ECOLOGICAL MOMENTARY ASSESSMENT OF VARIABLES ASSOCIATED WITH POSTPARTUM DEPRESSION IN WOMEN IN HAWAIʻI

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAIʻI AT MĀNOA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

PSYCHOLOGY

MAY 2015

By
Michelle Marie Kawasaki

Dissertation Committee:

Stephen Haynes, Chairperson
Elaine Heiby
Kentaro Hayashi
Lisa Duke
Claudio Nigg

ACKNOWLEDGEMENTS

I would like to sincerely thank my chairperson and advisor, Dr. Stephen Haynes, for generously giving his time to provide me with thoughtful feedback and support throughout my work on this dissertation. I would also like to thank Dr. Kentaro Hayashi and Michelle Lopez for their help with my statistics and Dr. Jeff Delmerico for his invaluable assistance in trouble-shooting programming issues with the Palm Pilots. Drs. Elaine Heiby and Claudio Nigg made many important suggestions for edits within this manuscript and I greatly appreciate their assistance. I would especially like to thank my participants for giving their time to participant in this study and the Wai‘anae Coast Comprehensive Health Center staff for their cooperative efforts and the use of their facility. Dr. Lisa Duke was especially helpful in providing me guidance in the development stages of my study as well as with recruitment efforts.

Lastly, I would like to thank my family for their love and support throughout this process. I want to thank my parents for their encouragement, love and countless hours of babysitting! In addition, I could not have completed this without the support of my amazing husband who has been by my side since the beginning of this project. And I want to thank my children, Evan and Mason, who make everything worthwhile.

ABSTRACT

This study used a multivariate time-series design to examine the associations among daily stressors, social support, and mood symptoms in postpartum women. Six women who gave birth in the past year and were 1) Native Hawaiian and/or 2) living in a primarily Native Hawaiian community were enrolled in this study. Ecological momentary assessment (EMA) was used to measure these variables via handheld computer (i.e., Palm Pilot). On average, participants completed three weeks (M=23.8 days, SD=6.1 days) and about 60 daily assessments (M=59.2, SD=14.5) during this study. Momentary positive affect and negative affect were negatively correlated for all six participants and this relationship was significant for five participants. Weekly retrospective assessments were compared to average weekly EMA assessments using z-score transformed scores. Results of percent agreement found participant ratings using retrospective measures of positive affect and social support, and to a lesser degree negative affect and positive mood, tended to be higher than momentary measures. In concurrent time series models, stress was a significant predictor of positive affect for four out of five participants and of negative affect for three out of five participants. Similarly, in time-lagged analyses, stress was a significant predictor of positive affect for four out of five participants and of negative affect for two out of five participants. Social support was an inconsistent predictor of positive and negative affect. This is the first known study to examine the relationship between mood, stress and social support in postpartum women using EMA methodology in a sample of Native Hawaiian women/women living in a Native Hawaiian community. Several methodological limitations of this study were noted.

TABLE OF CONTENTS

Acknowledgements……..……ii

Abstract……...iii

List of Tables……..xi

List of Figures …….xiii

Chapter 1……..1

Introduction……..1

Overview of Introduction…….....1

Postpartum Depression……1

Consequences of Postpartum Depression……3

Risk Factors for Postpartum Depression……..6

History of Depression……..6

Social Support…….……6

Stress……...……7

Other Risk Factors……...8

Postpartum Depression Studies in Hawai‘i…….....…….……..8

Summary of Methodologies Used in Postpartum Depression Studies……..11

Ecological Momentary Assessment……...12

Characteristics of Studies Investigating Mood Symptoms using EMA…….13

Results of the EMA Studies...……...……13

Experimental versus Control Group Findings……...13

Retrospective versus Momentary Mood Ratings……...14

Mood and Daily Stressors……..23

Mood and Social Interactions……24

Methodology Used in the EMA Studies…..……..24

EMA Mood Measures……24

Electronic Devices…….24

Frequency of Assessments…….25

Ethnicity of Study Participants……..25

Rationale and Goals of the Present Study……..26

Chapter 2……28

Method……...28

Participants…….28

Procedure……...30

Palm Pilots: Programming and Testing…….30

Palm Pilot: EMA Study…….....31

Recruitment……31

WCCHC…….31

Non-WCCHC…….31

Eligibility Screening……..32

Initial Appointment……33

Consent process…….33

Palm pilot training……..34

Baseline measures……..35

Ecological Momentary Assessments…….35

Weekly Retrospective Assessments……...36

Measures……37

Demographic Information……..38

Mood……..38

International Positive and Negative Affect Schedule Short Form……38

Mood Visual Analog Scale (Mood VAS)..……39

Centers for Epidemiologic Studies – Depression (CES-D) Scale…….40

CES-D-VAS-Very Short version (CES-D-VAS-VS)……...43

Social Support……43

Postpartum Support Questionnaire……43

Social Support VAS……...44

Daily Stress……44

Perceived Stress Scale……44

Daily Stressful Events Scale…..……45

Participants Evaluation of their Study Experience……46

Statistical Analyses……46

Data Reduction……...46

Descriptive Statistics……..47

EMA versus Retrospective Data Analyses……47

Multivariate Time-Series Regression Analyses.……48

Chapter 3……49

Results……....49

Study Participation……49

Retrospective Measures of Mood and Affect……50

Retrospective Measures of Social Support and Stress……..52

Momentary Measures of Positive and Negative Affect……53

Momentary Measures of Social Support and Stress……..61

Retrospective vs. Ecological Momentary Assessment Data Analyses……..61

Positive Affect…….……..62

Negative Affect……64

Positive Mood……64

Negative Mood……..65

Social Support……65

Management of Missing Data for Time-Lagged Time Series Analyses……..……..66

Multivariate Time Series Regression Analyses of Relationships among Positive Affect, Negative Affect, Social Support and Stress……..66

Autocorrelation Results for Concurrent Analyses……78

Concurrent Relationships between Positive Affect Negative Affect, Stress and Social Support……78

Positive Affect and Stress……..78

Positive Affect and Social Support……78

Positive Affect and Interaction between Stress and Social Support…….78

Negative Affect and Stress……79

Negative Affect and Social Support……..79

Negative Affect and Interaction between Stress and Social Support……79

Time-Lagged Time Series Analyses between Positive Affect, Negative Affect, Social Support and Stress……...79

Positive Affect and Stress……..…90

Positive Affect and Social Support……90

Positive Affect and Interaction between Stress and Social Support……..90

Negative Affect and Stress…….90

Negative Affect and Social Support……..90

Negative Affect and Interaction between Stress and Social Support……91

Participant Study Satisfaction……91

Chapter 4……93

Discussion……..93

Background……93

Current Study Methods……..95

Concordance between Retrospective vs. Ecological Momentary Assessment…..95

Covariance between Positive and Negative Affect Scores Over Time……..96

Covariance between Mood and Stress……...96

Covariance between Mood and Social Support…….97

Limitations…….98

Future Directions…….100

References……102

List of Appendices……...113

LIST OF TABLES

Table Page

1. Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA…….15

2. Demographic Information for Study Completers……..29

3. Summary of Participant Involvement……....41

4. Summary of Administered Measures…….42

5. Number of Anticipated and Actual Days and Measurement Points……..49

6. Means and Standard Deviations of Retrospective Positive and Negative Mood Raw Scores by Participant Averaged Across All Assessment Sessions……51

7. Means and Standard Deviations of Retrospective Raw Social Support and Stress Scores by Participant Averaged Across All Assessments…….52

8. Means and Standard Deviations of Momentary Positive and Negative Mood Raw Scores by Participant Averaged Across All Assessment Points……54

9. Pearson Product-Moment Correlation Coefficients between Momentary Positive and Negative Affect for each Participant……..61

10. Average Momentary Social Support and Stress Scores by Participant…….62

11. Percent Agreement between Measures of Retrospective and Ecological Momentary Assessment for Participants #2 through #6……63

12. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #2 (*n*=73)…….68

13. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #3 (*n*=67)…….70

14. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #4 (*n*=64)…….72

15. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #5 (*n*=60)…….74

16. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #6 (*n*=28)…….76

17. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #2 (*n*=72)…….80

18. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #3 (*n*=66)…….82

19. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #4 (*n*=63)…….84

20. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #5 (*n*=59)…….86

21. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #6 (*n*=27)…….88

22. Summary of Evaluation of Palm Pilot Study Item Scores for All Participants....…….91

LIST OF FIGURES

Figure Page

1. Summary of Study Recruitment and Participation……33
2. Positive and Negative Affect Scores across Time Points for Participant #1…….55
3. Positive and Negative Affect Scores across Time Points for Participant #2…….56
4. Positive and Negative Affect Scores across Time Points for Participant #3…….57
5. Positive and Negative Affect Scores across Time Points for Participant #4…….58
6. Positive and Negative Affect Scores across Time Points for Participant #5…….59
7. Positive and Negative Affect Scores across Time Points for Participant #6…….59
8. Positive Affect, Stress and Social Support across Time Points for Participant #2……60
9. Negative Affect, Stress and Social Support across Time Points for Participant #2……..69
10. Positive Affect, Stress and Social Support across Time Points for Participant #3……71
11. Negative Affect, Stress and Social Support across Time Points for Participant #3……..71
12. Positive Affect, Stress and Social Support across Time Points for Participant #4……73
13. Negative Affect, Stress and Social Support across Time Points for Participant #4……..73
14. Positive Affect, Stress and Social Support across Time Points for Participant #5……75
15. Negative Affect, Stress and Social Support across Time Points for Participant #5……..75
16. Positive Affect, Stress and Social Support across Time Points for Participant #6……77
17. Negative Affect, Stress and Social Support across Time Points for Participant #6……..77
18. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #2……81
19. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #2……81

20. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #3……83

21. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #3……83

22. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #4……85

23. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #4……85

24. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #5……87

25. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #5……87

26. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #6……89

27. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #6……89

CHAPTER 1

INTRODUCTION

Overview of the Introduction

This study examined the associations among daily stressors, social support, and mood symptoms in women who were one to twelve months postpartum using ecological momentary assessment (EMA) methodology. Participants were recruited from community events, a community health center and through word of mouth. Chapter 1 first presents a brief description of postpartum depression including symptoms, prevalence, consequences, and risk. Next, studies that examined postpartum depression in Native Hawaiian or Pacific Islander women are reviewed. The third section summarizes the methodologies of studies that have investigated postpartum depression. Fourth, a description EMA is presented. Then, studies that have investigated mood symptoms with EMA are discussed. Finally, the rationale and goals of the study are presented.

Postpartum Depression

Research findings on postpartum depression are primarily based on studies that have used clinical interviews (e.g., Structured Clinical Interview for DSM-IV disorders [SCID]; First, Spitzer, Gibbon, & Williams, 2002) to determine a diagnosis or cut-off scores on various depression measures (e.g., Edinburgh Postpartum Depression Scale [EPDS]; Cox, Holden, & Sagoyski, 1987), Beck Depression Inventory-Second Edition [BDI-II]; Beck, Steer, & Brown, 1996), Centers for Epidemiological Studies-Depression [CES-D] Scale; Radloff, 1977) to define women at-risk for depression. Studies have typically used the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition-Text Revision (DSM-IV-TR) criteria for a diagnosis of *Major Depressive Disorder, Postpartum Onset* which can be given to women experiencing

symptoms consistent with major depressive episode, with the onset of symptoms occurring within four weeks of childbirth (American Psychiatric Association [APA], 2000). Symptoms include depressed mood, irritability, anhedonia, insomnia, fatigue, problems with appetite, feelings of guilt, psychomotor agitation/depression, poor concentration, and suicidal or homicidal ideations. The identification of a depressive disorder during the postpartum period, most often termed *postpartum depression*, can occur a few days to up to one year following childbirth. However, the majority of cases occur from two weeks to three months postpartum (Ugarizza & Schmidt, 2006) with duration depending on the severity of symptoms (Cox, Murray, & Chapman, 1993). However, the Major Depressive Disorder, Postpartum Onset diagnosis has recently been modified in the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-V) to include women experiencing a major depressive episode during pregnancy. Thus, the diagnosis of *Major Depressive Disorder, Peripartum Onset* can be given to women experiencing symptoms consistent with major depressive episode, with the onset of symptoms occurring in pregnancy or within four weeks of childbirth (APA, 2013).

Several studies examined the prevalence rates for postpartum depression (e.g., O'Hara & Swain, 1996; Gavin et al., 2005; Vesga-Lopez et al., 2008). Rates varied depending on the composition of samples, timing of assessment, diagnostic criteria (e.g., major depressive disorder or subclinical depressive symptoms), and whether the studies were retrospective (lower rates) versus prospective (higher rates). A frequently cited meta-analysis of 59 studies from the United Kingdom, United States, and Japan reported the prevalence of postpartum depression to be 13% (N = 12,810; 95% CI, 12.3-13.4%; O'Hara & Swain, 1996). Another meta-analysis examined 28 studies that assessed women for depression during pregnancy or the first year postpartum with a structured clinical interview (Gavin et al., 2005). The authors found that 7.1% of women met

diagnostic criteria for a major depressive episode and 19.2% of women reported subclinical depressive symptoms in the first 12 months postpartum (Gavin et al., 2005).

There is inconsistent evidence regarding whether the postpartum period is a time of increased risk for depression. Some studies report that prevalence rates of childbearing-age women, regardless of pregnancy, postpartum, or non-childbearing status, are comparable (Gavin et al., 2005; Oppo et al., 2009). However, a large, nationally representative study reported that women who had given birth in the past 12 months were at higher risk (AOR = 1.52, 95% CI = 1.07-2.15) for a major depressive episode compared to women who had not been pregnant or given birth in the past 12 months (Vesga-Lopez et al., 2008). In addition, a Norwegian study found that when risk factors for postpartum depression (i.e., history of depression, stressful life events, poor relationship to partner) were controlled for, postpartum women were at greater risk for depression (defined as Edinburgh Postnatal Depression Scale score $\geq$ 10) than non-postpartum women (AOR = 1.60. 95% CI = 1.0-2.6; Eberhard-Gran et al., 2002). In summary, there is some evidence to indicate that the postpartum period is a time of increased vulnerability for depressive symptoms.

Consequences of Postpartum Depression

Postpartum depression has been shown to be associated with a woman's lower level of functioning and well-being. An Australian study found that, compared to age-appropriate normative data, depressed (defined as Edinburgh Postnatal Depression Scale score > 12) postpartum women were impaired on five (i.e., Mental Health, Social Functioning, Role Limitations due to Physical and Emotional Problems, and Vitality) of eight dimensions of the Short-Form Health Survey, while non-depressed (defined as Edinburgh Postnatal Depression Scale score $\leq$ 12) postpartum women were impaired on just two (i.e., Role Limitations due to

Emotional Problems and Vitality) dimensions (Boyce et al., 2000). In addition, depressed postpartum women significantly differed on six (i.e., Mental Health, Social Functioning, Role Limitations due to Physical and Emotional Problems, Vitality, and Bodily Pain) dimensions compared to non-depressed postpartum women (Boyce et al., 2000). The authors concluded that there were declines in functioning and well-being for postpartum women in general. However, the elevated depression scores during the postpartum period were associated with additional areas of functional impairment. Despite experiencing increased difficulties postpartum, one study found that of women diagnosed with a mood disorder in the past year, women who had also given birth in the past year were less likely (AOR = 0.55, 95% CI = 0.31-0.96) than non-pregnant/postpartum women to seek treatment for the mood disorder (Vesga-Lopez et al., 2008).

If untreated, postpartum depression has been associated with serious consequences such as suicide, which is one of the leading causes of maternal death in the United Kingdom (Lindahl et al., 2005). In addition to the impact on the mother herself, experiencing postpartum depression can also affect the health and well-being of the infant. One study found that depressed (defined as Edinburgh Postnatal Depression Scale score $\geq$ 11 and Parent Health and Depression Questionnaire $\geq$ 2) mothers were more likely than non-depressed (defined as Edinburgh Postnatal Depression Scale score < 11 and Parent Health and Depression Questionnaire < 2) mothers to engage in inadequate infant health practices (Zajicek-Farber, 2009). The study found that depressed compared to nondepressed mothers were more than twice as likely to not place their baby in the recommended back-to-sleep position (31.1% vs. 15%, respectively); more than three times as likely to have an incomplete immunization series (39.2% vs. 11.7%, respectively); more than four times as likely to use corporal punishment in disciplining their infant (35.1% vs. 8.3%, respectively); and approximately three and a half times

as likely to not have a smoke alarm in their household (24.3% vs. 0.7%, respectively) (Zajicek-Farber, 2009).

Additionally, symptoms of postpartum depression have been associated with impairments in a mother's capacity to engage positively with her baby in important social interactions, including gazing at their infants, response to infant utterances, and mothers' positive and negative facial expressions (Murray et al., 2003; O'Hara, 2009). Such interaction deficits have been associated with decreased attachment and poorer emotional and cognitive development in these infants compared to infants of non-depressed mothers (Sharp et al., 1995; Murray et al., 1999; & Hay et al., 2001; 2003; Murray & Cooper, 1996; 1997).

In addition to the mother and infant, negative outcomes related to the relationship between the mother and her partner have been reported to be associated with postpartum depression. A recent longitudinal study of women with a history of major depressive disorder was conducted throughout pregnancy and the postpartum period (Whisman, Davila, & Goodman, 2011). The authors found that higher depressive symptom ratings on the EPDS significantly predicted lower relationship adjustment scores in lagged analyses ($B = -.053$, $\beta = -.054$, $p < .05$); however, relationship adjustment did not predict subsequent depression scores. Similarly, Milgrom & McCloud (1996) found that depressed postpartum women (i.e., EPDS ≥ 12) and their partners scored significantly lower ($M = 104$, $SD = 21.7$) on a measure of relationship adjustment than did non-depressed (i.e., EPDS < 12) women and their partners ($M = 118$, $SD = 12.6$, $p < .001$). The aforementioned studies suggest that elevated depression scores in the postpartum period are associated with poorer outcomes on multiple domains for the mother, infant, and family.

Risk Factors for Postpartum Depression

Several variables have been found to be significantly associated with the risk of postpartum depression. In particular, history of depression, depression and/or anxiety during pregnancy, recent stressful life events or current daily stressors, poor marital relationship, insufficient social support, and low socioeconomic status have been found to significantly increase the risk of postpartum depression (e.g., Beck, 2001; Brugha, 1998; Dennis, Janssen, & Singer, 2004; O'Hara & Swain, 1996; Pooler et al., 2013; Robertson et al., 2004).

History of Depression

A personal history of depression is one of the most consistently reported risk factors for postpartum depression (e.g., Milgrom et al., 2008; O'Hara & Swain, 1996). One study estimated that the risk of depression was 25% to 50% higher in women with a history of major depressive disorder who had given birth compared to women with a history of major depressive disorder who had not given birth (Altshuler, Hendrick, & Cohen, 1998). In addition to the postpartum period, depression or anxiety during pregnancy has also been shown to be a significant risk factor (Beck, 2001; Heron et al., 2004; Matthey et al., 2003; Page & Wilhelm, 2007). A retrospective Italian study by Grussu & Quatraro (2009) found that women who scored higher on a postpartum depression measure (i.e., EPDS) were three times more likely to have also reported feeling anxious during pregnancy than women who scored lower on the postpartum depression measure (OR = 3.23, 95% CI = 1.27-8.19, $p < .05$).

Social Support

Social support during pregnancy and the postpartum period has been reported to be associated with the likelihood or severity of postpartum depression symptoms (Brugha et al., 1998; Honey et al., 2003; Milgrom et al., 2008). Social support can be considered emotional,

such as providing love or understanding, or instrumental, such as offering goods or services (Beach & Gupta, 2006; Page & Wilhelm, 2007). In addition, social support can be received from a number of sources, including one's spouse, partner, friends, family, co-workers, and church. However, the type of support provided has been reported to be most helpful if it is consistent with the recipient's perceived need (Logsdon, Birkimer, & Usui, 2000; Logsdon & Usui, 2001; Page & Wilhelm, 2007). For example, a study with low-income, young, African-American women found a significant relationship between depressive scores and the women's perception of importance of the social support ($r = .32$, $p < .05$). However, no relationship was found between depressive scores and the amount of support received (Logsdon & Usui, 2000). Similarly, Grussu & Quatraro (2009) found that women scoring higher on postpartum depression measures (i.e., EPDS and General Health Questionnaire-12 [GHQ-12]) were significantly less likely to report sufficient social support from friends than women with lower scores on the postpartum depression measures (OR = 0.26, 95% CI = 0.10-0.69). In addition, a study with low-income Latina women found that for women considered at high-risk for depression (i.e., history of depression and/or CES-D score $\geq$ 16), lower depression scores were associated with higher levels of social support ($z = -4.05$, $p < .0005$) across pregnancy and the postpartum period (Diaz, Le, Cooper, & Muñoz, 2007).

Stress

Experiencing higher amounts of recent stressful life events have also been identified to be a risk factor for postpartum depression. Experiencing more current stressful life events (> 5) has been associated with higher depressive scores postpartum (AOR = 6.6, 95% CI = 1.7-25.6; Eberhard-Gran et al., 2002). Rubertsson and colleagues (2005) found that having two or more stressful life events in the year prior to pregnancy was significantly associated (OR = 3.7, 95%

CI = 2.2-6.1) with elevated depressive scores (i.e., EPDS $\geq$ 12) at all three assessment points (early prenatal, two- and 12 month-postpartum). Another study found that experiencing a stressful life event (i.e., moving) was reported significantly more often by women with higher postpartum depression scores (i.e., EPDS $\geq$ 9 and GHQ-12 $\geq$ 4) than by women with lower scores on the postpartum depression measures (33% vs. 17.2%, respectively; Grussu & Quartraro, 2009). In addition to stressful life events, which are generally infrequent occurrences (e.g., changing jobs, losing a loved one), increased daily stressors (e.g., demands from family, financial problems) have also been associated with elevated postpartum depression scores due to the cumulative effect of multiple smaller stressors (Page & Wilhelm, 2007). The individual's appraisal of a stressful life event or daily stressor has also been shown to be significantly associated with mood ratings (Page & Wilhelm, 2007).

Other Risk Factors

Although results have been inconsistent across studies, higher risk for postpartum depression symptoms has also been associated with several other variables. These variables include familial history of depression (Johnstone et al., 2000; Milgrom et al., 2008), low socioeconomic status (SES; Milgrom et al., 2008; Patel et al., 2002; Pooler et al., 2013), low self-esteem (Ritter et al., 2000), history of sexual, physical, or psychological abuse (Boyce, 2003; Collins et al., 2011; Kendall-Tackett, 2007; Records & Rice, 2005), difficult or unsatisfactory birth experience, poor prenatal or postpartum care, and difficult infant temperament (APA, 2000; Beck, 2001; Benoit et al., 2007; Robertson et al., 2004).

Postpartum Depression Studies in Hawai'i

The majority of the previously reviewed studies have been conducted in Europe, Australia, Canada, and the mainland United States. Only three studies were found that

investigated postpartum depression in Hawaiian, Pacific Islander and/or Asian and Pacific Islander women (Hayes et al., 2010; Liu & Tronick, 2013; Onoye, Goebert, Morland, Matsu, & Wright, 2009).

A study based on data from the Hawai‘i Pregnancy Risk Assessment and Monitoring System (PRAMS) surveyed 7,154 women with a recent live birth and found that 14.5% reported postpartum depressive symptoms (Hayes et al., 2010). Prevalence rates were higher among Samoan (17.9%), Hawaiian (17.2%), Hispanic (16.6%), and Filipino (16.2%) compared to Caucasian (8.6%) women. The authors used a generalized logit model procedure with ethnicity and socioeconomic variables as covariates. They found that Korean (adjusted odds ratio (AOR) = 2.8, 95% Confidence Interval (CI) = 2.0-4.0), Filipino (AOR = 2.2, 95% CI = 1.7-2.8), Chinese (AOR = 2.0, 95% CI = 1.5-2.7), Samoan (AOR = 1.9, 95% CI = 1.2-2.3), Japanese (AOR = 1.6, 95% CI = 1.2-2.2) and Hawaiian (AOR = 1.7, 95% CI = 1.3-2.1) women were more likely to report postpartum depressive symptoms than Caucasian women (AOR = 1.0 [reference group]) in this sample. Although the authors did not report significant differences in prevalence rates or odds ratios between Native Hawaiian/Pacific Islander and Caucasian women, the results suggested that there was an increased risk of having depressive symptoms during the postpartum women for these women.

A recent study by Liu & Tronick (2013) analyzed data from the New York City PRAMS study and specifically sought to examine disparities in postpartum depression diagnoses between ethnic groups. The authors found that Asian and Pacific Islander women were the most likely to receive a postpartum depression diagnosis, and the likelihood of receiving this diagnosis remained significantly higher than other ethnic groups (i.e., African American, Hispanic, White) even after accounting for other variables such as socioeconomic variables. The likelihood that

prenatal depression was associated with postpartum depression was also highest for Asian and Pacific Islander women in their study compared to other ethnic groups.

A third study was conducted as part of a larger, longitudinal study of perinatal behavioral health (Onoye et al., 2009). The larger study interviewed women at four time points (approximately once during each trimester and once four to eight weeks postpartum). However, this study used data from only the last time point (four to eight weeks postpartum). The authors found that Pacific Islander women demonstrated the highest overall rates of probable postpartum behavioral health disorders including PTSD, depression, and anxiety (as measured by elevated scores on the Traumatic Life Events Questionnaire, CES-D, and the State-Trait Anxiety Inventory, respectively), compared to Asian and Caucasian women in Hawaiʻi; however, there were no significant differences by ethnicity. Specifically, the authors found that 31.8% of the Pacific Islander women's scores indicated they were at-risk for the development of postpartum depression (Onoye et al., 2009).

The aforementioned studies found that the prevalence of and risk for postpartum depression was highest among Native Hawaiian, Pacific Islander and Asian/Pacific Islander women compared to women of other ethnicities. However, one study investigated Pacific Islander women living in New York City and this group also included Asian women (Liu & Tronick, 2013); therefore, generalizability of these findings to Native Hawaiian and Pacific Islander women from Hawaiʻi is uncertain.

