS, although the sole prevalence of acne or alopecia as indicators of PCOS is controversial and needs further clarification (Azziz et al., 2009).

Anovulation can be evaluated with a progesterone level during days 20-24 of a menstrual cycle. A level less than 3-4 ng/ml suggests anovulation (Azziz et al., 2009). An ultrasound examination can detect polycystic ovaries. While polycystic ovaries can be detected on ultrasound, 10-30% of women with PCOS will not have polycystic ovaries visible on ultrasound (Azziz et al., 2006). Conversely, approximately 23% of women without PCOS will have polycystic ovaries on ultrasound (Futterweit, 2007). An ovarian ultrasound image demonstrating an ovarian volume in one ovary of greater than 10cm³ or 12 or more follicles measuring 2-9 mm in diameter is considered diagnostic (Azziz, et al., 2006).

Other laboratory tests can be conducted in the workup of the women with PCOS, but they are not considered diagnostic (Azziz et al., 2009). Levels of FSH and LH can be measured on day 3 of a woman’s menstrual cycle; an LH: FSH ratio that is >2:1 or 3:1 is suggestive of PCOS (Futterweit, 2007). The normal LH: FSH ratio is 1:1. However, due to variations in measurement, this test is not considered diagnostic (Azziz et al., 2009). Other supportive tests can include a glucose tolerance test for insulin resistance and/or diabetes (Fauser, 2004).

The workup for PCOS also needs to include tests to exclude other causes of androgen excess including hypo- or hyperthyroidism, hyperprolactinemia, Cushing’s syndrome, androgen-secreting neoplasms, congenital adrenal hyperplasia, severe insulin resistance, other hyperandrogenism syndromes, and idiopathic hirsutism (Azziz et al., 2009).

**Treatment of PCOS**

Treatment of PCOS is aimed at symptom management, improving HRLQ, and prevention of the metabolic consequences of PCOS such as CVD and T2DM (Jones et al., 2008). Estimates suggest that 40% of women with PCOS will develop T2DM by age 40 (Thatcher, 2000). Various treatment modalities are used for symptom management (Futterweit, 2007). Lifestyle modification including weight loss helps reduce androgen levels and restore ovulation
Menstrual dysfunction can be regulated with oral contraceptives that help decrease androgen levels (Futterweit, 2007). Insulin-sensitizing agents such as metformin can help decrease insulin resistance and restore ovulation (Futterweit, 2007). Ovulation induction agents such as clomiphene citrate can help achieve pregnancy for those women with PCOS desiring to conceive (Futterweit, 2007). In addition, the anti-androgen medication spironolactone can help ease the effects of acne, hirsutism, and alopecia (Futterweit, 2007).

**Theoretical Framework: Transactional Model of Stress and Coping**

One of the goals of this study was developing more foundational knowledge regarding the coping processes that women with PCOS use to manage stressful life events. With this knowledge, nursing interventions can be developed to support or develop positive coping processes that may improve the HRQL of women with PCOS and decrease their risks for psychosocial distress. This study was a foundational study for helping to promote positive health behavior in women with PCOS. The effects of health behavior change are most useful when they are guided by a health behavior theory (Glanz, Rimer, & Viswanath, 2008). Theories of health behavior help identify behavior that needs modification, the methods for implementation of these changes, as well as identification of outcomes from health behavior strategies (Glanz et al., 2008).

An illness and its associated consequences such as diagnosis, treatment, and outcomes can produce stressful reactions in people (Glanz & Schwartz, 2008). The manner in which a person successfully or unsuccessfully copes with a stressful situation can affect their health behavior and health choices (Glanz & Schwartz, 2008). Therefore, it is essential to understand theories of stress and coping in order to implement successful coping strategies that will promote the optimum biopsychosocial well-being of a person.

PCOS is known to create psychosocial distress in some affected women. This distress includes risks for depression, anxiety, suicide, and decreased HRQL (Dokras et al., 2011, 2012; Janssen et al., 2008; Jones et al., 2008; & Månsson et al., 2008). Women with PCOS are also at risk for maladaptive coping processes (Benson et al., 2010; Özenli et al., 2008). Therefore, an
appropriate theory for guiding this research is a health theory that involves understanding responses of women with PCOS to stressful life events. The Transactional Model of Stress and Coping is a well-known health behavior theory that specifically addresses the role of stress and coping in difficult life circumstances such as illness. Consequently, this model of health behavior was chosen to guide this research study. The theoretical framework is described in Figure 1.1. This outline of the elements in the Transactional Model of Stress and Coping is based on the description of the model by Lazarus and Folkman (1984).

The model describes a person’s response to psychological stress. The components of the transactional model include primary and secondary appraisal of a potential source of psychological stress, coping efforts, and adaptational outcomes (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984; Park & Folkman, 1997). Psychological stress refers to a person-environment transaction that is appraised as beyond a person’s usual resources and is a threat to the person’s well-being (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984). Primary appraisal refers to the personal, initial meaning attached to a person-environment transaction (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984; Park & Folkman, 1997). Examples of primary appraisal include, for example, whether a situation is irrelevant, benign-positive such as pleasurable, or stressful (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984). Secondary appraisal occurs after primary appraisal and addresses what needs to be done to cope with and manage the situation (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984). Finally, reappraisal is based on new information from the transaction between the person and environment (Lazarus & Folkman, 1984).

The appraisal of a stressful situation is based on beliefs and attitudes of a person as well as the nature of the psychological stressor (Lazarus & Folkman, 1984). Individual characteristics affecting appraisal include commitments that are important to a person and affect choices to maintain ideals or goals, beliefs regarding personal control over a situation and its outcome, and existential beliefs such as in a higher power or the natural order of the universe that allows people
to create meaning from difficult situations (Lazarus & Folkman, 1984). Situational factors that affect appraisal include the novelty of the situation whereby new situations are often not appraised as stressful, the predictability of a situation, and event uncertainty with a large amount of uncertainty in an event being appraised as very stressful (Lazarus & Folkman, 1984). Imminence, duration, and temporal uncertainties are also important in the appraisal of a person-environment interaction. The more imminent an event, the more urgent is the appraisal, an event with a long duration has the potential to exhaust a person, and temporal uncertainty refers to the inability to predict an event which may result in either increased or decreased stress (Lazarus & Folkman 1984).

Coping processes are defined as “constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984, p. 141). Coping processes are designed to

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**Figure 1.1 Transactional Model of Stress and Coping based on Lazarus & Folkman, 1984**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Psychological Stress:</strong> Relationship between person &amp; environment that is perceived by person as beyond his or her resources to manage and endangers well-being</td>
</tr>
<tr>
<td><strong>Primary Appraisal:</strong> Assessment of person/environment transaction Perceived as irrelevant, benign-positive, or stressful Depression can be an appraisal and response to perceived stress</td>
</tr>
<tr>
<td><strong>Secondary Appraisal:</strong> Assessment of coping options to manage perceived stress</td>
</tr>
<tr>
<td><strong>Coping Processes:</strong> Cognitive and behavioral efforts to manage demands that are perceived by a person as beyond their usual resources to manage. Coping processes may mediate the relationship between stress and outcomes</td>
</tr>
<tr>
<td><strong>Adaptational Outcomes:</strong> The effects of appraisal and coping processes on a person’s quality of life (Physical &amp; Mental Health)</td>
</tr>
</tbody>
</table>
manage a problem and control the emotional response to the problem (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984). They involve what a person actually does to manage a stressful situation. In addition, coping processes can function as mediators or the driving force between the stressor / appraisal and the outcome (Glanz & Schwartz, 2008; Lazarus, 1993). Coping processes are influenced by several factors. These involve a person’s resources such as health, energy, and personal beliefs; commitments; problem-solving skills; social skills; social support; and material resources (Lazarus & Folkman, 1984). Coping styles or traits are enduring characteristics of a person that motivate a person’s response to stress and subsequent coping efforts (Glanz & Schwartz, 2008). Coping styles or traits can function as moderators of coping behaviors (Glanz & Schwartz, 2008).

Adaptational outcomes of appraisal and coping processes include functioning in work and social situations, life satisfaction, and health which can all be termed quality of life (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984). Determining if a coping process is adaptive depends on the person, the situation, and the outcome under question (Lazarus, 1993).

In summary, the Transactional Model of Stress and Coping provided a well-recognized theoretical foundation to understand and interpret psychological stress, appraisal, coping processes, and HRQL adaptational outcomes in women with PCOS. Knowledge of the coping processes women with PCOS used to manage psychological stress may lead to the development of effective interventions that support adaptive coping processes to improve HRQL in women with PCOS and decrease their risk for psychological stress, anxiety, and depression.

Conceptual Model

The conceptual model used in this study (Figures 1.2 and 1.3) described the relationships among depressive and anxiety symptoms, perceived stress, BMI, coping processes, and HRQL that may be present in adult women with PCOS. The conceptual model was based on the Transactional Model of Stress and Coping (Lazarus and Folkman, 1984). In the proposed model, perceived stress, coping processes, and HRQL correspond to the main variables in the
Transactional Model of Stress and Coping (Lazarus & Folkman, 1984). Perceived stress is defined as “the degree to which situations in one’s life are appraised as stressful” (Cohen et al., 1983, p. 385). Perceived stress is, therefore, equated with the Lazarus and Folkman (1984) variables of stress and appraisal. Coping processes in the conceptual model are identical to the variable of coping in the Lazarus and Folkman (1984) theory and examine cognitive and behavioral efforts a person makes to manage stressors that are deemed beyond the person’s efforts to satisfactorily manage (Lazarus & Folkman, 1984). HRQL corresponds to the short- and long-term adaptational outcomes or quality of life in the Lazarus and Folkman (1984) theory. Relationships among depressive and anxiety risk, BMI, coping processes, and HRQL were also key components of this study to help further explain reasons why women with PCOS are at high risk for depression and anxiety.

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key components of this study to help further explain reasons why women with PCOS are at high risk for depression and anxiety.

Figure 1.2 Conceptual Model, Part 1

Figure 1.3 Conceptual Model, Part 2
BMI=Body Mass Index; HRQL=Health-Related Quality of Life

Coping can be a mediating variable between the person and environment transaction and adaptational outcomes (Glanz & Schwartz, 2008; Lazarus & Folkman, 1984). The literature
demonstrated that perceived stress, depressive and anxiety symptoms, coping processes, as well as BMI can affect HRQL (Benson et al., 2010; Lau & Yin, 2011). If a direct relationship exists between depressive symptoms, anxiety symptoms, perceived stress, BMI, coping processes, and HRQL, then a test of mediation could be performed (Baron & Kenny, 1986; Bennett, 2000) to determine if coping mediated the relationship between perceived stress, depressive or anxiety symptoms, or BMI and HRQL in women with PCOS. These relationships are depicted in Figures 1.2 and 1.3 of the conceptual model.

According to Lazarus and Folkman (1984) the ordering of the variables in the Transactional Model of Stress and Coping is: stress→appraisal→coping→outcomes. This ordering of the variables is followed in the conceptual model and is based on reason, logic, and background information (Norris, 2005).

**Research Questions**

This research study sought to provide new information and understanding regarding the increased risk for psychosocial distress in women with PCOS and the manner in which women with PCOS are coping or trying to manage their condition.

1. What are the measurement scores of depressive symptoms, anxiety symptoms, perceived stress, and HRQL in adult women with PCOS?
2. What types of coping processes do women with PCOS use to manage their condition?
3. Do measurement scores of depressive symptoms, anxiety symptoms, perceived stress, BMI, and coping processes individually predict the HRQL of adult women with PCOS?
4. Do coping processes mediate the relationship between each independent variable (depressive symptoms, anxiety symptoms, perceived stress, BMI) and the dependent variable HRQL in adult women with PCOS?

**Significance to Nursing**

The significant risks for depression, anxiety, psychological stress, suicide, and decreased HRQL in women with PCOS have important implications for nursing. Identification of women
with PCOS who are at risk for psychosocial distress is paramount. Knowledge from this study provides further guidance and direction to help nurses identify women with PCOS who are at risk for psychosocial distress.

PCOS has been described as a “hidden epidemic” that is often unrecognized and undertreated (Thatcher, 2000). Nurses may encounter women with PCOS in a variety of health care settings. Nurses need to know how to intervene and care for this underserved population of women. Quality nursing care is grounded in nursing knowledge gained from nursing research. However, nursing research is limited in women with PCOS. This research study helps unlock the doors of mystery and silence that surround women with PCOS and promote further inquiry into issues of concern to women with PCOS. There is a compelling need for nurses to be actively engaged in research and practice leading to better recognition and treatment of this devastating syndrome that so distinctly impinges on the life cycle of affected women.
CHAPTER II

REVIEW OF THE LITERATURE

Research and clinical interest in the psychosocial aspects of women with PCOS has increased prodigiously over the past 15 years. In 2002, Jones, Kennedy, and Jenkinson conducted a systematic review of the literature on HRQL in common benign gynecological conditions in women and identified one journal article concerning women with PCOS. That paper (Cronin et al., 1998) described the development of the Polycystic Ovary Syndrome Questionnaire (PCOSQ) to measure HRQL in women with PCOS. In 2008, Jones, Hall, Balen, and Ledger conducted another systematic review of the HRQL literature specific to PCOS and identified 19 research studies that qualified for analysis. The majority of early research concerning PCOS dealt with pathophysiology and treatment (McCook, Reame, & Thatcher, 2005).

The climate of attitudes toward the care of the women with PCOS is shifting with more and more research recognizing the importance of addressing the various psychosocial aspects of the syndrome. A recent consensus report on women’s health aspects of PCOS by the European Society of Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM) (Fauser et al., 2012) noted that women with PCOS were at risk for the development of psychological disorders and decreased HRQL. They concluded that further research is needed in these areas. The current research study focuses on the effects of depressive and anxiety symptoms, perceived stress, BMI, and coping processes on the HRQL of adult women with PCOS. This section presents the results of an extensive literature review that identifies the current state of inquiry in relation to women with PCOS.

Literature Review Search Process

A literature search was conducted using the following electronic databases: Ovid MEDLINE (R) 1950 to Present with Daily Update (Ovid SP through March 30, 2012); EMBASE (through March 30, 2012); CINAHL (through March 30, 2012); and PsycINFO (Ovid SP through March 30, 2012). Guidance for the literature review was provided by the systematic reviews of
HRQL in women with PCOS (Jones et al., 2008), depressive risk in women with PCOS (Dokras et al., 2011) and risk for anxiety symptoms in women with PCOS (Dokras et al., 2012). The five variables in the previous reviews were the key search terms: HRQL, depressive symptoms (disorder), anxiety, perceived stress, and coping processes. BMI was included in the review of the literature in the variable sections. The key variables and search terms are displayed in Table 2.1.

Table 2.1 Review of Literature Search Terms

<table>
<thead>
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<th>Term</th>
<th>Related Search Terms</th>
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<tbody>
<tr>
<td>Polycystic Ovary Syndrome</td>
<td>Polycystic Ovarian Syndrome, Polycystic Ovaries</td>
</tr>
<tr>
<td>Health-Related Quality of Life</td>
<td>Quality of Life, Health Status Measurement, Subjective Health Status</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Anxiety Disorders, Anxious, Panic, Phobia</td>
</tr>
<tr>
<td>Depressive Disorder</td>
<td>Mood Disorders, Dysthyemic Disorder</td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>Psychological Stress, Perceived Stress Scale, Women</td>
</tr>
<tr>
<td>Coping Processes</td>
<td>Ways of Coping Questionnaire, Women</td>
</tr>
</tbody>
</table>

The search terms for HRQL, depressive and anxiety symptoms, perceived stress, and coping processes were each combined with the search terms for PCOS. Since there were few research studies examining PCOS and perceived stress or coping processes, related searches were performed that combined search terms without the inclusion of PCOS terms. For example, searches were performed using the combination search terms of perceived stress, HRQL/quality of life, and women; or coping processes, HRQL/quality of life, and women. Electronic hits ranged from 0-7589, depending on the data base and search term combination.
In addition to the electronic databases, other search methods were utilized in the literature review. References lists from obtained articles were searched for other relevant studies. Older seminal works (Lazarus & Folkman, 1984; Cohen et al., 1983) were also included in the literature review.

**Inclusion Criteria for Reviewed Research Studies**

**Health-Related Quality of Life**

Inclusion criteria for the HRQL literature review followed guidelines established by Jones et al. (2008). HRQL is a multidimensional term covering physical, psychological, and social aspects of life that are affected by an illness (Colwell, Mathias, Pasta, Henning, & Steege, 1998). The inclusion criteria are listed in Table 2.2

**Table 2.2 Inclusion Criteria for HRQL Reviewed Research Studies**

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
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<tbody>
<tr>
<td>1. Study addressed more than one aspect of HRQL as HRQL is multidimensional</td>
</tr>
<tr>
<td>2. Use of standard HRQL instruments</td>
</tr>
<tr>
<td>3. Unless noted in the review, women in the studies were clinically diagnosed with PCOS using the NIH (Zadwadski &amp; Dunaif, 1992) or the Rotterdam criteria (Rotterdam ESHRE/ASRM, 2004) for diagnosing PCOS after excluding other endocrine or excess androgen disorders.</td>
</tr>
<tr>
<td>4. Study available in English</td>
</tr>
</tbody>
</table>

HRQL=health-related quality of life; PCOS=polycystic ovary syndrome; NIH=National Institutes of Health; ESHRE=European Society for Human Reproduction and Embryology; ASRM=American Society for Reproductive Medicine

**Depressive and Anxiety Symptoms**

Inclusion criteria for the literature review of depressive and anxiety symptoms followed the guidelines established by Dokras and colleagues (2011, 2012) in their systematic reviews and
meta-analyses of depressive and anxiety risk in women with PCOS. The inclusion criteria are listed in Table 2.3.

Table 2.3 Inclusion Criteria for Depressive and Anxiety Symptoms Reviewed Research Studies

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
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</thead>
<tbody>
<tr>
<td>1. Research study focused on depressive or anxiety symptoms, not related conditions such as eating disorders</td>
</tr>
<tr>
<td>2. Unless noted in the review, women in the studies were clinically diagnosed with PCOS using the NIH (Zadwadski &amp; Dunaif, 1992) or the Rotterdam criteria (Rotterdam ESHRE/ASRM, 2004) for diagnosing PCOS after excluding other endocrine or excess androgen disorders.</td>
</tr>
<tr>
<td>3. Use of validated instruments to measure depressive and anxiety symptoms</td>
</tr>
<tr>
<td>4. Comparison control group of women without PCOS</td>
</tr>
<tr>
<td>5. Use of standard depressive and anxiety symptoms instruments</td>
</tr>
<tr>
<td>6. Study available in English</td>
</tr>
</tbody>
</table>

PCOS=polycystic ovary syndrome; NIH=National Institutes of Health; ESHRE=European Society for Human Reproduction and Embryology; ASRM=American Society for Reproductive Medicine

Unless noted, exclusion criteria in the reviewed studies on depressive and anxiety risk generally included no use of psychotropic or hormonal medications. Internet studies were excluded for analysis.

**Perceived Stress and Coping Processes**

Research studies examining perceived stress and coping processes in women with PCOS were very limited. Inclusion criteria for articles in these sections were based on the guidelines from Dokras et al. (2011, 2012) and Jones et al. (2008). The inclusion criteria are listed in Table 2.4.
Table 2.4 Inclusion Criteria for Perceived Stress and Coping Processes Reviewed Research Studies

Inclusion Criteria

1. Research study focused on perceived stress or coping processes
2. Unless noted in the review, women in the studies were clinically diagnosed with PCOS using the NIH (Zadwadski & Dunaif, 1992) or the Rotterdam criteria (Rotterdam ESHRE/ASRM, 2004) for diagnosing PCOS after excluding other endocrine or excess androgen disorders.
3. Use of standard perceived stress and coping processes instruments
4. Study available in English

PCOS=polycystic ovary syndrome; NIH=National Institutes of Health; ESHRE=European Society for Human Reproduction and Embryology; ASRM=American Society for Reproductive Medicine

Due to the limited nature of the results, two English abstracts were included in the review. One abstract was from a conference and another from the English abstract of a study published in German. An online survey on coping in women with PCOS with a self-reported PCOS diagnosis was also included due to its relevance to the topic.

Subject Recruitment: Women with PCOS and Control Groups of Women without PCOS

The women with PCOS, in general, tended to be recruited for the research studies from hospital outpatient clinics, particularly endocrinology, obstetrics and gynecology, or reproductive endocrinology. Women without PCOS for control groups were usually recruited from the surrounding area or from a gynecology clinic. Mean age of the women with PCOS and control groups of women in the studies, excluding adolescent studies, was approximately ±30 years of age.
Evidence Tables

A total of approximately 110 articles and abstracts were used for this literature review. Of these, approximately 40 studies focusing on women with PCOS met the inclusion criteria for the reviewed research studies. Evidence tables for research studies involving HRQL, depressive and anxiety symptoms, perceived stress, and coping processes in women with PCOS were created for each research study chosen for review (Appendix A). Relevant BMI data was included in the evidence tables. Only research studies relating to the variables and women with PCOS were included in the evidence tables; related articles used for comparison were not included. Due to the overlap of some of the variables in the studies, a study may appear in more than one evidence table.

Overview of Literature Review Format

The literature review is based on the variables in the study: the effects of depressive and anxiety symptoms, perceived stress, BMI, and coping processes on the HRQL of adult women with PCOS. The evidence from the literature review is presented in the following order: HRQL, depressive symptoms, anxiety symptoms, perceived stress, and coping processes. BMI results are included in each variable section. For clarity, each variable is reviewed in its entirety in a complete section. The section for each variable includes an introduction to the variable, description of instruments to measure the variable, review of research studies with the variable and women with PCOS, a summary of the variable in women with PCOS with research gaps, and limitations to the reviewed studies.

Health-Related Quality of Life in Women with PCOS

Problems and symptoms associated with PCOS can affect the HRQL of women with the syndrome (Jones et al., 2008). The common symptoms of PCOS such as weight, hirsutism, infertility, and menstrual dysfunction are associated with reduced HRQL; although the role of specific PCOS symptoms such as weight gain in decreased HRQL, for example, is unclear (Jones
et al., 2008). This section of the literature review examines studies evaluating HRQL in women with PCOS. The evidence table for relevant research studies for HRQL is found in Appendix A.

Researchers began addressing HRQL in more detail in women with PCOS in 1998 with the publication of the Polycystic Ovary Syndrome Questionnaire (PCOSQ) (Cronin et al., 1998). Prior to this publication, most PCOS research focused on the pathophysiology and treatment of PCOS (McCook et al., 2005). Since there is no cure for PCOS, treatment of the condition is aimed at improving a woman’s HRQL through symptom management and the prevention of significant health-related consequences of the condition such as CVD and T2DM (Jones et al., 2008).

The definition of HRQL is multidimensional. HRQL describes the effects of a condition on the well-being of a person. The constitution of the World Health Organization (WHO) defines health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (WHO, 2006, p. 1). Due to the inclusion of well-being in the WHO definition, quality of life became an area of research interest (Hashimoto et al., 2003). HRQL can be influenced by psychosocial factors that may include cultural interpretations of ideal beauty, perception of wealth, traditional treatments, and body size (Hashimoto et al., 2003). HRQL is a multidimensional outcome measure (Jones, Kennedy, & Jenkinson, 2002) that addresses the physical, emotional, and social perspectives of a disease and its treatment (Colwell et al., 1998) or “a...woman’s own experience and estimation of a situation, of which mental health and physical health are the most important components” (Lau & Lin, 2011, p. 669). HRQL affects a person’s ability to find happiness in the circumstances of life (Coffey, Bano, & Mason, 2006; Janssen, Hahn, Tan, Benson, & Elsenbruch, 2008).

HRQL is an important outcome variable in the long-term management of chronic diseases such as PCOS that require effective coping strategies (Sundararaman, Shweta, & Sridhar, 2008). Chronic conditions such as PCOS can affect HRQL (Jones et al., 2002). Clinical assessment and measurement of a woman's clinical and laboratory parameters may not accurately
portray a woman’s perception of the severity of her PCOS condition or the psychosocial problems that a woman living with PCOS may experience that affect her HRQL (Kumarapeli, Seneviratne, and Wijeyaratne, 2010; Sundararaman et al., 2008; Trent, Rich, Austin, & Gordon, 2002). HRQL focuses on the subjective perceptions a woman with PCOS has regarding her condition (Jones et al., 2002). Self-perceived assessment has demonstrated a more direct relationship with HRQL in women with PCOS than clinical assessment alone (Kumarapeli et al, 2010; Trent et al., 2002; Hahn et al., 2005). Women’s perceptions of their PCOS symptoms and problems in relation to HRQL are needed for the development of useful health care interventions to support women with the syndrome and decrease the physical and emotional consequences of the condition.

**HRQL Instruments**

HRQL can be assessed with either a generic, condition specific, or, if available, a disease specific instrument (Jones, Balen, & Ledger, 2008). A generic HRQL instrument measures health status in any health condition, a condition specific instrument measures a specific condition such as pain or obesity, and a disease specific instrument measures the HRQL for the disease for which the instrument was developed (Jones et al., 2008). Limitations of generic HRQL instruments include lack of disease specific items that would not be identified with a generic instrument such as the effects of hirsutism and infertility in women with PCOS (Jones et al., 2002) The literature suggests that ideal measurement would consist of both generic and disease specific HRQL instruments so that comparisons could be made between the two results (Jones et al., 2002). Parkerson, Connis, Brodhead, Patrick, Taylor, & Tse (1993) suggested that measuring HRQL with both generic and disease specific instruments offered multiple perspectives from the patient’s viewpoint. The number and quality of items selected for an instrument may also be important; research suggests that including all potential items of major and minor importance provides a more accurate picture of HRQL than a brief instrument focusing only on major problems (Wong, Cronin, Griffith, Irvine, & Guyatt, 2001). HRQL can also be assessed with a
qualitative methodology using, for example, in-depth interviews with patients having the condition of interest (Jones et al., 2008).

The Short Form-36 (SF-36) is an example of a generic instrument that is often used to measure HRQL in women with PCOS. The SF-36 was originally developed from the Medical Outcomes Study which examined physician practices and patient outcomes (Stewart, Hays, & Ware, 1988). The scale consists of 36 items grouped into eight health concepts selected from the Medical Outcomes Study (Ware & Sherbourne, 1992). The eight health concepts are: physical functioning (bathe, dress, walking distance ability, activity level), physical role (difficulty in achieving task), bodily pain (magnitude of pain), general health (health rating), vitality (level of energy), social functioning (extent and time of socializing), emotional role (level of accomplishment or carefulness), and mental health (nervous, peaceful, sad, happy, discouraged).

Each subscale scale on the SF-36 receives a value. The total score for physical health is composed of the physical functioning, physical role, bodily pain, and general health scores. The total score for mental health is composed of the vitality, social functioning, emotional role, and mental health sub scores. Reliability scores for coefficient alpha range from 0.76 for social functioning to greater than or equal to 0.80 for the remaining scales (Ware 2000). Validity was established for the SF-36 by comparing four different patient groups differing in physical and mental health as well as degree of severity (McHorney, Ware, & Raczek, 1993). The scale uses a Likert scale with five response choices. Possible scores range form 0-100 with 100 representing best health; general population norms have been established with a mean of 50 and standard deviation units of 10 (Ware, 2000).

In contrast, a disease specific HRQL instrument is able to more accurately measure the impact of specific disease associated problems on HRQL and to measure the effects of treatment plans on disease associated problems. Cronin and colleagues (1998) developed the Polycystic Ovary Syndrome Questionnaire (PCOSQ) to measure the HRQL in women with PCOS. The PCOSQ will be more fully described in Chapter 3 as it is the HRQL instrument of choice for this
study. The five domains of the PCOSQ are emotions, hirsutism, weight, infertility, and menstrual dysfunction with each domain having at least 4 questions. The questions on the PCOSQ are scored in a 7-point Likert scale with 7 being optimal functioning and 1 the lowest function. Women are instructed to answer a question using the previous 2 weeks as a reference.

Wong and colleagues (2001) cautioned against the tendency to try to shorten HRQL surveys to make the surveys more efficient and include only questions regarding serious problems. These researchers found that less serious problems also can affect a person’s HRQL. Their results suggested that including major and minor problems, rather than just focusing on major problems, enhanced the content and construct validity of HRQL surveys and helped to better differentiate between people with higher or lower HRQL.

HRQL in Women with PCOS: Adolescence

Women with PCOS appear to have reduced HRQL compared to control groups of women without PCOS. This trend may develop in adolescence. Trent and colleagues (2002) (USA) found that adolescent girls with PCOS had significantly lower HRQL in several areas compared to control adolescent girls. Their study compared 97 adolescent girls with PCOS (mean age 16.9) to 186 healthy girls without PCOS (mean age 17.0). The participants with PCOS had higher mean BMI (31.7 kg/m$^2$ vs. 23.5 kg/m$^2$), Ferriman-Gallwey hirsutism scores, and Global Acne Scores than the controls. HRQL was measured with the Child Health Questionnaire-Child Self-Report Form (CHQ-CF87) which measures the physical and psychological health of adolescents. Adolescent girls with PCOS scored significantly lower on general health, physical functioning, general behavior, and limitations in family activities due to health compared to controls. However, adolescent girls with PCOS scored significantly higher on change in health in the past year than controls suggesting health improvement and positive interventions from health care providers.

A later study of this data by Trent, Austin, Rich, and Gordon (2005) examined the effect of BMI on HRQL in adolescent girls with PCOS compared to controls. After controlling for
BMI, the differences in the above described subscale measurements between adolescents with PCOS and control adolescents without PCOS were eliminated. The researchers suggested that differences in HRQL were largely explained by a higher BMI rather than PCOS. BMI mediated the relationship between PCOS and HRQL.

In addition, Trent, Rich, Austin, and Gordon (2003) used the previously described data set of adolescent girls with and without PCOS (Trent et al., 2002) to determine if fertility issues affected HRQL. The analysis indicated that adolescent girls with PCOS who were concerned about their ability to have children in the future \((n = 63)\) scored significantly lower on 10 of the 12 CHQ-CF87 subscales than girls with PCOS who were not worried about their ability to have children \((n = 30)\) suggesting a decreased HRQL in girls who were concerned about their fertility. Adolescent girls with PCOS were 3.4 times more likely than adolescent girls without PCOS to be concerned about their ability to have children. Fertility may be an issue that affects HRQL in adolescent girls with PCOS.

This series of studies by Trent and colleagues (2002, 2003, & 2005) suggests that decreased HRQL for adolescents with PCOS is a complex issue. Results suggested that decreased HRQL in adolescent girls with PCOS may be more related to weight issues than to other PCOS symptoms and problems; BMI may mediate the relationship between PCOS and HRQL. However, future fertility concerns appeared to affect the HRQL of adolescent girls with PCOS. The studies also suggested that self-perceptions regarding PCOS symptoms may be a determinant of HRQL. In the 2002 study, most of the adolescent girls with PCOS described their condition as mild, based on their responses to acne, hirsutism, and weight questions, despite the fact that 69% of the sample had moderate to severe clinical severity scores. A direct relationship was not found between clinical severity of PCOS symptoms and HRQL. However, girls with PCOS who perceived their condition as moderately severe scored lower on general health perceptions of HRQL compared to girls who perceived their PCOS condition as mild. The authors suggested that the absence of a direct relationship between clinical severity of PCOS
symptoms and HRQL could be explained in that clinical severity of symptoms may not affect HRQL, another unmeasured confounder that may affect HRQL, or lack of power in the studies to detect a difference between groups. While fertility is a concern to girls with PCOS, the studies did not address which specific PCOS symptom was most distressing, so this remains unknown in adolescent girls with PCOS.

**HRQL in Women with PCOS: Studies with Generic HRQL Instruments**

Several studies have evaluated HRQL in women with PCOS using generic HRQL instruments, particularly the SF-36. Using the generic HRQL SF-36, Elsenbruch et al. (2003) (Germany) found significant differences between women with PCOS ($n = 50$) and an age-matched control group ($n = 50$) in 6 of the 8 SF-36 subscales: physical role function, bodily pain, vitality, social function, emotional role function, and mental health. Controlling for BMI, women with PCOS continued to have significantly lower HRQL in the areas of physical role function, emotional role function, and mental health than controls suggesting decreased HRQL independent of BMI. These results suggested that BMI may not be a major factor in the psychological HRQL of women with PCOS. Since general health perceptions were similar between groups, and there were no differences in socioeconomic data between groups, Elsenbruch et al. (2003) suggested that PCOS-specific factors might account for the differences in HRQL between the 2 groups of women.

Another study by the same group of German researchers with a different principal investigator (Hahn et al., 2005) compared another group of 120 women with PCOS to the control group of 50 women from their 2003 study. Results from the SF-36 indicated that women with PCOS scored significantly lower than controls on physical function, physical role function, bodily pain, vitality, social function, emotional role function and mental health. These results were similar to their 2003 study. Controlling again for BMI, BMI was significantly linked with physical function, bodily pain, general health perception, and the physical sum score. Higher BMI was correlated with decreased physical sum scores, but not psychological sum scores. Hahn et al.
(2005) noted that the psychological differences in HRQL in women with and without PCOS appeared to be independent of BMI, which appeared to affect more physical components of HRQL in women with PCOS.

Further analysis of their 2005 data from this German group of researchers in 2006 continued to support decreased HRQL on SF-36 subscales in women with PCOS, particularly those with more psychological distress as measured by the SCL-90-R (Elsenbruch et al., 2006). Women with PCOS who had a SCL-90-R Global Severity Index (GSI) of at least 63 (n = 22, 15.4% of sample) indicating a possible psychological disorder scored significantly lower on all SF-36 subscales than women with PCOS with GSI scores less than 63 (n = 121) which is indicative of normal psychological functioning. Women with PCOS with elevated and normal GSI scores also scored significantly lower than German normative data on the SF-36 subscales. These results suggested that women with PCOS with normal GSI scores have lower HRQL despite normal GSI scores. BMI was significantly greater in the psychologically distressed women with PCOS. In this study, moreover, Elsenbruch et al. (2006) found that desire to conceive, age, and level of psychological distress accounted for 47% of the variance in the SF-36 psychological sum score. Removing psychological distress reduced the variance from age and desire to conceive to 10%. The SF-36 physical sum score was predicted by BMI and education. Psychological distress appeared to be a significant predictor of decreased HRQL in the psychosocial area of HRQL, whereas BMI appeared to affect the physical aspects of HRQL. The relationship between BMI and physical aspects of HRQL is logical as excess weight may contribute to problems with mobility and pain from stress on joints. Other studies by the German group (Benson et al., 2007; Benson et al., 2009; Benson et al., 2010; Tan et al., 2008) continued to support the supposition that psychological distress including depression, anxiety, and maladaptive coping processes affects the HRQL of women with PCOS. As mentioned earlier, while the generic HRQL SF-36 provides important HRQL information, the tool does not provide specific HRQL information related to the symptoms of PCOS.
HRQL: Studies with the Disease Specific PCOSQ

The PCOSQ provides a different perspective on HRQL in women than the generic SF-36; the PCOSQ provides information on PCOS specific symptoms that may affect HRQL. Guyatt et al. (2004) (Canada/UK/USA) found in a baseline sample of 393 women with PCOS that weight was the domain of greatest concern, followed by hirsutism, menstruation/infertility (tied) and finally, emotion was the domain of least concern to women with PCOS. Scores were moderate to high (2.61-4.27) in the PCOSQ range of 1-7 suggesting moderate to high perceived reductions in HRQL.

Jones et al. (2004) (UK) examined HRQL with the PCOSQ in a sample of 82 British women. In this sample, weight was again the HRQL area of greatest concern followed by infertility, menstrual dysfunction, emotions, and hirsutism. Similarly, McCook, Reame, and Thatcher (2005) (USA) found that the PCOSQ domains of greatest concern were ranked as follows: weight, menstrual problems, infertility, emotions, and hirsutism. Scores were again moderate to high (2.33-4.34). BMI was significantly correlated with the weight subscale of the PCOSQ. Women who had been pregnant but had not delivered a viable infant had the lowest scores on the infertility subscale. The hirsutism subscale score correlated with the woman’s Ferriman-Gallwey (F/G) score. The F/G score was also significantly correlated with emotions.

