DEPRESSIVE SYMPTOMS IN THE TRANSITION TO MENOPAUSE: THE ROLE OF IRRITABILITY, PERSONALITY VULNERABILITY, AND SELF-REGULATION

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April 5, 2012

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Doctor of Philosophy.

DEDICATION

I dedicate this work, with all my love, to my extraordinary family.

ACKNOWLEDGMENTS

As I draft my final thoughts and conclusions in my dissertation, I feel a deep sense of indebtedness to all those who have guided, encouraged, and supported me along this journey. While my progress and arrival at this long awaited destination is a function of important contributions by many, I would be remiss if I did not express my deepest appreciation and admiration to my supervisor, Dr. David Zuroff. As a mature student with a diverse academic background, you believed in me from the onset and provided straightforward feedback when warranted and unwavering support and solutions when setbacks seemed overwhelming. I could have not conquered the numerous challenges without you. I thank you forever.

My advancement in this endeavor would have not been possible without the support and guidance from my other Committee members: Dr. Barbara Sherwin, for introducing me to the field of psychoneuroendocrinology, and Dr. Blaine Ditto. As I reflect over the early days in the program, I am reminded of Dr. Yoshio Takane, who thankfully reawakened my passion for quantitative analysis, which has proved to be an important ingredient in enabling me to try and keep up with Dr. Zuroff!!! I would also like to express my appreciation of the support over the years from Dr. Sullivan and Dr. Knäuper, who were there for me when needed. Thank

you to Chantale Bousquet and Giovanna LoCascio for helping me navigate through administrative matters.

How does a mother of triplet boys balance the demands of a Ph.D. program with significant family obligations? I could not have completed my Ph.D. without the love, friendship, and assistance from my mother. You're an amazing mom! Dad, I have learned so much from you in the way you observe and approach life. I also want to thank my brother Eddie, the thinker, who has been an incredible role model of analytical thinking. A big hug goes to my very large extended family and to all my friends, especially to Debbie, my soul sister, and to Debi, my oldest friend from Campichuelo, for being so caring and for defining true friendship.

Finally, I could have not succeeded in this daunting task without the unconditional love, encouragement, and never-ending belief in me from my incredibly energetic husband. He is my soul mate who has always been next to me throughout this ride along a winding road. I am also truly blessed to have the most extraordinary caring sons who understood me while I was reading, writing, downloading, printing, and monopolizing almost every room in our house. Josh, Jonathan, and Daniel, you are about to embark on your own journeys through University and have my blessing to do what it takes, and even to dominate the house! And I'll even lower my music for you! You guys are amazing!!!

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ABSTRACT

Menopause is a natural occurrence that all women experience during the midlife. Recent investigations indicate that although there may be some women who develop depression during the menopausal transition (MT), a much more prevalent concern is an increase in irritable mood. Evidence stemming from research unrelated to menopause indicates that irritability and depression are distinct mood conditions. Furthermore, various researchers have proposed that irritable mood is a prodrome of full-blown depression, especially if other vulnerability factors are involved. The overarching objective of this dissertation was to examine factors that contribute to increases in depressive symptoms and identify women at risk as they transition to menopause.

I first investigated whether irritability and depressive symptoms are differentially associated with menopausal status – premenopause, early and late transition to menopause, and postmenopause. Irritability was expected to be elevated in women in the MT compared to those who were either pre- or postmenopause. Next, I examined whether the personality variables of self-criticism and dependency, two personality styles considered to increase susceptibility to depression during various stages of life, moderate the impact of irritability in predicting depressive symptoms in women transitioning to

menopause. Lastly, I tested two models of mediated-moderation to examine the role of affect-related self-regulation in explaining the moderated effect of irritability by personality vulnerability factors on depressive symptoms.

The study used a cross-sectional design and was administered over the Internet. Of the 376 women who participated in the study, 102 were premenopausal, 157 had entered the transition phase, and 117 were postmenopausal. Determination of menopausal status was based on self-reported menstrual bleeding pattern and chronologic age, and is in accordance with widely used systems established for research on menopause. Moderation was examined using hierarchical regression analysis. Mediation hypotheses were examined using the causal steps procedure for testing basic mediation (Baron and Kenny, 1986) and extended by Muller, Judd, and Yzerbyt (2005) to test for the combined effect of moderation and mediation.

As predicted, analyses showed that women in the MT reported significantly higher levels of irritability compared to pre- and postmenopausal women. Also, irritability was significantly associated with depressive symptoms. Importantly, and as predicted, self-criticism moderated this association. Simple slope analyses showed that it is among women with high levels of self-criticism that irritability produces a marked increase in depressive symptoms. Finally, results supported a mediated moderation model in which self-regulation was the mediator. Self-regulation was defined

as the ability to access effective strategies for coping with a negative mood, and to maintain goal directed behavior and inhibit impulsive behavior when one is in a negative mood state. Findings based on this model indicated that irritability significantly compromised women's ability to self-regulate, especially among women who were highly self-critical, and dysfunction in self-regulation partially explained their increased level of depressive symptoms. The second model, which tested non-acceptance of negative emotion as the mediator, was not supported. In sum, findings of this study suggest that the transition to menopause may represent an especially vulnerable period for women with high levels of self-criticism. Although irritability is transitory for most women; for women who are highly self-critical, irritability may tax their ability to self-regulate and lead to more encompassing symptoms of depression. Clinical implications are discussed.

ABRÉGÉ

La ménopause est un état naturel que chaque femme éprouve vers le milieu de la vie. De récentes études indiquent que malgré le fait que certaines femmes développent une dépression durant la période de transition ménopausale (TM), une augmentation de l'irritabilité est une manifestation beaucoup plus courante chez ces femmes. Des résultats provenant d'études ne portant pas sur la ménopause indiquent que l'irritabilité et la dépression sont deux états émotionnels distincts. De plus, des recherches variées indiquent que l'irritabilité est un prodrome de la dépression avérée, notamment si elle est accompagnée d'autres facteurs de vulnérabilité. L'objectif prédominant de cette dissertation était d'examiner les facteurs contribuant à la dépression ainsi que d'identifier les femmes à risque à celle-ci lors de la période de transition vers la ménopause.

J'ai d'abord évalué si l'irritabilité et les symptômes de la dépression sont différentiellement associés au statut ménopausal- préménopause, la période de transition vers la ménopause, et postménopause. Il était attendu à ce que l'irritabilité soit élevée chez les femmes en TM comparé a celles étant soit en pré- ou postménopause. Par la suite, j'ai examiné si des variables liées a la personnalité, soit l'auto-critique ou la dépendance, deux styles de personnalité présumés augmenter la susceptibilité à la dépression durant différentes étapes de la vie, modèrent l'impact de l'irritabilité en prévoyant la

dépression chez les femmes transitant vers la ménopause. Finalement, j'ai examiné la manière dont l'auto-régulation liée à l'affect pouvait expliquer la relation entre l'impact de l'irritabilité, modéré par des facteurs de vulnérabilité de la personnalité (ci-haut mentionnés), et les symptômes de la dépression.

Cette étude était de nature transversale et a été effectuée par le biais d'Internet. Parmi les 376 femmes ayant participé à cette étude, 102 étaient en préménopause, 157 étaient en phase de transition, et 117 étaient en postménopause. Le statut ménopausal a été déterminé par le patron de saignement menstruel et par l'âge chronologique auto-rapportés par les participantes, et en accord avec des systèmes communément utilisés dans la recherche sur la ménopause. La modération statistique a été examinée par l'usage de l'analyse de régression hiérarchique. Les hypothèses de médiation ont été testées en utilisant les étapes de procédures de base pour la médiation (Baron and Kenny, 1986), et élaborée par Muller, Judd, and Yzerbyt (2005) pour tester l'effet combiné de la modération et médiation.

Comme prévu, les analyses indiquent que les femmes en état de TM rapportaient des niveaux d'irritabilité significativement plus élevés que celles en pré- et postménopause. Aussie, l'irritabilité était significativement associée aux symptômes de la dépression. Il est important de souligner que tel que prévu, l'auto-critique a joué un rôle de modérateur dans cette

association. Les analyses ont montré que c'est parmi les femmes ayant de hauts niveaux d'auto-critique que l'irritabilité produit une augmentation marquée des symptômes de la dépression. Finalement, les résultats appuient le modèle de modération dans lequel l'auto-régulation était le médiateur. L'auto-régulation était définie comme étant la capacité d'avoir recours à des stratégies efficaces pour gérer une humeur négative, de maintenir des comportements motivés, et d'inhiber des comportements impulsifs quand une personne est d' humeur négative. Les résultats basés sur ce modèle indiquent que l'irritabilité compromet de façon significative la capacité des femmes à s'auto-réguler, notamment parmi les femmes qui étaient hautement critiques envers elles-mêmes; aussi, le dysfonctionnement dans l'auto-régulation expliquait partiellement leur niveau élevé de symptômes de la dépression. Le deuxième modèle, testant le rôle médiateur de la non-acceptation des émotions négatives, n'a pas été appuyé par cette étude.

En résumé, les résultats de cette étude suggèrent que la période de transition vers la ménopause représente une période de particulière vulnérabilité pour les femmes étant hautement critiques envers elles-mêmes. Bien que l'irritabilité soit transitoire pour la plupart des femmes, l'irritabilité pourrait compromettre la capacité à s'auto-réguler et mener à davantage de symptômes de la dépression pour celles qui sont hautement critiques envers elles-mêmes. Les implications cliniques sont abordées.

Chapter 1 Introduction

The focus of the current research is on mood disturbances in women during the transition from the reproductive to the nonreproductive phase of life. Research on menopause has been rapidly expanding given that: (a) half of the population that reaches midlife experiences menopause, (b) a large segment of the population - the baby boomers - have been entering the peak years of the transition (Whitbourne & Willis, 2006), and (c) approximately 2 million women in the US reach menopause each year (Alexander & Dennerstein, 2007). Menopause is defined as the permanent cessation of menses, and is recognized after 12 months of amenorrhea (Soules et al., 2001). The transitional phase prior to the menopause is characterized by widely fluctuating and declining hormonal levels, and lasts on average four years (McKinlay, Brambilla, & Posner, 1992). The phase also coincides with mid-life, a time when people reflect on their lives and experience increased social stressors, which, for many women, may provoke a psychological state of turmoil. Thus the transition to menopause has been portrayed as a period of great emotional vulnerability. It has been associated with an increased risk of depression.

Diverse neurobiological, psychological and social factors that contribute to the onset, maintenance, and recurrence of depression have

been identified. An abundance of evidence has accumulated implicating female sex steroid hormones in mood regulation, suggesting that the female hormonal environment may predispose some women to mood disorders. The influence of hormonal factors is consistent with data indicating that depression is twice as prevalent in females as in males (Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993; Weissman et al., 1996), with similar patterns existing across cultures in North America, Europe, Asia, and the Middle East (Weissman et al., 1996). It is also consistent with the pattern of prevalence rates which show that rates do not differ between the genders in childhood, but begin to diverge with the onset of puberty (Kessler et al., 1993). Puberty commences with the activation of the hypothalamic-pituitary-gonadal system, which is responsible for producing sex hormones. Epidemiological studies also indicate that the gender difference in prevalence becomes less marked after the menopause (Bebbington et al., 2003), when ovarian hormone levels are permanently low (NAMS, 2010). It has also been widely documented that women are more vulnerable to mood symptoms during certain phases of the menstrual cycle and during reproductive events that are associated with drastic changes in sex hormonal levels, such as the postpartum period, and during the transition to menopause.

However, empirical support for an increased risk of depression during the menopausal years has been inconsistent, and researchers have proposed

that it may be more fruitful to investigate individual mood states, such as irritability (Born, 2004). Irritability is considered to act as a precursor to anger. It can be defined as "a state of excessive, easily provoked anger, annoyance, or impatience" (VandenBos, 2007). To date, there is a paucity of research that investigates individual mood symptoms purported to be exacerbated during the transition to menopause. Born and Steiner (1999) propose that irritability may be a distinct mood condition associated with reproductive events and cyclicity, and present evidence indicating that irritability is a common presenting complaint in reproductive-related mood disorders. In the menopause literature, irritability is cited as a frequent, and even as the primary, emotional complaint in transitioning women (Baram, 2005; Bromberger et al., 2003). Born (2004) states that for up to 70% of perimenopausal women, irritability and not depressive mood is the primary complaint. Furthermore, in empirical investigations not related to the menopause, it has been noted that irritability may be a prodromal symptom of clinical depression; it often precedes the onset of the full depressive syndrome by weeks and even months (Fava & Tossani, 2007), and depending on the presence of other risk factors (e.g., personality factors), this somewhat benign and transitory emotional state may develop into a more pervasive and enduring psychological state.

Although the evidence for the modulating effect of sex hormones on the serotonergic system and mood regulation is well-documented, and whereas all women experience the hormonal fluctuations associated with reproductive events, not all women experience emotional distress during such events, including as they traverse to menopause. In fact, mid-life women report that they are in the prime of their lives and have an enhanced sense of control and mastery (Busch, Barth-Olofsson, Rosenhagen, & Collins, 2003; Jones, 1994). However, many do experience a change in mood during this time. Hence, as many researchers have voiced, and as highlighted by National Institute of Health (NIH, 2005), there is a need to better identify and understand women potentially at risk for mood symptoms during the menopausal transition and to examine the contribution of psychological factors, including personality dispositions, which may moderate mood symptoms, such as irritability, and explain a distinct pathway to more encompassing psychological distress for a subgroup of menopausal women.

A consistent finding in the empirical literature is that prior depression is the primary factor related to depression during the menopausal transition (Avis, Brambilla, McKinlay, & Vass, 1994; Hunter, 1990; Kuh, Wadsworth, & Hardy, 1997). This is not surprising given that underlying vulnerabilities to depression, such as the personality factors, are relatively stable. Therefore, it is possible that there may be a subgroup of women who are psychologically

vulnerable and have higher rates of complaints and distress during any period of transition. Since the early 2000s, there has been some interest in examining the role of personality-related factors that increase susceptibility to depressive states during the menopausal transition. However, very few of these studies analyzed the role of personality factors from the perspective of a diathesis-stress model. These models posit that although a particular stressor may be an important risk factor in precipitating and maintaining psychological disorders, the stressor is especially potent in individuals with certain diathetic characteristics. In depression research, widely studied models propose cognitive and personality constructs as the diathesis. In this regard, an extensive body of research has focused on examining self-criticism and dependency as personality styles that confer a vulnerability to depression. There is now considerable support that these two personality styles and their maladaptive qualities increase susceptibility to depressive states during diverse stages of life. Based on this research, as well as investigations that suggest that certain mood symptoms, such as irritability, are more pronounced and persistent during the menopausal transition, a primary goal of this study was to explore whether the menopausal transition presents as a period of increased vulnerability for women with highly self-critical or dependent personality styles.

Another goal of the study was to examine the role of affect-related self-regulation as a plausible mechanism mediating the association between irritability and depressive symptoms. The inability to effectively regulate mood can compromise many aspects of an individual's life and lead to a cascade of stressors and psychological difficulties. In this respect, it is important to note that even if the menopausal transition is associated with increases in persistent negative moods such as irritability (Bromberger et al., 2003), and irritability is a prodromal symptom of depression (Fava, Grandi, Canestrari, & Molnar, 1990), the ability to regulate such emotions (regardless of the process or mechanism that initiated the emotion) would be expected to be particularly important. Indeed, Werner and Gross (2010) state that difficulties in regulating mood states has been implicated in up to 75% of disorders listed in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000), including depression (Gross & Muñoz, 1995; Werner & Gross, 2010). Also, difficulties in the regulation of negative mood states may be more pronounced in vulnerable women, as indicated by research reporting that self-criticism and dependency are associated with higher frequency and longer duration of mood disturbances (Santor & Patterson, 2004), and poor regulation of negative affect (Fichman, Koestner, Zuroff, & Gordon, 1999).

To date, there has been a paucity of research that examines diathesis-stress models, in which presumed menopause-related mood interacts with preexisting personality vulnerability factors to elicit more pervasive depressive symptoms in women during this reproductive transition. In essence, the personality vulnerability factors of self-criticism and dependency have been associated with increased risk during other stages of life, and are not specific to depression during the menopausal transition. However, based on evidence that negative mood states may be exacerbated during the menopausal transition, women with high levels in either of these personality styles may be particularly more affected given that, as research seems to indicate, they have difficulties regulating mood. Identifying women at risk of developing more encompassing psychological distress during the menopausal transition, and the pathway through which an otherwise benign mood symptom can cascade into more dysfunctional distress, may better inform clinical practice.

The relationship between irritability and depressive symptoms in association with the menopause has not been previously studied. Additionally, there have been no studies on the effects of self-criticism and dependency, which have been linked to depression at various other life stages in both men and women, during the transition. Finally, this is the first study to my knowledge to test an integrated model of mediated-moderation to

address whether affect-related self-regulation processes explain the cascading of initial mood states into a more encompassing depressive symptoms, as a function of personality vulnerability factors. As such, this study provides a novel contribution to the literature.

Chapter 2 Background and Literature Review

To facilitate an understanding of the issues involved in the literature linking dysphoric mood and menopause, some background information is necessary. Therefore, the present chapter begins with a description of the biological aspects of the female reproductive system. Next, terminology and definitions relating to menopause and reproductive aging, and description of the changes that occur as the female traverses from the reproductive to the nonreproductive phase of life are presented. The preliminary section concludes with a history of the association between mood and menopause, and a review of the major methodological issues implicated in this line of research. The empirical literature relevant to the main areas of the current investigation is reviewed next. This literature includes studies on the prevalence of mood disorders surrounding the menopause, as well as those that examine etiological models of reproductive-related mood disorders. Following this review I present three areas of investigation which may be particularly relevant but have not received much attention in the menopause literature: irritable mood, affect-related self-regulation, and personality vulnerability factors to depression. The chapter concludes with the rationale and description of the present investigation.

The Female Reproductive System

Because the most widely used indicators of reproductive status include menstrual cycle patterns and hormonal levels, a basic understanding of the endocrinology of the female reproductive system is useful. The female reproductive system includes the hypothalamus, the pituitary gland, and the ovaries, which form the hypothalamic-pituitary-gonadal axis (HPG-axis), an integrated and highly synchronized system regulated through a closed loop negative feedback mechanism (Brown, 1994). The HPG-axis is active prenatally and during early infancy, but then remains dormant throughout childhood until puberty when it reactivates. Puberty begins with the onset of secretion of gonadotropin-releasing hormone (GnRH) from the hypothalamus, and menarche - the first menstrual cycle. At 20 weeks of gestational age, a female fetus has approximately seven million oocytes (Bruce & Rymer, 2009). This finite number of oocytes in the ovaries is reduced to approximately one to two million by birth, and approximately 400,000 remain at menarche (Bopp & Seifer, 1998). Of these, about 400 will mature and be ovulated between menarche and menopause; the rest are depleted through follicular atresia (Blackburn, 2003). Each oocyte is encapsulated in a follicle.

Hormones and the menstrual cycle.

The menstrual cycle is regulated by sex (gonadal) steroid hormones. These hormones fluctuate in a predictable manner over the course of the cycle. Sex hormones are produced in the gonads (ovaries or testes), the adrenal glands, and tissue (e.g., liver, fat cells). The main classes of sex hormones are androgens (e.g., testosterone), progestagens (progesterone), and estrogens. There are three types of estrogens: estrone (E1), estradiol (E2), and estriol (E3). The most potent estrogen, estradiol, is the primary estrogen in women of reproductive age - from menarche to menopause; it is produced in the ovaries. Estrone, the primary estrogen in postmenopause, is produced by the adrenal glands. Estriol is the primary estrogen circulating during pregnancy. All classes of sex hormones are present in each gender; however, females have significantly higher levels of progesterone and estrogens, and lower levels of androgens than do males. In males, estrone is produced in the adrenal glands. In females, the ovaries secrete estrogen, progesterone, testosterone, the peptide hormones inhibin A and B, and anti-Mullerian hormone. Also implicated in the menstrual cycle is GnRH, a neurohormone that is produced in the hypothalamus, and the gonadotropins, follicle-stimulating hormone (FSH) and leutinizing hormone (LH) which are secreted by the pituitary gland (Carlson, 2010; Keeton, Gould, & Gould, 1993). The menstrual cycle begins with the first day of bleeding, which is

counted as Day 1. The cycle typically lasts 28 days, and is divided into three phases:

1) Follicular phase (Day 1 – Day 13): On Day 1 of the cycle, GnRH is secreted by the hypothalamus and travels to the pituitary gland. In response to GnRH, the pituitary gland secretes FSH which travels to the ovaries and stimulates the follicles to enlarge; as these enlarge, they produce and secrete small amounts of estrogen. FSH is regulated by a negative feedback mechanism, such that as estrogen level rises to a certain level, production of GnRH is reduced, which in turn suppresses production of FSH. As FSH decreases, estrogen levels secreted by the follicles rise abruptly. When estrogen reaches a level of approximately 200 picograms (p), LH is released from the pituitary gland. LH causes the follicle to mature and release its egg (ovulation).

2) Ovulation (Day 14): Ovulation occurs within 36 hours of the LH surge, at which time the follicle, which contains one ooocyte, has matured, ruptures, and releases the ovum. Estrogen levels peak at ovulation.

3) Luteal Phase (Day 15- Day 28): Following ovulation, estrogen levels drop significantly, but then rise again as the empty follicle that had released the ovum forms the corpus luteum and begins to secrete progesterone and estrogen. This second increase in estrogen is smaller but remains elevated for a longer time. Progesterone is involved in preparing the

endometrium, which lines the uterus, for the fertilized egg to implant. In the absence of pregnancy, levels of both hormones decline in the premenstrual week; estrogen levels drop for the second time.

Reproductive status and associated endocrinology.

There is much variability in the terminology and operational definitions of menopausal status used across studies. In fact, the executive director emeritus of the North American Menopause Society (NAMS), has referred to the terminology used in the menopause literature as representing a Tower of Babel (Utian, 2004). Since the 1980s there have been several attempts to standardize the terminology and develop criteria to categorize the phases of the reproductive lifecycle. In 1981, the World Health Organization (WHO) published a report recommending definitions for the various phases of the female reproductive cycle (WHO, 1981). A second report followed in 1996, refining the definitions (WHO, 1996). More recently, the terminology was further refined and a staging system was developed by the Stages of Reproductive Aging Workshop (STRAW; Soules et al., 2001), which was organized and sponsored by NIH, NAMS, and the American Society for Reproductive Medicine (ASRM). The staging system proposed by STRAW was subsequently slightly modified and validated based on empirical findings of the ReSTAGE Collaboration (Harlow et al., 2007).

The STRAW classification system is based on endocrine activity, as distinct endocrinological changes are associated with ovarian aging. These changes are reflected in menstrual cycle pattern and FSH levels. According to this system (see Figure 1), female reproductive life can be divided into seven stages that are grouped into three phases: Phase 1 includes the reproductive years, which are subdivided into three stages; Phase 2 includes the transition years, which are subdivided into two stages; and Phase 3 includes the postmenopause years, which are subdivided into two stages. The final menstrual period (FMP) anchors the staging system, with five stages occurring before the FMP and two stages occurring after.

The STRAW staging system.

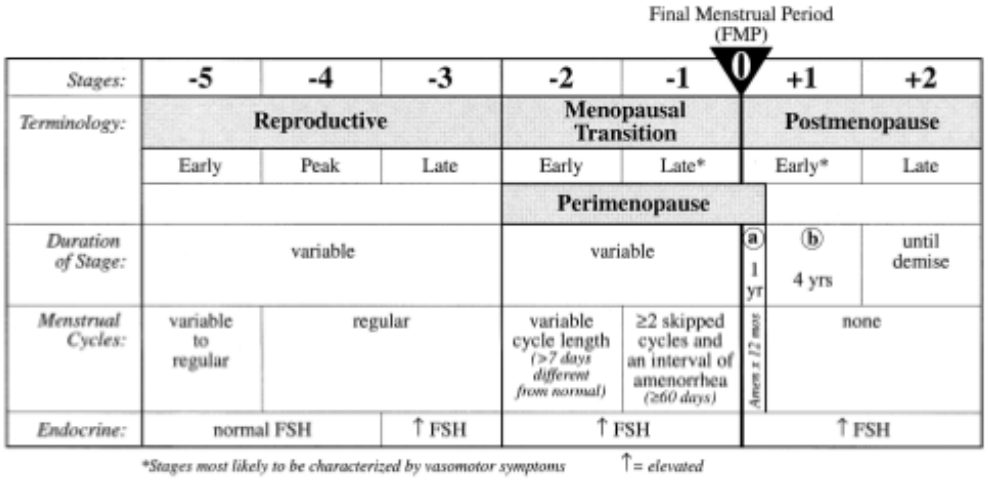

Figure 1. Stages of reproductive aging. Adapted from "Executive summary: Stages of Reproductive Aging Workshop (STRAW)," by Soules et al., 2001, Fertility and Sterility, 76, p. 875. Copyright 2001 by the American Society for Reproductive Medicine.

(Natural) Menopause, designated as Stage 0, refers to the permanent cessation of menstruation due to the natural aging of the reproductive system. Menopause is marked by the FMP, which can only be identified in retrospect, after 12 consecutive months of amenorrhea. The STRAW definition of menopause is consistent with that proposed by the WHO. The average age of menopause in the Western world is 51.4 years (McKinlay et al., 1992), with a range of 35 to 58 years (Burger et al., 2007). *Premature menopause* is defined as occurring before the age of 40. *Induced menopause* is the cessation of menses due to surgical procedures (*surgical menopause*), such as bilateral oophorectomy (removal of both ovaries), in which case one may go directly from a reproductive state to menopause. Menopause is also an iatrogenic consequence of certain medical interventions, such as chemotherapy. These may result in the cessation of menses either immediately or over a span of a few months.

Postmenopause (Stages + 1 and + 2) commences the day following the FMP. Establishing that one is in postmenopause, in a natural trajectory, is made in retrospect, after 12 months of amenorrhea.

The *Reproductive years* refer to the time from menarche to the inception of the transitional phase. The reproductive years are subdivided into three stages. The Early stage of the reproductive years (Stage - 5) refers

to the approximately two years after menarche, when menstrual cycles are irregular. Once regularity is established, the woman enters Stage - 4, which is the peak of fertility. FSH levels during Stage - 4 fluctuate within the normal range in accordance with the menstrual cycle. Menstrual periods occur every 21 to 35 days. The Late Reproductive stage (Stage - 3) is indicated by slight elevations in FSH levels in the early part of the follicular phase of the menstrual cycle. Menstrual cycles remain regular during this time (Hale & Burger, 2005).

The *Menopausal Transition* (Stages - 2 and -1) refers to the period when endocrine changes manifest in observable changes in menstrual cycle length, and ends with the FMP. The term *perimenopause* is sometimes used interchangeably with the *menopause transition,* but extends from Stage -2 to 1 year after the FMP. The perimenopause is the time surrounding the menopause. The transition typically lasts four years (McKinlay et al., 1992), though it may last longer. The median age of onset is 47.5 years (McKinlay et al., 1992; Rasgon, Shelton, & Halbreich, 2005). According to the STRAW classification, a woman is considered to have entered the transition when FSH concentration, which has been rising progressively since the late reproductive years, results in observable changes in the menstrual cycle. The transition phase is subdivided into an early stage (Stage -2), and a late stage (Stage -1). The early stage commences when there is a change in cycle length

of seven days or more in one's regular cycle. For example, if a woman's regular cycle is 29 days, an observable change would be marked by cycles that are shorter than 22 days, or longer than 36 days.

Although menopause is one point in time, it is important to understand that reproductive aging is a process, not an event, and before reaching menopause many endocrinological changes occur as the supply of oocytes diminishes and approaches depletion. Approximately 10 years before menopause, the rate of depletion due to atresia accelerates (Bopp & Seifer, 1998; Bruce & Rymer, 2009). The quality of the remaining follicles also deteriorates during this time, and the feedback mechanism between the hypothalamus and the ovaries slows down as the ovaries become less responsive to the stimulatory effects of gonadotrophins (Weiss, Skurnick, Goldsmith, Santoro, & Park, 2004). Production of estrogen diminishes, and estrogen does not reach the levels necessary to bring the follicle to maturity and release the remaining eggs. However, enough estrogen may be produced to generate the endometrium, and result in an anovulatory menstrual cycle. Also, at times, estrogen levels will be very low, while at other times excessive levels of estrogen may be produced (Hale & Burger, 2005; Hale, Hughes, Burger, Robertson, & Fraser, 2009). Furthermore, as communication within the HPG- axis becomes more sporadic, cycles become irregular. More FSH

is needed from the pituitary gland for the ovaries to respond, and this may stimulate two follicles to respond (Hale et al., 2009).

As the woman progresses through the transition, FSH levels continue to rise. The late transition (Stage -1) is indicated by FSH levels greater than 40IU/L, and 60 days of amenorrhea, but at least one menstrual period in the preceding 12-month period (Harlow et al., 2007). As the woman approaches the FMP, more of the cycles are unovulatory (Burger, Hale, Dennerstein, & Robertson, 2008; Burger et al., 2007). The follicular phase of the menstrual cycle also shortens, and the luteal phase is prolonged (Burger et al., 2007). Eventually, the ovum supply is depleted; however, the pituitary gland continues to secrete FSH and LH in attempts to stimulate the ovary. After menopause, estrogen levels decrease dramatically. Estrone, the weaker form of estrogen, is the main estrogen in postmenopause. Estrone is produced in the adrenal glands. After menopause, production of other hormones, such as testosterone, also decrease, and activity of the HPG-axis becomes more stable (Harsh, Meltzer-Brody, Rubinow, & Schmidt, 2009).

It is important to understand that although there are notable hormonal trends that reflect phases of reproductive aging, there are no independent, objective biological markers or indicators with clear cut-offs that can be used to define the onset of the transition to menopause, or that demonstrate a monotonic relation of menopausal stage. In fact, the high

degree of inter-, as well as intra-individual variability in hormonal levels precludes the determination of a single, point-in-time measure (NAMS, 2010). As highlighted by Burger, Hale, Dennerstein, and Robertson (2008), the norm of the transition is characterized by highly unpredictable cycle lengths and an erratic fluctuating hormonal environment, such that, in contrast to the monthly cyclical hormonal fluctuations of the reproductive phase, hormonal fluctuations during the transition are inconsistent and may vary widely on a daily basis.

Physical and Psychological Symptoms of the Menopausal Transition

A wide range of symptoms have been associated with the menopausal transition (NAMS, 2010). These symptoms last throughout the period of transition, but for some women may persist for longer than 10 years (Col, Guthrie, Politi, & Dennerstein, 2009). Based on factor analytic studies (Freeman, Sammel, Liu, & Martin, 2003; Greene, 1998; Heinemann et al., 2004; Holte & Mikkelsen, 1991; Perz, 1997), symptoms have been classified into at least three main categories: vasomotor symptoms, somatic symptoms, and psychological/emotional symptoms. Vasomotor symptoms (VS), which refer to the classic menopausal symptoms such as hot flashes/flushes and cold/night sweats, occur in up to 80% of transitioning and early

postmenopausal women in Western societies (Ratka et al., 2006). It is reported that VS symptoms are a daily experience for approximately 10 – 15% of such women, with episodes typically lasting 1 – 5 minutes (NAMS, 2010). For approximately 6% of these women, hot flashes may last longer than six minutes (Kronenberg, 1990), and some report experiencing a single episode that lasts as long as 30 minutes (Kronenberg, 1994). Vasomotor symptoms produce much discomfort, and are reported to negatively impact quality of life (Avis et al., 2009; Burleson, Todd, & Trevathan, 2010). Somatic symptoms include headaches, tiredness, gastric complaints, muscle and joint pains (Conboy, Domar, & O'Connell, 2001), and urogenital complaints (Dennerstein, Dudley, Hopper, Guthrie, & Burger, 2000).

Psychological/emotional symptoms reported to increase in frequency and severity with the menopausal transition include mood lability, irritability, and feeling "blue" and depressed (Bromberger et al., 2001), as well as cognitive difficulties (Mitchell & Woods, 2001). Other reported complaints include sleep disturbance (Dennerstein et al., 2000) and change in sexual interest (NIH State-of-the Science Panel, 2005). Menopausal symptoms, except vaginal dryness which becomes more prevalent in postmenopause, are more prevalent in the early and late stages of the menopausal transition than in pre- or postmenopause (NIH State-of-the Science Panel, 2005). For some women who experience symptoms as they transition to menopause,

symptoms are not necessarily bothersome (Porter, Penney, Russell, Russell, & Templeton, 1996), do not interfere with daily functioning, and have no major impact on quality of life; however, for others symptoms do affect at least one area of their lives (Simon & Reape, 2009). It is important to note that not all women are symptomatic, and cross-cultural differences in prevalence and symptom presentation have been widely documented (Avis et al., 2001; Freeman & Sherif, 2007; Gold et al., 2000).

Historical Background: Menopause and Mood Disorders

The association between menopause and depression has a long history, much controversy, and is plagued by inconsistent findings. It is beyond the scope of this exposition to present a comprehensive account of the historical and social underpinnings of contemporary attitudes and beliefs associated with the menopause; suffice it to say that culture invariably influences attitudes and beliefs of the time and how experience is constructed. Constructions of the menopause are influenced by beliefs about gender role and reproductive sexuality.