Although the literature on risk factors for postpartum depression is extensive and fairly consistent, one review found that participant demographics in these studies have primarily been conducted with 25-35 year old, partnered, mid- to high-SES, Caucasian women (Ross, Campbell,

Dennis, & Blackmore, 2006). Therefore, it is important to examine understudied populations, including Native Hawaiian and Pacific Islander women.

Summary of Methodologies Used in Postpartum Depression Studies

The studies previously reviewed investigated depressive symptoms during pregnancy and/or the postpartum period using several different assessment strategies and research designs. Studies utilized retrospective (e.g., Grussu & Quatraro, 2009), cross-sectional (e.g., Eberhard-Gran et al., 2002; Logsdon & Usui, 2001), and longitudinal (e.g., Boyce, 2000; Milgrom & McCloud, 1996; Rubertson et al., 2005; Whisman et al., 2011; Zajicek-Farber, 2009) research designs. Although most studies reviewed used a longitudinal design, these studies included only two to three time points for assessment. Only one study reviewed used a more intensive data collection strategy in which the authors conducted 15 monthly assessments throughout pregnancy until six months postpartum (Whisman et al., 2011).

The previously reviewed studies also used different assessment methods and measures of postpartum depression. Only two studies used a structured clinical interview to determine a postpartum depression diagnosis (Vesga-Lopez, 2008; Whisman et al., 2011). The majority of the reviewed studies used various depression self-report questionnaire measures including the EPDS (Boyce, 2000; Eberhard-Gran et al., 2002; Grussu & Quatraro, 2009; Milgrom & McCloud, 1996; Rubertson, 2005; Zajicek-Farber, 2009); CES-D (Logsdon & Usui, 2000; Page & Wilhelm, 2007); and BDI-II (Whisman et al., 2011).

Although approximately one out of eight women experiences clinically significant depressive symptoms postpartum, the majority (70% to 80%) of new mothers experience milder mood disturbances following childbirth (APA, 2000; Henshaw, Foreman, & Cox, 2004). Studies that have investigated postpartum depression have generally assessed women across two to three

time points using a depression measure. To date, no published studies have investigated within-subject fluctuations in mood for women, and variables associated with those fluctuations, during the postpartum period.

Ecological Momentary Assessment

As mentioned, the previously reviewed studies used different assessment strategies but the majority of studies relied on paper-and-pencil self-report questionnaires to obtain participant data. Although informative regarding the emotional state of the participant, there are several limitations to these methods of assessments. For example, depending on the particular measure, the participant may be asked to recall their emotional state over the past few days to a few weeks that may lead to retrospective biases in their report (Haynes, Smith, & Hunsley, 2011; Wenze & Miller, 2010). Recent studies (e.g., Ben-Zeev et al., 2009; Byslma et al., 2011; Solhan et al., 2009) have used in-the-moment assessment of mood symptoms (and variables associated with depression) that minimize the limitations, particularly the retrospective biases, of traditional assessment strategies.

One method to reduce retrospective biases is to use traditional paper-and-pencil assessments which participants are asked to complete at pre-determined times every day. However, participants are required to remember to complete these assessments, which can be challenging for individuals with mood disturbances. To address this issue, participants can be given a digital wristwatch or beeper, set to sound an alarm at a certain number of times a day to alert participants to complete assessments during their daily routines (Wenze & Miller, 2010). However, the researcher cannot be certain of when the participant completes the paper-and-pencil assessment. For example, one study found that participants reported that they completed

assessments at the designated time, but photo sensors on the assessments determined that compliance rates were significantly lower than reported (Broderick et al., 2003).

To address the issues of retrospective biases and participant compliance, the use of computer-assisted methodologies have become increasingly more common, particularly with the prevalence of cellular phones, the Internet, and handheld computers. Many of these devices have alarms, but can also be programmed with the assessment instrument(s), time-stamp when a participant completes an assessment, and lock-out the participant from completing an assessment after a certain time-period to minimize retrospective recall (Wenze & Miller, 2010). In addition, these devices are also portable and can more easily travel with the participant to minimize disruption to their daily routine to further increase the ecological validity of their responses. This method of collecting participant data is called *ecological momentary assessment* (EMA) as it captures in-the-moment data during the participant's everyday life. (For a review of EMA, see Ebner-Priemer & Trull, 2009.)

Characteristics of Studies Investigating Mood Symptoms using EMA

Table 1 includes a representative sample of published studies between 2003 and 2013 that used EMA methodology to investigate variables associated with mood. A review of the results including: (a) experimental versus control group findings, (b) retrospective versus momentary mood ratings, (c) mood and daily stressors, (d) mood and social interactions, and methodology including: (e) EMA mood measures, (f) electronic devices, (g) frequency of momentary assessments, and (h) ethnicity of participants investigated in these studies are presented below.

Results of the EMA Studies

Experimental versus Control Group Findings

Twelve of the 13 studies reviewed assessed mood symptoms. Of these, seven investigated individuals with major depressive disorder. Of these seven, six studies compared the depressed group to a non-clinical control group (Ben-Zeev et al., 2009; Bylsma et al., 2011; Conrad et al., 2008; Myin-Germeys et al., 2003; Peeters et al., 2003; Wichers, Lothmann, et al., 2012). As expected, all found that the depressed group reported significantly higher momentary negative affect and lower positive affect than the control group. The seventh study compared the depressed group (or dysthymic) group to participants with borderline personality disorder (Solhan et al., 2009).

Retrospective versus Momentary Mood Ratings

Of the seven studies that investigated individuals with major depressive disorder, three compared retrospective mood ratings (measures traditionally used in research) to momentary mood ratings (Ben-Zeev et al., 2009; Bylsma et al., 2011; Solhan et al., 2009). These studies found discrepancies between the two types of ratings. One study found that positive and negative affect were significantly higher in retrospective versus momentary ratings (Ben-Zeev et al., 2009). The authors found that the depressed group showed a greater difference in their negative affect ratings than the control group ($t(49) = 2.79$, $p < .01$), but not in the positive affect ratings. Bylsma et al. (2011) found that negative and positive affect were highly correlated between the two types of ratings; however, contrary to the aforementioned study's findings, negative and positive affect were significantly lower in retrospective than the momentary ratings. The difference in findings may be because the retrospective rating in Bylsma et al. (2011)'s study was completed at the end of the day, as opposed to one week (i.e., Ben-Zeev et al., 2009).

Table 1. Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions Using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Ben-Zeev et al. (2009)	Compared average momentary affect to retrospective summaries of positive affect (PA) & negative affect (NA) in individuals with current **major depressive disorder (MDD; N=26) and non-clinical controls (N=25)**.	EMA Type: Palm Tungsten E2 (Palm OS Garnet V 5.4) Frequency: ~ 8 times a day (every 1.5 hours ± 10 minutes (9am-10pm)) Duration: 7 days Total Signals: ~56 Compensation: $75	Mood: Positive and Negative Affect Schedule (PANAS) (Asked about any major or unexpected life events during the week of data collection)	One sample t-tests indicated mean difference score for control PA, control, NA, depressed PA, depressed NA was significantly overestimated in retrospect than in moment average (all ps < .02). 2 (affect type) x 2 (diagnosis) Mixed ANOVA found that the depressed group showed greater inaccuracy (absolute difference between ratings) than controls in NA, $t(49) = 2.79$, $p<.01$, $d=0.83$ (but not in PA).
Bylsma et al. (2011)	Conducted a multi-method assessment of emotional reactivity to daily life events in individuals with **current major (MDD; N=35), minor (mD; N=26), & no history of depression (N=38)**. And to extend findings from Peeters et al., 2003.	EMA Type: Palm Zire22 (plus Day Reconstruction Method (DRM) survey at end) Frequency: 10 times a day (approximately every 1.5 hours, semi-randomly between 8:00am-11:00pm) Duration: 3 days (Tuesday-Thursday; DRM on Friday) Total Signals: 30	Mood: State PA and NA for each event using 7 positive and 7 negative mood ratings. Event contexts: Multiple choice questions regarding type of activity, nature of event, location of event, & with whom interacting Event appraisals: Appraisal of event on (un)pleasantness, stressfulness, importance, expectedness, & feeling in control (Objective event rating):	Method Type: NA & PA data were highly correlated between methods; however, NA & PA were both significantly lower in the DRM than ESM data. Mood: MDD and mD groups reported reduced daily PA and greater overall daily NA compared to controls in ESM, with MDD and mD groups not significantly differing from each other. Events: MDD and mD groups reported experiencing events as less pleasant, more unpleasant, and more stressful than controls. Mood response to events: MDD and mD groups reported greater decreases in NA in

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Bylsma et al. (2011) continued		Compensation: Not reported	Research assistants independently & blindly coded (un)pleasantness of participants event descriptions from DRM)	response to pleasant events compared to controls; however, groups did not differ in their NA response to unpleasant events. MDD and mD group reported greater increases in NA to increased stressfulness of events than mD and control groups & MDD group showed greater increases in NA to unpleasant events compared to mD and control groups.
Wichers, Lothmann et al.(2012)	Examined how PA and NA influence each other in depression and how this influence can impact treatment response in treatment-seeking **MDD (N=46)** vs. age and gender matched **healthy controls (N=39)**.	EMA Type: Digital wristwatch sounded alarm to complete self-report measures collated in booklet for each day Frequency: 10 beeps at semi-random intervals of approximately 90 minutes (7:30am-10:30pm) Duration: 6 days Total signals: 60 Compensation: not reported	Mood: 10 NA & 7 PA adjectives rated on 7-point scales Current context: activity, persons present and location Appraisals of current situation: rated on 7-point scale	MDD group showed significantly higher baseline average NA (F=22.1, df=3, p<.001) and lower PA (F=69.2, df=3, p<.001) than control group. There was no significant difference between NA and PA between types of responders (responders/non-responders with either first or recurrent episode). For recurrent-episode future responders, daily maximum PA increase resulted in significantly lower levels of NA over the next few hours compared to future non-responders (B=-0.046, p=.045) and first-episode responders (B=-0.067, p=.009). Recurrent-episode future responders also showed greater reductions in subsequent NA levels over the few hours following daily maximum PA increased compared to healthy controls (B=-0.063, p=.003).

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Solhan et al. (2009)	Studied the discrepancy between trait questionnaire, retrospective reports, and EMA measures of affective instability in outpatients with **borderline personality (BPD; N=58) & MDD or dysthymic disorder (DYS; N=42)**	EMA Type: Palm Zire 31 Frequency: 6x/day (participants waking hours divided into 6 equal intervals, alerted once during each interval) Duration: 28 days Total Signals: 168 Compensation: $180 ($45/week x 4 weeks)	Mood: PANAS-X (expanded form) – 21 items for NA, PA, hostility, fear, & sadness (rated 1=very slightly or not at all, 5= extremely)	Low to moderate agreement between retrospective or trait reports of mood instability/intensity and momentary assessments for BPD and MDD/DYS groups. Both groups were more accurate in recalling days without than days without extreme mood fluctuations.
Conrad et al (2008)	Assessed whether cardio-pulmonary parameters, cortisol, & mood differ across the day in individuals with **MDD (N=46) vs. controls (N=19). All participants at risk for CVD & at least 55 years old.**	EMA Type: Timex watch sounded alarm to complete mood ratings on hand-held computer on LifeShirt system (also measured continuous HR, respiration, & accelerometry). Frequency: 6x/day (set times) Duration: 3 days Total Signals: 18 Compensation: $50	Mood: PANAS (five PA & five NA items) Cardiac: single lead ECG Respiratory: plethysmographic sensors transduce breath waveforms to derive pulmonary variables Activity: accelerometer Cortisol: saliva collected by cotton swab	NA was higher ($F(1, 61) = 23.26$, $p<.001$) and PA was lower ($F(1, 61) = 13.71$, $p<.001$) in MDD compared to control group. High NA was related to low HRV in control but not in depressed group. Contrary to hypotheses, no significant differences were found in HRV, cortisol, or respiratory between MDD & control groups.

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Myin-Germeys et al. (2003)	Investigated emotional reactivity to small disturbances in daily life in individuals with a **history of non-affective psychosis (NAP; N=42), bipolar disorder (BP; N=38), current MDD (N=46), & controls (N=49).**	EMA Type: Digital wristwatch sounded alarm to complete self-report measures collated in booklet for each day Frequency: 10x/day (randomly signaled between 7:30am-10:30pm) Duration: 6 days Total Signals: 60 Compensation: not reported	Mood: 8 NA & PA items on 7-point Likert scale (1=not at all to 7=very) Activity-related Stress: rated current activity on 3 items Social Stress: reported social context (activity, persons present, location) & rated item "I would rather be alone."	Results indicated differences in emotional reactivity across groups. Mood: MDD group reported significantly higher NA than NAP, BP, and control groups. Control group reported significantly higher PA than NAP and BP groups, which were significantly higher than the MDD group. Activity-related Stress: The BP group reported significantly more activity-related stress than the other three groups and the MDD group reported significantly more activity-related stress than the control group. Social Stress: The MDD group reported significantly higher stress related to social situations than the control group.
Peeters et al. (2003)	Compared the effect of daily positive & negative stressful events on PA & NA between individuals with **MDD (N=46) vs. age- & gender-matched controls (N=39).**	EMA Type: Digital wristwatch sounded alarm to complete self-report measures collated in booklet for each day Frequency: 10 beeps at semi-random intervals of 90 minutes (7:30am-10:30pm) Duration: 6 days (including 1 weekend)	Mood: 16 NA & PA adjectives rated on 7-point scales (1=not at all to 7=very) Stressful events: describe any positive or negative event happened since last rating. Appraisals: Rated (1=not at all to 7=very) positive events on pleasant, important, & stressful and negative events on unpleasant, important, & stressful.	Mood responses to positive events were greater in control group whereas mood responses to negative events were greater in depressed group. Frequency of negative events were similar in both groups but depressed group reported fewer positive events than the control group ($t(79)=3.03$, $p=.003$). For both groups, negative events were followed by increased NA and decreased PA and enhanced when the negative event was appraised as stressful. Depressed group appraised negative events as more unpleasant ($t(79)=4.33$, $p<.001$), more

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Peeters et al. (2003) continued		Total signals: 60 Compensation: $30		important (t(79)=2.18, p=.03), and more stressful (t(79)=7.27, p<.001); however, the mood responses were blunted in comparison to the control group.
Goldschmidt et al. (2013)	Studied the temporal relation among NA, stressful events and bulimic events in women with **bulimia nervosa (BN; N=133)**	EMA Type: Palm 5X handheld computer Frequency: 6x/day (semi-random prompts between 8am-10pm); 1x/day before bedtime; and each time they experienced an eating disorder behavior Duration: 2 weeks Total signals: 98 Compensation: $200 for 2 weeks, plus $50 bonus for compliance rates of 85% +	Mood: PANAS – 11 NA items rated on 5-point scale from 1 (not at all) to 5 (extremely) Stressful Events: Daily Stress Inventory (DSI) and the Daily Experiences Survey (DES) – participants selected from a list of 35 stressful events (26 events selected from the 60-item DSI and 8 from the 60-item DES) that occurred since the last beep, how long ago the event happened and how stressful they found the event	Increases in NA significantly mediated the relations between Time 1 interpersonal stressors (indirect effect estimate (IEE)=0.006; 95% CI=0.004 to 0.007), general daily hassles (IEE=-0.005; 95% CI=-0.007 to -0.003), and stress appraisal (IEE=0.013; 95% CI=0.011 to 0.016) and Time 2 binge eating and purging (interpersonal stressors IEE=0.006; 95% CI=0.004 to 0.008; general daily hassles IEE=-0.005; 95% CI=-0.007 to -0.006; stress appraisal IEE=0.014; 95% CI=0.011 to 0.017).
Smyth et al. (2009)	Studied the binge/purge behavior, mood, & type & severity of stress in women with **BN (N=33).**	EMA Type: Palm handheld computer Frequency: 6x/day (semi-random prompts within individual's waking hours) Duration: 2 weeks Total signals: 84	Mood: Profile of Mood States (POMS) – Anger-Hostility subscale & PANAS – 13 PA & 11 NA items Daily Stress: DSI – selected 26 items to assess general daily hassles. Added 4 items to assess interpersonal	Mood (Time of Day): PA increased from 8am to 4pm then decreased [F (1,10946)=355.42, p<.001]. NA and anger-hostility increased steadily throughout the day [F (1,10946)=104.47, p<.001 and F (1,10946)=12.86, p<.001, respectively]. Mood (Day of Week): PA was higher on weekdays than weekends [t(1, 737)=2.21, p=0.27] and was highest on Friday and lowest on Sunday. NA was lowest on

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Smyth et al (2009) continued		Compensation: $100 per week, plus $50 bonus for compliance rates of 85% or higher	stressors and 4 items to assess work-environment-related stress. If stressor reported, asked how stressful the event was (1=not at all to 5=very much).	Friday and Saturday than other days [t(1,787)=3.70, p<.001]. Highest NA was on Tuesdays. Stress (Time of Day): Number of general hassles decrease throughout the day [F(1,9681)=17.14, p<.001]. Significant linear effect for frequency and significant quadratic effect for severity of work-environment-related stressors. Significant linear effect for frequency and severity of interpersonal stressors. Stress (Day of Week): Significantly higher frequency of stressors reported on weekdays than weekends [F(1, 787}=15.57, p<.001].
Müller et al. (2012)	Examined mood & daily stress in individuals with **compulsive buying (N=25; 2 males, 23 females)**	EMA Type: handheld computer Frequency: 3x/day (semi-random prompts throughout the day); after each compulsive buying episode; 1x/day before bedtime Duration: 2 weeks Total signals: 56 Compensation: $200 for 2 weeks, plus $50 bonus for compliance rates of 85% or higher	Mood: PANAS – rated 13 PA and 11 NA items on scale from 1 (not at all) to 5 (extremely) Daily Stress: DSI – selected 35 items including financial, work, and familial stressors.	Within-day analyses found that NA significantly increased and PA significantly decreased prior to a CB episode. There was a significant decrease in NA following a CB episode but no significant change in PA. Findings did not support significant differences in daily stress on days in which CB episodes occurred vs. days in which they did not occur.

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Wichers, Peeters et al. (2012)	Studied the effects of physical activity on affective state in **healthy female twin pairs (N=504)**, part of larger population-based survey from Flanders, Belgium.	EMA Type: Digital wristwatch sounded alarm to complete self-report measures in booklet for each day Frequency: 10 beeps at semi-random intervals in 90-minute time blocks (7:30am-10:30pm) Duration: 5 days Total signals: 50 Compensation: not reported	Mood: PANAS – 4 PA & 6 NA items rated on 7-point scale. Physical Activity: rated how physically active participants have been since last beep rated on 7-point scale (resting, sitting, walking, household chores such as vacuum cleaning, biking, playing tennis and running). Appraisals: rated current activities (e.g., "I prefer doing something else") on 7-point scale from 1 (not at all) to 7 (very much).	Within-subject increase in physical activity was significantly associated with increase in PA up to 3 hours following increase in activity. However, those with a history of MDD lost gains in PA at significantly higher rates 2 beeps after physical activity (t+2) than participants without MDD history. Participants with a history of MDD showed significantly higher mean levels of NA 1 beep before (t-1) and at (t) activity increase compared to participants with no prior history. In combined sample, PA was significantly higher 3 beeps before increase in physical activity as compared to 1 beep before.
Jacobs et al. (2007)	Assessed daily stressors, current mood, & salivary cortisol in **healthy women (N=556)**, majority one member of a twin pair as part of larger study in Belgium.	EMA Type: Digital wristwatch sounded alarm to complete self-report measures in booklet for each day Frequency: 10 beeps at semi-random intervals in 90-minute time blocks (7:30am-10:30pm) Duration: 5 days Total signals: 50 Compensation: not reported	Mood: Rated 15 mood items on PA, NA, agitation, irritated (excluded in analyses), and feeling controlled (excluded in analyses) Activity-related Stress (2 items) Social Stress (2 items) Event-related Stress: reported most important event since last signal, if event is still ongoing, & rated pleasantness (-3=very unpleasant to +3=very pleasant)	Minor daily stressors (for all three subscales) were significant predictors of mood states. Increased stress was associated with decreased PA and increased NA and agitation ($p<.001$).

Table 1 (Continued). Summary of Studies that Investigated Daily Mood, Stressors, and/or Social Interactions using EMA

Study	Aims of Study	Study Design	EMA Measure(s)	Results
Janicki et al. (2006)	Assessed marital adjustment & social interactions in **older, married, healthy adults (N=245).**	EMA Type: Palm handheld computer Frequency: once every 45 minutes during waking hours Duration: Two 3-day periods (separated by 3-4 month interval) Total signals: ~ 120 Compensation: not reported	Diary of Ambulatory States (DABS) – 45-item closed-ended measure designed for repeated real-time assessment of psychological/behavioral influences on cardiovascular activity in daily life. Social Interaction: Describe most recent interaction.	Increased marital adjustment (retrospective dyadic adjustment scale) associated with more agreeable and less conflictual spousal interactions. Marital adjustment was unrelated to highly conflictual spousal interactions. Highlights the importance of positive rather than negative interactions in impacting marital quality.

Mood and Daily Stressors

Of the 12 EMA studies that assessed mood symptoms, seven also examined the association between daily stressors and momentary mood ratings (Bylsma et al., 2011; Goldschmidt et al., 2013; Jacobs et al., 2007; Müller et al., 2012; Myin-Germeys et al. 2003; Peeters et al., 2003; Smyth et al., 2009). All studies asked participants to describe an event (e.g., stressful, significant, positive/negative) since the last data entry and the participant's appraisal of the event (e.g., pleasant/unpleasant, important, stressful). Peeters et al. (2003) found that the frequency of reported negative events were similar in both the depressed and control groups, but the depressed group reported fewer positive events than the control group ($t(79) = 3.03$, $p = .003$). The authors found that the depressed group appraised negative events as more unpleasant ($t(79) = 4.33$, $p < .001$), more important ($t(79) = 2.18$, $p = .03$), and more stressful ($t(79) = 7.27$, $p < .001$) than the control group. Similarly, Myin-Germeys et al. (2003) found that the depressed group reported daily activities as more stressful than the control group. One recent study found that stressful events preceded bulimic behaviors and this relationship was mediated by negative affect in women with current bulimia nervosa (Goldschmidt et al., 2013). Bylsma et al. (2011) found that the depressed group did not report experiencing events as less pleasant, more unpleasant, or more stressful than the control group. The authors also found that the depressed group reported greater decreases in negative affect in response to pleasant events than did the control group. However, they also found that the depressed group showed greater increases in negative affect in response to increased stressful and unpleasant events compared to mildly depressed and control groups (Bylsma et al., 2011). According to Müller et al. (2012), there were no significant differences between mood and daily stress for participants with compulsive buying

on days in which a compulsive buying episode occurred compared to days in which an episode did not occur.

Mood and Social Interactions

Of the 13 studies reviewed, four examined social interactions (Jacobs et al., 2007; Janicki, Kamark, Shiffman, & Gwaltney, 2006; Myin-Germeys et al., 2003; Smyth et al., 2009). One study found that stressful social interactions (as well as activity- and event-related stress) significantly predicted positive and negative affect in healthy women in Belgium (Jacobs et al., 2007). As expected, increased stress was associated with decreased positive affect and increased negative affect and agitation (Jacobs, et al., 2007). For individuals diagnosed with depression, this finding may be amplified. For example, Myin-Germeys et al. (2003) found that the depressed group reported significantly higher social stress compared to a healthy control group.

Methodology Used in the EMA Studies

EMA Mood Measures

Of the 13 studies reviewed, 12 examined daily mood symptoms using a version of the Positive and Negative Affect Schedule (PANAS). One study out of these 12 used an additional measure of mood (i.e., Profile of Mood States [POMS]) for momentary assessment of mood; however, only one subscale was used (i.e., Anger-Hostility; Smyth et al., 2009). Another study also used the Hamilton Depression Rating Scale; however, this measure was administered to participants monthly and was not used as a momentary assessment measure (Wichers, Lothmann et al., 2012).

Electronic Devices

Of the 13 studies reviewed, seven used handheld computers to collect the momentary assessment data (Ben-Zeev et al., 2009; Bylsma et al., 2011; Goldschmidt et al., 2013; Janicki et

al., 2006; Müller et al., 2012; Smyth et al., 2009; Solhan et al., 2009). One study used a digital wristwatch to alert participants to complete momentary assessments at set times on a handheld computer (Conrad et al., 2008). The remaining five studies used a digital wristwatch that beeped at random times within a set interval to alert participants to complete their momentary assessments in a booklet (Jacobs et al., 2007; Myin-Germeys et al., 2003; Peeters et al., 2003; Wichers, Lothmann et al., 2012; Wichers, Peeters et al., 2012).

Frequency of Assessments

Of the 13 studies reviewed, nine studies collected data over seven days or less. The longest study length period was 28 days (Solhan et al., 2009). All but one study signaled participants to complete momentary assessments at least six times a day. The one study reviewed that signaled participants less than six times a day, signaled participants to complete momentary assessments four times a day (three random and one before bedtime) and whenever a specific event occurred (i.e., compulsive buying episode). The length of this study was two weeks (Müller et al., 2012). Seven of the 12 studies signaled participants at least 10 times a day. Given the burden on participants to complete such a high number of assessments in one day, it seems appropriate that the length of the majority of these studies was relatively short.

Ethnicity of Study Participants

Of the 13 studies reviewed, five were conducted in Europe and ethnicity was not reported (Conrad et al., 2008; Jacobs et al., 2007; Solhan et al., 2009; Wichers, Lothmann et al., 2012; Wichers, Peeters et al., 2012). The remaining eight studies were conducted on the United States mainland and the ethnicity of participants was predominantly reported as Caucasian. As such, it is difficult to know the degree to which the results of these studies are generalizable to populations with other ethnic backgrounds.