In summary, weight appears to be the PCOSQ domain that most affects the HRQL of western women with PCOS. Infertility and menstrual problems appear to be the next area of concern. Hirsutism and emotions appear to be the areas of least concern to western women with PCOS as measured by the PCOSQ. This result is interesting as it will be shown in a later section that women with PCOS are at risk for the development of depression. Cultural differences in women’s attitudes to their PCOS symptoms will also be addressed in a later section. While the PCOSQ correlates with the SF-36, the PCOSQ provides more disease specific information on which aspects of PCOS most affect a woman’s HRQL. The degree of decreased HRQL in women
with PCOS appears to be in the high to moderate category suggesting that PCOS symptoms have an important impact on the HRQL in women with PCOS.

**HRQL in Women with PCOS: Studies with Generic and Disease Specific Instruments**

Several studies have been conducted in women with PCOS using both generic and disease specific HRLQ instruments. Coffey, Bano, and Mason (2006) (UK) examined HRQL in a sample of women with PCOS \( (n=22) \) compared to a control sample of women \( (n=96) \). The women with PCOS were also compared to normative data on HRQL in adults with chronic illnesses including asthma, epilepsy, diabetes, back pain, arthritis, and coronary heart disease. The SF-36 scores of the women with PCOS were significantly lower in 6 of 8 domains on the SF-36; however, the differences in the SF-36 scales largely disappeared when adjustment was made for BMI between the two groups of women which suggests that BMI was a key factor in HRQL scores. The psychological SF-36 sum score was moderate at 45.1, and the physical sum score was also moderate at 37.2 The PCOSQ revealed different results. Compared to the control group of women, women with PCOS had a 59% lower score on the weight domain, 51% lower score for infertility, 48% lower for hirsutism issues, 40% lower score on the emotions domain, and 37% lower for menstrual dysfunction. After controlling for BMI, the PCOSQ scores continued to be lower than the control group. These results suggested that the disease specific PCOSQ has greater discriminative ability to detect differences between women with PCOS and controls. Compared to the normative data from patients with other chronic illness groups, the mental composite score for women with PCOS was 20% lower than patients in any of the illness groups. The physical composite score was the same for women with PCOS and patients with asthma, epilepsy, diabetes, and back pain, but the women with PCOS scored higher and therefore, considered their physical symptoms milder compared to patients with arthritis and coronary heart disease.

Another study from Australia (Ching, Burke, & Stuckey, 2007) examined the effects of patient information regarding PCOS and HRQL in a sample of women with PCOS \( (N=173) \) using the SF-36 and PCOSQ. The SF-36 results were compared to age and sex-matched
Australian normative data. The HRQL of women with PCOS was significantly lower than normative data on the SF-36 in the domains of physical, bodily pain, general health, vitality, social function, role emotion, and mental health. Increased BMI was associated with decreased HRQL in several areas and age was associated with decreased physical function and role physical. Socioeconomic status did not affect the results. For the PCOSQ, BMI was negatively associated with decreased HRQL in all domains except hirsutism. Age was negatively correlated with hirsutism and weight. Weight was the greatest PCOS domain of concern, followed by hirsutism, menstrual problems, infertility, and emotions. Patient education was significantly correlated with HRQL on the SF-36; the perception of adequate information regarding PCOS significantly correlated with higher HRQL scores. Women with PCOS received most of the information from a specialist physician (47%) followed by the Internet (39%), books (27%), family physician (16%), magazines (15%), medical journals (9%), dietician (6%), friend (6%), and a nurse (2%).

The SF-36 and the PCOSQ both have the ability to measure HRQL in women with PCOS and controls. However, the PCOSQ continues to provide a more specific and discriminative view of how PCOS symptoms affect a woman’s HRQL. Weight continues to be a dominant issue affecting HRQL. While decreased HRQL is independent of BMI in some studies, BMI is a factor in decreased HRQL according to other studies. However, other factors may contribute to decreased HRQL as well. All of the commonly measured signs and symptoms of PCOS adversely affect a woman’s HRQL.

**HRQL in Women with PCOS: BMI**

Increased BMI contributes to decreased HRQL in some women with PCOS, but the relationship between BMI and HRQL is complex. Some studies found that BMI was a factor in decreased HRQL (Álvarez-Blasco, Luque-Ramirez & Escobar-Morreale, 2010). Other studies found that decreased HRQL was independent of BMI (Ching et al., 2007; Coffey et al., 2006; Elsenbruch et al., 2003; Hahn et al., 2005). BMI appears to be more related to physical function
HRQL than psychological HRQL (Benson et al., 2008; Elsenbruch et al., 2006; Hahn et al., 2005). In contrast, Benson et al. (2009; 2010) found a significant relationship between BMI and both physical and psychological HRQL. However, the Benson et al. (2009; 2010) studies were limited by the use of an internet format from a PCOS support web site with a self-report PCOS diagnosis. Ching et al. (2007) found a significant relationship between BMI and physical and mental health aspects of the SF-36. Of interest, Ching et al. (2007) found that women with PCOS (mean BMI 33.7 kg/m$^2$) had significantly poorer HRQL than overweight and obese women in the general Australian population, suggesting that factors other than BMI may contribute to decreased HRQL. Coffey et al. (2006) found that normal weight women with PCOS also appeared to have concerns about their weight.

For the more discriminative PCOSQ, McCook et al. (2005) found that BMI predicted scores on the weight subscale, but not on the subscales of body hair, emotions, infertility or menstrual dysfunction. Higher BMI scores were associated with decreasing weight subscales scores.

The Spanish researchers Álvarez-Blasco et al. (2010) evaluated the effects of obesity on the HRQL in women with PCOS ($n = 32$) compared to weight matched control women ($n = 72$). The women were grouped by BMI into overweight (BMI 25.0-29.9 kg/m$^2$), Grade 1 obesity (BMI 30.0-34.9 kg/m$^2$), Grade 2 obesity (BMI 35.0-39.9 kg/m$^2$), and Grade 3 obesity (BMI $\geq 40$ kg/m$^2$) The SF-36 scores were similar between groups except that the women with PCOS scored significantly worse than controls in the emotional role function. Women with Grade 2 and Grade 3 obesity had lower or worse scores than overweight women in the physical functioning item and general health was reduced in women with Grade 3 obesity. These results indicated that weight affected HRQL scores more than other PCOS symptoms. Hahn et al. (2005) also found decreasing physical HRQL with increasing BMI, but no effect on psychological health scores using the SF-36.
**HRQL in Women with PCOS: Sociodemographics**

Some aspects of sociodemographic status may influence HRQL in women with PCOS, although, again, the results are not consistent across studies. No differences were found in one study between groups of women with and without PCOS with respect to age, family status or marriage, education or employment, finances, leisure activities, friends, or living conditions suggesting HRQL scores were independent of sociodemographic variables (Elsenbruch et al., 2003). However, Elsenbruch et al. (2006) later found that education contributed a small but significant amount to the physical SF-36 HRQL sum score ($\beta = .292$, $p < .001$), while age ($\beta = .194$, $p < .05$) desire to conceive ($\beta = -.265$, $p < .01$), and education ($\beta = -.172$) contributed to the SF-36 psychological HRQL sum score. Ching et al. (2007) also found that age significantly affected hirsutism and weight scores. Ladson et al. (2011) did not find significant differences between black and white women with PCOS, although black women with PCOS scored higher on HRQL on the PCOSQ than white women. Lack of adequate information about PCOS may also contribute to decreased HRQL in women with PCOS (Ching et al., 2007).

**HRQL in Women with PCOS: Infertility**

The relationship between infertility and HRQL in women with PCOS, like weight, is a complex issue. Hahn et al. (2005) did not find significant psychological correlations between women with PCOS who had a desire to conceive and those without a desire to conceive. However, in 2006, Elsenbruch et al. found a small but significant correlation between desire to conceive ($\beta = -.262$, $p < .01$) and the psychological sum score of the SF-36. Trent et al. (2003) found that adolescent girls with PCOS were 3.4 times more likely than controls to be concerned about fertility. The adolescent girls concerned about fertility also had significantly reduced HRQL scores.

In 2008, a German research group (Tan et al.) examined the role of infertility on the psychological functioning of women with PCOS. The study sample consisted of 115 untreated women with PCOS with an average age of 28 and an average BMI of 32.3 kg/m². In the sample,
59 of the women had an unfulfilled wish to conceive and 56 women did not have a current wish to conceive. In addition, 76.1% of the women expressed anxiety about remaining childless. HRQL scores were significantly lower than the German norm, but there were no differences in scores between the two groups of women with PCOS based on desire to conceive. The authors commented that the higher percentage of women expressing anxiety about ability to conceive a child indicated that fertility concerns are important to women with PCOS. However, the study indicated no differences in HRQL, depressive symptoms, or emotional distress between groups of women based on desire to conceive. Consequently, the authors suggested that infertility was not the sole factor explaining decreased HRQL and increased depressive symptoms in women with PCOS.

On the PCOSQ, results indicate that infertility is an issue of concern to women with PCOS. Infertility often ranks first in Middle Eastern women (Jones et al., 2010; Schmid, Kirchengast, Vytska-Binstorfer & Huber, 2004) and second or third in western women with PCOS (Jones et al., 2004; McCook et al., 2005). Fertility concerns are an issue with women with PCOS, although infertility does not appear to solely account for decreased HRQL in women with PCOS.

**HRQL in Women with PCOS: Hirsutism**

Hirsutism affects the HRQL of women with PCOS. Some studies (including the qualitative study by Kitzinger & Willmott, 2002) indicated that women with PCOS believed their hirsutism issues made them less sexually attractive and feminine (Elsenbruch, 2003; Kitzinger & Willmott, 2002). Hirsutism scores significantly correlated with HRQL areas of bodily pain, general health perception, and physical sum score on the SF-36 (Hahn et al., 2005). In another study, Hahn et al. (2006) found that hirsutism scores significantly correlated with SF-36 scores on pain, general health perception, and physical sum score. McCook, Reame, and Thatcher (2005) found that Ferriman-Gallwey scores correlated with hirsutism and emotions subscales on the PCOSQ suggesting hirsutism was associated with decreased emotional health, although in this
sample emotions rated 4/5 in participant concern. However, on the PCOSQ, weight and infertility usually rank higher than hirsutism issues, with hirsutism, in general, being an area of lesser concern (Jones et al., 2004; McCook et al., 2005). While hirsutism is an important PCOS symptom, it does not appear to be the sole determinant of decreased HRQL in women with PCOS.

**HRQL in Women with PCOS: Androgen levels**

Androgen levels do not appear to affect HRQL scores on the SF-36. Hahn et al. (2005) and Elsenbruch et al. (2006) found no significant correlations between testosterone levels and HRQL. There had been earlier speculation (Weiner et al., 2004) that androgen levels might affect mood function in women with PCOS.

**HRQL in Women with PCOS: Insulin Resistance**

Insulin resistance does not appear to affect HRQL in women with PCOS as measured by the SF-36. Hahn et al. (2005) found that controlling for BMI eliminated differences between insulin resistance scores, area under the insulin resistance curve (AUC-1) and homeostasis model assessment of insulin resistance (HOMA-IR) in women with and without PCOS. Elsenbruch et al. (2006) further confirmed that insulin resistance did not affect HRQL in women with PCOS.

**HRQL in Women with PCOS: Acne**

The effects of acne on the psychological HRQL of women with PCOS are uncertain, although many women with PCOS suffer from acne (Jones et al., 2004). Hahn et al. (2005) found no significant correlations between women with and without acne on the psychological scores of the SF-36. A limitation to studying the effects of acne on HRQL is that neither the SF-36 nor the PCOSQ contains an acne subscale, which has been acknowledged as a problem with the PCOSQ (Jones et al., 2004).

**HRQL in Women with PCOS: Ethnic Variations**

A few research studies in women with PCOS suggest there may be ethnic differences in the attitudes of women regarding their PCOS problems that are reflected in their HRQL. Schmid
et al. (2004) (Austria) examined the effects of ethnicity of PCOS symptoms, and, in particular, infertility in a sample of 35 Austrian and 14 Moslem immigrant women in Austria with PCOS. In the sample, 66.7% of the Moslem women were overweight (BMI≥25.0 kg/m^2) compared to 48.0% of the Austrian women. The study used the PCOSQ. The results demonstrated that the Moslem women scored higher on all 5 domains of the PCOSQ indicating greater personal problems with PCOS symptoms. Infertility and menstrual disturbances were more of a problem for the Muslim women than for the Austrian women. Although there were no differences in the weight between the two groups (mean BMI for Austrians 26.5 kg/m^2, for Muslims 26.9 kg/m^2), weight was the second most problematic area for Austrian women after infertility, and weight was the least problem for Muslim women. The most problematic areas for Austrian women in rank were: infertility, weight, hirsutism, menstrual disturbances, and emotions. For the Muslim women the rankings were: infertility, hirsutism, menstrual disturbances, emotions, and weight. These results may reflect cultural values such as the emphasis in the Islamic world on childbearing and the western concept of the ideal thin woman may reflect greater concern about weight among Austrian women. Therefore, it is important to recognize that cultural differences may affect a woman’s response to her PCOS symptoms.

In another cross-cultural study, Jones et al. (2010) (UK) compared the HRQL between Caucasian women with PCOS (n =129) and women with PCOS from the South Asian subcontinent of India, Pakistan, Sri Lanka, Bangladesh, and Nepal (N = 42) who were living in the UK. HRQL was measured with the PCOSQ and the SF-36. The lowest scoring areas for the South Asian women on the PCOSQ were infertility, followed by weight, hirsutism, emotions, and menstrual problems. For the Caucasian women, the domain of greatest concern was weight, followed by infertility, menstrual problems, emotions, and hirsutism. On the SF-36, South Asian women scored significantly lower in all areas of the SF-36 compared to Caucasian women. While HRQL scores were lower for the South Asian women compared to Asian normative data, the South Asian women scored significantly lower on social functioning and general health. The
Caucasian women with PCOS scored lower than Caucasian normative data in several areas with the most significant being role-emotional and social functioning. While HRQL on the SF-36 was lower in South Asian compared to Caucasian women, the results of the PCOSQ were very similar with weight and infertility being the issues of greatest concern for both groups of women. This study adds to the influence of culture and ethnicity in the HRQL evaluation of women with PCOS.

For comparison, another study of women with PCOS in India, (Sundararaman, Shweta, & Sridhar, 2008) (India) examined the levels of psychological distress in women with PCOS (N = 99). The study used the General Health Questionnaire (GHQ-28). The GHQ-28 is a validated psychological instrument with subscales to measure social dysfunction and depression. In the sample, 54% had a GSQ-28 score >8 suggesting psychological distress. PCOS symptoms that significantly correlated with the GSQ-28 score included family size <4, obesity, hirsutism, waist circumference >88 cm, Ferriman-Gallwey score >4. This study again supports the increased psychological distress and poor HRQL in women with PCOS. The authors noted that weight appeared to be the area of greatest concern for women with PCOS in western societies, while in non-western cultures, infertility appeared to be more stressful for women. In this study, appearance and infertility appeared to have the largest effect on HRQL in Indian women with PCOS.

Kumarapeli et al. (2010) (Sri Lanka) examined the effects of psychological distress on HRQL in a sample of Sri Lankan women with PCOS (N = 146) compared to a control group of women without PCOS (n = 170). HRQL and psychological health was measured with the World Health Organization Quality of Life questionnaire (WHOQOL-BREF) and the 30 item General Health Questionnaire (GHQ30). The WHOQOL-BREF is a shortened version of the WHOQOL-100 that measures the quality of life domains of physical health, psychological health, social relationships, and environment. The women with PCOS scored significantly lower on the physical health, psychological health and social relationships domains of the WHOQOL-BREF.
compared to controls. There was not a significant difference in the environmental score although women with PCOS scored lower than controls. The GHQ30 score was significantly higher in women with PCOS (mean 5.25) compared to the control group (mean 1.58) indicating greater psychological distress. A GHQ score of greater than or equal to 6 indicates psychological distress and 32.9% of the women with PCOS reached this score. None of the controls scored greater than or equal to 6. Hirsutism was the only factor identified among PCOS symptoms that was significantly correlated with psychological distress. None of the common PCOS symptoms (oligo/amenorrhea, acne, hirsutism, generalized obesity, central obesity, or subfertility were significant predictors of decreased HRQL in women with PCOS. It was noteworthy that only 52.8% of the sample with a BMI greater than or equal to 25 kg/m² perceived themselves to be obese suggesting that the perception of obesity is less than its actual occurrence. This study again suggests that women with PCOS experience greater psychological distress and lower HRQL than women without PCOS. Hirsutism rather than BMI was associated with psychological distress in this group of South Asian women. The determinants of decreased HRQL continue to be elusive.

Hashimoto et al., (2003) (Brazil/Austria) compared subjective assessment of PCOS symptomatology and weight status on HRQL using the PCOSQ with a sample of 31 Austrian women with PCOS and 102 Brazilian women with PCOS each living respectively in their own country. The results from the PCOSQ indicated that the Brazilian women with PCOS were most concerned with hirsutism, followed by infertility, menstrual dysfunction, and weight. For the Austrian women, their HRQL was most affected by weight, followed by menstrual dysfunction, infertility, and hirsutism. Emotion scores were not discussed. The Austrian and Brazilian women had a nearly equal PCOSQ score on weight although the Brazilian women were heavier than the Austrian women. This study suggests that cultural influences such as the western ideal of a thin woman may influence a woman’s perception of herself within the context of her PCOS symptoms.
Finally, Ladson et al. (2011 b) (USA) looked for racial differences between black and white American women with PCOS. Their sample consisted of 77 white (mean age 26, mean BMI 37.7 kg/m$^2$) and 43 black women with PCOS (mean age 27.9, mean BMI 39.0 kg/m$^2$).

HRQL was measured with the PCOSQ. Composite scores indicated that black women with PCOS had a more favorable outlook on HRQL with higher scores for physical, emotional, and general well-being, although there were no significant differences between groups for the individual PCOSQ domain scores. Overall, the differences between black and white women with PCOS were few and minor; consequently black and white women with PCOS could be grouped together according to the authors.

**HRQL in Women with PCOS: Treatment**

Treatment of PCOS symptoms appears to improve HRQL. Various treatment therapies are used to help women manage the symptoms of PCOS. Metformin, an insulin sensitizer and anti-androgen medication, is often used to treat insulin resistance, as well as ovulation dysfunction in women with PCOS (Futterweit, 2007). Hahn et al. (2006) (Germany) reported that a 6 month course of metformin improved the psychological aspects of HRQL as measured by the SF-36. Van Wely, Bayram, Bossuyt, and van der Veen (2004) (The Netherlands) examined the effects of 2 different methods of ovulation induction (electrocautery of the ovaries or recombinant follicle stimulating hormone (FSH) on HRQL in a sample of 168 infertile women with PCOS. The HRQL instrument was the SF-36. The SF-36 indicated no significant differences between the groups in HRQL in follow-up, although a pregnancy resulted in better mental health. The SF-36 scores for psychological distress and overall quality of life were comparable to a reference norm population. This report is contrary to the German research group who previously reported who noted that the HRQL scores in women with PCOS as measured by the SF-36 were significantly lower than the German norm on most of the SF-36 subscales (Elsenbruch et al., 2006). This suggests the possibility of a cultural difference between German and Dutch women with PCOS.
regarding HRQL. Successful treatment of the PCOS symptom of infertility did improve some HRQL outcomes.

Treatment of hirsutism, although not often ranked at the top of women’s concerns with PCOS, nevertheless, does improve HRQL. Clayton, Lipton, Elford, Rustin and Sherr (2005) (UK) found that a 6 month laser intervention treatment of hirsutism in a sample of women \((n = 51)\) with PCOS versus a sham laser intervention in a control sample of women with PCOS \((n = 37)\) improved HRQL. At the end of the trial, both groups reported feeling better knowing that someone was able to help them, although this was more significant for the intervention group. Lipton, Sherr, Elford, Rustin, and Clayton (2006) further described the baseline characteristics of the group of 88 women with PCOS mentioned in the previous intervention study. The overall HRQL measured by the World Health Organization Quality of Life instrument (WHOQOL-BREF) was moderate to good, although reduced HRQL was associated with higher levels of depression and anxiety and low self-esteem. Over 50% of the sample of women scored above the midpoint on each of the QOL subscales: physical (81.6%), environmental (80.5%), psychological (56.3%), and social (56.3%). Low self-esteem was also associated with higher depression and anxiety. However, the mean score for self-esteem reflected moderate to high levels of self-esteem. It was interesting that while only 24.4% of the sample demonstrated no evidence of psychological morbidity, the overall quality of HRQL was moderate to good and for self-esteem, moderate to high.

Lifestyle interventions, including diet and exercise, can improve HRQL in women with PCOS, but drop-out rates in the studies are high indicating that motivation and retention are possible hindrances to lifestyle interventions (Ladson, 2011a). Thomson, Buckley, Lim, Noakes, Clifton, Norman, et al. (2010) assessed a lifestyle management intervention on HRQL and depression in overweight and obese women with PCOS \((N = 94)\). The 3 interventions consisted of diet, diet and aerobic exercise, or diet and combined aerobic-resistance exercise for 20 weeks. All 3 groups had significant improvements in the PCOSQ scores, except for the hirsutism domain, at
week 20. Body weight correlated with changes in the emotion and weight domain. This study further indicated that lifestyle interventions can improve HRQL, possibly through weight loss. The dropout rate in this study was high with 52/94 women completing the study.

Ladson et al. (2011a) explored the effects of a lifestyle intervention composed of diet and exercise with metformin on HRQL and the symptoms of PCOS. The sample consisted of 2 groups of women with PCOS. One group received lifestyle plus metformin and the placebo group received lifestyle plus a placebo. The dropout rate was high and from the intervention group of 55, 22 completed the study. In the placebo group, 59 began the study and 16 finished. At 6 months completion, there were no significant changes in HRQL scores between the two groups, although the domains of emotions and weight improved within each group. The authors noted that the dropout rate could indicate that women with PCOS are unwilling or lose motivation, although lifestyle therapy is effective for women with PCOS.

While complementary and alternative medicine (CAM) is used by many adults, its use in PCOS has not been well described. Raja-Khan, Stener-Victorin, Wu, and Legro (2011) discussed the possibilities of CAM therapy for women with PCOS. While CAM therapy such as acupuncture, Chinese herbal medicine, dietary supplements, Qi Gong, Tai Chi, and mindfulness meditation may have the potential to improve clinical and HRQL in women with PCOS, studies supporting CAM therapy in women are very limited and need further investigation.

**HRQL in Women with PCOS: Systematic Reviews**

Several systematic reviews have evaluated HRQL in women with PCOS. Jones et al. (2008) conducted a systematic review of the literature evaluating HRQL in women with PCOS. The review examined 19 studies that measured HRQL in more than one dimension using standard HRQL instruments. The review concluded that PCOS adversely affects the HRQL of women with the syndrome compared to control groups of women without PCOS. The symptoms of PCOS result in decreased HRQL. The role of BMI in HRQL is very complex. Women with PCOS have been shown to have reduced HRQL independent of BMI. Also, BMI tends to be more correlated
with physical symptoms than psychological symptoms. Increased weight, however, continues to be shown to influence HRQL in women with PCOS. Infertility was also identified in the review as an area of concern to women with PCOS. The authors noted that the number of reviewed studies indicated that clinicians and researchers were more aware of the importance of researching HRQL issues in women with PCOS.

Coffey and Mason (2003) conducted an older systematic review of HRQL on women with PCOS. They identified 7 studies examining HRQL in women with PCOS. Two of the studies are the previously mentioned studies by Trent et al. (2003) and Cronin et al. (1998). Their review also concluded that PCOS was associated with decreased HRQL. Their review found that increased weight and hirsutism affected HRQL more than menstrual dysfunction or infertility. Acne also negatively affected HRQL. However except for the Cronin et al. (1998) and the Trent et al. (2003) studies, limitations of this review included the use of interviews or non-standard HRQL measures. Again, this systematic review reinforces the negative effects of PCOS on the HRQL of affected women and demonstrates the steady progress that has been made in studying this issue.

**Limitations of HRQL Studies in Women with PCOS**

The HRQL studies that were analyzed for this review of HRQL in women with PCOS had several limitations. Limitations of reviewed studies included small sample size (for example, 49 women with PCOS for study), repeated use of the same sample for some of the studies, and controls not BMI matched with PCOS women. Few studies used the recommended generic and disease specific measurements together for comparison of HRQL. Also, various instruments were used to measure HRQL which could affect the results. This series of HRQL studies indicates the importance of continuing to develop and implement research studies to examine HRQL in women with PCOS.
Summary of HRQL Studies in Women with PCOS

This review of the literature on HRQL in women with PCOS strongly suggests that women with PCOS experience decreased HRQL in comparison with control groups of women without PCOS and/or normative data. Results are mixed, however, with some studies not indicating a difference in HRQL between groups. Overall, the evidence indicates that PCOS does affect the HRQL of affected women.

The etiology of the decreased HRQL may be multifactorial. Obesity is associated with decreased HRQL in people without PCOS (Kolotkin, Meter, & Williams, 2001). Approximately 55-60% of women with PCOS are overweight (Futterweit, 2007). While some studies indicate that obesity is associated with decreased HRQL in women with PCOS, other studies suggest that decreased HRQL is independent of BMI. Similarly, many women with PCOS express concerns about their ability to bear children. Yet once again, some studies do not consistently link infertility with decreased HRQL. The research suggests that all of the common symptoms of PCOS as measured by the PCOSQ are related to decreased HRQL. The five domains of weight, infertility, menstrual dysfunction, hirsutism, and emotions are the areas that women with PCOS suggested to the PCOSQ tool developers as areas of concern for them. Therefore, all of the symptoms of PCOS may contribute to decreased HRQL, in general, although the exact role of specific symptoms such as BMI or infertility, for example, is complex.

Cultural variations among women with PCOS are important in evaluating HRQL. This review of the HRQL literature in women with PCOS reveals the transcultural approach to evaluating HRQL. Western women with PCOS live in a culture where thinness is the feminine ideal so weight may be an area of important concern to them. However, Middle Eastern women live in a culture that values children so infertility and menstrual disorders may be of chief concern to them.

Treatment of PCOS symptoms such as infertility, weight, and hirsutism appear to improve HRQL. Lifestyle modification can be effective in improving HRQL and decreasing the
risk for complications of PCOS such as CVD and T2DM. Unfortunately, lifestyle intervention studies had very high dropout rates suggesting that lifestyle interventions may be difficult to implement and sustain. Hair removal treatment improves HRQL, but cost may be a factor with most insurance carriers declining to cover the cost of hair removal. CAM therapy may be a useful adjunct therapy with conventional allopathic medicine, but the limited results preclude conclusions.

Decreased HRQL is an area of documented concern to women with PCOS. HRQL affects a person’s ability to be happy and effectively manage the physical, emotional, and social perspectives of their condition. Limited data suggest that women with PCOS may use maladaptive coping processes (Özenli et al., 2008; Benson et al., 2010). The literature also suggests that patient perception of their PCOS condition affects their HRQL.

An alternative method to examining the reasons behind decreased HRQL involves approaching the topic from the perspective of the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984). None of the reviewed studies examined the relationship among depressive and anxiety symptoms, perceived stress, BMI, and coping processes on the HRQL of women with PCOS. Most of the reviewed studies measured the HRQL of women with PCOS with a HRQL tool and then tried to correlate the results with clinical or biochemical measures such as BMI, hirsutism scores, androgen levels, or desire for a child. Lazarus and Folkman (1984) suggested that the relationship between the person and the source of psychological stress (perceived stress) is influential in appraisal of a situation and subsequent coping processes and HRQL. For example, rather than BMI alone causing decreased HRQL, it may be the woman’s appraisal of her BMI that is significant. One woman may not be affected by her weight, while another woman may be significantly affected by her weight. This appraisal of perceived stress could account for some of the discrepancies in the studies over specific symptoms such as BMI or infertility. Measuring levels of perceived stress in women with PCOS, as well as further identification of coping processes may produce additional information to help researchers,
educators, and clinicians further understand HRQL in women with PCOS. This information could then be used to identify coping processes that either support or do not support HRQL in women with PCOS.

**Depressive Symptoms in Women with PCOS**

Women with PCOS have an increased risk for developing depressive symptoms (Dokras et al., 2011). The etiology of this risk is unclear (Dokras et al., 2011). This section of the literature review will examine studies evaluating depressive risk in women with PCOS. Depressive risk in women with PCOS needs to be understood, recognized, and treated to avoid the adverse health outcomes, such as CVD, associated with depression. The evidence table for relevant research studies for depressive symptoms is found in Appendix A, Table 11.

The Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV-TR, 2000) defines a Major Depressive Episode (MDE) as “a period of at least 2 weeks during which there is either depressed mood or the loss of interest or pleasure in nearly all activities” (p. 349). In addition to the two major symptoms, five or more of the following symptoms must also be present for diagnosis: depressed mood most of the day or almost every day, loss of interest or pleasure in most activities most of the day or almost every day, weight loss or appetite changes, insomnia problems, psychomotor disturbances, fatigue, feelings of worthlessness or guilt, concentration disturbances, thoughts of death or suicide. To diagnose depression, other causes of depressed mood need to be excluded such as a medical condition, substance abuse, or bereavement. The prevalence of MDE is approximately 10-25% for women and 5-12% in men. MDE is 1.5-3 times more common among first-degree biologic relatives with the disorder than among the general population. Episodes of MDE often occur after a stressful life event.

In addition to MDE, people can have Dysthymic Disorder which is defined as “depressed mood for most of the day, for more days than not…for at least 2 years” (DSM-IV-TR, 2000, p. 380). In addition, the person needs to experience the following symptoms: appetite changes,
insomnia difficulties, fatigue, decreased self-esteem, concentration difficulties, or hopelessness.

Exclusion criteria are the same as for MDD.

A major depressive disorder (MDD) is categorized as recurrent MDEs that are not accountable by other psychiatric or medical diagnosis (DSM-IV-TR, 2000). The lifetime risk for MDD is 10-25% in women and 5-12% in men (DSM-IV-TR, 2000). The average age on onset is in a person’s 20s (DSM-IV-TR, 2000).

Depression affects a person’s ability to enjoy the pleasures and interests in life (DSM-IV-R, 2000). A person’s well-being may be affected by depression evidenced by difficulties in social interactions, marriage, occupation, or academics. Depression may also affect a person’s ability to think, concentrate, or make decisions (DSM-IV-R, 2000).

Depression places a significant economic burden on our society and health care system. Hollinrake, Abreu, Maifeld, Van Voorhis, and Dokras (2007) reported that depression resulted in an economic burden of $44 billion in absenteeism and lost productivity compared to $13 billion for people without depression.

**Women and Depression**

Women, in general, have an increased risk for depression. According to Mental Health America (MHA) (2011), 12 million women in the US have clinical depression each year with 1 in 8 women estimated to develop clinical depression in their life. The rate of depression in women is estimated to be twice the rate of depression in men (MHA, 2011). The cause of depression in women may be multifactorial including hormonal, reproductive, genetic, and developmental differences as well as differing social pressures such as the stress from work, family responsibilities, sexual abuse, and poverty. MHA also reports that depression in women is misdiagnosed in approximately 30-50% of cases. Less than 50% of women with clinical depression seek care for their depressive symptoms. The peak age for depression in women is between the ages of 25-44.
An Australian survey (Wilhelm, Mitchell, Slade, Brownhill, & Andrews, 2003) examined the prevalence of depression with data collected from the National Survey of Mental Health and Well-being (NSMHWB) that included 10,641 adults aged 18-75. The total prevalence rate for major depression was 3.2% with women having an increased rate (3.9% women, 2.4% men). Predictors of major depression included being female, unemployment, smoking and having a medical condition.

Kessler, Berglund, Demler, Jun, Koretz, and Merikangras et al. (2003) examined the lifetime risk for major depressive disorder with participants (n = 9083) aged 18 years and older in the National Comorbidity Survey Replication conducted in the US from 2001-2002. Women had a greater odds ratio (1.7) than men (1.0) for a lifetime risk of developing major depressive disorder. The lifetime risk was highest among people aged 30-44 years, followed by the 45-59 years old group. These results suggest that women with PCOS may be at risk for the development of depression due to their predisposing factors of female gender and chronic PCOS condition.

**Depression and Cardiovascular Disease**

Current literature suggests the potential exists for a link between depression and cardiovascular disease (CVD) risk which is another major reason for assessing and evaluating women with PCOS who may have depressive symptoms. Women with PCOS are at risk for the development of CVD (Wild et al., 2010). A meta-analysis of 55 studies with 146,538 participants suggested there was an 80% increased risk of developing or dying from CVD in relationship with depression (Nicholson, Kuper, & Hemingway, 2006). However, the authors noted that due to limitations of the studies, depression could not be established as an independent risk factor for CVD. Another longitudinal study of 7641 adults aged 17-39 from the 1988-1994 Third National Health and Nutritional examination Survey suggested in adults less than 40 years of age, depression and a history of attempted suicide were each significantly associated with CVD and ischemic heart disease in both men and women (Shah, Veledar, Hong, Bremner, & Vaccarino, 2011). Women with PCOS are at risk for suicide attempts. Månsson et al. (2008) in a study of
depression risk in women with PCOS found that 14% of the 49 women with PCOS had attempted suicide compared to 2% of the control group of women.

In another longitudinal study from the Heart and Soul Study of 1017 outpatients with stable coronary heart disease, the researchers found that the rate of CVD events in people with depression was 10.0% and among people without depression, 6.7% (Whooley et al., 2008). Adjustment for biological mediators such as cortisol levels, and behavioral mediators such as medication and physical activity suggested that physical inactivity explained 44% of the CVD risk. Similarly, from the same Heart and Soul Study, Duivis et al. (2011) suggested that increases in inflammatory markers such as high-sensitivity C-reactive protein (hsCRP) in patients with depressive symptoms and coronary heart disease were related to health behaviors such as inactivity, smoking, and increased weight. Psychological stress can result in depression (Lazarus & Folkman, 1984). Psychological stress may result in CVD through behavioral and/or physiologic mechanisms such as increased cortisol (Shah et al., 2011).

**Cardiovascular Disease Risk in Women with PCOS**

Women with PCOS are at risk for the development of cardiovascular disease (CVD) (Wild et al., 2010). Several risk factors for CVD may be found in women with PCOS. These risk factors include impaired glucose tolerance (IGT) and insulin resistance, dyslipidemia, the metabolic syndrome (MBS), and depression, anxiety, and decreased quality of life (Wild et al., 2010). Insulin resistance is present in approximately 60-80% of women with PCOS and in 95% of women with PCOS who are obese. Dyslipidemia occurs in approximately 70% of women with PCOS. Dyslipidemia may be related to insulin resistance, hyperandrogenism as well as environmental factors such as diet and exercise. MBS consists of elevated blood pressure ($\geq 130/85$ mm Hg), increased waist circumference ($\geq 88$ cm, non-Asian, $\geq 80$ cm for East or South Asian women), elevated fasting glucose ($\geq 100$ mg/dl), decreased high-density lipoprotein (HDL)-cholesterol (HDL-C) ($\leq 50$ mg/dl in women) and elevated triglyceride levels ($\geq 150$ mg/dl). In the US, approximately 33-47% of women with PCOS have MBS (Wild et al., 2010).
Women with PCOS are also at risk for the development of type 2 diabetes (T2DM) which is a risk factor for CVD. Talbott et al. (2007) examined the contribution of PCOS to the overall burden of T2DM in women. The authors estimated that 15.0-35.6% of T2DM in Caucasian mid-life women aged 40-59 could be attributed to PCOS. Approximately 40-45% of women with PCOS will develop T2DM (Futterweit, 2007).