The term *menopause* is derived from the Greek words *men,* meaning 'month' and *pausis,* meaning 'cessation' (Utian, 1997). In ancient Greece, explanations of menopause were based on contemporary theory of bodily humors. It was believed that everything in the universe, including the human

body, was composed of four elements: fire, earth, water, and air. The four elements were associated with four bodily humors: yellow bile, black bile, phlegm, and blood. Hippocrates applied humoral theory to medicine in the 4th century BC, which was expanded by Galen in the 2nd century AD, to explain physical and emotional conditions, and proposed that such that ailments were due to an excess or absence/suppression of four humors. A balance of the humors was deemed essential to well-being. "Suppressed" menstruation was believed to be the main cause of women's illnesses. It was believed that blood would accumulate, rise toward the brain, and cause insanity. Treatment for suppressed menstruation consisted of bloodletting. Bloodletting was also used to treat melancholia, as this condition was believed to be caused by a surplus of black bile produced in the spleen. Although melancholia was not thought to be more prevalent among women, afflicted women were believed to suffer more than afflicted men. The notion of women as frail and at risk of developing physical and mental diseases prevailed into the 17th century (Formanek, 1990), and was incorporated into 18th century medical theory and practice. In 1777, John Leake noted an association between menopause and somatic symptoms (as cited in Utian, 1997).

In the 19th century, medicine became a recognized profession. The specialty of obstetrics and gynecology is believed to have emerged from the

view that women were more prone to disease, that many of their afflictions were related to or due to the (mal) functioning of reproductive organs, and that they were in need of special care (Formanek, 1990). During this time, the association of menopause with various medical ailments strengthened. In 1854, Charles Meigs, a professor of midwifery and the diseases of women and children, who had a major influence on the development of the specialty, claimed that changes in a woman's reproductive system affected her emotional state (as cited in Formanek, 1990). The first book written on the subject of menopause, by E. J. Tilt, was first published in 1851, and described more than 100 symptoms (as cited in Formanek, 1990). With respect to the association between reproductive organs and the brain, he wrote: "when women are under the influence of increased ovarian action they are also more irritable, more easily impressed by cold, noise, other physical agents, and emotional stimuli" (Tilt, 1882, p. 173, as cited in Formanek, 1990). Also, English physician Henry Maudsley (1880) wrote that the "internal revolution which takes place in women at the climacteric period leads to many outbreaks of a melancholic insanity in them between forty and fifty." (p. 243). At around the same time, in 1896, a similar depressive syndrome with onset during the involutional years in both men and women was described by Emil Kraepelin (Harsh et al., 2009). Finally, in 1929, Adolf Butenandt, a German biochemist, successfully extracted estrone from the urine of pregnant women,

and with it the physiological process of the menstrual cycle and menopause could be more accurately described and associated with psychiatric conditions (as cited in Formanek, 1990). Formanek posits that this discovery gave legitimacy to labeling reproductive-related experiences as psychiatric disorders that merited both inclusion in the DSM and pharmacologic treatment.

In the first edition of the DSM (DSM-I; APA 1952), a classification guide of mental disorders published in 1952, involutional melancholia was included as a separate disorder category under the label *involutional psychotic reaction*, and classified as disorders "due to disturbances of metabolism, growth, nutrition or endocrine function," hence linking it to the menopause. Distinguishing features justifying it as a separate disorder were based on the following: 1) age of onset - with a first onset occurring during the involutional years, 40-55 years in women, 50-65 years in men; 2) duration - tending to have a prolonged course; 3) poor prognosis; 4) symptom presentation - including depression, agitation or anxiety, insomnia, guilt, somatic concerns; 5) family history - low risk for affective disorder in family members; and 6) pre-morbid personality (APA, 1952). Subsequent to the publication of the DSM-I, much controversy existed. This controversy stimulated more systematic investigations. By the publication of the DSM-III (APA, 1980), data from these investigations suggested that there was

insufficient evidence to substantiate the validity of a distinct depressive syndrome that is confined to the involutional period. Based on a review of the literature, Weissman (1979) concluded that: "depressed patients who are in the menopausal years do not have a distinct symptom pattern, an absence of previous episodes, or an absence of life-stress precipitants. The evidence thus far supports the decision to exclude involutional melancholia" (p. 742) from the DSM. Involutional melancholia was not included in the DSM-III (APA, 1980). However, critics maintained that these early investigations were based on inadequate methodology (Brown, Sweeney, Loutsch, Kocsis, & Frances, 1984) and failed to consider the various forms of affective disorders (Schmidt & Rubinow, 1991).

Conceptual and Methodological Challenges

The methodological complexities involved in studying the menopause-depression link are well-documented in the literature (Crawford, 2000; Gath, 1998; Harsh et al., 2009). Some of the major challenges involve classification and sampling issues related to menopausal groupings, separating the effects of chronological aging from the effects of reproductive aging, and how the outcome (e.g., depression) is conceptualized and measured. For example, factors related to menopausal classification which were not adequately considered in earlier studies include surgical menopause, which produces

more sudden hormonal changes, and use of hormonal supplements or medical treatments, which mask or alter menstrual cyclicity. Also, and importantly, investigations that were conducted prior to the establishment of the STRAW standardized staging system used inconsistent criteria to define stages of reproductive life. Indicators used to demarcate the different stages include age, menstrual cycle patterns, and hormonal measures. It is recommended that a combination of these be used to improve reliability of menopausal classification (Harsh et al., 2009); however, many of the earlier studies used indicators in isolation. For instance, many studies have used age as the sole criterion. A common age range used to classify women as perimenopausal is 45-55 years. However, considering that the average age of the FMP is 51 years (Harsh et al., 2009), and the average period of transition is 4 years (McKinlay et al., 1992), it is likely that a portion of 45 year-old women may in fact be in (late) premenopause, and not in transition phase as they are classified in studies that use age as the basis for classification. Other studies, even some that were conducted subsequent to the STRAW publication, have used cycle irregularity, as defined by STRAW (which marks entry into the transition), as the sole criterion for classification. However, cycle irregularity is not restricted to the transition phase (Harsh et al., 2009) as, for example, younger women may experience irregular menstruation due to causes that are unrelated to ovarian aging. Still other studies have relied

on FSH concentration to define reproductive status. However, because of the unpredictability of hormonal fluctuations, FSH level is not an accurate indicator and is not recommended as the sole criterion for determining status (Burger, 2008; Burger, Dudley, Robertson, & Dennerstein, 2002; Hale & Burger, 2005; Soules et al., 2001).

Another widely cited critique, especially of earlier investigations, is that samples were not representative of the general population. For example, the bulk of the research evidence is based on studies involving Caucasian women and did not consider cultural differences; there is now evidence that symptom experience and reporting varies among cultures (Bromberger et al., 2001). Other studies were based on small samples of women attending gynecologic and menopause clinics. As expected, women who seek medical care for menopause-related complaints report higher levels of depressive symptoms than women who do not (Jones, Marshall, & Nordin, 1977; Moore, Gustafson, & Studd, 1975; Soares, Joffe, & Steiner, 2004), and many women who consult menopause or gynecology clinics during this time do so for mood disorders (Hay, Bancroft, & Johnstone, 1994). Therefore, critics assert that estimates of depression are likely inflated and not generalizeable to the population of menopausal women.

With respect to the outcome variable, inconsistent patterns of results in the literature may be due, at least in part, to differences in how depression

has been conceptualized. The term *depression* is used in reference to a wide range of experience. It can refer to a mood state, a symptom, or a syndrome. However, these experiences differ in degree of severity, persistence, and impairment. As a basic mood or affect, feeling depressed entails a transient, normal state of distress; of feeling sadness, or feeling "blue." As a symptom, sadness or depressed mood is associated with a variety of psychiatric conditions, and is not unique to mood disorders. In contrast, the syndrome of depression is defined by the presence of a group of symptoms that co-occur, and implicates not only affective (e.g., sad mood), but also cognitive (e.g., pessimism, poor concentration), behavioral (e.g., psychomotor retardation/agitation), and physical/somatic symptoms (e.g., fatigue).

A related issue concerns measurement. With respect to the syndrome, the method of measurement reflects whether depression is conceptualized and studied as a dimensional phenomenon, or whether it is conceptualized as a discrete category, such that one either has or does not have the disorder. Regardless of whether depression is assessed by clinical interview or by self-report measure, the categorical approach to designating caseness, especially when depressive syndromes of lesser severity are omitted, will yield very different conclusions from a dimensional approach, which includes minor, or subsyndromal levels of depression. Many studies, especially the earlier ones, have excluded cases at the low end of the

spectrum. In essence, the distinction between depressed mood, depressive symptoms, and clinically significant depressive disorder is not always recognized in the menopause literature; hence the inconsistent findings may be, at least partially, a function of different outcomes being investigated.

Recent Prevalence Studies

Many of the earlier methodological issues have been addressed in the more recent investigations. Beginning in the late 1980s, several large, well-designed, prospective longitudinal studies of community-based samples, carried out in North America, Australia, Europe, and Japan, began to emerge. These studies tracked changes in women's mental and physical health as they transitioned through the reproductive stages. The largest study carried out in North America is the Study of Women's Health Across the Nation (SWAN; e.g., Sowers et al., 2000). Other studies include the Massachusetts Women's Health Study (e.g., Avis & McKinlay, 1991; McKinlay et al., 1992), the Seattle Midlife Women's Health Study (e.g., Mitchell & Woods, 1996; Mitchell, Woods, & Mariella, 2000), the Penn Ovarian Aging Study (e.g., Freeman et al., 2004), the Manitoba Project on Women and their Health in the Middle Years (e.g., Kaufert, Gilbert, & Tate, 1992), The Melbourne Women's Midlife Health Project (e.g., Dennerstein et al., 2000), and the Norwegian Menopause Project (e.g., Holte, 1992).

These studies have examined, among other issues, whether a causal relationship between reproductive aging and mood exists, and a number of them have published results from cross-sectional analyses of their data (e.g., Bromberger et al., 2001). However, though these major studies incorporated significant improvements in their design and methodology, they have also yielded inconsistent findings, and the debate about whether reproductive aging is associated with psychological and mood disturbance endures. For example, in support of an association, data from longitudinal investigations indicate that the risk for depressive symptoms increases from pre- to perimenopause and from peri- to postmenopause (Maartens, Knottnerus, & Pop, 2002); other data shows that depressive symptoms increase during the menopausal transition (Avis et al., 1994; Bromberger et al., 2001; Freeman et al., 2004; Hunter, 1992) and then improve after menopause (Freeman et al., 2004). A study by Freeman, Sammel, Lin, and Nelson (2006), based on data from the Penn Ovarian Aging Study, which followed premenopausal women at baseline for eight years, showed that clinically significant depressive symptoms (CES-D scores $\geq$ 16) were four times more likely to occur, and a clinical diagnosis of depressive disorder (based on DSM-IV criteria) was 2 ½ times more likely during the period of transition than in premenopause. Schmidt, Haq and Rubinow (2004) also reported that compared with premenopause, the 24-month period surrounding the FMP (the menopause)

was associated with a 14-fold increased risk of episodes of minor depression relative to the 31-year time period that preceded the onset of the transition. Furthermore, although prior depression has been reported as a significant, and even the primary, risk factor for depression during the menopausal transition (Freeman et al., 2004; Harlow, Wise, Otto, Soares, & Cohen, 2003; Hunter, 1990), data from the Penn Ovarian Aging Study indicated that the risk for new onset of depressed mood was elevated during the transition, even in women with no history of prior depression (Freeman et al., 2006). Others have found a similar frequency of new onset of minor and major depression (Cohen, Soares, Vitonis, Otto, & Harlow, 2006; Schmidt , Haq et al., 2004). However, results of other studies failed to support the relation between menopausal status and risk of depression, as defined by a CES-D score ≥ 16 (Busch, Zonderman, & Costa, 1994; Kaufert et al., 1992), depressive symptom severity (Matthews et al., 1990), and individual mood symptoms, such as irritability (Freeman, Sammel, Lin, Gracia, & Kapoor, 2008).

The evidence that emerged from cross-sectional examinations of these larger studies has also been inconsistent. Some found no evidence for an association between menopause status and the following outcomes: depressive symptoms, using standardized measures of depression such as the CES-D (Porter et al., 1996; Slaven & Lee, 1998; Woods & Mitchell, 1997),

negative mood (Dennerstein, Smith, & Morse, 1994; Slaven & Lee, 1998), psychological symptoms (Kuh et al., 1997; Porter et al., 1996), and nervousness and mood lability (Holte & Mikkelsen, 1991). However, other cross-sectional studies do indicate higher rates of psychological distress, specifically of depressive symptomatology and of psychological distress such as nervousness and mood lability (Avis, Kaufert, Lock, McKinlay, & Vass, 1993; Bromberger et al., 2003; Bromberger et al., 2001), and a slight rise in irritability (Bromberger et al., 2003; Kuh et al., 1997), in women who are in the perimenopausal stage compared to those in pre- and postmenopause. The study by Bromberger et al. (2001) is especially noteworthy in that it is based on the SWAN data obtained from a multi-ethnic sample of 16, 065 women in seven geographic regions of the United States.

Although prospective longitudinal designs are more pertinent to investigating causal links between psychological change and reproductive aging, they do not necessarily overcome all of the methodological complexities. Notwithstanding these limitations in methodology and less than consistent findings, it is now generally accepted that although the majority of women do not develop severe mood disturbances as they traverse to menopause, some do (Mazure, Keita, & Blehar, 2002). Reed and associates estimate that 26-33% of women experience a first episode of depression during the transition (Reed et al., 2009). Identifying the factors

that affect susceptibility to dysphoric states for this subset of women is the recommended next step (Schmidt, Steinberg, & Rubinow, 2008). It has also been proposed that there is a need to consider affective changes other than depression (Avis, 2000; 2003; Bromberger et al., 2003; Woods, Mariella, & Mitchell, 2006). Although most of the research has focused on depression, irritability and mood lability appear to be prevalent complaints associated with the transition to menopause. Furthermore, examining individual mood conditions may circumvent some of the challenges in studying depression in the context of menopause that stem from the overlap between some of the symptoms of depression and those of menopause. For example, low energy, disturbed sleep, and diminished concentration may be indicative of depression, menopause-related endocrinological changes, or perhaps both. In assessing single mood states such overlap is lessened. To date, there is a paucity of research that investigates individual mood symptoms purported to be exacerbated during the transition to menopause.

Models of Menopause-Related Mood Disorders

The field of women's mental health, especially as it relates to reproductive-related mood conditions, is controversial. The controversy is not only about whether the menopause is associated with an increase in psychological distress, but also about the nature of such distress. There are

several models that have been postulated to explain mood disorders experienced during the menopausal transition. Biological models propose a direct or indirect domino effect of hormonal activity on mood and depression. Non-biological models consider social and psychological factors, such as stress, poor coping responses, maladaptive personality traits, as well as social circumstances and cultural context, in explaining depression outcomes during the menopausal transition.

Direct Effect Model

According to this model, depression is a direct result of declining and erratic hormonal levels that characterize the transition. The hypothesized relationship between sex hormones and mood processes is based on data indicating that prevalence rates of depression do not differ between the genders in childhood, but that differences begin to emerge during early adolescence and coincide with pubertal status (Steiner, Dunn, & Born, 2003a, 2003b). In adulthood, women are twice as likely as men to suffer from unipolar mood disorders (Kessler et al., 1993; Weissman et al., 1996). Also, as has been widely documented, women are more vulnerable to depression during phases of the menstrual cycle (e.g., premenstrually), and during reproductive events that are associated with drastic fluctuations in sex hormonal levels, such as postpartum and during the period of transition to menopause (Mazure et al., 2002). For example, it is estimated that up to

75% of women experience mood symptoms premenstrually (Mazure et al., 2002), and approximately 5% experience more severe symptoms that meet criteria for premenstrual dysphoric disorder (Cunningham, Yonkers, O'Brien, & Eriksson, 2009; Halbreich, 2009; Mazure et al., 2002) during the last week of the luteal phase when levels of estrogen and progesterone begin to decrease. These symptoms remit during the early part of the follicular phase, when hormones are low but stable. Also, symptoms are absent during anovulatory cycles (Cunningham et al., 2009) or when ovulation is suppressed by drug treatment (Schmidt, Nieman, Danaceau, Adams, & Rubinow, 1998). With respect to pregnancy, studies indicate that although pregnancy does not appear to increase the risk of depression, up to 15% of women experience symptoms of depression in the postpartum period (Sherwin, 2005; Steiner et al., 2003a, 2003b), when levels of progesterone and estrogen drop dramatically upon delivery of the infant and placenta. Additionally, and as discussed previously, the period of transition to menopause, which is characterized by a widely fluctuating hormonal environment, appears to be associated with an increased risk of developing depressive symptoms (Bromberger et al., 2001). Indeed, Schmidt and associates reported a 14-fold risk of developing depression during the perimenopause relative to the premenopause phase (Schmidt, Haq et al., 2004). For many women, mood disturbances are reportedly absent prior to the onset of the transition (Cohen

et al., 2006; Freeman, et al., 2006), and resolve after menopause (Freeman et al., 2004) when levels of estrogen are low and stable. Evidence suggesting that sex hormones play a role in mood regulation also comes from treatment outcome studies, which indicate that mood symptoms can be effectively treated with estrogen (Sherwin, 1988; Sherwin & Gelfand, 1985, 1987; Sherwin & Suranyi-Cadotte, 1990; Soares, Almeida, Joffe, & Cohen, 2001; Zweifel & O'Brien, 1997).

The serotonin deficit hypothesis is one of the most prominent biological theories of the etiology of depression. Both animal and human studies have shown a link between low levels of serotonin and higher depressive symptoms (or aggression and irritability in animal studies), and there is an abundance of research on the effects of sex hormones on brain structure and brain function (Rubinow Schmidt, & Roca, 1998). Hormones modulate behavior either by binding to specific receptors in target regions of the brain or by activating second messenger systems (McEwen, 2002). These mechanisms of action influence different neurotransmitter systems and protein synthesis. With respect to mood disorders, the hormones that have received the most empirical attention are estrogen, progesterone, and testosterone, as receptors for these are hormones are found in many brain structures that are implicated in mood regulation (McEwen, 2002). Estrogen is known to act as an agonist of the serotonergic system; it increases

serotonergic post-synaptic responsivness, the number of serotonergic receptors, the transport and uptake of serotonin, and reduces MAO levels. MAO is an enzyme that catabolizes serotonin. There are also numerous progesterone receptors in the same brain regions. Progesterone has an opposing effect: it increases the concentration of MAO, which results in a decrease of serotonin concentration. Based on physiological, pharmacological, and behavioral evidence from animal studies accumulated to date, Steiner, Lepage, and Dunn (1997, as cited in Born & Steiner, 1999) proposed that the serotonergic system may be more vulnerable to dysregulation in females.

In sum, many researchers in the field of women's mental health cite an extensive body of evidence to support the existence of a reproductive-related depression that they contend is a distinct clinical entity that can be conceptualized as "a specific biological response to the effects of hormonal fluctuations in the brain that leads to depression" (Payne, Palmer, & Joffe, 2009), and that some women may be more sensitive to such fluctuations (Joffe & Cohen, 1998; Payne et al., 2009; Steiner et al., 2003a, 2003b). Such differential sensitivity may partially explain the fact that only a minority of women become depressed, though all experience the hormonal changes associated with reproductive events. Furthermore, women who do experience mood disturbances in conjunction with any reproductive event

tend to be more vulnerable during other reproductive events in their lives (Stewart & Boydell, 1993). For example, women with a history of premenstrual related mood disturbance are at increased risk of developing depressive symptoms as they transition to menopause (Freeman et al., 2008; Freeman et al., 2004; Richards, Rubinow, Daly, & Schmidt, 2006). However, due to the extreme intricacies of the endocrine system, it is a complicated matter to link dysphoric mood to the effect of a specific hormone, independent of other hormonal influences. In fact, numerous studies have been unable to substantiate a direct link between various hormones and depressive symptoms (Brown, Gallicchio, Flaws, & Tracy, 2009; Gallicchio, Schilling, Miller, Zacur, & Flaws, 2007). Also, due to the transient nature of the hormonal environment and the dynamic and complex nature of psychological constructs such as depression, a clear association between the two systems is difficult to substantiate.

Indirect Effect / Domino Model

A second biological model, the indirect effect or domino model, posits that depression is secondary to vasomotor symptoms and/or chronic sleep disturbance (Avis et al., 1994; Avis, Crawford, Stellato, & Longcope, 2001; Campbell & Whitehead, 1977; Schmidt & Rubinow, 1991). Vasomotor symptoms are deemed to reflect hormonal changes; sleep disturbance reflects hormonal changes either directly, or indirectly through vasomotor symptoms.

Critics of the direct effects hypothesis contend that because the earlier studies neglected to account for vasomotor symptoms and sleep difficulties, findings of such studies cannot be convincingly interpreted. The evidence that decreasing levels of estrogen produce vasomotor symptoms is robust (Dennerstein et al., 2000; Kronenberg, 1990). Sleep disturbance has also been reported be more prevalent during the transition, and in surgically-induced menopause (Kravitz et al., 2003), as well as during various reproductive events associated with hormonal fluctuations (Driver & Shapiro, 1992). In support of the domino hypothesis, some studies show that both vasomotor symptoms (Avis, Crawford et al., 2001; Bosworth et al., 2001) and sleep disruption (Avis, Crawford et al., 2001; Baker, Simpson, & Dawson, 1997; Brown et al., 2009) contribute to mood symptoms. For example, data from the Massachusetts Women's Health Study, which included measures of estradiol levels taken annually for a three-year period, showed that absolute level of estradiol was related to depression, as indicated by a CES-D score > 16, but that this association did not hold in analyses that adjusted for poor sleep quality and hot flushes/night sweats (Avis, Crawford et al., 2001).

However, support for the domino hypothesis has been inconsistent, as data from various studies indicate that depressive symptoms remain elevated during the menopause transition even after accounting for the effects of

vasomotor symptoms and poor sleep (Freeman et al., 2006; Freeman et al., 2004). Also, there is research that shows that vasomotor symptoms do not always precede mood symptoms (Freedman & Roehrs, 2004; Freeman, Sammel, & Lin, 2009; Schmidt, Haq et al., 2004), as would be required to substantiate a causal role in depression. In other studies, objective indicators of sleep quality and vasomotor symptoms were unrelated (Polo-Kantola et al., 1999), and sleep problems did not mediate the relationship between vasomotor symptoms and negative mood (Burleson et al., 2010). An alternative interpretation for the seeming domino effect has been proposed by, among others, Joffe and associates (2002). They explain that vasomotor symptoms and mood changes may both be markers of sensitivity to the effects of sex hormones on neurotransmitters.

Psychosocial Model

With respect to non-biological models, Rostosky and Travis (1996), who reviewed the literature published between 1984 and 1994, noted that only 6 % of the work considered the role of social or psychological factors in menopause-related research. Presently, although biological models continue to dominate, studies conducted since the 1990s have increasingly considered the etiological role of a multiplicity of psychosocial factors, including the influence of the sociocultural environment. The psychosocial model suggests that women who suffer from depression as they traverse to menopause may

have maladaptive personality characteristics and coping styles, low levels of social support, and encounter more stressful life events, which may be more numerous during this life stage, especially as many women juggle caregiving of children and aging parents while holding full-time employment. The model also posits that negative attitudes towards the menopause and aging render women more vulnerable to psychological distress.

As expected, research indicates that many of the risk factors that account for depression during the menopausal transition are indeed psychosocial in nature. Some of the predictors are general, whereas some are specific to the menopause (Hunter, 1993). These include life stress, such as stressful life events, daily hassles, and interpersonal stress (Dennerstein, Dudley, & Burger, 1997; Dennerstein, Lehert, Burger, & Dudley, 1999; Dennerstein, Lehert, & Guthrie, 2002; Dennerstein, Lehert, Guthrie, & Burger, 2007; Schmidt, Murphy, Haq, Rubinow, & Danaceau, 2004; Woods et al., 2008), holding negative expectations of menopause (Holte & Mikkelsen, 1991), as well as negative attitudes toward the menopause and aging (Ayers, Forshaw, & Hunter, 2010; Dennerstein et al., 1999; Hunter, 1990), and cultural differences (Avis et al., 1993).

Recently, studies have begun to emerge that focus on the role of personality factors in mood disturbance. Becker and associates postulated that it is not just the menopausal stage, with its associated biological and

social changes, that confers vulnerability to psychological distress, but also the relatively stable personality characteristics that render certain women more susceptible to psychological distress during any period of transition, including the menopause (Becker et al., 2001). This premise is consistent with reports that prior depression is the primary risk factor for depression during the transition (Avis et al., 1994; Hunter, 1990; Kuh et al., 1997). Becker et al (2001) examined whether rates of psychological distress differed as a function of menopausal stage, and as a function of type of symptom. They proposed that symptoms specific to the menopause reflect a somatic nature, and that non-specific complaints are psychosomatic. Accordingly, they hypothesized that prevalence rates for somatic complaints, but not for psychosomatic symptoms, would differ between the stages. They also hypothesized that psychosomatic complaints would be related to variables such as stable personality characteristics and psychological vulnerabilities.

As a first step, Becker and associates conducted a factor analysis of the Kupperman-Blatt Menopausal Index, a widely used checklist that is comprised of 11 menopausal symptoms and complaints (Blatt, Weisbader, & Kupperman, 1953). Two factors emerged. The first contained psychosomatic complaints. It included tiredness, palpitations, headaches, dizzy spells, irritability and nervousness, feeling “blue” and depressed, and problems sleeping. The second factor reflected somatic complaints.

Complaints that loaded on this factor included vasomotor symptoms, rheumatic pains, numbness, and tingling. Consistent with their hypothesis, menopausal status was related to the somatic factor, and not to the psychosomatic factor. Results also showed that the nonspecific, psychosomatic symptoms were associated with stable personality characteristics, as indicated by measures of body image, femininity, perceived control, and trait anxiety. Based on these findings, the authors suggested that there may be a group of women who are psychologically vulnerable during any period of transition. In transitioning to menopause, these women likely experience and report higher rates of complaints and distress that are of a psychosomatic nature, and that are not specific to the menopause (Becker at al., 2001).

The effects of dispositional traits on menopausal stress and depressive symptoms was examined in a small number of studies. Bosworth, Bastian, Rimer, and Siegler (2003) examined the relationship between the Big Five personality dimensions (neuroticism, extraversion, agreeableness, conscientiousness, and culture) and coping style, and women's appraisals of the menopause. The outcome variable consisted of one item, which asked women to rate how stressful they experienced the menopause to be. Results showed that women who were close to the menopause (a category equivalent to the STRAW early transition) rated the menopause as least stressful, and

those who had just began the menopause (equivalent to STRAW late transition) as most stressful. Of interest was the finding that irritability and neuroticism were strongly associated with rating the menopause as stressful. Other significant predictors included seeking social support, hot flashes, and insomnia (Bosworth et al., 2003). A more recent study of Taiwanese women by Lin, Ko, Wu, and Chang found a significant interaction between neuroticism and extroversion on depressive symptoms, but no effect for menopausal status (Lin et al., 2008).

Two studies examining personality factors were conducted by Bromberger and Matthews. In their first study, based on data from a longitudinal study, Bromberger and Matthews (1996b) looked at the contribution of pessimism, trait anxiety (which is highly correlated with measures of neuroticism), and examined whether these moderate the effect of acute and chronic stressful events on depressive symptoms. All participants were premenopausal and nondepressed at study entry when they completed measures of trait anxiety and pessimism. At the follow-up assessment, approximately three years later, these measures as well as measures of stressful events were completed. At this time, some women had begun the transition, some had become postmenopausal, and some remained premenopausal. Findings revealed that menopausal status was unrelated to study variables, including severity of depressive symptoms, as assessed by the

BDI. However, pessimism predicted higher levels of depressive symptoms, especially in the presence of an acute or ongoing stressor. Trait anxiety also significantly predicted depressive symptoms, but this effect was not exacerbated by the presence of stress. In other words, trait anxiety renders women more susceptible to increases in depressive symptoms, regardless of stressful circumstances (Bromberger & Matthews, 1996b).

In a second study, Bromberger and Matthews (1996a) speculated that having a strong identification with the female gender role, as indicated by high levels of gender role-related traits, increases the severity of depressive symptoms in midlife women, especially in the context of life stress. In a similarly designed study, and using the same longitudinal data as in the study described above, they examined the effect of instrumentality and expressivity, self-focused attention, and trait anger-in. Results showed significant main effects for three of the tested personality variables, and revealed that women low in instrumentality (e.g., low agency, passivity), high in self-focused attention, and whom suppress angry feelings, had higher depressive symptoms at follow-up. Expressivity did not predict depressive symptoms. The diathesis-stress component of this prediction was supported for self-focused attention, indicating that stressful life events have a greater impact on depressive symptoms in women who ruminate (Bromberger & Matthews, 1996a). These studies by Bromberger and Matthews appear to be the only

ones that have examined the effect of personality disposition on depression in the context of a diathesis-stress model.

Studies have also examined the benefits of certain dispositional coping resources in adaptation during the menopause. In a small study, Bielawska-Batorowicz and Gorzela (2002) studied the relationship between one's sense of coherence and depression. Sense of coherence is a personality characteristic defined as a general orientation and belief that internal and external stimuli are predictable, that one has the necessary resources to cope with such stimuli, and that it is important to do so (Antonovsky, 1993). As expected, they found that women with a strong sense of coherence reported lower levels of depressive symptoms. Findings also suggested that these women were better able to cope with the transition in that they perceived menopausal symptoms, including symptoms of depression, as being less severe and less intense than women with a weaker sense of coherence. Findings of this study are consistent with those of an earlier study by an independent group of researchers, which found that women with a strong sense of coherence, as well as those with an optimistic orientation, reported fewer psychological and somatic symptoms as they transitioned to menopause (Caltabiano & Holzheimer, 1999).

Summary of Models

In summary, all models have received empirical support, though not unequivocal. Also, many of these studies used models that were not comprehensive enough to disentangle competing influences. For example, some studies of the psychosocial model did not consider the impact of biological influences, and vice versa. As stated earlier, the field of reproductive-related mental health is particularly controversial because research has been dominated by the medical model, and thus much of the focus has been on the underlying biological aspects. Wilk and Kirk (1995) assert that the importance of such research is not at issue, but rather that the developmental complexity of the menopause, encompassing psychological and social aspects, has received much less attention, even from social scientists, and that a more comprehensive understanding is essential. This has changed tremendously in the past few decades, as investigations have been based on the more integrative bio-psychosocial perspective, recognizing that mood changes in midlife stem from multiple causes.

Knowledge Gaps in the Menopause-Mood Relationship

The association between affective disturbance and reproductive aging has been written about and studied extensively, but the major focus of these investigations has been on the symptoms and syndrome of depression, and findings have been mixed. Recently, researchers proposed that it may be

more fruitful to investigate individual mood states which are commonly reported in association with the menopause (Born, 2004). Unlike depression which is a relatively broad construct that encompasses somatic/physical, cognitive, and emotional dimensions, individual mood states have less overlap with features associated with the menopause and the psychosocial elements of midlife. Irritability is one such mood state.

Also, given that not all women experience affective disturbance during the menopausal transition, there is a need to identify what factors render certain women more susceptible to developing depression during the menopausal transition. In this regard, diathesis-stress models that incorporate personality factors have garnered much empirical support as factors that confer a vulnerability to mood disorders, but have received scant attention in menopause research. Finally, a fundamental process involved in the development and maintenance of mood conditions involves affect-regulation. Difficulties in affect-regulation may explain a distinct pathway to depression for a subgroup of menopausal women who experience mood symptoms. The literatures on irritability, personality vulnerability factors, and affect-regulation as related to depression are reviewed next.

Irritability

The *APA Dictionary of Psychology* defines irritability as "a state of excessive, easily provoked anger, annoyance, or impatience; and as an abnormal sensitivity or excessive responsiveness, as of an organ or body part, to a stimulus" (VandenBos, 2007). According to the humoral theory of ancient Greece, both melancholia and irritability were conceptualized as psychological manifestations of physiological disturbances. As noted earlier, a surplus of black bile was believed to result in melancholia. In contrast, irritability was thought to be produced by an excess of yellow bile (Jackson, 1986). Diseases caused by black bile were observed to have a chronic time course, whereas acute diseases resulted from yellow bile (Jackson, 1986). Therefore, though melancholia was observed to be associated with irritability (Jackson, 1986), humoral theory posited that a different etiology and time course characterized these experiences, suggesting that they are distinct conditions.

The doctrine of the four humors remained dominant until the Age of Enlightenment (Born & Steiner, 1999) when an explosion of empirical research resulted in a paradigm shift (Shorter, 1992). Beginning in the early 1700s, theories about disease began to focus on the nerves and the nervous system. Experiments with muscle fibers conducted by Albrecht von Haller in the mid-1700s showed that muscle has the capacity to respond to stimuli, and that irritability, an innate nervous force, is a property of muscle tissue

(Shorter, 1992). Haller described the mechanism of nerve and muscle activity in the *Doctrine of Irritability* published in 1752 (Shorter, 1992), in which he proposed that physical illness was caused by excessive irritability of the nervous system. By the end of the eighteenth century, the concept of irritation was used to explain pathology and disorder in general. The notion was that any body tissue could become irritated.

This early work laid the foundations for theories of psychopathology that posited the central nervous system as the cause of mental illness, and thus linked psychiatry to neurology. In 1868, Wilhelm Griesinger, a respected German psychiatrist, wrote that "the so-called 'mental illnesses' [occur in] individuals with brain disease and neurological disease" (as cited in Shorter, 1992, p. 209). He theorized that brain disease caused symptoms of mental illness in individuals predisposed to "irritable weakness." In these individuals, sensory stimuli led to agitation that was out of proportion with the stimuli that provoked it. With respect to the mental component, Giersinger wrote that irritable weakness meant that the individual had "greater psychical sensitivity, an easier susceptibility to psychic pain, the condition wherein every thought causes some emotional agitation." (as cited in Shorter, 1992, p. 209). Almost a half a century later, in the 1920s, Kraepelin proposed that individuals characterized by an irritable

temperament were more vulnerable to manic-depressive illness (as cited in Born & Steiner, 1999).