In summary, most of the EMA studies reviewed compared a group with current major depressive disorder to a non-depressed control group. As expected, most studies found that the depressed group reported higher negative and lower positive affect than the control group. Studies also found differences between participants' retrospective (i.e., traditional self-report measures) and momentary mood ratings. To this investigator's knowledge, no study that used EMA to study women who are at risk for postpartum depression has been conducted. Additionally, none of the studies reviewed focused on ethnic minority populations nor did any study examine variables associated with daily mood fluctuations with these populations.

Rationale and Goals of the Proposed Study

Approximately 13% of women experience clinically significant depressive symptoms (O'Hara & Swain, 1996) and the majority of women experience mild symptoms following childbirth (O'Hara, 2009; APA, 2000; Henshaw, Foreman, & Cox, 2004). Some evidence indicates that EMA can provide valid measures for the study of within- and across-day changes in mood symptoms over time in various populations. Although the postpartum period is a time of increased vulnerability for mood disturbance in women, no study to date has utilized EMA methodology with this population. In addition, there is a paucity of research on postpartum depression with women in Hawai‘i and no study to date has examined variables associated with postpartum depression in a primarily Native Hawaiian population.

The present study examined the associations between mood, social support, and daily stress during the year following childbirth in a small cohort of women at-risk for postpartum depression in Hawai‘i, using multivariate time-series EMA-based assessment strategies over a two to four week period. The specific goals of this study were as follows:

1) To estimate the degree of concordance between two to three times a day momentary and retrospective measures of positive and negative affect, social support, and daily stress,
2) To examine the relationship between positive and negative affect over time,
3) To examine the proportion of shared variance in concurrent a) positive affect and daily stress, b) positive affect and social support, c) negative affect and daily stress and d) negative affect and social support, and
4) To examine the proportion of shared variance in time-lagged a) positive affect and daily stress, b) positive affect and social support, c) negative affect and daily stress and d) negative affect and social support.

CHAPTER 2

METHOD

Participants

Six women who gave birth within the preceding year and were Native Hawaiian and/or living in a primarily Native Hawaiian community (e.g., Waiʻanae Coast on the island of Oʻahu) participated in this study. See Table 2 for participant demographic information. Participants in this study were women in their 30's (M = 35.7, SD = 3.4) and most of them primarily identified with being Native Hawaiian (n=4, 66.7%). All participants were of mixed ethnic heritage and reported at least four different ethnicities. Native Hawaiian, Chinese and Filipino were the most frequently reported ethnicities followed by Puerto Rican and Spanish. Participants were at least high school graduates, with half of them completing a graduate level degree. Most participants were employed full-time (n=4, 66.7%) and their household income was at least $50,000 per year (n=5, 83.3%). Half of the participants' babies were four to six weeks old at the time of enrollment in this study. All of these babies were delivered vaginally with no significant complications. All of the participants were living with the father of their baby (i.e., husband, boyfriend), their baby and if applicable, other children. On average, participants had a total of three children (M=3.2, SD=1.7). All but one participant (#3) denied any previous psychiatric history. One participant (#2) was interested in and referred for behavioral health services at the completion of this study. All participants denied current psychiatric medications.

All prospective participants were screened for inclusion and exclusion criteria by the PI using the Eligibility Checklist (see Appendix A). Responses to eligibility criteria questions were self-reported by the prospective participant. Participants met the following inclusion criteria: 1) were at least 18 years of age, 2) delivered a live baby between one to 12 months prior to

Table 2. Demographic Information for Study Completers

Participant #	Age (years)	Primary Ethnicity	Highest Education	Employment	Baby Age (weeks)	Total # Children
1	39	Filipino	High School	None	4	6
2	35	Native Hawaiian	High School	On leave from Full-time	4	3
3	34	Native Hawaiian	High School	On disability	6	3
4	38	Native Hawaiian	Graduate School	Full-time	40	4
5	30	Native Hawaiian	Graduate School	Full-time	36	1
6	38	Japanese	Graduate School	Full-time	18	2

enrollment, 3) were currently receiving postpartum care (e.g., Waiʻanae Coast Comprehensive Health Center's (WCCHC) Women's Health Clinic services), 4) are Native Hawaiian and/or were living in a rural, Native Hawaiian community, 5) speak and understand English, 6) had a health care provider who could confirm that the prospective participant received an elevated depression score (e.g., Center for Epidemiological Studies-Depression [CES-D] scale score $\geq$ 16) and/or the prospective participant self-reported low mood during her recent pregnancy/postpartum and/or ever received psychological treatment for a depressive disorder, and 7) was living with an adult (e.g., family member, spouse, boyfriend, roommate, etc.) at the time of enrollment. Exclusion criteria were as follows: 1) history of schizophrenia-spectrum, bipolar, and/or current substance use disorders and 2) reported suicidal or homicidal ideation.

Inclusion and exclusion criteria were selected to optimize women's: 1) understanding of the study protocol (i.e., age 18 or older, English-speaking), 2) elevated risk for mood

disturbance, and likely variability in mood across days, postpartum (i.e., confirmed elevated depression score or self-reported low mood during recent pregnancy/postpartum, history of treatment for depressive disorder, approximately one to 12 months postpartum) unrelated to increased hormonal fluctuations (i.e., at least four weeks postpartum) or more severe disorders affecting mood (i.e., exclude history of schizophrenia-spectrum, bipolar and/or current substance use disorders), 3) established linkage to appropriate services if they experience distress related to symptoms or the study protocol (i.e., currently receiving WCCHC Women's Health Clinic or similar postpartum services), and 4) minimal chance that they will be at risk to themselves or others (i.e., exclude reported suicidal or homicidal ideation).

Procedure

Palm Pilots: Programming and Testing

Ten Palm Pilots (Tungsten E2 Personal Digital Assistants) were purchased by the University of Hawai'i's Department of Psychology. Momentary measures were programmed onto the Palm Pilots by this investigator with assistance from a graduate-level programming student. Once the EMA measures (e.g., PANAS) were programmed, this investigator tested the Palm Pilots and momentary measures, subject-interface, and alarm system (described in "Ecological Momentary Assessments" section below). Following this initial testing, beta-testing was completed by two individuals (one high school graduate and one graduate student) unfamiliar with this study. Beta-testing lasted one to two days. Beta-testers reported that they were able to effectively complete the momentary measures on the Palm Pilot (i.e., the alarms worked, instructions were easy to understand, there were no error messages, etc.); therefore, no revisions to the EMA measurement strategy were made.

Palm Pilot: EMA Study

Recruitment

Study approval was obtained by the WCCHC's and the University of Hawai'i's Institutional Review Boards.

WCCHC. The goals, rationale, and methods of this study were presented to key WCCHC Women's Health Clinic providers (i.e., directors, managers). Providers were asked provide the client with a brief verbal description of the study and a flyer with the principal investigator's (PI) contact information (Appendix A). Providers were asked to emphasize to the client that study participation is voluntary. Providers were asked to complete an eligibility checklist for women they believe to fit the study eligibility criteria (Appendix B). Interested clients were to be directed to the PI if she was on-site, or to call the phone number on the flyer for more information or to schedule an initial appointment at the clinic. This process was anticipated to take about 10 minutes of provider time per client. Due to the provider's busy schedules, they were not able to complete the eligibility checklists; therefore, they were asked to hand out study flyers to potentially eligible clients. Study flyers were also placed in the waiting areas of the Women's Health Clinic and the Pediatric Clinic (in the same building). The PI also approached potentially eligible clients in these waiting areas to discuss the study and provided them with a study flyer. If interested, the checklist was completed and/or a time for an initial meeting was scheduled (see Appendix D for script).

Non-WCCHC. The PI also recruited Native Hawaiian women who were not necessarily WCCHC clients (e.g., via events for Native Hawaiian women) and non-Native Hawaiian women who lived in primarily Native Hawaiian communities (e.g., word of mouth). Interested non-WCCHC women were given a flyer and the PI provided a brief verbal description about the

study. The PI completed the eligibility checklist with the prospective participant. If eligible, the prospective participants were scheduled for their initial appointment at a private location (e.g., office, participant's home). If enrolled, the participant's provider was contacted to inform them of the participant's enrollment in the study.

Eligibility Screening

Of the 24 women screened (i.e., completed the eligibility checklist), five were ineligible (e.g., not Native Hawaiian or living in a Native Hawaiian community, their baby was over 12 months old, etc.) and 19 were eligible for the study. Of the 19 eligible women, four decided not to pursue this study and 15 chose to schedule an initial appointment. Of the 15 women that scheduled an initial appointment, over half of them (i.e., eight) no-showed and did not reschedule. The investigator called prospective participants the day before to remind them of their appointments or when they were late for their appointment. If they did not attend the initial appointment, this investigator made at least two attempts to reschedule them for another time. As there appeared to be challenges with recruitment (i.e., difficulty recruiting women between four to 12 weeks postpartum), the PI submitted a request to broaden the eligibility criteria to one to 12 months postpartum to the University of Hawaii's IRB. This modification request was approved on July 25, 2013. Recruitment and enrollment continued until six participants completed the study protocol. No participants exhibited signs of psychological distress during participation in this study. One participant was already receiving behavioral health services and was encouraged to continue treatment. Another participant was interested in receiving behavioral health services and was referred to a psychologist at the WCCHC Women's Health Clinic upon her study completion. See Figure 1 for an overview of study recruitment procedures.

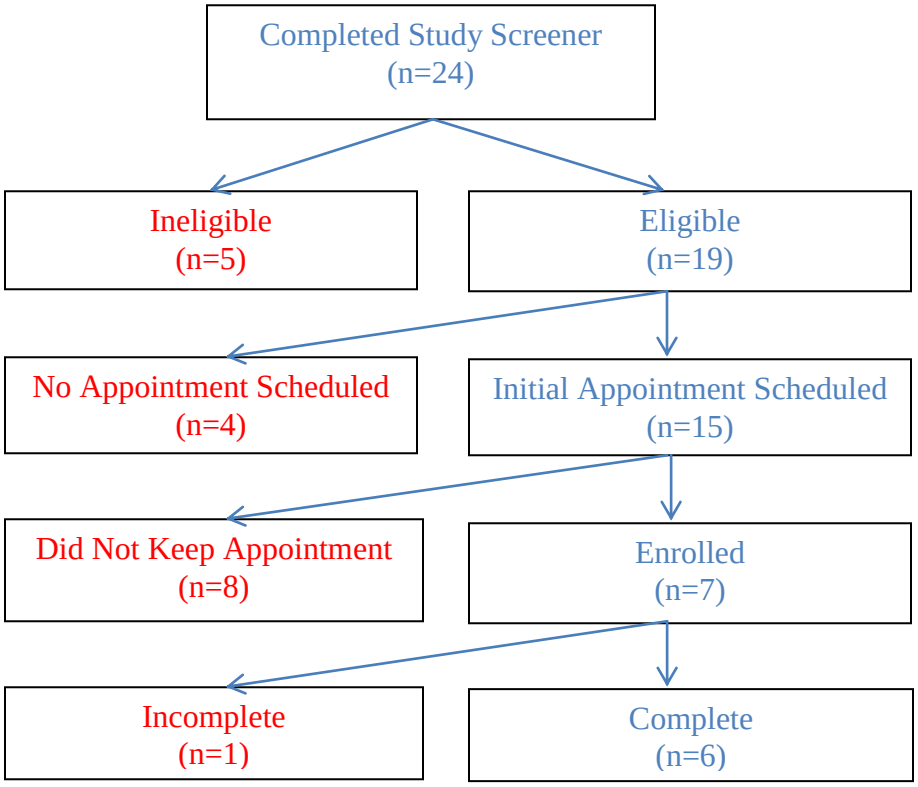


Figure 1. Summary of Study Recruitment and Participation

Initial Appointment

Consent process. During the initial appointment, the Informed Consent Form (WCCHC or General Version; see Appendix C) was reviewed and potential participants had the opportunity to ask any questions regarding their participation in the study. In signing the Informed Consent Form, participants agreed to be responsible for a specific hand-held computer (Palm Pilot) for the duration of the study and to return the Palm Pilot at the end of their study participation. Participants were encouraged to complete all momentary Palm Pilot assessments on-time (i.e., as close to but within 15 minutes of the first alarm, as described below).

Participants were notified that if they completed less than 70% of their momentary assessments on-time for one week, they will be disenrolled from the study due to insufficient data. After all questions had been answered, the potential participant was asked to sign the Informed Consent Form. Participants were given a copy of the Informed Consent Form for their records. Of the seven women who kept their initial appointment, all seven enrolled in the study.

Palm Pilot training. Participants received training on the use of the Palm Pilots including discussion of unlocking the Palm Pilot, the audible prompts, how long they have to complete the measures once prompted, how to use the stylus, etc. Participants practiced completing each momentary measure on the Palm Pilot to ensure their ability to use Palm Pilot and to understand the content of the items and the rating scales. Participants were given a Palm Pilot Training Guide to reference during their study participation (see Appendix E). Participants were encouraged to keep the Palm Pilot near them (i.e., within earshot of the alarm) at all times.

Timely responding to prompts was emphasized, except under unsafe or inappropriate situations (e.g., driving, working etc.), and participants were notified that compliance will be checked at weekly appointments. Participants were also encouraged to call this investigator if they have any questions about using the Palm Pilot.

After the training, participants were given the option to decide whether they wanted to complete momentary assessments two or three times a day. Six of the seven participants that enrolled in the study chose to complete momentary assessments three times a day.

Participants were informed that they would receive a $10 gift card at the beginning of their in-person appointments as a thank you for their time. They were also be informed that they would receive a “bonus” depending on the number of daily assessments they complete and duration of time that they participated in the study (delineated on the Informed Consent Form) as

an appreciation for their time and efforts. The first random prompt was programmed to occur on the next time interval following the Palm Pilot training.

Baseline measures. Following the training, participants were asked to complete several retrospective, self-report questionnaires on mood, social support, and daily stress (Appendices I, L, N, P, and Q). Participants were also asked to complete a demographic information form (Appendix F). The initial appointment lasted approximately 45-60 minutes.

Ecological Momentary Assessments

Palm Pilots were programmed to emit an audible alarm ("beep") at a pre-determined time unknown to the participant during two or three time blocks (e.g., for three daily assessments over two weeks, once between 8:00 am and 12:00 pm, once between 12:00 pm and 4:00 pm, and once between 4:00 pm and 8:00 pm) each day for 14 consecutive days. Beeps were programmed to sound at least three hours apart to more fully capture the participant's daily experiences. Participants were asked if there were any times of the day that they knew they would not be able to complete momentary assessments (e.g., during working hours). If so, the time intervals were adjusted to accommodate the participant's availability. After every beep, participants were asked to complete momentary assessments concerning their current mood, social support, and daily stress on the Palm Pilot (see descriptions of measures below). Participants were instructed to complete the assessments immediately after the beep to minimize distortions in memory. If the participant did not begin the measures immediately, a reminder beep sounded after five minutes and again after another five minutes of inactivity. Recorded data were electronically time-stamped to determine when participants completed the momentary assessments. On the second day of momentary assessments, participants were called by to check for and problem-solve any difficulties in completing study procedures.

Weekly Retrospective Assessments

Participants were scheduled for an in-person appointment once a week (e.g., days 8 and 15) to complete retrospective measures (see section on Measures), download the past weeks' recorded data, check for compliance, and problem-solve any difficulties with the EMA. Participants were called the day before (e.g., days 7 and 14) to remind them about their weekly appointment. The PI uploaded the past weeks' recorded data to a password-protected laptop computer to check for compliance. Issues with missing data were discussed and problem-solved, and good recording practices were reinforced. Participants were then asked to complete retrospective, paper-and-pencil measures covering the past week. Amount of the participant's bonus depended on whether they completed two or three times a day assessments and the number of weekly assessments completed (i.e., at least 70% or 100%). Specifically, participants received gift cards in the amounts of: $10 (regardless of number of assessments completed), $15 (for completing at least 70% of twice daily assessments), $20 (for completing 100% of twice daily assessments or at least 70% of three times daily assessments), or $30 (for completing 100% of three times daily assessments). As previously mentioned, participants were disenrolled if their compliance rates are less than 70% for one week. One participant was disenrolled following the second week of participation due to insufficient data (i.e., 100% compliance Week 1 and only 14.3% compliance Week 2).

At their final visit, participants were asked to complete weekly appointment requirements, a questionnaire on their experience participating in this study (i.e., the use of the Palm Pilot; see Appendix G), and turn in their Palm Pilot. Of the seven participants that were provided with a Palm Pilot, 100% turned them in at their last appointment. Interested participants were given the opportunity to participate in an individual psychoeducational session

on postpartum depression provided by the PI; however, no one requested this option. As previously mentioned, one participant was interested in behavioral health services so a referral to a WCCHC behavioral health provider was provided.

Participants who were able to complete at least the minimum study protocol requirements (i.e., at least 70% on-time daily assessments for two weeks) were offered the opportunity to continue participation in the study for up to two more weeks with additional compensation. This option was provided to increase the number of data points for the study without requiring the participant to commit to participation for an entire month. Five of the six eligible participants opted to continue participation; with two participants opting to continue for an additional week and three opting to continue participation for the maximum two additional weeks. Weekly appointments lasted approximately 15 minutes. See Table 3 for a summary of participant involvement.

Measures

Multiple measures were collected for each variable (see below for z-score transformations). In addition, measures were selected, in part, for their psychometric evidence and brevity to reduce participant burden. Demographic Information was obtained using the Demographic Information Form. Mood was assessed using four measures: 1) International Positive and Negative Affect Schedule Short Form (Thompson, 2007), 2) Mood Visual Analog Scale, 3) Center for Epidemiologic Studies – Depression Scale (Radloff, 1977), and 4) a Very Short Visual Analog Scale of the Center for Epidemiological Studies – Depression Scale (Moullec et al., 2011). Social support was assessed using two measures: 1) Postpartum Support Questionnaire (Logsdon, Usui, Birkimer, & McBride, 1996) and 2) a Social Support Visual Analog Scale. Daily Stress was assessed using two measures: 1) Perceived Stress Scale (Cohen,

Kamarck, & Mermelstein, 1983) and 2) a Daily Stressful Events Scale. An evaluation of the study was obtained using the Evaluation of Postpartum Women's Study questionnaire. Psychometric evidence for each measure is presented below.

Demographic Information

The Demographic Information Form (see Appendix F) is a brief questionnaire requesting information regarding participants' background (e.g., age, ethnicity, education, marital status), mental health history (e.g., past and present medication and therapy), and maternal status (e.g., number of children, breastfeeding status, recent delivery type). This form was administered to the participants by the PI at the initial appointment. See Table 4 for a summary of all measures administered in this study.

Mood

International Positive and Negative Affect Schedule Short Form (I-PANAS-SF; Thompson, 2007)

The original 20-item PANAS (see Appendices H and I; Watson, Clark, & Tellegen, 1988) has been well-validated and cited in numerous studies, including EMA studies investigating mood (e.g., Ben-Zeev et al., 2009). Reported limitations of this measure include that it may be somewhat long for studies involving multiple measures or assessment points and that it may not be appropriate for non-native English speakers (Thompson, 2007). To address these issues, Thompson (2007) developed and validated the 10-item, internally reliable PANAS and found it to be a psychometrically sound measure of affect. Cronbach alpha coefficients for the positive affect subscale was .78 and negative affect subscale was .76 (Thompson, 2007). Karim, Weisz, and Rehman (2011) examined the I-PANAS-SF in France and Pakistan and found similar internal consistency results for positive and negative affect ($\alpha = .75$ and $\alpha = .80$, respectively). The instructions for the I-PANAS-SF are "Thinking about yourself and how you

normally feel, to what extent do you generally feel…" followed by five items each from the positive affect (alert, inspired, determined, attentive, and active) and negative affect (upset, hostile, ashamed, nervous, and afraid) scales. The response options for each item are on a 5-point Likert-type scale from 1 (*never*) to 5 (*always*). Scores for each scale range from five to 25, with higher scores indicating greater identification with that scale. For the purposes of this study, the instructions and response options were slightly modified to be more appropriate as momentary and weekly retrospective measures. Participants completed the I-PANAS two to three times a day on their Palm Pilot with the instructions, "Thinking about yourself and how you feel right now, to what extent do you feel…" Participants also completed the I-PANAS-SF at their initial and weekly retrospective assessment appointments with the instructions "Thinking about yourself and how you've felt this past week, to what extent did you generally feel…" Response options for both versions ranged from 1 (*very slightly or not at all*) to 5 (*extremely*), consistent with response options from the 20-item PANAS. The I-PANAS-SF took approximately two to three minutes to complete. In the current study the Cronbach alpha coefficient was .85 for the retrospective and .76 for the momentary positive affect subscales. The Cronbach alpha coefficient was .93 for the retrospective and .95 for the momentary negative affect scales.

Mood Visual Analog Scale (Mood VAS)

Visual Analogue Scales (VAS) have been used extensively in studies on mood and numerous studies have provided support for the reliability and validity of VAS measures of daily mood in different populations (e.g., Bromberg, Gil, & Schanberg, 2011; Steiner, Streiner, & Pham, 2005; Kreindler et al., 2003). Participants completed a one-item Mood VAS twice a day on their Palm Pilot (see Appendix J). Participants were presented with instructions to "Use the

stylus to indicate the point on the line below that corresponds to your current mood." The continuous line was anchored with the statements "worst mood ever" and "best mood ever". Participants also completed a one-item Mood VAS (see Appendix K) at their initial and weekly retrospective assessment appointments. The Mood VAS was administered as a paper-and-pencil instrument with instructions to "Use a pen to indicate the point on the line below that corresponds to your mood over the past week". The momentary and weekly versions of the Mood VAS each took less than one minute to complete.

Centers for Epidemiologic Studies – Depression (CES-D) Scale (Radloff, 1977)

The CES-D (see Appendix L) is a 20-item self-report instrument developed to measure depressive symptoms in the past week in the general population. A recent study by Holditch-Davis and colleagues (2014) used the CES-D with mothers of pre-term infants in North Carolina and Illinois. The authors found Cronbach alpha coefficients of .86 to .90 in their sample of postpartum women. An example CES-D item is "I was bothered by things that usually don't bother me" with possible response options ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). A score of 16 or higher is generally considered indicative of mild depressive symptoms and is the most frequently used cut-off score for indicating risk for depression (e.g., Logsdon, Birkimer, & Usui, 2000). The CES-D is routinely administered to all women receiving prenatal services at WCCHC's Women's Health Clinic. For consistency with the prenatal assessment, participants completed the CES-D at initial and weekly retrospective assessment appointments. The CES-D took approximately five minutes to complete. In the current study the Cronbach alpha coefficient was .88.

Table 3. Summary of Participant Involvement

Visit or Contact	Study Day	Purpose	Anticipated Duration
Contact 1	Not applicable	PI scheduled (in-person or over the phone) an initial appointment	5 minutes
Visit 1*	Day 1	Initial appointment reviewed informed consent forms and waivers, training received on Palm Pilot equipment and measures, completion of baseline self-report measures, scheduled all weekly appointments, & received gift card	60-90 minutes
Contact 2	Day 2	PI called participant to problem-solve any difficulties with study procedures	5-10 minutes
Contact 3	Day 7	PI called to remind participant of weekly appointment the next day	1-2 minutes
Visit 2	Day 8	Weekly appointment to download recorded data, completion of weekly self-report measures, & received gift card	30 minutes
Contact 4	Day 14	PI called to remind participant of weekly appointment the next day	1-2 minutes
Visit 3	Day 15	Final appointment to download recorded data, returned Palm Pilot, completion of weekly self-report measures & study evaluation questionnaire, & received gift card. If compliant with study procedures and if interested, participant continued with study for up to two more weeks.	30 minutes
Contact 5 (optional)	Day 21	PI called to remind participant of weekly appointment the next day	1-2 minutes
Visit 4 (optional)	Day 22	Weekly appointment to download recorded data, completion of weekly self-report measures, & received gift card	30 minutes
Contact 6 (optional)	Day 28	PI called to remind participant of weekly appointment the next day	1-2 minutes
Visit 5 (optional)	Day 29	Final appointment to download recorded data, returned Palm Pilot, completion of weekly self-report measures & study evaluation questionnaire, & received gift card. Psychoeducational session was offered.	30 (to 60) minutes
Not applicable	Days 1-15 (optional Days 15-29)	Completion of two to three times daily momentary assessments on Palm Pilot when prompted by beep	5-10 minutes each

Table 4. Summary of Administered Measures

Measure Category	Measure Name	Measure Format	Administration (Number of Times)	Anticipated Duration
Demographic Information	Demographic Information Form	Paper-and-pencil (interviewer administered)	Initial appointment* (1x)	5 minutes
Mood	I-PANAS-SF	Paper-and-pencil	Initial and weekly appointments** (3x^)	2-3 minutes
	I-PANAS-SF	Palm Pilot	2 or 3x/day on Palm Pilot*** (28-84x^^)	2-3 minutes
	Mood VAS	Paper-and-pencil	Initial and weekly appointments (3x)	< 1 minute
	Mood VAS	Palm Pilot	2 or 3x/day on Palm Pilot (28-84x)	< 1 minute
	CES-D	Paper-and-pencil	Initial and weekly appointments (3x)	5-10 minutes
	CES-D-VAS-VS	Palm Pilot	2 or 3x/day on Palm Pilot (28-84x)	1-2 minutes
Social Support	Postpartum Support Questionnaire	Paper-and-pencil	Initial appointment (1x)	10-15 minutes
	Social Support VAS	Paper-and-pencil	Weekly appointments (2x)	1-2 minutes
	Social Support VAS	Palm Pilot	2 or 3x/day on Palm Pilot (28-84x)	1-2 minutes
Stress	Perceived Stress Scale	Paper-and-pencil	Initial and weekly appointments (3x)	3-5 minutes
	Daily Stressful Events Scale	Palm Pilot	2 or 3x/day on Palm Pilot (28-84x)	1-2 minutes
Study Satisfaction	Evaluation of Palm Pilot Study	Paper-and-pencil	Final appointment (1x)	2-3 minutes

Note. I-PANAS-SF = International Positive and Negative Affect Schedule Short Form; VAS = Visual Analog Scale; CES-D = Centers for Epidemiologic Studies – Depression scale; VS = Very Short
*Initial appointment measures anticipated to take approximately 30-40 minutes
**Weekly appointment measures anticipated to take approximately 15-20 minutes
***Each momentary assessment anticipated to take approximately 5-10 minutes
^Number of administration times for two week participation
^^Total possible number of assessments for two or three times a day assessments, respectively

CES-D-VAS-Very Short version (CES-D-VAS-VS; Moullec et al., 2011)

Although the CES-D is a well-validated, and frequently used measure of depression in research and clinical settings, it is not intended to be a daily measure of depression. In addition, it is too lengthy for use in EMA. To address these issues, a French study was conducted to develop and validate a very short (4-item) VAS version of the French CES-D specifically for EMA methodology (Moullec et al., 2011; see Appendix M). The authors found support for the factor validity, reliability (internal consistency = .80), and convergent validity of their 4-item version (1-item for each dimension of the original measure). The four items included: "I am happy," "I talk less than usual," "I have crying spells or feel like it," and "I feel that people dislike me." The continuous line is anchored with the statements "not at all" and "absolutely." Participants completed the CES-D-VAS-VS two to three times a day on their Palm Pilots. The CES-D-VAS-VS took approximately one to two minutes to complete. In the current study the Cronbach alpha coefficient was .75.