**Depression Instruments**

While many standard tools were used in the reviewed research studies to measure depressive symptoms, the most commonly used tool was the Beck Depression Inventory (BDI) which is fully described in Chapter III. The reviewed studies included other standard measurement tools to measure depressive risk. Measurement tools in the studies extracted for this review included the State-Trait Depression Adjective Checklist, Symptom Checklist Revised (SCL-90-R), the Primary Care Evaluation of Mental Disorder Patient Health Questionnaire (PRIME-MD PHQ), the semi-structured MINI International Neuropsychiatric Interview, the Comprehensive Psychopathological Rating Scale for Affective Syndromes (DPRS-S-A), and the Hospital Anxiety and Depression Scale (HADS).

A commonly used tool in the studies for measuring depression and other aspects of psychological distress is the Symptom Checklist Revised (SCL-90-R). The SCL-90-R measures psychological distress in the areas of somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, aggression, phobia, paranoid ideation, psychoticism, and provides measures for the Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive Symptoms Total (PST). It should be noted that subscales of the SCL-90-R such as depression, anxiety, or phobia cannot be interpreted as diagnostic categories.

**Early Research**

Current research supports an increased risk for depressive symptoms in women with PCOS (Dokras et al., 2011). Recognition of psychological distress in women with PCOS began with early work by researchers such as Orenstein, Raskind, Wyllie, Raskind, and Soules (1986),
Ghaziuddin (1989), and Bruce-Jones, Zolese, and White (1993). The research on depressive risk in women with PCOS has expanded in the past 10 years, as more clinicians and researchers are realizing the risk and long-term health implications for depression in women with PCOS.

Multiple international studies (Germany, Greece, India, Sweden, Turkey, & USA) document a significantly increased risk for depression in women with PCOS compared to control groups of women without PCOS (Bhattachaarya & Jha, 2010; Hahn et al., 2005; Hollinrake et al., 2007; Månsson et al., 2008; Laggari et al., 2009; Özenli et al., 2008; Weiner, Primeau, & Ehrmann, 2004). However, the etiology of this risk is uncertain (Dokras et al. 2011). Researchers have examined the risk for depression in women with PCOS from various perspectives in an attempt to more fully understand and describe the etiology of the increased risk for depressive symptoms.

**Depressive Symptoms in Women with PCOS: Androgen Levels**

Early work examining depressive risk in women with PCOS focused on the relationship between androgen levels and depression. The role of androgens on the brain and behavior of women is controversial (Weiner et al., 2004). For example, premenstrual syndrome (PMS) is a cyclic mood disorder that historically had been proposed to be linked with increased androgens (Bloch, Schmidt, Su, Tobin & Rubinow, 1998; Weiner et al., 2004). Bloch et al. (1998) (USA) did not find increased testosterone levels in 10 women with PMS compared to 10 controls. However, Eriksson, Sunblad, Lisjö, Modigh, and Andersch (1992) (Sweden) found higher levels of free testosterone and dehydroepiandrosterone sulfate (DHEA-S) in 11 women with PMS compared to 11 control women. Van Honk et al. (1999) (The Netherlands) found a significant relationship between saliva testosterone levels and anger and tension in 16 women and 16 men. Further, Baischer, Koinig, Hartman, Huber, and Langer (1995) (Austria) found significantly higher levels of testosterone in 20 premenopausal women diagnosed with major depression compared to 10 age-matched control women.
Against this background, Weiner et al. (2004) (USA) examined the relationship of androgen levels to levels of self-reported depression, anger, anxiety, and aggression in 27 women with PCOS compared to 27 controls case-matched for BMI. The results indicated that women with PCOS had significantly more acute and chronic depressive symptoms than control women (state and trait depression 11.30/12.37 PCOS; 6.81/7.89 Controls). The women with and without PCOS were examined as a group, and the women who had elevated free testosterone levels slightly higher than normal (10-26 pg/ml) exhibited the most depressive symptoms. The authors found a curvilinear relationship between hostility and anxiety with low levels of anxiety and hostility observed at both very high and normal levels of free testosterone. The authors suggested that physical symptoms such as acne and hirsutism did not account for negative mood disorders since the women with the highest levels of free testosterone had acne and hirsutism scores similar to women with PCOS with less negative moods and the women with the highest levels of free testosterone had lower levels of negative moods. Since the subjects were BMI matched, weight was controlled for in the study. The risk for depressive symptoms in women with PCOS was thus independent of BMI. The subjects were also matched for age, ethnicity, and education. This early study on androgens and mood states suggested that there might be a relationship, albeit very complex, between androgen levels and negative mood states in women with PCOS. While women, in general, are more at risk for depression, this study was looking for a link between androgens and depressive, anxiety, anger, and aggression risk that might account for the increased psychiatric symptomatology in women with PCOS compared to women without PCOS.

However, the role of androgens in depressive risk for women with PCOS has since been refuted in several succeeding studies. Hahn et al. (2005) (Germany) examined the effects of PCOS symptoms on psychosocial well-being of women including depression risk. Scores on the depression subscale of the Symptom Checklist-90-R (SCL-90-R) were significantly higher for women with PCOS ($n = 120$) than control women ($n = 50$) suggestive of greater psychological distress. The analysis indicated psychological distress was not associated with androgen levels.
Studies by Adali et al. (2008) (Turkey), Barry, Hardiman, Saxby, and Kuczmierczyk (2011) (UK), Bhattacharya and Jha (2010) (India), Hollinrake et al. (2007) (USA), Månsson et al. (2008) (Sweden), and Soyupek, Guney, Eris, Cerci, Yoidiz, and Mungan (2008) (Turkey) also found no relationship between depression and androgen levels in women with PCOS. The meta-analysis and systematic review of depressive risk in women with PCOS (Dokras et al., 2011) did not find a relationship between androgen levels and depressive risk. In a consensus report that summarized current knowledge about PCOS from the European Society of Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM) 3rd PCOS Consensus Workshop Group, the panel concluded that the evidence did not indicate if the risk for psychological disturbances such as depression was caused by the disorder itself or the manifestations of the disorder such as obesity, hirsutism, menstrual dysfunction, or infertility (Fauser et al., 2012). In summary, the role of androgen levels in depressive risk in women with PCOS is unclear.

**Depressive Symptoms in Women with PCOS: Insulin resistance**

The role of insulin resistance as a predictor of depressive risk in women with PCOS is also uncertain. Insulin resistance is present in approximately 50% of women with PCOS (Futterweit, 2007). Metabolic disturbances such as insulin resistance have been suggested a possible factor contributing to the increased risk of depression in women with PCOS (Hahn et al., 2005; Hollinrake et al., 2007). Insulin resistance has been suggested as a link to depressive risk in women with PCOS through, for example, an interaction between insulin and serotonin (Rasgon et al., 2003). However, links between insulin resistance and depression have not been confirmed (Rasgon et al., 2003). Insulin resistance is usually calculated in studies with the homeostasis model assessment of insulin resistance (HOMA-IR).

Rasgon et al. (2003) (USA) found that depression was significantly associated with insulin resistance in a sample of 16 women with PCOS who had CES-D scores indicating depression, although this was not a controlled study. Hollinrake et al. (2007) (USA) also found
higher levels of insulin resistance in depressed women with PCOS compared to the non-depressed PCOS women in their study. The authors noted that depression is associated with features of insulin resistance such as increased cortisol, decreased serotonin levels, and increased sympathetic activity.

Hahn et al. (2005) found that covarying for BMI eliminated relationships between depression and insulin resistance. Insulin resistance was more associated with BMI than depressive risk. Other studies by Adali et al., 2008, (Turkey) and Benson et al., 2008 (Germany) again suggested that depression was not associated with insulin resistance.

A study by the German group of researchers (Benson et al., 2008) found that inflammatory markers such as high-sensitivity C-reactive protein (hsCRP) and leukocyte numbers did not correlate with BDI scores in women with PCOS suggesting that inflammation was not a factor in the development of depressive symptoms in women with PCOS. Inflammatory markers have been associated with CVD risk (Benson et al., 2008).

The meta-analysis and systematic review of depressive risk in women with PCOS (Dokras et al., 2011) did not suggest a relationship between insulin resistance and depressive risk, although the Hollinrake et al. (2007) study group included Dokras. The review did acknowledge that neuroendocrine circuits including serotonin could be involved in the risk for depression in women with PCOS. In summary, the role of insulin resistance, which is often seen in women with PCOS, remains unclear in the etiology of depressive risk for women with PCOS.

**Depressive Risk in Women with PCOS: Sociodemographic Variables**

In the general population, BDI scores have not been shown to be influenced by socioeconomic status (Dixon et al., 2003). Many studies of depressive risk in women with PCOS versus a control group of women found that socioeconomic factors did not differ between women with PCOS and controls without PCOS (Adali et al., 2008; Bhattacharya and Jha, 2010; Elsenbruch et al., 2003; Hollinrake et al., 2007; Weiner et al., 2004). The studies generally reported that women with and without PCOS did not differ on variables such as age, ethnicity,
family or marital status, education, or employment (Adali et al., 2008; Hahn et al., 2005; Hollinrake et al., 2007; Özenli et al., 2008; Weiner et al., 2004)

One study suggested that sociodemographic variables might be a factor in depressive risk in women with PCOS. Himelein and Thatcher (2006a) (USA) found that body image and education explained 66% of the depression variance in women with PCOS. Education showed a slight significant negative relationship with depression ($r = -1.16$, $p = .06$); the mean years of education in the study were 15.6. Again, the role of sociodemographic data in the etiology of depressive risk in women with PCOS is uncertain.

**Depressive Symptoms in Women with PCOS: Acne, Hirsutism, Menstrual Dysfunction**

Several studies failed to find a relationship between acne, hirsutism, or menstrual dysfunction and psychological symptoms in women with PCOS (Adali et al., 2008; Hahn et al., 2005; Weiner et al., 2004). S reported previously, Hahn et al. (2005) found that hirsutism scores correlated with physical but not psychological aspects of HRQL. Bhattacharya and Jha (2010) (India) did not find a relationship between hirsutism and depression scores in women with PCOS.

**Depressive Symptoms in Women with PCOS: BMI and Weight**

The role of BMI as a risk factor for the development of depression in women with PCOS has been intensely studied from several perspectives. However, the role of BMI continues to be controversial due to varying results of the relationship between depression and BMI. While obesity and depression are linked in several studies in women with PCOS (Soyupek et al., 2008; Månsson et al., 2008; & Adali et al., 2008), depression has also been shown to exist independent of BMI in women with PCOS (Benson et al., 2008; Battaglia et al., 2008; & Hollinrake et al., 2007). Obesity is the most common chronic disease in modern society, and depression is the most common occurring psychological condition (Dixon, Dixon, & O’Brien, 2003). Consequently, it is important to understand the relationship between the two variables in women with PCOS.
**Depression and Obesity**

For baseline information, several studies have examined the relationship between obesity and depression in the general population. Dixon et al. (2003) (Australia) examined the relationship between depression and obesity in a sample of 487 subjects (85% female) before and after gastric weight loss surgery. Prior to surgery, higher Beck Depression Inventory (BDI) scores were significantly associated with severely obese (mean BMI 43.7 kg/m$^2$) women. Higher BDI scores were associated with younger age, female gender, a history of depressive illness, poor physical function, and poor self-evaluation of appearance. Mean BDI scores declined from 17.7 pre-surgery to 7.8 at 1 year post surgery and 9.6 at 4 years post-surgery. Predictors of improved BDI scores were being female, younger age, and greater weight loss. The authors concluded that obesity aggravated depressive symptoms. This study is relevant to women with PCOS since many of the women with PCOS have a poor sense of body satisfaction (Himelein & Thatcher, 2006a).

Onyike, Crum, Lee, Lyketsos, and Eaton (2003) (USA) examined the link between obesity and major depression using data from the Third National Health and Nutrition Survey (1988-1994). The sample population included 39,695 people aged 2 months to over 90 years. The Onyike et al. (2003) study focused on 8,410 people aged 15-39 who participated in the psychiatric interview using the Diagnostic Interview Schedule which allowed for psychiatric diagnoses according to the DSM-III. There were no significant sociodemographic differences between men and women participants. Obesity (BMI $\geq$30 kg/m$^2$) was associated with depression in women with an odds ratio of 1.82, but not in men (odds ratio 1.73). Depression was associated with obesity in both men and women with a BMI$\geq$40 kg/m$^2$. Obesity with a BMI$\geq$40 kg/m$^2$ was also associated with a lifetime depression risk in women (odds ratio 2.15). Increased levels of obesity in women were associated with increased risk for depression over their lifetime. The results controlled for age, education, marital status, health status, use of psychotropic medications, cigarette smoking and use of alcohol or illicit substances. This study demonstrated that obesity and depression may be related to each other.
Stunkard, Faith, and Allison (2003) reviewed the literature examining the association between depression and obesity. The authors proposed that moderators and mediators affected the relationship between depression and obesity. Potential moderators of the relationship included the severity of the depression (more depressed may be more likely to be obese), the severity of the obesity (depression associated with higher levels of obesity), gender (relationship between obesity and gender stronger for women than for men), socioeconomic status (SES) (obesity and depression in women associated with a higher SES class), and gene-environment interactions (potential genetic component). Potential mediators to the relationship between depression and obesity included eating and physical activity (many depressed people are inactive; overeating may be a sign of depression), teasing (teasing of obese people may lead to problems with self-image and subsequent depression), disordered eating (may promote development of depression by stress about eating behavior), and stress (depressed people may experience stress that leads to obesity through physiological means as increased production of cortisol as well as disordered diet and activity. This review indicates that the relationship between depression and obesity in the general population is very complex and may be multifaceted in origin.

**Women with PCOS, Depression, and Obesity**

The results of studies examining the relationship between BMI and depressive risk in women with PCOS are complex. Several studies support that depressive risk exists independent of BMI (Barry, Hardiman, Saxby & Kuczmierczyk, 2011; Benson et al., 2008, Bhattacharya and Jha, 2010). In a BMI-matched, controlled study of depressive risk in women with PCOS, Weiner et al., (2004) (USA) found that the women with PCOS had significantly more acute and chronic depressive symptoms than control women, independent of BMI. Similarly, Hollinrake et al. (2007) (USA) found that controlling for BMI and family history of depression, the odds ratio of a positive screen for depression in women with PCOS was 5.11. While the authors noted a higher risk for depression among obese women with PCOS, there was not a consistent positive association between BDI scores and BMI for all women with PCOS. The risk for depression was
independent of BMI. Barry et al. (2011) (UK) found in an age and BMI matched sample of women with and without PCOS that the women with PCOS had significantly higher levels of depression and anxiety, although the levels of depression were in the normal range for both groups.

Depression risk has been examined in lean women with PCOS. Battaglia et al. (2008) (Italy) examined the risk for depression and sexual dysfunction in a sample of 25 lean women with PCOS (mean age 27.7, mean BMI 21.6 kg/m$^2$) and a sample of 18 control women age and BMI matched (mean age 30.7, mean BMI 21.2 kg/m$^2$). The results demonstrated no significant difference in BDI scores between the 2 groups of women. For women with PCOS, 20% had mild to moderate depression scores, and 4% had moderate to severe depression scores. In comparison, 16% of the control women had mild to moderate depression scores, and 5% had moderate to severe depression scores. It is interesting in that in an age- and BMI- matched sample of lean women with PCOS, depression scores did not significantly vary between women with PCOS and control group of women. This study calls into question again the role of BMI in the development of depression.

Other studies indicate that BMI may play a role in depressive risk in women with PCOS. When Himelein and Thatcher (2006a) controlled for BMI in their study, the difference in depression scores between women with and without PCOS was no longer significant indicating that BMI might be a factor in depressive symptoms. Adali et al. (2008) (Turkey) found in their study of depressive risk in women with PCOS ($n = 42$) versus a control group of women ($n = 42$), that BDI scores were significantly correlated with BMI in women with PCOS. Månsson et al. (2008) (Sweden) also found a relationship between BMI and recurrent depressive disorder, but the authors noted this did not indicate a causal relationship as other factors could be involved. Soyupek et al. (2008) (Turkey) found a positive correlation between BDI scores and BMI. The authors again noted that depression may exist independently of BMI as weight gain and obesity are often associated with depression.
In summary, the relationship between BMI and depressive risk in women with PCOS is unclear. Obesity is linked to depression in the literature. Many women with PCOS are obese. However, studies indicate that depressive risk in women is independent of BMI. A study of lean women found no difference in depression scores between lean, young women with and without PCOS. Other studies have indicated that BMI might be a factor in depressive symptoms in women with PCOS. Månsson et al. (2008) noted that although they found a relationship between BMI and recurrent depressive disorder, this did not indicate a causal relationship. Research, such as this study, may produce other factors that further explain the relationship between BMI and depressive risk in women with PCOS. BMI may be a potential moderator or mediator of these other potentially unknown factors and depressive risk in women with PCOS.

**Depressive Symptoms in Women with PCOS: Infertility**

Infertility has also been intensely examined as a predictor of depressive risk in women with PCOS. The results of this review do not appear to indicate that infertility is a predictor of depressive risk in women with PCOS. Studies that did not indicate a relationship between infertility and depressive symptoms included those by Hahn et al. (2005) (Germany), Hollinrake et al. (2007) (USA), and Månsson et al., (2008) (Sweden).

Himelein and Thatcher (2006a) (USA) compared depressive symptoms in women with PCOS \(n = 40\), women without PCOS who were infertile \(n = 40\), and women who had neither PCOS nor infertility \(n = 40\). Depressive risk was not associated with infertility.

However infertility is a cause of concern to women with PCOS. Trent et al. (2003) found that adolescents with PCOS were 3.4 times more likely than control adolescents to be worried about their future fertility. In one study, women who had lost a pregnancy had the lowest scores on the infertility domain of the PCOSQ (McCook et al., 2005). Also, Muslim women are more likely to be affected by infertility than western women (Schmid et al., 2004). Hollinrake et al. (2007) suggested that while infertility is a common problem in women with PCOS, many women with proper management will achieve a pregnancy and deliver a healthy infant.
In a review of infertility studies in women with PCOS, Jones, Balen, and Ledger (2008) suggested that there had not been enough research in infertility to fully assess its impact on women. Also, instruments such as the PCOSQ or the SF-36 may not have enough questions to assess infertility concerns. They suggested the use of measures such as the Infertility Questionnaire or the Fertility Problem Inventory to further assess infertility issues in women with PCOS.

**Depressive Symptoms in Women with PCOS: No Difference between Groups**

Two reviewed research studies indicated no difference in depression scores between women with PCOS and control women. As previously mentioned, Battaglia et al. (2008) (Italy) did not find a significant difference in BDI scores between lean women with PCOS and lean women without PCOS. Jedel et al. (2010) (Sweden) examined the prevalence of anxiety and depression in a sample of women with PCOS (n = 30) and a control sample of women (n = 30) who were age and BMI matched. The study used the Comprehensive Psychopathological Rating Scale for Affective Syndromes (DPRS-S-A) which assesses anxiety and depressive risk. The depressive subscale is equivalent to the BDI. There was no difference between groups for depression risk. Except for higher free androgens and a greater waist-hip ratio in women with PCOS, there were no clinical or sociodemographic differences between the groups of women. Except for the sleep subscale, there were no significant differences between groups for the depression subscales. For depression, 53% of women with PCOS had a clinically relevant depression score compared to 20% of controls which was not significant (p=0.078). Limitations to the study, according to the authors, included a low study power and sample size that may have resulted in the unexpected depression results.

**Depressive Symptoms in Women with PCOS: Measurement Scores**

The level of depressive symptoms is not consistent in the studies, indicating a wide variability in depressive symptoms. For example, while Himelein and Thatcher (2006a) (USA) found that women with PCOS had more depressive symptoms than control women, mean
depression score were in the mild range. Battaglia et al. (2008) (Italy) found no significant difference in BDI scores between lean women with and without PCOS. For women with PCOS, 20% had mild to moderate depression scores, and 4% had moderate to severe depression scores. In comparison, 16% of the control women had mild to moderate depression scores, and 5% had moderate to severe depression scores. Benson et al. (2008) in Germany found that BDI scores in women with PCOS suggested mild to moderate rather than severe depression. Barry et al. (2011) (UK) found that while levels of depression were higher in women with PCOS who were matched for age and BMI with a control group, the levels of depression were in the normal range for both groups of women. Laggari et al. (2009) found that the correlation between PCOS and depression in adolescent girls (mean age 16.95) was not statistically significant. The results indicated that 27.3% of the girls with PCOS had BDI scores indicating mild depression compared to 20.0% for girls with Mayer-Rokitansky-Küster-Hauser Syndrome (MRKHS) and 9.1% for controls. The results also indicated that none of the girls with PCOS had moderate depression compared with 20.0% of girls with MRKHS and 0% of the controls. MRKHS occurs in 1:5000 births and is characterized by a 46XX genotype with intact ovaries, but the vagina, uterus, and fallopian tubes are either partially or completely absent.

**Depressive Symptoms in Women with PCOS: Psychiatric Diagnoses**

Two studies have specifically addressed the type of psychiatric disorders that affect women with PCOS. Rassi et al. (2010) (Brazil) found in a sample of 72 women with PCOS (mean age 26.2) that 56.9% of the women had at least one psychiatric diagnosis based on the Mini International Neuropsychiatric Interview (MINI). The most common psychiatric disorders were major depression (26.4%), bipolar disorder (11.1%), generalized anxiety disorder (9.7%), Dysthymia (4.2%), and social phobia (4.2%).

Månsson et al. (2008) (Sweden) also examined the prevalence of psychiatric disorders in a sample of 49 women with PCOS (mean age 35.9) compared to a control group of women (mean age 35.9) using the MINI. The results indicated that women with PCOS had a significantly higher
incidence of major depression (67% vs. 35%, p=0.0012), recurrent depression (45% vs. 18%, p=0.0048), suicide attempt (14% vs. 2%, p=0.027), social phobia (27% vs. 2%, p=0.00053), and any eating disorder (21% vs. 4%, p=0.01). This study is striking in its revelation that women with PCOS are seven times more likely than controls to have attempted suicide. Social phobia had the highest odds ratio compared to a control group of women. Social phobia was also correlated with BMI. The authors suggested that hirsutism and BMI issues could be contributory factors to social anxiety in women with PCOS. In a study of the lived experience of hirsutism in a group of 10 hirsute women (PCOS diagnosis not known), Ekbäck, Wijma and Benzein (2009) (Sweden) found that hirsutism concerns caused the women to limit their social contacts. Lipton et al. (2006) also found that 39.8% of their sample of 88 women with PCOS (mean age 33) felt uncomfortable in social situations due to their hirsutism issues.

**Systematic Reviews Examining Depressive Symptoms in Women with PCOS**

There have been a few reviews of the research involving depressive risk in women with PCOS. Dokras et al. (2011) conducted a recent systematic review and meta-analysis of the prevalence of abnormal scores for depressive symptoms in women with PCOS. The sample of reviewed articles contained 17 studies that met the inclusion criteria of defined PCOS according to NIH or Rotterdam criteria, depression as the primary outcome, control studies of women with and without PCOS, age and BMI stated for both groups of women. The results showed an odds ratio of 4.03 for abnormal depression scores in women with PCOS compared to control groups of women. The review indicated that the risk for depressive symptoms was independent of BMI, although the authors acknowledged that obesity is a risk factor for depression. The authors did not find significant correlations between depression and androgen levels, hirsutism scores or infertility. Consequently, the etiology of the increased risk for depression in women with PCOS remains unknown.

Another review of the PCOS literature by Farrell and Antoni (2010) found similar results regarding risk for depression and other emotional disturbances. The reviewers searched the data
bases of Pub Med, Medline, ISI, PsycInfo, CINAHL, and the web browser Google. This review again covered many of the same articles used in the Dokras et al. (2011) review. The purpose of the review by Farrell and Antoni (2010) was to summarize the common physiological and psychological characteristics of women with PCOS. Their review found, again, a high risk for depressive symptoms in women with PCOS compared to control groups of women. The authors found that depressive risk existed in women with PCOS, independent of obesity.

Himelein and Thatcher (2006b) also conducted a review of the literature regarding mental health in women with PCOS. The authors examined studies published in English and identified through the Pub Med and PsycINFO databases. As with the Dokras et al. (2011) review, Himelein and Thatcher also noted that women with PCOS were more at risk for the development of depressive symptoms than either control groups of women without PCOS or normative data. The Himelein and Thatcher (2006b) review covered many of the same studies reviewed in the Dokras et al. (2011) review. Himelein and Thatcher (2006b) concurred that depressive symptoms were not associated with androgen levels, hirsutism, or infertility. Himelein and Thatcher also noted that the association of BMI with depression is uncertain with some studies suggesting a relationship and other studies not showing a link between BMI and depressive symptoms.

**Depression and Endocrine Disease**

Sonino et al. examined the prevalence of emotional distress in patients who were being treated for endocrine disease. PCOS is an endocrine disorder. The sample consisted of 146 people of whom 115 were female with an average age of 39.4. The patients had either been cured of their condition for at least 6 months or were in remission. The endocrine disorders included pituitary disorders such as prolactinoma (47%), thyroid conditions such as hyper or hypothyroidism (27%), adrenal gland disorders such as Cushing’s syndrome (18%), hirsutism (5%), diabetes insipidus (1%), and hyperparathyroidism (<1%). The women with diagnosed hirsutism could have included women with PCOS. The measurement instruments included a modified version of the Structured Clinical Interview for DSM-IV, a shortened version of the Diagnostic Criteria for Psychosomatic
Research, the Psychosocial Index (measures acute and chronic stress, abnormal illness behavior and psychological well-being), and the Medical Outcomes Study (quality of life). The results indicated that 81% of the endocrine patients had at least 1 psychiatric or psychological diagnosis. The most common diagnoses were generalized anxiety disorder (29%), major depression (26%), agoraphobia (8%), adjustment disorder (7%), and panic disorder (5%). The authors noted that major depression in medical outpatient clinics ranges from 5-15% compared to community cases of 2-4%. Limitations of the study included not knowing if the psychological distress either preceded or followed the endocrine disorder diagnosis. The authors noted it was important to recognize and treat psychological disturbances in patients with endocrine disease. This study aids in the study of PCOS through the knowledge that depressive symptoms are often encountered in people who are ill, and depression in women with PCOS may reflect the chronic state of PCOS management.

**Limitations of Depression Studies in Women with PCOS**

The research studies involving depressive symptoms in women with PCOS had several limitations. A small sample size was noted in several of the research studies ($N = 43-84$). The majority of the previously described studies had a total sample population of less than 100 participants which included both women with PCOS and the control group of women. Another limitation was the use of varying definitions of PCOS for inclusion criteria. The most commonly used definitions were the NIH (Zadwaski & Dunaif, 1992) or the Rotterdam criteria (Rotterdam ESHRE/ASRM, 2004) for diagnosing PCOS after excluding other endocrine or excess androgen disorders. The use of these two definitions allow for more heterogeneity in the PCOS sample population (Himelein & Thatcher, 2006b). The use of differing tools among the studies to measure depressive symptoms is also a limitation to the results (Himelein & Thatcher). Another potential limitation could be recruitment of women from specialty clinics rather than the general healthcare system; the specialty clinics may have included more women with psychological
problems than would have been found in women treated by general healthcare providers (Mánsson et al., 2008).

**Summary of Depressive Risk Studies in Women with PCOS**

This review of the literature supports that women with PCOS are at risk for the development of depressive symptoms that may lead to clinical depression. The review also supports that the etiology of the increased risk remains unclear. The reviewed studies spanned the past decade and are multinational in scope. Depressive risk in women with PCOS is not conclusively linked to BMI, infertility, or other androgenic symptoms of PCOS as acne or hirsutism. As noted in the review, the cause of depressive risk in women with PCOS may be multifactorial and may involve many undiscovered mediators and moderators of the relationship between PCOS and depressive risk. The increased risk for suicide in this group of women is extremely serious.

This review also indicates that depressive risk is not unique to women with PCOS. Women, in general, appear to be more prone to the development of depression than men. Having a medical problem is associated with depressive risk and people with various endocrine disorders are at risk for depression. Consequently, women with PCOS may be more vulnerable to the development of depression than women in the general population.

Perceived stress and coping processes are two potential mediators between PCOS symptoms and depressive outcomes that need further examination. It is important to understand how a woman with PCOS appraises her PCOS condition; i.e., is her PCOS a source of psychological stress? Depression can be a reaction to stress (Lazarus & Folkman, 1984). The literature also suggests that women with PCOS may use maladaptive coping processes to manage the effects of their PCOS condition. Benson et al. (2010) and Özenli et al. (2008) suggested that maladaptive coping may be associated with depressive risk although the data is limited. The literature is very supportive regarding the risk for depression in women with PCOS. Questions remain as to the cause of the risk and, more importantly, what can be done to help support women.
with PCOS and decrease the risk for the development of depression. Other factors besides BMI, infertility, acne, or hirsutism need to be investigated. Examining the perceived stress level and coping processes of women with PCOS may provide additional information regarding a women’s risk for depression in the setting of PCOS.

**Anxiety Symptoms in Women with PCOS**

Women with PCOS have an increased risk for developing anxiety symptoms (Dokras et al., 2012). The etiology of this risk is uncertain with no conclusive links established with clinical or biochemical attributes of PCOS (Dokras et al., 2012). It is important to recognize anxiety in women with PCOS due to the long-term health risks including decreased psychosocial functioning and CVD risk associated with anxiety (Dokras et al., 2012; *DSM-IV-TR*, 2000; Moser et al., 2011). This section of the literature review will examine the evidence regarding anxiety symptoms in women with PCOS. The evidence table for relevant research studies for anxiety symptoms is found in Appendix A.

The *Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV-TR, 2000)* includes several disorders under the general heading of anxiety disorders. These disorders include panic attacks, phobias, obsessive-compulsive disorder, stress disorders, and generalized anxiety disorder (GAD). The diagnostic criteria for GAD include excessive anxiety and worry about events occurring more days than not over a six month period; difficulty in controlling worrying; inclusion of other symptoms such as restlessness, fatigue, difficulty concentrating, irritability, or insomnia; the worry is not related to a known physiological or psychological reason; and the symptoms impair daily functioning (*DSM-IV-TR*, 2000). GAD often occurs with other anxiety disorders or depression. The prevalence of GAD is 3% for 1 year prevalence, and 5% lifetime prevalence (*DSM-IV-TR*, 2000). The symptoms often, but not always, begin in childhood or adolescence. GAD is more prevalent in women (55-60% of those diagnosed) (*DSM-IV-TR*, 2000). A distinguishing factor between GAD and everyday worry is that the worries of GAD are difficult to control and impair daily functioning, whereas the worries of daily life are more
controllable and can be set aside for later thinking (*DSM-IV-TR*, 2000). In addition, everyday worries are usually not accompanied by physical symptoms such as fatigue or irritability.

**Anxiety and Cardiovascular Disease**

Anxiety is associated with increased risk for CVD disease (Moser et al., 2011). The links between anxiety and CVD risk are uncertain (Moser et al., 2011). However, biological and behavioral reasons have been suggested. Biologic explanations for the relationship between anxiety and CVD risk include changes in autonomic nervous symptom tone, inflammatory markers, coagulation markers, endothelial function, and vascular reactivity (Moser et al., 2011). These biological changes can result in arrhythmias, ischemia, and plaque rupture causing cardiac mortality (Moser et al., 2011). Behavioral links between anxiety and CVD risk include inability to learn due to anxiety causing poor life-style changes, more risk taking behavior in an attempt to manage anxiety symptoms, and less likely to follow clinician advice (Moser et al., 2011).

As noted previously, women with PCOS are at risk for the development of CVD (Wild, et al., 2010). These risk factors include impaired glucose tolerance (IGT), insulin resistance, dyslipidemia, the metabolic syndrome (MBS), depression, anxiety, and decreased quality of life.

**Anxiety Instruments**

Anxiety in the reviewed studies was measured with several validated instruments. These included the State-Trait Anxiety Inventory (STAI), the Symptom Checklist-90-R (SCL-90-R), the MINI International Neuropsychiatric Interview (MINI), Beck Anxiety Inventory (BAI), Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME MD PHQ); the Brief Scale for Anxiety (BSA-S) from the Comprehensive Psychopathological Rating Scale for Affective Syndromes (CPRS-S-A), and the Hospital Anxiety and Depression Scale (HADS). It should be noted that subscales of the SCL-90-R such as anxiety or phobia cannot be interpreted as diagnostic categories.
Early Research

Current research indicates that women with PCOS have an increased risk for anxiety (Dokras et al., 2012). Multiple factors such as androgen levels, BMI, and infertility have been suggested as possible causes for the increased risk with no conclusive links proven (Dokras et al., 2012). This review will examine the current state of evidence regarding anxiety risk in women with PCOS. Several of the studies in this section have been described previously in the HRQL and depression risk section as multiple psychosocial factors were measured in each study. Anxiety has not been as extensively examined in women with PCOS as compared to HRQL and depressive symptoms.

Anxiety Risk in Women with PCOS: Adolescence

The risk for anxiety in women with PCOS may begin in adolescence. Laggari et al. (2009) found that adolescent girls with PCOS (mean age 16.95) had significantly higher levels of state anxiety compared to a control group of adolescent girls. The authors suggested that state anxiety scores increase with psychological stress.

Anxiety Risk in Women with PCOS: Anxiety Disorders

Women with PCOS have significantly higher levels of anxiety than control groups of women (Cinar et al., 2011; Hahn et al., 2005; Jedel et al., 2010; Månsson et al., 2008; Özenli et al., 2008). However, Özenli et al. (2008) noted that the levels of anxiety in their study were not in the pathological range. Månsson et al. (2008) assessed the prevalence of psychiatric disorders in a sample of women with PCOS (n = 49) compared with an age-matched control sample of women without PCOS (n = 49). The women were interviewed with the MINI semi-structured interview. Among anxiety disorders, social phobia had a significantly higher occurrence in women with PCOS (27% vs. 2%, p=0.00053). GAD was more common in women with PCOS than controls, but the difference was not significant (13% vs. 2%, p = .056). There were no significant group differences for panic or obsessive-compulsive disorder. BMI and androgen levels were higher in women with PCOS with social phobia. Jedel et al. (2010) found significant differences between
BMI matched women with PCOS \( (n = 30) \) and a control group of women \( (n = 30) \) in the anxiety symptom areas of sleep, worry about unimportant matters, phobias, and pain. Among women with PCOS, 63% had a BSA-S anxiety score of greater than or equal to 11 suggesting a pathological state of anxiety. Cinar et al. (2011) found that 42.3% of a sample of 64 women with PCOS (mean age 23.2, mean BMI 24.7 kg/m\(^2\)) had a HADS anxiety score greater than or equal to 11 suggesting a probable anxiety disorder.

**Anxiety Risk in Women with PCOS: Acne Levels**

The role of acne in the pathogenesis of anxiety in women with PCOS is uncertain and needs further exploration. Månsson et al. (2008) in their study of anxiety in women with PCOS did not find an association between acne and anxiety disorders in a controlled study of women with and without PCOS.

**Anxiety Risk in Women with PCOS: Androgen Levels**

The relationship between androgen levels in women with PCOS and anxiety is complex and unclear at this point in time. Weiner et al. (2004) specifically addressed the relationship between androgen levels and psychosocial issues including anxiety in women with PCOS \( (n = 27) \) and BMI and demographic matched control women without PCOS \( (n = 27) \). Anxiety symptoms were measured with the State-Trait Anxiety Inventory (STAI). There were no differences between groups for anxiety scores when symptoms and other mood disorders were covaried in a MANCOVA test suggesting that anxiety may be related to symptoms. The maximum state-trait anxiety changes occurred at testosterone levels of 10-26pg/ml which is just above the upper limits of normal. These were mainly women with PCOS. Higher levels of testosterone did not cause more elevated moods. This study suggested a possible link between androgens and mood disorders such as anxiety.

Månsson et al. (2008) found that higher androgens were associated with social phobia. Cinar et al. 2011 also reported there was a significant correlation between the free androgen index of women with PCOS and anxiety scores. However, a later study by Hahn et al. (2005) did not
find a significant correlation between androgen levels and psychological distress including anxiety.