There was relatively little interest in the relationship between irritability and psychiatric disorders until the latter half of the twentieth century, when attention shifted to the study of hostility. The first self-report measure of irritability appeared in the Buss-Durkee Hostility Inventory (Buss & Durkee, 1957). Buss and Durkee (1957) defined irritability as "a readiness to explode with negative affect at the slightest provocation" (p.343), and identified it as one of eight components of hostility. A factor analysis of the items that comprised the eight components yielded two factors: an attitudinal dimension of hostility, and a "motor" dimension. Irritability was included in the motor dimension with items that tapped assaultiveness, indirect hostility, and verbal hostility (Buss & Durkee, 1957). The Buss-Durkee inventory was based on a non-clinical population and measures irritability as a trait.

A decade later, R. P. Snaith was inspired to investigate the construct of irritability following Pitt's (1968) findings that postpartum mood disorders were characterized by marked irritability (Snaith & Taylor, 1985). In an effort to measure irritability as a transitory state rather than as a stable disposition to experience this emotion (a personality trait), to differentiate it from concepts such as hostility, anger, and aggression, and to make it relevant to research within a clinical context, Snaith and colleagues

developed the widely used Irritability, Depression, and Anxiety Scale (Snaith, Constantopoulos, Jardine, & McGuffin, 1978), comprised of four subscales (Inward Irritability, Outward Irritability, Depression, and Anxiety). Snaith et al. (1978) conceptualized irritability as a psychological state, characterized by intolerance, impatience, and poorly controlled anger, that is expressed outwardly towards others, or inwardly towards oneself. Snaith and Taylor (1985) defined irritability as:

> a feeling state characterized by reduced control over temper which usually results in irascible verbal and behavioral outbursts, although the mood may be present without observed manifestation. It may be experienced as brief episodes, in particular circumstances, or it may be prolonged and generalized. (p.128)

They noted that irritability is a normal mood state and not indicative of psychological or physical disorder unless it is excessive, intensifies, or manifests in someone not normally irritable. Based on their research and a review of the literature, they proposed that outward irritability may be a distinct mood state that is independent of depression and anxiety, and highlighted that their findings support Pitt's observation that irritability is a prominent feature of postpartum mood disorder (Snaith & Taylor, 1985).

In a more recent review of the literature, Born and Steiner (1999) concur with Snaith and Taylor that irritability and depression are independent mood conditions. They point out that although irritability is

associated with depression, it is also associated with numerous other mental disorders (e.g., Axis I disorders: depressive disorders, bipolar disorders, substance-induced mood disorder, generalized anxiety disorder, post-traumatic stress disorder, eating disorders; Axis II Disorders: antisocial personality disorder, borderline personality disorders). It is also associated with neurological conditions such as temporal lobe epilepsy, traumatic brain injury (Kim, Manes, Kosier, Baruah, & Robinson, 1999), and Parkinson's disease (Aarsland et al., 1999), as well as medical conditions, most notably those related to endocrine dysfunction such as Cushing's syndrome, hyperthyroidism, and coronary heart disease (Born & Steiner, 1999). For example, in a study based on over 600 outpatients suffering from a variety of medical disorders, irritable mood (based on criteria outlined in the Diagnostic Criteria for Psychosomatic Research and assessed by structured interview), was found in 27% of the sample (Mangelli et al., 2006). In contrast, major depression (based on DSM-IV criteria and assessed by structured interview) was indicated in only 19% of the total sample. The prevalence of irritability was highest in those with endocrine disorders. It accounted for 44% of those cases. Also, 37% of patients with recent first myocardial infarction episodes reported irritability. With respect to endocrine disorders, findings from Mangelli et al. (2006) are consistent with the literature that shows that up to 80% of patients with endocrine disorders

report irritable mood (Sonino & Fava, 1998; Sonino et al., 2004). Results are also consistent with respect to cardiovascular disease. Studies show that the most pathogenic component of the Type A personality, a well-documented risk factor for cardiovascular disease, is hostility (Fava, Fabbri, Sirri, & Wise, 2007; Miller, Smith, Turner, Guijarro, & Hallet, 1996). Also, results indicated that two-thirds of patients designated as meeting criteria for depression did not meet criteria for irritable mood, and of those with irritable mood, 77% did not meet the criteria for major depression. Based on these findings, the authors of the study concluded that irritable mood is independent of major depression (Mangelli et al., 2006).

Irritability and depression have also been differentiated based on how symptoms respond to pharmacologic treatment. For example, premenstrual irritability responds to intermittent administration of SSRIs (Landén et al., 2007), and responds more rapidly (Landén, Erlandsson, Bengtsson, Andersch, & Eriksson, 2008), and requires a lower dosage relative to the onset of action and dosage needed in treating depression (Endicott et al., 1999). It also responds to treatment with GnRH agonists which suppress ovulation (Brown, Ling, Andersen, Farmer, & Arheart, 1994; Endicott et al., 1999). Additional evidence is provided by studies that use the challenge technique of acute tryptophan depletion (ATD), which suppresses serotonin

synthesis. In these studies ATD produced an exacerbation of premenstrual mood symptoms, particularly, irritability (Menkes, Coates, & Fawcett, 1994).

In their review, Born and Steiner (1999) note that although irritability is a normal human mood state, in both males and females, the study of irritability and related constructs, such as aggression, anger, and hostility, has focused mostly on the male experience. However, irritability as a prominent dimension of mood disturbance associated with female reproductive events and cyclicity has been virtually neglected by the research community. They present evidence indicating that irritability is a common presenting mood complaint associated with the menstrual cycle and the transition to menopause. For example, in a study of women with premenstrual syndrome, irritability, anxiety and mood lability were the three most common, stable (cycle to cycle recurrence) mood symptoms (Bloch, Schmidt, & Rubinow, 1997). Likewise, findings of a prospective longitudinal study indicate that irritability, nervousness, and tension are prominent symptoms of the perimenstrual syndrome (Angst, Sellaro, Stolar, Merikangas, & Endicott, 2001). Furthermore, Angst and associates report that a large proportion of women experiencing these symptoms did not report depressed mood (Angst et al., 2001).

Currently, premenstrual dysphoric disorder (PMDD) is included in the DSM-IV under Depressive Disorders Not Otherwise Specified (APA,

2000); irritability is listed as a core symptom of PMDD. However, it is noteworthy that, based on a review of the empirical literature published subsequent to the DSM-IV, an expert panel of clinicians and researchers concluded that "PMDD is a distinct clinical entity," and not a variant of a depressive disorder (Endicott et al., 1999). It is characterized by a constellation of symptoms dominated by internal tension, anger, and irritability, an onset and remission of symptoms that are linked to the menstrual cycle, symptoms which are stable from cycle to cycle and over time, and a response to treatment that is distinct from depression.

With respect to postpartum mood disorders, research has focused almost exclusively on depression. However, as noted earlier, there is research indicating that irritability dominates the clinical presentation of mood complaints following childbirth (Lanczik et al., 1992; Pitt, 1968; Snaith & Taylor, 1985). Also, an indication that irritability may be separate from depression comes from a factor analysis of a scale developed by Cox and associates (1987) to detect depression following childbirth, which yielded a factor composed of items that tapped irritability that was unrelated to depression (Cox, Holden, & Sagovsky, 1987).

In the menopause literature, irritability is cited as a frequent mood complaint of perimenopause (Baram, 2005; Bromberger et al., 2003; Powell, 1996). Born (2004) states that for up to 70% of perimenopausal women,

irritability, not depressive mood, is the primary mood complaint. Results based on over 1200 participants of a large national prospective birth cohort study conducted in the UK (the Medical Research Council National Survey of Health and Development) showed that irritability was the only psychological symptom that was rated as bothersome in everyday life in the preceding 12- month period by the group of perimenopausal women (Kuh et al., 1997). Other psychological symptoms assessed but which were not rated as bothersome included anxiety and depression, tearfulness, panic attacks, and forgetfulness. Another study showed that perimenopausal women were more symptomatic than pre- and postmenopausal women, and based on a list of 20 symptoms, irritability was ranked fifth as the most commonly experienced symptom in the previous two-week period; depression was ranked eighth (O'Connor et al., 1994). Data from a cross-sectional investigation of the SWAN study, based on a sample of over 3,000 participants, also showed that irritability, nervousness and frequent mood changes, but not “feeling blue”/depressed were more persistent in the group of perimenopausal women compared to postmenopausal women. Mood was defined as persistent if it occurred on six or more days in the preceding two-week period (Bromberger et al., 2003).

In contrast to these findings and to anecdotal reports and clinical observations that increased and persistent irritable mood accompanies the

transition to menopause, data from other studies challenge this association. For example, data from the longitudinal Penn Ovarian Aging Study showed that estradiol levels did not predict irritability, but consistent with the literature on depression, perceived stress was associated with increased irritability and mood swings (Freeman et al., 2008). Furthermore, Freeman and associates found that rather than increasing, irritability decreased with increasing levels of FSH; however, after adjusting for PMS the inverse relationship of irritability with FSH was no longer significant (Freeman et al., 2008). In line with findings of no association between menopausal status and irritability reported by Freeman and associates (2008), a more recent study based on a sample of 163 perimenopausal and postmenopausal women attending a menopause clinic in Greece found that perimenopusal women did not differ from postmenopausal women in their mean level of either outward or inward irritability (assessed by the IDA scale; Spyropoulou et al., 2009). However, in this study, levels of FSH and LH were associated with outward irritability (Spyropoulou et al., 2009).

A major weakness in the study of irritability in a female population is that, until recently, instruments that reflect the numerous aspects of the construct of irritability for use with this population did not exist. Except for the study by Spyropoulou and associates (2009), investigations of irritability associated with the female reproductive cycle and events have assessed the

frequency and severity of irritability based on a single item, usually an item found embedded within a list of menopause related symptoms or a depression inventory (e.g., the BDI item 11). Assessment based on a single item fails to capture the many aspects of irritability. Also, although a number of self-report measures for irritability have been designed, the majority were based on the Buss-Durkee measure of hostility, and others were designed for research with specific clinical populations (e.g., Irritability, Aggression and Apathy in Huntington and Alzheimer Disease; Burns, Folstein, Brandt, & Folstein, 1990). Another problem identified by Born and colleagues was that the items in these measures were based on typically male-oriented language and behavior (e.g., IDA item 12 "I feel I might lose control and hit or hurt someone"). In a preliminary study conducted by Born (2004) to investigate gender differences in the phenomenology and manifestation of irritability, male and female respondents used different vocabulary when providing spontaneous descriptions of irritability. Women used words such as "impatient" and "moody" whereas men used "looking for trouble" and "aggressive." Gender differences with respect to sensory sensitivity were also noted, with approximately 36% of women compared to 10% of men reporting that noises were bothersome when in an irritated state. Also, more men (32.3%) than women (7%) reported an increase in energy and a tendency to be more physical when irritable. Based on these findings, Born

and associates concluded that the available measures may fail to capture the female experience and manifestation of irritability and hence may not be valid instruments for a female population (Born, 2004).

To detect and study irritability in women, Born and Steiner (1999) designed the Born-Steiner Irritability Scale (BSIS). In conceptualizing irritability, they note that, although there is considerable overlap with concepts used in the literature such as *anger, hostility, anger attack, irritable aggression, pathologic aggression,* and *impulsive aggression,* the concept of irritability can be more distinctly construed as a negative affect that acts as a precursor to these phenomena. They define irritability as a negative affective state characterized by some or all of the following: 1) heightened or excessive sensitivity to external stimuli; 2) a state of physical and psychological tension which may suddenly and rapidly escalate; 3) reduced control over temper, proneness to anger, annoyance, and impatience; and 4) irascible verbal or behavioral outbursts, even explosive aggressiveness (Born & Steiner, 1999). The BSIS is described in the Methods section of the present document. Briefly, the authors of the BSIS refer to this new instrument as a gender-specific measure of state irritability. It contains a number of items that were selected from existing measures, but modified to reflect the wording used by female respondents in spontaneous descriptions of how they experience irritable mood, and original items that assess other core elements of

irritability, such as sensory features, that are not included in older measures (Born, 2004).

Though irritability is often a normal and transitory state, more prolonged or excessive levels can have a negative impact on physical and psychological health, can impair daily functioning, particularly within the home (Hylan, Sundell, & Judge, 1999), and cause friction in interpersonal relationships (Born, Steiner, & Koren, 2002; Fava, 1987; Fava et al., 2007), especially with one's spouse (Born et al., 2002). With respect to physical health, the data in support of an association between hostility and coronary heart disease are robust. For example, findings suggest that hostility, which is closely related to irritability, contributes to the development and course of coronary heart disease (Miller et al., 1996), is a risk factor for the development of arterial fibrillation (Eaker, Sullivan, Kelly-Hayes, D'Agostino, & Benjamin, 2004), and in individuals with significant coronary arterial disease, anger and hostility can trigger acute cardiac events such as a myocardial infarction episode (Helmers et al., 1993).

With respect to psychological functioning, irritability is highly correlated with depression (Biondi, Picardi, Pasquini, Gaetano, & Pancheri, 2005; Pasquini, Picardi, Biondi, Gaetano, & Morosini, 2004; Perlis et al., 2005); however, as mentioned earlier, the DSM-IV does not list irritability as a symptom of mood disorders in adults. In explaining the relationship

between irritability and depression, Van Praag (1996a, 1996b) notes that there is accumulating empirical evidence indicating that heightened sensitivity to environmental stressors, which is manifested as irritability, may be the primary and initial experience of a mood disturbance, whereas depression is secondary to such dysregulation. For example, in an investigation of prodromal symptoms of unipolar major depression, Fava, Grandi, Canestrari and Molnar (1990) report that, compared to a non-depressed control group, each of the depressed (out)-patient subjects had at least one prodromal psychiatric symptom six months prior to the onset of depressed mood and of the full depressive syndrome. They reported that anxiety and irritable mood were the most frequent prodromes (Fava et al., 1990). Similar findings have been reported others (Iacoviello, Alloy, Abramson, & Choi, 2010; Mahnert, Reicher, Zalaudek & Zapotoczky, 1997). Fava and Tossani (2007) proposed that in the presence of other risk factors, these initial mood symptoms increase the likelihood that a full-blown depressive episode will develop.

In this respect, the relationship between irritability and depressive symptoms associated with the transition to menopause may be understood through a vulnerability model. The concept of vulnerability, also referred to as diathesis, has been applied to explain why it is that although many individuals who experience conditions of extreme stress do not develop

psychopathology of any kind, for others, moderate and even minimal amounts of stress can lead to dysfunction. Diathesis-stress models posit that although stress may be an important risk factor in precipitating and maintaining psychological disorders, it is especially potent in individuals with certain characteristics. A dual-vulnerability model (DVM), as proposed by Young and associates (Young, Watel, Lahmeyer, & Eastman, 1991), may be specifically applicable to the development of depression within the context of menopause. This model was put forth to explain why symptoms of seasonal affective disorder (SAD) develop sequentially. According to this model, individuals most likely to develop the full syndrome of SAD possess two distinct vulnerabilities, each giving rise to a specific set of symptoms. The first is a biological vulnerability, which renders individuals more sensitive to the shortening of the photoperiod, and gives rise to the first set of symptoms. These are the vegetative symptoms of SAD and include fatigue and hypersomnia. These symptoms then act as stressors. In individuals who also possess the second vulnerability, which is of a psychological nature, these stressors then precipitate the second set of symptoms, and hence the full syndrome of SAD (Young et al., 1991). In the context of menopause, the biological vulnerability would manifest as irritability. The psychological vulnerability may implicate personality dispositions. The role of personality vulnerability has been widely studied in relation to depression, but not as a

factor that moderates the relation between irritability, which has been shown to be prevalent in the transition to menopause, and depressive outcomes. According to the DVM model, women at increased risk for depression as they transition to menopause should be those who possess both vulnerabilities.

Cognitive-Personality Vulnerability Model of Mood Disorders

Cognitive-personality diatheses are considered to be trait-like characteristics of the individual that are stable and enduring, though not immutable. The diatheses play critical roles in mental health (Segal & Blatt, 1993) as they are posited to negatively impact social perception, interpersonal interactions, behaviors, and self-regulatory processes, thereby increasing the likelihood of experiencing a pathological reaction in response to stressors. In depression research, widely studied models propose cognitive and personality constructs as the diathesis. The few studies that examined the role of personality factors in depression in women transitioning to menopause were reviewed earlier. Results from these studies suggested that certain personality variables may be related to psychological distress in menopausal women; however, the personality variables were posited as risk factors, and few were analyzed from the perspective of a diathesis-stress model. Risk factors increase the probability of developing negative health

outcomes in all individuals. Vulnerability factors, which may act as risk factors in the absence of a stressor, increase the likelihood of negative outcomes to a greater degree in the presence of stressors. Furthermore, except for the studies conducted by Bosworth et al. (2003) and by Lin et al. (2008) which examined the Big Five personality traits, the personality domains selected for study were not derived from a broader theoretical framework. One comprehensive model of personality and psychopathology, developed by Blatt and colleagues (Blatt, 1974; Blatt, Aurebach, & Levy, 1997; Blatt & Shichman, 1983; Blatt & Zuroff, 1992), may provide valuable insights into the occurrence of depressive symptoms during the transition to menopause.

This theoretical framework posits a continuum between adaptive psychological functioning and psychopathology, and integrates intrapsychic (motivational, cognitive, and affective) and interpersonal components into a unified formulation of personality organization. The model has stimulated an abundance of research over the last three decades, and has yielded support for the validity of two broad-based components of personality, which in their maladaptive forms, have been studied from a diathesis-stress perspective and shown to constitute two distinct types of vulnerability to diverse forms of psychopathology, specifically depression (Blatt, 2004). The two components of personality have been identified as “self-definition” and

"relatedness." Self-definition refers to one's sense of individuality, autonomy, and self-assertion. Relatedness refers to the universal human need (Sheldon, Elliot, Kim, & Kasser, 2001) to form interpersonal relationships and to feel affiliated with others. Maladaptive forms of the two components are distinguished by whether an individual's concerns are predominantly focused on issues of self-definition, which manifest as a self-critical personality style, or on issues of interpersonal relatedness, which leads to a dependent personality style (Blatt, 1974; Blatt, D'Affilitti, & Quinlan, 1976; Blatt, Quinlan, Chevron, McDonald, & Zuroff, 1982).

According to this framework, different patterns of challenging early parent-child relationships foster the development of self-criticism and dependency (Blatt & Homann, 1992). For example, a self-critical style is posited to arise out of parenting that is over-controlling, intrusive, critical, and punitive, and in which parental expression of love is contingent on the child's accomplishments and ability to meet the high expectations and rigid standards set by the parents; this parental style conflicts with the child's basic need to obtain parental approval, acceptance, and unconditional love. In order to compensate for their perceived inadequacies, to prove their self-worth, to gain the coveted approval of significant others, and to avoid (real or imagined) criticism and disapproval, these individuals develop a relentless drive to perform and achieve; their concerns become focused around issues

of self-control and autonomy. They "strive for excessive achievement and perfection, are often highly competitive and work hard" (Blatt & Zuroff, 1992, p.528), and they "possess the basic wish to be acknowledged and respected" (Vettese & Mongrain, 2000, p.610). However, the overemphasis and high investment involved in the incessant pursuit of achievements comes at the expense of developing and maintaining interpersonal relationships.

The second maladaptive personality orientation, dependency, is posited to result from parenting that is nonresponsive, inconsistent, and in which parental display of affection is unpredictable and oscillates between rejection and overindulgence. Such parenting style creates conflicts in the infant around issues of dependency and impedes the development of a secure attachment with the caregiver. The young child develops insecurities about being loved and cared for, and fears abandonment. These insecurities manifest as neediness and a constant quest to obtain reassurance from others. Consequently, development of the relatedness dimension, of the ability to establish mature and mutually satisfying relationships, becomes distorted and maladaptive. In adulthood, these individuals "rely intensely on others to provide and maintain a sense of well-being"; they "have a desperate need to be in close physical contact with gratifying others, and they experience deep longings to be loved, cared for, nurtured, and protected" (Blatt & Zuroff, 1992, p.528). For these individuals, the importance of

maintaining interpersonal relationships, and the fear of losing such attachments, come at the expense of developing a sense of individuality and autonomy. Furthermore, because the sense of individuality is not adequately developed, the capacity to cultivate and sustain mature interpersonal relationships is hindered, and the relatedness dimension remains at an immature level.

Although a number of measures have been developed to assess individual differences in vulnerability related to interpersonal relatedness and self-definition, the most widely used instrument is the Depressive Experiences Questionnaire (DEQ; Blatt et al., 1976). It consists of three subscales, two of which measure individual differences in self-criticism and dependency. Both factors have been shown to be related to traditional self-report measures of depression in clinical as well as in non-clinical samples. The effect sizes are generally stronger for the self-criticism factor (Blatt et al., 1982; Luyten et al., 2007; Mongrain & Zuroff, 1994; Nietzel & Harris, 1990; Zuroff, Mongrain, & Santor, 2004), regardless of measure used to assess severity of depression. For example, Nietzel and Harris (1990) conducted a meta-analysis of studies published between 1976 and 1989 and found the mean effect size to be .49 for self-criticism and .29 for dependency. Based on the 9 of the 12 studies included in their analysis that used the BDI,

they reported effect sizes for both, dependency and self-criticism, to be in the medium range (as defined by Cohen, 1992) (Nietzel & Harris, 1990).

Considerable research has shown that various affective and cognitive variables, as well as motivational orientations, coping mechanisms, and interpersonal styles, are associated with these personality styles in theoretically expected ways (Zuroff et al., 2004). Self-criticism has been associated with introjective dysfunctional attitudes (Mongrain & Zuroff, 1989; Zuroff, Igreja & Mongrain, 1990), and higher achievement and fewer interpersonal strivings (Mongrain & Zuroff, 1995). With respect to interpersonal styles, individuals high in self-criticism are guided by a fearful-avoidant attachment style (Zuroff & Fitzpatrick, 1995), which suggests that they hold negative representations of self and of others (Blatt et al., 1997; Levy, Blatt, & Shaver, 1998). Such attachment style has been shown to remain relatively stable over time and across interpersonal relationships (see Mongrain, 1998). In romantic relationships, individuals with high levels of self-criticism tend to be distrustful of their partner, and in fact avoid intimacy and self-disclosure (Zuroff & Fitzpatrick, 1995). Indeed, they favor romantic partners who are also achievement-oriented and who can enhance their own status, rather than choosing partners who interpersonally-oriented and focused on sharing intimacy (Zuroff & deLormier, 1989).

Dependency has been empirically associated with anaclitic dysfunctional attitudes (Mongrain & Zuroff, 1989), with higher interpersonal and fewer independence and achievement strivings (Mongrain & Zuroff, 1995), and with personality traits of extraversion, agreeableness, and anxiety (Mongrain, 1993). Their anxious-preoccupied attachment style (Levy et al., 1998; Zuroff & Fitzpatrick, 1995) may be interpreted as an indication that they hold positive views of others. Highly dependent individuals favor intimacy-oriented romantic partners (Zuroff & deLormier, 1989), and report experiencing intense feelings of love in such relationships (Zuroff & Fitzpatrick,1995). Consistent with their interpersonal orientation, they also report frequent and intimate interactions in ordinary daily social encounters (Zuroff, Stotland, Sweetman, Craig, & Koestner, 1995).

The contention that the two personality styles constitute specific vulnerabilities to depression has also been supported, though investigations of the more specific congruence hypothesis have yielded mixed results. According to the congruence hypothesis, the two personality styles are postulated to be associated with sensitivities to different stressors (Blatt & Zuroff, 1992), one triggered by disruptions in interpersonal relationships, the other triggered by a loss in self-esteem (Blatt, 1974; Blatt et al., 1976; Blatt & Maroudas, 1992; Blatt et al., 1982). Some studies have provided support for the congruence hypothesis for both dimensions (e.g., Santor & Patterson,

2004; Zuroff et al., 1990), whereas others have not (Mongrain & Zuroff, 1994). In general, the congruence effect is stronger with respect to dependency (Blaney & Kutcher, 1991; Hammen, Marks, Mayol, & DeMayo, 1985; Mongrain & Zuroff, 1989; Robins, 1990; Zuroff & Mongrain, 1987). The empirical evidence for the effect of negative events in the achievement domain for self-criticism is quite mixed (see Nietzel & Harris, 1990); some studies provide support for the congruency effect (Segal, Shaw, Vella, & Katz, 1992), whereas findings from other studies indicate self-criticism to be associated with elevated depression scores in response to both types of stressors (Hammen et al., 1985; Zuroff & Mongrain, 1987). Despite the relatively weaker support for the specificity hypothesis, findings indicate that both personality styles constitute potent vulnerabilities towards psychopathology (for an extensive review see Blatt, 2004).

The contention that self-criticism and dependency are temporally stable and enduring characteristics of the individual, has been contested by Coyne and Whiffen (1995). Coyne and Whiffen claimed that although there is a strong association between the two personality factors and depression, their levels decrease as depression remits and thus they state that such characteristics seem to be concomitant manifestations of depressive symptomatology, or possibly arise consequent to depressive episodes, and hence should not be conceptualized as true vulnerability factors (1995).

However, a number of studies have shown that self-criticism and dependency are indeed relatively stable and enduring constructs (Koestner, Zuroff, & Powers, 1991; Zuroff et al., 1990; Zuroff, Moskowitz, Wielgus, Powers, & Franko, 1983). Furthermore, as Zuroff, Mongrain, and Santor (2004) explain in their rejoinder to Coyne and Whiffen, there are different approaches to defining stability, and the critique they raised pertains specifically to absolute stability of scores on each personality dimension. Zuroff and associates indicate that research that considers relative stability- the rank order of individuals with respect to the two dimensions- (Zuroff, Blatt, Sanislow, Bondi, & Pilkonis, 1999) and ipsative stability - the intraindividual stability of one's level self-criticism relative to one's level of dependency- have yielded support for conceptualizing the two personality factors as vulnerabilities (Zuroff et al., 2004). Furthermore, they proposed the state-trait vulnerability model to explain how vulnerability factors have both stable, trait-like features, as well as fluctuating, state-like features, so that characteristics of the vulnerability may become more or less accessible and salient as a function of mood states, social context, and psychological or biological processes (Zuroff et al., 1999). The state-trait model is consistent with findings from a series of studies that examined the mood-state model proposed by Miranda and Parsons (Miranda & Persons, 1988; Miranda, Persons, & Byers, 1990;

Persons & Miranda, 1992) which posits that negative mood activates dysfunctional cognitions.

Pertinent to the current investigation are studies that examine the affective correlates of self-criticism and dependency. In this respect, a number of different aspects of affective experience (e.g., valence or hedonic tone, frequency, duration, intensity, regulation) have been investigated. For example, with respect to hedonic tone, studies indicate that self-criticism is associated with low positive affect, and high negative affect (Mongrain, 1998; Mongrain, Vettese, Shuster, & Kendal, 1998; Mongrain & Zuroff, 1995; Zuroff et al., 1995), whereas dependency is associated with high negative affect, but seems to be unrelated to positive affect (Mongrain & Zuroff, 1995; Zuroff et al., 1995). This pattern of correlations is consistent with the empirical reports of a stronger effect size for the association of depression with self-criticism than for dependency.

The frequency and duration of mood symptoms have also been posited to contribute to the development a full-blown depressive syndrome. The DSM-IV criteria for a depressive episode requires that the rate of recurrence of depressed mood be daily and extend over a two-week period. Accordingly, Santor and Patterson (2004) examined the relationship between self-criticism and dependency and these two aspects of affective experience with respect to three symptoms commonly experienced by distressed

individuals: depressed mood, hopelessness, and anxiousness. Using a daily diary methodology, undergraduate university participants rated the extent to which they experienced each of the three mood symptoms. An episode of mood disturbance was operationalized as a significant increase (1 standard deviation above the mean across all observations) in a mood rating, with a return to baseline (to within 1 standard deviation of the mean). Duration of episodes was computed by summing over the number of days during which the episode of disturbed mood persisted, and frequency of disturbed mood was computed as a simple sum of all episodes. They also computed the frequency of episodes that were of short duration (lasting at least 7 days) and frequency episodes of long duration (lasting at least 14 days). Their results showed that mood disturbances were rare. However, both vulnerability factors correlated significantly with the mean severity of each of the three symptoms, mean duration of the disturbance, and frequency of disturbances in depressed mood lasting at least 7 and 14 days (Santor & Patterson, 2004). Self-criticism and dependency were also related to frequency of short disturbances in hopelessness, and dependency also correlated with frequency of longer disturbances (Santor & Patterson, 2004). In short, the pattern of relationship between mood disturbance and self-criticism and dependency was largely as expected.

Studies have also sought to investigate the intensity of affective experience. Intensity refers to the strength of the emotional experience and behavioral response. It is independent of hedonic tone (Larsen & Diener, 1985; 1987) and of relative frequency of affective states (Diener, Larsen, Levine, & Emmons, 1985). Intensity of affect is considered a dimension of temperament, and as such is measured as a stable characteristic of the individual. Individuals high in this dimension experience all emotion, both positive and negative affect, with great intensity (Larsen & Diener, 1985;1987). Affect intensity is correlated with diverse measures of neurotic and somatic symptoms (Larsen & Diener, 1987; Lynch, Robins, Morse, & Krause, 2001), and is characteristic of borderline and histrionic personality disorders (APA, 2000; Koenigsberg, 2010).

Mongrain and Zuroff (1994) examined whether intensity of affect could explain the relationship between dependency and self-criticism and depression. They expected both personality factors to be related to intensity of affective experience, but to different degrees. According to Blatt (1990; 2006), a distinguishing aspect of the two personality orientations is their differential emphasis of emotion versus reason. Individuals who are high in self-criticism value reason over emotion whereas the reverse is postulated to characterize those high in dependency. Based on this distinction, Mongrain and Zuroff (1994) hypothesized that individuals high in dependency would

display intense affect to a greater degree than individuals high in self-criticism. Using an extreme group design, Self-Critical and Dependent groups were predicted to display greater intensity of emotion than the control group, which was composed of individuals with scores in the lower range of the personality scales. Indeed, the hypothesized relationships between each of the personality orientations and intensity of affective experience were supported. However, consistent with results from Larsen and Diener (1987), there was no relationship between affect intensity and depressive symptoms, and thus the mediation model was not supported; Affect intensity did not account for the link between these personality variables and severity of depressive symptoms (Mongrain & Zuroff, 1994). As Larsen and Diener (1987) suggest, because affect intensity reflects a strong response style regardless of hedonic tone, the experience of intense positive affect may moderate instances of intense negative affect, thereby balancing, diminishing, or even cancelling out, the unfavorable effect of negative affective experience. This may explain the results, especially in the context of dependency, which is associated with high negative but moderate positive affect (Mongrain & Zuroff, 1994).

In addition to the aspects of affect reviewed above which relate to the internal experience of emotion, other aspects that have been studied in association with physical and mental health include styles of emotion

expression (e.g., expression vs. nonexpression), and emotion regulation. It is generally believed that emotion must find expression. Thus, the overt expression emotion is assumed to be adaptive, whereas nonexpression of an experienced emotion is believed to lead to the development of physical and psychological symptoms (Lynch et al., 2001). For example, the inhibition of emotional expression has been linked to the development and course of cardiovascular disease and cancer (see King & Emmons, 1990; Mauss & Gross, 2004). However, it is also the case that the overt expression of emotion is not universally healthy. For example, the expression of negative emotion is an aspect of the Type A behavior pattern which has been linked to coronary heart disease (see Mauss & Gross, 2004). On the other hand, inhibition of expression is not necessarily associated with adverse health outcomes. In fact, societal norms require that emotional expression be regulated, and that the behavioral manifestation (verbal or psychomotor) of emotional impulses be inhibited (Gross & Levenson, 1997). Thus, depending on the surrounding circumstances, the nonexpression of emotion can be adaptive. In line with this thinking, King and Emmons (1990) proposed that it is not the expressive style per se that seems to be the operative element underlying unfavorable outcomes in health and well-being, but rather the feeling of ambivalence over whether or not to express the felt emotion. They suggested that the ambivalence may be due to conflicts between the desire to

express and actual expression. The conflict can take on several forms (King & Emmons, 1990). For instance, an individual may want to express the experienced emotion, but may either inhibit the behavior (inhibited expression), or else express it reluctantly (reluctant expression), or express it but later have regrets (Katz & Campbell, 1994).

Ambivalence about emotion expression has been associated with indices of poor psychological functioning, including daily negative affect, depressive symptoms, phobic anxiety, and paranoid ideation, and inversely associated with measures of psychological well-being, such as self-esteem, and satisfaction with life (Katz & Campbell, 1994; King & Emmons, 1990, 1991; Mongrain & Vettese, 2003), even when controlling for expressiveness of emotion (Katz & Campbell, 1994; King & Emmons, 1990, 1991). Mongrain and Zuroff (1994) examined the role of ambivalence as a mediating variable in the prediction of depressive symptoms in the context of dependency and self-criticism. They predicted that individuals high in self-criticism should experience inner conflict with respect to expressing emotion because of their constant need to obtain approval from their social environment, and hence would report greater ambivalence (Mongrain & Zuroff, 1994). Their predictions for dependency were based on findings of an early study that showed dependency to be associated with guilt in expressing hostility (Zuroff et al., 1983). As predicted, ambivalence over

emotional expression appears to be one mechanism through which self-criticism and dependency increase susceptibility to depression.

In addition to feeling such ambivalence, these individuals also appear to have difficulty producing emotionally appropriate responses. For example, in conflict-resolution tasks, women high in dependency behave more lovingly and express less hostility towards their boyfriends (Mongrain et al., 1998). In essence, they suppress negative feelings. In contrast, women high in self-criticism tend to react aggressively, with overt manifestations of hostility (Mongrain et al., 1998). As Mongrain and Vettese (2003) note, although self-criticism is associated with the ability to express negative emotion, it also seems to be associated with a greater sense of submissiveness, which suggests that such individuals may feel incompetent and disempowered. Such secondary negative emotions, as well as habitually inhibiting negative emotion, as found with respect to dependency, tend to perpetuate and intensify emotional states.