Social Support

Postpartum Support Questionnaire (PSQ; Logsdon, Usui, Birkimer, & McBride, 1996)

The PSQ (see Appendix N) is a 34-item instrument developed to assess four categories of support (material, emotional, informational, and comparison). Participants rated each item (e.g., "Needed to talk with another new mother about how to do baby care") on the importance of the support from 0 (*not important*) to 7 (*very important*) and on the support actually received from 0 (*no help*) to 7 (*lot of help*). Total scores range from 0 to 238 with higher scores indicating higher levels of importance or support received. Internal consistency for total scores ranged from .88 to .96 (Logsdon, Usui, Birkimer, & McBride, 1996). As the importance of social support is not likely to vary greatly by day or even by week, participants completed this measure at their initial

assessment appointment only. The PSQ took approximately 5-10 minutes to complete. For this study, the Cronbach alpha coefficient was .97.

Social Support VAS

As previously mentioned, the importance of social support is not likely to vary momentarily, as such, this investigator is not aware of any EMA for social support. Social support VASs assessing how much support is received were constructed for the purposes of this study. The PSQ items were condensed into four VASs assessing the amount of support received since the last beep (see Appendix O). For example, the material support VAS will instruct the participant to rate the statement "Since the last beep, I have received _____ support with gifts or money, running errands, doing household chores, etc." on a continuous line anchored with the statements "no" and "a lot of." Participants completed the four momentary social support VASs two to three times a day on their Palm Pilots.

In addition, participants completed four weekly social support VASs covering material, emotional, informational, and comparison support at their weekly retrospective assessment appointments (see Appendix P). For example, the weekly material support VAS will instruct the participant to rate the statement "During the past week, I have received _____ support with gifts or money, running errands, doing household chores, etc." on a continuous line anchored with the statements "no" and "a lot of". The momentary and weekly versions of the Social Support VASs took approximately one to two minutes to complete. In the current study the Cronbach alpha coefficient was .87.

Daily Stress

Perceived Stress Scale (PSS; Cohen & Williamson, 1988)

The PSS (see Appendix Q) is a 10-item, widely used and well-validated measure for assessing the perception of stress (Cohen & Williamson, 1988). Participants are asked to rate their feelings and thoughts on each item (e.g., "In the last month, how often have you been upset because of something that happened unexpectedly?") from 0 (*never*) to 4 (*very often*). Four positively-worded items (#4, #5, #7, and #8) are reverse scored. Total scores range from zero to 40 with higher scores indicating greater experience of stress. Scores between 12 to 15 are considered 'average' and scores above 20 are considered 'very high'. The authors reported internal consistency of .78 for this measure. A study investigating the PSS with pregnant women taking antidepressants reported a Cronbach coefficient alpha of .90 (Karam et al., 2012). For the purposes of the current study, each item will be modified to begin with "In the last week…" to assess perceived stress at initial and weekly retrospective assessment appointments. The PSS took approximately three to five minutes to complete. For this study, the Cronbach alpha coefficient was .91.

Daily Stressful Events Scale

Similar to other EMA studies assessing stress (e.g., Bylsma et al., 2011; Peeters et al., 2003; Jacobs et al., 2007), the present study assessed momentary stress by asking participants to report their current activity and the most significant event since the last beep using a drop-down menu of options (e.g., paid work, studying, commuting, etc.). For each activity/event, participants were asked to report whether the activity/event was positive or negative and rate the activity/event using three VASs on pleasantness, importance, and stressfulness. Participants completed momentary assessments of stressful events two to three times a day using their Palm Pilots. The Daily Stressful Events Scale (see Appendix R) took approximately two to three minutes to complete.

Participants Evaluation of their Study Experience

The Evaluation of Postpartum Women's Palm Pilot Study (see Appendix G) is a 14-item questionnaire developed for this study to inquire about the participants' experience using the Palm Pilot, answering Palm Pilot questionnaires, and participating in the study in general. Twelve quantitative items were used to obtain feedback from participants about their experience. An example item is "The Palm Pilot was easy to use" with response options on a 4-point Likert-type scale from 1 (*strongly disagree*) to 4 (*strongly agree*). Six of these items are reverse scored. Total scores range from 12 to 48 with higher scores indicating higher levels of ease and satisfaction with the use of the palm pilot and this study. Two open-ended questions were used to obtain qualitative information about participants' experience in this study. An example item was "What did you like the most about this study?" This questionnaire was administered at the final appointment and took approximately two to three minutes to complete. For this study, the Cronbach alpha coefficient was .77.

Statistical Analyses

Data Reduction

To conduct analyses on measures of positive and negative mood, Pearson product-moment correlations between multiple measures of mood were examined to determine whether they share enough variance to justify aggregating scores. Raw positive and negative mood scores were totaled for each measure and converted to their corresponding z-scores. Z-scores are measures that quantify the distance each data point is from the mean of a data set and are frequently used to create a single composite score from multiple measures of the same construct that differ in their metric or normal distribution (Haynes, Smith, & Hunsley, 2011, pg. 211). Z-scores were combined to construct positive and negative momentary and retrospective mood

scores. Positive momentary mood scores were comprised of the five positive affect items on the I-PANAS-SF and the positive mood items on the Mood VAS and CES-D-VAS-VS. Negative momentary mood scores were comprised of the five negative affect items on the I-PANAS-SF and the negative mood items on the Mood VAS and CES-D-VAS-VS. Positive retrospective mood scores were comprised of the five positive affect items on the I-PANAS-SF and the positive mood items on the Mood VAS and CES-D. Negative momentary mood scores were comprised of the five negative affect items on the I-PANAS-SF and the negative mood items on the Mood VAS and CES-D. Each composite z-score was then divided by three (average of the three measures) to serve as the participant's final score. The resulting composite z-score is assumed to be a more valid measure of the construct because it reduces the idiosyncratic error associated with each individual measure.

Descriptive Statistics

Data collected from the Demographic Information Form at the initial appointment and the Evaluation of Palm Pilot Study and the final appointment were used to describe the participants in this study. Frequency, means and standard deviations for participants on these measures are presented.

EMA versus Retrospective Data Analyses

To estimate the degree of concordance between two to three times a day momentary and weekly retrospective assessments of mood, social support, and stressors, average weekly momentary scores were calculated and compared to weekly retrospective scores for each measure. Descriptive information for each participant (e.g., means, standard deviations) is reported. Data from each measure at each of four weekly time points were compared to average weekly EMA measures using percent of agreement.

Multivariate Time Series Regression Analyses

EMA data were analyzed via a series of multivariate time-series regression analyses. Multivariate time-series regression models are forms of multiple regression models in which the dependent (or outcome) variable and two or more independent (or predictor) variables are recorded over time. As such, autocorrelation, or the extent to which a given observation is predicted by regression terms given by previous observations of the same variable, in addition to the regression coefficient of the independent variable, must be considered. Therefore, each time-series analysis was be subjected to a Ljung-Box (Ljung-Box, 1978) test for autocorrelation of residuals.

The proportions of variance in positive and negative mood explained by daily stress and social support were examined using a step-wise time series regression equations. Data were analyzed using the IBM Statistical Package for the Social Sciences Program Version 22 (SPSS v. 22) Grad Pack Premium Forecasting Module to examine multivariate relations for each participant.

CHAPTER 3

RESULTS

Study Participation

Participants were considered "study completers" if they completed an average of two to three palm pilot assessments every day for at least two weeks. Participants varied in their level of participation in this study from the minimally required two times a day assessments for two weeks to the maximally allowed three times a day assessments for four weeks. On average, participants completed three weeks (M=23.8 days, SD=6.1 days) and about 60 daily assessments (M=59.2, SD=14.5) during this study. See Table 5 for a summary of participant's participation in this study.

Table 5. Number of Anticipated and Actual Days and Measurement Points.

Participant #	# Anticipated Measurement Days	# Actual Measurement Days	# of Anticipated Measurement Points[a]	# Actual Measurement Points	# Missing Measurement Points
1	14	21	42	63	1
2	14	28	42	73	11
3	14	31	42	67	26
4	14	27	42	64	17
5	14	22	42	60	6
6	14	14	28	28	0

[a]Anticipated measurement points were estimated by multiplying the participant's chosen number of daily assessments (i.e.., two or three) by 14 days.

Retrospective Measures of Mood and Affect

Across the six participants, the mean CES-D score at the initial appointment was 18.8 (SD=10.4). One half of the participants scored above 16 on the CES-D, indicating a clinically significant level of depressive symptoms. This is consistent with the eligibility criteria on recruiting women with a history of or current symptoms of depression or stress.

Table 6 presents each participant's mean weekly retrospective measures (i.e., from paper-and-pencil questionnaires) averaged across all assessment sessions for positive and negative affect (the positive and negative affect subscales of the Positive and Negative Affect Scale), positive and negative mood (the respective scaled scores of the Mood Visual Analog Scale), and positive and negative CES-D (the positive and negative items on the Center for Epidemiological Studies Depressive Scale). All participants completed at least three (i.e., initial, post-week 1 and post-week 2) weekly retrospective assessments. Participants #1 and #5 completed one additional assessment and Participants #2-4 completed two additional assessments.

Table 6. Means and Standard Deviations of Retrospective Positive and Negative Mood Raw Scores by Participant Averaged Across All Assessment Sessions.

Participant #	Positive Affect[a]		Negative Affect[a]		Positive Mood[b]		Negative Mood[b]		Positive CES-D[c]		Negative CES-D[c]	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	9.00	4.08	5.50	.58	37.50	9.15	0.00	0.00	10.75	.50	7.00	3.16
2	19.40	1.14	7.00	1.73	13.20	12.30	2.60	4.78	4.40	2.97	13.80	6.22
3	16.80	.45	5.80	.84	.400	.89	14.00	9.30	3.60	1.14	19.40	4.51
4	13.20	6.61	12.00	8.72	9.60	10.71	19.20	26.30	7.40	2.70	14.60	11.70
5	17.50	1.73	5.50	.58	24.75	16.52	0.00	0.00	11.25	.96	4.75	4.50
6	10.33	1.53	5.33	.58	6.67	6.51	.33	.58	9.00	1.00	2.00	0.00

[a]Positive and Negative Affect scores derived from respective subscales of the International Positive and Negative Affect Scale Short Form (possible scores range from 5 to 25 with higher scores indicating increased positive or negative affect).
[b]Positive and Negative Mood scores derived from Mood Visual Analogue scale (possible scores range from 0 to 50 with higher scores indicating higher positive or negative mood).
[c]CES-D=Centers for Epidemiological Studies Depression scale. Positive CES-D scores derived from the four reverse-scored items of the CES-D (scores range from 0 to 12 with higher scores indicating less depressed mood). Negative CES-D scores derived from the remaining 12 items of the CES-D (scores range from 0 to 48 with higher scores indicating more depressed mood).

Retrospective Measures of Social Support and Stress

Table 7 presents each participant's average retrospective measure scores for social support (from the Total Help Subscale of the Postpartum Support Questionnaire for Time 1 and Social Support Visual Analogue Scale for Time Points 2 through 5) and stress (from the Perceived Stress Scale).

Table 7. Means and Standard Deviations of Retrospective Raw Social Support and Stress Scores by Participant Averaged Across All Assessments.

Participant #	PSQ: Help subscale score at Initial visit	Social Support Visual Analogue Scale		Perceived Stress Scale	
		Mean	SD	Mean	SD
1	227	188.0	35.6	18.3	3.0
2	63	117.8	43.8	21.4	8.3
3	76	112.0	48.5	22.0	4.5
4	83	241.3	62.4	21.6	10.8
5	197	301.0	83.5	10.3	7.8
6	130	118.0	35.4	8.3	2.1

Note. PSQ=Postpartum Support Questionnaire (possible scores range from 0 to 236 with higher scores indicating higher self-reported social support) was administered at the Initial visit only. Social Support Visual Analogue Scale (possible scores range from 0 to 400 with higher scores indicating higher self-reported help from social support) was administered at all subsequent visits. PSS=Perceived Stress Scale (possible scores range from 0 to 40 with higher scores indicating higher self-reported stress) was administered at Initial and all subsequent visits.

Momentary Measures of Positive and Negative Affect

Table 8 presents each participant's average momentary time-sampled measures (from Palm Pilot) for positive and negative affect (the positive and negative affect subscales of the International Positive and Negative Affect Scale Short Form), positive and negative mood (the respective scaled scores of the Mood Visual Analog Scale), and positive and negative CES-D (the positive and negative items on the Very Short Center for Epidemiological Studies Depressive Scale Visual Analog Scale). Graphs of each participant's momentary positive and negative affect scores over time are presented in Figures 2-7.

Table 8. Means and Standard Deviations of Momentary Positive and Negative Mood Raw Scores by Participant Averaged Across All Assessment Points.

Participant #	Positive Affect[a]		Negative Affect[a]		Positive Mood[b]		Negative Mood[b]		Positive CES-D[c]		Negative CES-D[c]	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	6.25	1.41	5.02	.13	34.22	10.49	0	0	89.49	7.74	2.05	11.78
2	16.94	4.77	5.21	.78	28.84	18.10	1.84	7.20	78.82	25.06	4.93	12.70
3	16.58	1.63	5.24	.63	0.39	1.51	22.45	12.39	26.19	13.61	144.73	45.27
4	14.11	5.85	7.78	5.14	7.14	8.44	5.89	12.76	53.17	16.99	20.00	38.20
5	15.48	3.94	5.20	.66	27.48	12.15	.63	3.11	94.43	11.82	1.03	8.00
6	10.64	3.05	5.61	1.17	6.04	9.61	4.86	9.25	52.54	14.11	9.29	17.78

[a]Positive and Negative Affect scores derived from respective subscales of the International Positive and Negative Affect Scale Short Form (possible scores range from 5 to 25 with higher scores indicating higher positive or negative affect).
[b]Positive and Negative Mood scores derived from Mood Visual Analogue scale (possible scores range from 0 to 50 with higher scores indicating higher positive or negative mood).
[c]CES-D=Centers for Epidemiological Studies Depression scale. Positive CES-D scores derived from the one positive item of the CES-D-VAS (scores range from 0 to 100 with higher scores indicating less depressed mood). Negative CES-D scores derived from the three negative items of the CES-D-VAS (scores range from 0 to 300 with higher scores indicating more depressed mood).

Figures 2-7 show z-score transformed measures of the three positive and negative subscales (relabeled as “Positive Affect” and “Negative Affect”) across EMA measurement time points for each participant.

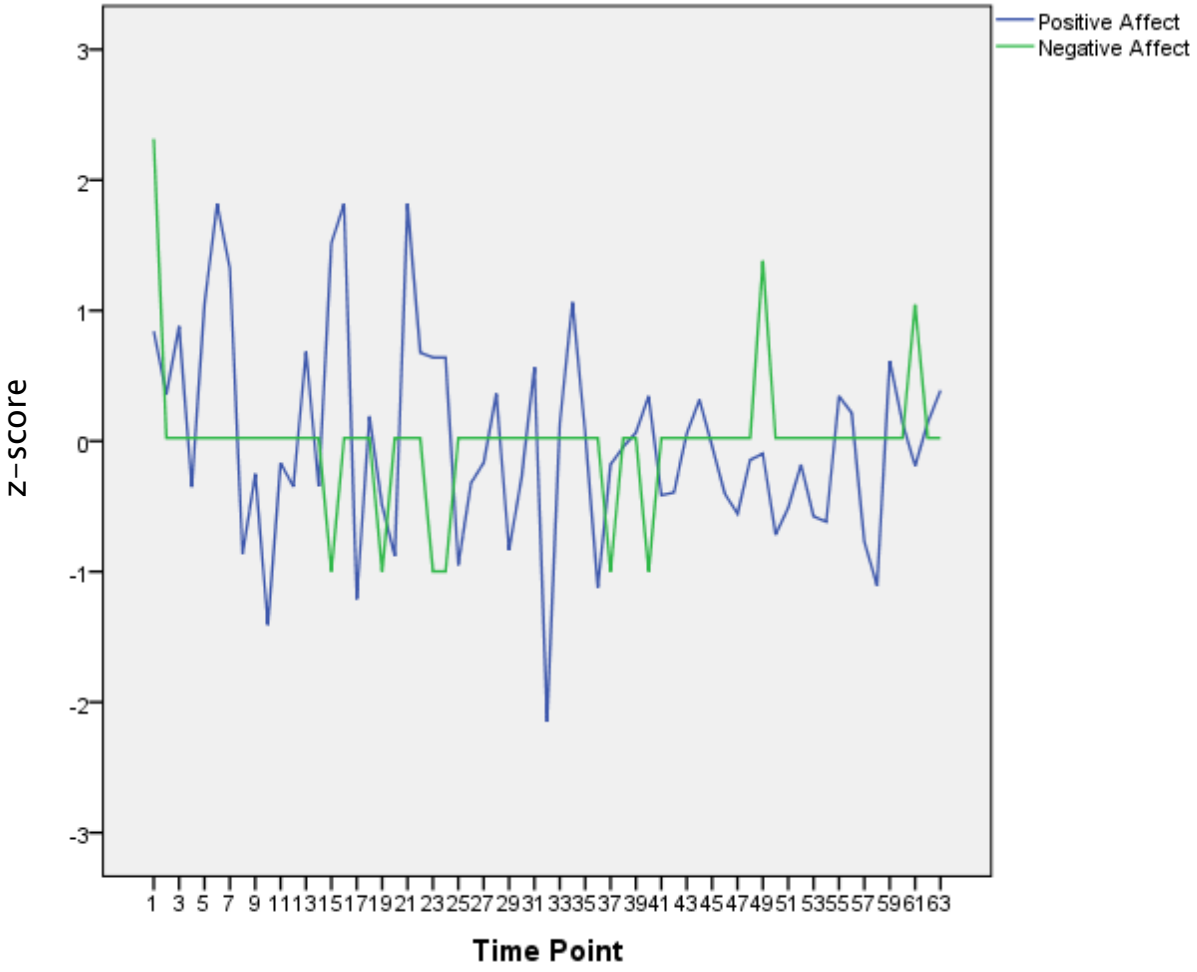


Figure 2. Positive and Negative Affect Scores across Time Points for Participant #1.

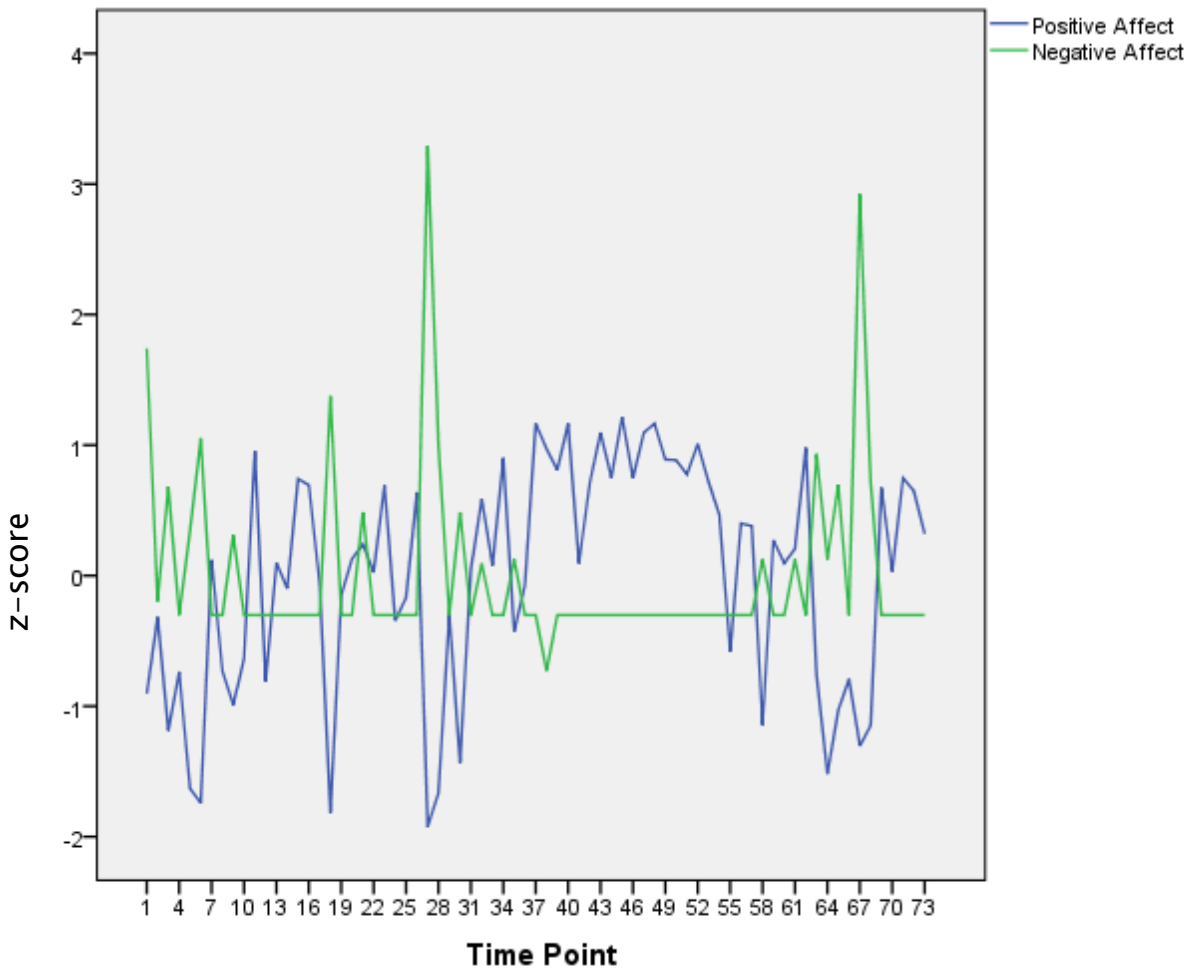


Figure 3. Positive and Negative Affect Scores across Time Points for Participant #2.

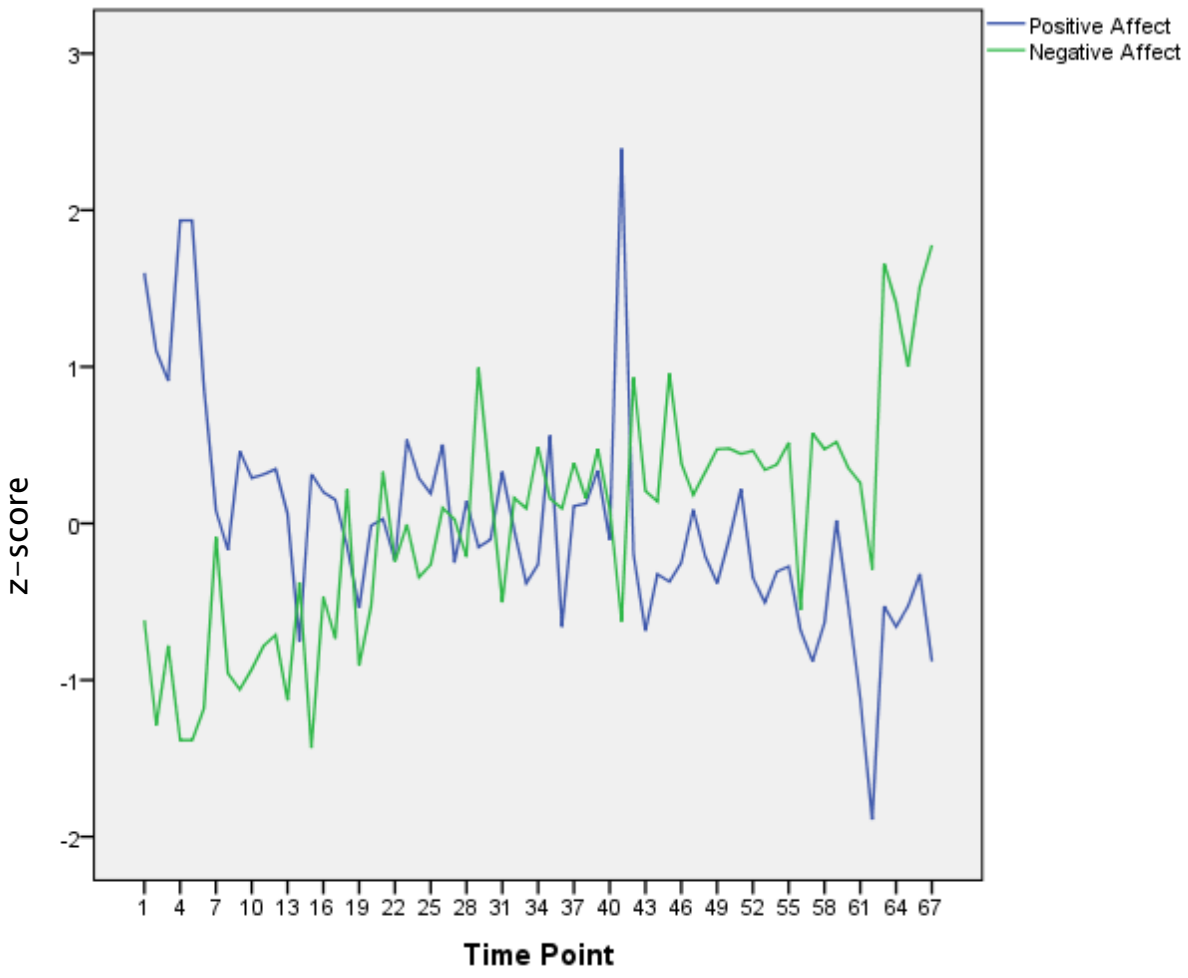


Figure 4. Positive and Negative Affect Scores across Time Points for Participant #3.