**Anxiety Risk in Women with PCOS: BMI**

The role of BMI in the risk for anxiety among women with PCOS is also uncertain. Weiner et al. (2004) found no significant difference in anxiety levels that could be attributed to BMI in a BMI matched study of women with and without PCOS. Hahn et al. (2005) also found that BMI did not contribute to psychological problems such as anxiety. Månsson et al. (2008) found that BMI was significantly associated with social phobia. Cinar et al. (2011) found that women with PCOS with a BMI greater than or equal to 30 kg/m² had significantly higher anxiety scores on the HADS but not the STAI than women with PCOS with a lower BMI.

**Anxiety Risk in Women with PCOS: Demographic Variables**

Demographic data does not appear to affect the risk for anxiety in women with PCOS. Weiner et al. (2004) matched a sample of women with PCOS \((n = 27)\) to a control group of women without PCOS \((n = 27)\) with regard to demographics and found no effect of demographics on anxiety levels. Hahn et al. (2005) and Jedel et al. (2010) also found that sociodemographic data did not affect the results as these variables were controlled for in their studies.

**Anxiety Risk in Women with PCOS: Hirsutism**

While hirsutism is a major symptom of PCOS, hirsutism has not been linked to anxiety risk. Hahn et al. (2005) did not find a significant correlation between hirsutism and psychosocial distress such as anxiety.

**Anxiety Risk in Women with PCOS: Insulin Resistance**

Clinical parameters such as insulin resistance have been examined as a possible contributing factor to anxiety risk in women with PCOS. The role of insulin resistance is controversial. Hahn et al. (2005) did not find a correlation between insulin resistance and psychological distress including anxiety. Cinar et al. (2011) reported significantly higher HADS scores for women with the metabolic syndrome which can include insulin resistance.
Anxiety Risk in Women with PCOS: Infertility

Due to limited information the relationship between infertility and anxiety risk remains unknown. Hahn et al. (2005) did not find that fertility concerns affected psychological risk including anxiety in a group of women with PCOS vs. a control group of women.

Anxiety Risk in Women with PCOS: HRQL

Anxiety appears to contribute to decreased HRQL in women with PCOS. Hahn et al. (2005) found that the anxiety subscale of the SCL-90-R significantly correlated with the psychological subscales of the HRQL tool Short Form-36 (SF-36) suggesting that greater anxiety could contribute to decreased HRQL. Additional work by this group including an internet survey with self-report symptoms that also suggested that anxiety as measured with the HADS could contribute to decreased HRQL (Benson et al., 2010).

Anxiety Risk in Women with PCOS: No Differences between Groups for Anxiety

Hahn et al. (2005) found no significant differences in the anxiety and phobia subscales of the SCL-90-R in a sample of women with PCOS (n = 120) and a control group of women without PCOS (n = 50). However there was a significant difference on the obsessive-compulsive subscale (p < .01) suggesting that women with PCOS suffer more from this anxiety disorder.

Anxiety Risk in Other Endocrine Disorders

The risk for anxiety is not unique to women with PCOS. Sonino et al. (2004) found that other people with endocrine disorders also suffer from anxiety. Using a semistructured clinical interview to assess psychological distress in a sample of patients (n = 146, 115 female, mean age 39.4) who had either been cured or were in remission from various endocrine disorders, the authors found that 29% of the sample met the diagnostic criteria for generalized anxiety disorder (GAD), 8% had agoraphobia, and 5% had panic disorder. The diagnosis of hirsutism accounted for 5% of the sample which may have included women with PCOS. Sonino et al. (2004) reported that anxiety rates in primary care patients average 7-8% for GAD, 4% for panic disorders, and 7% for phobias. The GAD rate for the people with endocrine disease was much higher than the
primary care prevalence rate. The authors noted that a significant limitation of their study was the inability to determine if the psychological distress preceded or followed the onset of the endocrine disorder. Sonino et al. (2004) also noted that clinical laboratory measures did not always capture the state of a person’s well-being, and the biomedical approach to the patient needed to shift to a more biopsychosocial approach in caring for the person with endocrine disease.

**Anxiety Studies in Women with PCOS: Systematic Reviews**

Dokras et al. (2012) performed a systematic review and meta-analysis of anxiety studies in women with PCOS. The researchers reviewed nine studies that met their inclusion criteria of clinical diagnosis of PCOS based on NIH or Rotterdam criteria, controlled studies with cross-section comparisons, age and BMI available for both groups, and use of validated screening tools. Exclusion criteria included internet surveys and review articles. The results indicated that GAD symptoms were significantly more prevalent in women with PCOS vs. control groups of women. The odds ratio for GAD was 6.88. Demographic data did not affect results. Other anxiety disorders such as social phobia, obsessive-compulsive disorder, and panic disorders are also more common in women with PCOS. The authors suggested that women with POS may be at increased risk for anxiety due to low self-esteem, poor body image, fear of future health problems including infertility, and perceived lack of effective PCOS treatment. The role of androgen levels in anxiety risk is uncertain with some studies suggesting a relationship while other studies do not support a relationship. The role of BMI in anxiety risk is also uncertain with some studies suggesting a relationship and other studies not supporting a relationship between BMI and anxiety. Limited studies hampered the evaluation of BMI and anxiety. Limited studies also prevented an analysis of the impact of infertility on anxiety risk. One study did not support a relationship between anxiety risk and infertility. In summary the authors felt that more research needed to be conducted to identify the anxiety risk in women with PCOS.
Barry, Kuczmiczyk, & Hardiman (2011) also conducted a systematic review of anxiety and depression in women with PCOS. The search included the following databases: Pub Med, Medline, EMBASE, and the Cochrane Reviews. Inclusion criteria included standard measures of anxiety, comparison group, published outcomes as mean and standard deviation and other values such as sample number. The review included 12 qualified studies. The authors concluded that the risk for anxiety symptoms was significantly higher in women with PCOS compared to control groups of women without PCOS. The researchers concluded that the link between BMI and anxiety was small. Barry et al. (2011) noted that while women with PCOS had scores for anxiety and depression that were mildly elevated, the authors questioned the significance of these findings, but concluded that any elevation in anxiety could have an effect on testosterone levels via the hypothalamic-pituitary-adrenal axis and exacerbate PCOS symptoms. This review included many of the same articles as used in the Dokras et al., (2012) review.

**Limitations of Anxiety Studies in Women with PCOS**

These reported studies examining the risk for anxiety in women with PCOS contain several limitations. One limitation was a small sample size in some studies ($N = 54-70$). Özenli et al. (2008) noted that a limitation to their study was the inclusion of only literate women; illiterate women were excluded. Another interesting limitation was the measurement scales. For example, Cinar et al. (2011) reported that anxiety was significantly increased among obese women with PCOS using the HADS scale, but there was not a significant difference with the STAI tool. So, one limitation may be the ability of the tool to measure the variable of interest.

**Summary of Anxiety Studies in Women with PCOS**

The risk for anxiety symptoms is substantiated in the literature. However, the etiology of this risk is uncertain and may be multifactorial. There is some evidence that androgen levels may contribute to anxiety risk. BMI may contribute to anxiety, but again, evidence regarding BMI and anxiety is not conclusive. Other variables such as demographic data, acne, or hirsutism have not been conclusively linked with anxiety risk. The role of infertility and anxiety risk need further
exploration. Health care for the women with PCOS needs to shift from a biomedical approach to a biopsychosocial holistic approach (Sonino et al., 2004) that examines other factors such as coping processes and levels of perceived stress in relation to anxiety symptoms.

**Perceived Stress in Women with PCOS**

Psychological stress can affect a significant number of women with PCOS (Elsenbruch et al., 2006; Janssen et al., 2008). Psychological stress can produce significant ramifications for women with PCOS including depression, anxiety, poor coping skills, suicide risk, and decreased HRQL (Benson et al., 2010; Dokras et al., 2011; Jones et al., 2008; Lazarus & Folkman, 1984; Månsson et al., 2008; Phillips, Yang, Zhang, Wang, Ji, & Zhou, 2002). Psychological stress is defined as “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (Lazarus & Folkman, 1984, p. 19). While women with PCOS are at risk for psychological stress and disorders, many women with PCOS do not score in the clinical range for depression, anxiety, or other psychiatric disorders on standardized measures (Battaglia et al., 2008; Dokras et al., 2011; Dokras, Clifton, Futterweit, & Wild, 2012;). Janssen et al. (2008) and Trent et al. (2002) suggested that it may not be possible to predict a woman’s psychological response to PCOS based on clinical assessment of her PCOS symptoms such as BMI, acne, or hirsutism scores; assessment of the psychological state of women with PCOS should be on an individual basis. This rationale suggests that an individual woman with PCOS may appraise and perceive her PCOS condition differently from the next woman with PCOS. This section of the literature review will examine the evidence regarding perceived stress in women with PCOS. The evidence table for relevant research studies for perceived stress is found in Appendix A.

Perceived stress involves the appraisal of a source of psychological stress. Specifically, perceived stress is defined as “the degree to which situations in one’s life are appraised as stressful” or the degree to which people “find their lives unpredictable, uncontrollable, and overloading” (Cohen et al., 1983, pp. 385, 387). Perceived stress is derived from the
Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) which indicates that stress is a relationship between the person and his or her environment. Thus, perceived stress is not grounded totally on an environmental or objective problem such as hirsutism in PCOS, but is dependent on the person’s cognitive appraisal of the situation which involves personal as well as contextual factors (Cohen et al., 1983). Consequently, one person can appraise and respond to a situation quite differently from another person with the same problem based on the meaning of an event to them (Park & Folkman, 1997). Cohen et al. (1983) suggested that the measurement of perceived stress could provide additional information on the relationship between stress and disease. Chronic stress may be a predictor of psychological distress or psychiatric disease (Dietrich, Abbott, Gartner-Schmidt, & Rosen, 2008).

Psychological stress can affect disease risk (Cohen, Janicki-Deverts, & Miller, 2007). Psychological stress may influence the development of physical disease such as depression or cardiovascular disease. Women with PCOS are at risk for the development of both of these conditions (Dokras et al., 2011, Futterweit, 2007). Stressful life experiences and major depression are associated with each other (Mazure, 1998). Psychological stress may cause the development of negative affective states such as depression which may result in behavioral or biological effects producing disease (Cohen, Janicki-Deverts, & Miller, 2007; Cohen, Kessler, & Gordon, 1997). Psychological stress may also influence the disease process by causing behavioral changes such as decreased exercise or compliance with medical care that may lead to disease (Cohen et al., 2007). Stressful events may be so overwhelming that they lead to persistent fear or sadness (Cohen et al., 1997). Conversely, it has been suggested that psychological stress may lead to psychiatric illness only if there is a personal predisposition or vulnerability to psychiatric illness (Cohen et al., 1997). A person’s appraisal of psychological stress as affecting personal self-worth, for example, may lead to depressive symptoms (Hammen, 2005). It has been further suggested that long-term exposure to psychological stress may result in permanent behavioral, biological, or psychological responses that affect the development of disease (Cohen et al., 1997).
Women appear to be more subject to depressive symptoms from chronic stress than men (Hammen, 2005).

**Perceived Stress and Cardiovascular Disease**

Mood disturbances such as stress, depression and anxiety may be linked to CVD risk. Hamer, Molloy, and Stamatakis (2008) found a relationship between psychological distress and CVD risk. In a study in the UK of 6,576 healthy men and women with a mean age of 50.9, CVD risk increased with levels of psychological distress (hazard ratio 1.54).

Psychological stress appears to affect the cardiovascular system through changes in the sympathetic-parasympathetic balance and the hypothalamic-pituitary-adrenal axis (Brotman, Golden, & Wittstein, 2007). Substances such as cortisol released from the adrenal cortex under stress can produce cardiovascular effects through increased blood pressure, decreased insulin sensitivity, increased coagulation effects, and/or potential endothelial dysfunction. Some cases of cardiac arrhythmias may also be related to the effects of stress.

Psychological stress can interfere with the endocrine system, potentially affecting disease development (Cohen et al., 2007). The two endocrine pathways most commonly involved in the stress response are the hypothalamic-pituitary-adrenocortical axis (HPA) and the sympathetic-adrenal-medullary (SAM) system. Prolonged activation of the HPA axis and SAM system can interfere with their functioning and lead to the potential development of physical or psychological disorders (Cohen et al., 2007). Cortisol, secreted by the HPA axis regulates anti-inflammatory responses and is involved in the metabolism of carbohydrates, fats, and proteins (Cohen, 2007). Catecholamines, secreted by the SAM system, affect the cardiovascular, hepatic, and pulmonary systems.

**Perceived Stress Scale**

The Perceived Stress Scale (PSS) will be described in detail in Chapter 3. However, a brief overview will provide information for understanding the results of the reviewed studies. The current PSS is a self-report scale of items that measures the degree to which participants find their
lives unpredictable, uncontrollable, or overloaded (Cohen et al., 1983). The items are scored on a 5 point Likert scale. The current PSS contains 10 items; an earlier version of the PSS contained 14 items.

**Perceived Stress and Women with PCOS**

Women with PCOS may have altered stress responses reflecting alteration of the endocrine system (Benson 2009a). As a test of psychological stress, 32 women with PCOS and 32 BMI-matched controls prepared and gave a speech on a topic. The women with PCOS had significantly increased cortisol and adrenocorticotropic (ACTH) levels as well as significantly increased heart rate and depression scores than the control group of women.

In spite of evidence in the literature supporting a role for perceived stress in assessing the psychosocial state of women with PCOS, there is a lack of formal studies measuring perceived stress levels in women with PCOS. Most of the information regarding perceived stress in women with PCOS is inferred as described in the above sections. This lack of research is alarming given the role that perceived stress may play in the etiology of physical and emotional disease to which women with PCOS are vulnerable. The concept of perceived stress is not new; it originates in the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984). This model is currently used in health behavior research (Benson et al., 2010; Glanz & Schwartz, 2008). The Perceived Stress Scale was developed in 1983 (Cohen et al., 1983). Studies from 2011 involving measures of perceived stress include studies by Kagan, Psaros, Alert, Styer, Shifren, and Park (2011) and Lau and Yin (2011).

A search of the databases Medline, CINHL, PsycINFO, and Embase did not produce any articles directly evaluating perceived stress with the Perceived Stress Scale (PSS) (Cohen et al., 1983) in women with PCOS. This section of the literature review will examine what is known about perceived stress in women with PCOS and bring in related research on perceived stress in other health conditions to supplement the PCOS research.
Women with PCOS may have different levels of perceived stress from what appears to clinicians and researchers. As reported previously, Trent et al. (2002) (USA) found in a study of 97 adolescent girls with PCOS (mean age 16.9), that most of the girls (exact number unknown) described their PCOS condition as mild, despite the fact that 69% of the sample had moderate to severe clinical severity scores for acne, hirsutism, and weight gain. The authors noted that since clinical severity of symptoms did not affect the HRQL scores, another potential variable could explain the etiology of lower HRQL in adolescents with PCOS compared to control adolescent girls.

Studies have suggested that women with PCOS tend to rate their health as good or very good (72%, Elsenbruch et al. 2003; 79%, Hahn et al., 2005). These numbers are interesting given the definite risk for psychological distress, suicide, depression, and decreased HRQL indicated in the literature.

While perceived stress levels have not been measured in women with PCOS, psychological distress is prevalent in women with PCOS. Hahn et al. (2005) reported in a study of women with PCOS ($n = 120$, mean age 29) versus a control group of women without PCOS ($n = 50$, mean age 30) that the women with PCOS scored significantly higher than the control women on several subscales of the Symptom Checklist-90-R (SCL-90-R) which assesses psychological disturbances, although not perceived stress per se. Women with PCOS scored significantly higher than controls on the subscales of obsessive-compulsive, interpersonal sensitivity, depression, aggression, and psychoticism. Women with PCOS also scored significantly higher on the Global Severity Index (GSI) (an indicator of overall distress) and the Positive Symptom Distress Index (PSDI) (intensity of distress). BMI and hirsutism scores of women with PCOS significantly correlated with the somatization subscale of the SCL-90-R. The remaining SCL-90-R subscales did not significantly correlate with BMI, hirsutism, or biochemical parameters such as androgen levels. Desire for a child was not associated with greater psychological distress in the study.
In a related study, Elsenbruch et al. (2003) also found that women with PCOS (n = 50, mean age 28.4) showed evidence of psychological distress with significantly higher scores on several of the SCL-90-R subscales. After controlling for BMI, women with PCOS still had significantly higher scores on the obsessive-compulsive, interpersonal sensitivity, depression, and psychoticism subscales than the control group of women (n = 50, mean age 29.9). Controlling for BMI eliminated differences between groups of women for the GSI score, suggesting that while BMI may be a contributing factor in psychological distress, psychological distress is present in women with PCOS independent of BMI.

Similarly, in 2006, Elsenbruch et al. reported in a study of 143 women with PCOS (mean age ≈30) that 15.4% had a GSI greater than or equal to 63 suggesting psychological distress and probable psychiatric illness. These women also scored significantly higher on all of the SCL-90-R subscales compared to the women with PCOS in the sample who had a GSI less than or equal to 63 and also compared to German normative values. Women with PCOS who had a GSI≤63 were considered to have normal levels of psychological distress. However, the women with normal GSI scores also differed significantly from the German norm in the areas of interpersonal sensitivity, depression, phobia, and positive symptom distress index. The women with a high GSI had a significantly elevated BMI compared to the other women with PCOS but there were no other differences in clinical, endocrine, metabolic, or sociodemographic variables. Psychological distress as measured by the GSI as well as age and desire to conceive were significant predictors of the health-related quality of life measure for the Short Form-36 (SF-36) psychological sum score. Psychological distress also correlated significantly with depressive symptoms as measured by the SCL-90-R. Psychological distress was related to HRQL and the study suggested that psychological distress predated HRQL.

Kumarapeli et al. (2010) found that psychological distress was greater in South Asian women with PCOS (n = 146, mean age 25.6) compared to a control group of women without PCOS (n = 170, mean age 27.0). Using the General Health Questionnaire (GHQ30) to assess
psychological distress, 32.9% of the women with PCOS had a GHQ30 score greater than or equal to 6, suggesting psychological distress. None of the control women had a GHQ30 score greater than or equal to 6. Hirsutism scores significantly correlated with psychological distress. Perception of excess body weight showed a trend toward significance at \( p=0.08 \).

For comparison, psychological distress is also prevalent in other patients with endocrine disorders. Sonino et al. (2004) found that in a survey of 146 endocrine patients (79% women) who were either cured or in remission of their disorder, that 81% had at least one psychiatric diagnosis with generalized anxiety disorder (29%) and major depression (26%) the common diagnoses. Women diagnosed with hirsutism accounted for 5% of the sample and may have represented women with PCOS. The study did not list the psychiatric diagnoses for women with hirsutism. The authors noted that due to the cross-sectional design of the study, they were unable to determine if the psychiatric condition predated the onset of their endocrine disorder or not.

**Perceived Stress in Related Populations**

Information gleaned from other studies involving perceived stress may be applicable to women with PCOS. Information from other related studies also helps to support the relationship of perceived stress to the other study variables of interest.

**Perceived Stress and HRQL**

Perceived stress can affect HRQL. A pertinent example of perceived stress and HRQL in women is from China (Lau & Yin, 2011). The authors examined levels of perceived stress and HRQL among 1151 Chinese women (average age greater than 25) who were in the second trimester of their pregnancy. Perceived stress was measured with the PSS and HRQL with the generic SF-12. Results suggested that higher levels of perceived stress were significantly associated with lower HRQL scores. Predictors of higher perceived stress scores were younger women (age less than or equal to 25), not married, lower education level (less than secondary), daily work hours greater than 10, or an unplanned pregnancy. The authors suggested that understanding a woman’s perception of her pregnancy was important as perceived stress could
affect a woman’s psychological well-being in pregnancy. The authors noted that while there was a relationship between perceived stress and HRQL, causality could not be confirmed. The authors debated the causality of perceived stress and HRQL, suggesting that perceived stress probably predated HRQL. Pregnancy could impact physical activities and role functioning causing perceived stress which could then affect HRQL. In the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), psychological stress and appraisal predated outcomes such as quality of life. This study adds to the suggested knowledge of perceived stress and HRQL in women with PCOS through acknowledging that perceived stress can impact physical and mental functioning and HRQL as well as being present in young women of reproductive age.

Another study also demonstrated the relationship between perceived stress and HRQL in women. Chronic fatigue syndrome (CFS) is a chronic disease that mainly affects women (80% of people affected) and is associated with psychological stress and decreased quality of life (Lopez et al., 2011). A study by Lopez et al. (2011) evaluated a cognitive behavioral stress management (CBSM) intervention in a group of 69 people (88% women, mean age 45.9) with CFS compared to a psychoeducation intervention in a control group in relation to perceived stress and quality of life. Perceived stress was measured with the PSS-14 and quality of life with the Quality of Life Inventory measuring importance and satisfaction in 17 life areas. The CBSM intervention significantly reduced pre and post levels of perceived stress and increased quality of life scores. The CBSM could be considered a form of a positive reappraisal coping process with its emphasis on relaxation and visualization which could be considered to be focusing on personal and spiritual growth as defined in positive reappraisal (Folkman & Lazarus, 1988). These results may be applicable to women with PCOS in which beneficial coping processes may reduce psychological or perceived stress and increase HRQL.

**Perceived Stress and Depression**

Perceived stress may be a predictor of depression in women and probably predates the onset of depressive symptoms (Lazarus & Folkman, 1984; Sangon, 2004). Sangon (2004)
examined predictors of depression in 142 Thai women (mean age 43.69) including both depressed 
\( n = 77 \) and non-depressed women. The PSS was used to measure stressful life events; 
depression was assessed with the Thai Depression Inventory and a short version of the DSM-IV 
Structured Clinical Interview for Major Depression. Depressed women scored significantly 
higher on the PSS than non-depressed women. Using a path analysis model, perceived stress 
significantly predicted clinical depression. The authors noted the importance of managing stress 
to help control depression.

Levels of perceived stress may affect treatment outcomes for depression. Kim et al. 
(2011) examined levels of perceived stress in relation to depression treatment outcomes in a 
sample of 580 people in Korea (73.8% female, mean age 46.9) who had been diagnosed with a 
depressive disorder based on DSM-IV criteria. Perceived stress was measured with the PSS-10. 
Participants received antidepressant medication for 12 weeks per patient’s clinician; several 
antidepressant medications were used in the study. The results indicated that participants with 
higher baseline levels of perceived stress had worse treatment outcomes as measured by 
depression, anxiety, and global severity. Limitations of this study included lack of a standardized 
antidepressant for all participants; antidepressants can vary in their effects. The authors noted the 
importance of assessing overall levels of stress and not just the number of stressors a person is 
experiencing. The number of stressful events experienced by a person did not affect treatment 
outcomes. This study suggested that levels of perceived stress may influence treatment outcomes 
and should be taken into account in patient care planning.

Chronic stress may be a prognostic indicator of future psychological disease such as 
depression (Dietrich, Abbott, Gartner-Schmidt, & Rosen, 2008). In a study of 160 patients with 
voice disorders, (73% women, mean age 50.6), Dietrich et al. (2008) found that elevated 
perceived stress, anxiety, and depression occurred in approximately 25-37% of the sample 
compared to normative data. Perceived stress was measured with the PSS-10, and anxiety and 
depression with the Hospital Anxiety and Depression Scale. The PSS in this study had an internal
consistency of 0.87. Females in the sample reported more elevated levels of perceived stress (mean PSS = 15.19) than men (mean PSS = 11.90). Women also had slightly higher depression scores than men (3.78 vs. 3.40). Perceived stress and depression were positively correlated indicating that perceived stress and depression were interrelated ($r = .61$, $p = .01$). The data from this study further supports the interconnection of perceived stress, anxiety, and depression, particularly among women with a chronic disorder.

Other studies continued to support a relationship between perceived stress and depression. Hand, Phillips, and Dudgeon (2006) found in a sample of 79 people with human immunodeficiency virus (HIV) (53% women, mean age 39.9) that perceived stress significantly correlated with depression and state and trait anxiety. Depression, fatigue, and state and trait anxiety accounted for 80% of the variance in perceived stress. In this study, perceived stress was the outcome variable suggesting that depression can contribute to perceived stress. This study used the Perceived Stress Questionnaire of Levenstein et al. from 1993.

**Perceived Stress and Anxiety/Coping**

Perceived stress can be associated with anxiety as mentioned in previous studies. In a study of 81 people (15 female, mean age 57) who experienced an acute coronary syndrome, perceived stress was significantly and positively correlated with state and trait anxiety as measured by the STAI (Di Benedetto, Lindner, Hare, & Kent, 2007). Coping was also significantly and negatively associated with perceived stress and state-trait anxiety. Dietrich et al., (2008) also found a strong positive correlation between perceived stress, anxiety ($r = .71$, $p = .01$), and depression ($r = .61$, $p = .01$) in a sample of 160 people (117 female, mean age 50.6) with voice disorders.

**Perceived Stress and BMI**

Weight gain has been suggested as a potential factor in HRQL in women with PCOS. Addressing perceived stress, race, and body weight, Kim, Burzac, White, DiLillo, and West (2009) found in a six month behavioral weight study of 217 women with T2DM (mean age 53,
mean BMI 36.5 kg/m²) using the PSS, that weight was not associated with baseline perceived stress scores. However, higher levels of perceived stress were associated with significantly less weight loss over the six month study period. The women in the lowest stress group also had significantly greater weight loss than women in the highest stress group. African-American women (39%) had higher levels of perceived stress than Caucasian women. The authors noted that the relationship between stress and weight management should be further explored.

Treatment of perceived stress may facilitate weight loss in women with PCOS. Since weight may be a partial factor in decreased HRQL in women with PCOS, and since many women with PCOS struggle with weight issues as well as susceptibility to T2DM, perceived stress in relation to BMI needs to be further examined in women with PCOS.

**Limitations of Studies of Perceived Stress in Women with PCOS**

These reviewed studies of perceived stress in women with PCOS have several limitations. The most significant limitation is an absence of studies measuring perceived stress in women with PCOS. Other limitations in the studies included self-report measures and lack of a control group for comparison. Most of the studies were cross-sectional in design thus permitting assessment at one specific point in time rather than a longitudinal study to follow participants. Cross-sectional studies do not allow casual relationships to be proposed. Lau and Lin (2011), Dietrich et al. (2008), and Sangon (2004) noted that relationships between the variables in their previously described studies cannot be fully assessed with cross-sectional studies, but require longitudinal studies for further analysis and confirmation of causal variable relationships.

**Summary of Studies of Perceived Stress in Women with PCOS**

While perceived stress has not been directly examined in women with PCOS, psychological distress is common among women with PCOS compared to control groups of women without PCOS. Psychological stress was a significant predictor of decreased psychological HRQL in women with PCOS. BMI and hirsutism scores may contribute to psychological distress. Psychological distress is not unique to women with PCOS; other patients...
with endocrine disease also exhibit signs of psychological distress. Psychological distress is significantly correlated with depressive symptoms.

Perceived stress is associated with decreased HRQL, anxiety, and depression. In populations other than PCOS women, perceived stress was associated with decreased HRQL scores. Predictors of increased perceived stress include younger women, not married, low educational level, increased work, or unplanned pregnancy. In a causal model, perceived stress was associated with decreased HRQL, and perceived stress appeared to predate HRQL. Perceived stress can predict depression, although depression can also predict perceived stress. Perceived stress can also affect treatment outcomes with higher perceived stress associated with poorer treatment outcomes. Finally, increased levels of perceived stress may be associated with decreased weight reduction.

Perceived stress appears to predict depressive symptoms (Thai, 2004), although Hand et al. (2006) suggested in their study of HIV-positive individuals that depression can also predict perceived stress. However, Lazarus and Folkman (1984) indicated that depression can be a reaction to perceived psychological stress.

Perceived stress is an area that needs further examination in women with PCOS. What we know about perceived stress in women with PCOS is inferred from their levels of psychological distress. In particular, there is a need to clarify if perceived stress leads to depressive and anxiety symptoms or the reverse; this is not clear from the existing studies. Psychological stress is associated with depression, decreased HRQL, anxiety, and poor treatment outcomes. Most clinical studies in women with PCOS correlate clinical variables such as BMI, hirsutism and acne scores, or desire for a child with outcome measurements such as depression or HRQL (Elsenbruch et al., 2006; Hahn et al., 2005). Knowledge of a woman’s levels of perceived stress would add to our knowledge of depressive and anxiety symptoms and HRQL in women with PCOS. Future interventions aimed at decreasing perceived stress may improve the HRQL in women with PCOS.
Coping Processes in Women with PCOS

A prominent question in health care research is “why some individuals fare better than others do when encountering stress in their lives” (Folkman & Moskowitz, 2004, p. 746). In the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), the answer to this ethereal question lies in the concept of “coping.” Coping is defined by Lazarus & Folkman (1984) as “constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (p. 141). Coping processes affect adaptational outcomes or quality of life (Lazarus & Folkman, 1984). Historically, coping became prominent as a field of psychological investigation in the 1970s and 1980s (Folkman & Moskowitz, 2004). This section of the literature review will examine the evidence regarding coping processes in women with PCOS. The evidence table for relevant research studies for coping processes is found in Appendix A.

Coping processes occur in response to a stressful situation that a person appraises as threatening to his or her goals (Folkman & Moskowitz, 2004). Coping occurs in an emotional setting and a major task of coping is to “down-regulate negative emotions that are stressful in and of themselves and may be interfering with instrumental forms of coping” (Folkman & Moskowitz, 2004, p. 747). It is now known that a stressful encounter can generate both positive and negative emotions (Folkman & Moskowitz, 2004). Poor mental health outcomes are usually associated with escapist coping processes while more positive types of coping, such as seeking social support, are associated with both positive and negative outcomes depending on the person-environment encounter (Folkman & Moskowitz, 2004).

Coping processes can involve problem-focused coping and emotion-focused coping (Folkman et al., 1992; Lazarus & Folkman, 1984; Park & Folkman, 1997). Problem-focused coping is sometimes referred to as “active” coping, while emotion focused coping may be referred to as “passive” coping (Benson et al., 2010).
Problem-focused coping examines a problem, creates potential solutions, evaluates the solutions, chooses a solution, and then acts accordingly (Folkman et al., 1992; Lazarus & Folkman, 1984). Problem-focused coping is often used when a person perceives that a problem can be changed or helped and enhances conflict resolution (Folkman et al., 1992; Lazarus & Folkman, 1984). Emotion-focused coping involves managing the emotional response to a problem (Lazarus & Folkman, 1984). Emotion-focused coping is often used when a person perceives that a stressful situation cannot be altered or modified (Lazarus & Folkman, 1984). Emotion-focused coping strategies include escape-avoidance, distancing, minimization, selective attention, keeping one’s feelings to oneself, seeking emotional support, and positive reappraisal of a situation in a positive manner (Folkman et al., 1992; Lazarus & Folkman, 1984). Emotion-focused coping tries to change either “the way the stressful relationship with the environment is attended to (as in vigilance or avoidance) or … the relational meaning of what is happening, which mitigates the stress” (Lazarus, 1993, p. 238). Emotion-focused strategies such as avoidance have been associated with higher levels of psychological distress (Glanz & Schwartz, p. 219).

A third type of a coping process is searching for meaning in a stressful or situational event (meaning-making coping) which can help people achieve adaptational outcomes (Park & Folkman, 1997; Glanz & Schwartz, 2008). Meaning-based coping processes can be utilized by a person facing a stressful situation when active or problem-focused coping cannot relieve the stressor. In such circumstances, meaning-making coping can help a person control the problem by finding meaning in it. People can either assimilate their appraisal of the situational stressor to fit their existing global belief systems (including spiritual beliefs) or a person can accommodate their beliefs to the situation (Park & Folkman, 1997). Both of these coping processes can result in positive adjustment to stressful events (Park & Folkman, 1997).

Coping styles and traits are different from coping processes. Coping traits are “properties of persons that dispose them to react in certain ways” (Lazarus & Folkman, 1984, p. 121). Coping styles “are similar, differing primarily in degree; they refer to broad ways of relating to
particular types of people or situations” (Lazarus & Folkman, 1984, p. 139). An example of a coping style is optimism (Glanz & Schwartz, 2008). Coping traits and styles do not accurately predict coping process as they can underestimate how people actually react to situations (Lazarus & Folkman, 1984). Coping traits can be viewed as moderators of the strength of the effects of stress on the coping processes and outcomes (Glanz & Schwartz, 2008). Avoidance and vigilance are examples of coping traits, for example (Lazarus & Folkman, 1984). Coping styles should be used consistently by a person to “interpret self and the world and therefore, how they cope with stress” (Lazarus, 1993, p. 241). However, there is often inconsistent use of coping styles to manage a situation (Lazarus & Folkman, 1984). Coping styles do not “adequately explain or predict intraindividual variations in the way given sources of stress are dealt with in specific contexts” (Lazarus, 1993, p. 241). Lazarus did note that it might be interesting to combine both style and process while retaining what is unique to each. This study is focusing on coping as process-what a person actually does to manage a stressful situation.

The most recent Ways of Coping Questionnaire information booklet (Folkman & Lazarus, 1988) updated the classification of coping processes. The authors no longer advocate the use of the terms “problem-focused” or “emotion-focused” coping as many coping strategies can contain a problem focused component as well as an emotion focused component. The authors used the example of seeking advice. Seeking advice can function as a problem-focused strategy if a person is seeking information regarding a problem. However, seeking advice can also function as emotion-focused coping if seeking advice makes the person feel more secure. Furthermore, Folkman and Lazarus (1988) noted that a coping process can be adaptive in one situation and maladaptive in another context.

The current Ways of Coping Questionnaire (Folkman & Lazarus, 1988) contains items derived from their previous Ways of Coping Checklist (Lazarus & Folkman, 1984). The eight coping scales in the Ways of Coping Questionnaire are: (a) confrontive coping (aggressive behavioral efforts to alter situation, risk taking),(b) distancing (cognitive efforts to minimize a
situation; detachment), (c) self-controlling (efforts to control feelings and actions), (d) seeking social support (efforts to seek information or emotional support), (e) accepting responsibility (recognizes one’s role in a situation), (f) escape-avoidance (wishful thinking and behavioral efforts to escape a situation), (g) planful problem solving (planned effort to manage a situation), and (h) positive reappraisal (efforts to create positive meaning in a situation which can also involve a spiritual component). It should be noted that coping scales from other authors and in research studies may continue to use the terms and subscales of problem-focused and emotion-focused coping.

Successful use of coping processes may help decrease perceived stress, depression, anxiety, and improve HRQL (Lazarus & Folkman, 1984). Coping processes are subject to change (Folkman et al., 1992) and can be learned with cognitive-behavioral therapy (Folkman & Moskowitz, 2004). This emphasizes the importance of identifying maladaptive coping processes that people use to manage a stressful transaction so that people can be taught more adaptive coping processes.

This knowledge of stress and coping is applicable to women with PCOS. It is known that women with PCOS suffer from psychological stress, depressive and anxiety symptoms, and decreased health-related quality of life. However, very little is known about the coping processes women with PCOS use to manage their PCOS symptoms and problems. This section of the literature review will examine the literature on coping processes in women with PCOS. In addition, relevant literature from other similar populations will be reviewed to provide more insight on coping processes in the context of perceived stress, depression, anxiety, and HRQL.

**Coping Processes in Women with PCOS**

Research studies examining the coping processes of women with PCOS are very limited. Özenli et al. (2008) (Turkey) first explored coping processes in women with PCOS. Coping processes were examined in this very small controlled study with 35 women with PCOS (mean age 27.58, mean BMI 25.43 kg/m²) and 35 controls (mean age 26.54, mean BMI 24.76 kg/m²).
There were no significant sociodemographic differences between the groups. Measurement tools included the Beck Depression Inventory (BDI) and the Ways of Coping Inventory of Folkman and Lazarus (unknown date). Coping subscales measured included self-controlling, positive reappraisal, self-blaming and helplessness, accepting responsibility, and seeking social support.