In essence, both personality styles appear to be associated with aspects of affective experience that underlie depressive disorders and dysphoria. For example, individuals high in self-criticism and dependency experience high levels of negative affect and those high in self-criticism also experience low levels of positive affect. They experience more persistent and frequent episodes of mood disturbances, and their affective states are also more

intense. Taken together, these characteristics suggest that affect-related self-regulatory abilities may be burdened, and perhaps impaired, in these individuals.

Mood-Related Self-Regulation

Humans have the capacity to regulate affective states regardless of the process or mechanism that generated the state. The capacity to regulate affect is an adaptive mechanism that allows individuals to maintain well-being and function within their social environments. The inability to effectively regulate mood and emotion can compromise many aspects of an individual's life and lead to a cascade of stressors and psychological difficulties. Difficulties with mood and emotion, and deficits in regulating such states have been implicated in up to 75% of disorders listed in the DSM-IV (Werner & Gross, 2010), including depression (Gross & Munoz 1995), generalized anxiety disorder (Mennin, Heimberg, Turk, & Fresco, 2005), eating disorders (Sim & Zeman, 2005, 2006), and borderline personality disorder (Glenn & Klonsky, 2009; Linehan, 1993a, 1993b). For this reason, some researchers have even proposed that psychopathology may be better classified using a transdiagnostic approach based on core disturbances and mechanisms that underlie psychiatric disorders, such as affect regulation (Kring, 2008; Sloan & Kring, 2010).

As noted by J. Gross (2007), interest in the study of affect regulation has grown exponentially since the early 1990s. The construct has been used to refer to a wide range of phenomena that cut across many subdisciplines of psychology, including developmental, biological, cognitive, personality, social, and clinical domains (Gross, 2007). Consequently, there is no clear agreed-upon definition as to what constitutes affect-regulation and which processes are involved (Bridges, Denham, & Ganiban, 2004). In general, regulation refers to changes associated with affective experience. One widely used definition given by Thompson explains emotion-related regulation as "the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals" (Thompson, 1994, p.27-28). The definition is broad, and includes processes that are externally imposed on the individual in regulating affective experience. Affect regulation has been studied extensively the child literature, where an important focus has been on the role of attachment figures in the development of the ability to self-regulate. Even in adulthood, interpersonal processes are important facilitators of intrapersonal regulation; however, the present discussion will be limited to the self-regulation of affective experience.

Before proceeding, certain terminology requires clarification. To begin with, it is necessary to note in that in much of the literature on the

regulation of affective experience, the distinction between mood and emotion is disregarded, and the terms *emotion-regulation* and *mood-regulation* are used interchangeably. Mood and emotion are both subjective states subsumed under the term *affect* (Gross & Thompson, 2007). Affect can be described by its valence/hedonic tone (positive or negative), and degree of activation/arousal (Russell & Carroll, 1999). Both states entail behavioral, experiential, and physiological responses. However, mood and emotion are distinct phenomena. Experts who study affective experience reserve the term *emotion* to refer to affective experience which has a specific onset and resolution, is more intense and less prolonged than mood, and is evoked by a stimulus which is appraised as having relevance to one's well-being (Larsen, 2000b; Watson, 2000). *Moods* differ from emotions in that they build up gradually, are more prolonged and generally less intense. An important distinction is that although mood states can be influenced by external events, they do not require any specific stimulus or cause to elicit the experience (Larsen, 2000b; Watson, 2000). For instance, internal, endogenous biological factors (e.g., the sleep-wake cycle, hormonal secretions - as during the menstrual cycle) are deemed to play a significant role in the onset and sustenance of mood (Watson, 2000). Indeed, research has been consistent in showing that mood fluctuates in a pattern consistent with the circadian cycle and with seasonal variation (Watson, 2000). On the other hand, emotion,

such as anger, does not present a cyclical variation. This distinction, that emotion requires an eliciting stimulus whereas mood states do not, suggests that an emotion state can be managed before the emotion response is activated, beginning when an emotion-provoking situation is identified and appraised, using antecedent-focused strategies (Gross, 1998; Gross & Thompson, 2007), whereas moods cannot. It follows then that because "moods do not have the 'aboutness' of emotions" (Larsen, 2000b, p.130), certain processes involved in emotion-regulation should differ from those required for mood-regulation.

Irritability and anger are good examples of affect states that have common valence and similar activation attributes, but reflect mood and emotion states, respectively. Irritability can be conceptualized as a milder, subthreshhold form of anger; it is less intense. Irritability is also more prolonged. For example, one may be in an irritable mood that may last an entire day or even several days, for no discernable reason. When irritable, the individual may quickly react with anger to events appraised as unfavourable in some way, for example, if a friend is late for a dinner date. Reappraising the event in a more empathic way, for example thinking that perhaps the friend was involved in a car accident, may quickly dissipate the feeling of anger. However, the irritable mood does not suddenly lift and change to joy; it persists. This example highlights that the relationship between mood and emotion is dynamic. Mood influences one's reactions to

and interpretation of events, which then activates an emotional reaction. Although not illustrated in the example above, an activated emotion also feeds back and reinforces the underlying mood.

Because the focus of the current study is on irritable mood, in the remainder of this section I use the terms *affect* and *mood* instead of *emotion*. The exception is when referring to names of established measures. I also use the terms *affect-* or *mood-related self-regulation*, instead of affect- or mood-regulation, to emphasize regulatory efforts that are initiated by the self.

Another concept that requires some clarification is the concept of *regulation*. Although a substantial portion of the research in the field has emphasized that regulation refers to the processes involved in affect as *regulated*, and examined the strategies that individuals employ to up- or down-regulate affective experience, others have used more comprehensive conceptualizations by incorporating processes that go beyond the regulation of the affective experience itself. As Cole, Martin, and Dennis (2004) indicate, the term can be applied to refer to changes in the experience itself - affect as *regulated*, but it has also been used to refer to processes and changes due to, or in the context of, the experience - affect as *regulating*. Thus mood is regulated, and it also regulates. Including the notion of affect as regulating embeds the construct within the broader concept of self-regulation. Self-regulation refers to "the processes by which the self alters its

own responses, including thoughts, emotions, and behaviors" (Baumeister, 1997, p.146). Of relevance to the present study is research that has shown that negative affect places demands on the overall self-regulatory system, and therefore can impair overall regulation (Baumeister, Zell, & Tice, 2007; Tice, Bratslavsky, & Baumeister, 2001). To explain this adverse effect, it is helpful to consider that affect-related self-regulation is a component of self-regulation. An important aspect of self-regulation is that the individual needs to engage effort to modulate or counter reactive tendencies, and such effort requires strength. Furthermore, as Larsen (2000a) explains, there are at least eight domains of regulation within the self-system (e.g., affective, cognitive, social, motivational) that may be operating at any one time, and all draw on the same psychological resources for their regulation. This single resource has a limited capacity (Baumeister, Vohs, & Tice, 2007; Doerr & Baumeister, 2010). As this limited resource is consumed with usage, if not replenished, it will result in *ego depletion* (Baumeister, Bratslavsky, Muraven, & Tice, 1998), and contribute to a type of self-regulation failure referred to as *under-regulation* (Baumeister & Heatherton, 1996). Under-regulation is reflected in behavior (e.g., individual has difficulty staying on task and engaging in goal-directed behavior), affect (e.g., individual has difficulty modulating negative emotions), and cognitive activity (e.g., individual has difficulty concentrating, or 'resisting' maladaptive cognitions).

The limited-resource model of self-regulation has been used to explain why people succumb to temptation when feeling distressed (Tice et al., 2001), and there is a large body of research on the role of self-regulation in psychopathology, including depression (Baumeister, Zell et al., 2007; Strauman, 2002). However, the literatures on affect as regulated and affect as regulating have remained largely unintegrated (Koole, 2008).

Gratz and Roemer (2004) proposed a framework that integrates both aspects of regulation, affect as regulated and as regulating. These researchers reviewed the theoretical and empirical literature on affect regulation and concluded that none of the available measures reflected the theoretical breadth of the construct and consequently researchers who wished to study affect-related self-regulation had to use multiple measures to capture its various dimensions (Gratz & Roemer, 2004). Based on their analysis, and with a focus on Thompson's (1994) definition of affect regulation, Gratz and Roemer designed a comprehensive instrument that has since been widely used in the field. Their conceptualization is particularly relevant to the present investigation as it can be applied in the study of mood. It also has particular clinical relevance as it considers the types of difficulties that lead to maladaptive responding in the context of negative mood.

Gratz and Roemer indicated that the effectiveness of strategies used to control affective experience is just one aspect that impacts affect-related

self-regulation. They proposed that adaptive regulation requires, and is reflected in, one's *understanding* of the affective experience, one's *acceptance* of the affective experience, and one's *self-management* in the presence of the experience (Gratz & Roemer, 2004). The understanding of emotional experience is necessary for monitoring. Accordingly, Gratz and Roemer proposed that processes involved in understanding the experience require *awareness*, that is, the ability to attend to and acknowledge one's affect state as valid and important, as well as *clarity*, which they define as the ability to make sense out of one's feelings and be able to identify and differentiate between states. As such, affect-related self-regulation can be thought of as a component of emotional intelligence (Salovey & Mayer, 1990). The second component, acceptance of affective experience, is related to the evaluative process that is inherent to regulation (see Thompson, 1994). Gratz and Roemer (2004) posit that acceptance of negative affect promotes adaptive responding in the context of negative affect states, whereas lack of acceptance can amplify emotional arousal and lead to secondary negative emotions, such as shame. Lack of acceptance can also be associated with avoidance and suppression of affective experience, which ultimately increases physiological arousal (Gross & Levenson, 1993, 1997), and further challenges one's regulatory system; it can paradoxically begin a downward spiral of dysregulation. Finally, Gratz and Roemer (2004) propose that a

fundamental aspect of adaptive functioning is the ability to maintain self-regulatory goals when feeling distressed. They posit that a fundamental function of efforts aimed at modulating the intensity or duration of an aversive affective state is to reduce the weight of the affective experience in order to maintain or promote goal-directed behavior (i.e., to effect activational control) and inhibit impulsive behavior (i.e., to effect inhibitory control). Therefore, affect-related self-regulation is reflected not only in the flexible use of strategies to cope with the mood state itself, but in the ability to manage various aspects of behavior when one is experiencing negative affect, so as to promote more adaptive outcomes. This last component of their model resembles the concept of self-regulation as described by Baumeister (1997).

Based on the abilities theorized to be implicated in affect-related self-regulation, Gratz and Roemer (2004) developed the Difficulties in Emotion Regulation scale (DERS) to assess affect dysregulation. The measure assesses individuals' habitual difficulties in six areas of regulation: (1) lack of emotional awareness (Awareness); (2) lack of emotional clarity (Clarity); (3) non-acceptance of affective experience (Non-Acceptance); (4) difficulties engaging in goal-directed behavior, when experiencing negative affect (Goals); (5) impulse-control difficulties, when experiencing negative affect

(Impulse); and (6) limited access to affect regulation strategies perceived as effective (Strategies) (Gratz & Roemer, 2004).

This comprehensive model of affect-related self-regulation has generated much empirical support. To begin with, elevated scores on the DERS have been associated with behaviors deemed to compensate for affect-related regulatory functions (Gratz, 2003), such as deliberate self-harm (Gratz & Roemer, 2004; Gratz & Roemer, 2008; Gratz & Tull, 2010), intimate partner abuse among men (Gratz, Paulson, Jakupcak, & Tull, 2009), and substance use (Fox, Axelrod, Paliwall, Sleeper, & Sinha, 2007; Fox, Hong, & Sinha, 2008). With respect to psychiatric disorders, the DERS was found to be elevated among individuals with borderline personality disorder (Glenn & Klonsky, 2009; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Kuo & Linehan, 2009) and diverse forms of anxiety disorders: generalized anxiety disorder, social anxiety disorder, post-traumatic stress disorder (Kuo & Linehan, 2009; McDermott, Tull, Gratz, Daughters, & Lejuez, 2009; McLaughlin, Mennin, & Farach, 2007; Mennin, McLaughlin, & Flanagan, 2009; Roemer et al., 2009; Soenke, Hahn, Tull, & Gratz, 2010; Tull, Barrett, McMillan, & Roemer, 2007; Tull, Stipelman, Salters-Pedneault, & Gratz, 2009).

Furthermore, recent studies indicate that regulation difficulties, as measured with the DERS, constitute a risk factor for the development of

depression. In one study, participants with a history of depression, but considered recovered at the time of the study, reported more difficulties in affect-related self-regulation than a matched, never-depressed group. Compared to the control group, the vulnerable group reported significantly more difficulties in understanding their affective experience in that they lacked clarity, and had significantly higher scores on the non-acceptance scale, reflecting the tendency to have negative secondary emotions in reaction to their negative affect states. They also showed impaired ability to access strategies deemed effective and reported more difficulties with goal-directed behavior when upset (Ehring, Fischer, Schnulle, Bosterling, & Tuschen-Caffier, 2008). Recovered participants also tended to be less emotionally aware and to have more problems with impulse control. Vujanovic, Zvolensky, and Bernstein (2008) also reported a positive association between difficulties in affect-related self-regulation and anhedonic depressive symptoms, as measured by the Mood and Anxiety Symptoms Questionnaire (Watson et al., 1995), among a sample of young adults. Lastly, findings from a study by Tull and Gratz (2008) provided support for the mediating role of the difficulties in engaging goal-directed behavior dimension in the relationship between anxiety sensitivity, particularly the fear of cognitive dyscontrol, and depressive symptoms. According to behavioral theories of depression, the inability to engage in

goal-directed activities will limit the potential to obtain positive reinforcement from one's environment and increase the risk for depressive symptoms.

In essence, Gratz and Roemer (2004) emphasized that adaptive regulation requires abilities that go beyond the use of strategies to up- or down-regulate the affective experience and propose that what accounts for affect-related difficulties seen in psychopathological disorders is not only, or even necessarily, related to emotionality per se, but to one's ability to remain composed in the face of a negative affect state so as to uphold adaptive pursuits and remain "on task." This conceptualization of affect-related self-regulation is particularly relevant to the present investigation, as a main thesis of this study is that women traversing to menopause are more prone to irritability, and hence inevitably the demands on the self-regulatory system become greater. Importantly, although irritability in and of itself can be relatively benign, in women who are more vulnerable to the effects of negative mood it may stimulate a downward spiral of dysregulated behavior and culminate in more encompassing distress.

Current Study and Hypotheses

The transition to menopause has been portrayed as a period of great emotional vulnerability that carries an increased risk of depression, and which has been explained, at least in part, by biological models which purport

a direct effect of hormonal activity on mood. However, although all women experience the drastic hormonal fluctuations associated with the transition, research has revealed that not all women experience emotional distress as they traverse to menopause. Born (2004) states that for up to 70% of transitioning women, irritability and not depression is their primary complaint. Although within limits, irritability is a normal and transitory state, more prolonged or excessive levels can impair daily functioning, cause friction in interpersonal relationships, and negatively impact physical and psychological health. For example, in empirical investigations not related to the menopause, it has been noted that irritability may be a prodromal symptom of clinical depression; it often precedes the onset of the full depressive syndrome by weeks and even months. Furthermore, the likelihood that this somewhat benign and transitory mood state develops into a more pervasive and enduring psychological state is purportedly heightened in the presence of other risk and vulnerability factors (e.g., personality factors).

Based on the above, and in order to postulate the causal relationship between irritability and severity of depressive symptoms assumed in the second and third sets of hypotheses (see below), the first goal of this study was to examine how the two constructs are distinct. To examine the extent of psychological and emotional distress associated with irritability versus

depressive symptoms, their associations with three indicators of well-being, as described below, were assessed. Also, to examine whether irritability and symptoms of depression manifest distinct relationships with endocrinological factors, their pattern of associations with stages of reproductive aging were assessed. The four stages of reproductive aging used in this study, as described below, have previously been used in cross-sectional studies as indirect indicators of hormonal factors.

A second, but most important goal of the current study was to examine whether certain women are more vulnerable to experiencing an increase in depressive symptoms when irritable. Two widely studied personality vulnerability factors, self-criticism and dependency, have been associated with an increased risk of depression during other stages of life, and research on the associated emotional profile suggests that women with high levels of these personality dispositions, particularly self-criticism, may have difficulty contending with such mood states. However, because a main concern of women with high dependency needs is to maintain interpersonal attachments and because they fear abandonment, dependency is associated with impression management. As such, highly dependent women may underreport or fail to endorse negative sentiments associated with irritability. Hence, an otherwise positive association between irritability and depression may be masked when dependency is taken into account. To date there has

been a paucity of research that examines diathesis-stress models, in which presumed menopause-related mood interacts with pre-existing personality vulnerability factors to elicit more pervasive depressive symptoms in women during this reproductive transition. Another goal of the study was to examine why this hypothesized moderated relationship exists. Specifically, the third goal of the study was to examine the role of affect-related self-regulation in mediating the association between irritability and severity of depressive symptoms in the context of personality vulnerability. A better understanding of the mechanisms through which a negative, but likely benign mood state can precipitate more dysfunctional outcomes in women who are already vulnerable to mood disorders can be used to develop more targeted psychological interventions for women transitioning to menopause.

In sum, the three goals of the study were as follows: (1) to examine distinctions between irritability and depressive symptoms, (2) to assess the moderating role of personality vulnerability in the relationship between irritability and depressive symptoms, and (3) to assess two mediating mechanisms through which personality vulnerability increases the effect of irritability on depressive symptoms. This study used a cross-sectional design to address these goals. Women were classified into the following four groups: (1) Premenopause, (2) Early Transition, (3) Late Transition, and (4) Postmenopause. These four groups are defined by changes in menstrual

patterns, and have been used as indirect markers of hormonal change. More specifics are provided in the Methods section. To address the second and third goals, the Early and Late Transition groups were combined into one Transition group. This decision was based on the rationale that, although the hormonal environments that underlie both phases of the transition may be somewhat different, they are quite similar, with very erratic fluctuations. Moreover, the entire transitional phase differs substantially from the hormonal characteristics of the pre- and postmenopause stages. Furthermore, based on the reviewed research, it was predicted that irritability would be more pronounced during the entire period of the transition compared to the pre- and postmenopausal stages, and a primary interest of the study was to test whether, and how, personality interacts with elevated negative mood. Hence, the hypotheses related to the second and third goals were tested only in the Transition group.

Each of the three goals gave rise to specific set of hypotheses as follows:

Hypothesis Set for Goal 1: Irritability and depressive symptoms.

H1.A: Although irritability is not integral to the experience of depression, and the DSM-IV does not list irritability as symptom of depression, increased irritability is an associated feature of clinical depression. It was therefore

hypothesized that there will be a positive association between level of irritability and severity of depressive symptoms across all groups.

H1.B: *Distinguishing depressive symptoms and irritability: Association with well-being.*

Based on evidence that suggests that irritable mood is distinct from depression, the two constructs were expected to show a differential pattern of association with diverse indices of well-being. The following components of well-being were assessed: (1) positive affect, (2) negative affect, (3) life satisfaction, and (4) psychological well-being. These components are considered to represent distinct aspects of well-being. Positive and negative affect reflect the affective component of well-being, life satisfaction refers to the cognitive component, and psychological well-being reflects fulfillment of existential potentials and is related to eudaimonic well-being (Keyes, Shmotkin, & Ryff, 2002). Severity of depressive symptoms is expected to encompass adverse consequences in all aspects of well-being, whereas irritability is expected to entail the negative affective domain. In other words, the effect of irritability is expected to be limited to the negative dimension of the affective component. Specifically:

> H1.B.i: Severity of depressive symptoms, but not level of irritability, will be associated with low positive affect across all groups;

H1.B.ii: Both, severity of depressive symptoms and level of irritability, will be associated with high negative affect across all groups;

H1.B.iii: Severity of depressive symptoms, but not irritability, will be negatively associated with life satisfaction across all groups.

H1.B.iv: Severity of depressive symptoms, but not irritability, will be associated with poor psychological functioning across all groups.

H1.C: *Distinguishing depressive symptoms and irritability: Association with menopausal stages.*

Based on previous findings that suggest that the most common mood symptom reported by transitioning women is irritability and not depression, a different temporal pattern of association vis-à-vis the four stages of menopause was expected. The temporal pattern with respect to onset and remission of irritability, but not severity of depressive symptoms, was expected to parallel the course of hormonal changes, as indexed by the four menopausal stages. Specifically:

H1.C.i: Irritable mood will be heightened in the early and late transition stages, relative to the pre- and post-menopausal stages. In other words, a quadratic trend was hypothesized to characterize this relationship.

H1.C.ii: Severity of depressive symptoms was hypothesized to increase in the early transition but then remain stable throughout the late transition and post-menopause stages. This pattern should reflect that factors other than hormonal ones are implicated in depressive symptom severity, and differ from that of irritable mood which was expected to show a decline in post-menopause when the hormonal system is no longer in flux.

Hypothesis Set for Goal 2*:* The diathesis-stress model.

Because a primary goal of this study was to examine the moderating effect of personality vulnerability on mood symptoms purported to be more pronounced and persistent during the menopausal transition, the hypotheses that follow were tested in the combined Transition (Early and Late Transition) group only.

H2.A: Personality vulnerability and depressive symptoms: In line with previous research, it was hypothesized that both vulnerability factors, self-criticism and dependency, will be positively associated with severity of depressive symptoms in transitioning women.

H2.B: Moderator effects of personality vulnerability in the relation between irritability and symptoms of depression:

> H2.B.i: Self-criticism will interact synergistically with irritability in the prediction of depressive symptoms, such that the relationship between irritability and symptoms of depression will be stronger at higher levels of self-criticism.
>
> H2.B.ii: A different interactive pattern was predicted with respect to dependency as studies have indicated that this dimension may feature protective qualities (Bornstein, 1998) that the individual can draw on in times of stress and counteract its maladaptive elements. Also, previous studies indicate that individuals who are high in dependency may minimize, underreport or deny negative sentiments (Lowyck, Luyten, Corveleyn, D'Hooghe, & Demyttenaere, 2009; Mongrain et al., 1998; Santor & Zuroff, 1997; Vliegen & Luyten, 2008). Therefore, it was predicted that dependency would have a mitigating effect on the relation between irritability and depressive symptom severity, such

that the relationship between irritability and severity of depression will be weaker at higher levels of dependency.

Hypothesis Set for Goal 3: Two models of mediated-moderation.

Gratz and Roemer's model highlights two potential pathways through which elevated, and perhaps chronic, levels of irritable mood can progress and degenerate into a more encompassing syndrome of depression. One pathway that could explain why irritable mood increases the depressive symptom severity entails the inability to engage effective strategies, maintain goal-directed behavior, and resist from acting on impulsive urges. Irritability is likely to challenge these self-regulatory abilities for all women. Moreover, it was predicted that in women with high levels of self-criticism, marked levels of irritability would further tax their already compromised self-regulatory capacities. Another potential pathway highlighted by Gratz and Roemer's model entails the non-acceptance of emotional experience. As reviewed earlier, a prominent characteristic of self-criticism is that it involves negative self-evaluations, and in the context of negative mood, this could result in producing secondary emotional reactions, and set in motion a sequence of negative responding that ultimately spirals downward.

Given the moderation model proposed under H2, the following hypotheses reflect a mediated-moderation process, whereby the predictor

interacts with a moderator to affect the mediator, which in turn affects the outcome. The general model is illustrated in Figures 2, 3-A, and 3-B (included in the Methods- Analytic Strategy section with a more thorough explanation for testing mediated-moderation models). Specifically, it was hypothesized that irritability indirectly increases the development of more severe depressive symptoms through difficulties in affect-related self-regulation, and through non-acceptance of the emotional experience. As tested under H2.B.i, self-criticism was hypothesized to moderate the relationship between irritable mood and depressive symptoms. Combining the effect of moderation with mediation produces a model of mediated-moderation which indicates that the first stage of the indirect effect (the path from irritability to the mediator) is moderated by self-criticism. That is, self-criticism was expected to compound the effect of irritability on the mediator. According to mediated-moderation, the effect of the mediator on the outcome variable, in this case depressive symptoms, is constant across levels of the moderator.

Two mediators were tested:

H3.A: The moderated effect of irritability by self-criticism on depressive symptoms will be mediated, at least partially, by difficulties in affect-related self-regulation.

H3.B: The moderated effect of irritability by self-criticism on depressive symptoms will be mediated, at least partially, by non-acceptance of negative affect states.

Chapter 3 Methods

Procedure and Participants

The study design was cross-sectional and administered over the Internet. Participants were recruited through two different sources. One group was recruited through online advertisements placed on Craigslist and listed in various cities in the U.S. and Canada. The study was advertised as an examination of the role of personality on health and well-being in adulthood. Participants were also acquired through a Canadian-based Internet market research firm, Interactive Tracking Systems Inc. (Itracks), which recruits and supplies participants for online research. Itracks recruited participants from their Canadian (Canada Talk Now) and US (U.S.A. Talk Now) panels. Women who agreed to participate in the study were instructed to click on a web link (provided on the Craigslist advertisement, and on the Itracks email invitation) that directed them to the survey site to complete the online questionnaires. The website was managed and operated by SurveyMonkey, an electronic survey engine (Survey Monkey, 1999). SurveyMonkey was programmed to accept only one submission per IP address.

To be eligible women had to be fluent in English, and have an intact uterus with at least one ovary. Exclusionary criteria included current use of psychotropic or hormonal medications, including hormonal contraceptives and hormone replacement therapy, pregnancy or breastfeeding, alcohol or drug abuse, and serious or chronic medical or psychiatric conditions (e.g., cancer, diabetes, hypothyroidism, schizophrenia). Once on the SurveyMonkey site, prescreening questions were administered to select women who met either of the following two age and menopausal status combinations: (1) aged between 35 to 40 years, and meet criteria for premenopause (as defined below), or (2) aged between 47 and 60 years, and meet criteria for any of the remaining three menopausal stages. Those who met either of the two criteria then proceeded to the consent form which delineated the purpose, procedure, benefits and risks, participant rights, and confidentiality issues concerning the study (see Appendix A). Itracks has access to all demographic information of their panelists that they provide upon enrolment; however, they did not have access to the data collected during this study. Participants provided informed consent by clicking on the "I agree" button, or they clicked on the "Exit" button to leave the website. Upon completion of the survey, participants clicked on a "Submit" button, which then automatically connected them to the Canadian Health Network's website operated by the Public Health Agency of Canada at

http://www.canadian-health-network.ca/servlet/ContentServer cid=1048003175135&pagename=CHN-RCS%2FPage%2FGTPageTemplate&c=Page&lang=En, where they were presented with information on women's health.

A total of 1961 women entered the SurveyMonkey site. Of these, 58% were blocked from continuing after completing the two prescreening questions either because they did not meet any of the age / menstrual pattern combination criteria to be assigned to a menopausal status group, or due to the fact that the quota for their age/ menstrual pattern had been met. Another 11% of women were eliminated due to exclusionary criteria, and 11% logged off the website after providing very limited information. Lastly, a visual inspection of the data revealed response set patterns for four participants. Their data was not included in the final sample.

A total of 391 women met study criteria. Each participant's self-reported menopausal status categorization was screened to ensure that it conformed with the menopausal classification criteria described below, and that the participant was included in the appropriate menopausal group. Group categorization was accomplished by inspecting a question in the Reproductive and Medical History Questionnaire, which asked the participant to provide the date of her last menstrual period. This procedure yielded a total of 10 participants who had to be reclassified as follows: one

participant self-classified as ET was reclassified as LT, four participants from LT to ET, and five participants from LT to Post. The number of participants included in each of the groups were as follows: (1) Premenopause : 106 (no change), (2) Early Transition: 96, (3) Late Transition: 68, and (4) Postmenopause: 121. It is noted that, of the participants who were still menstruating, the majority reported their periods as being regular (96% of Premenopause group), or that they had been regular prior to entering the transition (92 % of Transition group). Participants who were recruited through Craigslist were entered into a lottery to win one of four cash prizes of $50 or $100 each. Participants from Itracks received a $2.50 gift card provided by the firm. Data was collected over a period of 6 months. The study was approved by the Ethics Research Board of McGill University (File # 276-0308).

Reproductive & Medical History

A questionnaire, adapted from the 22-item questionnaire used by Schleifer (2003), was used to collect information on reproductive characteristics (e.g., menstrual history and bleeding patterns, use of hormonal preparations), and medical history (see Appendix B).

Menopausal Status

There are no independent, objective biological markers or indicators with clear cut-offs that can be used to define the process to menopause (NAMS, 2010). According to Harsh et al. (2009), the most reliable method combines plasma gonadotropin levels, chronologic age, and menstrual cycle characteristics. The present study used the most cost-effective method for assessing stages of reproductive aging that is based on menstrual bleeding patterns (Soules et al., 2001) and chronologic age (Bastian, Smith, & Nanda, 2003). Chronologic age, though not a good marker of menopausal status, is important to consider because cycle irregularity is not restricted to the transitioning period (Harsh et al., 2009) and in women younger than 40 years may reflect a lifetime pattern of variability rather than a changing endocrine environment (Harlow et al., 2007). Also, as indicated by Bastian and colleagues (2003), staging menopausal status in early to mid-forties is rather challenging. Thus, in the present study, age was used in conjunction with staging criteria (described below), to categorize women into four groups.

Menopausal status was determined using items that asked participants about cycle regularity, date of last cycle, and four mutually exclusive questions regarding participants' menstrual bleeding pattern in the preceding 12 months (see Appendix B). Classification was based on a widely used system established by SWAN (Sowers et al., 2000), which is similar to the STRAW criteria. Women were classified as follows: (1) Premenopause:

menstrual cycles have been regular with no change in cycle length; (2) Early Transition: menstruated in previous 3 months, but experienced a change in frequency (more or less frequent periods); (3) Late Transition: had a period in last 12 months, but not in past 3 months; and (4) Postmenopause: did not have a menstrual period in previous 12 months. Women were included in the premenopause group if they met the relevant criteria and were between the ages of 35 and 40 years. Based on evidence that the median age of onset of the transition is 47.5 years (McKinlay et al., 1992), an age range for sampling women in the menopause transition (Early and Late) and postmenopause was restricted to those between the ages of 47 to 60 years.

Measures

McGill Revision of the Depressive Experiences Questionnaire

(DEQ; Blatt, D'Afflitti & Quinlan, 1976; Santor, Zuroff, & Fielding, 1997). The DEQ is a widely used instrument designed to measure individual differences in self-criticism and dependency. The DEQ does not assess symptoms of depression, but rather the cognitions, emotions, and attitudes about the self and interpersonal relationships that are frequently related to depression in normal populations. The two vulnerability personality styles are measured as nearly orthogonal constructs. The self-criticism factor reflects feelings of failure, self-doubt, inadequacy, and guilt; the dependency

factor contains items that assess insecurities about being loved and cared for, and fears of abandonment. The McGill Revision of the original DEQ was used in the present study. It consists of 48 of the original 66 items. Each factor is composed of 30 items: 18 items assess self-criticism, 18 items assess dependency, and 12 items that assess both dimensions but scored in opposite ways. Participants respond by indicating degree of agreement to each item using a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Scoring has also been simplified by using unit-weighted scoring, versus factor-derived scale scores that is used in the original DEQ. Scores on the revised scales may range from 30 to 210 for each. Santor and colleagues report that both scales of the McGill version were highly correlated with the respective original measures in their non-clinical student sample, and importantly, retained their near orthogonality (Santor et al., 1997). The revised scales' psychometric properties, as evaluated in a non-clinical college population, indicate adequate internal consistencies, with Cronbach's alpha ranging from .69 to .76 for self-criticism, and .65 to .78 for dependency. Support for its construct validity is substantial for the original DEQ (see Blatt 2004). The revised version has been validated in clinical and nonclinical populations by Santor, Zuroff, Mongrain, and Fielding (1997). In the present study, the self-criticism scale yielded scores ranging from 53 to 162, and a Cronbach alpha of .80 for the combined, and from 53 to 152, and alpha

of .76 for the transition sample. For the dependency scale, scores ranged from 76 to 171, and the coefficient alpha was .71 for the combined sample, and 86 to 167 and alpha of .70 for the transition sample.

Born-Steiner Irritability Scale - Self-Rating (BSIS; Born, Koren, Lin, & Steiner, 2008). The BSIS is a self-report measure designed to assess severity of irritability specific to women. The instrument was developed to fill a gap in the assessment of *state* irritability in women which is reportedly a prominent symptom associated with reproductive events and cyclicity. The scale measures irritable mood as a unidimensional construct with 14 items that assess the following core symptoms of irritability: (1) annoyance (e.g., "It took very little for things to bother me"), (2) anger (e.g., "I have been felling mad"), (3) tension (e.g., "I have been feeling ready to explode"), (4) hostile behavior (e.g., "I have yelled at others"), and (5) sensitivity (e.g., "I have been irritable when someone touched me"). Participants use a 4-point Likert scale from 1 (not at all) to 4 (most or all of the time) to rate the extent to which the item was experienced during a specified time frame. Ratings are summed over items, with higher scores indicative of greater irritability. The scale's psychometric properties were examined in a sample of English-speaking Canadian women, most of whom had completed post-secondary education, were middle-class, and employed. The authors report evidence of

strong internal consistency reliability (Cronbach's alpha = .93), and test-retest reliability (.70) over a mean interval of 21 days. The measure has good content validity, and there is preliminary support for convergent validity as evidenced by the significant correlations of the self-rated with observer-rated ratings (Born et al., 2008). However, it is a relatively new measure, hence construct validity remains to be established. In the present study, Cronbach's coefficient alpha was .96 (for both samples). In order to keep the time frame consistent among all measures used in the study, participants were required to indicate how they felt in the *past week*.