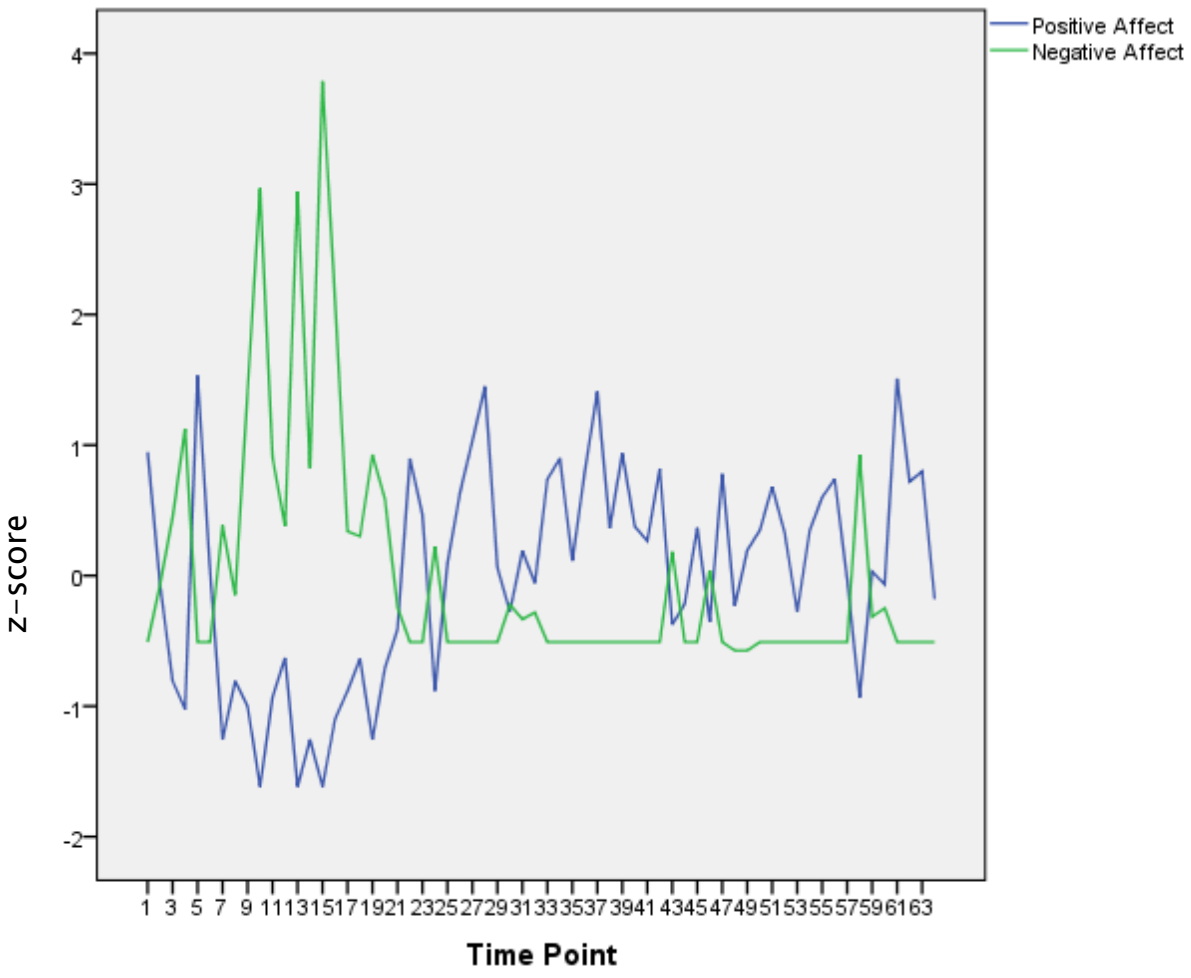


Figure 5. Positive and Negative Affect Scores across Time Points for Participant #4.

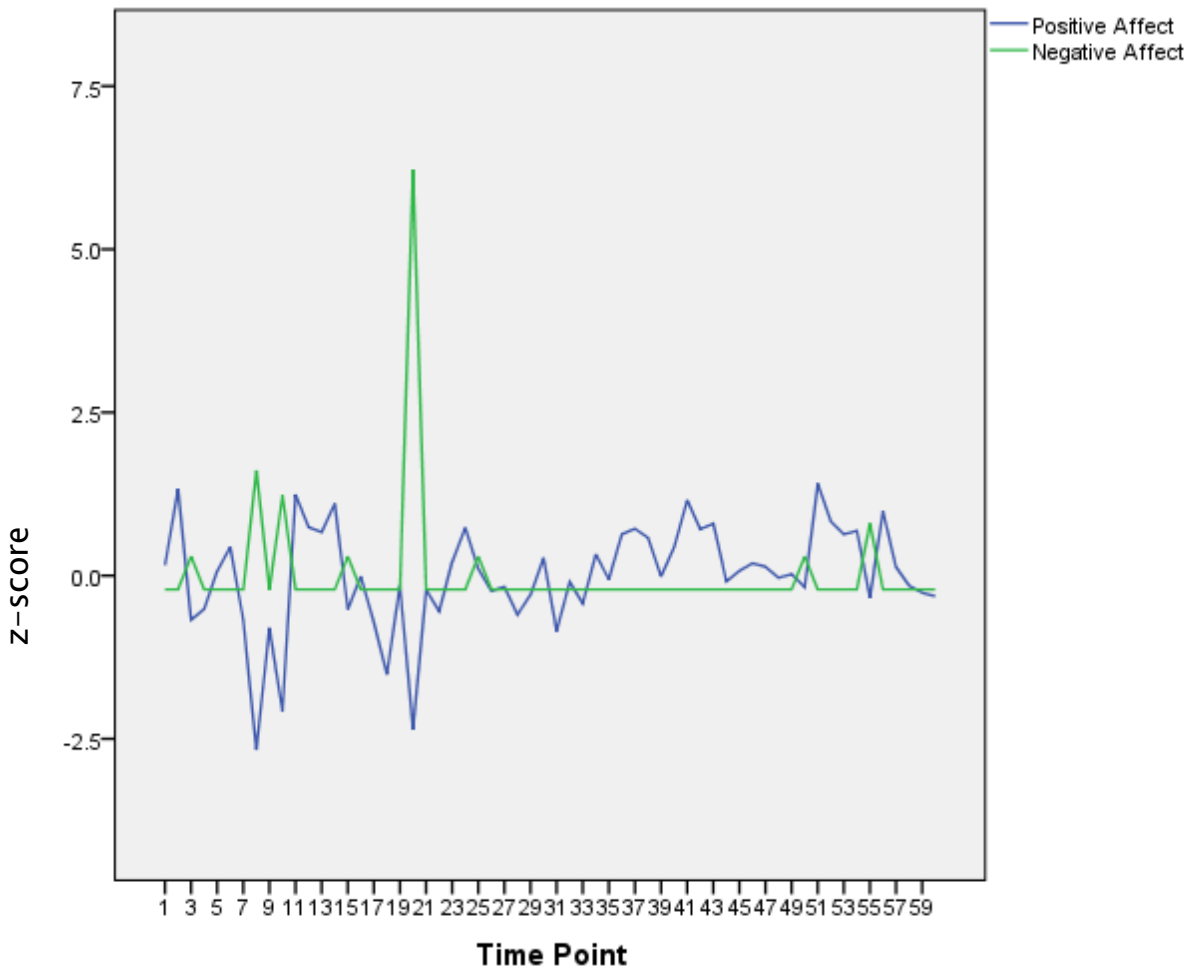


Figure 6. Positive and Negative Affect Scores across Time Points for Participant #5.

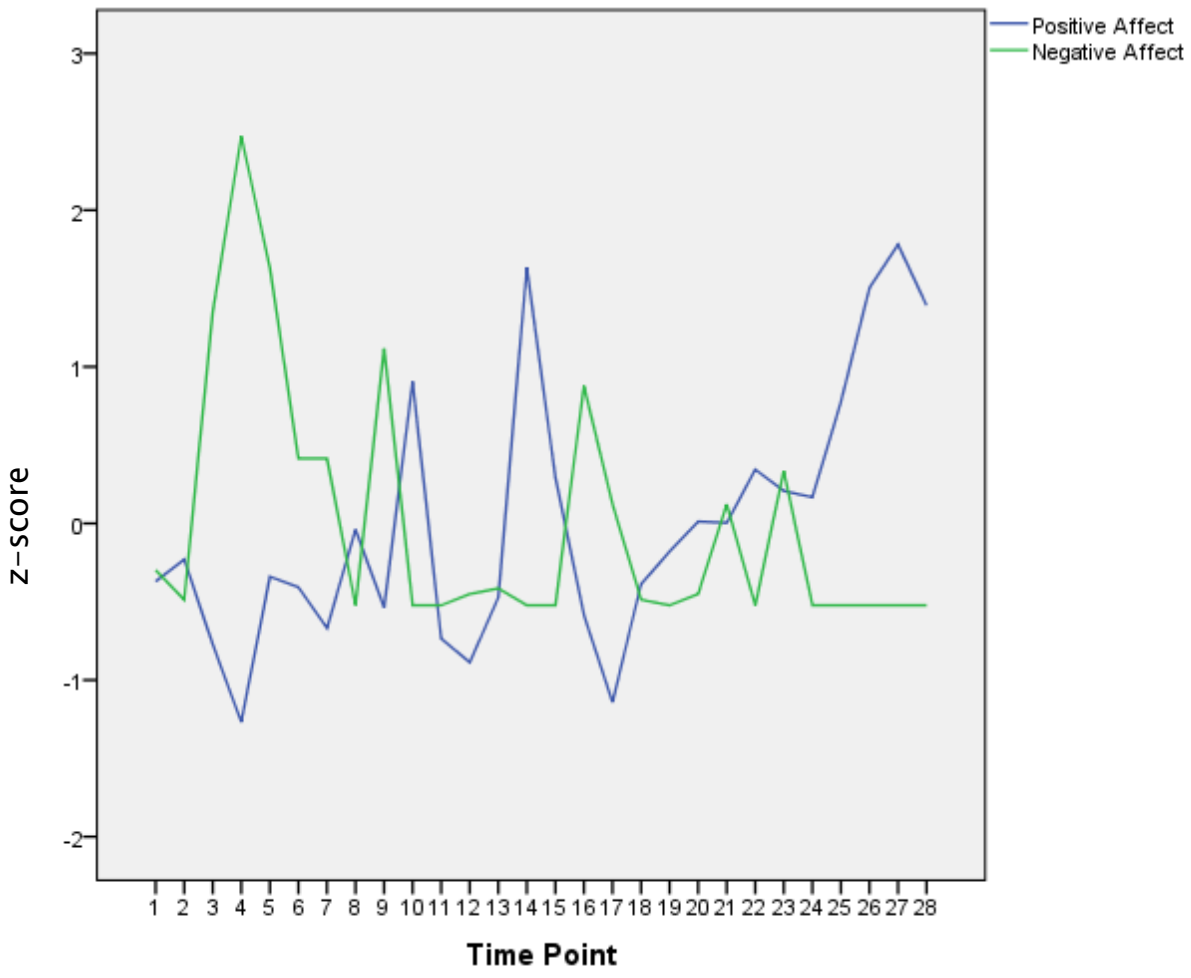


Figure 7. Positive and Negative Affect Scores across Time Points for Participant #6.

The relationship between positive affect (as measured by the positive items of the I-PANAS-SF, mood VAS and CES-D-VAS) and negative affect (as measured by the negative items of the I-PANAS-SF, mood VAS and CES-D-VAS on the Palm Pilot) for each participant was investigated using Pearson product-moment correlation coefficients. See Table 9 for a summary of the results. There was a significant negative correlation between positive and negative affect over time for five (Participants #2 through #6) of the six participants. The correlation between positive and negative affect for Participant #1 was not significant (r=-.04,

Table 9. Pearson Product-Moment Correlation Coefficients between Momentary Positive and Negative Affect for each Participant.

Participant #	Number of Time Points	Pearson Correlation	Sig. (2-tailed)*
1	63	-.04	.762
2	73	-.66	.000
3	67	-.55	.000
4	64	-.77	.000
5	60	-.57	.000
6	28	-.53	.004

*p<.05

n=63, p=.762), suggesting the possibility that her responses to EMA questionnaires may have been random. Due to this concern, data from Participant #1 was excluded from further analyses.

Momentary Measures of Social Support and Stress

Table 10 presents each participant's momentary scores for social support (from the Social Support Visual Analog Scale) and stress (from the Daily Stressful Events Scale items) averaged across all Palm Pilot measurements. As previously stated, data from Participant #1 is excluded due to concerns with the validity of her data.

Retrospective vs. Ecological Momentary Assessment Data Analyses

As previously mentioned, short versions of assessment instruments were used for Palm Pilot assessments to decrease the burden on participants. Assessments were found to adequately measure the same constructs (e.g., positive affect). Therefore, not all assessment instruments used for the retrospective weekly assessments (i.e., CES-D, PSS) were used for the momentary assessments and the relationships between end-of-the-week retrospective and average weekly momentary measures were examined only for positive and negative affect, positive and negative

Table 10. Average Momentary Social Support and Stress Scores by Participant.

Participant #	Number of Time Points	Social Support VAS		Perceived Stress	
		Mean	SD	Mean	SD
2	73	60.00	55.90	35.22	32.20
3	67	92.43	34.63	112.55	32.87
4	64	129.42	102.36	49.91	45.65
5	60	206.55	62.03	53.67	46.34
6	28	105.04	37.44	53.50	50.08

Note. Social Support VAS= Social Support Visual Analogue Scale (possible scores range from 0 to 400 with higher scores indicating higher self-reported help from social support). Perceived Stress score derived from the two stress items on the Daily Stressful Events Scale (possible scores range from 0 to 200 with higher scores indicating higher levels of stress).

mood, and social support. The correlation between the two assessment methods were not calculated due to the small sample sizes (i.e., ranging from two to four comparisons). Instead, the relationship between the two assessment methods (i.e., raw retrospective score vs. average weekly EMA score) was examined using percent of agreement (Berk 1979; McDermott, 1988), calculated by dividing the smaller value into the larger value for each construct (i.e., positive affect, negative affect, etc.). The method (i.e., retrospective or EMA) attributed to the larger value was noted. See Table 11 for a summary of percent agreement between retrospective and EMA methods for each participant.

Positive Affect

As indicated in Table 11, percent of agreement between retrospective and EMA measures of positive affect (using the I-PANAS-SF subscale) for Participant #2 ranged between 72.1% and

Table 11. Percent Agreement between Measures of Retrospective and Ecological Momentary Assessment for Participants #2 through #6.

Participant #	Week #	Positive Affect	Negative Affect	Positive Mood	Negative Mood	Social Support
2	1	85.31[a]	86.00[a]	*	20.09[a]	84.41[a]
	2	90.39[a]	87.83[a]	69.96	*	39.69[a]
	3	97.86[a]	83.33[a]	53.22	100[a]	53.64[a]
	4	72.10[a]	77.43[a]	93.24	*	47.44[a]
3	1	98.88[a]	96.34	*	37.84[a]	72.64[a]
	2	99.71	85.17[a]	100[a]	42.21	74.13[a]
	3	100[a]	96.71	*	71.15	84.28
	4	94.63[a]	79.57[a]	100[a]	64.44	84.24[a]
4	1	73.73[a]	60.33[a]	*	31.51[a]	93.22[a]
	2	73.69	100[a]	81.40[a]	*	58.60[a]
	3	85.95[a]	97.47	36.54[a]	*	42.48[a]
	4	91.23[a]	88.81	57.33[a]	*	37.05[a]
5	1	84.94[a]	89.67[a]	96.69[a]	*	55.53[a]
	2	76.47[a]	98.81	74.25[a]	100[a]	79.81[a]
	3	91.17[a]	97.28	84.08[a]	100[a]	78.76[a]
6	1	87.30[a]	84.60	55.86[a]	*	85.95[a]
	2	99.00[a]	92.42	57.00[a]	*	99.50

[a]Retrospective method value was equal to or larger than momentary method value.
[*]When scores were zero, the percent of agreement was zero no matter how far apart the two scores were because the smaller number (i.e. zero) was in the numerator. One exception was if both scores were zero, the percent of agreement was 100%.
Note. Positive and Negative Affect scores were computed from respective subscales of the International Positive and Negative Affect Scale Short Form. Positive and Negative Mood scores were computed from the Mood Visual Analogue Scale. Social Support scores were computed from the Social Support Visual Analogue Scale.

97.86% across four time points (i.e., four weeks). Percent of agreement for Participant #3 ranged between 94.63% and 100% across four time points. Percent agreement for Participant #4 ranged from 65.75% to 85.95%. Percent agreement for Participant #5 ranged from 76.47% to 91.17% across three time points. Percent agreement for Participant #6 ranged from 87.30% to 99.00% across two time points. Retrospective measures of positive affect were equal to or larger than momentary measures for 88.24% (i.e., 15 out of 17) of the comparisons.

Negative Affect

Percent of agreement between retrospective and EMA measures of negative affect (using the I-PANAS-SF subscale) for Participant #2 ranged from 77.43% to 87.83% across four time points (i.e., four weeks). Percent of agreement for Participant #3 ranged from 79.57% to 96.71% across four time points. Percent of agreement for Participant #4 ranged from 60.33% to 100% across four time points. Percent of agreement for Participant #5 ranged from 89.67% to 98.81% across three time points. Percent of agreement for Participant #6 ranged from 84.60% to 92.42% across two time points. Retrospective measures of negative affect were equal to or larger than momentary measures for about half (52.94%) of the comparisons.

Positive Mood

Percent of agreement between retrospective and EMA measures of positive mood (using the Mood Visual Analogue Scale) for Participant #2 was 0% for one time point and ranged from 53.22% to 93.24% across the remaining three time points. Of note, when scores were zero, the percent of agreement was zero no matter how far apart the two scores were because the smaller number (i.e. zero) was in the numerator. Percent of agreement for Participant #3 was 0% for two time points and 100% for the other two time points. Percent agreement for Participant #4 was 0% for one time point and ranged from 57.33% to 81.40% across the remaining three time

points. Percent agreement for Participant #5 ranged from 74.33% to 96.69% across three time points. Percent agreement for Participant #6 ranged from 55.86% to 57.00% across two time points. Retrospective measures of positive mood were equal to or larger than momentary measures for about half (58.82%) of the comparisons.

Negative Mood

Percent of agreement between retrospective and EMA measures of negative mood (using the Mood Visual Analogue Scale) for Participant #2 was 0% for two time points, 20.09% for one time point and 100% for the fourth time point. Percent of agreement for Participant #3 ranged from 37.84% to 71.15%. Percent of agreement for Participant #4 was 0% for three time points and 31.51% for the fourth time point. Percent of agreement for Participant #5 was 0% for one time point and 100% for the remaining two time points. Percent of agreement for Participant #6 was 0% for both time points. Retrospective measures of negative mood were equal to or larger than momentary measures for 35.29% (i.e., six out of 17) of the comparisons.

Social Support

Percent of agreement between retrospective and EMA measures of social support (using the Social Support Visual Analogue Scale) for Participant #2 ranged from 39.69% to 84.41% across four time points (i.e., four weeks). Percent of agreement for Participant #3 ranged from 72.64% to 84.28% across four time points. Percent of agreement for Participant #4 ranged from 37.05% to 93.22% across four time points. Percent of agreement for Participant #5 ranged from 55.51% to 79.81% across three time points. Percent of agreement for Participant #6 ranged from 85.95% to 99.50% across two time points. Retrospective measures of social support were equal to or larger than momentary measures for 88.24% (i.e., 15 out of 17) of the comparisons.

Management of Missing Data for Time-Lagged Time Series Analyses

Five of the six participants missed at least one time-sampled data point throughout the study. Missing measures did not affect the concurrent time series analyses (0-order correlations between affect, social support and stress). However, the data was transformed for the time-series analyses. If a whole day was missing (three data points), the day was excluded from the analyses. If just one data point was missing, the previous data point was used in the analyses. No participant missed two data points on the same day.

Multivariate Time Series Regression Analyses of Relationships Among Positive Affect, Negative Affect, Social Support and Stress

The proportions of variance in positive and negative mood explained by daily stress and social support were examined using multivariate time series regression equations. Multivariate time-series regression models are forms of multiple regression models in which the dependent (or outcome) variable and two or more independent (or predictor) variables are recorded over time. As such, autocorrelation, or the extent to which a given observation is predicted by regression terms given by previous observations of the same variable, in addition to the regression coefficient of the independent variable, must be considered. Therefore, each time-series analysis was subjected to a Ljung-Box (Ljung-Box, 1978) test for autocorrelation of residuals. The Ljung-Box statistic provides an indication as to whether the model is correctly specified. A significance value of less than .05 indicates that there is structure in the observed series that is not accounted for by the model (Ljung and Box, 1978). The R^2 values are only significantly affected by Mean Residual Autocorrelation Function (ACF) at lag 1 if its value is less than -.2 or greater than .2.

Tables 12-16 present the results for the following analyses of concurrently measured variables (using z-score transformed composite scores for each construct): the results of the Ljung-Box test, the mean Residual ACF at lag 1 for the criterion variable, whether or not significant autocorrelation was present, the regression coefficient R^2 value, change in R^2 value with the addition of a predictor variable (i.e., social support and the interaction between stress and social support), model parameters including *t* and *p* values, and whether or not the independent variables (i.e., stress, social support and the interaction) were significant predictors of positive and negative affect using Autoregressive Integrated Moving Average (ARIMA) models from the SPSS Forecasting Time Series Modeler program. Figures 8-17 illustrate concurrent measured positive affect, stress and social support and negative affect, stress and social support over time for each participant.

Table 12. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #2 (*n*=73).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variables(s)
Model 1: PA Stress	.075	.271	No	.265		t=-5.053 p=.000	Stress
Model 2: PA Stress Social Support	.034	.297	Yes	.286	.021	t=1.443 p=.153	Stress
Model 3: PA Stress Social Support Interaction	.014	.312	Yes	.290	.004	t=.611 p=.543	Stress
Model 1: NA Stress	.971	.111	No	.215		t=4.412 p=.000	Stress
Model 2: NA Stress Social Support	.883	.134	No	.252	.037	t=-1.856 p=.068	Stress
Model 3: NA Stress Social Support Interaction	.770	.154	No	.264	.012	t=-1.043 p=.301	Stress

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

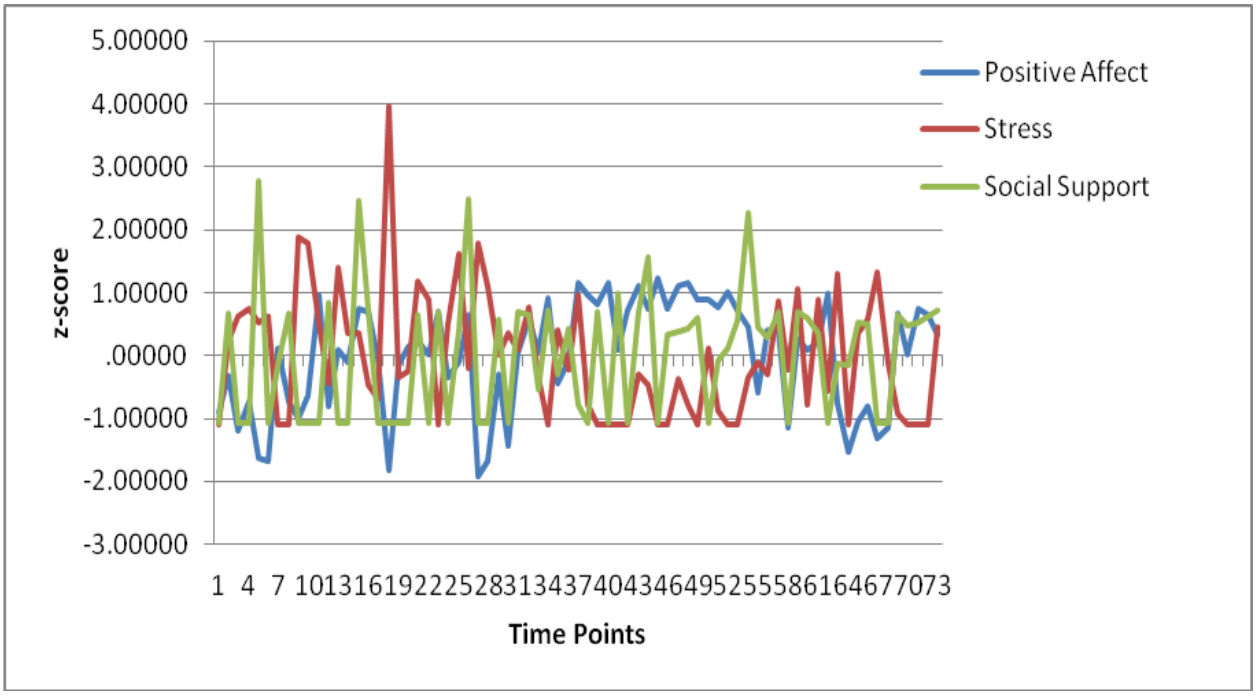


Figure 8. Positive Affect, Stress and Social Support across Time Points for Participant #2.