BDI scores were significantly higher in the women with PCOS, but the scores were not considered in the pathological range. The Ways of Coping Inventory scores were significantly higher in women with PCOS than controls for the coping subscales of self-blaming and helplessness (13.17 vs. 7.53, \( p = .001 \)) and accepting responsibility (7.80 vs. 4.80, \( p = .002 \)) indicating greater use of these subscales for coping. There were no significant differences between the groups for the other three subscales. According to the authors, self-blaming and helplessness are emotion-focused coping processes. Emotion focused coping processes tend to try to control the emotional response to a problem (Lazarus & Folkman, 1984).

Accepting responsibility is a problem focused coping process that involves accepting one’s responsibility for the situation and efforts to remedy the stressor (Bigatti, Wagner, Lydon-Lam, Steiner, & Miller, 2011). Özenli et al. (2008) regarded the results of these two coping subscales as maladaptive. The researchers suggested that the women with PCOS had difficulty using emotion-focused (passive) coping to solve their problems which could result in physical or psychological problems. This very small Turkish study suggests that women with PCOS may use maladaptive coping strategies to cope with their PCOS problems and symptoms. Limitations of this study include small sample size (\( N = 70 \)) and an older version of the Ways of Coping Questionnaire that only included 5 of the 8 subscales in the updated (1988) Ways of Coping Questionnaire.

Benson et al. (2010) (Germany) also examined coping processes in women with PCOS. Their study consisted of a sample on 448 German women with a self-reported PCOS diagnosis, mean age 29.6. The survey was conducted on the internet through a German PCOS support site. Measures included the German coping questionnaire (Freiburg Questionnaire of Coping with
Illness-FKV) based on the Ways of Coping Checklist of Lazarus and Folkman (1984), the Hospital Anxiety and Depression Scale (HADS), and the Short Form 12 Health Survey (SF-12). The FKZ contains 35 items assessing active or problem solving coping and passive or emotion-focused coping. Active coping in the measure included seeking information, living more intensely, plans for action, fighting the illness, and problem solving. Passive coping processes included brooding, arguing with fate, withdrawal, self-pity, acting impatiently, or projecting thoughts and feelings onto other people.

The results indicated that women with PCOS had significantly increased depression and anxiety compared to German normative data. Women with PCOS used more passive coping than normative women (p<0.001) while active coping was not significantly different from the German norm (p=0.67). Passive coping was associated with greater depression and anxiety, and decreased HRQL. Active coping was not significantly associated with anxiety or psychological quality of life. Active coping was negatively correlated with depression, although the significant correlation was small (r =-.19, p <.001). Active coping was also slightly positively associated with physical HRQL (r = .10 p <.05). Predictors of the psychological HRQL score were passive coping, depression, anxiety, and BMI which explained 50.1% of the variance with passive coping accounting for 40.5% of the variance. Predictors of the physical HRQL score were BMI, depression, anxiety, and age; these predictors accounted for 25.6% of the variance in the physical HRQL score. These results suggested that women with PCOS may use maladaptive coping processes such as those measured with the passive coping scales to manage their PCOS symptoms and problems. The associations among active coping and depression and HRQL were very small, suggesting that women with PCOS may infrequently use active coping processes. Limitations included a specific population (German women with PCOS) and a self-reported PCOS diagnosis which may have allowed for the participation of women without PCOS.

In another German study reported as an English abstract in PsycINFO, Jauca, Jager, and Frank (2010) found in a study of 33 women with PCOS that the women tended to use less active
and problem oriented coping processes. Coping was assessed with the Essener Coping Questionnaire. This information is very limited due to the abstract nature of the results, but does continue to support the trend of maladaptive coping by women with PCOS.

**Coping Processes: Related Populations**

Due to the limited number of research studies involving women with PCOS, other research studies involving coping processes were examined. The information obtained from these related studies may be applicable for understanding coping processes in women with PCOS.

**Coping Processes, Depression, and HRQL**

Studies support the role of coping skills in lowering depressive risk and increasing HRQL. Faul, Jim, Williams, Loftus, & Jacobsen (2010) (USA) found that increased stress management skills as assessed by the Measure of Current Status (MOCS) were associated with significantly lower levels of depressive symptoms as measured by the Center for Epidemiological Studies Depression Scale (CES-D) and significantly increased mental quality of life as measured with the SF-36. The sample consisted of 110 adults (average age = 56.3, 65% women) with stage I-IV cancer of whom 41% had breast cancer. Stress management skills could be interpreted as the planful problem solving and positive reappraisal subscales of the Ways of Coping Questionnaire (Folkman & Lazarus, 1988).

Englbrecht et al. (2011) (European multination) examined coping processes in a sample of 434 people (77% female, mean age 55.96) with rheumatoid arthritis (RA). The study did not use the Ways of Coping Questionnaire (WOCQ) (Folkman & Lazarus, 1988), but rather the Coping with Rheumatoid Arthritis Questionnaire (Cronbach’s alpha ≥0.7) that contains subscales similar to the WOCQ. The most common coping processes used by the participants were distancing, cognitive reframing, and active problem-solving and emotional expression. Age and duration of RA did not affect the coping processes. Increased coping effectiveness was associated with better HRQL as measured by the SF-36.
Coping Processes and Perceived Stress.

Successful use of coping processes can help decrease perceived stress. In a controlled study of women with early stage (Stages I, IIA, IIB) breast cancer, Kovačič and Kovačič (2011) (Slovenia) found that relaxation training (Yoga in Daily Life®) significantly reduced levels of perceived stress (measured with Perceived Stress Scale-14) in the intervention group (n = 16) compared to the control group (n = 16). The authors suggested that relaxation training decreased the stress associated with breast cancer through several means including increased attention from the physiotherapist-patient relationship, diverting attention away from the worry about breast cancer to pleasant and relaxing thoughts, having control over their disease, and inspiring hope. The 4 week Yoga in Daily Life® intervention appeared to function as an adaptive coping process which could be viewed as utilizing the Ways of Coping Questionnaire (Folkman & Lazarus, 1988) subscales of seeking social support, self-controlling, and positive reappraisal. Decreased perceived stress as an outcome suggests that coping processes have the potential to mediate the relationship between perceived stress and improved HRQL.

Women with a spinal cord injury, a serious chronic condition, can result in psychological stress. A thoughtful and insightful study by Lequerica, Forschheimer, Tate, Roller, and Toussaint (2008) (USA) examined coping processes from the Ways of Coping Questionnaire (WOCQ) (Folkman & Lazarus, 1988) in a sample of 44 women with a mean age of 46 and mean years post-injury of 11.2. The study used the WOCQ and the Perceived Stress scale-10 (Cohen et al., 1983). Perceived stress was the outcome variable. The results indicated that the WOCQ subscale of escape-avoidance accounted for 34.3% of the perceived stress variance followed by positive reappraisal with 7.4% and seeking social support with 4.7%. Mean perceived stress scores were 16.45 from a range of 5-31; the mean PSS score for women in the general population is 13.7. Positive reappraisal was negatively associated with perceived stress, while escape/avoidance and seeking social support were positively related to perceived stress. The authors noted that the results could suggest that specific coping processes may be more relevant to certain populations.
than other coping processes. The authors also suggested that a group of individuals with a common problem such as a spinal cord injury or PCOS, for example, may have general reactions to stress and use similar coping processes as a result. Internal consistency in this study for the WOCQ subscales ranged from 0.24 for confrontive coping to 0.79 for seeking social support. The authors noted that internal consistencies may vary in groups other than the population used to develop the WOCQ internal consistencies. The original sample for the WOCQ was composed of 75 married, white couples with at least one child living at home (Folkman & Lazarus, 1988). The WOCQ subscales of positive reappraisal, escape-avoidance, and seeking social support had internal consistencies above 0.70 and were considered as a result to be the coping scales most meaningful to women with spinal cord injury.

In a related example of coping, perceived stress, and depression, Kagan et al. (2011) (USA) from the Benson-Henry Institute for Mind Body Medicine, Boston, MA developed a 10-session pilot program to improve resiliency or the ability to positively adapt to adversity in a sample of 51 women (mean age=35.5) with infertility and undergoing infertility treatment. The study intervention included the relaxation response, cognitive re-appraisal, health enhancing behaviors, and promotion of optimism. Measurements included pre and post intervention testing with the Perceived Stress Scale and Beck Depression Inventory-II. Test results showed significant reductions in perceived stress, depressive symptoms, and increased optimism following the intervention. While this study was reported as a meeting poster abstract and the details of the study are not known, this study supports further examination of similar relationships among perceived stress, depressive symptoms, appraisal, and coping in women with PCOS who often undergo fertility treatment to achieve a successful pregnancy. While not explicitly stated in the abstract, most of the studied concepts are contained in the Transactional Model of Stress and Coping and illustrate that coping can improve perceived stress and depression levels (Lazarus & Folkman, 1984). This study also serves to inform the path analysis model in which perceived stress and depression predate coping processes.
In another study of perceived stress and coping in a sample of 50 women (mean age 30) treated at home for premature labor, Lowenkron (1999) (USA) found that the most commonly used coping processes from the Ways of Coping Questionnaire (Lazarus & Folkman, 1988) were seeking social support, planful problem solving, and positive reappraisal which are beneficial adaptive strategies. Coefficient alpha for the eight WOCQ subscales ranged from 0.51 to 0.70. The coefficient alphas for seeking social support, planful problem solving, and positive reappraisal were all 0.70 indicating that these three subscales were meaningful to women with premature labor. Mean Perceived Stress Scale score for the group of women on the PSS-14 was 26.75 just below the scale mid-point of 28. Coefficient alpha for the PSS in this study was 0.85 revealing good internal consistency to measure perceived stress. Appraisal of their premature labor situation as revealed by the women through interviews included reactions such as threatening, challenging, and frustrating. Higher levels of perceived stress were associated with the more maladaptive coping processes of accepting responsibility and escape/avoidance suggesting that the more women felt responsible for their condition and the higher the stress, the more likely the women were to use the more maladaptive coping processes of escape/avoidance. This study indicated that levels of perceived stress need to be assessed in women with PCOS in relation to the use of coping processes for more information on how women with PCOS perceive, appraise, cope with their condition.

**Coping Processes and Anxiety**

Anxiety may be associated with poor coping skills. Di Benedetto et al. (2007) found that anxiety and perceived stress scores were higher and use of coping resources lower in depressed patients with acute coronary syndrome. Citing Waltz (1986), De Benedetto noted that people with high anxiety may perceive their coping skills as inadequate. Tuncay, Musabak, Gok, and Kutlu (2008) found that use of problem-focused coping strategies including acceptance, religion, emotional support, and positive reframing were associated with less anxiety in 161 Turkish patient with type 1 or type 2 diabetes. Cohen (2002) also found that anxiety was more associated
with emotion-focused coping (cognitive avoidance, behavioral avoidance, and distancing) in a sample of 80 women with primary and recurrent breast cancer (mean age 60.4-62.3). A positive attitude was associated with less anxiety symptoms.

**Limitations of Studies of Coping Processes in Women with PCOS**

The results of the reviewed studies have several limitations. First, studies of coping processes in women with PCOS are very limited in number; more information on coping processes in women with PCOS is needed. Several of the studies had small sample sizes of 30-50 participants. Use of self-report symptoms of PCOS affected the validity of the results in one large study of coping processes in women with PCOS (Benson et al., 2010). Low internal consistencies are noted in some WOCQ subscales (Lequerica et al., 2008). Lower levels of internal consistency will contribute to less variance in the dependent variable (Lequerica et al., 2008). The two studies in women with PCOS did not use the current Ways of Coping Questionnaire (Folkman & Lazarus, 1988). Finally, the results from other comparison studies may not be applicable to women with PCOS.

**Summary of Studies of Coping Processes in Women with PCOS**

Knowledge regarding the coping processes that women with PCOS use to manage their PCOS symptoms and problems is very limited. The existing literature suggests that women with PCOS use maladaptive coping processes such as self-blaming and helplessness, and accepting responsibility (Özenli et al., 2008). Passive or emotion-focused coping may contribute to anxiety, depression, and decreased HRQL in women with PCOS (Benson et al., 2010). There are no studies examining the use of coping processes in American women with PCOS for a comparison cultural reference point.

Research studies in other populations suggest that the appropriate use of coping processes may be beneficial to people with various medical conditions. Coping processes may help decrease depressive risk and increase HRQL. Successful use of coping processes may also help reduce
perceived stress. However, higher levels of perceived stress are associated with maladaptive coping processes.

This review of the coping literature in women with PCOS reveals that the knowledge on this topic is preliminary at best. More research studies in a variety of cultural settings are needed to further evaluate coping processes in women with PCOS. Use of a standardized coping measure such as the Ways of Coping Questionnaire (Folkman & Lazarus, 1988) would help to standardize the results, although this may not be possible in non-English speaking countries.

Research Gaps and Summary

This literature review of the current state of inquiry regarding the effects of perceived stress, depressive and anxiety symptoms, BMI, and coping processes on the HRQL of women with PCOS reveals several gaps that need further exploration. It is well known that adult women with PCOS are at risk for psychological stress, depression, anxiety, suicide, and decreased HRQL. This literature review also supports these conclusions.

The literature review, however, reveals knowledge is very limited regarding the processes women with PCOS use to appraise and cope with this chronic syndrome. The literature suggests that women may not be coping very well with their PCOS condition. In addition, there is a scarcity of knowledge regarding levels of perceived stress in women with PCOS. It is important to understand levels of perceived stress in women with PCOS which then lead to the use of coping processes and outcomes such as HRQL. Effective use of coping processes may mitigate levels of perceived stress, depressive and anxiety risk, and improve HRQL.

This research study was designed to address the gaps in the literature regarding perceived stress levels and the coping processes of adult women with PCOS. This study will also provide an American viewpoint of coping processes to compare with the German and Turkish results. Cultural variations are known to exist in women with PCOS. Successful use of coping processes can lead to improved adaptational outcomes such as HRQL as well as decreased levels of perceived stress and depressive risk. This study will also provide additional information regarding
the etiology of the increased risk for depression and anxiety and decreased HRQL in women with PCOS. Knowledge gained from this study may lead to the development of successful coping strategies to decrease perceived stress and depressive and anxiety symptoms and improve HRQL in women with PCOS.
CHAPTER III

METHODS

Chapter III describes the research design and methods that were used to examine the relationships among depressive and anxiety symptoms, perceived stress, BMI, coping processes, and HRQL in adult women with PCOS. The overall intent of this study was to gain a better understanding of the psychosocial needs of women with PCOS in order to offer suggestions to help improve HRQL and decrease their risk for psychosocial health care problems. This chapter describes the purposes of the study, research questions, study design, ethics, subjects and setting, inclusion and exclusion criteria, instruments and measures, recruitment and consent, data analysis methods for research questions, and limitations and potential difficulties related to the study.

**Purposes of the Study**

The purposes of this research study were (1) to identify and describe the measurement scores and relationships between the independent variables of depressive symptoms, anxiety symptoms, perceived stress, BMI, coping processes and the dependent variable of HRQL measured as the subscales of the PCOSQ in adult women with PCOS, (2) determine the types of coping processes that adult women with PCOS use to manage their PCOS condition, and (3) determine if depressive symptoms, anxiety symptoms, perceived stress, BMI, or coping predict the HRQL of adult women with PCOS as measured by the PCOSQ subscales, and (4) determine if coping processes mediate the relationship between each independent variable (depressive symptoms anxiety symptoms, perceived stress, BMI) and HRQL in women with PCOS.

**Research Questions**

This research study sought to provide new information and understanding regarding the increased risk for psychosocial distress in women with PCOS and the manner in which women with PCOS were coping or trying to manage their condition.

1. What are the measurement scores for depressive symptoms, anxiety symptoms, perceived stress, and HRQL in adult women with PCOS?
2. What types of coping processes do women with PCOS use to manage stressful situations?

3. Do measurement scores of depressive symptoms, anxiety symptoms, perceived stress, BMI, and/or coping processes predict HRQL in adult women with PCOS?

4. Do coping processes mediate the relationship between the independent variables (depressive and anxiety symptoms, perceived stress, BMI) and the dependent variable HRQL?

**Research Design and General Procedures**

This research study was a descriptive, cross-sectional, correlational research design suitable for answering the study research questions.

To answer research question #1, depressive and anxiety symptoms, perceived stress, and HRQL measured as the subscales of the PCOSQ were obtained in adult women with PCOS. The measurement tools were the Beck Depression Inventory II-Second Edition (BDI-II) (Beck, Steer, & Brown, 1996), the Trait Anxiety Scale from the State-Trait Anxiety Inventory for Adults) (STAI) (Spielberger 1983), the Perceived Stress Scale-10 (PSS-10 (Cohen et al., 1983), and the Health-Related Quality-of-Life Questionnaire for Women with Polycystic Ovary Syndrome (PCOSQ) (Cronin et al., 1998).

To answer research question #2, the types of coping processes adult women with PCOS used to manage stressful situations were measured. Coping processes were assessed and measured with the Ways of Coping Questionnaire (WAYS) (Folkman & Lazarus, 1988).

Research question #3 was answered by computing correlations among depressive symptoms, anxiety symptoms, perceived stress, BMI, coping processes and the subscales of the PCOSQ. Significant correlations among the dependent variables and dependent variables were further analyzed with hierarchical multiple regression.

Research question #4 was answered based on the results from question #3.
Ethical Considerations

The research study was approved by the Colorado Multiple Institutional Review Board (COMIRB) prior to recruitment of participants. The study was submitted for expedited review as the risk to participants was minimal, but personal health information (PHI) (confirmation of PCOS diagnosis, height, and weight) was obtained from the participants’ personal health records. The study was approved for Continuing Review for one year on 12-3-13. Two Protocol Amendments were approved on 10-18-13 and 12-3-13.

Subjects and Setting

The study sample was recruited from adult women with PCOS residing primarily in Colorado. In 2012, Colorado had a population estimate of 5,116,796 (http://quickfacts.censusgov/qfd/states, 2014). In 2012, the White population comprised 88.1% of the population, Black or African American 4.3%, American Indian and Alaska Native 1.6%, Asian 3.0%, native Hawaiian and other Pacific Islander 0.2%, and Hispanic or Latino 21.0%. PCOS occurs in women in all racial and ethnic groups (Futterweit, 2007) with an estimated prevalence rate of 6.5-9% of reproductive aged women (Azziz, 2008). Recruitment was designed to obtain a sample of women reflective of Colorado population demographics.

Inclusion Criteria

Inclusion criteria stipulated that participants in the research study:

1. Have an established PCOS diagnosis determined by the Rotterdam criteria (Rotterdam ESHRE/ASRM-sponsored PCOS Consensus Workshop Group, 2004).
2. Be an adult woman between the ages of 18 and 40.
3. Be able to read and write in the English language.
4. Not pregnant.
5. Able to provide informed consent.
Exclusion Criteria

Exclusion criteria stipulated that participants would be excluded from participating in the research study for the following conditions or reasons:

1. Conditions that would prevent the person from completing the study surveys based on the personal health record including dementia, alcohol, or substance abuse.
2. Unwillingness to participate in the study.

Instruments and Measures

The independent variables (depressive and anxiety symptoms, perceived stress, coping processes), and the dependent variable of HRQL in adult women with PCOS were measured with standard instruments. The BMI for each participant was calculated from a recent height and weight in the participant’s personal health record.

Health-Related Quality of Life

HRQL in women with PCOS was measured with the Health-Related Quality-of-Life Questionnaire (PCOSQ) for women with PCOS (Cronin et al., 1998). This tool measures physical and emotional health of women with PCOS. Cronin et al. (1998) wanted a simple, brief, easily self-administered tool that included items relevant to women with PCOS, and with results reported in scores suitable for statistical analysis. The authors hoped that treatment of the problems associated with PCOS would reduce the psychological distress associated with the syndrome and improve HRQL. The instrument’s five domains of focus are emotions, hirsutism, weight, infertility, and menstrual problems.

Cronin and colleagues (1998) reported that the PCOSQ was developed in four stages. The initial phase was the selection of 182 items grouped in eight domains of symptoms, emotions, social contacts and leisure activities, marital/partner sexual relationship, dating relationship, sexual functioning/sexuality, vocational/financial issues, and family/friends relationship. The items were selected from the PCOS literature, health professionals, and interviews with 10 women with PCOS in the United States. The list of 182 items was then reduced through item
importance and content validity analysis with health care professionals. Interviews with 10 women with PCOS in the United States were also included to identify the frequency, importance, and impact of the physical, emotional, and social problems associated with PCOS. A factor analysis then identified 5 domains and decreased the number of included items to 26.

The PCOSQ consists of 26 items scored in Likert style with 1 representing the lowest functioning and 7 optimal functioning (Cronin et al., 1998). The domains are assessed over the past two weeks or since the last menstruation for menstruation related questions. A domain score (emotions, body hair, weight problems, menstrual problems, and infertility) can be obtained by dividing the domain score by the number of items in the domain (Cronin et al., 1998). This instrument was chosen, in part, to enable data obtained in this study to be compared with other research study scores using the PCOSQ. Table 3.1 lists the PCOSQ subscales and the PCOSQ numbered items contained in each subscale. The PCOSQ is designed to use subscale results rather than a total score for the entire survey.

Table 3.1 PCOSQ Subscales and Numbered Items (Cronin et al., 1998)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Items in the PCOSQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotions</td>
<td>2, 4, 6, 11, 14, 17, 18, 20</td>
</tr>
<tr>
<td>Body Hair</td>
<td>1, 9, 15, 16, 26</td>
</tr>
<tr>
<td>Weight</td>
<td>3, 10, 12, 22, 24</td>
</tr>
<tr>
<td>Infertility</td>
<td>5, 13, 23, 25</td>
</tr>
<tr>
<td>Menstrual Problems</td>
<td>7, 8, 19, 21</td>
</tr>
</tbody>
</table>

PCOSQ=Polycystic Ovary Syndrome Questionnaire

The PCOSQ was validated by Guyatt, Weaver, Cronin, Dooley, and Azziz (2004) (Canada/UK/USA), and Jones et al. (2004) (UK). Guyatt et al. (2004) found Cronbach’s alphas to be greater than 0.7 for 4 or the 5 PCOSQ subscales; the exception was the menstruation domain.
Validity of two subscales were supported with positive correlations between aspects of hirsutism and the body hair domain of the PCOSQ ($r = -.46, p < .01$), and between characterization of menstrual cycles and the menstruation domain ($r = .31, p < .01$). Jones et al. (2004) found Cronbach’s alphas to range from 0.70-0.97 for all 5 PCOSQ domains. Positive correlations were reported between similar scales of the PCOSQ and the SF-36, particularly in the emotions subscale of the PCOSQ and the mental health ($r = .62, p < 0.01$) and role-emotional subscales ($r = .49, p < .01$) of the SF-36. Jones et al. (2008) noted that an omission in the PCOSQ was the absence of an acne subscale since acne is a common symptom and problem of PCOS.

**Depressive Symptoms**

Depressive symptoms were measured with the Beck Depression Inventory-Second Edition (BDI-II) (Beck et al., 1996). The BDI-II is a 21-item self-report scale that measures the degree of depression in people aged 13 and older. The BDI-II was based on the criteria for diagnosing depressive disorders in the *Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition* (1994). The BDI-II can be completed in about 5-10 minutes. The directions state that the participant is to answer the questions based on their feelings over the past 2 weeks including the present day. THE BDI-II score is computed by adding the score for the 21 scale items. Each item on the BDI-II is rated 0-3 in severity. The maximum total score is 63. The BDI-II is used in this study to screen for depressive risk within groups, and is not intended to diagnose depression in a given person (Dixon et al., 2003). The interpretation of BDI-II scores is detailed in Table 3.2.
Table 3.2 Interpretation of BDI-II Scores (Beck et al., 1996)

<table>
<thead>
<tr>
<th>Total Score</th>
<th>Range of Depressive Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-13</td>
<td>Minimal</td>
</tr>
<tr>
<td>14-19</td>
<td>Mild</td>
</tr>
<tr>
<td>20-28</td>
<td>Moderate</td>
</tr>
<tr>
<td>29-63</td>
<td>Severe</td>
</tr>
</tbody>
</table>

Internal consistency of the BDI-II was estimated with coefficient alphas for the BDI-II. These ranged from .92 (psychiatric outpatients) to .93 (college students) (Beck et al., 1996). Convergent validity of the BDI-II was demonstrated by the positive correlation ($r = .71$) between the BDI-II and the Hamilton Psychiatric Rating Scale for Depression (Beck et al., 1996).

**Anxiety Symptoms**

Anxiety symptoms were measured with Spielberger’s trait anxiety scale from the *State-Trait Anxiety Inventory for Adults* (STAI) (Spielberger, 1983). The trait anxiety scale (T-Anxiety scale or STAI) is a 20-item self-report measure that assesses anxiety as a general trait. Trait anxiety refers to “anxiety-proneness” (Spielberger, 1983, p. 5). State anxiety refers to “a palpable reaction or process taking place at a given time and level of intensity” (Spielberger, 1983, p. 5). The T-Anxiety Scale measures how people “generally feel”, while the state anxiety scale measures how people feel “right now, at this moment” (Spielberger, 1983, p. 6).

The STAI is suitable for people with a 4th or 5th grade reading ability and requires about 6 -10 minutes to complete (Spielberger, 1983). The directions ask that the participant respond to questions indicating how he or she generally feels (Spielberger, 1983). Each of the 20 items on the STAI scale is scored from 1-4 with 4 indicating a high level of anxiety. Scores are weighted and added for the total score. Some items (21, 23, 26, 27, 30, 33, 34, 36, and 39) of the STAI are
anxiety absent items and are reverse scored with responses marked 1, 2, 3, or 4 scored as 4, 3, 2, or 1 (Spielberger, 1983). Total anxiety scores can range from 20-80. Normative data for evaluating the scores is available for working adults, college students, and military recruits (Spielberger, 1983).

The STAI scale was used in this study to screen for anxiety risk within women with PCOS, and was not intended to diagnose anxiety in a given person (Dixon et al., 2003). The STAI scale has been successfully used with many different populations including college students, working adults, military personnel, psychosomatic patients, and medical and surgical patients (Spielberger, 1983).

The STAI scale has good reliability and validity (Spielberger, 1983). For internal consistency, alpha coefficients ranged from .86 (male high school students) to .95 (female military recruits) (Spielberger, 1983). Validity was established for the STAI through correlations with other anxiety measures. Correlations between the STAI and the IPAT Anxiety Scale were .75-.77 (Spielberger, 1983). Correlations between the STAI and the Taylor Manifest Anxiety Scale were .79—.83 (Spielberger, 1983).

**Perceived Stress**

Perceived stress was measured with the Perceived Stress Scale-10 (PSS-10) (Cohen et al., 1983). Cohen et al. (1983) developed the PSS-10 to address the need for a scale to measure perceived stress to provide additional information regarding the relationship between stress and pathology (Cohen et al., 1983). The PSS measures “the degree to which situations in one’s life are appraised as stressful” (Cohen et al., 1983, p. 385). The main assumption of perceived stress is that a measure of stress is not solely a reaction to an event, but is a combination of an event and the person’s response to the event which is based on personal characteristics (Cohen et al., 1983). Cohen’s view of perceived stress was based on the stress and coping work of Richard Lazarus. The PSS is a subjective measure of stress as opposed to an objective measure of stress which, for example, measures the frequency of a stressful event over a 6-month time period. The value of
the PSS is in evaluating the role of appraised stress in behavioral disorders or disease (Cohen et al., 1983).

The current PSS-10 (Cohen, 1994) is a 10-item self-report scale that measures perceived stress levels or the degree to which one’s life is appraised as “unpredictable, uncontrollable, and overloaded” (Cohen, 1994, ¶1). The instructions ask the participant to evaluate thoughts and feelings during the past month. Responses are scored with a 5-point Likert type scale with 0 being never, and 4 representing very often. Normative data are available for the scale. The reading level is at the junior high school level and the scale can be completed in a few minutes (Cohen et al., 1983). Scores for the PSS-10 are obtained by reverse scoring items 4, 5, 7, and 8 and then adding all scores. The original PSS contained 14 items; a 10 item PSS was derived from the PSS-14. The PSS-10 was used in this study. The PSS-10 is valid and reliable. Internal consistency as measured by Cronbach’s alpha was .78 (Cohen & Williamson, 1988). Validity of the PSS-10 was assessed by comparison with PSS-10 scores and self-reported health and utilization of health services with poorer health and more hospitalizations associated with higher PSS-10 scores ($p < .001$).

The PSS significantly correlated with the Center for Epidemiological Studies depression scale (CES-D) ($r = .76, .65, p < .001$) (Cohen et al., 1983). However, when partial correlations were analyzed, the CES-D and PSS were found to be measuring different constructs (Cohen et al., 1983).

**Coping Processes**

Coping processes were measured with the Ways of Coping Questionnaire (WAYS) (Folkman & Lazarus, 1988). The WAYS “assesses the thoughts and actions individuals use to cope with the stressful encounters of everyday living…it measures coping processes, not coping dispositions or styles” (Folkman & Lazarus, 1988, p. 1). Folkman and Lazarus (1988) noted that measures of coping traits “underestimate the complexity and variability of actual coping processes” (Folkman & Lazarus, 1988, p. 2). Coping processes are outwardly directed toward...
changing the environment surrounding a stressful encounter or inwardly directed toward changing the meaning of the encounter (Folkman & Lazarus, 1988). However, coping styles can “moderate” the effects of coping behaviors (Glanz & Schwartz, 2008, p. 220).

The WAYS is derived from the extensive work of Lazarus and Folkman. The current WAYS is derived from an earlier version known as the Ways of Coping Checklist (Lazarus & Folkman, 1984). Folkman and Lazarus developed the WAYS from interviews with 75 middle and upper middle class married couples with at least one child in the home. Each month for 5 months, each man and women was asked to describe the most stressful encounter in their life and to complete the WAYS. The results yielded the current 8 coping subscales of the WAYS. The WAYS subscales are described in Table 3.3. The item numbers for each subscale are listed in Table 3.4.

The directions for the WAYS are very specific. An individual is to think about the most stressful encounter in the past week. The individual is to remember the details of the encounter including where the encounter occurred, who was involved, actions taken, and the importance of the encounter. Then after considering the stressful situation, the individual completes the WAYS indicating the extent to which a coping process was used in the situation.

Each of the 66 items on the WAYS is rated from 0-3. The score of 0 means the coping process did not apply or was not used, while a score of 3 indicates that coping process was used a great deal (Folkman & Lazarus, 1988)

Scores on the WAYS can be reported as either raw scores or relative scores. A raw score indicates the amount of coping effort for each of the eight subscales (Folkman & Lazarus, 1988). A high raw score suggests that the person used the particular coping process a great deal to manage the encounter. The relative score is the raw score expressed as a percentage and represents the proportion of effort for each subscale. The relative score is calculated as follows:

1. Calculate the average response per coping subscale by dividing the total score for each subscale by the number of subscale items.
2. Sum the average responses per subscale

3. Divide the average score for each subscale by the sum of the averages for all 8 subscales. This is the relative score and compares the use to the other subscales as a percentage.

Table 3.3 Ways of Coping Questionnaire Subscales: (Folkman & Lazarus, 1988, p. 7)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confrontive Coping</td>
<td>Aggressive actions to alter a situation; risk taking</td>
</tr>
<tr>
<td>Distancing</td>
<td>Cognitive efforts to detach from a situation and minimize the significance of the situation</td>
</tr>
<tr>
<td>Self-Controlling</td>
<td>Efforts to control thoughts and feelings</td>
</tr>
<tr>
<td>Seeking Social Support</td>
<td>Efforts to seek information, tangible, or emotional support</td>
</tr>
<tr>
<td>Accepting Responsibility</td>
<td>Acknowledges one’s role in the problem and efforts to correct the situation</td>
</tr>
<tr>
<td>Escape-Avoidance</td>
<td>Wishful thinking or behavioral efforts to escape or avoid a problem</td>
</tr>
<tr>
<td>Planful Problem Solving</td>
<td>Problem-focused efforts to change a situation and solve a problem</td>
</tr>
<tr>
<td>Positive Reappraisal</td>
<td>Efforts to attain positive meaning through personal growth; can include religiosity/spirituality</td>
</tr>
</tbody>
</table>
Table 3.4 WAYS Subscales and Items (Folkman & Lazarus, 1988)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Items in the WAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confrontive coping</td>
<td>6, 7, 17, 28, 34, 46</td>
</tr>
<tr>
<td>Distancing</td>
<td>12, 13, 15, 21, 41, 44</td>
</tr>
<tr>
<td>Self-Controlling</td>
<td>10, 14, 35, 43, 54, 62, 63</td>
</tr>
<tr>
<td>Seeking Social Support</td>
<td>8, 18, 22, 31, 42, 45</td>
</tr>
<tr>
<td>Accepting Responsibility</td>
<td>9, 25, 29, 51</td>
</tr>
<tr>
<td>Escape-Avoidance</td>
<td>11, 16, 33, 40, 47, 50, 58, 59</td>
</tr>
<tr>
<td>Planful Problem Solving</td>
<td>1, 26, 39, 48, 49, 52</td>
</tr>
<tr>
<td>Positive Reappraisal</td>
<td>20, 23, 30, 36, 38, 56, 60</td>
</tr>
</tbody>
</table>

WAYS=Ways of Coping Questionnaire

Folkman and Lazarus demonstrated the reliability and validity of the WAYS through interviews, field studies with people, and calculation of Cronbach’s coefficient alpha averaged over five administrations of the WAYS with 75 couples with at least one child in the home. The mean Cronbach’s alpha for the 8 subscales ranged from 0.61 to 0.79 on 5 occasions of the administration of the questionnaire (Folkman & Lazarus, 1988). The results are presented in Table 3.5. Validity of the WAYS was affirmed through study results consistent with the theoretical predictions of Folkman and Lazarus that coping consists of problem- and emotion-focused coping, and coping is a process (Folkman & Lazarus, 1988).

Recruitment and Consent

Participants were recruited from the University of Colorado Hospital outpatient clinics of reproductive medicine, metabolic endocrinology, and/or obstetrics/gynecology in Aurora, CO. Additional participants were recruited from women’s health clinics in the Denver metro area, the
Dermatology & Laser Center of Fort Collins, as well as reproductive medicine clinics in Colorado Springs, CO and Fort Collins, CO.

Table 3.5 Alpha Coefficients for WAYS (Folkman & Lazarus, 1988)

<table>
<thead>
<tr>
<th>Scale/Subscale</th>
<th>Alpha Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ways of Coping Questionnaire</td>
<td></td>
</tr>
<tr>
<td>Confrontive Coping</td>
<td>0.7</td>
</tr>
<tr>
<td>Distancing</td>
<td>0.61</td>
</tr>
<tr>
<td>Self-Controlling</td>
<td>0.7</td>
</tr>
<tr>
<td>Social Support</td>
<td>0.76</td>
</tr>
<tr>
<td>Accepting Responsibility</td>
<td>0.66</td>
</tr>
<tr>
<td>Escape-Avoidance</td>
<td>0.72</td>
</tr>
<tr>
<td>Planful Problem Solving</td>
<td>0.68</td>
</tr>
<tr>
<td>Positive Reappraisal</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Recruitment flyers were posted on the University of Colorado Research List Serve, Craig’s List for the Denver metro area, and Facebook. The flyers contained information about the study, inclusion criteria, and contact information for the PI. In addition, participants were recruited from the University of Colorado arm of the Pregnancy in Polycystic Ovary Syndrome II study with permission from the Reproductive Medicine Network. Potential participants from the PPCSO II study were sent a letter, either through the US Postal Service or via electronic mail, from Dr. Ruben Alvero, Section Head, Reproductive Endocrinology and Infertility, University of Colorado Hospital, Aurora, CO. The letter to the participants described the proposed study including risks and benefits to the participants. Potential participants contacted the principal investigator (PI-Rebecca Carron) for further information regarding participation in the study. Potential participants who contacted the PI were pre-screened with a telephone call to assess if a potential participant met the inclusion/exclusion criteria for the study and to explain the consent process. A consent form was emailed to the potential participant for her signature. Consents were
returned electronically or with an addressed, stamped envelope for mailed consents. Confirmation of the potential participant’s PCOS diagnosis according to the Rotterdam criteria and a recent height and weight were obtained from the participant’s health record. Confirmation of the participant’s PCOS diagnosis was obtained either by the participant emailing health records to the PI or by clinics receiving a signed records release form from the participants and sending records to the PI at the University of Colorado College of Nursing. After confirmation of the participant’s PCOS diagnosis, the participant was emailed the PCOS survey. The REDCap survey consisted of a demographic form and the five surveys as described previously.