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS is a 36-item self-report measure designed to assess the following six dimensions related to difficulties in emotional regulation: (1) non-acceptance of negative emotions, (2) difficulties in engaging in goal-directed behavior, (3) impulse control difficulties, (4) lack of emotional awareness, (5) limited access to emotion regulation strategies, and (6) lack of emotional clarity. Most statements begin with the stem *When I'm upset….* Participants rate the degree to which each statement provided applies to them using a 5-point Likert scale from 1 (almost never - 0 to 10%) to 5 (almost always - 91 to 100%). Ratings are summed to yield six subscores, and across subscores to obtain a global score. Items that are negatively framed

are reversed scored. Higher scores indicate greater degree of difficulty in regulating emotion. The measure has demonstrated very good psychometric properties. The authors report high internal consistency for the overall scale (Cronbach's alpha = .93) and the subscales (alpha > .80 for each), and test-retest reliability over a period of between 4 and 8 weeks in the range of .57 to .89 for each of the subscales, and .88 for the overall scale (Gratz & Roemer, 2004). The authors demonstrated convergent and predictive validity for the DERS by its association with various measures of emotion dysregulation and avoidance, and various behavioral outcomes related to emotional regulation deficits. The scale has been widely used since its introduction, and studies have provided considerable evidence for the validity of the overall DERS in clinical and non-clinical samples.

For the present study, difficulties in affect-related self-regulation (DSR) was measured with the DERS Goals, Impulse, and Strategy subscales. The DSR was formed by summing scores across the three subscales. These scales were combined based on their high intercorrelations as reported by Gratz and Roemer (r = .61 and .62 for Strategies with Impulse and with Goals, respectively, and .50 between Goals and Impulse), and their conceptual interpretation, as presented earlier in the Introduction section. In the present study, Cronbach's alpha for the DSR measure was .90. The Non-Acceptance subscale served as a separate mediator measure. Items

comprising the Non-Acceptance subscale assess emotional consequences of experiencing negative affective states, such as embarrassment, shame, and guilt. This subscale yielded an alpha estimate of .88. The correlation between Non-Acceptance and the composite DSR scale was significant (r = .58, $p < .01$) but not entirely redundant, and because it was considered to be conceptually different from the DSR, it was retained as a separate factor.

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is widely used and accepted in research as a self-report measure of the severity of depressive symptoms in adolescents and adults. However, the BDI is not a diagnostic instrument. It is composed of 21 items, each representing a category of depressive symptoms that reflects the diagnostic criteria described in the DSM-IV (APA, 2000). For each symptom category, four statements are provided that describe symptom manifestation in ascending severity, and scored on a 0-3 point scale (0 = not present to 3 = severe symptom manifestation). The BDI has strong psychometric properties (Beck et al, 1996; Steer, Ball Ranieri, & Beck, 1997). For purposes of this study, the item assessing the symptom *irritability* was omitted so as to remove redundancy with the construct irritable mood, which was measured with the BSIS. Also, due to the sensitive nature of item that assesses suicidal intent, and our inability to provide clinical support to any

participant who endorses the option indicating high risk of self-harm, this item was omitted. The modified BDI was therefore based on 19 items, with potential overall scores ranging from 0 to 57. Overall scores ranged from 0 to 34. The internal consistency coefficient based on 19 items used was .87 for the combined sample, and .89 for the transition sample. In the present study, participants were required to indicate how they felt in the *past week*.

Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988). The PANAS is a self-report measure designed to measure the affective component of subjective well-being. It is comprised of 20 adjectives, 10 describing pleasant activated affect states (PA), and 10 describing negatively valenced activated affect states (NA). High PA is described as a state of alertness and enthusiasm, while low PA describes a state of fatigue and boredom. On the NA axis, high NA is a state of tension and upset, while low NA denotes a state of relaxation and contentment. PA and NA are independent dimensions (Barrett & Russell, 1998). The affective component of subjective well-being is conceptualized as the presence of PA and absence of NA (Myers & Diener, 1995). The PANAS requires participants to rate the extent to which they have felt the emotion using a 5-point Likert scale, from 1 (very slightly or not at all) to 5 (extremely) over a specified time frame (e.g., today, past week). Two

separate scores are calculated by summing across the PA items and the NA items. Scores for each subscale can range from 10 to 50. The scales have been shown to possess high internal reliability over a number of different time frames (e.g., at this moment, today, over the past few days). Watson, Clark, and Tellegen (1988) reported a Cronbach's alpha = .87 for both subscales for the period "over the past few weeks." Test-retest reliability coefficients over an 8-week retest interval for the various time frames ranged from .47 to .68 for the PA subscale, and from .39 to .71 for the NA subscale. Construct validity is demonstrated by the scales' correlations with measures of anxiety, depression, and general psychological distress (Watson, Clark, & Carey, 1988). For example, the dimensions have been differentially related to depression and anxiety, with NA being related to both anxiety and depression, and PA showing stronger negative relationship with depression (Jolly, Dyck, Kramer, & Wherry, 1994; Watson et al., 1988). In the present study, participants were required to indicate how they felt in the *past week*. Overall scores for the PA dimension ranged from 10 to 50, and had an internal consistency coefficient of .94. The NA dimension had scores ranging from 10 to 39, with an internal consistency coefficient of .89.

Extended Satisfaction with Life Scale (ESWLS; Alfonso, Allison, Rader & Gorman, 1996; Gregg & Salisbury, 2001). Satisfaction with life is

conceptualized as one's intellectual evaluation of one's life in diverse domains considered important to one's sense of well-being (Myers & Diener, 1995). The ESWLS is an extended version of the Satisfaction with Life Scale developed by Diener, Emmons, Larsen, and Griffin (1985). The original original ESWLS version contained five items per life domain, but was subsequently shortened to two items, the two most highly loaded items for each factor in the full-item ESWLS. In this study satisfaction was assessed with respect to the following five domains: (1) general/global life, (2) self, (3) marital/relationship, (4) sex, and (5) family. Participants are required to rate degree of agreement to each item using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Scores are based on sum of ratings over items for each subscale, and globally across the subscales, with higher scores indicative of greater life satisfaction. The scale has been well-validated (see Alfonso et al., 1996) and possesses very good psychometric properties. Factor analysis supports the factor structure of the original ESWLS and comparable factor structure is reported for the shorter, modified version (Gregg & Salisbury, 2001). In the present study, Cronbach's coefficient alpha based on the five subscales used was .90 and therefore a global score was used in all analyses.

Psychological Well-Being Scale (PWB; Ryff, 1989; Ryff & Keyes, 1995). The PWB is a multidimensional self-report instrument designed to

measure aspects of positive functioning and psychological well-being. Psychological well-being and subjective well-being are purported to be conceptually distinct. Subjective well-being entails an "evaluation of life in terms of satisfaction and balance between positive and negative affect" (Keyes, Shmotkin, & Ryff, 2002, p.1007); "psychological well-being entails perception of engagement with existential challenges of life" (p. 1007). The PWB scale comprises six subscales that tap theoretically-derived core components of psychological well-being described as follows: (1) self-acceptance (positive attitudes toward oneself); (2) positive relations with others; (3) autonomy (includes qualities of self-determination, and independence); (4) environmental mastery (one's ability to engage in and manage activities in one's world); (5) purpose in life (feeling that there is meaning in one's life); and (6) personal growth (one's continual development and striving for self-expansion). Participants use a 6-point Likert scale to rate degree of agreement from 1 (strongly disagree) to 6 (strongly agree). Ratings are summed across items of each subscale to yield six subscores, and across subscales to obtain a global score. Higher scores are indicative of greater psychological well-being. Responses to negatively formulated items are reversed scored. The original scale (Ryff, 1989) included 20 items per subscale and was subsequently shortened to 3 of the original 20 items (18 items in total). For the present study, the 18-item version was used.

Subscales of this shortened version correlate from .70 to .89 with the respective subscale of the original longer version, and factor analysis confirmed the structure theorized to underlie PWB, with inter-scale correlations ranging from .13 to .46 (Ryff & Keyes, 1995). The full 18-item scale has adequate internal consistency, as estimated with Cronbach's alpha (.81) (Keyes, 2005); however, due to the limited number of items each subscale contains, internal consistency is compromised. The authors indicate that items were selected to support content validity and conceptual breadth rather than maximize internal consistency. Test-retest reliability over a 6-week interval for the original scales ranged from .81 to .88, and both versions demonstrate good construct validity (Keyes, 2005; Keyes et al., 2002; Ryff, 1989). In the present study, Cronbach's coefficient alpha for the full scale was .84; therefore the global score was used in all analyses.

Covariates

Based on previous research that showed an association between depression and certain demographic variables, menopausal symptoms, and attitudes towards menopause and aging, the following instruments were used to measure covariates in the present study.

Demographic Questionnaire. A total of nine items were used to collect information on demographic variables, such as education, occupational

status, marital status, ethnicity, and annual household income. Five items asked about health-related behaviors, such as use of alcohol, smoking, and exercise. One item asked participants to list current major stressors and life changes. The total number of stressors listed was used as an index of stress.

Attitudes Towards Menopause and Aging (ATMA; Sommer et al., 1999). This 7-item measure was developed by SWAN to assess the participant's attitude towards aging and menopause in their multiethnic community-based studies. Participants use a 3-point Likert scale to rate degree of agreement with each statement, from 1 (disagree) to 3 (agree). Ratings are summed across the seven items, with higher scores indicative of a more positive attitude towards menopause and aging. Responses to negatively formulated items are reversed scored. In the present study, Cronbach's alpha was .70 in the combined sample and .71 in the transition sample.

Menopause Rating Scale (MRS; Schneider, Heinemann, & Thiele, 2002). The MRS is a self-report measure developed by the Berlin Center for Epidemiology and Health Research and subsequently translated into multiple languages and used internationally. It is composed of 11 items designed to assess symptoms and complaints in women who are still menstruating or transitioning to menopause. Factor analysis of the 11 items yielded three factors: (a) Psychological symptoms; (b) Somatic symptoms;

and (c) Urogenital symptoms. Using a 5-point Likert scale, participants rate their perceived severity of symptoms from 0 (none) to 4 (very severe). The MRS yields three scores, based on the sum of items in each domain, and a global score. Validity has been established by comparison with other established measures of menopausal symptoms. The measure has shown good internal consistency with Cronbach's alpha > .65 for the individual factors, and .83 for the overall scale, and test-retest reliability coefficients > .84 and .90 for the overall scale, across countries in Europe, Latin and North America, and Asia (Heinemann et al., 2004). In the present study, the somatic factor (SOMA) was used as it assesses symptoms of hot flashes and sleep disturbance. Cronbach's coefficient alpha for the SOMA factor was .68 in the combined sample, and .71 in the transition sample. In order to keep the time frame consistent among all measures used in the study, participants were required to indicate severity of symptom experience in the past week.

Analytic Strategy

Results are presented in four sections. The first section describes how the data were screened and prepared to ensure that they conformed with assumptions of multiple regression. The second section describes characteristics of the sample and assessment of covariates that were conducted prior to examination of the primary hypotheses. Descriptive

statistics are reported in the third section. Results of the hypotheses are reported in section four. All statistical analyses were conducted using SAS, Version 9.1 (SAS Institute, 2004). The alpha level used as criterion of statistical significance was set at $p < .05$.

The sample consisted of four groups as follows: Premenopause (Pre), Early Transition (ET), Late Transition (LT), and Postmenopause (Post). Analyses were performed on ungrouped data as well as on grouped data. As well, a series of analyses were performed on grouped data that combined the ET and LT groups; the combined group was labeled 'Transition.' Cases with missing data were deleted on a pairwise or listwise basis, depending on the statistical procedure being used. Analysis of variance, *t* statistics, and chi-square statistics (for qualitative variables) were used to examine descriptive data; analysis of variance, and correlation and regression analyses were conducted to assess the hypotheses. For moderation analyses, the cross-product of the standardized predictor and standardized moderator variable was used to test hypotheses. Simple effects analysis was conducted to further analyze the nature of significant moderator effects.

Mediation hypotheses were examined using the causal steps procedure for testing basic mediation (Baron and Kenny, 1986) and extended by Muller, Judd, and Yzerbyt (2005) to test for the combined effect of moderation and mediation. In mediation analysis, the total effect of the

predictor-criterion relationship is partitioned into two separate components, the indirect or mediated effect through one or more intervening variables, and the residual direct effect of the predictor on the criterion variable. The model for basic mediation is depicted in Figure 2.

To test for basic mediation, three hierarchical regression equations are formulated:

1. Dependent Model: $Y = \beta_{10} + \beta_{11} X + \varepsilon_1$

2. Mediator Model: $Me = \beta_{20} + \beta_{21} X + \varepsilon_2$

3. Dependent Model: $Y = \beta_{30} + \beta_{31} X + \beta_{32} Me + \varepsilon_3$

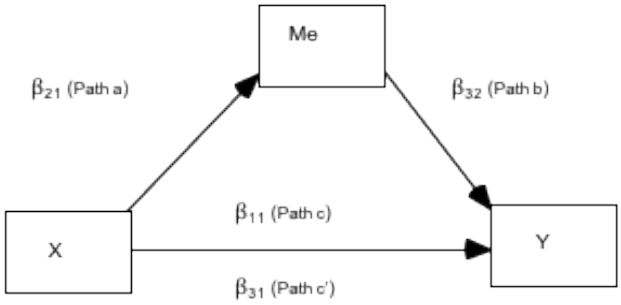

Figure 2. Basic Mediation Model. Adapted from 'The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations," by R.M. Baron and D.A. Kenny, 1986, *Journal of Personality and Social Psychology*, 51, p. 1176, Copyright by the American Psychological Association.

In accordance with the causal steps procedure developed by Baron and Kenny (1986), four conditions must be met for mediation to be

supported: (1) The relation between the predictor and the outcome is significant (Path *c*, β_{11} from Equation 1); (2) The relation between the predictor and the mediator is significant (Path *a*, β_{21} from Equation 2); (3) The relation between the mediator and the outcome, controlling for the predictor, is significant (Path *b*, β_{32} from Equation 3); and (4) The residual direct effect, that is, the relation between the predictor and the outcome when the mediator is included in the model (Path *c'*, β_{31} from Equation 3) is smaller than in Equation 1 ($\beta_{11} > \beta_{31}$). An intervening variable is said to fully mediate the association if Path c' is non-significant. If the residual direct effect remains statistically significant, though smaller in magnitude than the direct effect, then the intervening variable is considered a partial mediator. The difference between the overall effect and the residual direct effect ($\beta_{11} - \beta_{31}$) corresponds to the estimate of the indirect effect, and is computed as the product of Path *a* by Path *b*: ($\beta_{21} * \beta_{32}$).

When the association between the predictor and criterion variable is found to be moderated by a third variable, the mediation of the moderated relationship may be assessed by combining analyses for moderation and mediation. The test for mediation in the context of an overall moderated effect of the predictor on the criterion is referred to as *mediated moderation*; in contrast, when the overall direct effect is not moderated, the process is referred to as *moderated mediation*. Edwards and Lambert (2007) further

explain that mediated moderation refers to the process whereby the predictor interacts with a moderator to affect the mediator (Path a_3 in Figure 3-B), which in turn affects the outcome. In other words, they posit a main effect for the mediation process. The process for moderated mediation may be produced through a main effect of the mediator (Path a_3), and/or through an interaction of the mediator by the moderator. However, as Muller et al. (2005) explain, the ultimate decision as to whether the process is referred to as moderated mediation or mediated moderation rests on the research question to be investigated and focus of interpretation. In mediated moderation, the focus is on the main effect of the mediating process that accounts for the effect of X*Mo on Y. The focus of moderated mediation is on whether mediation varies as a function of the moderator.

To combine moderation and mediation analyses, Muller and associates expanded on the classic causal steps approach by providing a general set of regression equations that may be modified depending on the hypothesized model to be tested. The following regression equations estimate the paths as depicted in Figures 3-A and 3-B:

4. Dependent Model: $Y = \beta_{40} + \beta_{41} X + \beta_{42} Mo + \beta_{43} X Mo + \varepsilon_4$

5. Mediator Model: $Me = \beta_{50} + \beta_{51} X + \beta_{52} Mo + \beta_{53} X Mo + \varepsilon_5$

6. Dependent Model: $Y = \beta_{60} + \beta_{61} X + \beta_{62} Mo + \beta_{63} X Mo + \beta_{64} Me + \beta_{65} Me Mo + \varepsilon_6$

Note. X = Independent variable
Mo = Moderator variable
Me = Mediator variable
X*Mo = Interaction of X and Mo
Me*Mo = Interaction of Me and Mo
Y = Dependent variable

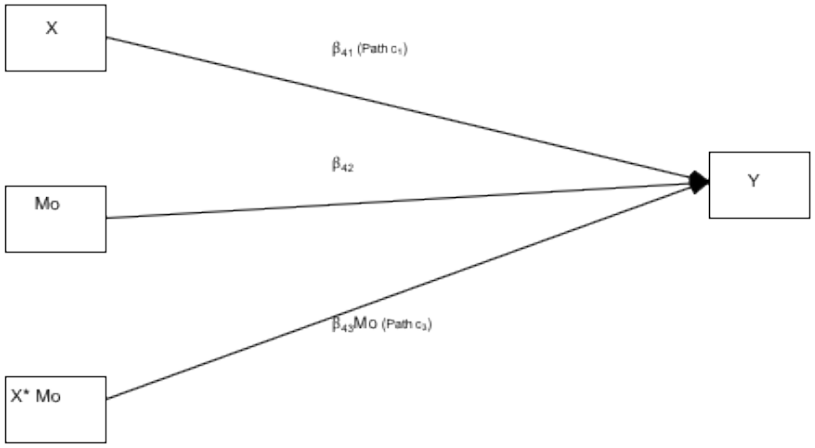

Figure 3-A. Mediated Moderation: Overall Effect. Adapted from 'The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations," by R.M. Baron and D.A. Kenny, 1986, *Journal of Personality and Social Psychology*, 51, p. 1174, Copyright by the American Psychological Association.

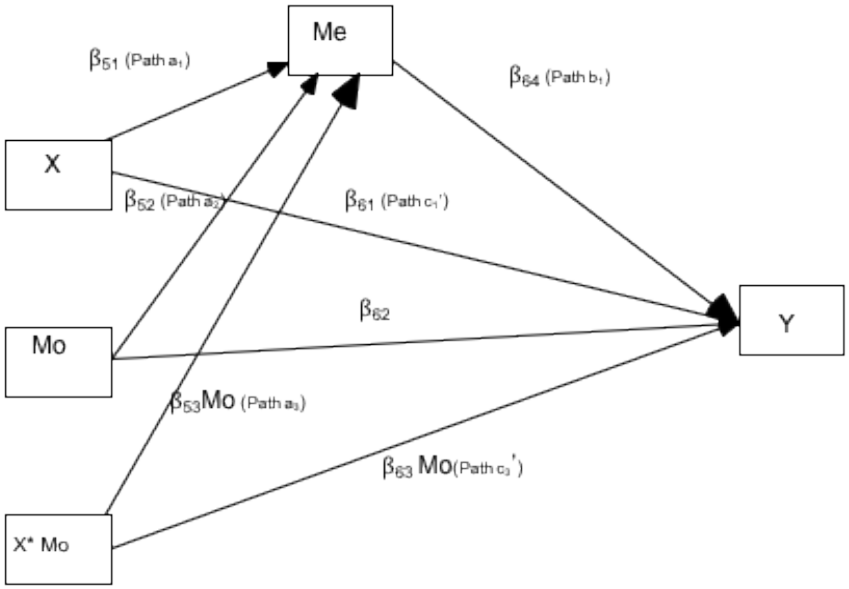

Figure 3-B. Mediated Moderation: Direct and indirect effects. Adapted from "Addressing moderated mediation hypotheses: Theory, methods, and prescriptions," by K.J. Preacher, D.D. Rucker, and A.F. Hayes, 2007, *Multivariate Behavioral Research*, 42, p. 194. Copyright 2007 by Lawrence Erlbaum Associates, Inc.

Equations 4 to 6 parallel Equations 1 to 3, and as in basic mediation, mediated moderation requires that four conditions be met (Muller et al., 2005):

(1) A prerequisite for mediated moderation is that there be significant moderation of the overall effect of X on Y (β_{43} from Equation 4 (Path c_3). This equation parallels Equation 1, but focuses on the moderated direct effect of the predictor on the outcome;

(2) There must be a significant moderation Path *a* (supported by a significant β_{53} coefficient (Path a_3); that is, the relation between the interaction of X by

Mo and the mediator is significant. Equation 5 parallels Equation 2, but the focus is on β_{53}, the coefficient that carries the effect of moderation between the predictor and the mediator;

(3) The relation between the mediator and the outcome, controlling for the predictor, the moderator, and their interaction, is significant (supported by a significant β_{64} coefficient (Path b_1). Equation 6 parallels Equation 3; and

(4) The residual direct effect of the moderation (β_{63}) is reduced compared to moderation of the overall effect (β_{43}) when the mediator is included.

Equation 6 is also used to test for moderation of Path b; moderated mediation is supported by a significant β_{65} coefficient (Path b_2), however, in testing for mediated moderation this term is omitted (Edwards & Lambert, 2007). Path b_2 is not shown in Figure 3-B.

The moderated causal steps procedure provides limited information; it allows one to classify the relationship through the mediator as one that either fully or partially accounts for the relationship between the interaction and the criterion, or not at all. Therefore, the mediated moderation analysis was supplemented by post hoc procedures. As in basic mediation, the total effect of the moderated relationship, given by ($\beta_{41} + \beta_{43}$Mo), may be partitioned into two additive components, providing point estimates as follows (Edwards & Lambert, 2007):

7. Indirect Effect: $(\beta_{51} + \beta_{53}\,Mo)\,\beta_{64}$

8. Residual Direct Effect: $\beta_{61} + \beta_{63}Mo$

Where $(\beta_{51} + \beta_{53}\,Mo)$ is the moderated effect of the predictor on the mediator (Path *a*), and β_{64} provides the magnitude of the effect of the mediator on the criterion (Path *b*). Also, from Equation 7, $\beta_{51}\beta_{64}$ is the point estimate quantifying the magnitude of the main mediated effect, and $(\beta_{53}Mo)\beta_{64}$ provides the point estimate for the mediated moderated effect. The indirect effect can also be calculated as the difference between the total effect and the residual direct effect: $(\beta_{41} + \beta_{43}Mo) - (\beta_{61} + \beta_{63}Mo)$.

Additionally, the product of coefficients procedure was used to quantify the magnitude of the mediated effect, and the Sobel test (Sobel, 1982) was used to test its significance. The Sobel test yields a *Z* score; it is calculated by dividing the indirect effect by its standard error as follows:

$$Z = (a)(b) / [(a^2 SE_b^2) + (b^2 SE_a^2)]^{1/2}$$

$$= (\beta_{53})(\beta_{64}) / [(\beta_{53}^2)(SE_{\beta 64}^2) + (\beta_{64}^2)(SE_{\beta 53}^2)]^{1/2}$$

Next, to facilitate interpretation, simple slopes (Aiken & West, 1991) were calculated and the mediated effects were plotted to depict the simple paths for the direct and indirect effects at low, moderate and high levels of the moderator (see Edwards & Lambert, 2007).

Chapter 4 Results

Data Preparation

All variables were screened for the presence of outliers and nonnormality. Univariate and multivariate outliers were sought separately for the sample obtained through the market research firm (IT), and for the sample recruited through online advertising (CL). Any case with an extreme score on a variable, as indicated by an absolute *z* score exceeding 3.29 ($p < .001$), was considered a univariate outlier and deleted from the data set. The Mahalanobis Distance statistic, based on the chi-square (X^2) distribution, was used to identify multivariate outliers. A total of 15 cases were identified as univariate outliers as follows: CL sample: two cases; IT sample: 13 cases. No multivariate outliers were identified.

As recommended by Tabachnick and Fidell (2007), if the sample size is large (n > 100), assessment of normality may be accomplished by visual inspection of the shape of the distribution of each variable. If the distribution of a variable appeared to depart from normality, prior to applying a transformation, it was considered whether the underlying construct is normally distributed by nature. Based on this strategy, one variable, Irritability, which was substantially (positively) skewed, was

transformed using a square root transformation, successfully correcting its level of skewness and kurtosis.

Preliminary Analyses

Sample Characteristics.

Prior to combining the samples of participants recruited from the two different sources, CL and IT, the groups were examined to determine whether they differed on demographic and study variables. Due to the large sample size, a more stringent significance level ($p < .001$) was applied for discriminating between-source differences, as otherwise a statistically significant difference at the more conventional alpha level of .05 would not likely indicate a difference of practical significance. There were no significant differences between the two groups; hence the samples obtained from the two recruitment procedures were combined for all subsequent analyses. The final sample consisted of 376 participants as follows: Premenopause: 102; Early Transition: 92; Late Transition: 65, and Postmenopause: 117.

Demographic information for the entire sample and by menopausal status is displayed in Table 1 (for the four menopausal groups), and Table 2 (aggregating Early and Late into Transition).

Table 1. *Demographic Characteristics of Combined Sample, and by Menopausal Status (four groups)*

Demographic Characteristic	Premenopause (N = 102) n (% Pre -sample) *M* (*SD*)	Early Transition (N = 92) n (% ET -sample) *M* (*SD*)	Late Transition (N = 65) n (% LT -sample) *M* (*SD*)	Postmenopause (N = 117) n (% Post -sample) *M* (*SD*)	Combined Sample (N = 376) n (% Total -sample) *M* (*SD*)	*F* / χ^2
Age	37.28 (1.69)	49.36 (1.90)	50.97 (3.10)	54.28 (3.68)	47.89 (7.28)	
Age Range	35 - 40	47 - 55	47 - 59	47 - 60	35 - 60	
Ethnicity [b]						11.71**
Caucasian (Non-Hispanic)	85 (84.2)	82 (91.1)	65 (100)	106 (90.6)	338 (90.6)	
Non-Caucasian	16 (15.8)	8 (8.9)	0 (0)	11 (9.4)	35 (9.4)	
Education [b]						36 **
Highschool	14 (13.7)	23 (25)	22 (33.9)	33 (28.2)	92 (24.5)	
College or Technical Diploma	48 (47.1)	51 (55.4)	27 (41.5)	54 (46.2)	180 (47.9)	
University Bachelor's Degree	23 (22.6)	13 (14.1)	12 (18.5)	21 (18)	69 (18.4)	
University Post-Graduate/Professional Degree	17 (16.7)	5 (5.4)	1 (1.5)	5 (4.3)	28 (7.5)	
Other	0 (0)	0 (0)	3 (4.6)	4 (3.4)	7 (1.9)	
Employment Status [b]						19.02 *
Unemployed	2 (2)	14 (15.2)	9 (13.9)	23 (19.8)	48 (12.8)	
Employed	73 (71.6)	61 (66.3)	44 (67.7)	67 (57.8)	245 (65.3)	
Student	1 (1)	0 (0)	1 (1.5)	1 (0.9)	3 (0.8)	
Retired/Homemaker	26 (25.5)	17 (18.5)	11 (16.9)	25 (21.6)	79 (21.1)	
Income (Average) [a]	5.92 $64, 200	5.48 $59, 800	5.52 $60, 200	5.71 $62,100	5.68	0.43
Marital Status [b]						24.95**
Single	11 (10.8)	10 (10.8)	8 (12.3)	5 (4.3)	34 (9)	
Married/Cohabiting	86 (84.3)	59 (64.1)	42 (64.6)	81 (69.2)	268 (71.3)	
Separated/ Divorced	5 (4.9)	19 (20.7)	13 (20)	24 (20.5)	61 (16.2)	
Widowed	0 (0)	4 (4.4)	2 (3.1)	7 (6)	13 (3.5)	
# Children [a]	1.87 (0.75)	2.23 (1.06)	2.06 (0.75)	2.41 (1.38)	2.17 (1.08)	3.92 **
HEALTH BEHAVIORS:						
Smoke [b]						3.93
Yes	26 (25.5)	28 (30.4)	26 (40)	37 (31.6)	117 (31.1)	
No	76 (74.5)	64 (69.6)	39 (60)	80 (68.4)	259 (68.9)	
Exercise [a]	3.27 (1.01)	3.14 (0.94)	3.09 (1.07)	3.23 (1.07)	3.19 (1.02)	0.64
BMI [a]	26.76 (6.25)	30.43 (8.98)	30.60 (6.89)	29.32 (6.89)	29.13 (7.46)	3.96 **

Note. BMI = Body Mass Index.
[a] ANOVA *F* Test. [b] Chi square test.
* $p < .05$. ** $p < .01$.

Table 2. *Demographic Characteristics of Combined Sample, and by Menopausal Status (three groups)*

Demographic Characteristic	Premenopause (N = 102) n (% Pre -sample) *M* (*SD*)	Transition (N = 157) n (% Tra -sample) *M* (*SD*)	Postmenopause (N = 117) n (% Post -sample) *M* (*SD*)	Combined Sample (N = 376) n (% Total -sample) *M* (*SD*)	F / χ^2 3-group comparison
Age	37.28 (1.69)	50.03 (2.58)	54.28 (3.68)	47.89 (7.28)	
Age Range	35 - 40	47 - 59	47 - 60	35 - 60	
Ethnicity [b]					8.20 *
Caucasian (Non-Hispanic)	85 (84.2)	147 (94.8)	106 (90.6)	338 (90.6)	
Non-Caucasian	16 (15.8)	8 (5.2)	11 (9.4)	35 (9.4)	
Education [b]					27.72 **
Highschool	14 (13.7)	45 (28.7)	33 (28.2)	92 (24.5)	
College or Technical Diploma	48 (47.1)	78 (49.7)	54 (46.2)	180 (47.9)	
University Bachelor's Degree	23 (22.6)	25 (15.9)	21 (18)	69 (18.4)	
University Post-Graduate/Professional Degree	17 (16.7)	6 (3.8)	5 (4.3)	28 (7.5)	
Other	0 (0)	3 (1.9)	4 (3.4)	7 (1.9)	
Employment Status [b]					17.78 **
Unemployed	2 (2)	23 (14.7)	23 (19.8)	48 (12.8)	
Employed	73 (71.6)	105 (66.9)	67 (57.8)	245 (65.3)	
Student	1 (1)	1 (0.6)	1 (0.9)	3 (0.8)	
Retired/Homemaker	26 (25.5)	28 (17.8)	25 (21.6)	79 (21.1)	
Income (Average) [a]	5.92 $64, 200	5.5 $60,000	5.71 $62,100	5.68 $61, 800	0.64
Marital Status [b]					24.67**
Single	11 (10.8)	18 (11.5)	5 (4.3)	34 (9)	
Married/Cohabiting	86 (84.3)	101 (64.3)	81 (69.2)	268 (71.3)	
Separated/ Divorced	5 (4.9)	32 (20.4)	24 (20.5)	61 (16.2)	
Widowed	0 (0)	6 (3.8)	7 (6)	13 (3.5)	
# Children [a]	1.87 (0.75)	2.16 (0.95)	2.41 (1.38)	2.17 (1.08)	5.45 **
HEALTH BEHAVIORS:					
Smoke [b]					2.31
Yes	26 (25.5)	54 (34.4)	37 (31.6)	117 (31.1)	
No	76 (74.5)	103 (65.6)	80 (68.4)	259 (68.9)	
Exercise [a]	3.27 (1.01)	3.12 (1.00)	3.23 (1.07)	3.19 (1.02)	0.76
BMI [a]	26.76 (6.25)	30.50 (8.18)	29.32 (6.89)	29.13 (7.46)	5.95 **

Note. BMI = Body Mass Index.
[a] ANOVA *F* Test. [b] Chi square test.
* $p < .05$. ** $p < .01$.

As can be seen, except for average household income and health-related behaviors, there were significant differences on all other demographic characteristics assessed. The sample was predominantly Caucasian (90.6%), and most participants had obtained post secondary education; Approximately 25% of the sample completed a university degree. However, a higher proportion of younger, premenopausal, women completed post-graduate degrees (16.7%) than women in the transition and postmenopause groups (3.8% and 4.3%, respectively). Two-thirds of participants were employed at the time that the survey was completed, though a slightly smaller proportion of postmenopausal women report full- or part-time employment. The average household income for the sample was $62,100. For the most recent period for which numbers are available, the average total income per household in the United States was $67,799 (U.S. Census Bureau, 2007) and in Canada for 2007 it was $77, 300 (Statistics Canada, 2009). With respect to marital status, most participants were married or cohabiting (71.3% of the entire sample); however, there was a four-fold greater prevalence of separation and divorce in the older women. The prevalence of separation or divorce was 4.90% for premenopausal women, and 20.44% in transitioning and postmenopausal women. The average number of children reported was 2.17, which is above the national average of 1.66 in Canada for 2007 (Statistics Canada, 2007), and 1.9 in the U.S. (U.S. Census Bureau, 2008).

With respect to health-related behaviors, approximately two-thirds of participants were non-smokers and, on average, reported engaging in physical exercise on an occasional basis. As indexed by the Body Mass Index (BMI; weight [kg] / height [m^2]), on average, participants were in the overweight range for body weight (BMI range 25.0 to 29.9) with a significant increase in BMI noted in the ET stage, when the mean BMI increased from 26.8 (SD = 6.25) in Premenopause to 30.4 (SD = 8.98), which is within the Obesity range (BMI > 30.0).

Assessment of Covariates

As the main hypotheses were tested on grouped data (that is, separately for the Pre, Transition, and Post groups), the search for covariates was conducted within menopause group. Again, due to the large sample size, a more stringent significance level ($p < .001$) was applied to evaluate whether a variable was a potential covariate to be controlled for in the regression models used to test hypotheses.