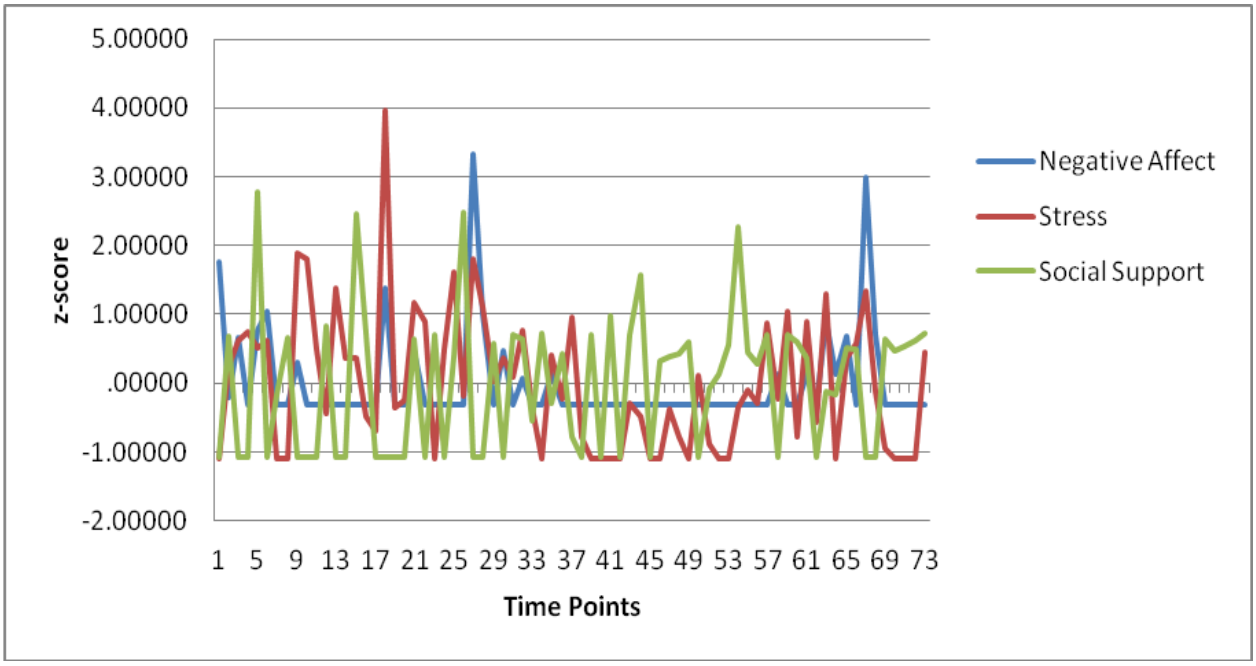


Figure 9. Negative Affect, Stress and Social Support across Time Points for Participant #2.

Table 13. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #3 (*n*=67).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variables(s)
Model 1: PA Stress	.190	.307	No	.288		t=-5.129 p=.000	Stress
Model 2: PA Stress Social Support	.517	.150	No	.363	.075	t=2.752 p=.008	Stress Social Support
Model 3: PA Stress Social Support Interaction	.716	.118	No	.382	.019	t=-1.364 p=.177	Stress Social Support
Model 1: NA Stress	.000	.359	Yes	.252		t=4.683 p=.000	Stress
Model 2: NA Stress Social Support	.003	.212	Yes	.350	.098	t=-3.111 p=.003	Stress Social Support
Model 3: NA Stress Social Support Interaction	.002	.222	Yes	.372	.022	t=-1.475 p=.145	Stress Social Support

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

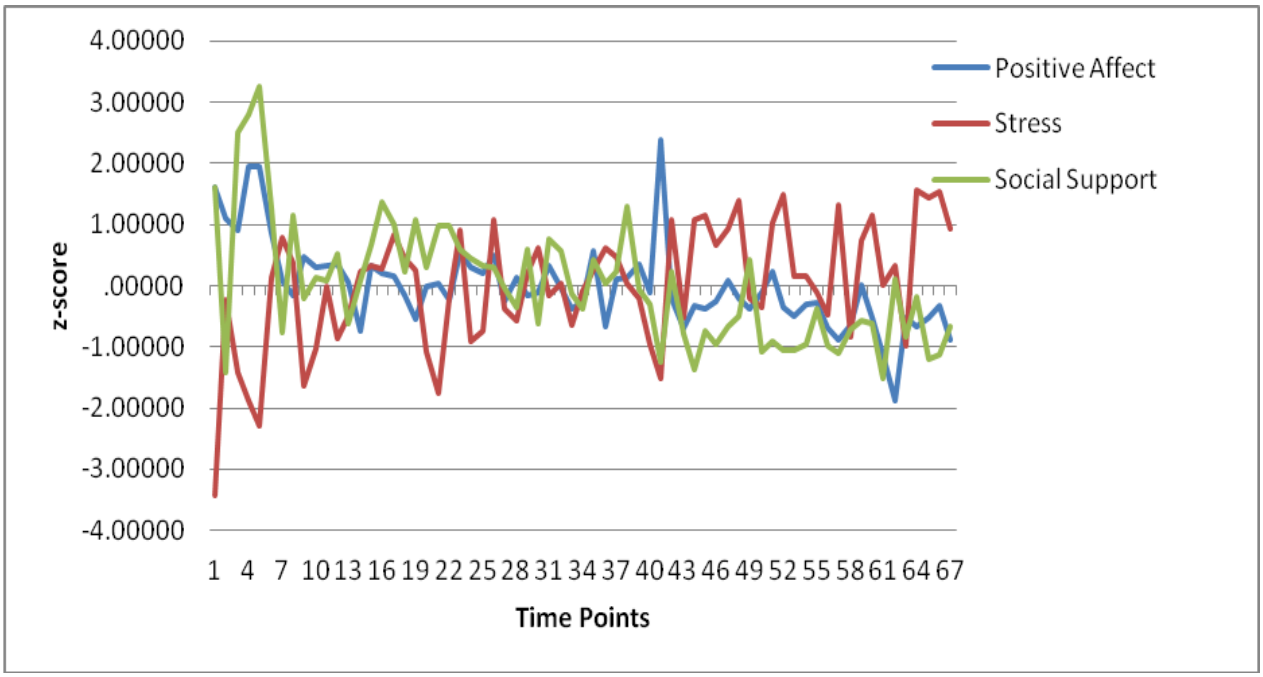


Figure 10. Positive Affect, Stress and Social Support across Time Points for Participant #3.

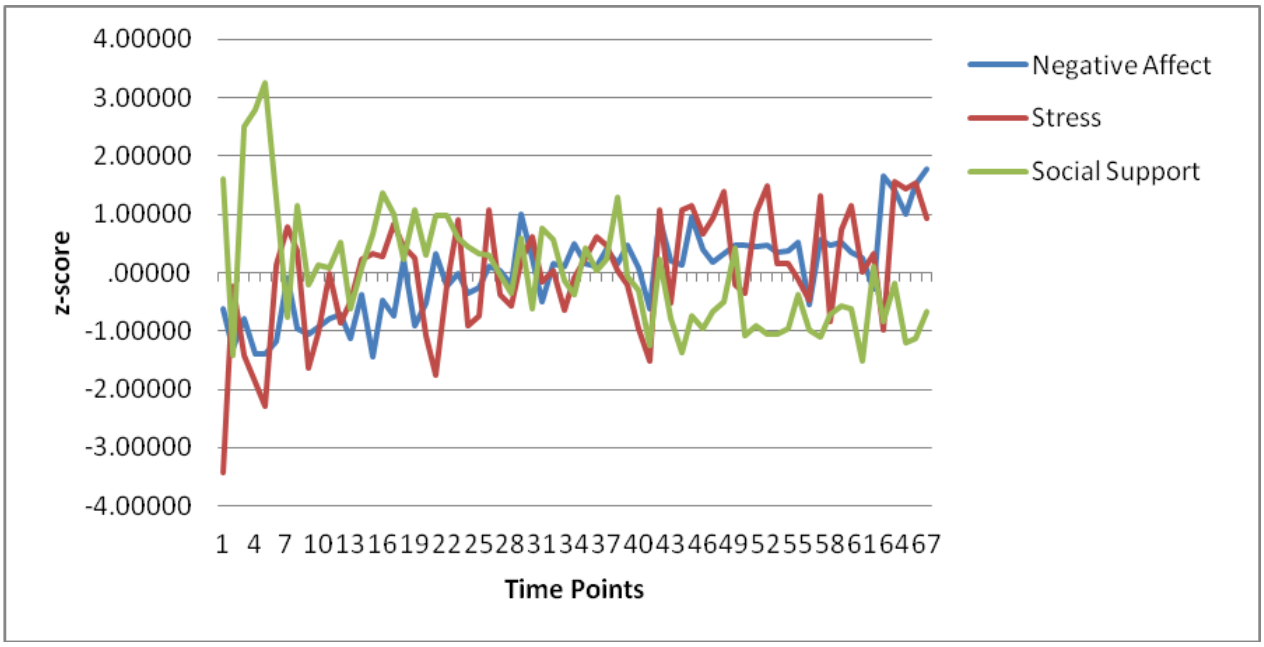


Figure 11. Negative Affect, Stress and Social Support across Time Points for Participant #3.

Table 14. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #4 (*n*=64).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Stress	.000	.517	Yes	.000		t=.034 p=.973	None
Model 2: PA Stress Social Support	.000	.518	Yes	.021	.021	t=1.136 p=.260	None
Model 3: PA Stress Social Support Interaction	.000	.524	Yes	.022	.001	t=-.222 p=.825	None
Model 1: NA Stress	.000	.541	Yes	.009		t=-.745 p=.459	None
Model 2: NA Stress Social Support	.000	.556	Yes	.024	.015	t=-.968 p=.337	None
Model 3: NA Stress Social Support Interaction	.000	.555	Yes	.024	.000	t=-.057 p=.954	None

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

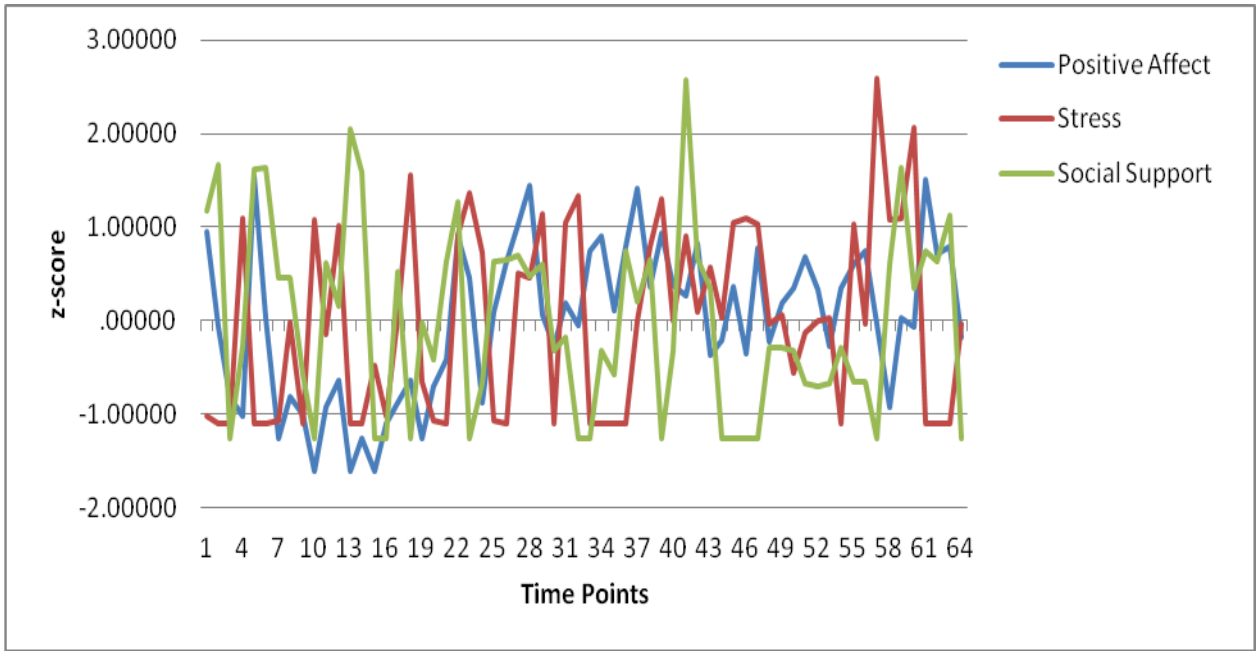


Figure 12. Positive Affect, Stress and Social Support acoress Time Points for Participant #4.

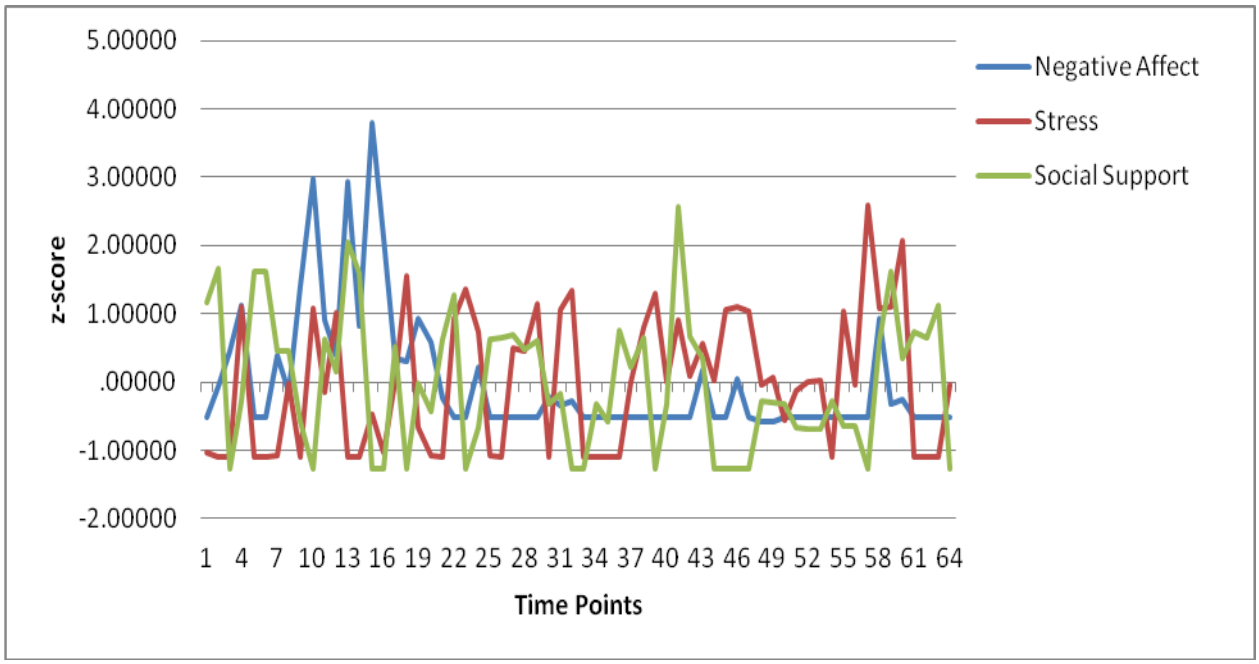


Figure 13. Negative Affect, Stress and Social Support across Time Points for Participant #4.

Table 15. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #5 (*n*=60).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Stress	.027	.254	Yes	.093		t=-2.434 p=.018	Stress
Model 2: PA Stress Social Support	.040	.226	Yes	.096	.003	t=-.429 p=.670	Stress
Model 3: PA Stress Social Support Interaction	.080	.235	No	.156	.060	t=1.994 p=.051	Stress
Model 1: NA Stress	.998	-.037	No	.054		t=1.823 p=.073	None
Model 2: NA Stress Social Support	.973	.051	No	.126	.072	t=-2.57 p=.035	Social Support
Model 3: NA Stress Social Support Interaction	.913	.075	No	.182	.056	t=-1.964 p=.054	Social Support

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

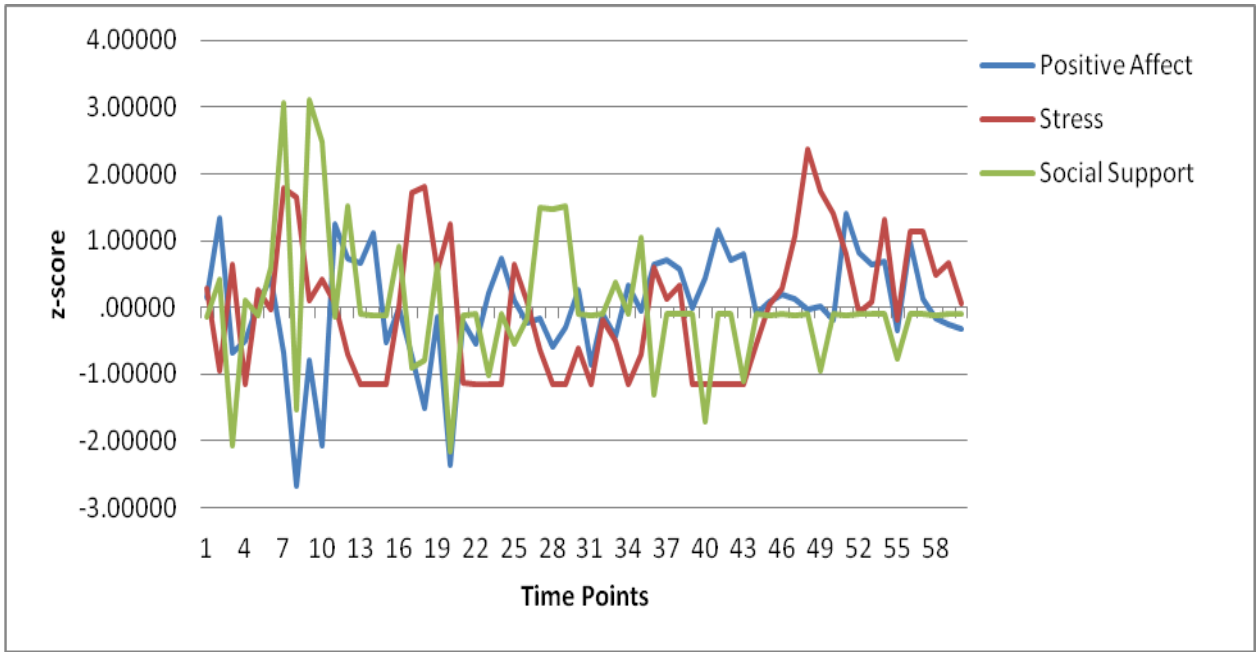


Figure 14. Positive Affect, Stress and Social Support across Time Points for Participant #5.

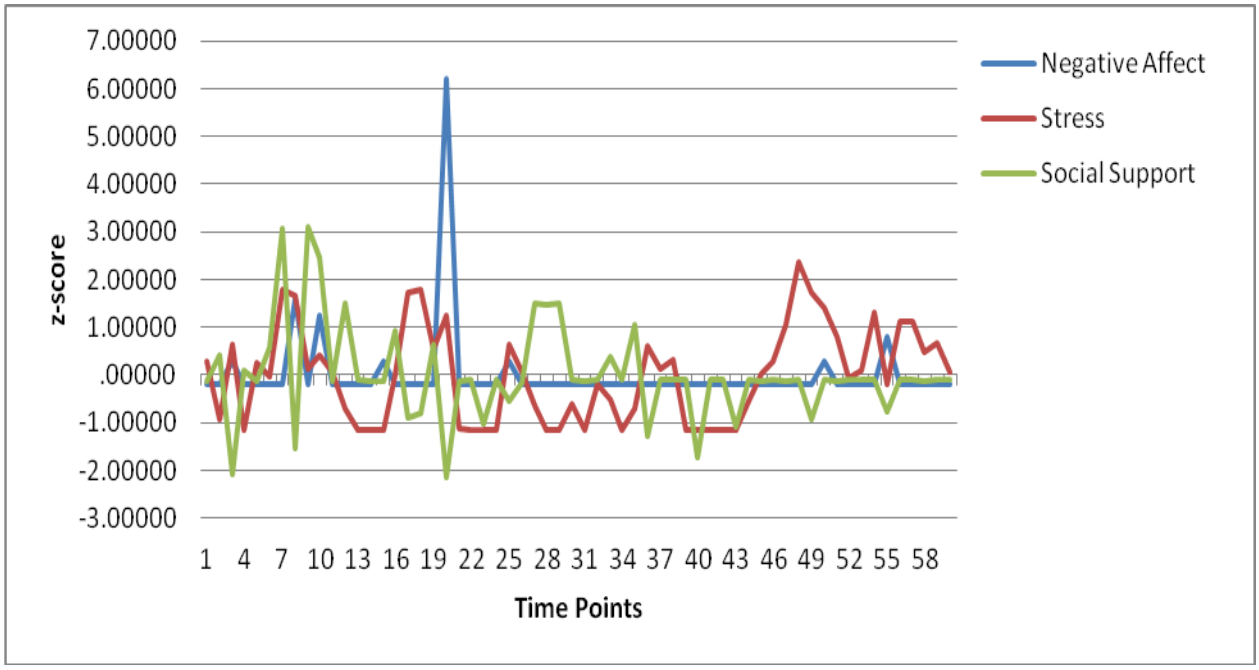


Figure 15. Negative Affect, Stress and Social Support across Time Points for Participant #5.

Table 16. Relationship between Concurrent Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #6 (*n*=28).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Stress	.062	.415	No	.216		t=-2.679 p=.013	Stress
Model 2: PA Stress Social Support	.055	.379	No	.227	.011	t=-.599 p=.555	Stress
Model 3: PA Stress Social Support Interaction	.086	.305	No	.236	.009	t=.518 p=.609	Stress
Model 1: NA Stress	.291	.452	No	.259		t=3.017 p=.006	Stress
Model 2: NA Stress Social Support	.389	.454	No	.279	.020	t=.834 p=.412	Stress
Model 3: NA Stress Social Support Interaction	.364	.463	No	.280	.001	t=.158 p=.876	Stress

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

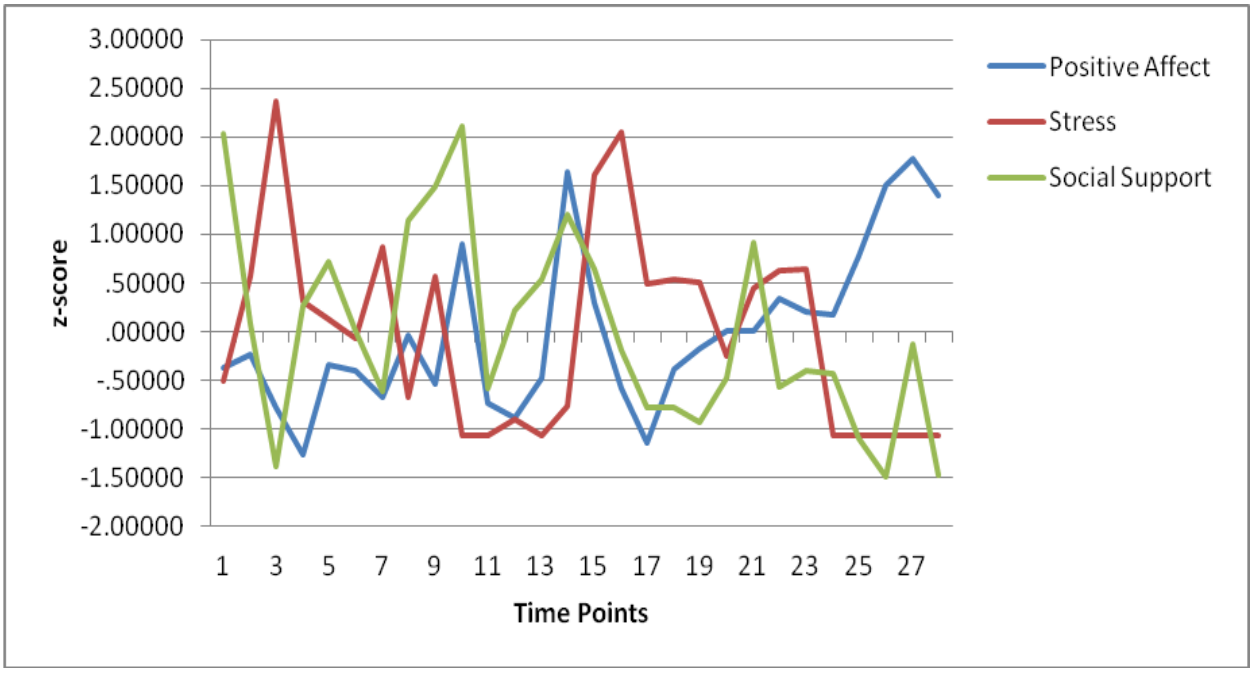


Figure 16. Positive Affect, Stress and Social Support across Time Points for Participant #6.