REDCap (Research Electronic Data Capture) was developed through a research consortium with 372 institutional partners of whom the University of Colorado Denver is a member. REDCap allows users to conduct online surveys quickly and securely (http://www.project-redcap.org/index.php).

For questions, the participants contacted the PI. After completion of the survey, the participant received a code to access a thank you gift card in the amount of $20.00 from Amazon.com.

**Data Management and Analysis**

The Statistical Package for the Social Sciences (SPSS) version 21 was used to analyze the data. The PI had access to the Center for Nursing Research (CNR) at the University Of Colorado College Of Nursing and the online REDCap survey. The CNR has procedures in place to protect the safety and confidentiality of the collected data. Data from the surveys were transferred to SPSS from REDCap. The data were evaluated for missing data with SPSS. Multiple imputation with SPSS was used to correct for missing data. Key variables were evaluated for normal distribution with a Levene’s test. The variables met the criteria for normal distribution. Table 3.6 describes the variables for each research question and the analysis tests. Participant characteristics from the study demographic form were determined with descriptive statistics using SPSS. The results were summarized in tables and in written format.
Table 3.6 Research Question, Variables, and Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Participant Characteristics</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td>2. Depression, Anxiety, Perceived Stress, HRQL</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td>3. Coping Processes</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td>4. Predictors of HRQL</td>
<td>Correlation and Multiple</td>
</tr>
<tr>
<td>5. Coping as a Mediator</td>
<td>Regression</td>
</tr>
</tbody>
</table>

HRQL=Health-Related Quality of Life

Psychometrics of the Measurement Tools

The psychometrics of the measurement tools in this study were analyzed for internal consistency with Cronbach’s alpha coefficient. The results were summarized in tables and written format.

Research Questions and Analysis

Research Question #1

What are the measurement scores for depressive symptoms, anxiety symptoms, perceived stress, and HRQL in adult women with PCOS?

Averages and frequencies of depressive symptoms (BDI), anxiety symptoms (STAI), perceived stress (PSS), and HRQL (PCOSQ) in the sample of adult women with PCOS were computed with SPSS to determine the measurement scores of these variables. The results were summarized in tables and in written format.
**Research Question #2**

What are the coping processes that women with PCOS use to manage stressful situations?

Means and frequencies of the coping processes used by the sample of women with PCOS were computed with SPSS using results from the WAYS. The results were summarized in tables and in written format.

The analysis also answered three supplemental questions about coping. The first question asked if coping scores varied between women in the sample with severe psychosocial distress versus those who did not score in the severe range. A Levene’s test assessed for normal distribution of the data prior to conducting the analysis. Coping subscale mean scores were compared with t-tests between women with severe psychological distress as indicated by a BDI score ≥ 29, STAI score ≥ 48, and/or suicide ideation as indicated by a score of ≥ 1 on question #9 of the BDI and women who did not score in the severe range.

The second question asked if coping scores varied between women with a BMI ≥ 30 kg/m² versus women with a BMI < 30 kg/m². Coping subscale mean scores were compared with t-tests to determine if coping subscales mean scores significantly differed between the two groups. The results were summarized in tables and in written format.

Finally, the third question asked if coping scores varied between women who described themselves on the demographic form as trying to conceive versus women who indicated they were not trying to conceive. Coping subscale mean scores were compared with t-tests to determine if coping subscales mean scores significantly differed between the two groups. The results were summarized in tables and in written format.

**Research Question #3**

Do measurement scores of depressive symptoms, anxiety symptoms, perceived stress, BMI, and/or coping processes predict the HRQL in adult women with PCOS?

Correlations were computed with SPSS to determine the strength of the relationship between each independent viable and each subscale of the PCOSQ. A Levene’s test assessed for
normal distribution of the data prior to the correlation analysis. Correlations were computed with the BDI, STAI, PSS, BMI (from clinical BMI), WAYS and the emotions, body hair, weight, and infertility subscales of the PCOSQ. Significant correlations were entered hierarchically in multiple regression to determine significant predictors and variance. The results were summarized in tables and in written format.

Research Question #4

Do coping processes mediate the relationship between each independent variable (depressive symptoms, anxiety symptoms, BMI, perceived stress) and the dependent variable HRQL in adult women with PCOS?

For a test of mediation the independent variables must significantly predict the outcome variable (Bennett, 2000). The next requirement in a mediation test is that the mediating variable significantly predicts the outcome variable (Bennett, 2000). Significant relationships among the eight coping processes and the five subscales of the PCOSQ was examined and evaluated.

Power Analysis

A power analysis was conducted to determine the number of participants needed to detect the smallest study effect with a power of .8 and a significance of .05 (Soper, 2006-2012). Table 3.7 provides the power analysis conducted to determine the minimum sample size required for the multiple regression analysis assuming five independent variables proposed in this study. The study requires a minimum sample size of 134 in order to detect the smallest study effect (.1) with a power of .8 and a significance of .05.
Table 3.7 Sample Size Power Analysis

<table>
<thead>
<tr>
<th>Power</th>
<th>0.1</th>
<th>0.15</th>
<th>0.2</th>
<th>0.25</th>
<th>0.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>134</td>
<td>91</td>
<td>70</td>
<td>57</td>
<td>49</td>
</tr>
<tr>
<td>0.85</td>
<td>149</td>
<td>102</td>
<td>78</td>
<td>64</td>
<td>54</td>
</tr>
<tr>
<td>0.9</td>
<td>170</td>
<td>116</td>
<td>88</td>
<td>72</td>
<td>61</td>
</tr>
<tr>
<td>0.95</td>
<td>204</td>
<td>138</td>
<td>105</td>
<td>85</td>
<td>72</td>
</tr>
<tr>
<td>1</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* = Effect size not applicable.
CHAPTER IV

RESULTS

The relationships among depressive and anxiety symptoms, perceived stress, body mass index (BMI), coping processes and health-related quality of life (HRQL) were examined in adult women with polycystic ovary syndrome (PCOS). The variables were measured with the Beck Depression Inventory-II (BDI) (Beck et al., 1996), Trait Anxiety Inventory for Adults (STAI) (Spielberger, 1983), Perceived Stress Scale-10 (PSS) (Cohen et al., 1983), BMI from most recent clinical weight, Ways of Coping Questionnaire, (WAYS) (Folkman & Lazarus, 1988), and HRQL with the Polycystic Ovary Syndrome Questionnaire (PCOSQ) (Cronin et al., 1998). Data from a sample of 72 participants with clinically confirmed PCOS (Rotterdam ESHRE/ASRM-sponsored PCOS Consensus Workshop Group, 2004) were analyzed with descriptive, correlational, and multiple regression procedures using the Statistical Package for the Social Sciences, Version 21 (SPSS) (2012).

Description of Sample

A total of 72 women completed the online PCOS Survey. Exclusion criteria included pregnancy. All participants were prescreened over the telephone. The prescreening questions included a question about pregnancy status. However, one woman who prescreened negative for pregnancy apparently became pregnant while her records were being confirmed for PCOS. Another woman, who also prescreened negative for pregnancy, did not indicate on the survey demographic if she was pregnant or not. After a filter analysis indicating that the two women did not significantly affect the results, the two women remained in the total sample of 72.

Mean age of the sample was 30.4 ± 4.54 years with a range of 22-39 years (Table 4.1). Mean BMI was 30.75 ± 8.26 kg/m² with a range of 19.5-54.7 kg/m².
Table 4.1 Participant Characteristics (Age, BMI)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value (SD) (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, in years</td>
<td>30.4 (4.54) (R = 22-39)</td>
</tr>
<tr>
<td>BM (kg/m²)</td>
<td>30.75 (8.26) (R = 19.5-54.7)</td>
</tr>
</tbody>
</table>

SD = Standard Deviation; R = Range; BMI – Body Mass Index

The majority of the sample was married (n = 48, 66.7%), single (n = 12, 16.7%), divorced (n = 5, 6.9%), or living with a partner (n = 7, 9.7%) (Table 4.2). No one was widowed. The sexual orientation of the sample included women who were heterosexual (n = 69, 95.8%), lesbian (n = 1, 1.4%), and bisexual (n = 1, 1.4%). Women trying to conceive totaled 27 (37.5%), 43 women (59.7%) were not trying to conceive, and 2 women did not indicate conception status. Regarding children, 30 (41.7%) of the women had children, while 42 (58.3%) women did not have children.

The ethnicity of the sample included Hispanic or Latina women (n = 11, 15.3%), and women who classified themselves as not Hispanic or Latina (n = 60, 83.3%) (Table 4.3). One woman did not report her ethnicity. The racial group composite included American Indian/Pacific Islander (n = 3, 4.2%), Asian (n = 1, 1.4%), Black/African American (n = 2, 2.8%), and White (n = 67, 93.1%).

Educational levels attained included high school graduate (n = 5, 6.9%), GED or equivalent (n = 1, 1.4%), associate degree (n = 8, 11.1%), baccalaureate degree (n = 29, 40.3%), master’s degree (n = 11, 15.3%), doctorate degree (n = 2, 28%), and some college (n = 16, 22.2%) (Table 4.4). The doctorate degrees included one JD and one PhD. Income levels of the women included $25K or less (n = 14, 19.4%), $26K-50K (n = 34, 47.2%), $51K-75K (n = 10, 13.9%), $76K-100K (n = 10, 13.9%), and >$100K (n = 4, 5.6%).
Table 4.2 Participant Characteristics (Marital Status, Sexual Orientation, Pregnancy, Children)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>12 (16.7)</td>
</tr>
<tr>
<td>Married</td>
<td>48 (66.7)</td>
</tr>
<tr>
<td>Divorced</td>
<td>5 (6.9)</td>
</tr>
<tr>
<td>Widow</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Living with Partner</td>
<td>7 (9.7)</td>
</tr>
<tr>
<td><strong>Sexual Orientation</strong></td>
<td></td>
</tr>
<tr>
<td>Heterosexual</td>
<td>69 (95.8)</td>
</tr>
<tr>
<td>Lesbian</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td>Bisexual</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td><strong>Pregnant</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td>No</td>
<td>70 (97.2)</td>
</tr>
<tr>
<td>Missing</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td><strong>Trying to Conceive</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27 (37.5)</td>
</tr>
<tr>
<td>No</td>
<td>43 (59.7)</td>
</tr>
<tr>
<td>Missing</td>
<td>2 (2.8)</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30 (41.7)</td>
</tr>
<tr>
<td>No</td>
<td>42 (58.3)</td>
</tr>
</tbody>
</table>

Table 4.3 Racial and Ethnic Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Number/Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethnic Group</strong></td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latina</td>
<td>11 (15.3%)</td>
</tr>
<tr>
<td>Not Hispanic or Latina</td>
<td>60 (83.3%)</td>
</tr>
<tr>
<td>Missing</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td><strong>Racial Group</strong></td>
<td></td>
</tr>
<tr>
<td>American Indian/Pacific Islander</td>
<td>3 (4.2%)</td>
</tr>
<tr>
<td>Asian</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>2 (2.8%)</td>
</tr>
<tr>
<td>White</td>
<td>67 (93.1%)</td>
</tr>
</tbody>
</table>
Table 4.4 Educational and Income Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Level</td>
<td></td>
</tr>
<tr>
<td>High School Graduate</td>
<td>5 (6.9)</td>
</tr>
<tr>
<td>GED or Equivalent</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>8 (11.1)</td>
</tr>
<tr>
<td>Baccalaureate Degree</td>
<td>29 (40.3)</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>11 (15.3)</td>
</tr>
<tr>
<td>Doctorate Degree (JD, PhD)</td>
<td>2 (2.8)</td>
</tr>
<tr>
<td>Some College</td>
<td>16 (22.2)</td>
</tr>
<tr>
<td>Income Level</td>
<td></td>
</tr>
<tr>
<td>$25K or less</td>
<td>14 (19.4)</td>
</tr>
<tr>
<td>$26K - 50K</td>
<td>34 (47.2)</td>
</tr>
<tr>
<td>$51K - 75K</td>
<td>10 (13.9)</td>
</tr>
<tr>
<td>$76K - 100K</td>
<td>10 (13.9)</td>
</tr>
<tr>
<td>&gt;100K</td>
<td>4 (5.6)</td>
</tr>
</tbody>
</table>

Geographically, 56 (77.8%) of the sample lived in a metro county and 15 (20.9%) lived in non-metro counties. One woman did not indicate her residence (Table 4.5).

Table 4.5 Geographical Setting

<table>
<thead>
<tr>
<th>Location</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Counties</td>
<td></td>
</tr>
<tr>
<td>1 Million People or More</td>
<td>23 (31.9%)</td>
</tr>
<tr>
<td>250,000 - 1 Million People</td>
<td>29 (40.3%)</td>
</tr>
<tr>
<td>250,000 or Fewer People</td>
<td>4 (5.6%)</td>
</tr>
<tr>
<td>Nonmetro Counties</td>
<td></td>
</tr>
<tr>
<td>20,000 or more adjacent to metro</td>
<td>5 (6.9%)</td>
</tr>
<tr>
<td>20,000 or more not adjacent to metro</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>2,500 - 19,999 adjacent to metro</td>
<td>3 (4.2%)</td>
</tr>
<tr>
<td>2,500 - 19,999 not adjacent to metro</td>
<td>4 (5.6%)</td>
</tr>
<tr>
<td>2,500 or less, rural, not adjacent</td>
<td>2 (2.8%)</td>
</tr>
<tr>
<td>Missing</td>
<td>1 (1.4%)</td>
</tr>
</tbody>
</table>
The sample included many diverse reported occupations. Occupations most frequently reported included Registered Nurse ($n = 4, 5.6\%$), stay-at-home mother ($n = 4, 5.6\%$), student ($n = 7, 9.8\%$), homemaker ($n = 2, 2.8\%$), receptionist ($n = 2, 2.8\%$), finance ($n = 2, 2.8\%$) and hairstylist ($n = 2, 2.8\%$). Other occupations mentioned once included clinical social worker, credit risk analyst, medical coder, medical technologist, psychotherapist, speech pathologist, and teacher.

Medications reported included contraceptives, fertility medications, metformin, spironolactone, one or more antipsychotics, and levothyroxine. All participants indicated in prescreening that PCOS signs and symptoms were not related to a thyroid condition.

**Preliminary Data Analysis**

Preliminary data analysis included determining and correcting for missing values and determining if the data met assumptions for normal distribution and equal variances among groups (Munro, 2005). Missing data are common on surveys where the respondent fails to answer an item (Munro, 2005). The researcher needs to identify the missing data and decide how to handle the missing data (Munro, 2005). A missing value analysis was performed on the data to check for missing values on instrument items. Values were missing on the BDI ($n = 13, 4.2\%$), STAI ($n = 5, 7\%$), PSS ($n = 4, 5.6\%$), WAYS ($n = 14, 19.6\%$), and PCOSQ ($n = 6, 8.4\%$).

The missing data in this study were estimated with multiple imputations whereby known relationships among variables are used to estimate the missing values (Munro, 2005). Nominal data as used in this study were imputed by SPSS with linear regression. Five sets of multiple imputations were conducted for the missing scores. After the multiple imputations were conducted, the values from the imputed data sets were added to the data file. The fifth imputation set was used in the analyses for this study as it appeared to have the most normal distribution of the five imputations and did not contain any missing data

The measurement scales and subscales were also assessed for degree of skewness (Table 4.6). In a normal distribution, the data are bell-shaped (Munro, 2005). Skewness represents an asymmetrical distribution of the data (Munro, 2005). In a perfect symmetrical presentation of data, the mean and median will be equal and the skewness coefficient 0 (Munro, 2005). Skewness values that are outside of the values -1 to +1 standard deviation units are considered substantially skewed (Munro, 2005). All the skewness coefficients for the scales and subscales in this study, except for the BDI, were within -1 to +1 standard deviations. The BDI skewness coefficient was 1.030. Transformation of BDI to z-scores, however, did not change skewness so original BDI scores were used to aid interpretation.

Levene’s Tests were performed on the data used for t-tests to assess for homogeneity of the variances in the distributions (Vogt, 2005). The Levene’s Tests demonstrated no significant F values indicating equality of variances. Assumptions of normal distribution of the data were met (Munro, 2005).

Reliability of the Measurement Instruments

Cronbach’s alpha was calculated for each measurement instrument to assess the internal consistency reliability and intercorrelation of the instrument items (Vogt, 2005). Cronbach’s alpha scores of 0.7 or higher are considered good internal consistency among the scale items (Vogt, 2005). The Cronbach’s alpha for the measurement tools are listed in Table 4.7.

The Cronbach’s alphas were greater than .7, indicating good internal consistency for the BDI, the STAI, and the PSS. Cronbach’s alphas for the eight subscales of the Ways of Coping Questionnaire ranged from .52 (Self-Controlling) to .82 (Positive Reappraisal), suggesting less robust internal consistency for the Ways subscales. For the PCOSQ, Cronbach’s alphas for four of the five PCOSQ subscales were greater than .7. However, the Cronbach’s alpha for the menstrual problem subscale was .50.
Table 4.6 Evaluation of Skewness

<table>
<thead>
<tr>
<th>Scale</th>
<th>Skew Coefficient</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>1.024</td>
<td>0.5845</td>
<td>0.4762</td>
</tr>
<tr>
<td>STAI</td>
<td>0.305</td>
<td>2.09</td>
<td>2</td>
</tr>
<tr>
<td>PSS</td>
<td>-0.168</td>
<td>1.78</td>
<td>1.9</td>
</tr>
<tr>
<td>WAYS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confrontive Coping</td>
<td>0.672</td>
<td>0.921</td>
<td>0.667</td>
</tr>
<tr>
<td>Distancing</td>
<td>0.78</td>
<td>0.816</td>
<td>0.833</td>
</tr>
<tr>
<td>Self-Controlling</td>
<td>0.498</td>
<td>1.32</td>
<td>1.28</td>
</tr>
<tr>
<td>Seeking Social Support</td>
<td>0.13</td>
<td>1.9</td>
<td>1.33</td>
</tr>
<tr>
<td>Accepting Responsibility</td>
<td>0.964</td>
<td>0.916</td>
<td>0.75</td>
</tr>
<tr>
<td>Escape-Avoidance</td>
<td>0.161</td>
<td>0.894</td>
<td>0.875</td>
</tr>
<tr>
<td>Planful Problem Solving</td>
<td>0.481</td>
<td>1.36</td>
<td>1.33</td>
</tr>
<tr>
<td>Positive Reappraisal</td>
<td>0.657</td>
<td>1.044</td>
<td>0.857</td>
</tr>
<tr>
<td>PCOSQ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotions</td>
<td>-0.048</td>
<td>4.27</td>
<td>4.31</td>
</tr>
<tr>
<td>Body Hair</td>
<td>0.151</td>
<td>3.86</td>
<td>3.8</td>
</tr>
<tr>
<td>Weight</td>
<td>0.868</td>
<td>2.87</td>
<td>2</td>
</tr>
<tr>
<td>Infertility</td>
<td>0.093</td>
<td>3.82</td>
<td>3.75</td>
</tr>
<tr>
<td>Menstrual Problems</td>
<td>-0.061</td>
<td>3.72</td>
<td>3.62</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; WAYS=Ways of Coping Questionnaire PCOSQ=Polycystic Ovary Syndrome Questionnaire

Since the Cronbach’s alphas were less than .7 for five of the eight WAYS subscales and, 5 for the menstrual problems subscale of the PCOSQ, the collected data results from the WAYS and the menstrual problems subscale were not used in this study analysis.

Results of Analyses by Research Question

This section of the results chapter is organized by the research questions as described in chapters I and III. The appropriate research question is repeated in each of the following sections with the statistical results and a brief written explanation.
Table 4.7 Cronbach’s Alpha Coefficient for the Instruments and Subscales

<table>
<thead>
<tr>
<th>Scale/Subscale</th>
<th>Alpha Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>0.91</td>
</tr>
<tr>
<td>STAI</td>
<td>0.94</td>
</tr>
<tr>
<td>PSS</td>
<td>0.92</td>
</tr>
<tr>
<td>WAYS</td>
<td></td>
</tr>
<tr>
<td>Confrontive Coping</td>
<td>0.64</td>
</tr>
<tr>
<td>Distancing</td>
<td>0.66</td>
</tr>
<tr>
<td>Self-Controlling</td>
<td>0.52</td>
</tr>
<tr>
<td>Social Support</td>
<td>0.78</td>
</tr>
<tr>
<td>Accepting Responsibility</td>
<td>0.65</td>
</tr>
<tr>
<td>Escape-Avoidance</td>
<td>0.66</td>
</tr>
<tr>
<td>Planful Problem Solving</td>
<td>0.74</td>
</tr>
<tr>
<td>Positive Reappraisal</td>
<td>0.82</td>
</tr>
<tr>
<td>PCOSQ</td>
<td></td>
</tr>
<tr>
<td>Emotions</td>
<td>0.89</td>
</tr>
<tr>
<td>Body Hair</td>
<td>0.95</td>
</tr>
<tr>
<td>Weight</td>
<td>0.96</td>
</tr>
<tr>
<td>Infertility</td>
<td>0.91</td>
</tr>
<tr>
<td>Menstrual Problems</td>
<td>0.50</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; WAYS=Ways of Coping Questionnaire; PCOSQ=Polycystic Ovary Syndrome Questionnaire

**Research Question #1**

What are the measurement levels of depressive and anxiety symptoms, perceived stress, and HRQL in the sample of adult women with PCOS?

The means, standard deviations, number of items, and range for the independent and dependent variables were computed for the scales and subscales (Table 4.8).

The mean score for the BDI was 12.28 ($SD = 9.05$). This score is at the border of minimal (0-13) and mild (14-19) depressive symptoms according to the BDI-II Manual (Beck et al., 1996). The mean score for the STAI was 41.88 ($SD = 11.8$). Rounded to 42; this score is at the 76$^{th}$ percentile for women aged 19-39. The mean for the PSS was 17.88 ($SD = 7.52$). The unadjusted
mean score on the PSS for men and women aged 25-34 was 17.78 in 2006 and 17.46 in 2009 (Cohen & Janicki-Deverts, 2012). These two scores averaged 17.62. The PSS score was slightly above average. The means and standard deviations are also presented for four of the five subscales of the PCOSQ.

Table 4.8 Instrument and Subscale Means, Standard Deviations, Number of Items, and Range

<table>
<thead>
<tr>
<th>Scale Name</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th># Items</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>12.28</td>
<td>9.05</td>
<td>21</td>
<td>0-40</td>
</tr>
<tr>
<td>STAI</td>
<td>41.88</td>
<td>11.8</td>
<td>20</td>
<td>20-69</td>
</tr>
<tr>
<td>PSS</td>
<td>17.78</td>
<td>7.52</td>
<td>10</td>
<td>2--34</td>
</tr>
<tr>
<td>PCOSQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotions</td>
<td>34.19</td>
<td>11.94</td>
<td>8</td>
<td>10-55</td>
</tr>
<tr>
<td>Body Hair</td>
<td>19.32</td>
<td>10.04</td>
<td>5</td>
<td>5-35</td>
</tr>
<tr>
<td>Weight</td>
<td>14.35</td>
<td>9.436</td>
<td>5</td>
<td>5-35</td>
</tr>
<tr>
<td>Infertility</td>
<td>15.33</td>
<td>7.628</td>
<td>4</td>
<td>4-28</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; PCOSQ=Polycystic Ovary Syndrome

The PCOSQ results are generally ranked by subscale score average with the lowest score of one representing the poorest function and seven the optimal function. The rankings for the subscale score averages minus the menstrual problems subscale are shown in Table 4.9.

Table 4.9 PCOSQ Subscale Score Averages According to Severity

<table>
<thead>
<tr>
<th>PCOSQ Subscale</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Score Average</td>
<td>2.87</td>
<td>1.89</td>
</tr>
<tr>
<td>Infertility Score Average</td>
<td>3.82</td>
<td>1.91</td>
</tr>
<tr>
<td>Body Hair Score Average</td>
<td>3.86</td>
<td>2.01</td>
</tr>
<tr>
<td>Emotions Score average</td>
<td>4.27</td>
<td>1.49</td>
</tr>
</tbody>
</table>

PCOSQ=Polycystic Ovary Syndrome; SD=Standard Deviation
The PCOSQ subscale reflecting the poorest HRQL was the weight subscale with a mean of 2.87 ($SD = 1.88$). The PCOSQ weight subscale was followed in severity of HRQL by infertility, body hair (hirsutism), and emotions.

Although the sample mean for depressive symptoms was in the minimal to mild range, five women rated themselves as severely depressed. Women who scored $\geq 29$ (severe) on the BDI, $\geq 48$ ($90^{th}$ percentile) on the STAI, or indicated any suicide ideation on the BDI-II question #9 were considered to have severe psychosocial distress and received a telephone call and counseling referral information from the PI (Rebecca Carron). The majority of the psychosocial distress was related to high anxiety ($n = 21, 29.2\%$). Four women ($5.6\%$) indicated that they had had thoughts of killing themselves but said they did not plan to commit suicide. Women with severe depression score comprised $6.9\%$ ($n = 5$) of the sample. In this sample, $30.6\%$ of the women with PCOS experienced severe psychosocial distress. This score was primarily due to anxiety symptoms, although depressive symptoms and suicide ideation were also factors in the score.

**Body Mass Index (BMI)**

A participant’s BMI was included in this data analysis because of its potential impact on psychosocial variables in women with PCOS. The descriptive statistics for the BMI for our sample are described in Table 4.10, and Table 4.11 lists BMI categories ([https://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm](https://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm)).

Table 4.10 BMI Statistics

<table>
<thead>
<tr>
<th>Statistic (N = 72)</th>
<th>Score</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>30.75</td>
<td>8.21</td>
</tr>
<tr>
<td>Minimum BMI</td>
<td>19.5</td>
<td></td>
</tr>
<tr>
<td>Maximum BMI</td>
<td>54.7</td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>31.6</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>28.25</td>
<td></td>
</tr>
</tbody>
</table>

BMI=Body Mass Index; $SD$=Standard Deviation
Table 4.11 BMI Categories (https://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm)

<table>
<thead>
<tr>
<th>Category (kg/m²)</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (16 - 18.4)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Normal (18.5 - 24.9)</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Overweight (25 - 29.9)</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Obese (30 or &gt;)</td>
<td>32</td>
<td>44</td>
</tr>
</tbody>
</table>

The mean BMI of the study sample of women was slightly obese. The BMI categories for the women ranged from low normal weight to very obese.

**Research Question #2.**

What types of coping processes do women with PCOS use to manage their condition?

This study did not address this research question due to the previously described low internal consistency of the WAYS subscales.

**Research Question #3**

Do levels of depressive and anxiety symptoms, perceived stress, BMI, and coping processes individually predict the HRQL of adult women as measured by the PCOSQ subscales?

This research question examined if levels of depressive symptoms, anxiety symptoms, perceived stress, BMI, or coping processes were significant predictors of HRQL as measured by the subscales of the PCOSQ. Data from the WAYS coping subscales or menstrual problems subscale of the PCOSQ were not included in the analysis.

Pearson correlations were first computed for each individual variable (depressive symptoms, anxiety symptoms, perceived stress, and BMI,) with the four subscales of the PCOSQ (emotions, weight, body hair, and infertility). Next, variables in the correlation matrix that had a significant correlation ($p < .05$) were entered in a multiple regression analysis to determine the significance and amount of variance ($R^2$) explained by a set of independent variables.
The emotions subscale was the first PCOSQ dependent variable examined. Significant correlations were found between BDI, STAI, PSS, BMI and emotions (Table 4.12). The first regression model indicated that STAI and PSS did not significantly contribute to the emotions score. BDI and BMI were the only significant variables affecting the emotions score. A second regression model with BDI and BMI as the entered variables indicated that BDI (Beta = -0.570, *p* < 0.001) and BMI (Beta = -0.245, *p* < 0.010) significantly predicted 43.6% of the variance of the emotions score (Table 4.13).

The body hair subscale was examined next. Significant correlations were found between BDI, STAI, BMI and body hair (Table 4.14). The first regression model indicated that BDI and STAI did not significantly contribute to the body hair score. BMI was the only significant variable affecting the body hair score. A second regression model with BMI and body hair as the entered variables indicated that BMI (Beta = -0.390, *p* < 0.001) significantly predicted 14% of the variance in the body hair score (Table 4.15).

Table 4.12 Pearson Correlations for the Emotions Subscale

<table>
<thead>
<tr>
<th>Scale/Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BDI</td>
<td>1</td>
<td>.844**</td>
<td>.709**</td>
<td>.241*</td>
<td>-.629**</td>
</tr>
<tr>
<td>2. STAI</td>
<td>.844**</td>
<td>1</td>
<td>.852**</td>
<td>.209</td>
<td>-.596**</td>
</tr>
<tr>
<td>3. PSS</td>
<td>.709**</td>
<td>.852**</td>
<td>1</td>
<td>.09</td>
<td>-.468**</td>
</tr>
<tr>
<td>4. BMI</td>
<td>.241*</td>
<td>.209</td>
<td>.09</td>
<td>1</td>
<td>-.382**</td>
</tr>
<tr>
<td>5. PCOSQ Emotions</td>
<td>-.629**</td>
<td>-.596**</td>
<td>-.468**</td>
<td>-.382**</td>
<td>1</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; BMI=Body Mass Index; PCOSQ=Polycystic Ovary Syndrome Questionnaire; *=Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed)
Table 4.13 Regression Analysis for PCOSQ Emotions Subscale

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Standardized Beta</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>0.452</td>
<td>0.436</td>
<td>-0.245</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>BDI</td>
<td>0.436</td>
<td>-0.57</td>
<td>p &lt; .001</td>
<td></td>
</tr>
</tbody>
</table>

BMI=Body Mass Index; BDI=Beck Depression Inventory; Sig=Significance

Table 4.14 Pearson Correlations for the Body Hair Subscale

<table>
<thead>
<tr>
<th>Scale/Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BDI</td>
<td>1</td>
<td>.844**</td>
<td>.709**</td>
<td>.241*</td>
<td>-0.301*</td>
</tr>
<tr>
<td>2. STAI</td>
<td>.844**</td>
<td>1</td>
<td>.852**</td>
<td>0.209</td>
<td>-0.319**</td>
</tr>
<tr>
<td>3. PSS</td>
<td>.709**</td>
<td>.852**</td>
<td>1</td>
<td>0.09</td>
<td>-0.199</td>
</tr>
<tr>
<td>4. BMI</td>
<td>.241*</td>
<td>0.209</td>
<td>0.09</td>
<td>1</td>
<td>-0.39**</td>
</tr>
<tr>
<td>5. PCOSQ Body hair</td>
<td>-0.301*</td>
<td>-0.319**</td>
<td>-0.199</td>
<td>-0.39**</td>
<td>1</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; BMI=Body Mass Index; PCOSQ=Polycystic Ovary Syndrome Questionnaire; *=Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed)

Table 4.15 Regression Analysis for PCOSQ Body Hair Subscale

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Standardized Beta</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>0.152</td>
<td>0.14</td>
<td>-0.39</td>
<td>p &lt; .01</td>
</tr>
</tbody>
</table>

BMI=Body Mass Index; Sig=Significance

Finally, the infertility subscale was examined. Significant correlations were found between BDI, STAI, BMI and the infertility subscale (Table 4.18). The first regression model indicated that BDI, STAI, and BMI predicted 8.6% of the variance in the infertility score. However, none of the predictors were significant. The infertility score was independent of BMI,
BDI, STAI, PSS, or coping processes scores (Table 4.19). The menstrual problems subscale was not included in this analysis due to the poor reliability of the scale.

Table 4.16 Pearson Correlations for Weight Subscale

<table>
<thead>
<tr>
<th>Scale/Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BDI</td>
<td>1</td>
<td>.844**</td>
<td>.709**</td>
<td>.241*</td>
<td>-0.483**</td>
</tr>
<tr>
<td>2. STAI</td>
<td>.844**</td>
<td>1</td>
<td>.852**</td>
<td>0.209</td>
<td>-0.419**</td>
</tr>
<tr>
<td>3. PSS</td>
<td>.709**</td>
<td>.852**</td>
<td>1</td>
<td>0.09</td>
<td>-0.277*</td>
</tr>
<tr>
<td>4. BMI</td>
<td>.241*</td>
<td>0.209</td>
<td>0.09</td>
<td>1</td>
<td>-0.516**</td>
</tr>
<tr>
<td>5. PCOSQ Weight</td>
<td>-0.483**</td>
<td>-0.419**</td>
<td>-0.277*</td>
<td>-0.516**</td>
<td>1</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; BMI=Body Mass Index; PCOSQ=Polycystic Ovary Syndrome Questionnaire; *=Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed)

Table 4.17 Regression Analysis for PCOSQ Weight Subscale

<table>
<thead>
<tr>
<th>R²</th>
<th>Adjusted R²</th>
<th>Standardized Beta</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.402</td>
<td>0.385</td>
<td>BMI 0.424</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BDI -0.38</td>
<td>p &lt; .001</td>
</tr>
</tbody>
</table>

BMI=Body Mass Index; BDI=Beck Depression Inventory; Sig=Significance

Table 4.18 Pearson Correlations for the Infertility Subscale

<table>
<thead>
<tr>
<th>Scale/Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BDI</td>
<td>1</td>
<td>.844**</td>
<td>.709**</td>
<td>.241*</td>
<td>-0.312**</td>
</tr>
<tr>
<td>2. STAI</td>
<td>.844**</td>
<td>1</td>
<td>.852**</td>
<td>0.209</td>
<td>-0.248*</td>
</tr>
<tr>
<td>3. PSS</td>
<td>.709**</td>
<td>.852**</td>
<td>1</td>
<td>0.09</td>
<td>-0.159</td>
</tr>
<tr>
<td>4. BMI</td>
<td>.241*</td>
<td>0.209</td>
<td>0.09</td>
<td>1</td>
<td>-0.234*</td>
</tr>
<tr>
<td>5. PCOSQ Infertility</td>
<td>-0.312**</td>
<td>-0.248*</td>
<td>-0.159</td>
<td>-0.234**</td>
<td>1</td>
</tr>
</tbody>
</table>

BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale; BMI=Body Mass Index; PCOSQ=Polycystic Ovary Syndrome Questionnaire; *=Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed)
Table 4.19 Regression Analysis for PCOSQ Infertility Subscale

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Standardized Beta</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>0.125</td>
<td>0.086</td>
<td>-0.169</td>
<td>NS</td>
</tr>
<tr>
<td>BDI</td>
<td></td>
<td></td>
<td>-0.317</td>
<td>NS</td>
</tr>
<tr>
<td>STAI</td>
<td></td>
<td></td>
<td>0.054</td>
<td>NS</td>
</tr>
</tbody>
</table>

BMI=Body Mass Index; BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; Sig=Significance

In summary, the significant variables predicting the overall HRQL in this sample of women with PCOS were BMI (body mass index) and BDI (depressive symptoms) (Table 4.20).

Table 4.20 Summary of Multiple Regression Analyses for PCOSQ Subscales

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotions</td>
<td>BMI</td>
<td>0.436</td>
<td>-0.245</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td></td>
<td>BDI</td>
<td></td>
<td>-0.57</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Body Hair</td>
<td>BMI</td>
<td>0.14</td>
<td>-0.338</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td>Weight</td>
<td>BMI</td>
<td>0.385</td>
<td>-0.409</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td></td>
<td>BDI</td>
<td></td>
<td>-0.365</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Infertility</td>
<td>BDI</td>
<td>0.086</td>
<td>-0.317</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>STAI</td>
<td></td>
<td>0.054</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>BMI</td>
<td></td>
<td>-0.169</td>
<td>NS</td>
</tr>
</tbody>
</table>

Dep. Var. =Dependent Variable; Indepen. Var. = Independent Variable; Adj.R²=Adjusted R²; Stan. Coeff. Beta = Standard Coefficient Beta; Sig. =Significance; BMI=body Mass Index; BDI=Beck Depression Inventory; STAI=Trait Anxiety Scale; PSS=Perceived Stress Scale PCOSQ=Polycystic Ovary Syndrome Questionnaire

The BDI score significantly predicted two of the four PCOSQ subscales analyzed (emotions and weight). The BMI score significantly predicted three of the 4 PCOSQ subscales.
(emotions, body hair, and weight). There were no significant predictors for infertility. Coping, anxiety, and perceived stress did not significantly predict the HRQL in this sample of women with PCOS.