As reported in the previous section, statistically significant differences between menopause groups were detected in most demographic characteristics; however, only some were significantly associated with the outcome variables under consideration. A summary of the zero-order correlations for continuous variables, and ANOVA F tests and t tests for

categorical variables are provided in Tables 3 to 5. As can be seen, the variable, attitudes towards menopause and aging (ATMA), which in previous research has been associated with depression (Woods & Mitchell, 1997), was inversely associated with severity of depression in each of the three menopausal groups, at the specified level of significance. As well, and as expected, severity of somatic symptoms (SOMA), showed a positive correlation with the primary outcome variable in the Pre and Transition groups; the correlation in the Post group did not reach statistical significance at the specified level. Based on these results, multiple regression models for all groups included a block of covariates that contained ATMA and SOMA. In addition, although the correlation between the main outcome and life stress did not reach statistical significance, this variable was included as a covariate based on the vast amount of empirical evidence indicating its substantial association with depression.

Table 3

Summary of Associations of Demographic Characteristics and Potential Covariates with Study Variables

Premenopause Sample

Demographic Characteristic	Depressive Symptoms	Irritability	Self-Criticism	Dependency	Non-Acc	DSR
Continuous Variables [a]						
Income	-.23 *	-.04	-.25 *	-.15	-.04	-.11
Life Stress	.27 **	.37 ***	.24 *	-.20	.21 *	.16
Somatic Symptoms	.42 ***	.41 ***	.34 **	.11	.29 **	.12
ATMA	-.34 ***	-.28 **	-.25 *	-.18	-.13	-.12
# of Children	-.21	-.04	-.12	.12	.02	-.02
Exercise	-.24 *	-.16	-.17	-.22 *	-.08	.01
BMI	.19	.03	.12	-.06	-.07	-.18
Categorical Variables [b, c]						
Education [b]	0.74	1.41	1.16	2.62	0.94	1.40
Employment Status [b]	1.22	0.14	0.05	0.51	0.77	0.38
Marital Status [b]	0.63	0.30	0.21	1.71	0.09	1.73
Ethnicity [c]	-0.30	-0.25	-0.18	0.18	-1.40	-2.86 **

Note. N = 102. Non-Acc = Non-acceptance; DSR = Difficulties in Self-regulation; ATMA = Attitudes Towards Menopause and Aging; BMI = Body Mass Index.

[a] Correlation. [b] ANOVA *F* test. [c] *t* test.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Summary of Associations of Demographic Characteristics and Potential Covariates with Study Variables

Transition Sample

Demographic Characteristic	Depressive Symptoms	Irritability	Self-Criticism	Dependency	Non-Acc	DSR
Continuous Variables [a]						
Income	-.16	-.08	-.05	.00	-.19 *	-.10
Life Stress	.14	.20 *	.19 *	.13	.19 *	.19 *
Somatic Symptoms	.39 ***	.52 ***	.26 **	.22 **	.23 **	-.28 **
ATMA	-.56 ***	-.51 ***	-.32 ***	-.20 *	-.30 ***	-.46 ***
# of Children	-.03	.02	-.05	-.10	-.11	-.04
Exercise	-.18*	-.07	-.10	-.02	.03	.02
BMI	-.04	-.35 ***	-.05	.16	-.10	-.12
Categorical Variables [b, c]						
Education [b]	1.08	0.93	0.65	1.02	0.41	0.48
Employment Status [b]	1.34	0.51	0.72	3.25 *	0.58	1.13
Marital Status [b]	2.50	2.23	3.15 *	2.96 *	0.60	1.18
Ethnicity [c]	-0.21	1.34	0.07	0.71	0.69	0.02

Note. N = 157. Non-Acc = Non-acceptance; DSR = Difficulties in Self-regulation; ATMA = Attitudes Towards Menopause and Aging; BMI = Body Mass Index.

[a] Correlation. [b] ANOVA *F* test. [c] *t* test.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5

Summary of Associations of Demographic Characteristics and Potential Covariates with Study Variables

Postmenopause Sample

Demographic Characteristic	Depressive Symptoms	Irritability	Self-Criticism	Dependency	Non-Acc	DSR
Continuous Variables [a]						
Income	-.14	-.07	-.02	.15	.11	-.05
Life Stress	.09	.28 **	-.06	-.04	-.06	.02
Somatic Symptoms	.25 **	.32 ***	.01	-.01	-.05	-.11
ATMA	-.50 ***	-.38 ***	-.42 ***	-.12	-.29 **	-.40 ***
# of Children	-.08	-.17	-.07	-.07	-.06	.04
Exercise	-.27 **	.00	-.12	.02	-.04	-.09
BMI	.11	.04	.02	-.16	.00	.03
Categorical Variables [b, c]						
Education [b]	0.79	0.26	0.41	0.67	0.69	0.34
Employment Status [b]	0.86	0.08	2.78 *	0.36	0.92	1.43
Marital Status [b]	0.34	0.43	0.24	1.01	0.48	0.34
Ethnicity [c]	0.51	0.05	1.52	0.54	0.33	-.55

Note. N = 117. Non-Acc = Non-acceptance; DSR = Difficulties in Self-regulation; ATMA = Attitudes Towards Menopause and Aging; BMI = Body Mass Index.

[a] Correlation. [b] ANOVA *F* test. [c] *t* test.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Descriptive Statistics

Cronbach's alpha, means, standard deviations, and zero-order correlations of the variables are presented in a way that is consistent with the primary analyses, that is, for the combined sample (Table 6), and separately for the Pre (Table 7), Transition (Table 8) , and Post (Table 9) groups. Cronbach's alpha coefficients, calculated for all measures that were composed of two or more items, are reported in the Methods section. Briefly, the internal consistency of all measures were satisfactory; coefficients ranged from .68 (for SOMA) to .96 (for Irritability).

As expected, in all three menopausal groups, severity of depressive symptoms was significantly correlated with personality vulnerability, and consistent with previous research, the association was stronger for Self-Criticism than for Dependency. Also, as expected, severity of depressive symptoms was associated with irritable mood, severity of somatic symptoms, negative affect, and with the two mediator variables, difficulties in self-regulation and non-acceptance of negative emotion. Severity of depressive symptoms was also related to having a negative attitude towards aging and menopause; the relation was stronger for transitioning and postmenopausal women than the premenopausal participants. Conversely, severity of depressive symptoms was inversely associated with the three indicators of well-being: positive affect, psychological well-being, and satisfaction with life.

The correlations obtained for irritability showed a similar pattern of association as depressive symptom severity did with all variables, in all menopausal groups. The pattern of correlations obtained for the four well-being measures was also as expected. Positive affect and negative affect were modestly correlated, and both were significantly correlated with life satisfaction and psychological well-being, but in opposite direction. The correlation between satisfaction with life and psychological well-being was also significant. These four indices, though correlated, reflect different aspects of well-being.

With respect to personality vulnerability, consistent with theoretical conceptualizations of the two dimensions as being nearly orthogonal, Self-Criticism and Dependency were unrelated in the Premenopause group. In the Transition and Post groups, the dimensions were significantly correlated (*r*s = .26 and .21, respectively), though it is noted that these relationships were quite modest and indicate that they measure non-redundant aspects of personality. Consistent with previous research, in addition to the above-mentioned relationship with depressive symptoms and irritability, both Self-Criticism and Dependency were associated with negative affect. Self-Criticism was inversely associated with positive affect, whereas Dependency yielded weaker or non-significant correlations with it. With respect to reports of somatic complaints, correlations for the Pre and Post groups

indicate that, contrary to the postulated association of the Dependency factor with somatic complaints (Blatt, 2004), Dependency was not associated with severity of somatic symptoms; in transitioning women, both dimensions of vulnerability showed modest associations with somatic symptoms. Both dimensions of personality vulnerability were associated with DSR and with non-acceptance of negative emotions, a finding that is consistent with the empirical literature, indicating that individuals high in self-criticism and dependency have difficulty regulating and managing negative emotionality; these associations held in the three menopausal groups. Lastly, consistent with theory and empirical findings that the factors be conceptualized as stable personality dimensions (Zuroff et al., 1999; Zuroff et al., 2004), one-way analysis of variance tests showed that mean level of Self-Criticism and of Dependency did not differ between the four menopause groups, $F(3, 334) = 0.40$, $p = .75$, and $F(3, 330) = 0.61$, $p = .61$, respectively, suggesting that these vulnerability traits are stable across time. Means and standard deviations are summarized in Table 10.

Table 6

Summary of Intercorrelations, Means, Standard Deviations, and Internal Consistency Reliability of Study Variables

Combined Sample

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
Depressive Symptoms	------												
Irritability	.55***	------											
Self-Criticism	.56***	.48***	------										
Dependency	.24***	.17***	.22***	------									
Somatic Symptoms	.38***	.42***	.19***	.14*	------								
Non-ACC	.36***	.43***	.45***	.43***	.18***	------							
DSR	.47***	.48***	.52***	.31***	.08	.60***	------						
Positive Affect	-.55***	-.34***	-.35***	-.13*	-.18***	-.15**	-.36***	------					
Negative Affect	.57***	.48***	.47***	.28***	.25***	.46***	.49***	-.23***	------				
Satisfaction with Life	-.62***	-.41***	-.53***	-.12*	-.30***	-.22***	-.36***	.40***	-.37***	------			
Psychological Well-Being	-.63***	-.36***	-.62***	-.25***	-.17**	-.36***	-.51***	.58***	-.41***	.62***	------		
Life Stress	.17**	.28***	.14*	.12*	.24***	.13**	.12*	-.07	.27***	-.11*	-.06	------	
ATMA	-.47***	-.42***	-.33***	-.16**	-.13*	-.25***	-.35***	.38***	-.35***	.37***	.44***	-.11 (t)	------
M	8.86	6.83	109.54	125.00	3.36	10.85	34.48	29.39	16.38	34.53	80.26	2.33	16.14
SD	6.76	6.06	19.59	15.87	2.67	4.55	10.39	8.93	6.20	7.91	11.18	1.50	3.11
α	.87	.96	.80	.71	.68	.87	.91	.94	.89	.90	.84		.70

Note. N = 376. Non-Acc = Non-acceptance; DSR = Difficulties in Self-Regulation; ATMA = Attitudes Towards Menopause and Aging.

(t) = trend $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7

Summary of Intercorrelations, Means, Standard Deviations, and Internal Consistency Reliability of Study Variables

Premenopause Sample

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
Depressive Symptoms	------												
Irritability	.57***	------											
Self-Criticism	.62**	.63***	------										
Dependency	.27**	.21*	.17	------									
Somatic Symptoms	.42**	.41***	.34**	.11	------								
Non-ACC	.41**	.47***	.50**	.51**	.29**	------							
DSR	.39**	.53***	.55**	.32**	.12	.63**	------						
Positive Affect	-.47**	-.47***	-.40**	-.22*	-.11	-.26**	-.44**	------					
Negative Affect	.57**	.38***	.49**	.34**	.37**	.47**	.39**	-.22*	------				
Satisfaction with Life	-.50**	-.34***	-.50**	-.21*	-.19 (t)	-.27**	-.41**	.40**	-.21*	------			
Psychological Well-Being	-.52**	-.38***	-.60**	-.32*	-.20*	-.38**	-.52**	.57**	-.46**	.56**	------		
Life Stress	.27**	.37***	.24*	.20 (t)	.34**	.21*	.16	-.16	.35**	-.09	-.15	------	
ATMA	-.34**	-.28**	-.25*	-.18 (t)	-.04	-.12	-.12	.28**	-.18 (t)	.27**	.27**	-.12	------
M	7.23	6.35	108.75	123.21	1.81	9.99	34.93	29.82	16.82	36.56	81.66	2.10	15.76
SD	5.67	5.46	20.53	17.32	1.80	3.78	10.64	9.12	6.04	6.89	11.68	1.37	2.74
α	.83	.96	.83	.75	.43	.82	.92	.94	.88	.88	.87		.60

Note. N = 102. Non-Acc = Non-acceptance; DSR = Difficulties in Self-Regulation; ATMA = Attitudes Towards Menopause and Aging.

(t) = trend $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 8

Summary of Intercorrelations, Means, Standard Deviations, and Internal Consistency Reliability of Study Variables

Transition Sample

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
Depressive Symptoms	------												
Irritability	.57***	------											
Self-Criticism	.55***	.45***	------										
Dependency	.28***	.22**	.26**	------									
Somatic Symptoms	.39***	.52***	.26**	.22**	------								
Non-ACC	.40***	.49***	.48***	.39***	.23**	------							
DSR	.63***	.56***	.51***	.33***	.24**	.58***	------						
Positive Affect	-.54***	-.29***	-.28***	-.15 (t)	-.28***	-.09	-.35***	------					
Negative Affect	.66***	.58***	.50***	.26**	.29***	.54***	.59***	-.21**	------				
Satisfaction with Life	-.60***	-.40***	-.53***	-.06	-.27**	-.21**	-.41***	.36***	-.45***	------			
Psychological Well-Being	-.65***	-.38***	-.64***	-.26**	-.26**	-.33***	-.47***	.57***	-.44***	.66***	------		
Life Stress	.14	.20*	.19*	.13	.15 (t)	.19*	.19*	-.05	.32***	-.12	-.11	------	
ATMA	-.56***	-.51***	-.32***	-.21*	-.26**	-.30***	-.46***	.43***	-.47***	.43***	.57***	-.14	------
M	9.37	8.01	110.27	125.86	3.91	11.17	33.81	28.86	16.28	33.63	79.64	2.54	15.95
SD	7.11	6.91	18.01	15.11	3.21	4.69	9.39	8.83	6.06	8.25	10.86	1.60	3.21
α	.89	.96	.76	.70	.71	.88	.90	.94	.89	.90	.83		.71

Note. N = 157. Non-Acc = Non-acceptance; DSR = Difficulties in Self-Regulation; ATMA = Attitudes Towards Menopause and Aging.

(t) = trend $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 9

Summary of Intercorrelations, Means, Standard Deviations, and Internal Consistency Reliability of Study Variables

Postmenopause Sample

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
Depressive Symptoms	------												
Irritability	.54***	------											
Self-Criticism	.55***	.42***	------										
Dependency	.15	.06	.21*	------									
Somatic Symptoms	.25**	.32***	.01	-.01	------								
Non-ACC	.24**	.31***	.41***	.40***	-.05	------							
DSR	.39***	.39***	.53***	.31**	-.11	.64***	------						
Positive Affect	-.64***	-.30**	-.37***	-.01	-.07	-.15	-.33***	------					
Negative Affect	.50***	.46***	.44***	.26**	.21*	.37***	.47***	-.07	------				
Satisfaction with Life	-.70***	-.50***	-.57***	-.07	-.26**	-.14	-.32***	.47***	-.42***	------			
Psychological Well-Being	-.68***	-.32***	-.61***	-.14	.05	-.36***	-.56***	.61***	-.36***	.61***	------		
Life Stress	.09	.28**	-.06	-.04	.27**	-.06	.02	.04	.14	-.05	.14	------	
ATMA	-.50***	-.38***	-.42***	-.12	-.10	-.29**	-.40***	.41***	-.31***	.40***	.46***	-.04	------
M	9.60	5.67	109.27	125.49	3.98	11.19	35.03	29.73	16.13	33.87	79.82	2.26	16.73
SD	6.96	5.02	20.86	15.50	2.60	4.89	11.49	8.93	6.57	8.07	11.13	1.44	3.22
α	.86	.95	.82	.69	.62	.88	.93	.94	.90	.90	.83		.74

Note. N = 117. Non-Acc = Non-acceptance; DSR = Difficulties in Self-Regulation; ATMA = Attitudes Towards Menopause and Aging.

(t) = trend p < .10. * p < .05. ** p < .01. *** p < .001.

Table 10

Means, Standard Deviations, and One-Way Analyses of Variance (ANOVAs) for Irritability, Depressive Symptoms, and Personality Vulnerability Variables as a Function of Menopausal Status

Variable		Combined Sample (N = 376)	Pre Menopause (N = 102)	Early Transition (N = 92)	Late Transition (N = 65)	Post Menopause (N = 117)	ANOVA		
							F	*p*	ω^2
Irritability	Mean	5.83	5.35	7.59	6.20	4.67	4.34	.005	.027
	SD	(6.06)	(5.46)	(7.35)	(6.21)	(5.02)			
Depressive Symptoms	Mean	8.86	7.23	9.37	9.38	9.60	2.62	.05	.013
	SD	(6.76)	(6.18)	(8.68)	(7.51)	(7.38)			
Self-Criticism	Mean	109.55	108.75	108.96	112.05	109.27	0.40	.75	.00
	SD	(19.59)	(20.53)	(19.78)	(15.28)	(20.86)			
Dependency	Mean	125.00	123.21	126.28	125.29	125.49	0.61	.61	.00
	SD	(15.87)	(17.32)	(14.79)	(15.66)	(15.50)			

Note. ω^2 = effect size= df_{btw} (F -1) / df_{btw} (F- 1) + N_{tot}

Assessment of Primary Hypotheses

H1. Irritabiity and depressive symptoms.

For purposes of examining the relationship between irritability and depressive symptom severity, the menopausal groups were combined. The means, standard deviations and zero-order correlations for the variables pertaining to H1 are displayed Table 6.

A. Irritability and depressive symptoms.

Although irritability is not integral to the experience of depression, and the DSM-IV does not list irritability as symptom of depression, increased irritability is an associated feature of clinical depression; it was therefore expected that the two constructs would be positively correlated (H1.A). This was confirmed, irritable mood was significantly associated with severity of depression ($r = .55$, $p < .001$).

B. Distinguishing irritability and depressive symptoms: Association with well-being.

To determine whether irritability can be distinguished from depressive symptoms, I examined whether the two experiences differentially predict diverse indicators of well-being. The domains of well-being assessed include the psychological component of well-being, the cognitive component, and the

positive and negative affective components. It was hypothesized that severity of depressive symptoms , but not irritability, would predict low positive affect (H1.B.i.), being dissatisfied with life (H1.B.iii), and poor psychological functioning (H1.B.iv), whereas both, severity of depressive symptoms and irritable mood, were expected to uniquely predict high negative affect (H1.B.ii).

This series of hypotheses was investigated by separately regressing the four indicators of well-being on depressive symptoms and irritability. The effect size of the squared semipartial correlation coefficients was calculated as follows:

$$f^2 = sr^2 / (1 - R^2)$$

Interpretation of the effect size was based on generally-accepted benchmarks for small, medium and large effect sizes defined as .02, .15, and .35, respectively (Aiken & West, 1991; Cohen, 1992).

All hypotheses were supported. A summary of the results is provided in Table 11.

Table 11

Summary of Regression Analyses of Depressive Symptoms and Irritability in Predicting Diverse Components of Well-Being

			Depressive Symptoms							Irritability						
							95% CI							95% CI		
	R^2	*p*	β	*SE*	*t*	*p*	*LL*	*UL*	f^2	β	*SE*	*t*	*p*	*LL*	*UL*	f^2
Criterion Variable:																
Negative Affect	.36	< .001	.45	.05	8.59	< .001	.35	.55	.22	.22	.05	4.26	< .001	.12	.33	.06
Positive Affect	.30	< .001	- .51	.06	- 9.27	< .001	-.62	-.40	.26	- .07	.06	- 1.28	.20	- .18	.04	.004
Life Satisfaction	.39	< .001	- .60	.05	- 11.55	< .001	- .70	- .49	.41	- .06	.05	- 1.10	.27	- .16	.05	.004
Psychological Well-Being	.39	< .001	- .63	.05	- 12.09	< .001	- .73	- .53	.46	.02	.05	0.34	.74	- .09	.12	.000

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. f^2 = effect size = sr^2 / (1 - R^2).

As can be seen, depressive symptom severity significantly predicted each of the four indices of well-being, in the expected direction, whereas irritable mood was only predictive of negative affect. Depressive symptom severity was a stronger predictor of negative affect, uniquely accounting for 14% of variability ($\beta = .45$, $p < .001$, $f^2 = .22$), whereas irritability produced a smaller but significant effect, and explained an additional 4% of variance in negative affect ($\beta = .22$, $p < .001$, $f^2 = .06$). Together, the shared contribution of the two predictors explained an additional 18% of variability. In total, 36% of variability in negative affect was accounted for by severity of depressive symptoms and irritability, $F(2, 335) = 93.27$, $p < .001$.

As hypothesized, only depressive symptom severity contributed significantly to the prediction of positive affect, uniquely accounting for 18% of variance ($\beta = -.51$, $p < .001$, $f^2 = .26$), with an additional 12% explained by the shared variance of the two predictors. Irritability accounted for a non-significant .3% of variability in positive affect ($\beta = -.07$, $p = .20$, $f^2 = .004$). Results also supported the hypotheses that irritable mood is not a significant predictor of life satisfaction or of the psychological component of well-being. The two predictors explained 39% of variability in each of these two outcomes (SWL : $F(2, 325) = 105.47$, $p < .001$; PWB : $F(2, 324) = 102.75$, $p < .001$). Of the total variance explained, severity of depressive symptoms uniquely accounted for 25% of variance in SWL ($\beta = -.60$, $p < .001$, $f^2 =$

.41), and 28% of the variance in PWB ($\beta = -.63$, $p < .001$, $f^2 = .46$), with the remaining variance accounted for by the shared contribution of the two predictors. In other words, irritability did not uniquely explain any of the variability in these two outcomes.

These results indicate that, other than predicting negative affect, irritable mood does not appear to be associated the broader components of well-being such being satisfied with one's life, and engagement in existential challenges in one's life. Depressive symptoms, however, do appear to be related to diverse components of well-being, with effect sizes in the moderate to large range.

C. Distinguishing irritability and depressive symptoms: Association with menopausal stages.

In order to more fully understand the relationship between mood and menopause, mean scores for depressive symptom severity and irritability were examined as a function of stages of reproductive aging. It was hypothesized that mean level of irritability would increase significantly during the ET, and remain elevated though subsiding somewhat in the LT, and then remitting to Pre-stage levels in postmenopause (H1.C. i). In other words, a quadratic trend would best characterize this relationship. With respect to timing, depressive symptoms were hypothesized to show a similar onset in the

early transition, but were hypothesized to follow a different temporal pattern, such that levels would not remit, but rather remain stable throughout the transition and into postmenopause (H1.C.ii). Differences in mean level of depressive symptom severity and irritability as a function of menopause stage were examined using one-way independent-groups ANOVAs. Planned contrasts with Premenopause as the referent group, and trend analyses were employed to further examine significant main effects and the timing and temporal relationship between each mood construct and menopause stage. Effect sizes, ω^2 and Cohen's *d*, were calculated as follows:

$$\omega^2 = \mathrm{df}_{\mathrm{btw}} (F\text{-}1) \,/\, \mathrm{df}_{\mathrm{btw}} (F\text{-}1) + N_{\mathrm{Tot}}$$

$$d = M_1 - M_2 \,/\, \text{Pooled } SD$$

Benchmarks for ω^2, provided by Kirk (1996), for small, medium and large effect sizes are given as .01, .059, and .138, respectively; benchmarks for Cohen's *d* are .20, .50, and .80 (Cohen, Cohen, West, & Aiken, 2003).

The results of these analyses, including the means and standard deviations are presented in Table 10. Both hypotheses, H1.C. i and H1.C. ii, were supported. As expected, a significant main effect of menopause status on irritability was obtained, $F(3, 365) = 4.34$, $p = .005$, $\omega^2 = .027$. Specifically, contrast tests indicate that irritability increases significantly from the premenopause stage to the early transition stage, $F(1, 365) = 6.64$, $p =$

.01, $d = .35$. Irritability then decreases slightly in the late transition, and continues to decrease postmenopausally to remit to a level that is comparable to that of premenopause, $F(1, 365) = 0.69$, $p = .41$. Postmenopausal women experienced significantly lower levels of irritability than women commencing the transition (Early Transition), $F(1, 365) = 12.03$, $p < .001$, $d = .48$. It is noted that mean irritability for each of groups correspond to the mild range for irritability as recommended by the developers of the measure (Born et al., 2008). However, because the BSIS is a relatively new instrument, norms have not been empirically established.

Results also revealed a significant main effect for menopause status on level of depressive symptoms, $F(3, 349) = 2.62$, $p = .05$, $\omega^2 = .013$. The effect size was slightly larger for irritability than for depressive symptoms, but both are considered small effects. Contrast analyses indicate that there was an increase in depressive symptom scores such that, compared to premenopause levels, mean level of depressive symptoms was higher in the early transition, $F(1, 349) = 4.63$, $p = .03$, $d = .32$), late transition, $F(1, 349) = 3.82$, $p = .05$, $d = .36$), and in postmenopause, $F(1, 349) = 6.40$, $p = .01$, $d = .37$. It is important to indicate that although mean levels of depressive symptoms were increased in the three groups of women who were not in premenopause compared to those who were premenopausal, all means were considered to reflect minimal depressive symptomatology. Cut-offs scores

suggested by Beck et al., (1996) are as follows: 0-13 (minimal symptomatology); 14-19 (mild depression); 20-28 (moderate depression); 29-63 (severe depression). Also important to note is that the current analyses were based on the mean scores of 19 items, not the full BDI-II inventory which is comprised of 21 items. As explained in the Methods section, the items that assess irritability and suicidality were omitted. However, even if the mean scores obtained in the current analysis are prorated to reflect two additional items, all means remained well within the minimal range: Pre = 7.99, ET= 10.35, LT= 10.37, Post = 10.61.

Results of the trend analysis indicate that there was no significant linear pattern in irritability as a function of menopause status, but a significant quadratic pattern was detected, $F(1, 365) = 8.76$, $p = .003$, $\omega^2 = .02$, indicating that irritability increases in the early transition, when it peaks, then remits in postmenopause to premenopausal levels. In contrast, depressive symptom severity is characterized by a linear pattern, $F(1, 349) = 5.53$, $p = .019$, $\omega^2 = .013$; the quadratic trend did not account for significant variance in depressive symptoms $F(1, 349) = 1.72$, $p = .19$, $\omega^2 = .002$. This noteworthy differential pattern of association for irritability and symptoms of depression across menopause status is illustrated in Figure 4.

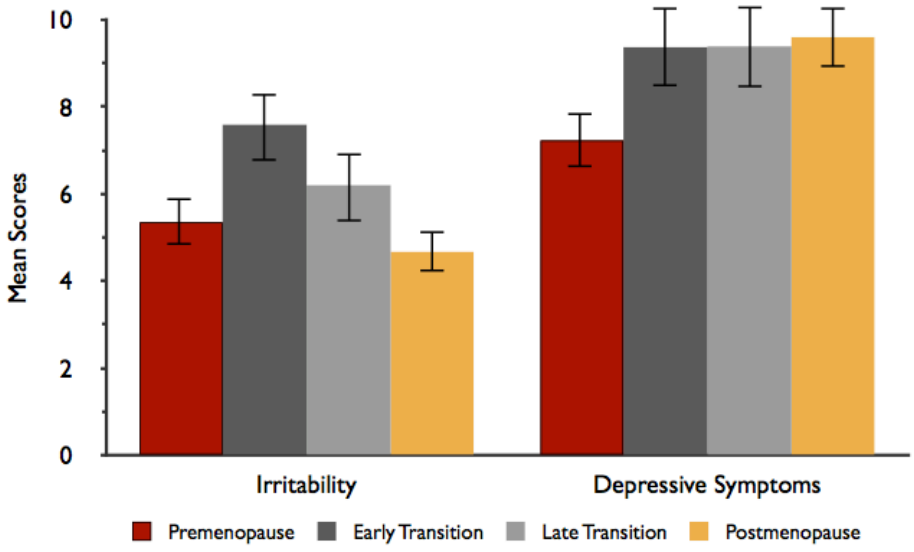

Figure 4. Mean level of irritability and depressive symptoms as a function of menopause status.

In sum, the results obtained for H1 indicate that although the association between irritability and depressive symptom severity is significant ($r = .55$, $p < .001$), and substantial, the two experiences are distinct in several ways. For example, in contrast to depressive symptoms, irritable mood does not appear to be associated with positive affect, life satisfaction or psychological functioning. Furthermore, irritability and depressive symptoms can be distinguished based on their differing time course with respect to stages of reproductive aging.

H2. The diathesis-stress model.

A principal thesis of this study is that the relationship between irritable mood and symptoms of depression will be especially marked in women with a self-critical personality orientation. In other words, having a self-critical orientation will combine synergistically with irritability to increase symptoms of depression. A different interactive pattern was predicted with respect to dependency: based on findings that individuals who are high in dependency may minimize, underreport or deny negative sentiments, it was predicted that dependency would have an interfering/antagonistic effect on the relation between irritability and depressive symptom severity. Support for this hypothesis is indicated if the impact of irritability on depressive symptoms is attenuated in the context of high dependency compared to low dependency. Because the primary interest was to examine the effect of personality on negotiating the mood symptoms purported to be more pronounced and persistent during the menopausal transition, these hypotheses were tested in transitioning women. However, analyses were also performed separately for the Pre and Post menopause groups, when irritable mood is significantly lower, and thus its moderation superfluous and therefore expected to be non-significant.

To test these hypotheses a series of hierarchical multiple regression analyses (HMRAs) were conducted. In all analyses symptoms of depression

served as the criterion variable. The predictor variables were entered in blocks as follows: Covariates were grouped into two functional sets in order to estimate the relative importance attributable to: (1) menopause-related, and (2) non- menopause covariates, in the prediction of depression. The menopause-related set included two variables, somatic symptoms (hot flushes and sweating, heart discomfort, sleep problems, and joint and muscular discomfort) and attitudes towards aging and menopause. This set was entered as Block 1 in the first step. The nonmenopause set, entered as Block 2, included a measure of life stress. Blocks containing the main effects of the predictor and moderator variables and the interaction terms formed to test for moderation were entered as described in the following sections. In accordance with procedures recommended for testing interactions in multiple regression, these terms were formed by the cross-products of variables that were entered as main effects. All variables were standardized within the Transition group prior to computing the cross-product terms (Aiken & West, 1991). Covariate interaction terms were similarly formed. Within each block, variables were entered simultaneously. Results for individual variables were interpreted and simple slopes for significant interaction effects were further examined only if the setwise F for the corresponding block met statistical significance. Effect sizes (f^2) of the

squared multiple partial correlations obtained for each block, and of the unique contribution of each predictor, were calculated as follows:

$$f^2 = \Delta R^2 / (1 - R^2)$$

$$f^2 = sr^2 / (1 - R^2)$$

Small, medium and large effect sizes for multiple and multiple partial correlations are operationally defined as .02, .15, and .35, respectively (Cohen, 1992).

A. Personality vulnerability and depressive symptoms.

An initial analysis was performed to examine whether the relationship between the two personality vulnerability factors and increases in level of depressive symptoms, which has been extensively reported in the empirical literature, would be replicated in the sample of women transitioning to menopause. For this analysis, Block 3 included the main effects for the two personality factors, and Block 4 their two-way interaction. The menopause-related predictors entered in step 1 accounted for 38 % of the variance, $F(2,100) = 31.07$, $p < .0001$, $f^2 = .79$; Somatic symptoms accounted for 7.7 % of unique variance ($\beta = .28$, $p < .001$, $f^2 = .16$), and having negative attitudes towards menopause and aging was a stronger predictor, accounting for 24% of unique variance ($\beta = -.50$, $p < .0001$, $f^2 = .50$). Life stress entered next in

Block 2 did not add to the prediction. Block 1 predictors remained significant when Block 3 was entered. Block 3 explained an additional 13% of variance ($\Delta F(2, 97) = 12.89$, $p < .0001$, $f^2 = .27$), constituting a moderately strong effect for the influence of personality factors in the prediction of depressive symptoms. This effect was primarily accounted for by the self-criticism dimension, which explained approximately 12% of the variance in symptoms of depression. The regression coefficients for Self-Criticism and Dependency were .38, $p < .0001$, $f^2 = .25$ and .03, $p = .68$, $f^2 = .002$, respectively. Thus, the prediction that symptoms of depression would be predicted by Self-Criticism was supported; however, contrary to previous findings, Dependency did not make a unique contribution to depressive symptoms and the interaction of Self-Criticism by Dependency was non-significant. The model, excluding Block 4, accounted for 53% of variance in depressive symptom scores, $F(5, 97) = 21.15$, $p < .0001$.

B. Moderator effects of personality vulnerability in explaining the relation between irritability and symptoms of depression.

Three separate analyses (Models A to C) were conducted to test the two moderator hypotheses. In all analyses blocks were entered sequentially in either four (Models A and B) or five steps (Model C). All models contained the first three steps: Blocks 1 and 2 contained the covariate

variables, and Block 3 the first-order effects of irritability (the independent variable), and of the moderator variable. In Model A, each of the 2-way interactions between irritability and personality that was the focus of the analysis was tested separately. Therefore Model A was run twice with Block 4 in Model A - 1 testing the contribution of Self-Criticism by Irritability in explaining variance in the criterion variable, and Model A - 2 assessing the contribution of Dependency by Irritability. Results of the analyses are summarized in Tables 12, 13, and 14.

Overall, Model A - 1, explained 60% of the variance in depressive symptom scores, $F(6, 94) = 23.44$, $p < .0001$. Block 3, containing the first-order effects of Irritability and Self-Criticism, explained 16% of variance ($f^2 = .40$, a large effect size). Controlling for the first-order effect of covariates, predictor, and moderator variables, Block 4 explained an additional 5% of variance in depressive symptoms, representing a medium effect size ($f^2 = .13$). Thus, as expected, there was a unique predictive contribution of irritability interacting with Self-Criticism ($\beta = .22$, $sr^2 = .05$, $p = .002$) not explained by the independent additive effects of the two variables to depressive symptoms, and thus qualifying the first-order effects. The same model (Model A-2), run for Dependency, explained only 47% of the variance in depressive symptom scores, $F(6, 94) = 14.03$, $p < .0001$. The analysis indicated that Dependency did not predict depressive symptoms ($\beta = .04$, p

= .61), and did not moderate the effect of Irritability on depressive symptoms (β = - .09, sr^2 = .008, p = .23). In each model, the moderating effect of each personality dimension, although not statistically significant for Dependency, was in the predicted direction. Models A - 1 and A - 2 were run separately for the Premenopause and Postmenopause groups. As expected, none of the moderation interactions were significant; therefore, no further analyses were conducted on these samples. As well, because there appeared to be no evidence that Dependency explains variability in depressive symptoms, either as a main effect or in modifying the effect of irritable mood on depressive symptoms, Dependency was not included in Models B and C.