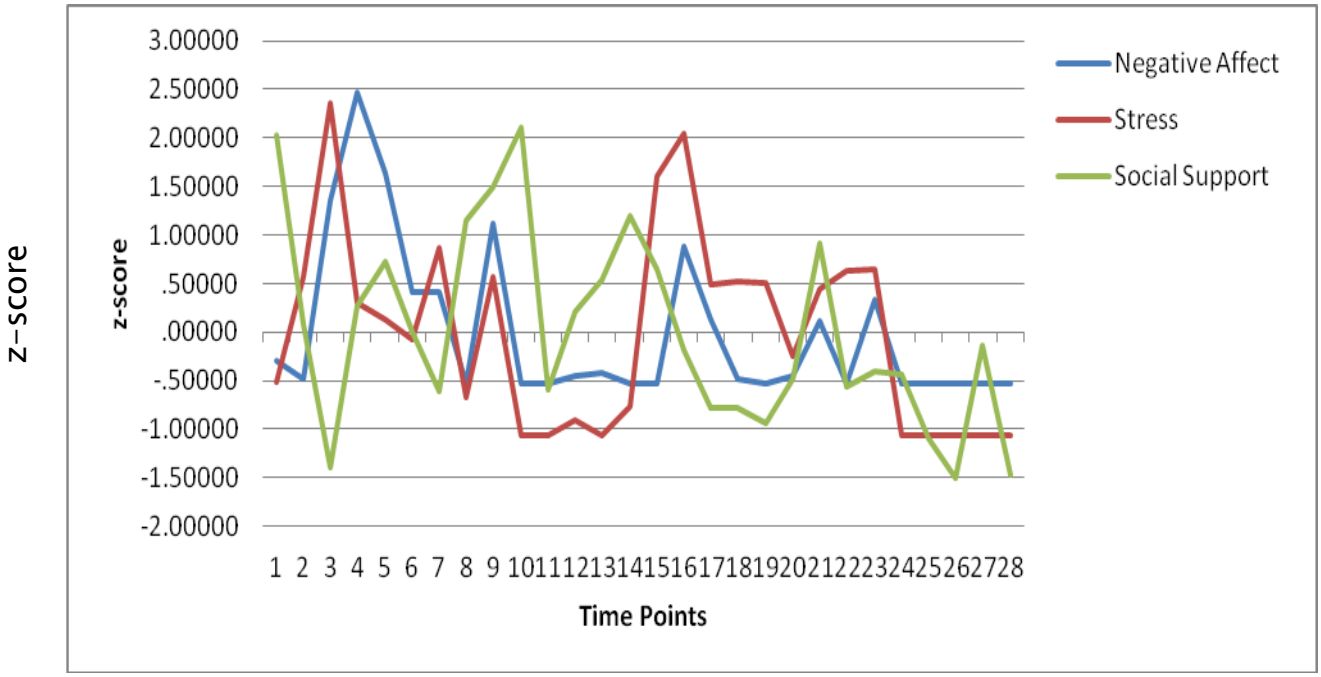


Figure 17. Negative Affect, Stress and Social Support across Time Points for Participant #6.

Autocorrelation Results for Concurrent Analyses

The means of the residual ACF at lag 1 and the results of the Ljung-Box test for concurrent analyses of: a) positive affect stress were significant for Participants #4 and #5, b) positive affect and social support were significant for Participants #1, #4 and #5, and c) positive affect and the interaction between stress and social support were significant for Participants #1 and #4. The means of the residual ACF at lag 1 and the results of the Ljung-Box test for concurrent analyses of negative affect and stress, social support and the interaction of stress and social support were significant for Participants #3 and #4. Therefore, there is structure in the observed series that is not accounted for by the model.

Concurrent Relationships between Positive Affect, Negative Affect, Stress and Social Support

Positive Affect and Stress

The degree to which variance in positive affect was accounted for by concurrent measures of stress was significant for Participants #2, #3, #5 and #6. However, autocorrelation significantly affected the model for Participant #5.

Positive Affect and Social Support

The degree to which variance in positive affect was accounted for by concurrent measures of social support was significant for only Participant #3.

Positive Affect and Interaction between Stress and Social Support

The degree to which variance in positive affect was accounted for by the interaction of stress and social support in concurrent analyses was not significant for any participant. However, the p-value approached significance for Participant #5 (p=.051).

Negative Affect and Stress

The degree to which variance in negative affect was accounted for by concurrent measures of stress was significant for Participants #2, #3 and #6 However, autocorrelation significantly affected the model for Participant #3.

Negative Affect and Social Support

The degree to which variance in negative affect was accounted for by concurrent measures of social support was significant for Participants #3 and #5. However, autocorrelation significantly affected the model for Participant #3.

Negative Affect and Interaction between Stress and Social Support

The degree to which the proportion of variance in negative affect was accounted for by the interaction of stress and social support was not significant for all participants. However, the p-value approached significance for Participant #5 (p=.054).

Time-Lagged Time Series Analyses Between Positive Affect, Negative Affect, Social Support and Stress

Time-lagged analyses were run to examine the relationship between positive and negative affect and the previous time point's stress, social support and the interaction between stress and social support. Tables 17-21 present the results for the following time-lagged analyses (using z-score transformed composite scores for each construct): the results of the Ljung-Box test, the mean Residual ACF at lag 1 for the criterion variable, whether or not significnat autocorrelation was present, the regression coefficient R^2 value, change in R^2 value with the addition of a predictor variable (i.e., social support and the interaction between stress and social support), model parameters including *t* and *p* values, and whether or not the independent variables (i.e., stress, social support and the interaction) were significant predictors of positive and negative

affect using Autoregressive Integrated Moving Average (ARIMA) models from the SPSS Forecasting Time Series Modeler program. Figures 18-27 illustrate time-lagged measured positive affect, stress and social support and negative affect, stress and social support over time for each participant.

Table 17. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #2 (*n*=72).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Lag 1 Stress	.028	.320	Yes	.064		t=-2.185 p=.032	Stress
Model 2: PA Lag 1 Stress Lag 1 Social Support	.046	.326	Yes	.076	.013	t=-.939 p=.351	Stress
Model 3: PA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.080	.332	No	.083	.007	t=-.732 p=.467	Stress
Model 1: NA Lag 1Stress	.902	.102	No	.002		t=.399 p=.691	None
Model 2: NA Lag 1 Stress Lag 1 Social Support	.881	.102	No	.055	.053	t=1.953 p=.055	None
Model 3: NA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.927	.095	No	.067	.012	t=.943 p=.349	None

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

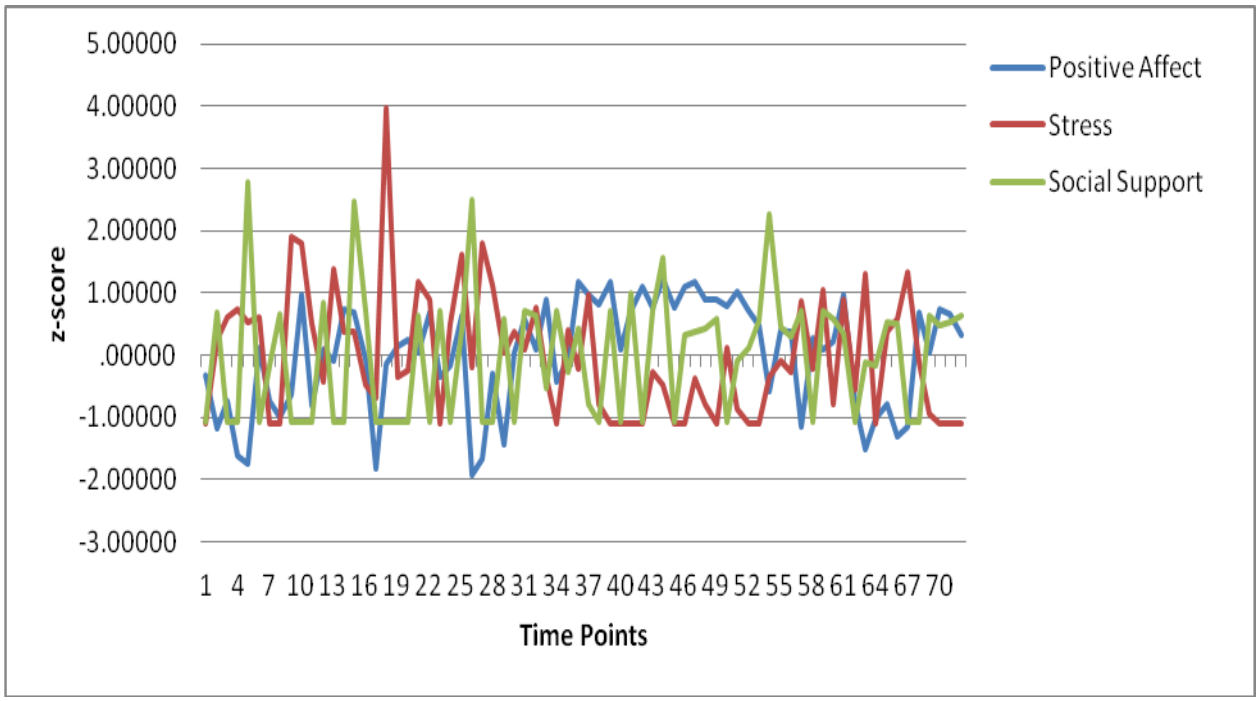


Figure 18. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #2.

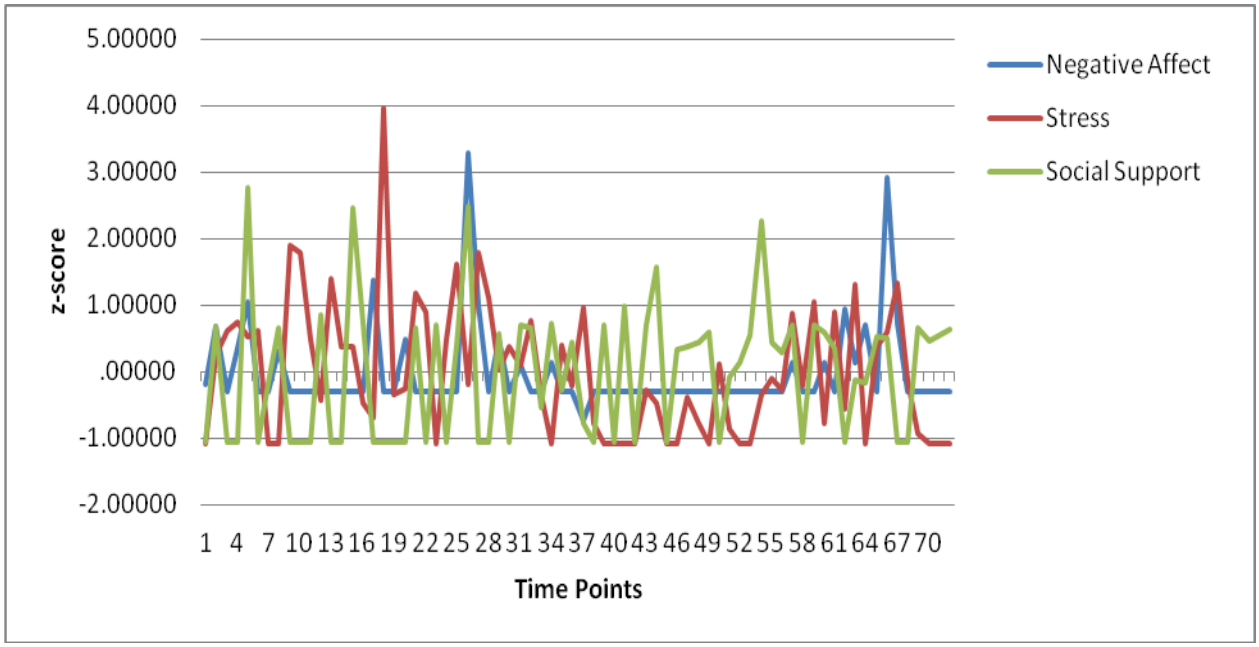


Figure 19. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #2.

Table 18. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #3 (*n*=66).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Lag 1 Stress	.567	.231	No	.255		t=-4.685 p=.000	Stress
Model 2: PA Lag 1 Stress Lag 1 Social Support	.709	.175	No	.388	.133	t=3.691 p=.000	Stress Social Support
Model 3: PA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.846	.160	No	.393	005	t=-.698 p=.488	Stress Social Support
Model 1: NA Lag 1Stress	.000	.410	Yes	.194		t=3.924 p=.000	Stress
Model 2: NA Lag 1 Stress Lag 1 Social Support	.024	.320	Yes	.337	.143	t=-3.680 p=.000	Stress Social Support
Model 3: NA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.023	.322	Yes	.337	.000	t=.089 p=.930	Stress Social Support

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

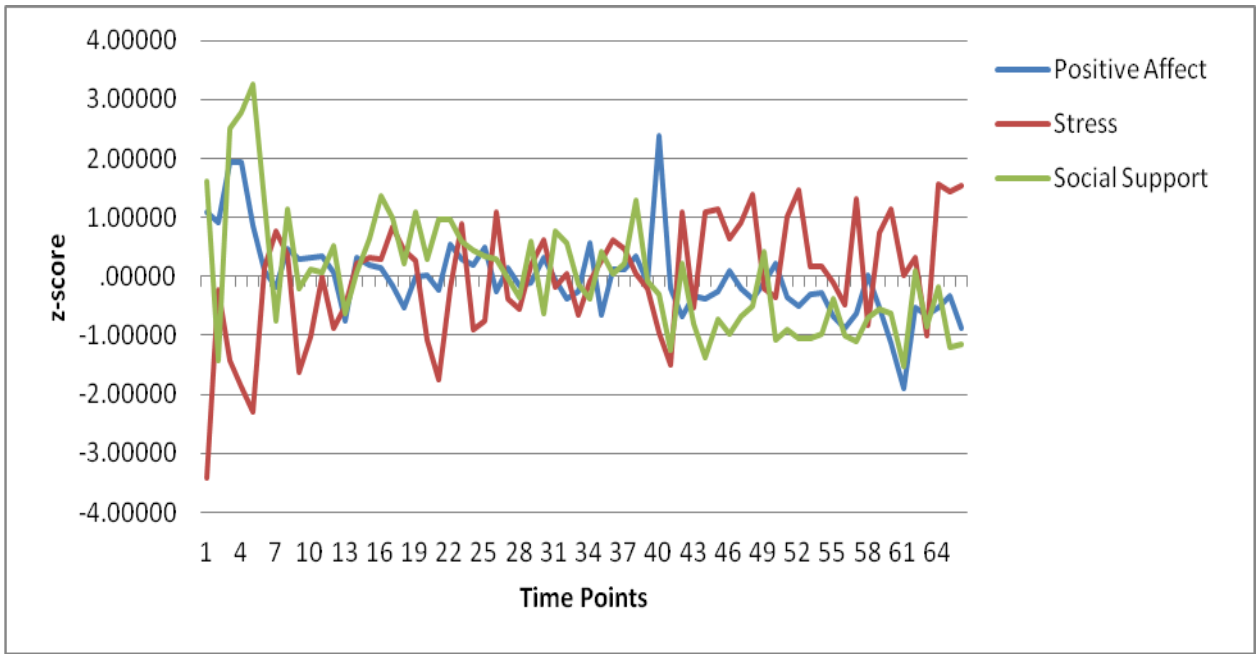


Figure 20. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #3.

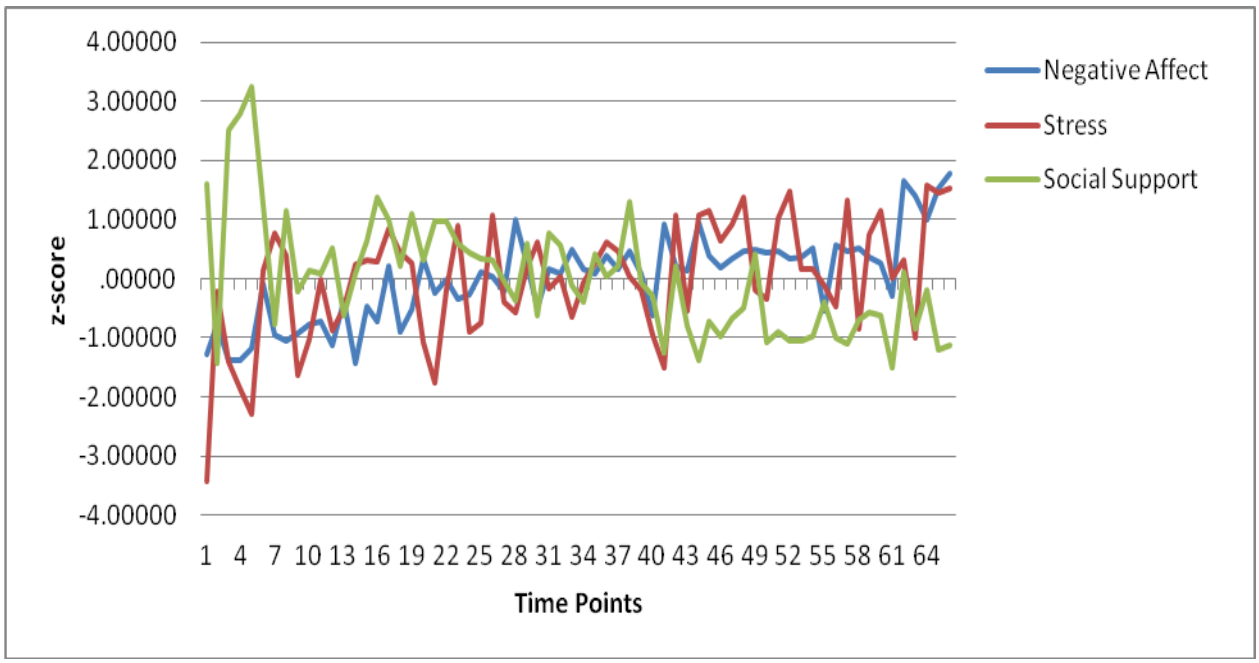


Figure 21. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #3.

Table 19. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #4 (*n*=63).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Lag 1 Stress	.000	.528	Yes	.006		t=.588 p=.599	None
Model 2: PA Lag 1 Stress Lag 1 Social Support	.000	.538	Yes	.009	.003	t=.470 p=.640	None
Model 3: PA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.000	.521	Yes	.066	.057	t=1.902 p=.062	None
Model 1: NA Lag 1Stress	.000	.538	Yes	.006		t=-.608 p=.545	None
Model 2: NA Lag 1 Stress Lag 1 Social Support	.000	.540	Yes	.006	.000	t=-.090 p=.928	None
Model 3: NA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.000	.522	Yes	.026	.020	t=-1.096 p=.277	None

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

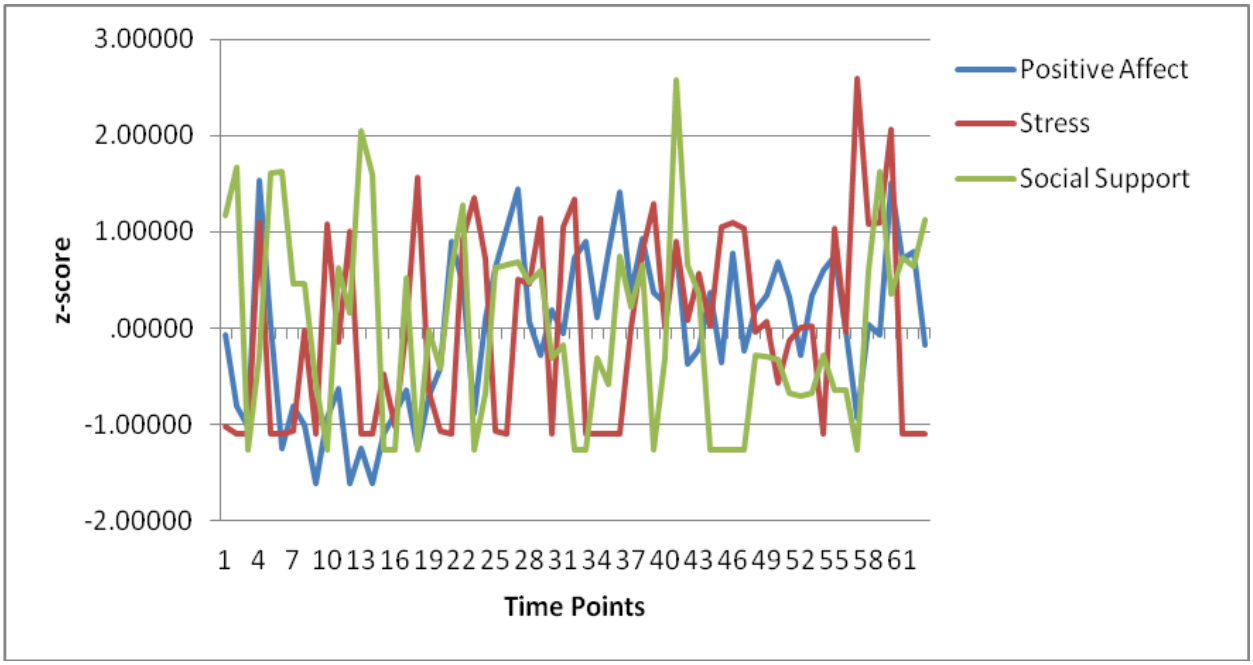


Figure 22. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #4.

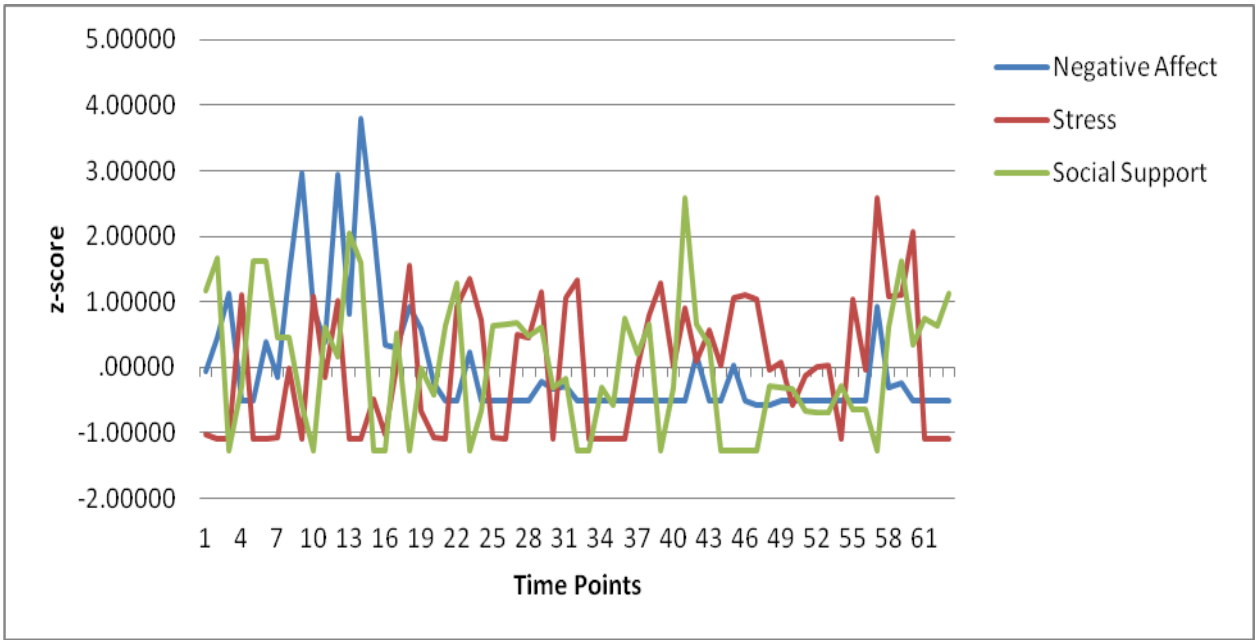


Figure 23. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #4.

Table 20. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #5 (*n*=59).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Lag 1 Stress	.023	.191	No	.066		t=-2.002 p=.050	Stress
Model 2: PA Lag 1 Stress Lag 1 Social Support	.122	.252	No	.173	.107	t=-.2.691 p=.009	Stress Social Support
Model 3: PA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.083	.262	No	.175	.002	t=-.419 p=.667	Stress Social Support
Model 1: NA Lag 1Stress	.894	-.124	No	.021		t=1.098 p=.277	None
Model 2: NA Lag 1 Stress Lag 1 Social Support	.973	-.002	No	.100	.079	t=2.220 p=.031	Social Support
Model 3: NA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.988	.043	No	.128	.028	t=1.336 p=.187	Social Support

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

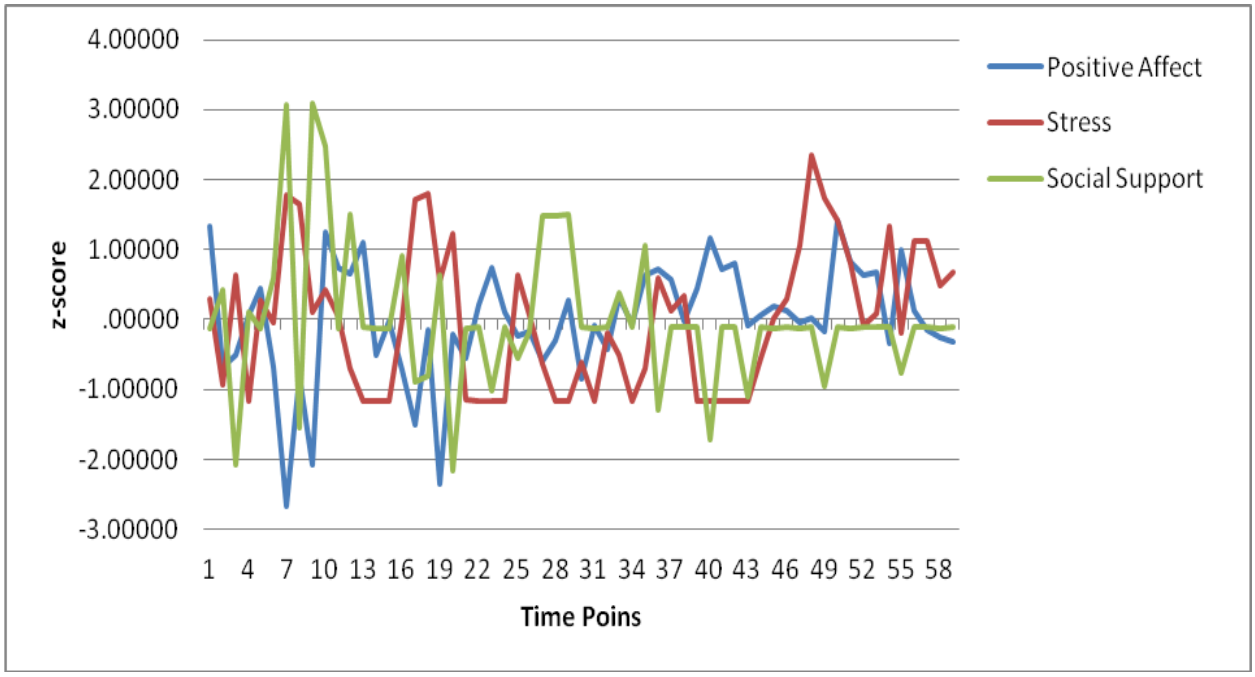


Figure 24. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #5.