**Research Question #4**

Do coping processes mediate the relationship between each independent variable (depressive symptoms, anxiety symptoms, perceived stress, BMI) and the independent variable HRQL in adult women with PCOS?

This analysis was not conducted due to the previously described low (<0.7) Cronbach’s alphas for five or the eight WAYS subscales.

**Summary**

This chapter detailed results of the research study analyzed from an online, HRQL survey with 72 English speaking, young adult women, primarily from the Denver metro area, with clinically confirmed PCOS who were not pregnant. The study sample was adequate to show significance with a power of 0.8, an alpha of 0.05, and a 0.2 effect size.

Missing data were replaced with multiple imputation procedures with SPSS. The data were analyzed for normality of distribution with evaluation of skewness and Levene’s tests. Internal consistency reliability was assessed with Cronbach’s alpha. Cronbach’s alpha was greater than 0.7 for the BDI, STAI, and PSS and four of the PCOSQ subscales.

The results indicated that 30.6% of the sample scored in the severe range for depression, anxiety, or suicide ideation. The mean scores, however, for depression were in the minimal depressive symptoms range for the BDI and at the 76th percentile for anxiety symptoms scores on the STAI. Mean score for the PSS was comparable to published mean normative PSS scores. Mean BMI was 30.75 ± 8.21 kg/m² or slightly obese.

Depressive symptoms and BMI were significant predictors of HRQL. BMI and BDI explained 43.6% of the variance for the emotions subscale of the PCOSQ. BMI explained 14% of variance for the body hair subscale of the PCOSQ. BMI and BDI explained 38.5% of the variance
for the weight subscale of the PCOSQ. None of the variables predicted the infertility subscale score.
CHAPTER V

DISCUSSION OF RESULTS

The effects of depressive and anxiety symptoms, perceived stress, and BMI on the HRQL in a sample of adult women with PCOS were examined in this research study. This chapter discusses the results presented in Chapter IV. After a description of the participant’s characteristics, the discussion is organized by research question. The chapter concludes with suggestions for further research and the nursing implications and significance of this research study.

Participant Characteristics

The study sample represented a majority of women with PCOS who were well-educated, middle income or higher, and lived in metro counties. Women who had a baccalaureate degree or higher comprised 68.4% of the sample compared with the 2012 Colorado average of 36.7% (http://quickfacts.census.gov/qfd/states/08000.html). The majority of women reported an income of $26K-50K (47.2%) with 33.4% reporting an income of $51K or greater, and 0.19% reported an income of equal or less than $25K. The Colorado average per capita income in 2012 was $31,039, and the median household income for 2008-2012 was $58,244 (http://quickfacts.census.gov/qfd/states/08000.html).

Comparative data are available from the PPCOS II trial (Legro et al., 2014). This multi-site American study included 750 women with clinically confirmed PCOS desiring conception; 43.1% of the women in this sample were participants in the UCH arm of the PPCOS II trial. In the PPCOS II study, 77.2% of the sample had a baccalaureate degree or higher compared with the 68.4% in this study. Average household income was reported as < $50K 38.3%, and > $50K 46.3%. This study had a lower income and educational level than the national PPCOS II trial. Although recruitment flyers were given to Denver Health for distribution, the primary source of recruitment was through internet advertising or email recruitment of the PPCOS II UCH participants. For a broader perspective of the experience of PCOS, researchers should make
attempts to appeal to a broad range of participants through recruitment advertising that is not internet dependent such as more intensive advertising in diverse neighborhoods or healthcare clinics utilized by diverse populations such as Denver Health or Kaiser Permanente.

**Sample Diversity**

The study sample was not as ethnically and racially diverse as we had hoped. Recruitment of women who were only fluent in Spanish was considered in designing the study. However, not all of the instrument tools were available in Spanish, so the study was limited to women who spoke and wrote in English. Women who described their ethnicity as Hispanic or Latina constituted 15.3% of the sample. According to 2012 Colorado population statistics (http://quickfacts.census.gov/qfd/states/08000.html), Hispanic ethnicity comprised 21.0% of the state population. A limitation of the study was that it lacked the perspective from non-English speaking women with PCOS in the mountain west area. Other racial and ethnic groups represented in the study with 2012 Colorado population statistics in parentheses were American Indian/Pacific Islander 4.2% (1.8%), Asian 1.4% (3.0%), Black/African American 2.8% (4.3%), and White 93.10% (88.1%). The study suggests researchers should devise recruitment strategies reaching to more racial and ethnic groups in the area for increased sample diversity and perspective.

**Age Characteristics**

The baseline characteristics of the sample described a group of young women with PCOS from the mountain west. The mean age of the sample was 30.43 ± 4.52 years with an age range from 22-39. Consequently, the women were born approximately between the years 1975-1992. The women in the sample belong to the demographic groups commonly termed “Generation X” (1965-1980) and “Millennials” (1981-2006) (http://www.brown.edu/Administration/Provost/Advance/Trower%20Generations%20and%20Me ntoring.pdf). According to Trower (2009), characteristics of Generation X include resourcefulness, self-reliance, and being highly adaptive to change and technology.
Characteristics of the Millennials include globally conferenced, realistic, and cyber-savvy. The ability of the women with PCOS in the study to scan and email documents and respond to an online survey may relate, in part, to their age.

Researchers should consider the generational characteristics of young women with PCOS who belong to the Generation X or Millennial groups. These characteristics, as expressed in this sample of women, represent novel changes and attitudes to consider in designing and evaluating research with these age groups. The sample of women was technologically competent and their preferred mode of contact was email. If communication was needed with a participant, email was more effective than a telephone call. Overall, the women experienced few difficulties with completing and returning a scanned or photographed online consent form, the online survey, or using their online thank you gift card.

Recruitment Issues

Recruitment began in January, 2013 and continued for 13 months which was longer than expected due to the low number of PPCOS II women who wanted to participate in the study, as well as problems with obtaining clinical PCOS diagnosis confirmation. The recruitment strategy was revised several times based on analysis of which recruitment strategies appeared to be successful and which ones were not helpful. Recruitment sites were expanded from the Denver metro area to sites in Colorado Springs, CO and Fort Collins, CO. Two amendments were submitted to COMIRB for recruitment expansion.

The resulting participants demonstrated self-reliance, resourcefulness, and cyber-savviness during the recruitment phase of the study. Advertisement flyers describing the research study were distributed to women’s health/reproductive medicine and metabolic endocrinology clinics at the University of Colorado in Denver and the UCH reproductive medicine clinic in Colorado Springs. Recruitment flyers were also distributed to reproductive medicine clinics in the Denver metro area and Fort Collins, CO. Study information was also posted on the University of Colorado Research List Serve, Craig’s List for the Denver area, and Facebook. While 31/72
(43.1%) of the sample were directly recruited from the PPCSO II trial with an email describing the study and contact information for the PI, the remainder of the women in the study learned about the study through various means and initiated contact with the PI. The majority of these women found the research study through the University of Colorado Research List Serve. Emails arrived from out-of-state women who were searching the University of Colorado Research List Serve for studies. The research study was advertised on the Denver Metro area Craig’s List, but this source provided no contacts. The women were searching for studies on a university approved site. A limitation in the recruitment strategy was that women may not have had an opportunity to participate who did not have access to the Internet.

Participation in a PCOS research study was important to many of the participants. Potential participants reported during the pre-screen telephone calls or subsequent telephone calls that they were looking for a PCOS research study in which to participate. Other women stated they had always wanted to be in a PCOS research study. In addition, women reported that they did not think there was enough information available about PCOS and participating in the study was important to provide more information for the care of women with PCOS. Participants received a $20.00 Amazon.com Gift Card provided on completion of the online survey as a thank you for participation time and effort. Some women reported that the gift card was not important to them; the main reason for participating was to help develop and disseminate more information about the care of women with PCOS.

**Confirmation of PCOS diagnosis**

Confirmation of a potential participant’s PCOS diagnosis significantly affected recruitment. Inclusion criteria for the study required clinical confirmation of a potential participant’s PCOS diagnosis by the Rotterdam criteria (Rotterdam ESHRE/ASRM-sponsored PCOS Consensus Workshop Group, 2004). This was strength of the study; only women participated who had a clinically confirmed diagnosis of PCOS by the Rotterdam criteria. If a woman had been previously evaluated at the University of Colorado Hospital or clinics (UCH),
confirmation of her PCOS diagnosis was easily obtained by appropriate researchers with access to the UCH Epic records. However, if a woman was diagnosed outside of UCH, records needed to be obtained documenting her PCOS diagnosis. This was a barrier to study enrollment as many women were not able to provide the location where their diagnosis was made, or they decided not to follow through with the study after learning they would need to provide access to their records. Obtaining the appropriate clinical documentation from facilities was challenging. In addition, some women self-reported a diagnosis of PCOS which was not confirmed by their clinical records. The growing use of patient access to personal health records may improve confirmation of a PCOS diagnosis in the future whereby a participant could self-access the needed information for PCOS confirmation such as testosterone levels or ovarian ultrasound reports. While the study sample of total participants was small ($N = 72$), a strength of the study was that it represented a sample of women with a clinically confirmed PCOS diagnosis.

**BMI**

The mean BMI for the sample was 30.75 kg/m$^2$. This is categorized as slightly obese (https://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm). Women with PCOS in the study reflected a broad range of BMI from normal weight (28%), overweight (28%), to obese (44%). PCOS is not limited to very heavy women. PCOS occurs in all weight classes as the study suggests. For comparison, the mean BMI for baseline women in the multisite PPCSO II trial was 35.1 ± 9.3. The sample was leaner which could reflect that Colorado where most of the participants lived has the lowest rate of obesity in the nation at 20.5% of the population (http://www.cdc.gov/obesity/data/adult.html). The average BMI for residents of Colorado is 25.89 (http://www.insureme.com/insurance/bmi-index-state). The BMI of the average adult women in the U.S. is 26.5 (http://www.cdc.gov/nchs/data/nhanes/databriefs/adultweight.pdf). In spite of the lower BMI compared to a recent reference population of women with PCOS, as well as state and national trends, the study indicated that BMI was an important, significant predictor of HRQL for the women in the sample. This will be discussed in more detail later in this chapter.
Medications

The study did not analyze the effects of participant medication on study scores. Participants reported the medications they were currently taking and they are described in Chapter IV. Participants were not required to discontinue medications for the study. The study reports the psychosocial scores of young adult women with PCOS during a cross-sectional day in their lives on their current medications including antipsychotic medications. However, seven of the 22 women in the severe psychosocial group of women were taking antipsychotic medications such as Lexapro or Celexa.

Summary

In designing research studies for young women with PCOS, the research suggests that researchers should consider the technologically competent characteristics of Generation X and Millennial generations. Researchers, however, should also consider potential participants who do not have access to the latest technology, and devise recruitment methods to reach these women with PCOS. Researchers should also consider barriers such as language, and more recruitment in areas with a broader income and geographical location in designing research studies. PCOS occurs in all racial and ethnic groups (Futterweit, 2007). Hopefully, the increased use of electronic medical records and the growing availability of patient access to medical records will provide more readily available information for confirmation of a woman’s PCOS diagnosis. Young women with PCOS appear to be concerned about their condition and eager for new information about PCOS.

Psychometrics of Measurement Instruments

Measurement instruments are used in research to collect data that are accurate, valid, and reliable (Polit & Beck, 2004). The psychometrics of the measurement tools in this study were analyzed for internal consistency with Cronbach’s alpha coefficient. The Cronbach’s alphas for the measurement instruments in the study produced mixed results which were considered in interpreting the results. The BDI (.913), STAI (.938), PSS (.920), the PCOSQ subscales for
emotions (.893), body hair (.948), weight (.973), and infertility (.906), had good internal consistency with Cronbach’s alphas > .7. These scales were used in the study analyses. The menstrual problems subscale of the PCOSQ and the WAYS were not used in the analyses due to low Cronbach’s alphas. Consequently, only the results from research questions #1 and #3 are included in the discussion section.

**Research Question #1: Measurement Scores for Depressive Symptoms, Anxiety Symptoms, Perceived Stress, BMI, and HRQL**

**Depressive Symptoms/Suicide Ideation**

The BDI study showed that women with PCOS were at risk for depression and suicide. From the sample, 5 (6.9) of the participants scored in the severe range of the BDI (29-63) and 4 (5.6%) indicated suicide ideation by responding to question #9 with “I have thoughts of killing myself, but I would not carry them out”. The community prevalence of depression is 7% with the prevalence 1.5 to 3 times higher in women than men (APA, 2013). Severe depression in the sample appeared to be less of a problem compared with severe anxiety as will be seen. The level of severe depression in the sample is roughly equal to the prevalence of depression in the community. However, as will be discussed in detail later in this chapter, BDI was an important, significant predictor of HRQL in the sample of women.

Also surprising, was the prevalence of suicide ideation (n = 4, 5.6%) in the sample. In a Swedish study, Månsson and colleagues (2008) reported that attempts at suicide by women with PCOS were seven times more prevalent than in control women without PCOS. In that sample of 49 women with PCOS and 49 women without PCOS, 7 (14%) women with PCOS had attempted suicide compared to 1 (2%) of the control group. The study used the MINI International Neuropsychiatric Interview (Sheehan et al., 1998) rather than a self-report survey. Hollinrake et al. (2007) reported suicidal thoughts in 12% of American women newly diagnosed with depression (n = 25). Subjects who screened positive for suicide ideation were contacted and referred for further evaluation and treatment. This study was required by the COMIRB to assess
and intervene as needed for severe depressive and/or severe anxiety symptoms, and/or suicide ideation. Participants who had positive test scores were sent counseling referral information. No one indicated an immediate threat to self. Suicide ideation needs to be reported in studies that measure it. This statistic may be tragically overlooked in this population of women.

The mean score on the BDI for the sample of women with PCOS was 12.35 ± 9.2. According to the BDI-II Manual Beck et al. (1996), this score is in the upper limits of minimal depression (0-13). However, according to American comparison historical data, this BDI level is higher than for control women without PCOS. Hollinrake and colleagues (2007) reported the results of the BDI in a group of 103 American women with PCOS and 103 control women without PCOS. The women in that study with PCOS and the control group were matched for age, but not for weight. Mean age of the group was 29.8 ± 6.2 (PCOS) and 30.7 ±8.5 (controls). The mean BDI score for the women with PCOS was 11.9 ± 11.1 which was significantly higher ($p < .001$) than the control group 4.5 ± 5.9. The mean score for women with PCOS of 12.35 ± 9.2 was slightly higher, but similar to the Hollinrake and colleagues (2007) sample. It should be noted that in addition to the BDI tool, Hollinrake and colleagues (2007) also measured psychosocial distress with Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ).

The 21 depressive symptoms items on the BDI are scored from 0-3 with 0 representing no symptoms for the item and 1-3 indicating the presence of the symptoms. Women with PCOS scored higher for the following depressive symptoms as indicated by a combined score of 1, 2, or 3 when compared to 0 scores: self-criticalness (57% vs. 43.1%), agitation (57.0% vs. 43.1%), energy (70.8% vs. 29.2%), sleep (70.9% vs. 29.2%), irritability (56.9% vs. 43.1%), appetite (52.7% vs. 47.2%), tiredness or fatigue (66.6% vs. 33.3%), and loss of interest in sex (51.5% vs. 48.6%). Women with PCOS in this sample had more depressive symptoms particularly in the areas of energy, sleep, and fatigue,
Importantly, findings for mean depressive symptoms scores in this study were similar to other American PCOS populations. The results provided further support for the conclusion that women with PCOS are at risk for depression and suicide. In a systematic review and meta-analysis of depressive studies in women with PCOS (n = 522) compared with control groups (n = 475) Dokras and colleagues (2011) found an odds ratio of 4.03 (95% confidence interval 2.96-5.5, p < .01) for depressive risk in women with PCOS. The risk was independent of BMI. Depression can be a response to stress according to the Transactional Model of Stress and Coping that guides this study (Lazarus & Folkman, 1984).

**Anxiety Symptoms**

Anxiety scores on the Trait Anxiety Scale (STAI) suggested that this sample of women with PCOS had greater problems with anxiety symptoms than depressive symptoms. The mean anxiety score in the sample on the STAI was 42.3 ± 11.836. Rounded to 42, this score corresponds to the 76th trait percentile for normal adult females aged 19-39. However of greater importance, 21/72 (29.2%) scored at the 90th percentile or above on the STAI suggesting severe anxiety symptoms. The prevalence of generalized anxiety disorder in the community is 2.9% of U.S. adults with anxiety occurring in twice as many females as males; the average age of onset is 30 (APA, 2013).

Among the 20 items on the STAI, this sample of women with PCOS had more anxiety in the areas of nervousness and restlessness (79.1% vs. 19.4%), managing difficulties (61.1% vs. 37.5%), excessive worry (77.8% vs. 22.2%), self-confidence (80.5% vs. 19.4%), unimportant bothersome thoughts (66.7% vs.33.3%), bothered by disappointments (55% vs. 23.6%), and state of tension (66.7% vs. 33%). In this sample anxiety symptoms were related most often to excessive worry and lack of self-confidence.

American historical data are available for a comparison analysis of the anxiety symptoms results. Weiner et al. (2004) compared a sample of American women with PCOS (n = 27) with an age- and weight-matched sample of women (n= 27) without PCOS. The mean STAI trait anxiety
score for women with PCOS was 43.89 ± 11.68, for controls 37.81 ± 8.94. The difference was not significant. This study result is comparable to the Weiner et al. (2004) result for trait anxiety in women with PCOS. However, it is the number of severe anxiety cases that is significant from this study.

Dokras and colleagues (2012) conducted a systematic review and meta-analysis of nine anxiety studies to examine the risk for anxiety symptoms in women with PCOS compared to controls. The odds ratio for anxiety symptoms in women with PCOS was 6.88, (95% confidence interval 2.5-18.9; p = .002). An included study with age and weight-matched women with PCOS and controls, found a higher prevalence of generalized anxiety and phobias suggesting anxiety was independent of BMI, while other included studies suggested there was an association with BMI and anxiety.

Anxiety in women with PCOS is important to recognize due to its association with an increased risk for CVD (Moser et al., 2011). Biologic explanations for the link include changes in the autonomic nervous system, inflammatory markers, and/or changes in endothelial function. Behavioral links for anxiety and CVD include poor life-style choices and being less likely to follow healthcare provider advice (Moser et al., 2011). Anxiety disorders are also a risk factor for suicide according to the American Foundation for Suicide Prevention (2014).

**Perceived Stress**

This study examined perceived stress as another indicator of psychosocial stress. Perceived stress as measured by the PSS-10 scale (Cohen et al., 1983) has not been previously measured in a sample of women with PCOS. Consequently the data provides unique information on perceived stress levels in women with PCOS. The PSS-10 scale is measuring “the degrees to which situations in one’s life are appraised as stressful” (Cohen et al., 1983, p. 385). Perceived stress appraisal corresponds to the first stage of the Lazarus and Folkman (1984) Transactional Model of Stress and Coping. In this initial state of the model, stress occurs when an interaction between the individual and the environment is perceived as beyond the resources of the person to
manage and affects the person’s well-being. Total possible scores on the PSS-10 can range from 0-40 (Wu & Amtmann, 2013).

The mean perceived stress level in the study was 17.78 ±7.52. This score corresponds to the 44th percentile of total score range. Published normative perceived stress score categories by degree of perceived stress are not available. According to normative data provided by Cohen and Janicki-Deverts (2012), the normative average score for the PSS-10 scale for people in the U.S. aged 25-34 in the years 2006 and 2009 was 17.62 ± 7.25. Thus, the sample mean for perceived stress score was roughly equal to published normative data in the U.S. The 90th percentile for the PSS-10 corresponds to a PSS score of 36 or more. For this sample, PSS scores ranged from 2-34. No one scored at the 90th percentile and above for perceived stress. The 85th percentile on the PSS corresponds to a score of 34. From the sample, 1/72 (1.4%) scored at the 85th percentile for perceived stress. The median score for the sample was 19 or the 48th percentile. The study results indicated 2 modes which occurred at scores 13 (32.5 percentile), and 23 (57.5 percentile).

In this sample, only one participant (1.4%) indicated increased levels of stress measured at the 85th percentile of the PSS. The mean, median, and mode scores for the sample were not extreme and centered on the 50th percentile. The vast majority of the sample did not perceive their lives as stressful as measured by the PSS. High levels of anxiety occur more frequently in the sample of women than depressive symptoms or perceived stress levels.

An item analysis of the PSS indicated that this sample of women with PCOS women indicated more perceived stress in the areas of unexpected happening (70.8% vs. 27.7%), uncontrollability of life events (66.6% vs. 31.9%), nervousness (90.3% vs. 9.7%), not able to cope (52.8% vs. 44.5%), anger over uncontrollability (69.4% vs. 30.6%), and not able to manage difficulties (51.4% vs. 48.6%). The greatest perceived stress symptoms were associated with nervousness and uncontrollability.

It is well established in the research that psychosocial stress is common in women with PCOS compared to control groups of women. Hahn et al. (2005) found in a controlled study of
German women with PCOS (n = 120, mean age 29 ± 5.4) and a control group without PCOS (n = 50, mean age 30 ± 5.7) that women with PCOS differed significantly from women without PCOS on the Symptom Checklist-90-R in the areas of obsessive-compulsive, interpersonal sensitivity, and depression. On the SF-36, women with PCOS differed significantly from control women in the area of physical role function, vitality, social function, emotional role function, and mental health.

Comparative scores in other population samples are available for the PSS-10. In a study of 160 men and women with voice disorders (mean age 50.6), Dietrich et al. found the mean PSS level in their study for females was 15.19 ± 8.19, and for males 11.90 ± 6.21. The study also found positive relationships among perceived stress, anxiety, and depression.

Lau and Yin (2011) examined perceived stress in a sample of 1151 Macao Chinese women in the second trimester of pregnancy, 69.9% of the sample were older than age 25. The median perceived stress level was 24.83 ± 6.81. Higher levels of perceived stress were associated with decreased HRQL as measured by the SF-12.

As a final exemplar of perceived stress, Lopez et al. (2011) examined pre and post perceived levels in a controlled sample of people with chronic fatigue syndrome (88% women, mean age 45.9 ± 9.3) undergoing a 12 week cognitive behavioral stress management program (CBSM). Perceived stress scores decreased in the intervention group from 29.22 ± 8.77 to 27.11 ±10.05. The control group PSS score increased from 22.39 ±7.31 to 23.46 ±6.72. The difference between the 2 groups was significant at p = .03. The results suggested that a positive coping intervention such as CBSM could improve perceived stress levels.

Cohen et al. (1983) suggested that the measurement of perceived stress could provide additional information on the relationship between stress and disease. Perceived stress which is an indication of how uncontrollable, unpredictable, and overloaded individuals feel can add additional information to the psychosocial description of women with PCOS. As shown by the results of this study, measures of perceived stress levels along with measures of depression,
anxiety, and suicide ideation may help to provide a more comprehensive picture of the psychosocial state of health in women with PCOS rather than one measurement tool alone.

**Health-Related Quality of Life**

HRQL affects an individual’s ability to find happiness in the circumstances of life (Coffey et al., 2006; Janssen et al. 2008). Health-related quality of life (HRQL) in women with PCOS was measured with the PCOSQ. The psychometrics of the 5 subscales of the PCOSQ have previously been described (Guyatt et al., 2004). The PCOSQ is a disease specific instrument and is intended to measure HRQL in areas of concern to women with PCOS (Jones et al., 2008). Scores from the PCOSQ subscales are reported as mean score averages. The results found that weight was the domain associated with the lowest HRQL (2.87) in the sample of women. Weight was followed in severity by infertility (3.82), body hair (3.87), and emotions (4.27). Considering the increased psychosocial distress found in the sample (30.56%), it is surprising that the emotions subscale had the least effect on HRQL. Again, it must be noted that the menstrual problems subscale had an unreliable Cronbach’s alpha at 0.5, but results were included for accuracy and completeness. On a scale of 1-7 from poor to optimal functioning, weight at 2.87 was in the more severe category of functioning, while the domain of emotions was in the more moderate category. The score for emotions would however correspond to the mild mean levels of depressive and anxiety symptoms as well as the perceived stress levels. The PCOSQ scores were not analyzed by percentiles, but with the mean score average.

American PCOSQ scores are available for comparison. Some of the women in the study (31) were from the PPCOS II study. Legro et al. (2014) recently published the PCOSQ baseline characteristics from 733 participants who were attempting conception with either clomiphene citrate or letrozole. The PCOSQ domain with the lowest mean was infertility (2.9), followed in severity by weight (3.3), body hair and menstrual problems (4.1), and emotions (4.5). In this ovulation induction study it is understandable that infertility was the domain of greatest concern to the women. However, again the domain of emotions was the domain of least concern to the
women. One might have expected the emotional distress accompanying infertility to be more of a concern than hirsutism issues.

Other studies with the PCOSQ also offer comparison values. Guyatt et al. (2004) examined the PCOSQ domains in a baseline sample of 393 women in Canada, the US, and the United Kingdom with PCOS undergoing a medication trial with placebo or troglitazone. The domain with the poorest function was weight (2.61), followed by body hair (3.28), menstrual problems (3.77), infertility (3.78), and emotions (4.27).

McCook et al. (2005) also examined the PCOSQ domains in a sample of 128 American women approximately half of whom were trying to conceive. The demographics of the sample (mean age 30.4 ± 5.5, 97% White, and 78% married) were similar to this sample. The lowest scoring PCOSQ domain was weight (2.33), menstrual problems (3.43), infertility (3.5), emotions (3.94), and body hair (4.34). Results for emotions and body hair are reversed from this sample, but the results are still quite similar.

The results suggest that the HRQL of the sample of women as measured with the PCOSQ was similar to other reference populations. To this point, the study indicated that the sample of women with PCOS was similar to other reference American PCOS populations with regard to depression, perceived stress, and HRQL scores. This sample, however, had higher anxiety scores than other American reference populations.

**Psychosocial Distress (Depression, Anxiety, Suicide Risk)**

The study results for severe psychosocial distress in the sample of women with PCOS were disturbing, and provided new insights into the psychosocial picture of young women with PCOS. The results of the study for levels of depression, anxiety, and suicide risk in women with PCOS supported previous studies documenting that women with PCOS are at risk for anxiety, depression, and suicide (Dokras et al., 2011, 2012; Hollinrake et al., 2007; Månsson et al., 2008). What was surprising was the level of severe psychosocial distress in the relatively small sample of women (N = 72). The analysis found that 22/72 (30.6%) of the women scored at the 90th
percentile or above for the STAI (score ≥ 48 = 90th percentile for women 19-39), in the severe psychosocial level of BDI ≥ 29, and/or screened positive for suicide ideation on Question #9 of the BDI. An answer ≥ 1 (suicide ideation, the prevalence of severe psychosocial distress in this sample was almost one out of every three women. Of these 22 women, 7 were on antipsychotic medicines.

Psychosocial distress is significant because of the impact it has on the lives of affected women. Depression affects a person’s ability to enjoy pleasures and interests in life (APA, 2000). Women, in general, are at increased risk for depression with twice the rate of depression compared to men (Mental Health America, 2011). People with depression may be at increased risk for cardiovascular disease (CVD) (Whooley et al., 2008). Women with PCOS are believed to be at risk for CVD due to risk factors including impaired glucose tolerance and insulin resistance, dyslipidemia, the metabolic syndrome (MBS), as well as depression, anxiety, and decreased quality of life (Wild et al., 2010). Insulin resistance is present in approximately 60-80% of women with PCOS and in 95% of women with PCOS who are obese (Wild et al., 2010). Consequently, it is imperative that all women with PCOS be routinely screened by health care providers for depression.

Historical data are available to put in perspective the data for psychosocial risk from the study. In a German study, Elsenbruch et al. (2006) found in a sample of 143 women with untreated PCOS that 22/143 (15.4%) of the women had a global severity index (GSI) ≥ 63 on the SCL-90-R which screens for psychosocial distress. GSI scores ≥ 63 suggests cases with a possible mental disorder. Subscales of the SCL-90-R include depressive and anxiety symptoms. Himelein & Thatcher (2006) also reported that in their sample of 40 American women with PCOS and control groups, they found levels of moderate to severe depression in 28% of the women with PCOS, 10% of women with infertility, and 2% of convenience control women. In an Italian study, Battaglia et al. (2008) found that 4% of women with PCOS (n = 25) had moderate to severe depression compared with 5% in a control group (n = 18). Suicide ideation as measured
by BDI Question # 9 was not reported in these studies using the BDI. These studies did not measure anxiety with depressive symptoms. However, not all studies were interested in combined anxiety and depression scores. For example, Himelein & Thatcher (2006) measured body image and were evaluating the role of body image in depression.

Dokras and colleagues (2009) found a mood disorder prevalence of 56.6% in a sample of 60 women with PCOS. The rate of depression was 40%, anxiety disorders 11.6%, and binge eating disorder 23.3%. In this sample, 14 of the 24 women screening positive for depression were on antidepressant medications. Hollinrake and colleagues (2007) found suicidal thoughts present in 12% of a sample of women (n = 25) newly diagnosed with depression.

The current sample yielded a high rate of severe psychosocial distress, but actual comparisons are limited by instruments, countries, and culture. Still, these results and those of other researchers concur that women with PCOS are at risk for severe psychosocial distress. Combining the results of depression inventory scores, suicide risk, and anxiety inventory scores may present a broader picture of psychosocial distress than reporting results from a single measurement instrument. By focusing on inventory means, or a single psychosocial instrument, researchers and clinicians may be missing a more complete picture of psychosocial distress in women. The results from this study and the studies by Elsenbruch et al. (2006) reinforce the need to evaluate women from a complete inventory score perspective. The following sections detail the components of the severe psychosocial distress score: depressive symptoms, suicide ideation, and anxiety symptoms.

**Effects of Depressive Symptoms, Anxiety Symptoms, Perceived stress, and BMI on the HRQL of women with PCOS**

This study found that depressive symptoms and BMI had the most significant effect on HRQL as measured by the PCOSQ in this sample of women with PCOS. Anxiety symptoms and perceived stress had significant correlations with some of the PCOSQ subscales, but did not significantly predict any of the PCOSQ subscales in the multiple regression analysis.
Each subscale of the PCOSQ was evaluated for significant correlations between the subscale and the independent variables. Independent variables with a significant correlation with the PCOSQ subscale were further analyzed with multiple regression. These collected variables as a group have not previously been evaluated in women with PCOS marking these findings as a unique contribution to existing science.

**Emotions**

The PCOSQ subscale of emotions was the first domain evaluated. Significant correlations were found between emotions and PSS score ($-0.468, P < 0.001$), BMI ($-0.382, p < .05$), STAI ($-0.596, p < .001$), and BDI ($-0.629, p < .001$). The significant correlation of emotions with the coping subscale escape-avoidance ($-0.276, p < 0.05$) was not used in the regression due to its low Cronbach’s alpha of .66.

BMI, BDI, STAI, and PSS were entered hierarchically into the regression analysis with the dependent variable emotions. STAI and PSS were not significant predictors of emotions. A second regression analysis with BMI and BDI as predictors indicated that an adjusted $R^2$ value of ($R^2 = 0.436$). This means 43.6% of the variance in the emotions score was predicted by BMI and BDI. The standardized Beta coefficient for BMI was significant ($-0.245, p < .05$) as was the standardized Beta for the BDI score ($-0.57, p < .001$).

Interestingly, frequency analyses showed that the emotions subscale was less important to women than the other PCOSQ subscales (weight, body hair, infertility, and menstrual problems. This higher optimum ranking of emotions on the PCOSQ was somewhat surprising, given the increased risk for depression and anxiety in women with PCOS. BMI was also a significant predictor of the emotions subscale. However, Dokras and their colleagues (2011) in their systematic review and analysis found that women with PCOS were at increased risk for depression independent of weight. The reason for abnormal psychosocial scores in women with PCOS continues to be complex.
Body Hair

The body hair (hirsutism) subscale was next evaluated. Significant correlations were found between body hair and BMI (-.390, \(p < .05\)), STAI (-.319, \(p < .05\)), and BDI (-.301, \(p < .05\)). The coping subscales did not significantly correlate with body hair. BMI, BDI, and STAI scores were entered hierarchically into the regression with the dependent variable body hair. In the first multiple regression, only BMI remained a significant predictor of body hair. When the regression was run again with BMI, the adjusted \(R^2\) was .14 meaning that body hair explained 14% of the total body hair score. The Standardized Beta was -.338, \(p < .05\). This means that 86% of the variance was explained by variables not measured in the study.

The relationship between body hair and BMI could be explained because increased weight causes more testosterone to be produced (Sowers, Beebe, McConnell, Randolph & Jannausch, 2001) which may affect hirsutism levels. Hahn et al. (2005) found that hirsutism clinical scores significantly correlated with the SF-36 bodily pain, general health perception, and physical sum, but were not significantly correlated with the psychosocial sum score. The 4th ranking of body hair in severity on the PCOSQ subscales, which is in accord with other published data, suggests that weight and fertility issues are of more concern to women with PCOS than hirsutism.

Weight

The weight subscale was next evaluated. Significant correlations were found between weight and PSS (-.277, \(p < .05\)), BMI (-.516, \(p < .001\)), STAI (-.419, \(p < .001\)), and BDI (-.483, \(p < .001\)). The coping subscales did not significantly correlate with the weight subscale. In the first multiple regression, only BMI and BDI remained significant predictors of weight. When the weight regression was computed again, both BMI (Standardized Beta -.409, \(p < 001\)) and BDI (Standardized Beta -.365, \(p < .001\)) remained significant predictors of weight. The adjusted \(R^2\) was 0.385 meaning that BMI and BDI scores predicted 38.5% of the weight score variance.
The PCOSQ weight subscale was significantly predicted by BMI and BDI scores which explained 40.4% of the variance. McCook et al. (2005) found in their sample of 128 women with PCOS that the greater the BMI, the lower the score on the PCOSQ weight subscale. The study did not find an effect for BMI on coping with the WAYS subscales, although the poor reliability of the tool may account for this non-significant finding. Historical study results indicated that weight can have an effect on HRQL, especially physical function. For example, Álvarez-Blasco et al. (2010) found that increasing grades of obesity were significantly associated with decreased general and physical aspects of HRQL on the SF-36. In a controlled study of women with PCOS and controls, Hahn et al. (2005) found that BMI was significantly correlated with the SF-36 scales of physical and general health, but no significant correlations were found with the psychosocial functions, including the psychosocial sum score. Increased BMI scores (≥ 25) were also associated with decreased SF-36 physical sum scores but not the psychosocial sum score. It is understandable that increased weight impacts an individual’s physical mobility. The study adds support to the PCOS literature showing BDI and BMI both contributed to a woman’s perception of the effects of her weight on her HRQL.

Infertility

The infertility subscale was last in evaluation. Significant correlations were found between STAI (r = -0.248, p < .05), BDI (r = -0.312, p < .05), BMI (r = -0.234, p < .05) and the infertility subscale. None of the coping subscales significantly correlated with infertility. In a hierarchical multiple regression analysis, none of the entered variables were significant. The Beta weights were STAI (r = -0.317, p > .05), BDI (r = -0.267, p > .05) and BMI (r = -0.156, p > .05). This result suggests that other variables not measured in the study may affect infertility. This study did not find a significant effect of coping between women attempting conception and those not attempting conception which is more fully discussed later in this section.