Prior to interpreting the interaction, two additional analyses, represented in Models B and C, were conducted. Model B assessed whether the moderated effect of irritability on severity of depressive symptoms by Self-Criticism may be better accounted for by a quadratic effect of Self-Criticism or Irritability. Given the significant correlation between Irritability and Self-Criticism (r = .45, $p < .001$), it is possible that the significant synergistic relation yielded by the previous analysis may be due to the shared variance between the two variables, and thus spurious. Therefore, in order to assess this possibility, two quadratic terms were formed by squaring Irritability and Self-Criticism and included in Block 4 (all terms in the block were entered simultaneously). This procedure is recommended by Lubinski

and Humphreys (1990). Results of Model B are presented in Table 13. Overall, Model B explained 62% of variance in depressive symptoms, $F(8, 92) = 18.81$, $p < .0001$. Block 4 contributed a significant 7% to variance in depressive symptom scores. As can be seen, the interaction of interest remained statistically significant with the competing quadratic terms in the model. Therefore, it does not seem that the measure of irritability is redundant with Self-Criticism and just measuring augmented levels of personality vulnerability as each interaction explained unique variance in the criterion variable. Furthermore, although the quadratic effect of Self-Criticism was just short of reaching significance ($\beta = .14$, $p = .06$, $f^2 = .05$), the interaction of Irritability by Self-Criticism was a stronger predictor ($\beta = .20$, $p = .016$, $f^2 = .08$). The quadratic effect of Irritability was not a significant predictor.

Lastly, Model C, which represents the most conservative analysis, was conducted to test whether the results would hold while controlling for the interactions between the covariates and the variables of investigation. This strategy is recommended as a final step in testing for moderator effects (Frazier, Tix, & Barron, 2004). The importance of controlling for covariate interactions has been highlighted by Hull, Tedlie, and Lehn (1992) and further emphasized by Yzerbyt, Muller, and Judd (2004). When the focus of the analysis is the interaction between a predictor and a moderator variable,

adjusting for the main effect of the covariate is insufficient. This is because the relation between the predictor and criterion may vary as a function of the covariate, and unless the competing covariate interactions are statistically controlled, the model will yield a biased estimate of the moderation effect. Therefore, to ensure that the moderating effect of Self-criticism on Irritability in predicting depressive symptoms was not due to the effect of stress, somatic symptoms, or negative attitudes interacting with the personality dimension or with Irritability, the covariate interactions were also partialled out. Accordingly, for the final analysis, Block 4 included six covariate interactions (representing the cross-product terms formed between each predictor with each of the three covariates). Block 5 was entered next, which included the three terms as in Model B.

Overall, Model C explained 63% of variance in depressive symptom scores, $F(14, 86) = 10.54$, $p < .0001$. The results of the final analysis (see Table 14) show that Block 4 did not explain additional variance in the criterion variable. More importantly, this more stringent test of the hypothesis shows that even when controlling for the effects of covariate main effects and interaction effects, Block 5's contribution to explained variance remained statistically ($\Delta R^2 = .06$, $p = .005$), and substantively significant, producing a moderate effect size ($f^2 = .16$). In this model, the interaction term for Self-Criticism by Irritability explained 3% of unique variance ($\beta =$

.28, $p = .009$, $f^2 = .08$). The quadratic effect of Self-criticism was no longer significant ($\beta = .10$, $p = .27$).

Table 12

Summary of Hierarchical Multiple Regression Analyses Predicting Symptoms of Depression: Moderational Effects of Self-Criticism and Dependency: Models A-1 and A-2

Predictors in Set							95% *CI*			*Change Statistics*		
	R^2	β	*SE*	sr^2	*t*	*p*	*LL*	*UL*	f^2	ΔR^2	ΔF	$p\ \Delta F$
Block 1: Covariates: Menopause-related [a]	.38								.95	.38	29.95	< .0001
Somatic Symptoms [a]		.28	.08	.08	3.44	< .001	.12	.44	.20			
ATMA [a]		- .50	.08	.24	-6.18	< .0001	- .66	- .34	.60			
Block 2: Covariates: Non-Menopause [a]	.39								.03	.01	1.82	.18
Stress [a]		.11	.08	.01	1.35	.18	- .05	.27	.03			
MODEL A - 1												
Block 3: Main Effects	.55								.40	.16	17.43	< .0001
Irritability		.23	.09	.04	2.71	.008	.06	.40	.10			
Self-criticism		.34	.08	.09	4.41	< .0001	.19	.49	.23			
Block 4: Moderational Effects	.60								.13	.05	10.58	.002
Irritability x Self-criticism		.22	.06	.05	3.25	.002	.08	.33	.13			
MODEL A - 2												
Block 3: Main Effects	.46								.13	.07	6.53	.002
Irritability		.32	.09	.07	3.48	.0001	.14	.50	.13			
Dependency		.04	.08	.002	0.51	.61	- .12	.20	.00			
Block 4: Moderational Effects	.47								.02	.01	1.44	.23
Irritability x Dependency		- .09	.09	.008	- 1.20	.23	- .28	.07	.02			

Note. CI = confidence interval; LL = lower limit; UL = upper limit; f^2 = effect size = $\Delta R^2/(1 - R^2)$ or $sr^2/(1 - R^2)$; ATMA =Attitudes towards menopause and aging.

[a] Based on Model A - 1

Model A-1 : $F(6, 94) = 23.44$, $p < .0001$.

Model A-2 : $F(6, 94) = 14.03$, $p < .0001$.

Table 13

Summary of Hierarchical Multiple Regression Analyses Predicting Symptoms of Depression: Moderational Effects of Self-Criticism and Dependency: Model B

Predictors in Set							95% *CI*			*Change Statistics*		
	R^2	β	*SE*	sr^2	*t*	*p*	*LL*	*UL*	f^2	ΔR^2	ΔF	$p\ \Delta F$
Block 1: Covariates: Menopause-related	.38								1.00	.38	29.95	< .0001
Somatic Symptoms		.28	.08	.08	3.44	< .001	.12	.44	.21			
ATMA		- .50	.08	.24	-6.18	.0001	- .66	- .34	.63			
Block 2: Covariates: Non-Menopause	.39								.03	.01	1.82	.18
Stress		.11	.08	.01	1.35	.18	- .05	.27	.03			
Block 3: Main Effects	.55								.42	.16	17.43	< .0001
Irritability		.23	.09	.04	2.71	.008	.06	.40	.11			
Self-criticism		.34	.08	.09	4.41	< .0001	.19	.49	.24			
Block 4: Moderational Effects	.62								.18	.07	5.36	.002
Irritability x Self-criticism		.20	.08	.03	2.45	.016	.04	.34	.08			
Self-Criticism x Self-criticism		.14	.05	.02	1.90	.06	.00	.19	.05			
Irritability x Irritability		- .09	.06	.00	- 1.03	.31	- .18	.05	.00			

Note. CI = confidence interval; LL = lower limit; UL = upper limit; f^2 = effect size = $\Delta R^2 / (1 - R^2)$ or $sr^2 / (1 - R^2)$; ATMA =Attitudes towards menopause and aging.
Model B : F (8, 92) = 18.81, p < .0001.

Table 14

Summary of Hierarchical Multiple Regression Analyses Predicting Symptoms of Depression: Moderational Effects of Self-Criticism and Dependency: Model C

Predictors in Set							95% *CI*			*Change Statistics*		
	R^2	β	*SE*	sr^2	*t*	*p*	*LL*	*UL*	f^2	ΔR^2	ΔF	$p\ \Delta F$
Block 1: Covariates: Menopause-related	.38								1.03	.38	29.95	< .0001
Somatic Symptoms		.28	.08	.08	3.44	< .001	.12	.44	.22			
ATMA		- .50	.08	.24	-6.18	.0001	- .66	- .34	.65			
Block 2: Covariates: Non-Menopause	.39								.03	.01	1.82	.18
Stress		.11	.08	.01	1.35	.18	- .05	.27	.03			
Block 3: Main Effects	.55								.43	.16	17.43	< .0001
Irritability		.23	.09	.04	2.71	.008	.06	.40	.11			
Self-criticism		.34	.08	.09	4.41	< .0001	.19	.49	.24			
Block 4: Covariate Interactions	.57								.05	.02	0.61	.72
Irritability x Somatic Symptoms		-.06	.09	.00	- 0.59	.56	- .22	.12	.00			
Irritability x ATMA		.01	.08	.00	0.12	.91	- .15	.17	.00			
Irritability x Stress		.01	.09	.00	0.07	.95	-.17	.18	.00			
Self-criticism x Somatic Symptoms		.02	.08	.00	0.26	.80	-.14	.18	.00			
Self-criticism x ATMA		-.12	.08	.01	- 1.45	.15	-.28	.04	.03			
Self-criticism x Stress		.09	.09	.01	1.12	.27	-.07	.25	.03			
Block 5: Moderational Effects	.63								.16	.06	4.64	.005
Irritability x Self-criticism		.28	.10	.03	2.66	.009	.07	.45	.08			
Self-Criticism x Self-criticism		.10	.06	.005	1.11	.27	-.07	.20	.01			
Irritability x Irritability		-.08	.08	.002	- 0.71	.48	- .23	.11	.01			

Note. CI − confidence interval; LL − lower limit; UL − upper limit; f^2 − effect size − $\Delta R^2/(1 - R^2)$ or $sr^2/(1 - R^2)$; ATMA −Attitudes towards menopause and aging. Model C : F (14, 86) = 10.54, p < .0001.

Given that the moderating effect of personality on the relation between Irritability and symptoms of depression held even under the more stringent tests, the interaction was probed following the two procedures recommended by Aiken and West (1991) and Jaccard and associates (Jaccard, Wan, & Turrisi, 1990) as follows: First, simple slopes for the regression of the criterion on the predictor were calculated by forming simple regression equations at three levels of the moderator variable, typically at 1 standard deviation below the mean of the moderator (SC_{Low}), at the mean (SC_{Mean}), and at 1 standard deviation above the mean (SC_{High}). To facilitate interpretation, the regression lines are then plotted graphically. The second recommended procedure is to conduct post hoc statistical tests to examine the statistical significance of the simple slopes, and to assess for differences in slopes between pairs of lines. The simple regression lines at low and high levels of Self-Criticism are shown in Figure 5.

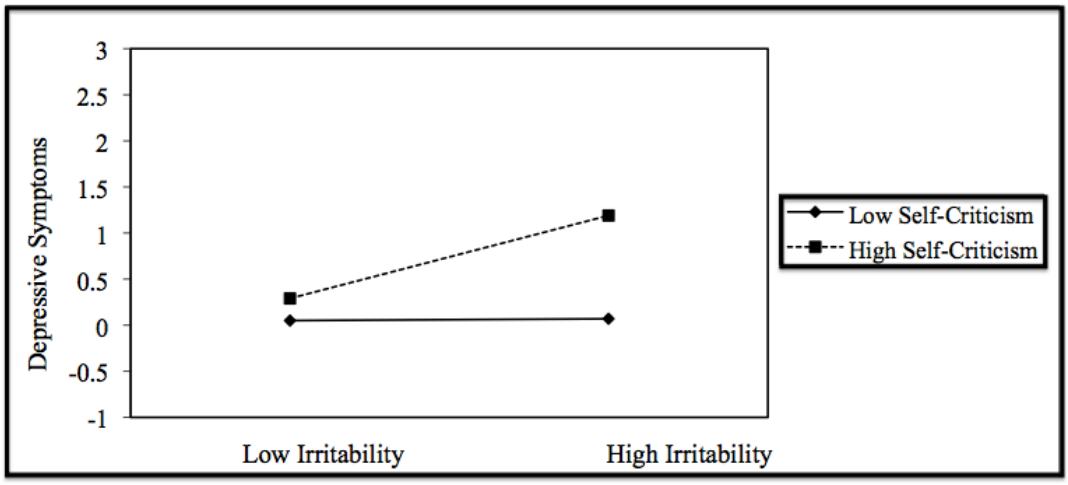

Figure 5. Two-way interaction between irritability and self-criticism predicting depressive symptoms. The plotted lines are slopes at high (one standard deviation above the mean) and low (one standard deviation below the mean) values of self-criticism.

As can be seen, the lines are not parallel, indicating that their slopes differ. At low levels of the moderator (SC_{Low}), the slope is flat ($\beta = -.02$, $t(99) = -0.15$, $p = .88$), but becomes steeper as level of Self-Criticism increases. It shows that at low levels of Self-Criticism, depressive symptom scores are not affected by increases in irritable mood; however, as level of Self-Criticism increases, increased irritability produces substantially more marked increases in depressive symptoms. In fact, the simple slope analyses show that the effect of irritability on the criterion is significant at moderate levels of Self-Criticism ($\beta = .20$, $t(99) = 2.58$, $p < .01$), and has an even

stronger enhancing effect at high levels of the moderator ($\beta = .42$, $t(99) = 4.20$, $p < .0001$). There was an almost significant difference between the slopes for moderate and high levels of Self-Criticism ($t(99) = 1.75$, $p = .08$); however, comparing the effect at low and moderate levels of the moderator indicates that there was no difference in the effect at low-moderate levels ($t(99) = 1.62$, $p = .11$). To test the region of significance, an extension of the Johnson-Neyman procedure was applied using a program developed by Preacher and associates (Preacher, Curran, & Bauer, 2006). Results of this procedure indicate that although the slope for SC_{Mean} was significant, slightly lower levels of Self-Criticism (values of .20 *SD*s below the mean) do not produce the significant synergistic effect produced at higher levels of Self-Criticism. At this boundary, the simple slope $\beta = .16$, $t(99) = 1.98$, $p = .05$.

For the Dependency dimension, although the effect of moderation did not reach statistical significance, the form of the relation of Irritability on depressive symptoms was as predicted. That is, as Dependency decreases, the association between irritability and depressive symptoms becomes stronger.

In sum, results of these analyses provide full support for the moderating effect of Self-Criticism, but failed to support a moderating effect of Dependency, though the pattern of results for this dimension was in the expected direction. Specifically, as predicted, results showed that the relation

between irritability and symptoms of depression was especially marked in women who scored high in Self-Criticism. Consequently, given that irritability appears to increase during this period, the menopausal transition may represent an especially vulnerable period for women high in this personality dimension, perhaps triggering an increase in depressive symptoms.

H3. Two models of mediated-moderation.

Given that, as reviewed in Chapter 2, irritability may be a prodrome to depression, often preceding the onset of a full depressive syndrome by weeks (Fava & Tossani, 2007), another goal of the study was to examine the role of self-regulation (H3.A) and of secondary emotional reactions (H3.B) as plausible mediators of the moderated effect of irritability by self-criticism on symptoms of depression. Both hypotheses postulated a main effect of mediation of the moderated effect of irritability on depressive symptoms as a function of Self-Criticism. That is, path *a*, but not path *b* was expected to be moderated. Hence, the hypothesized mediated moderation model, illustrated in Figures 3-A and 3-B, was tested with Equations 5 and 6, but omitting β_{65} Me Mo. (It is noted that the full model estimating β_{65} Me Mo was tested and yielded non-significant results for Path b).

Results related to H3.A are summarized in Tables 15 to 18, and those for H3.B in Table 19.

Table 15

Summary of Regressions for Difficulties in Self-Regulation and Depressive Symptoms

Predictor	*Mediator Model:* Difficulties in Self-Regulation			
	β	*SE*	*t*	*p*
Irritability (β_{51})	.34	.10	3.58	< .001
Self-criticism (β_{52})	.29	.08	3.54	< .001
Irritability x Self-criticism (β_{53})	.21	.07	2.75	.007

Predictor	*Dependent Model:* Depressive Symptoms			
	β	*SE*	*t*	*p*
Irritability (β_{61})	.12	.08	1.36	.18
Self-criticism (β_{62})	.27	.07	3.69	< .001
Irritability x Self-criticism (β_{63})	.17	.06	2.54	.013
Difficulties in Self-regulation (β_{64})	.26	.09	3.08	.003

Table 16

Sobel Test of Basic and Mediated Moderation of Irritability on Depressive Symptoms through Difficulties in Self-Regulation

	β	*SE*	*Z*	*p*
Mediator Model				
Irritability (a_1) β_{51}	.34	.10	2.20	.028
Self-Criticism (a_2)				
Irritability x Self-criticism (a_3) β_{53})	.21	.07	2.10	.036
Dependent Model				
Difficulties in Self-Regulation (b_1) β_{64}	.26	.09		

Note. $Z = (a)(b) / [(a^2 SE_b^2) + (b_1^2 SE_a^2)]^{1/2}$. *p* is the significance of *Z* scores

Table 17

Summary of Indirect, Direct, and Total Effects of Irritability on Depressive Symptoms through Difficulties in Self-Regulation, at Three Levels of Self-Criticism

	Path a (β_{51} + β_{53} Mo)	Path b β_{64}	Indirect Effect (β_{51} + β_{53} Mo) β_{64}	Direct Effect (β_{61} + β_{53} Mo)	Total Effect (Indirect + Direct)
SC_{Low}	.13	.26	.034	- .05	- .02
SC_{Mean}	.34	.26	.088	.12	.21
SC_{High}	.55	.26	.143	.29	.43

Table 18

Sobel Test for Conditional Effects at Three Levels of the Moderator

	Indirect Effect (β_{51} + β_{53} Mo) β_{64}	*SE*	*Z*	*p*
SC_{Low}	.034	.035	0.97	.33
SC_{Mean}	.088	.038	2.32	.02
SC_{High}	.143	.058	2.46	.014

In the present analysis, the set of covariates were entered in the first step followed by the main effect block, which included the predictor (Irritability) and moderator (Self-Criticism), and a block containing the two-way interaction. For both hypotheses, the first condition for mediated moderation that predicted a significant moderation of the overall effect, was already established and reported in the moderation analyses. With respect to hypothesis H3.A, the overall regressions for both models were significant. For the mediator model $F(6, 94) = 13.63$, $p < .001$, $R^2 = .47$, and for the dependent model $F(7, 93) = 23.28$, $p < .0001$, $R^2 = .64$. Condition 2, tested with the mediator model, was satisfied: Irritability interacted with level of self-criticism to predict difficulties in self--regulation ($\beta_{53} = .21$, $sr^2 = .04$, $t(94) = 2.75$, $p = .007$). Also, the dependent model yielded a significant effect of self-regulation difficulties on depressive symptoms ($\beta_{64} = .26$, $sr^2 = .04$, $t(93) = 3.08$, $p = .003$), after controlling for the first-order effects of Self-Criticism and Irritability and their interaction, thereby satisfying Condition 3. Finally, Condition 4 was met. The moderated effect of Irritability by Self-Criticism on depressive symptoms was weaker after entering the mediator in the regression ($\beta_{63} = .17$, $t(93) = 2.54$, $p = .013$ vs. $\beta_{43} = .22$, $t(94) = 3.37$, $p < .001$), but still significant, signifying that difficulties in self-regulation only partially explains the mechanism through

which irritable mood produces elevated depressive symptoms in the context of self-criticism. The model is depicted in Figure 6.

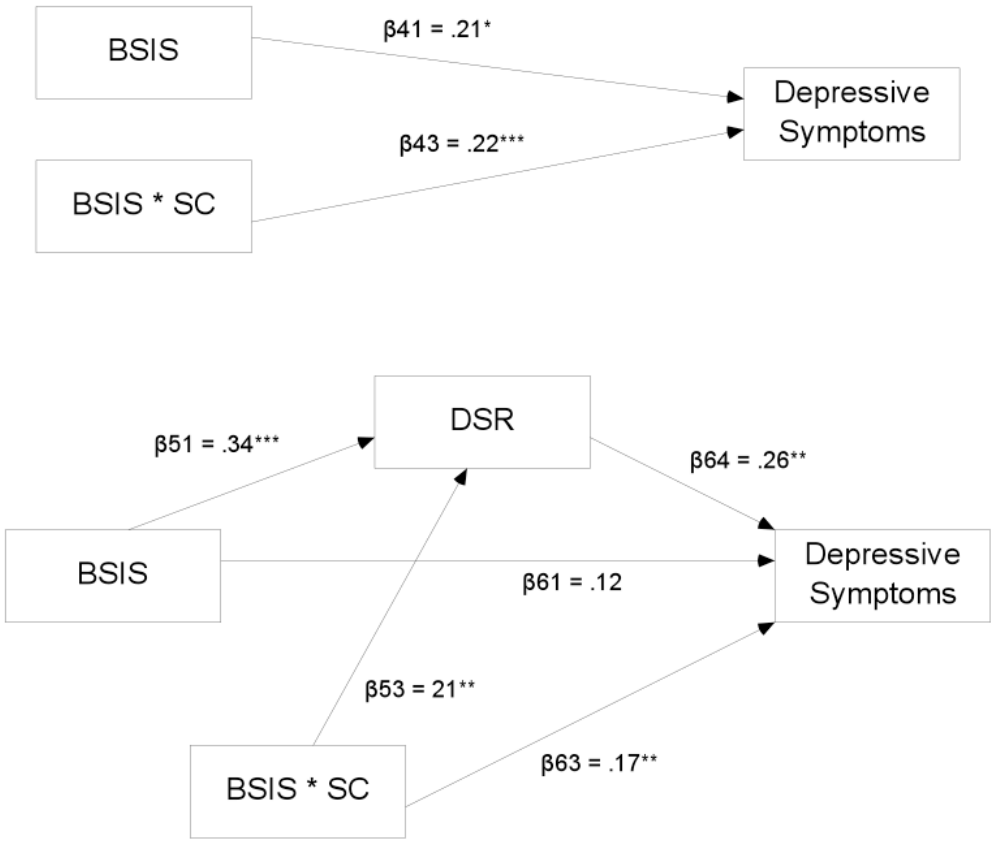

Figure 6. Mediated Moderation: Direct and indirect effects of irritability on depressive symptoms moderated by self-criticism via DSR.
BSIS = irritability; DSR = Difficulties in self-regulation; BSIS * SC = interaction of BSIS by self-criticism;
* p < .05. ** p < .01. *** p < .001.

The point estimates for the two components of the indirect effects were next computed and tested for significance; results are summarized in

Table 16. The point estimate for the main mediated effect was significant (β_{51} * β_{64} = .088 (*SE* = .04), *Z* = 2.20, *p* = .028), indicating that difficulties in self-regulation partially mediated the effect of irritability on depressive symptoms, at the average level of self-criticism. That is, irritable mood tended to affect ability to exert self-control with respect to behavior, affect, and cognition, which in turn predicts increased level of depressive symptoms. With respect to the mediated moderation component of the indirect effect, the main focus of hypothesis H3.A, the Sobel test indicated that the point estimate for this effect was also significant (β_{53} * β_{64} = .055 (*SE* = .026), *Z* = 2.10, *p* = .036), suggesting that the relationship between the irritability by self-criticism interaction on depressive symptoms was partially mediated by deficits in self-regulation.

Simple slopes for the effect of Irritability on Difficulties in Self-Regulation at 1 *SD* above and below the mean of Self-Criticism were computed from the coefficients presented in Table 15. Simple slopes are presented in Table 17 (Path a coefficients). At low levels of Self-Criticism, the effect of Irritability on DSR, was not significant (β_{51} = .13, *t* (94) = 1.16, *p* = .25), and neither was the total indirect effect (β_{51}* β_{64} = .034 (*SE* = .035), *Z* = 0.97, *p* = .33), summarized in Table 18. At moderate (at the mean) and high levels of Self-Criticism, Irritability significantly increased difficulties in self-regulatory capacities, but the simple slopes at moderate and high Self-

Criticism did not differ from each other, $t\,(94) = 1.40$, $p = .16$. At the mean of Self-Criticism, the slope, $\beta_{51} = .34$, $t\,(94) = 3.58$, $p < .0001$, and the total indirect effect (equal to the main mediated effect) was also significant, $\beta_{51} * \beta_{64} = .088$ ($SE = .038$), $Z = 2.32$, $p = .02$. At high levels of Self-Criticism, the slope becomes steeper, $\beta_{51} = .55$, $t\,(94) = 4.70$, $p < .0001$, and contributed to a stronger indirect effect, $\beta_{51} * \beta_{64} = .143$ ($SE = .058$), $Z = 2.46$, $p = .014$.

The estimates for the direct and indirect effects derived from this analysis sum up to a total effect of irritability on depressive symptoms at the three levels of Self-Criticism ($\beta = -.02, .21, .43$ for low, moderate and high levels, respectively), and are consistent with the simple slopes reported previously in the moderational analysis ($\beta = -.02, .20, .42$ for low, moderate and high levels of self-criticism, respectively). The region of significance analysis revealed that the association between irritability and difficulties in self-regulation became significant at .67 *SD*s below the mean of Self-Criticism, and the association becomes increasingly stronger thereafter. In other words, for women with low levels of self-criticism, irritable mood did not seem to affect their ability to self-regulate. The simple regression lines for Self-Criticism are shown in Figure 7.

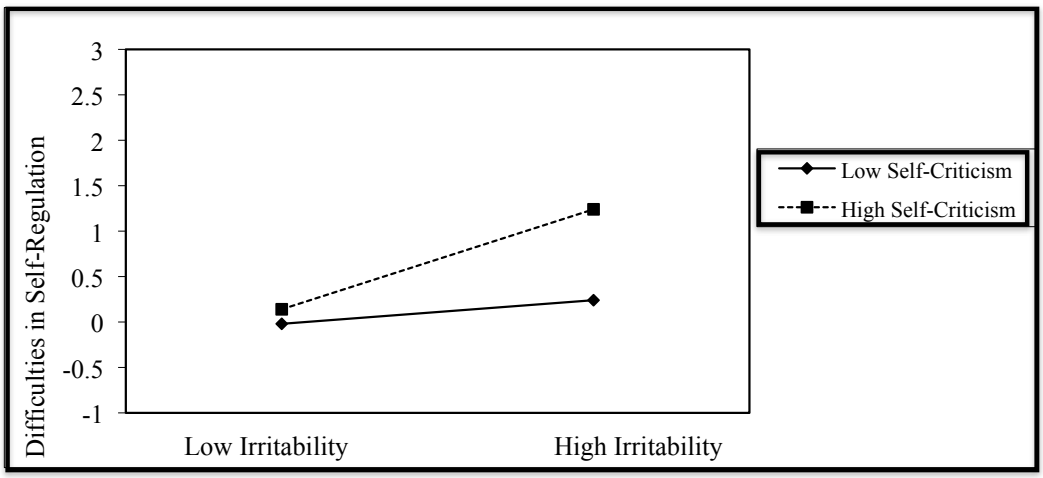

Figure 7. Two-way interaction between irritability and self-criticism predicting difficulties in self-regulation. The plotted lines are slopes at high (one standard deviation above the mean) and low (one standard deviation below the mean) values of self-criticism.

The hypothesis with respect to the meditational effect of Non-Acceptance was not supported. Results are presented in Table 19. Only the requisite condition for mediation, that there be a significant moderated effect of the predictor on the criterion variable, was supported. However, although irritable mood was associated with non-acceptance of negative emotional experience (Path *a*, $\beta_{51} = .35$, $t\,(97) = 3.32$, $p = .001$), this association was not significantly affected by level of Self-Criticism, $\beta_{53} = .13$, $t\,(97) = 1.49$, $p = .139$ (Condition 2). Furthermore, the dependent model yielded a non-

significant and weak result for the effect of non-acceptance of negative affect in predicting depressive symptoms (Path *b*, $\beta_{64} = -.02$, $t(97) = -0.24$, $p = .808$). Consequently, Condition 4, that there be a reduction of the moderated effect of the predictor on the criterion when the mediator is included in the model, was not satisfied ($\beta_{63} = .225$, $p = .001$ vs. $\beta_{43} = .222$, $p < .001$). Additional analyses were conducted to test whether the pathway through Non-Acceptance accounts for the noted effects of irritable mood in increasing symptoms of depression, omitting the effect of Self-criticism from the model (using Equations 2 and 3). Results for this basic mediation analysis showed that it does not. The point estimate for the basic mediated (indirect) effect (Path *a* * Path *b*) was not significant: $\beta_{21} * \beta_{32} = .06$ ($SE = .041$), $Z = 1.54$, $p = .12$.

Table 19

Summary of Regressions for Non-Acceptance of Negative Emotion and Depressive Symptoms

Predictor	*Mediator Model:* Non-Acceptance			
	β	*SE*	*t*	*p*
Irritability (β_{51})	.35	.11	3.32	.001
Self-criticism (β_{52})	.29	.09	3.12	.002
Irritability x Self-criticism (β_{53})	.13	.08	1.49	.139

Predictor	*Dependent Model:* Depressive Symptoms			
	β	*SE*	*t*	*p*
Irritability (β_{61})	.20	.09	2.38	.019
Self-criticism (β_{62})	.35	.07	4.68	< .001
Irritability x Self-criticism (β_{63})	.23	.06	3.35	.001
Non-Acceptance (β_{64})	- .02	.08	- 0.24	.808

In sum, results of the mediated moderation analyses indicate that, as hypothesized, one important pathway for the link between irritable mood and depressive symptoms is through compromised ability to self-regulate: irritability significantly disrupts one's ability to self-regulate resulting in under-regulation, or failure to exert self-control with respect to behavior, cognition and affect. The deterioration of self-regulatory capacity, in turn, appears to be implicated in increasing depressive symptoms. This effect becomes stronger as level of Self-criticism increases, and provides a partial explanation of strong link between irritable mood and depressive symptoms in the context of self-criticism.

Chapter 5 Discussion

The present study sought to examine factors that contribute to elevated symptoms of depression in women in order to better understand and identify women at risk for depression as they transition from the reproductive to the non-reproductive phases of life. Three sets of hypotheses were tested, the last one incorporating all factors into integrated models of mediated-moderation. The study found evidence to support the first set of hypotheses, and indicated that irritability and depressive symptoms, though related, are distinct. Furthermore, the two conditions were found to be differentially related to reproductive status. Irritability was significantly higher in transitioning women, compared to those who were pre- or postmenopausal. Depressive symptoms were significantly higher in transitioning and postmenopausal women. Because higher levels of both irritability and symptoms of depression were found in transitioning women, and because the research efforts have identified the transition to menopause as the phase in which mood changes are exacerbated, only women in the transition group were included in testing the second and third sets of hypotheses. The study found partial support for the second set of hypotheses, which tested the diathesis-stress component of the final integrated model. Specifically, results showed that the association between irritability and depressive symptoms

becomes more marked as level of self-criticism increases. The hypothesis for the dependency dimension was not supported. Dependency was not a significant predictor of depressive symptoms, and though the interaction between dependency and irritability was in the expected direction, it failed to reach statistical significance. Finally, given the reports of heightened negative mood states during the menopausal transition, and findings that individuals high in self-criticism have difficulties regulating emotion, a third set of hypotheses examined mood-related self-regulation constructs as mediators of the diathesis-stress model for self-criticism. Two such mediators were tested in two separate models. Because it was predicted that dependency would not affect the irritability-depression association, no hypothesis was formulated for this dimension. The first model, which tested for mediation through difficulties in self-regulation, was supported; however, low acceptance of negative affect did not explain why self-critical women who experience irritability develop increased levels of depressive symptoms. Each set of hypotheses depicting these relationships will be addressed in turn.

Irritability and Depressive Symptoms

In the study of menopause, there appears to be no research that has examined the role of specific negative mood states in precipitating more encompassing depressive symptoms. In line with previous research (e.g., Fava et al., 2010; Perlis et al., 2005), results of the current study confirmed the

hypothesis that irritable mood is related to depressive symptoms, but importantly, that it is distinct in ways that suggest that irritable mood may be an antecedent to the development of depression. First, results of this study showed that the two experiences are differentially related to diverse domains of well-being. (Note: the first set of hypotheses were tested using statistical models which did not include any covariates that were included in HMRA models used to test the second and third set of hypotheses.)

As predicted, severity of depression was associated with the affective, intellectual, and psychological components of well-being, whereas irritable mood was only associated with the negative dimension of affective experience. As these results suggest, increased irritability does not seem to consume one to such an extent that it interferes with the capacity to engage in existential challenges of one's life, as indicated by the measure of psychological well-being used in this study, with the ability to experience positive affect, or with the belief that one can derive satisfaction from life. According to these results, which were based on the combined sample that included women in all reproductive phases, irritable mood appears to be generally quite benign. However, it must be kept in mind that persistent irritable mood can disrupt daily functioning. For example, in a study on the effects of menopausal symptoms in the workplace, based on a sample of women working in various industries, including banking, government,

education, legal and health professions, irritability and mood changes were the only symptoms that significantly predicted poor job performance (High & Marcellino, 1994). Other symptoms reported by women, but which did not affect their job performance, included hot flashes, night sweats, weight gain, bloating, headaches, dizziness, nervousness, and depression (High & Marcellino, 1994). Thus, although findings of the current study suggest that irritable mood is not as disabling as depressive symptoms, it can potentially cause disruptions and eventuate in a depression.

The current study also found support for the hypothesis that irritability and depressive symptom severity can be distinguished based on their different pattern of association with respect to reproductive status. Results showed that women who were in the early stage of the transition had significantly higher levels of irritability than women in premenopause. In fact, women who were in the early and late stages of the transition reported the highest level of irritable mood. Postmenopausal women reported levels that were low and comparable to levels reported by women in premenopause. Depressive symptoms showed a similar onset, such that women in the early stage of the transition reported significantly higher levels of depressive symptoms than premenopausal women. However, unlike irritability, levels of depressive symptoms in the late transition and postmenopause were comparable to those of the early transition. However, again, it is important

to note that means for each of the group are considered to reflect minimal levels of depressive symptoms. As these analyses suggest, while both mood conditions are increased in women in the early transition as compared to levels reported by women in premenopause, irritability appears to wane in postmenopause, whereas depressive symptom levels do not.

The vast majority of research on mood conditions associated with the menopause has focused on depression, variously defined and operationalized. The heightened levels in each of the mood conditions reported by women in the current study who were in the early transition are consistent with findings from previous research suggesting that some women do experience emotional and mood changes in the years surrounding the menopause (e.g., Avis et al., 1994; Freeman et al., 2006; Freeman et al., 2004; Schmidt et al., 2004). The analyses of the current study highlight that irritable mood is a distinct experience, and that this mood condition also increases with the onset of the transition. This is in accordance with Born (2004) who reported that women in the transition very commonly report irritability. The increase in irritability found in the current study is also consistent with findings from the large SWAN study which showed that the risk of psychologic distress was strongly associated with menopausal status (Bromberger et al., 2001), with higher rates being reported by women in the early transition than by pre- or postmenopausal women. Specifically, the

increase in psychologic distress reported pertained to higher rates of persistent irritability, nervousness, and frequent mood changes (Bromberger et al., 2003). A more recent study conducted by Gallicchio et al. (2008) also found that perimenopausal women were 50% more likely than premenopausal women to have experienced irritable mood within a period of a month. One weakness of these last three studies is that assessment of irritability was carried out by very brief measures. In the SWAN study, psychologic distress was assessed using a 4-item measure, with one item inquiring about irritability. Similarly, Gallicchio et al. (2008) used a single item. In contrast, the current study assessed severity of depressive symptoms and irritable mood as separate constructs, using multi-item, psychometrically sound instruments. As such, this study provides more compelling evidence, albeit on a much smaller sample than the SWAN study, that the menopausal transition may be associated with increases in both irritability and depressive symptoms, and that irritability seems to be transient.

These differential patterns of association with reproductive status suggest that different etiological mechanisms may underlie these two conditions. The finding that increases and decreases in irritability coincide with reproductive status suggests that hormonal factors may be strongly implicated. Reproductive stages have been defined clinically by changes in menstrual bleeding patterns. These changes reflect the endocrinological

events of the aging reproductive system. Irritability could be another such manifestation. It may be that neuroendocrine activity has an indirect effect on the affective system and the physiological state affects one's state of arousal or threshold for reactivity, rendering some women more responsive to the external environment (Buchanan, Eccles, & Becker, 1992; Hyde, Mezulis, & Abramson, 2008). Although irritability has not been widely studied in relation to the menopause, it is reported as a prominent dimension of mood disorders related to reproductive events and cyclicity (Born & Steiner, 1999; Halbreich, 2009). For example, irritability is a predominant mood symptom of PMDD (APA, 2000). Indeed, women with PMDD report feeling irritable, but not depressed (Angst et al., 2001), and a cardinal feature of PMDD is the cyclical onset and remission of symptoms (APA, 2000).

Taken together, the implication of findings from the first set of hypotheses is that depressive symptoms predict a wider range of well-being outcomes, and thus is a more complex construct. Irritability was only predictive of negative affect, and may therefore be considered to be less debilitating. Additionally, irritability may be a more direct manifestation of hormonal dynamics. Admittedly, this interpretation requires direct testing as hormonal levels were not measured in this study. The relevance of the hormonal system in mood, and the theoretical models and empirical research

pertaining to depression and irritability were previously discussed in Chapter II of this document.

Personality vulnerability, irritability, and depressive symptoms: The diathesis-stress model.

Having found support for the first set of hypotheses, that irritability and depressive symptoms, though related, are distinct phenomena with possibly different underlying mechanisms, a main goal of this study was to examine a diathesis-stress model to test the role of the personality dimensions of dependency and self-criticism as moderators of the irritability-depression link in women transitioning to menopause. The diathesis-stress model for self-criticism was supported. However, the data did not support the hypothesis for the dependency dimension.

With respect to dependency, although the zero-order correlation between dependency and depressive symptoms was positive and significant, it did not contribute to the prediction of depressive symptoms in the regression model which included irritability and controlled for the effects of menopause-related somatic symptoms, life stress, and attitudes towards aging and menopause. Although the effect failed to reach significance, simple slope analyses revealed that the pattern and direction of the effect was as expected. That is, as predicted, irritability and depressive symptoms were positively associated, but the association was weaker (though not significantly

weaker) in women with high levels of dependency than in those who reported lower dependency. The pattern of results between irritability and depressive symptoms in the context of a dependent personality style in menopausal women is similar to results obtained by Vliegen and Luyten (2008) in a study that examined the role of dependency in the relationship between anger and postpartum depression (PPD). That study was based on the rationale that because anger is an associated feature of depression, postpartum depressed mothers would report higher levels of anger than non-depressed mothers. Vliegen and Luyten found that this association held, but only in mothers with low levels of dependency. The authors interpreted these findings as indicating that dependency is associated with impression management, and that perhaps women with high dependency needs underreport negative feelings for fear that endorsing angry feelings may compromise one's relationships (Vliegen & Luyten, 2008). A similar interpretation may be advanced to explain the current findings. One may speculate that perhaps women who are highly dependent may become increasingly reluctant to endorse symptoms of depression, or perhaps they minimize or deny that such symptoms reflect their experience, especially when they are feeling more emotionally reactive or irritable for fear of alienating important people in their lives.

As expected, results of this study showed that self-criticism was associated with significantly higher levels of depressive symptoms. This is consistent with theory and previous research (Luyten et al., 2007; Mongrain & Zuroff, 1994; Nietzel & Harris, 1990). Importantly, the interaction of self-criticism with irritability predicted significantly higher levels of depressive symptoms indicating that although symptoms of depression increase with elevations in irritability, the magnitude of this effect depends on level of self-criticism. The unique contribution of the interaction term remained significant even in the most conservative test of the hypothesis, using a model that included factors which have previously been associated with depression, such as hot flashes, sleep disturbance, life stress, and negative attitudes towards aging and menopause, as well as the interaction of each of these variables with each of the predictors, and the quadratic effect of irritability. As the simple slope analysis indicated, it is among women with high levels of self-criticism that irritable mood seems to be particularly detrimental, leading to a more marked increase symptoms of depression. In women with lower levels of self-criticism, irritability and depressive symptoms were not associated. For these women, symptoms of depression remained stable, even when irritable mood increased. As such, these findings suggest the presence of a vulnerable group of women who may be at greater risk of increases in

depressive symptoms during the menopausal transition when, as the previous analyses revealed, irritable mood becomes more pronounced.

Taken together, findings from the first two sets of hypotheses are consistent with the dual-vulnerability model (DVM) of SAD proposed by Young and associates (Young et al., 1991). This model was developed to explain their findings that only the vegetative symptoms SAD are related to seasonality, not the mood and cognitive symptoms of the disorder. The DVM is a diathesis-stress model that posits that individuals at risk for developing the full syndrome of SAD possess two distinct vulnerabilities. The first is a biological vulnerability which increases the individual's sensitivity to reduced sunlight, and is posited to account for the vegetative symptoms that are characteristic of seasonality. These are symptoms, such as hypersomnia, fatigue, and increased appetite that emerge with the shortening of the photoperiod. Vegetative symptoms then act as the stressor, which interact with the psychological vulnerabilities (e.g., depressogenic schemas, cognitive processes such as rumination), and increase the risk that the mood and cognitive symptoms required for the full syndrome of SAD will develop. In other words, the mood and cognitive symptoms are developed secondary to the vegetative symptoms. According to this model, some individuals may develop the primary vegetative symptoms, but not the more widespread

mood and cognitive symptoms required for a full-blown episode of SAD (Young et al., 1991).

Applying the DVM to findings of the present study, it can be argued that there are some women who possess a biological vulnerability which renders them more sensitive to the physiological effects of the hormonal changes taking place during the transitional phase. This biological vulnerability manifests in several ways. There is evidence from several lines of research, as indicated in my literature review, and as suggested by the results of this study that irritability is a mood manifestation of a biological vulnerability. Irritability then functions as a stressor. Indeed, a stressor need not exist in the external environment. As Alexander et al. (2007) indicated "being symptomatic in the transition is in and of itself a unique stressor of the midlife woman" (p. S100), and there is evidence that menopausal symptoms predict a decline in physical and social functioning (Kumari, Stafford, & Marmot, 2005). Irritable mood, then, may itself be construed as a stressor. Furthermore, irritability is a mood state that can impinge on the woman's ability to function effectively, and adversely affect how she responds to life stressors in the external environment (Born et al., 2002; Fava, 1987; Hylan et al., 1999). In women who possess maladaptive characteristics associated with self-criticism, irritable mood may become even more disrupting and more noxious as the self-critical woman's concern to maintain self-control is

challenged, and especially if the mood state is prolonged. In sum, the dynamic and transactional nature between these different sources of stress (e.g., internal mood states, external life events and hassles), and between the stressors and the personality diathesis, likely amplify and prolong the underlying mood, making it more difficult to recover from the initial affective state.

Such a dual-vulnerability, diathesis-stress conceptualization may explain certain findings in the literature on reproductive-related mood disorders. It is helpful to consider each vulnerability at the extreme high (H) or low (L) end of the continuum, yielding four groups. The first comprises women with low levels in each of the vulnerability factors. According to this model, these women are the least susceptible to developing depression. The second group consists of women with high levels of the biological vulnerability only (H/L). These women would be considered to be at risk of developing symptoms of irritability, but not necessarily depression. Indeed, there is evidence that irritability is the predominant mood complaint reported by women transitioning to menopause, not the more encompassing mood, cognitive and behavioral symptoms of the syndrome of depression (Born, 2004; Bromberger et al., 2003). It is also now widely recognized that women who suffer from any type of reproductive-related syndrome have a greater risk of mood disturbance during other reproductive related events,

such as premenstrually, and postpartum (Bloch, Rotenberg, Koren, & Klein, 2005; Halbreich, 2009; Soares & Zitek, 2008). Irritability is a very common mood symptom of these reproductive-related mood disorders. Indeed, Born and Steiner (1999) state that irritability is a "forgotten dimension of female-specific mood disorders" (p153). The third combination of the two vulnerabilities defines a group comprised of women with high levels of psychological vulnerabilities (L/H), such as self-criticism, and low levels of the biological vulnerability. These women would be considered to be susceptible to developing depression throughout their lifetime because personality diatheses represent stable and trait-like characteristics of the individual. The fourth group of women consists of those who possess both diatheses (H/H). It is for this group of women that all reproductive events represent a time of great vulnerability.

The two distinct vulnerabilities are not specific to the development of more severe depressive symptoms associated with the menopausal transition. However, certain distinctions are noted which may render the menopausal transition a more difficult phase. With respect to the psychological vulnerability, it is noted that the menopausal transition occurs during the midlife, and many of the psychological concerns of midlife are central to issues of the self-critical personality, hence these concerns may become more salient for self-critical women and trigger or compound their insecurities.

For example, research by Carol Ryff has shown that having a strong sense of autonomy, of accomplishment, and of environmental mastery are important concerns in midlife (Ryff, 1989, 1991). In general, middle aged adults expect to be in control of, and be able to manage their life competently. Indeed, a sense of autonomy and environmental mastery were found to be key indicators of well-being in middle aged adults (Ryff, 1995). Women who are highly self-critical strive for mastery and derive their sense of worth from their accomplishments and goals they set for themselves in every domain of their lives (Blatt, 1995, 2004). However, because of their excessively high standards and insecurities of 'not being good enough', a sense of accomplishment and of mastery is likely more difficult for them to satisfy. These concerns and struggles are not particular to their functioning in midlife. But at midlife, when such concerns become more central, the self-critical woman's sense of self-worth may be even more compromised. Personality vulnerability factors, such as self-criticism, may explain findings in the menopause literature that for many women the first episode of depression is experienced during the transition (Cohen et al., 2006; Freeman et al., 2006; Reed et al., 2009; Schmidt et al., 2004).

The biological vulnerability is also not specific to the development of depression associated with the menopausal transition. It can be used to explain the risk for depression associated with other reproductive-related

events, such as PMDD. The commonality among these syndromes is that symptoms are transitory, and the timing of onset and remission coincides with changes in the hormonal dynamics (Halbreich, 2009). However, there are important differences in certain characteristics of the hormonal changes associated with these different events. For example, the hormonal fluctuations that underlie the menstrual cycle, a cycle that lasts on average 28 days, are predictable (Cowdry, Gardner, O'Leary, Leibenluft, & Rubinow, 1991). Premenopausal women who are biologically vulnerable are able to predict when symptoms will appear and remit. Notwithstanding the distress and impairment experienced by women who suffer from PMDD, the ability to predict when mood changes will occur enables women to have more control, or at least the perception of control, and to anticipate the need to mobilize their internal psychological resources to cope with such mood states. They can also plan activities and social interactions with such awareness in mind. In comparison, the hormonal milieu that defines the menopausal transition is highly variable and fluctuations are very erratic. Hence, because of the volatile nature of fluxes in hormones during this time, the experience of irritability may not be as predictable during the menopausal transition. Because of its imprecise temporal appearance and unpredictable duration, irritability may be a more difficult stressor to cope with and possibly trigger more dysfunction during this phase. This idea is speculative, and I am not

aware of any research that has examined daily variability in irritable mood in transitioning women. Furthermore, much remains to be known about the precise temporal effect of hormones on shifts in mood.

In sum, the results of the first two sets of hypotheses provide evidence that the menopausal transition is associated with increased levels of irritable mood, and that for women who are high in self-criticism, irritable mood is a strong predictor of depressive symptoms.

Difficulties in self-regulation and non-acceptance of emotional experience as mediators of the moderated association between irritability and depressive symptoms.

Regardless of the differences in strength, type, or quality of the stressors encountered during the transition, considering that some women may be more susceptible to mood changes such as irritability during this reproductive phase, the question then becomes why is the effect of irritable mood more detrimental in women with high levels of self-criticism. Two models of mediated-moderation were hypothesized to explain the more marked association between irritability and depressive symptom severity among self-critical women. In both models, the mechanism of mediation between irritability and depressive symptoms was expected to be constant, and not vary as a function of the woman's personality style; however, the effect of irritability on the mediator was hypothesized to be stronger in women who were highly self-critical. The first model, which tested

difficulties in self-regulation (DSR) as the mediator, was supported. DSR was assessed with three subscales of the Difficulties in Emotion Regulation (Gratz & Roemer, 2004). These subscales measure the extent to which one has difficulties in maintaining goal directed behavior and inhibiting impulsive behavior, and a compromised ability to access effective strategies for coping with mood when she is in a negative mood state. The second model, which tested non-acceptance of negative emotion as the mediator, was not supported.

Results for the first model showed that, as predicted, depressive symptoms resulted from a compromised ability to self-regulate, and that the ability to self-regulate became increasingly taxed as menopausal women's level of irritability increased. As these results suggest, symptoms of depression may develop during the transition to menopause because irritability, which becomes elevated for many women during this time, may impair their ability to regulate in various domains of the self-system. Concerning the main effect of the mediator, this finding is consistent with previous studies (Ehring et al., 2008; Vujanovic et al., 2008) that show that problems in self-regulation underlie the development of depressive symptoms (see Sloan & Kring, 2010, for a review). This finding also extends research that links negative mood to depressive symptoms (Kopala-Sibley & Zuroff, 2010; Fava et al., 1990; Fava & Tossani, 2007) by providing evidence

that self-regulation is implicated as one process that accounts for this relationship.

Importantly, analyses revealed that irritability generated considerably more dysfunction in self-regulation if women had high levels of self-criticism. Furthermore, as predicted, a compromised ability to self-regulate partially explained the stronger association between irritability and depressive symptoms in this group of women. In contrast, women with low levels of self-criticism were able to maintain self-control regardless of how irritable they felt. The finding that negative mood does not appear to affect individuals with low levels of self-criticism is consistent with the suggestion by Miranda and associates (Miranda, Gross, Persons, & Hahn, 1998) that what differentiates individuals with a lifetime history of depression (classified as 'vulnerables') versus those with no history ('nonvulnerables') is not only the vulnerables more depressogenic cognitive schema, which becomes activated by mood (Miranda & Persons, 1988; Miranda et al., 1990), but also their response to negative mood. For example, following a negative mood induction, the vulnerable group showed an increase in dysfunctional thinking, whereas the nonvulnerable group had a decrease in such cognitions (Miranda et al., 1998). These researchers therefore proposed that, in contrast to vulnerable individuals, nonvulnerables are perhaps able to respond to

negative mood in ways that are more adaptive and that allow them to atone or counter the effects of a negative mood (Miranda et al., 1998).

The question then becomes, what sorts of difficulties interfere with adaptive responding? Previous studies have linked the increase in depressive symptoms associated with self-criticism to these individuals' dysfunctional attitudes, ineffective coping skills, lack of social support, and difficult interpersonal interactions. The current findings contribute to the growing literature on self-criticism as they indicate that in addition to these various mechanisms that have been proposed and tested, self-critical women also become exceedingly disorganized and dysregulated when they are in a negative mood state. Although self-regulation as assessed in the current study pertained to impaired concentration and disrupted performance of short-term tasks, these lower-level activities lead to the attainment of higher-level goals. Self-critical women set high standards for themselves in all domains of activity, and have an incessant need not only for control and to maintain a positive sense of self, but also to gain the approval and respect of others. Therefore, the difficulties in self-regulation encountered in the more immediate term may be especially detrimental to them, if their larger, longer-term achievements are jeopardized due to their inability to successfully engage in the tasks that lead to such accomplishments. Furthermore, the menopause transition coincides with the midlife, and for many, this is a time

of increased responsibilities, especially if she is caring for aging parents, parenting adolescents or young adult children into healthy adulthood, maintaining a household, and perhaps establishing or re-establishing herself in the workforce. For the woman with a highly self-critical stance, all these tasks require that they be accomplished to the best of standards. Their incessant struggles to maintain a positive sense of self and to ward off disapproval, all the while coping with internal emotional arousal (e.g., irritability) burden the self-regulatory resources and deplete the self-system. Indeed, the limited-resource model of self-regulation can be applied to understand why irritability makes it increasingly difficult to self-regulate especially for women who have high levels of self-criticism as they transition to menopause. According to this model, negative affect place demands on self-regulatory resources; it consumes the resource so that less is available to service other domains (Baumeister, Zell et al., 2007; Bruyneel, Dewitte, Franses, & Dekimpe, 2009; Leith & Baumeister, 1996). Importantly, the association between negative affect and self-regulation is bidirectional such that impaired self-regulation triggers negative affect and distress. In this regard, Strauman (2002) proposed that depression is a disorder of self-regulation. He proposed that negative affect can impair self-regulatory efforts, and that this loss of control promotes feelings of failure, which feeds back to the initial negative feeling state, perhaps compounding it, further

taxing self-regulatory strength. As negative affect and feelings of failure become more chronic, one can degenerate through a downward spiral into a more encompassing episode of depression.

The second model tested for mediation through the non-acceptance of negative affect. This model was not supported. Non-acceptance of emotional experience is reflected in the development of secondary negative emotions. These secondary emotions perpetuate and amplify the primary negative affective state and are posited to contribute to the development of depressive symptoms. Indeed, consistent with a recent study by Flynn, Hollenstein, and Mackey (2010), results of the current study showed that poor acceptance of negative emotions was associated with higher levels of symptoms of depression. Results also showed that as level of irritability increased, women seemed to be less accepting of their own negative moods. For example, as women's level of irritable symptoms increased, they reported higher ratings of feeling weak, embarrassed and angry at themselves for feeling that way. Self-criticism was also associated with having more difficulties in accepting such moods; however, there was no evidence of a synergistic effect for the combination of irritability and self-criticism, as predicted. The influence of self-criticism and irritability on the non-acceptance factor was additive, not multiplicative. Based on the evidence that irritability was related to non-acceptance and that non-acceptance was

associated with severity of depression, a model of basic mediation was tested. Surprisingly, the pathway through difficulty in accepting negative affect states did not emerge as an important link between irritability and depressive symptom severity.

Limitations

The overall objective of the study was to determine whether a certain group of women are more vulnerable to the effects of irritability, such that their self-regulatory capacity is compromised and, as a result are more likely to develop symptoms of depression. Although the data and analyses supported the majority of the hypotheses tested, there are several important limitations that need to be considered. First and foremost, the hypotheses and models of mediated-moderation tested imply causation; however, the current study used a cross-sectional design in which all variables were assessed concurrently. Consequently, the study only provides evidence as to the association between the variables, but not about the direction of causality. Hence, any statement or interpretation of causation is merely suggestive. Prospective, longitudinal studies are required to delineate the direction of causality.

Next, a number of limitations are associated with the aspect of the study pertaining to the association of irritability and symptoms of depression with reproductive status. Reproductive status was based solely on self-report,

and relied on women's recollection of when their last menstrual cycle occurred. Misclassification of women included in the pre- and postmenopause groups was less likely to have occurred, as these consisted of women who had either no change in their regular cyclicity over the prior 12 months (STRAW criteria for Premenopause) or did not have a menstrual cycle in the prior 12 months (Postmenopause). However, misclassification could have occurred between the early and late stages of the menopause if, for example, a participant mistakenly remembered her last cycle as having been within the previous 3 months (Early Transition) when it was within the past four months (Late Transition). However, based on results which showed no difference between these two groups in level of irritability and of depressive symptoms, the two groups were combined. It is acknowledged that endocrine activity may differ between these two phases of the transition, however, the focus of this study was not to uncover the particular effects of hormonal dynamics. Indeed, no hormonal information was collected, hence, any assertion that the differential association of irritability and depressive symptoms with reproductive status is due to the effects of sex hormones is tentative.

Another limitation of the study is that it relied exclusively on self-report measures. The measures used were psychometrically strong, however, several drawbacks inherent to self-report exist. With respect to the specific

measures used, a strength of this study is that, compared to previous investigations of menopause-related irritability, it used a multi-item measure which is specific to women. However, the instrument used to measure non-acceptance of emotional experience included only five items, and may not have fully assessed this construct.

Finally, this study was administered over the internet. Two main issues that must be considered in this regard is that there may be significant self-selection bias, and furthermore, although use of internet technology is now quite ubiquitous in psychological research, the possibility remains that access to technology may be limited in certain segments of the population (e.g., low SES, older women). In this regard, women who participated in this study were predominantly Caucasian and middle class. As such, results of this study may not generalize to the entire population of mid-age women.

Implications and Future Directions

Findings of this study suggest that the increase in irritability is transitory and, as others have reported, it is a common experience of women as they transition to menopause. Although mean scores peaked in the transition phase, all group means were within the mild range, as defined by the developers of the instrument (see Born et al., 2008). However, it must be emphasized that because the instrument used to measure this construct is relatively new there is a need to establish norms for this population. The cut-

off scores suggested by the developers of the measure is not empirically-derived (Born et al., 2008).

Analyses also showed that irritability was highest, relative to premenopausal women, in women who were in the transition phase, a phase which is associated with a very widely fluctuating hormonal environment. However, it is important to note that these results do not, in any way whatsoever provide evidence for or against the use of hormonal replacement therapy for the alleviation of irritability. Though support for a positive effect of estrogen on mood is well documented, many women do not wish to use hormonal preparations, and for others HRT may be contraindicated for various reasons. In this vein, psychological approaches to curtailing the effects of irritable mood may be beneficial. One benefit of this study is that it identifies women who may be at particular risk for adverse effects and consequences of this mood symptom, and the mechanism through which their vulnerability operates.

Specifically, women who may benefit from psychological interventions are those who possess self-critical characteristics. The accumulated empirical findings of the last three decades show that the underlying difficulties associated with self-criticism are widespread and multifaceted. It can be speculated that a self-critical stance and the associated psychological demands consume inordinate amounts effort and resources, and thus these

women may be functioning at close to depletion levels, even in the absence of irritability or other negative mood states. In the presence of irritability, their psychological resources may become exhausted, and this could lead to a decreased ability to persist in goal-directed and interfere with productive activity. It is perhaps this rigid, unforgiving, relentless pursuit of high standards, applied to every facet of life that needs to be addressed. If so, psychological interventions, such as schema-focused therapy (Young, Klosko, & Weishaar, 2003), would be of benefit as the target of these interventions is to modify of the core fundamental attributes that underlie such maladaptive personality styles.

The findings that self-critical women have difficulty with self-regulation as a function of irritability suggest that these women may benefit from learning skills to cope with emotional shifts that may be especially marked during the period of the menopausal transition. For example, dialectical behavior therapy, which was originally developed by Marsha Linehan (1993a, 1993b) as a treatment for borderline personality disorder, has been adapted for use with a wider audience seeking, and specifically for individuals who are in need of learning skills, such as distress tolerance, and radical acceptance, to better cope with overwhelming emotions (McKay, Matthew, Wood, & Brantley, 2010). In this regard, although this study found no evidence that low acceptance mediated the irritability-depression link in

the context of self-criticism; it was associated with both irritability and with self-criticism. At the very least, acknowledging and validating that such mood changes are experienced by many women as they transition to menopause, and that there may be some physiological basis for feeling irritable, may in some way, enhance the woman's ability to tolerate the state of negative arousal. The notion of acceptance is consistent with third generation cognitive-behavioral interventions (Emmelkamp, Ehring, & Powers, 2010), such as acceptance and commitment therapy, and mindfulness-based approaches to treatment, which emphasize "controlling behavior while accepting negative affect" (Emmelkamp et al., 2010, p. 5). The concept is that negative affect itself is a normal experience.

Results of the current study point to three different avenues for future research. To begin with, future investigations could address some of the limitations of the study, for example, by supplementing self-report with observer ratings of irritability. Also, the use of a prospective longitudinal design is more consistent with the mediational hypotheses that were tested and would provide a clearer understanding of the nature of the relationships between the variables that were assessed.

The second focuses on the mood manifestations of hormonal changes that accompany the final stages of reproductive aging. There is a lack of research that examines the effects of neuroendocrine activity on irritability.

The present study provides some evidence that the increase in irritability is confined to the menopausal transitional phase, and implies that hormonal factors may be at play. The evidence is admittedly indirect and would require more a sophisticated methodology to make such an assertion. However, to associate the effects of the neuroendocrine dynamics with variations in such mood states is very difficult, as hormonal fluctuations are very erratic and levels vary widely between individuals and within individuals, even on a daily basis. Such intricate measures of hormonal concentrations aside, the use of an experience sampling methodology may allow for further insights into the nature of emotional changes that women seem to be experiencing. It would provide important information as to their frequency, duration, and intensity. Behavioral and physiological assessments would also be beneficial in this respect.

A third avenue for future research is to further explore the relationship between irritability, self-criticism and depressive symptom severity within the context of the dual-vulnerability model. The DVM model has only been examined in the context of seasonal affective disorder, though it has been recommended that it may be fruitful to examine whether the combination of biological and psychological diatheses explains the development of symptoms of other mood disorders which have prominent biological underpinnings and contain symptom clusters that manifest

different temporal patterns of onset or offset (Young, Reardon, & Azam, 2008). In this regard, women who report high levels of irritable mood in relation to various reproductive-related could be examined.

Conclusion

This is the first study, to my knowledge, to examine whether self-criticism in women could potentially place them at increased risk of developing depression as they transition to menopause, and to test models of mediated-moderation to examine the factors and mechanisms that underlie the relationship. Findings from this study make several significant contributions to the current literature. First, they show that different processes may underlie irritable mood and depressive symptoms, as levels of both irritability and depressive symptoms seem to increase with the onset of the transition, but only irritability abates at postmenopause. Importantly, results suggest that the transition to menopause, which is associated with an increase in irritable mood, may be more challenging for women with high levels of self-criticism.

Although the transition to menopause may present with certain challenges, it is not suggested that it be conceptualized as a universal time of crisis, a physical disease, or a psychological disorder. For a multitude of women the transition to menopause is unremarkable; for others, it is represents a liberating experience with expanded opportunities for growth

and positive development. However, for some women, especially for those with certain long-standing personality characteristics such as self-criticism, the trajectory to menopause may be unsettling. Importantly, whether emotional changes are hormonally induced or not, it should not predicate a helpless attitude. Indeed, the findings from this study, that irritability impairs these women's ability to self-regulate and partially accounts for the increase in depressive symptoms, suggest that it is largely amenable to psychological intervention.

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APPENDIX A:

Informed Consent

*Womens Health

6. INFORMED CONSENT

Purpose: The purpose of this study is to increase our understanding of how an individual's personality style impacts her physical health and well-being. We are specifically interested in women's health issues. The study is being conducted by Dr. Zuroff's research lab in the Psychology Department at McGill University. The study has been reviewed and approved by the Research Ethics Board-II at McGill University.

Study Procedures: You will be asked to complete a one-time online survey. The survey will take approximately 25 minutes to complete. You will be asked some background information (age, education, etc.), questions concerning your health (reproductive and medical history), and questions related to personality and well-being.

Benefits and Risks to Participants: The study is being conducted for research purposes. The results could help us better understand the impact of one's personality on health and well-being in adulthood. There are no foreseeable risks associated with your participation in this study. The study employs only questionnaires; there are no medical tests of any sort. Participants will be asked to provide personal information on the questionnaires, and some individuals may feel slightly uncomfortable answering questions about themselves.

Confidentiality: This website is on a secure server. This means that no one besides the principal investigator and research staff will be able to access your information when you send it. Also, in order to ensure and maintain confidentiality, all information and data collected, including all completed questionnaires received by e-mail will be saved in files identified by a numerical code only. Your name will not appear on questionnaires saved in electronic files or hard copies. Only summary results and statistics aggregating responses from all participants will be reported. Results will be used for scientific purposes only (e.g., academic research publications and presentations).

Withdrawal from Study: You are under no obligation to participate in this study. Your participation is voluntary. You also have the right to withdraw from the study at any time without any consequences. You may decline to respond to any item(s) on the survey.

Compensation: Upon receipt of your fully completed questionnaire by the researcher, Canada Talk Now will provide you a gift card in the value of $2.50.

Contact Information: If you have any questions or concerns regarding this online study, you may contact either 1) Viviana Mauas, Ph.D. Candidate, in the Department of Psychology at McGill University at (514) 398- 7425, or by email at mcgill.womenshealth@gmail.com ; or 2) Dr. David Zuroff in the Department of Psychology at (514) 398- 6126 or by email at zuroff@psych.mcgill.ca

INFORMED CONSENT:

(1) I have carefully read and understood the above information on the study.

(2) I am a woman in one of the following age groups:
a. 35-40 years; or
b. 47-60 years; or

*Womens Health

*** 1. I agree to the terms outlined above and agree to participate in this online study (please click on one of the following to indicate your response):**

◯ AGREE

◯ DISAGREE: If you don't agree to participate, you may exit the survey by clicking "Exit this Survey" button which appears at the top right of your screen.

APPENDIX B:

Reproductive and Medical History

*Womens Health

8. REPRODUCTIVE AND MEDICAL HISTORY

*** 1. Please choose one of the following alternatives which best describes your menstrual cycle pattern:**

◯ a. Over the past 12 months, my menstrual cycles have been regular and there has been NO CHANGE in cycle length.

◯ b. I have menstruated in the last 3 months, but I have experienced a change in menstrual frequency (more or less frequent periods).

◯ c. I have not had a menstrual period in the last 3 months, but had at least 1 menstrual period in the last 12 months.

◯ d. I have not had a menstrual period in the last 12 months.

You may write any comments in the box:

2. Are your periods (or were your periods) usually regular?

◯ Yes

◯ No

3. If you have had a menstrual period in the last 12 months, please indicate the APPROXIMATE date of the the 1st day of bleeding of your last menstrual period.

	MM	DD	YYYY
Date of last menstrual period	___ /	___ /	____

*Womens Health

4. Please indicate the method of birth control, if any, that you are currently using:

- ◯ None
- ◯ Sterilization (tubes tied)
- ◯ Male partner vasectomy
- ◯ Birth-control pill, ring, or skin patch
- ◯ IUD- MIRENA
- ◯ IUD- Other
- ◯ Injectable hormone
- ◯ Implanted hormone
- ◯ Diaphragm
- ◯ Foam/gel
- ◯ Condoms
- ◯ Natural family planning/ Rhythm
- ◯ Other

5. Do you have or have you ever sought treatment for any of the following medical conditions or illnesses (please specify where appropriate)

	Yes	No
a. Diabetes	◯	◯
b. Thyroid disorder	◯	◯
c. Heart condition	◯	◯
d. High/low blood pressure	◯	◯
e. High cholesterol	◯	◯
f. Cancer	◯	◯
g. Other	◯	◯

If you answered Yes to any of the above, please specify (e.g., date of diagnosis, treatment)

*Womens Health

6. Do you have, or have you ever sought treatment for any of the following psychological conditions or illnesses (please specify where appropriate)

	Yes	No
a. Anxiety (including phobias)	◯	◯
b. Depression	◯	◯
c. Mood disturbance following birth delivery	◯	◯
d. Mood disturbance associated with menstruation	◯	◯
e. Hallucinations/ schizophrenia	◯	◯
f. Alcoholism	◯	◯
g. Drug use/abuse	◯	◯
h. Other	◯	◯

If you answered Yes to any of the above, please specify (e.g., date of diagnosis, treatment)

7. Please list the current major stressors or life changes in your life (e.g., related to work, home, health , financial domains, etc.)?

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

8. Do you currently smoke cigarettes?

◯ Yes

◯ No

If yes, # of cigarettes per day

*Womens Health

9. Do you drink alcohol?

◯ Yes

◯ No

If yes, how many drinks do you have each week?

10. Exercise

	Never	Rarely	Occassionally	At least 3x/week	Almost daily
How often do you exercise?	◯	◯	◯	◯	◯

11. What is your height

◯ The answer I have provided below is in metric units (e.g., meters)

◯ The answer I have provided below is in standard units (e.g., feet/inches)

My height is :

12. What is your weight:

◯ The answer I have provided below is in metric units (e.g., kilograms)

◯ The answer I have provided below is in standard units (e.g., pounds)

My weight is:

13. Are you taking hormone replacement therapy?

◯ Yes

◯ No

If yes, please specify the medication you are taking and the dosage