For comparison, McCook et al. (2005) found in their study that women with PCOS who reported only pregnancy losses without a viable infant had the lowest score on the infertility
subscale. However, infertility did not affect the other PCOSQ subscales. Dokras et al. (2011) reported an increased risk for depression independent of infertility, but admitted that results were conflicting. This study suggests that factors other than the variables in this study may affect perceptions of infertility by a woman with PCOS.

**Limitations of the Study**

This study included several limitations. Current use of medications by the participants such as hormonal, anti-androgen, or anti-psychotic medications may have affected the test results. This limitation was addressed with the participants listing the medications they were currently taking for interpretation in the final analysis.

The participant sample was limited in ethnic and racial diversity. The sample should have reflected the ethnic and racial pattern of Colorado. While the state of Colorado is predominately White, more representation from Hispanic/Latina and Native American populations would have provided a unique perspective in this study.

Language was another study limitation. Participants had to be able to read and write in the English language in order to participate in the study. This would have excluded some minority or illiterate women.

The proposed study did not contain any procedures, situations, or materials were hazardous to personnel or required special precautions.

**Suggestions for Future Research**

Psychosocial research in women with PCOS is still in the early stages. However, clinicians and researchers are recognizing the enormous psychosocial impact that PCOS has on women with the syndrome and psychosocial research continues in this select population. Based on the findings, a long-range goal for this investigator is to further examine coping in women with PCOS with different research methodologies for a broader perspective of the experience of coping in PCOS rather than relying on one measurement tool for results. Potential follow-up studies could include:
1. A qualitative study examining the motives or rationale for the choices that women made on the surveys. This study would be helpful for examining the lived experience of coping with PCOS. A narrative approach would allow participants to give their own interpretations of the psychosocial distress accompanying PCOS. This study created a database of participants who are interested in being contacted for future research studies so this follow-up is possible. The future sample of women could be selected using a stratified random sample technique whereby women are selected from different categories from the total population in the study (Vogt, 2005). For a proposed study women could be selected from the categories of severe psychosocial distress and non-severe psychosocial distress. An intervention study could be designed based on the study results to help improve the HRQL in women with PCOS.

2. This group of women could also be followed longitudinally both quantitatively and qualitatively to assess for changes in the independent and dependent variables over time.

3. Another study suggestion would be to replicate this study in a larger PCOS population with the assistance of other research institutions focusing on PCOS research.

**Implications for Nursing Research and Practice**

This study has many important implications for nursing research and practice. These results in a clinically confirmed American sample of young adult women with PCOS indicated that American women with PCOS are at risk for psychosocial distress including depression, anxiety, suicide, and decreased HRQL. All women with known or suspected PCOS should be screened at each clinical visit for psychosocial distress and referred or treated as indicated. Nurses can ask women with PCOS how they are coping with life and the problems of PCOS. Based on responses, nurses could guide women to improve or alter coping responses. The study indicated that weight management issues are a challenge for women with PCOS. Clinicians and researchers need to be aware that women with PCOS are concerned about their weight. Women should be encouraged to discuss weight management issues with their healthcare providers. This study also
indicated that cutaneous issues such as hirsutism are issues of concern. Young women around 30 years of age are making important decisions about marriage, careers, children, and education. Women like to look their best, and nurses could help women with information on appropriate hair control services. Nurses could also advocate that treatment for medically induced cutaneous issues such be hirsutism be covered by insurance policies.

Nurses are premier self-management coaches. Building a strong nurse-patient relationship with women with PCOS might help a woman to feel more comfortable discussing her problems and effective ways to cope and manage them. Nurses may encounter women with PCOS in a wide range of health care settings. Nurses need to be alert that women with PCOS may need extra care and attention as they seek effective solutions to very distressing and challenging life problems and situations.

**Conclusion**

This study in a clinically confirmed population of young adult women with PCOS indicates the need for ongoing psychosocial research in women with PCOS. This study found increased risk for depression, anxiety, suicide, and decreased HRQL in women with PCOS. Depressive symptoms and weight were significant predictors of decreased HRQL for this group of women. The question still remains as to the manner in which clinicians and researchers should respond to this psychosocial threat in a vulnerable group of young women. These women are confronting issues such as infertility, weight, and hirsutism at an age when they are making important life choices. The added stress of PCOS problems and issues can be a challenging and complicating factor. Nursing continues to have the incredible opportunity to intervene and assist this group of underserved women to find joy and happiness in their daily life.
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<td>Qase et al. (1996) Canada/USA</td>
<td>Tool development to measure PCS and HQL</td>
<td>N = 130 age ranges 18-45 years</td>
<td>Interviews</td>
<td>Questionnaire</td>
<td>PCS and QOL Questionnaire for 5 areas: emotions, body image, weight, infertility, menopausal symptoms</td>
<td>No questions about acne or alopecia</td>
<td>Not applicable to older women with no menopausal symptoms</td>
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<td>Wong et al. (2001) Canada</td>
<td>Examine the impact of severity of problems with PCS and HQL and the short form HQLQ</td>
<td>N = 100 (FQOL) mean age 53.1</td>
<td>Quantitative</td>
<td>PCS Questionnaire</td>
<td>Including potential items that could affect HQL, providing a more accurate portrayal of HQL than a selected approach focusing on major problem areas; sex-related problems can also have important effects on HQLQ.</td>
<td>Be wary of shortening scales as a shorter scale may not provide a complete picture of the person's HRQL.</td>
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<td>Trent et al. (2002) USA</td>
<td>Examine HQLQ in adolescents with PCS compared to controls and assess if biological or self-perceived severity of PCS affects their HQLQ</td>
<td>N = 97 (PCOS) mean age 16.3</td>
<td>Quantitative</td>
<td>Child Health Questionnaire, Severity of Illness Questionnaire, Fatigue, Galesworthy, Global scale score</td>
<td>PCS adolescents scored lower on general health perceptions, physical functioning, general behavior, and limitations in family activities than controls indicating lower HQLQ than controls. PCS adolescents scored lower than those who were diagnosed with PCOS but in the past year. No significant difference in HQLQ in the mild, moderate, or severe clinical categories of PCOS. Most adolescents described their HQLQ as relatively good, despite 60% of sample had moderate to severe PCOS. Adolescents perceived view of HQLQ may affect HQLQ rather than the child's assessment.</td>
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<tr>
<td>Eisenbruch et al. (2003) Germany</td>
<td>Examine effects of PCS on psychosocial and emotional functioning, HQLQ, and sexual satisfaction</td>
<td>N = 51 (PCOS) mean age 29</td>
<td>Quantitative</td>
<td>SCL-90, QOLI, FDI, PFS, PTI</td>
<td>Affected areas of life with PCS: family life, professional activities, leisure activities, and physical fitness. Higher scores on obsessive-compulsive, interpersonal sensitivity, depression, and anxiety on SCL-90. Lower HQLQ in physical role function, bodily pain, vitality, social function, emotional role function, mental health. Lower life satisfaction in areas of health, self, sex. Women with PCOS experience psychological and psychosocial problems that affect the HQLQ of women. Women with PCOS experience decreased satisfaction with sex life. Women with PCS feel that their appearance affects their security and outer appearance makes it difficult to form social contacts. BM affects HQLQ in areas of physical role function, emotional role function, and mental health. BM does not affect sexual satisfaction. No impact of BM, PCOS, QOL.</td>
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Women with PCOS experience psychological and psychosocial problems that affect the HQLQ of women. Women with PCOS experience decreased satisfaction with sex life. Women with PCS feel that their appearance affects their security and outer appearance makes it difficult to form social contacts. BMI affects HQLQ in areas of physical role function, emotional role function, and mental health. BMI does not affect sexual satisfaction. No impact of BMI, PCOS, QOL.
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<td>Hashimoto et al. (2009)</td>
<td>Examine the impact of weight on PCOS symptoms between women with PCOS from Brazil and Austria</td>
<td>Cross-cultural comparison Quantitative</td>
<td>Brazilian women with PCOS had higher prevalence of PCOS symptoms with a more negative effect on quality of life. Women from Brazil were more concerned with fertility.</td>
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<td>Trent et al. (2009)</td>
<td>Examine fertility issues and sexual activity in adolescent girls with PCOS</td>
<td>Quantitative Child Health Questionnaire Version DHE General Health Questionnaire, hormone- related symptoms, sexual activity</td>
<td>Controls were 2.8% more likely to have had sexual relations than girls with PCOS, and differences in age at first sexual encounter (13.7 vs. 14.3). Girls with PCOS were 3.6% more likely to be concerned about their ability to have children. Girls with PCOS were worried about their ability to have children who scored lower on quality of life on QOL. Boys with PCOS who were not worried about fertility. Poorer scores for girls with PCOS.</td>
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<td>Guyet et al. (2004)</td>
<td>Measurement properties of PCOS Questionnaire in women with PCOS</td>
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<td>The PCOSQ is a valid and reliable instrument for detecting treatment effects in women with PCOS. Triglycerides zone has been removed from the market.</td>
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<td>Jones et al. (2004)</td>
<td>Examine psychometric properties of PCOS Questionnaire in women with PCOS</td>
<td>Quantitative PCOSQ SF-36</td>
<td>Weight scored the lowest in HRQL, followed by infertility, menopausal symptoms, and depression. The best negative effect on HRQL was on the SF-36 role limitations-emotional and energy and skills scored the lowest. In general, the PCOSQ is a reliable instrument for measuring HRQL in women with PCOS.</td>
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<td>Schmitz et al. (2004)</td>
<td>Examine the etiology of cultural differences of PCOS symptoms and infertility between Austrian and Muslim women in Austria</td>
<td>Quantitative PCOSQ</td>
<td>HRQOL in Muslim women/women in Austria was significantly lower than in Muslim women. Rank of problems for Muslim women: infertility, menopausal symptoms, and depression. Rank of problems for Austrian women: infertility, weight, menopausal problems, and depression.</td>
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<td>van Wely et al. (2004)</td>
<td>Examine effects of hypergynec corelarity of men with PCOS Questionnaire</td>
<td>SF-36 Nottingham Health Profile QOL</td>
<td>HRQOL was not significantly different between groups on any of the scales. SF-36 and PCOS scores for psychological problems were comparable to a normative data. A pregnancy resulted in lower psychological distress.</td>
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*PCOSQ: Polycystic Ovary Syndrome Questionnaire, HRQL: Health-related Quality of Life, SF-36: Short Form 36, BMI: Body Mass Index.*
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<td>2006</td>
<td>Examine effects of laser treatment for fibrotones on psychological morbidity in women with PCOS</td>
<td>n = 44 (intervention) vs. n = 30 (controls) Mean age 35.5 years</td>
<td>Quantitative</td>
<td>HAAS, WHPDQ, SF-36, Rosenberg scale</td>
<td>Depression and anxiety scores decreased in both groups but significantly greater in intervention group. Psychological QoL increased significantly more in intervention group. No difference in groups on self-esteem. Self-reported views indicated a more positive appraisal in the intervention group. Treatment of fibrotones improves psychological QoL in women with PCOS.</td>
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<td>Hoeh et al.</td>
<td>2005</td>
<td>Examine effects of PCOS symptoms on HRQoL, psychological functioning, and sexual satisfaction</td>
<td>n = 120 (PCOS) vs. n = 38 (controls) Mean age 30.8 years Mean BMI 30.4 kg/m²</td>
<td>Quantitative</td>
<td>SF-36, BDI-11, VAS, Acne and Hirsutism clinical scores, demographics</td>
<td>PCOS women had lower HRQoL scores including emotional well-being and mental health (SF-36), higher depressive scores (BDI-11), and lower VAS scores. Women with PCOS reported less sexual attractiveness and hirsutism was worse. No correlation was found between BMI and HRQoL or psychological functioning. Hirsutism results were mixed—some negative results on general health perception and sexual attractiveness, but no association with psychological distress.</td>
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<td>McGinn et al.</td>
<td>2004</td>
<td>Examine effects of obesity, fertility status, and androgen scores on HRQoL in women with PCOS</td>
<td>n = 150</td>
<td>Quantitative</td>
<td>PCOSQ</td>
<td>PCOSQ scores were highest in women with PCOS. Women with PCOS and low BMI had significantly lower PCOSQ scores than those with high BMI. Women with PCOS and low BMI had significantly lower PCOSQ scores than those with high BMI.</td>
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</tbody>
</table>
| Trend et al. | 2003 | Examine differences in BMI among adolescent girls with PCOS and controls and assess the effect of BMI on QoL | n = 87 (PCOS) vs. n = 166 (controls) Mean age 17 Mean BMI 22.7 kg/m² | Quantitative | Child Health Questionnaire, General Health Questionnaire | Girls with PCOS scored lower on general health perceptions, physical functioning, emotional role functioning, family activities, general behavior, mental health, and higher on change in health over past year. Differences in QoL were largely explained by higher BMI in girls with PCOS. Need to address weight loss issues in girls with PCOS. Weight more than PCOS contributed to decreased HRQoL.
<table>
<thead>
<tr>
<th>Study</th>
<th>Characteristics</th>
<th>Sample Size</th>
<th>Health Instruments</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linton et al. (2006)</td>
<td>No coauthor provided</td>
<td>N = 82</td>
<td>HADS</td>
<td>33.2% of sample had levels of depression above the clinical cutoff. 74.1% had clinical levels of anxiety, and 21.3% had clinical levels of both. 34.4% of women had no psychological morbidity. Self-esteem scores were moderate to high in spite of depression and anxiety. Lower self-esteem correlated with higher depression and anxiety. QOL scores overall were moderate to good, with correlation of QOL with HADS score. Poor QOL associated with decreased QOL.</td>
</tr>
<tr>
<td>Citing et al. (2007) Netherlands &amp; Australia</td>
<td>To examine the HMQS</td>
<td>N = 179</td>
<td>SF-36, GHS-28, PCOSQ</td>
<td>BMI is negatively correlated with decreased HMQS, but BMI may not be solely determined as HMQS scores are lower than HMQS scores for overweight normative women. Pain perception may be important.</td>
</tr>
<tr>
<td>Jones et al. (2010)</td>
<td>To compare HMQS in South Asian and white Caucasian women with PCOS</td>
<td>n = 139 (Caucasian) n = 42 (South Indian, Pakistani or Indian Origin, 1% Bangladeshi) Mean age: 30 BMI: 21.5 kg/m² 72% (Caucasian) 79% (South Indian)</td>
<td>PCOSQ, SF-36, Oxford Health &amp; Ultrasound Survey (Normative Data)</td>
<td>HMQS similar in South Asians and Caucasians with PCOSQ.</td>
</tr>
<tr>
<td>Avera-Basco et al. (2010)</td>
<td>To examine the effects of obesity on HMQS in women with PCOS</td>
<td>N = 51 (PCOS) N = 71 (Controls) Mean age: 31 (PCOS) Mean age: 33 (Controls) Mean BMI: 35 kg/m² (both groups)</td>
<td>SF-36, Nottingham Health Profile</td>
<td>HMQS scores similar in both groups; both groups had women scoring in abnormal range on the SF-36. No differences found between groups, which is consistent with lower scores in energy and mobility, levels of obesity affecting pain and physical abilities. Contrasting for weight, few differences in HMQS. Women with and without PCOS. Role-emotional area worse for PCOS women than controls. Obesity was associated with worse scores in pain and physical ability of HMQS and physical functioning and general health of SF-36. Abnormal scores for role-emotional and role-physical functioning were equally distributed among weight groups which may reflect impact of PCOS on emotional aspects of HMQS. Obesity impairs HMQS more than PCOS.</td>
</tr>
<tr>
<td>Authors</td>
<td>Title</td>
<td>Sample</td>
<td>Methods</td>
<td>Results</td>
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<tr>
<td>Thornton et al. (2000) Australia</td>
<td>Examine effects of diet, diet and exercise, and diet and exercise combined on adherence to diet and alcohol for 20 weeks on depressive symptoms and HRQoL in overweight and obese women with PCOS</td>
<td>n=5 (completed study)</td>
<td>Quantitative</td>
<td>Significant reduction in bodyweight with exercise provided no additional benefit to that seen with diet, short-term improvement in depressive symptoms that was not maintained over long term. Lifestyle changes can improve HRQoL in women with PCOS.</td>
</tr>
<tr>
<td>Benson et al. (2010) Germany</td>
<td>Examine effects of coping strategies on HRQoL in women with PCOS in an internet survey with self-reported PDDQ</td>
<td>n=46</td>
<td>Quantitative</td>
<td>No significant reduction in scores by end of 20 weeks, although greater weight loss associated with greater reductions in CES-D score. However, there was significant improvement in CES-D score at week 10 that disappeared at week 20. Average CES-D scores &gt; 10 indicating mild depression. All 3 groups had significant improvements in PDDQ scores by week 20, except for distress. Change in body weight and symptom scores were related to change in weight. Weight was domain of PDDQ with lowest scores.</td>
</tr>
<tr>
<td>Kumar et al. (2012) Sri Lanka</td>
<td>Examine effects of psychological well-being on women with PCOS in Sri Lanka</td>
<td>n=146 (PCOS)</td>
<td>Quantitative</td>
<td>GHQ scores higher in women with PCOS indicating more psychological distress than controls. HRQoL a significant predictor of psychological distress. HRQoL scores lower in physical health, psychological health, and social relationships in women with PCOS vs controls, although none of these were predictors of HRQoL in sample. BMI was not a predictor of HRQoL, therefore, not a significant contributor to psychological distress and decreased HRQoL in women with PCOS.</td>
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</table>

**Notes:**
- CES-D: Center for Epidemiologic Studies Depression Scale
- PDDQ: Perceived Disease Discomfort Questionnaire
- GHQ: General Health Questionnaire
<table>
<thead>
<tr>
<th>Source</th>
<th>Purpose</th>
<th>Sample</th>
<th>Instruments</th>
<th>Results</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wacker et al. (1994) USA</td>
<td>Baseline relationship between mood and androgen levels in women with PCOS and controls</td>
<td>n = 27 (cases)</td>
<td>Acute rating scale</td>
<td>State depression (mean) PCOS = 51.28 Control = 45.48</td>
<td>Androgens may alter mood dysregulation in women with PCOS.</td>
</tr>
<tr>
<td>Helin et al. (2004) Germany</td>
<td>Baseline effects of PCOS symptoms on quality of life, psychosocial well-being, sexual satisfaction</td>
<td>n = 198 (controls)</td>
<td>SF-36, HRQOL, VAS</td>
<td>Depression (SG-100) 0.86 (P&lt;0.001) 0.84 (Controls) 0.77 (PCOS Women)</td>
<td>Androgens, infertility, menstrual disturbances, BMI, insulin, or age did not explain mood dysfunction at different free testosterone levels.</td>
</tr>
<tr>
<td>Himeleh &amp; Thatcher (2006) USA</td>
<td>Baseline depression and body dissatisfaction in women with PCOS vs. women with infertility or controls</td>
<td>n = 40 (PCOS)</td>
<td>BDI</td>
<td>Women with PCOS demonstrated more depressive symptoms and greater body dissatisfaction, infertility not associated with depression; weight may be associated with depression. Body dissatisfaction and education explained 66% of depression variance.</td>
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<tr>
<td>Hoffmann et al. (2007) USA</td>
<td>Baseline risk for depression in women with PCOS vs. controls</td>
<td>n = 103 (PCOS), Mean age 28.4, Mean BMI 34.9 kg/m²</td>
<td>BDI</td>
<td>Women with PCOS were at increased risk for development of depression, independent of BMI. Odds ratio 5.1. Risk for depression was not associated with androgen level or infertility. Depressed women with PCOS had higher BMI than non-depressed women with PCOS.</td>
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<tr>
<td>Bettaglia et al. (2008) Italy</td>
<td>Baseline risk for depression and sexual dysfunction in lean women with PCOS and controls</td>
<td>n = 26 (PCOS), Mean age 27.7, Mean BMI 21.6 kg/m²</td>
<td>MPCI, SDS</td>
<td>No difference in MPCI and SDS scores between women with PCOS and controls. The incidence of depression did not differ between groups. PCOS women (20%) and controls (18%) had mild to moderate depressive symptoms. PCOS women (4%) and controls (3%) had moderate to severe depression. No difference was found between groups.</td>
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</table>
Acakli et al. (2008) - Turkey

<table>
<thead>
<tr>
<th>Study Title</th>
<th>Design</th>
<th>Methods</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence of chronic depression symptoms and clinical characteristics in women with PCOS versus controls.</td>
<td>Quantitative</td>
<td>n = 42 (PCOS), Mean age 29.34, Mean BMI 35.21</td>
<td>BMI scores significantly higher in women with PCOS. 10.5% of women with PCOS had 31.1% of depressive symptoms compared to 4.3% in the control group. BMI and triglyceride were significantly higher in women with PCOS. Clinical and biochemical parameters not related to depressive risk.</td>
</tr>
</tbody>
</table>

Benno et al. (2008) - Germany

<table>
<thead>
<tr>
<th>Study Title</th>
<th>Design</th>
<th>Methods</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Impact of depression on quality of life in women with PCOS.</td>
<td>Quantitative</td>
<td>n = 28 (PCOS), Mean age 29</td>
<td>HAQ/R-36 scores higher in women with PCOS than in controls. Inflammatory markers did not correlate with HAQ/R-36 scores. BMI and BMI did not correlate. HAQ/R-36 scores were correlated with psychological HRQOL, but not physical scores. BMI and age correlated with psychological HRQOL, but not physical scores. BMI and age were higher than controls. HAQ/R-36 scores were lower than controls. No association between inflammatory markers and disease severity.</td>
</tr>
</tbody>
</table>

Milonkovic et al. (2008) - Sweden

<table>
<thead>
<tr>
<th>Study Title</th>
<th>Design</th>
<th>Methods</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Incidence of psychiatric disorders in women with PCOS vs. controls.</td>
<td>Clinical Interviews</td>
<td>n = 69 (PCOS), Mean age 35.3, Mean BMI 28.5</td>
<td>Results indicated a significantly higher rate of depression, eating disorders, and anxiety disorders. Use of psychiatric drugs higher in women with PCOS. BMI was associated with MDD and social phobia. Depression was associated with fertile status.</td>
</tr>
</tbody>
</table>

Özçakar et al. (2008) - Turkey

<table>
<thead>
<tr>
<th>Study Title</th>
<th>Design</th>
<th>Methods</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence of anxiety, depression, and coping in women with PCOS</td>
<td>Quantitative</td>
<td>n = 35 PCOS, Mean age 27.76</td>
<td>Women with PCOS had statistically increased levels of depressive symptoms and anxiety than controls. Women with PCOS had statistically more self-blaming/helplessness and accepting responsibility coping processes than controls. Women with PCOS are at risk for anxiety and depressive symptoms.</td>
</tr>
</tbody>
</table>

Women with PCOS may use maladaptive coping processes in managing the condition. |
<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Description</th>
<th>Methodology</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Soyapet et al. (2008)</td>
<td>Dexametazem depression and anxiety symptoms in women with PCOS vs. controls</td>
<td>Quantitative</td>
<td>No difference in hand strength and hand dexterity between groups. Hand function was significantly impaired in women with PCOS. SDI scores significantly increased in women with PCOS. BMI scores associated with BMI. 31.1% of women with PCOS had BMI score &gt; 31 and 11.1% of controls had a BMI &gt; 31. BMI and SH were significantly correlated. No correlation between BMI and testosterone levels.</td>
</tr>
<tr>
<td>Leggari et al. (2008)</td>
<td>Dexametazem depression and anxiety symptoms in adolescent girls with PCOS and MDRH vs. controls</td>
<td>Quantitative</td>
<td>27.3% of girls with PCOS had mild depression compared to MDRH (20.3%) and controls (9.1%). 16.5% of girls with PCOS had moderate depression compared to MDRH (5%) and controls (5%). For anxiety, girls with PCOS scored significantly higher than controls. Anxiety scores for girls with MDRH were also elevated.</td>
</tr>
<tr>
<td>Bhattacharya et al. (2010)</td>
<td>Dexametazem depression and anxiety symptoms in women with PCOS and controls</td>
<td>Quantitative</td>
<td>64.4% of women with PCOS scored in the depressive disorders range. This was significantly higher than in the control group. Adjusting for social and medical factors, depression was still found to be significantly higher in women with PCOS. Except for BMI, no difference in sociodemographic variables between PCOS women and controls: BMI higher in women with PCOS, no difference in sociodemographic, clinical, or biochemical parameters between depressed and non-depressed women with PCOS. No difference in BMI between PCOS groups. Depression risk is independent of BMI. No determinants of depression risk identified.</td>
</tr>
<tr>
<td>Jehel et al. (2020)</td>
<td>Dexametazem depression and anxiety symptoms in women with PCOS vs. BMI matched controls</td>
<td>Quantitative</td>
<td>Anxiety scores were significantly higher in women with PCOS than controls. Depression scores were not significantly different between groups. The only depressive subscale showing a difference between groups was sleep. No difference in sociodemographic between groups. A clinically relevant anxiety score &gt; 1.5 found in 64% of women with PCOS versus 12% of controls, and a clinically relevant depression score of &gt; 1.1 was found in 38% of women with PCOS versus 20% of controls.</td>
</tr>
</tbody>
</table>
| Berry et al. (2013) | Examined relationship n = 76 (PCOS), mean | Quantitative | HAGS  | In a group of women matched for age, BMI, and smoking, women with PCOS had significantly higher levels of depression and anxiety. Women with PCOS had significantly higher neuroticism and anhedonia. Testosterone levels did not contribute to mood dysfunction.

UK | between testosterone and mood disorders | between testosterone and mood disorders | Spanish Personality Questionnaire | Language Expression Inventory | Exclusion criteria: history of psychosis, Melatonin or anti- androgens avoided.

Women with PCOS | n = 49 (control), Mean age 35.52, Mean BMI 24.49 kg/m² | Aggression Questionnaire | Exclusion criteria: history of psychosis, Melatonin or anti- androgens avoided.

n = 49 (control), Mean age 35.52, Mean BMI 24.49 kg/m² | Exclusion criteria: history of psychosis, Melatonin or anti- androgens avoided.

Testosterone levels did not affect results. |
<table>
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<tr>
<th>Source</th>
<th>Purpose</th>
<th>Sample</th>
<th>Design</th>
<th>Instruments</th>
<th>Results</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wammer et al. (2024) USA</td>
<td>Evaluate relationship among androgen levels and mood disorders in women with PCOS vs. controls</td>
<td>182</td>
<td>Quantitative</td>
<td>Mood Task Anxiety Inventory, and other aggression, anger, depression, hostility, anxiety, and eating disorder scales</td>
<td>Significant difference in anxiety between groups suggesting mood changes related to symptomatology. Higher anxiety increased in the anogenital area; BMI not a role in anxiety.</td>
<td>Unrelated role of androgens in mood disorders in this BMI method controlled study.</td>
</tr>
<tr>
<td>Hain et al. (2022) Germany</td>
<td>Examine effects of PCOS on mood and well-being in women</td>
<td>182</td>
<td>Quantitative</td>
<td>SC - 90 - R</td>
<td>Women with PCOS scored significantly higher on depression compared to controls. Need to treat women with PCOS as individuals as clinical symptoms may not correlate with psychosocial distress. Anxiety significantly correlated with HP and psychological subscales. BMI not correlated with anxiety.</td>
<td></td>
</tr>
<tr>
<td>Milsom et al. (2022) Sweden</td>
<td>Examine prevalence of psychiatric disorders in women with PCOS vs. controls</td>
<td>182</td>
<td>Quantitative</td>
<td>MN</td>
<td>Women with PCOS had significantly higher scores for social phobia. Generalized anxiety disorder and depression in women with PCOS. BMI and androgens correlated with social phobia.</td>
<td></td>
</tr>
<tr>
<td>Örland et al. (2020) Turkey</td>
<td>Examine anxiety, depression, and coping in women with PCOS vs. controls</td>
<td>182</td>
<td>Quantitative</td>
<td>BAI, MABS</td>
<td>Women with PCOS had significantly higher depression and anxiety scores than controls. Women with PCOS used more “self-blame” and “helplessness” coping strategies. Anxiety and depression linked to the pathological range.</td>
<td></td>
</tr>
<tr>
<td>Lapiard et al. (2019) Greece</td>
<td>Examine anxiety and depression in adolescent girls with PCOS and normal women vs. controls</td>
<td>182</td>
<td>Quantitative</td>
<td>BAI, STAI</td>
<td>Adolescents with PCOS had higher state anxiety scores than controls, but not significant. Women with PCOS had significantly higher state anxiety scores than controls.</td>
<td></td>
</tr>
<tr>
<td>Jed et al. (2018) Sweden</td>
<td>Compare anxiety and depression in women with PCOS vs. controls</td>
<td>182</td>
<td>Quantitative</td>
<td>MHGRS</td>
<td>The BDI-1 anxiety score was significantly higher in women with PCOS than controls. No difference was found for symptomatology depression scores. 60% of women with PCOS vs 15% of controls had an anxiety score &gt;11 suggesting clinical anxiety. Clinical depression was 50% PCOS vs 20% controls. Higher anxiety associated with mood, worry, phobia and panic problems than controls.</td>
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<tr>
<td>Source</td>
<td>Purpose</td>
<td>Sample Description</td>
<td>Design</td>
<td>Instruments</td>
<td>Results</td>
<td>Implications</td>
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<tr>
<td>Teelt et al. (2002)</td>
<td>Examine HRQL in adolescents girls with PCOS vs. controls</td>
<td>n = 177 PCOS, mean age 16.0, n = 180 (controls), mean age 17.0</td>
<td>CHQ-CF 17</td>
<td>HRQL lower in adolescents with PCOS compared to control. Most symptoms described PCOS as mild even with moderate to severe clinical symptoms score.</td>
<td></td>
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</tr>
<tr>
<td>Elsbron et al. (2005)</td>
<td>Examine psychological distress, HRQL, and sexual satisfaction in women with PCOS vs. controls</td>
<td>n = 50 PCOS, mean age 28.4, mean BMI 31.1 kg/m², n = 50 controls, mean age 26.6, mean BMI 26.4 kg/m²</td>
<td>SCL-90-R, SF-36</td>
<td>Women with PCOS had significantly lower HRQL and significantly higher psychological distress compared to controls on several subscales of tools. Many differences remained significant after controlling for BMI.</td>
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<tr>
<td>Hohn et al. (2001)</td>
<td>Examine effects of PCOS symptoms on HRQL, psychological functioning and sexual satisfaction</td>
<td>n = 120 PCOS, mean age 25, mean BMI 31.1 kg/m², n = 50 controls, mean age 25 BMI 24 kg/m²</td>
<td>SCL-90-R, SF-36</td>
<td>Women with PCOS had significantly lower HRQL and significantly higher levels of psychological distress than controls on several subscales of tools. Psychological distress significantly correlated with HRQL, increasing decreased HRQL with increased psychological distress BMI significantly correlated with physical health not mental health. Other clinical symptoms not relevant.</td>
<td></td>
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</tr>
<tr>
<td>Elsbron et al. (2001)</td>
<td>Examine impact of emotional distress on HRQL in women with PCOS</td>
<td>N = 143, mean age 28.5 ± 3.1, mean BMI 26.8 ± 3.0 kg/m²</td>
<td>SCL-90-R, SF-36</td>
<td>15.4% of women with PCOS had a DSI ≥ 13 indicating psychological distress. 31% cases had significantly lower HRQL compared to normal controls. Psychological distress was significantly lower in women with PCOS compared to normal controls. Women with PCOS had a significantly higher percentage of physical and psychological HRQL. Women with PCOS who had normal levels of psychological distress may still have decreased HRQL. BMI is associated with physical and psychological HRQL. Women with PCOS who had normal levels of psychological distress had a significantly higher percentage of physical and psychological HRQL. Mental health was assessed using the Mini International Neuropsychiatric Interview.</td>
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<tr>
<td>Milson et al. (2008)</td>
<td>Examine prevalence of psychiatric disorders in women with PCOS vs. controls</td>
<td>n = 49 PCOS, mean age 35.5, n = 49 controls, mean age 35.5</td>
<td>MINI International Neuropsychiatric Interview</td>
<td>Women with PCOS had increased incidence of depression, social phobia, and eating disorders compared to controls. Women with PCOS were 7 times more likely than controls to have attempted suicide (14% vs. 2%). No association with fertility or endogenous depression risk. Social phobia had higher odds ratio compared to controls.</td>
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<tr>
<td>Source</td>
<td>Purpose</td>
<td>Sample Design</td>
<td>Findings</td>
<td>Results</td>
<td>Implications</td>
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<tr>
<td>David et al. (2009)</td>
<td>Examine coping style, depressive symptoms,</td>
<td>Quantitative</td>
<td>Women with PCOS used more “positive” or emotion focused coping processes</td>
<td>Women with PCOS had significantly higher scores indicating higher use of this coping process. “Self-blame and helplessness” and “accepting responsibility” were more likely in pathological ranges.</td>
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<td>and anxiety in women with PCOS vs controls</td>
<td>n = 33 (PCOS), n = 33 (Control)</td>
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<tr>
<td></td>
<td>Turkey</td>
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<td>Depression severity, BMI, Mean weight, Age, Mean BMI</td>
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<td>75.43 ± 4.72, 25.34 ± 0.54, 24.76 ± 0.3</td>
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<tr>
<td>Benson et al. (2019)</td>
<td>Examine coping processes, depressive</td>
<td>Quantitative</td>
<td>Women with PCOS used significantly more “active” coping than normative</td>
<td>Women with PCOS may use more maladaptive coping processes which may be a risk factor for psychological distress.</td>
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<td>risk, anxiety, and HRQ in a sample of women</td>
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<td>population. Significant differences in use of “active” or problem-focused coping were noted.</td>
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<td>with supported and un-supported PCOS.</td>
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<td></td>
<td>Germany</td>
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<td>Depression and anxiety, BMI, Mean weight, Age, Mean BMI</td>
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<td>86 ± 10, 25 ± 10, 24.5 ± 0.5</td>
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<tr>
<td>Jurca et al. (2016)</td>
<td>Examine coping and psychological distress in</td>
<td>Quantitative</td>
<td>Women with PCOS used more “depressive” and less active coping processes.</td>
<td>Women with PCOS used more “depressive” and less active coping processes.</td>
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<tr>
<td></td>
<td>a sample of women with PCOS.</td>
<td></td>
<td>Psychological distress, BMI, Mean weight, Age, Mean BMI</td>
<td>Women with PCOS had psychological distress and less satisfaction with life in general.</td>
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</tr>
<tr>
<td></td>
<td>Germany</td>
<td></td>
<td>75 ± 10, 25 ± 10, 24.5 ± 0.5</td>
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<td></td>
<td>ABSTRACT</td>
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APPENDIX B

DEMOGRAPHIC DATA FORM
Demographic Data Form

Demographic Information

Please provide the following demographic information for our PCOS research study:

Age: ________
Height: _______
Weight: ______

Current Occupation: __________________________________________________

Marital Status:  Single: ______ Married: ______ Divorced: ______ Widow: ______

Sexual Orientation:  Heterosexual: ______ Lesbian: ______ Bisexual: ______

Pregnant:  Yes: ______ No: ______

Trying to Conceive:  Yes: ______ No: ______

Unable to Conceive:  Yes: ______ No: ______

Children:

Yes: ______  Number of children: ______

No: ______

Please list your current prescription medications (including any hormonal contraceptives such as oral contraceptives, intrauterine devices, Implanon, rings, patches, or Depo-Provera):

1. _________________________________  6. _________________________________
2. _________________________________  7. _________________________________
3. _________________________________  8. _________________________________
4. _________________________________  9. _________________________________
5. _________________________________  10. _________________________________

How would you best describe yourself?

American Indian or Other Pacific Islander: ______

Asian: ______
Black or African American: ______
Hispanic or Latina: ______
White: ______

**What is your highest educational level?**

High School Graduate: ______
Did not finish high school: ______
General Educational Development Test (GED) or Equivalent: ______
Associate Degree: ______
Baccalaureate Degree: ______
Master’s Degree: ______
Doctorate Degree: ______ List type of doctorate and area:
____________________________

Some College: ______

**What is your income level?**

$25K or less: ______
$26K - 50K: ______
$51K - 75K: ______
$76K - 100K: ______
> $100K: ______