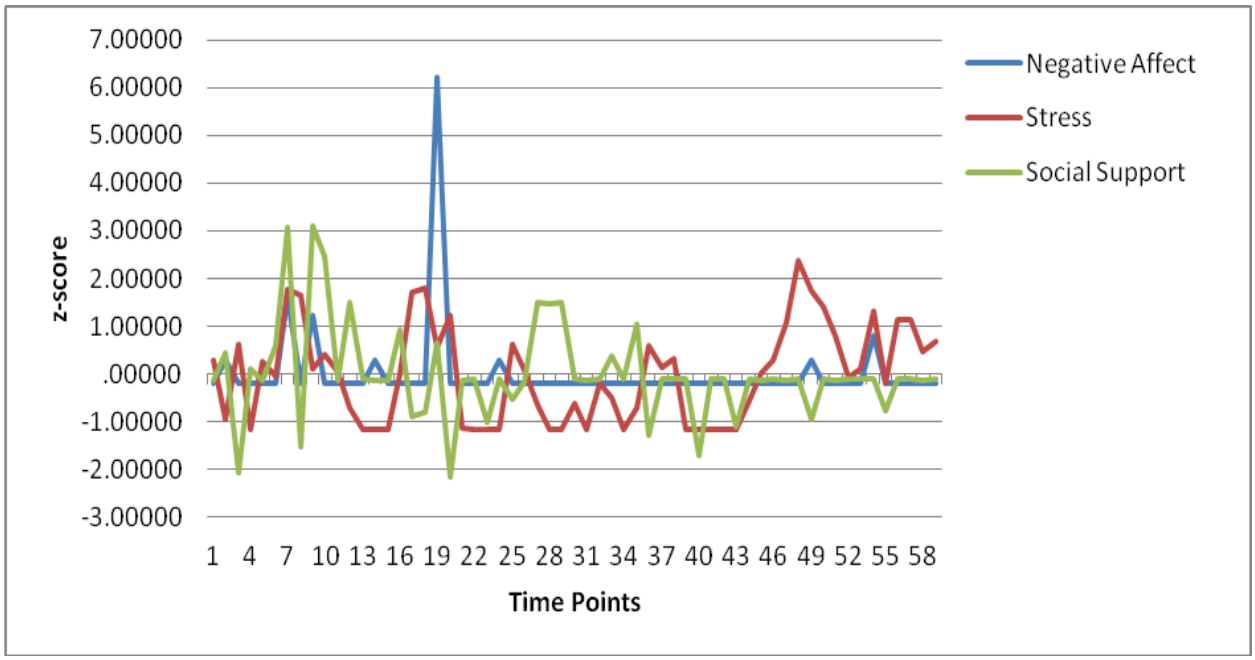


Figure 25. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #5.

Table 21. Relationship between Time-Lagged Stress, Social Support, and Stress/Social Support Interaction on Positive and Negative Affect for Participant #6 (*n*=27).

	Ljung-Box Test p-value	Mean of Residual ACF at Lag 1	Significant Auto-correlation?	R^2	ΔR^2	Model Parameters	Significant Predictor Variable(s)
Model 1: PA Lag 1 Stress	.388	.224	No	.274		t=-3.070 p=.005	Stress
Model 2: PA Lag 1 Stress Lag 1 Social Support	.785	.139	No	.333	.059	t=-1.459 p=.158	Stress
Model 3: PA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.571	.112	No	.437	.104	t=2.066 p=.050	Stress Interaction
Model 1: NA Lag 1Stress	.205	.202	No	.270		t=3.042 p=.005	Stress
Model 2: NA Lag 1 Stress Lag 1 Social Support	.254	.194	No	271	.001	t=.146 p=.885	Stress
Model 3: NA Lag 1 Stress Lag 1 Social Support Lag 1 Interaction	.411	.151	No	.313	.042	t=-1.183 p=.249	Stress

Note: PA=Positive Affect. NA=Negative Affect. Positive and Negative Affect scores were derived from their respective positive and negative composite subscale scores of the I-PANAS-SF, Mood VAS and CES-D-VAS. Stress scores were derived from the two stress items of the Daily Stressful Events scale. Social Support scores were derived from the Social Support VAS. Interaction scores were derived from the Stress and Social Support scores.

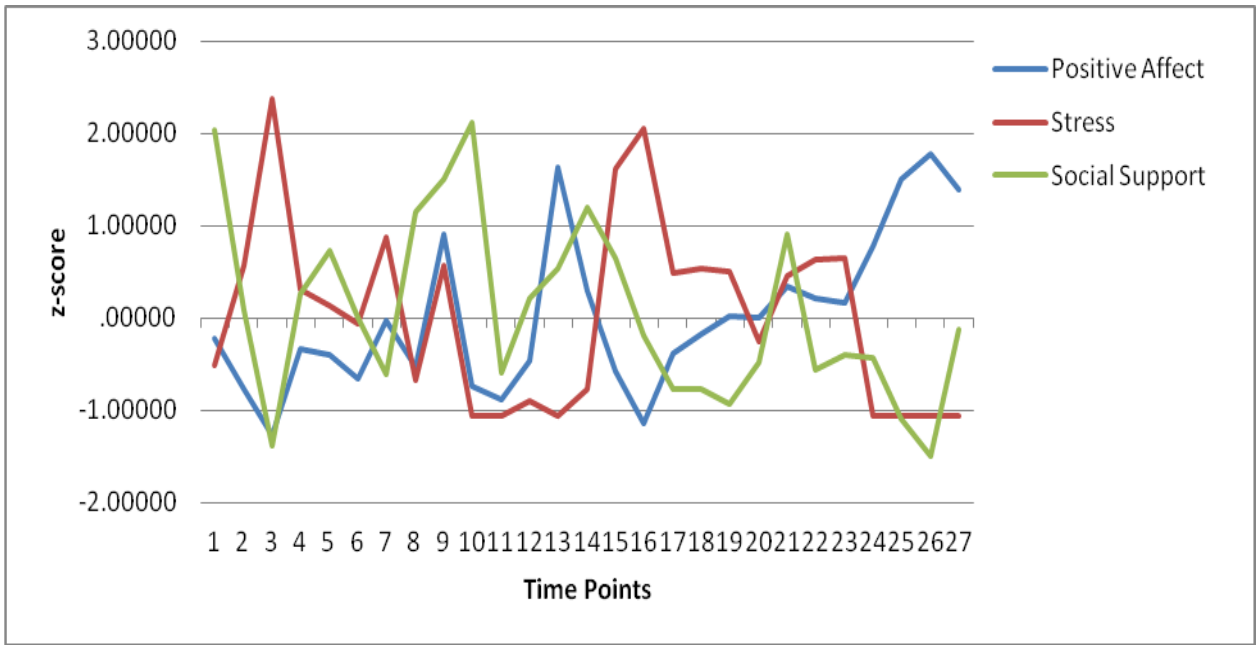


Figure 26. Time-Lagged Positive Affect, Stress and Social Support across Time Points for Participant #6.

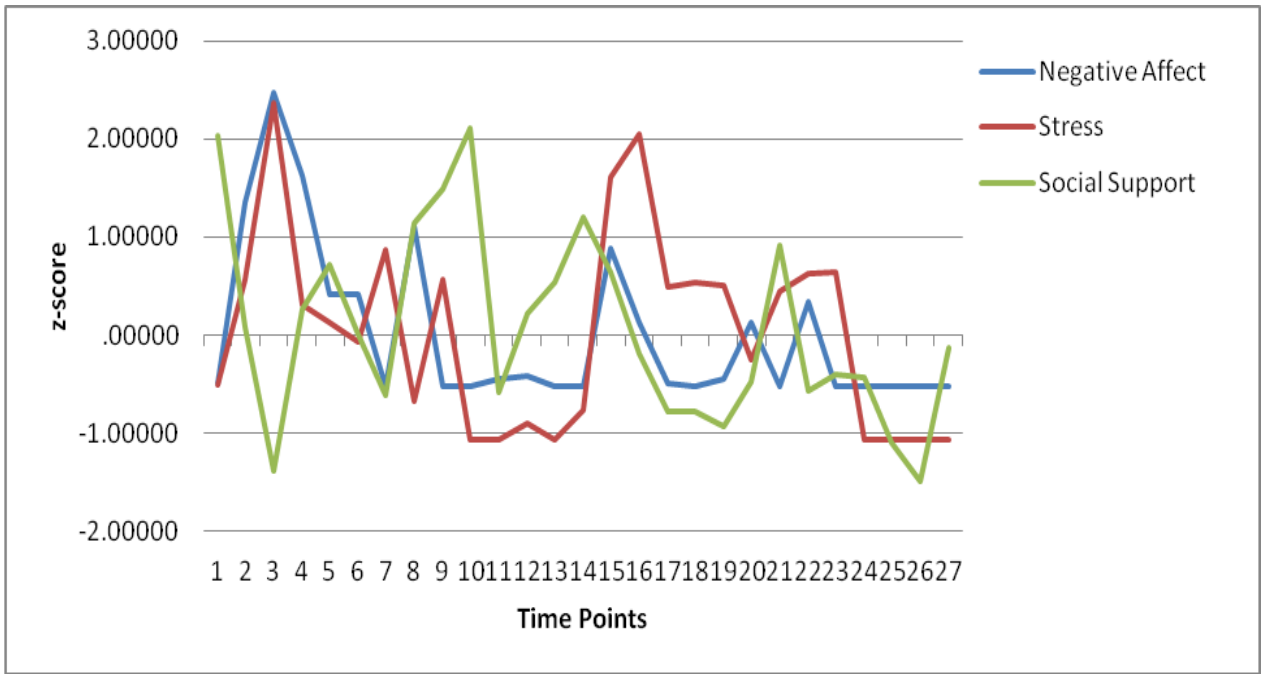


Figure 27. Time-Lagged Negative Affect, Stress and Social Support across Time Points for Participant #6.

Positive Affect and Stress

The degree to which variance in positive affect was accounted for by measures of stress in concurrent analyses was significant for Participants #2, #3, #5 and #6. These relationships were also significant at time lag 1. However, autocorrelation significantly affected the models for Participants #2 and #5.

Positive Affect and Social Support

The degree to which variance in positive affect was accounted for by measures of social support in concurrent analyses was significant for only Participant #3. This relationship was also significant at time lag 1. In addition, the relationship was also significant for Participant #5 at time lag 1.

Positive Affect and Interaction between Stress and Social Support

The degree to which variance in positive affect was accounted for by the interaction between measures of stress and social support in concurrent analyses approached significance for Participant #5; however, this relationship was not maintained in time-lagged analyses. The relationship was significant for Participant #6 at time lag 1.

Negative Affect and Stress

The degree to which variance in negative affect was accounted for by measures of stress in concurrent analyses was significant for Participants #2, #3 and #6. This relationship was significant at time lag 1 for only Participant #3 and autocorrelation significantly affected the model.

Negative Affect and Social Support

The degree to which the proportion of variance in negative affect was accounted for by measures of social support in concurrent analyses was significant for Participants #3 and #5.

These relationships were also significant at time lag 1 and autocorrelation continued to significantly affect the model for Participant #3. In addition, the relationship approached significance for Participant #2 (p=.055).

Negative Affect and the Interaction between Stress and Social Support

The degree to which the proportion of variance in negative affect was accounted for by the interaction of stress and social support in concurrent analyses was approaching significance for Participant #5; however, this relationship was not maintained at time lag 1.

Participant Study Satisfaction

The 12-item Evaluation of Palm Pilot Study (Appendix G) was administered to all participants at the completion of the study. Item responses ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). Possible scores range from 12 to 48 with higher scores suggesting higher satisfaction with study elements. Participants reported good satisfaction with use of the palm pilot and participation in this study (M=38.50, SD=4.32). See Table 22 below for average individual item responses.

Table 22. Summary of Evaluation of Palm Pilot Study Item Scores for All Participants (n=6).

Item	Average Score (SD)	Equivalent Average Response
1. The Palm Pilot was easy to use.	3.67 (.52)	Agree to Strongly Agree
2. The questions on the Palm Pilot were easy to understand.	3.67 (.52)	Agree to Strongly Agree
3. The Palm Pilot alarms sounded at times that were inconvenient for me.	2.83 (.98)	Slightly Agree

4. It took too long to complete the questions on the Palm Pilot.	1.50 (.55)	Disagree to Strongly Disagree
5. It would have been convenient for me to complete more than 2 to 3 assessments a day (e.g., 3 or 4 times a day).	2.67 (1.03)	Slightly Agree
6. I needed more technical help to use the Palm Pilot.	1.83 (.98)	Disagree to Strongly Disagree
7. If given the chance, I would participate in a similar study in the future.	3.50 (.55)	Agree to Strongly Agree
8. Two weeks was too long to participate in this study.	1.50 (.55)	Disagree to Strongly Disagree
9. I enjoyed using the Palm Pilot.	3.33 (.52)	Agree to Strongly Agree
10. The questions on the Palm Pilot were too confusing.	1.33 (.52)	Disagree to Strongly Disagree
11. I would recommend participating in this study to a friend.	3.33 (.52)	Agree to Strongly Agree
12. My participation in this study was inconvenient to others (e.g., family, friends).	1.33 (.52)	Disagree to Strongly Disagree

Note. Item responses ranged from 1 (*strongly disagree*) to 4 (*strongly agree*).

CHAPTER 4

DISCUSSION

Background

It is estimated that approximately 13% of women experience clinically significant depressive symptoms (O'Hara & Swain, 1996) and the majority of women experience mild symptoms following childbirth (O'Hara, 2009; APA, 2000; Henshaw, Foreman, & Cox, 2004). The frequency and strength of depressive symptoms during the postpartum period have been shown to be significantly associated with a number of maternal impairments including level of functioning and well-being (Boyce et al., 2000), ability to engage positively with the baby in important social interactions (Murray et al., 2003; O'Hara, 2009) and the relationship between the mother and her partner (Whisman, Davila, & Goodman, 2011; Milgrom & McCloud, 1996).

Several variables have been found to be significantly associated with the risk of postpartum depression. In particular, history of depression, depression and/or anxiety during pregnancy, recent stressful life events or current daily stressors, poor marital relationship, insufficient social support, and low socioeconomic status have been found to significantly increase the risk of postpartum depression (e.g., Beck, 2001; Brugha, 1998; Dennis, Janssen, & Singer, 2004; O'Hara & Swain, 1996; Pooler et al., 2013; Robertson et al., 2004). The majority of the previously reviewed studies have been conducted in Europe, Australia, Canada, and the mainland United States.

Only three studies were found that investigated postpartum depression in Hawaiian, Pacific Islander and/or Asian and Pacific Islander women (Hayes et al., 2010; Liu & Tronick, 2013; Onoye, Goebert, Morland, Matsu, & Wright, 2009). The aforementioned studies found that the prevalence of and risk for postpartum depression was highest among Native Hawaiian,

Pacific Islander and Asian/Pacific Islander women compared to women of other ethnicities. However, one study investigated Pacific Islander women living in New York City and this group also included Asian women (Liu & Tronick, 2013). Therefore, it is uncertain if these findings can be generalized to Native Hawaiian and Pacific Islander women in Hawai‘i. Although the literature on risk factors for postpartum depression is extensive and fairly consistent in its findings, one review found that these studies have primarily been conducted primarily with 25-35 year old, partnered, mid- to high-SES, Caucasian women (Ross, Campbell, Dennis, & Blackmore, 2006). Cross-cultural research investigating different ethnicities and backgrounds are important to understand which predictor variables operate across cultures. This is especially important when research shows that prevalence rates are highest among certain cultural groups. Despite the paucity of research investigating postpartum depression in Native Hawaiian and other Pacific Islanders, further research appears warranted as the prevalence rates of depressive symptoms are highest among these populations.

Limitations of previous studies that investigated depressive symptoms during pregnancy and/or the postpartum period include: 1) data limited to one to three time points, 2) primary usage of paper-and-pencil self-report questionnaires, and 3) limited inclusion of participants from diverse populations. Some evidence indicates that EMA can provide valid measures for the study of within- and across-day changes in mood symptoms over time in various populations. Although the postpartum period is a time of increased vulnerability for mood disturbance in women, no study to date has utilized EMA methodology with this population. In addition, there is little research on postpartum depression with women in Hawai‘i and no study to date has examined variables associated with postpartum depression in a primarily Native Hawaiian population.

Current Study Methods

To address many of these limitations, this study: 1) assessed participants two to three times a day for two to four weeks, 2) used a handheld computer to collect data in real-time (i.e., ecological momentary assessment), and 3) included post-partum Native Hawaiian women and women living in rural Native Hawaiian communities. The present study examined the associations between mood, social support, and daily stress during the year following childbirth in a small cohort of women at-risk for postpartum depression in Hawai‘i, using multivariate time-series EMA-based assessment strategies over a two to four week period. The specific goals of this study were as follows:

1) To examine the degree of concordance between two to three times a day momentary and retrospective measures of positive and negative affect, social support, and daily stress,
2) To examine the relationship between positive and negative affect over time,
3) To examine the proportion of shared variance in concurrent a) positive affect and daily stress, b) positive affect and social support, c) positive affect and the interaction between stress and social support, d) negative affect and daily stress, e) negative affect and social support, and f) negative affect and the interaction between stress and social support, and
4) To examine the proportion of shared variance in time-lagged a) positive affect and daily stress, b) positive affect and social support, c) positive affect and the interaction between stress and social support, d) negative affect and daily stress, e) negative affect and social support, and f) negative affect and the interaction between stress and social support.

Concordance between Retrospective vs. Ecological Momentary Assessment

Prior studies have compared retrospectively versus momentarily collected mood ratings (e.g., Ben-Zeev et al., 2009; Bylsma et al., 2011; Solhan et al., 2009). This study found that

retrospective assessments of positive and negative affect, positive and negative mood and social support were rated higher than momentary assessments 61.5% of the time across participants. Positive affect and social support were the variables most often rated higher using retrospective measures. Retrospective measures of both positive affect and social support were equal to or larger than momentary measures for 88.24% (i.e., 15 out of 17) of the comparisons. Retrospective measures of negative affect and positive mood were equal to or larger than momentary measures for slightly more than half of the comparisons (52.94% and 58.82%, respectively). However, momentary measures of negative mood were equal to or larger than retrospective measures for 82.35% (i.e., 14 out of 17) of the comparisons. This is consistent with previous literature that found discrepancies between retrospective and momentary methods. One study found that positive and negative affect were rated significantly higher in retrospective versus momentary ratings (Ben-Zeev et al., 2009).

Covariance between Positive and Negative Affect Scores Over Time

As expected, results indicated that there was a significant negative correlation between positive and negative affect over time for five (Participants #2 through #6) of the six participants. The results for Participant #1 suggested the possibility that her data were entered at random as there was a very small correlation between her positive and negative affect scores ($r=-.04$ $n=63$, $p=.762$). See Figure 2 for a graphical representation of her data. As previously mentioned, data for Participant #1 was excluded from additional analyses due to this concern.

Covariance between Mood and Stress

The current study found that a significant proportion of the variance in positive affect was associated with concurrent stress in four (#2, #3, #5 and #6) out of the five participants with R^2s ranging from .22 to .29. Although the p-value was significant for Participant #5 ($p=.018$),

autocorrelation significantly reduced confidence in the strength of the association in the model. These relationships continued to be significant in time lagged analyses, except autocorrelation significantly affected the model for Participants #2 and #5. The study also found that a significant proportion of the variance in negative affect was attributable to concurrent stress in three out of the five participants (#2, #3 and #6) with R^2 ranging from .22 to .26. Although the p-value was significant for Participant #3 ($p<.000$), autocorrelation significantly reduced confidence in the strength of the association in the model. The only relationship that continued to be significant at time lag 1 was Participant #3. These findings were consistent with literature that found relationships between depressed individuals' ratings of stress (Goldschmidt et al., 2013) and depressed individuals' negative affect and increased ratings of stress and unpleasant events (Bylsma et al., 2011). As this was not a consistent finding across all participants in this study, this suggests individual differences in a person's experience of stress.

Covariance between Mood and Social Support

The current study found that a significant proportion of the variance in positive affect was attributable to concurrent social support in only one (#3) of the five participants in concurrent ($R^2=.36$, $p=.008$) and time-lagged ($R^2=.39$, $p<.000$) analyses. In addition, time-lagged analyses were also significant for Participant #5 ($R^2=.17$, $p=.009$). The study also found that a significant proportion of the variance in negative affect was attributable to social support in two participants (#3 and #5) for concurrent ($R^2=.13$, $p=.035$) and three participants (#3, #5 and #6) for time-lagged analyses. Although the p-value was significant for Participant #3 in concurrent and time-lagged analyses, autocorrelation significantly reduced confidence in the strength of the association in these models. These finding are consistent with previous literature that found that stressful social interactions significantly predicted positive and negative affect (Jacobs et al.,

2007) and that this finding may be amplified in depressed individuals (Myin-Germeys et al., 2003). These findings indicate that the amount of social support received does not consistently correlate with an individual's positive or negative mood.

Limitations

There were several limitations to the current study. One important limitation was the small sample size used in this study (i.e. six participants). This writer attempted to recruit women at a specific time point in their life (i.e., one to three months postpartum), which made initial recruitment efforts difficult. In addition, due to concerns with one participant's data, her information was dropped from most of the analyses reducing the available sample size to five. A larger sample size would help identify patterns between mood and other variables over time. A second, related limitation was a modification in the inclusion criteria during study recruitment. A study modification was approved mid-way through recruitment to allow for the inclusion of women up to one year postpartum (which was consistent with criteria used in other studies). Therefore, some of the participants had newborns while others had near-toddlers which may have affected their mood and interactions with their babies and significant others. The sample size precluded an examination of this possible covariate.

A third limitation concerns the measures used in this study. The aim of the study was to frequently assess women over time so measures were chosen and modified to reduce participant burden. As such, some measures that have not been validated for this use were included. However, internal consistency was assessed for most measures in this study and they were comparable to those reported in previous studies. Specifically, previously reported alpha coefficients for the paper-and-pencil I-PANAS-SF were .75 for positive affect and .80 for negative affect (Karim, Weisz, & Rehman, 2011). Cronbach alpha coefficients for the

momentary I-PANAS-SF in the current study were somewhat higher at .93 for positive affect and .95 for negative affect. Karam and colleagues (2012) administered the PSS to pregnant women taking antidepressants and reported an alpha coefficient of .90. This is consistent with findings of .91 in the current study. Both studies used paper-and-pencil versions of the PSS. The reported internal consistency for the CES-D-VAS-Very Short was .80 (Moullec et al., 2011) which is comparable to .75 found in the current study with the momentary version. As such, these findings suggest good reliability for use of these instruments with the current population.

In addition, a large proportion of the variance in positive and negative affect was not accounted for by stress or social support in this study. Therefore, the measurement of other variables that affected participant's mood was not captured such as anxiety, socioeconomic status, birth experience, etc.

A fifth limitation to this study was the frequency of daily assessments. The current study gave participants the options to complete palm pilot assessments two or three times a day over two to four weeks. These options were suggested by the IRB committees so as to not overburden the participants. The current study measured participants an average of 2.5 times a day for 23.8 days (59.5 time points). A review of previous studies using EMA methodology assessed participants an average of 8.9 times a day for 8.7 days (77.4 time points). Therefore, perhaps the frequency of daily assessments was not often enough to sufficiently capture fluctuations in mood.

A sixth limitation of this study was the clinical characteristics of the participants. Although this study targeted postpartum women with a history of depressive symptoms including low mood, only one participant reported a diagnosis of depression and was receiving individual psychotherapy at the time of her participation in the study. Previous studies examined

individuals diagnosed with Major Depressive Disorder (e.g., Ben-Zeev e al., 2009; Bylsma et al., 2011), Borderline Personality Disorder (e.g., Solhan et al., 2009); Bipolar Disorder (e.g., Myin-Gemeys et al., 2003) and Bulimia Nervosa (e.g., Smyth et al., 2009). Therefore, variability in mood may be more evident in clinical populations.

Future Directions

Given the aforementioned limitations, it would be beneficial for future studies to use a larger sample size to be able to identify patterns over time. Widening participant inclusion criteria to include women up to one year postpartum may be helpful for this. In addition, EMA study that start at the beginning of pregnancy and continues through the post-partum period would be useful. Also, increasing the frequency of daily assessments and shortening the length of participation (e.g., six daily assessments for 10 days) would be more consistent with other studies using EMA methodology to examine mood changes (however shortening the length of participation could also make it difficult to detect cyclicity in the measures). Future studies should use measures validated for EMA methodology or seek to validate measures for EMA methodology. It would also be important for future studies to investigate other variables shown to affect postpartum depression such as maternal anxiety, marital/partner relationship variables, and baby's behavior to further understand the factors that contribute to variance in positive and negative affect. Future studies should also focus on recruiting women diagnosed with postpartum depression to be able to generalize findings to this specific population. Finally, momentary tools could be used to provide feedback to women on their changes in mood based on clinical interventions (e.g., activity scheduling) or in providing in-the-moment coping skills if they report increased depression. Future research could examine the feasibility and effectiveness of mobile devices for the prevention and treatment of postpartum depression.

In summary, this is the first study to this writer's knowledge to examine the relationship between mood, stress and social support in postpartum women using EMA methodology in a sample of Native Hawaiian women/women living in a Native Hawaiian community. Findings generally indicate that stress was a significant predictor of positive affect for most participants in concurrent and time-lagged analyses and to a lesser degree for negative affect. Social support was an inconsistent predictor of positive and negative affect but appeared to have more of an impact in time-lagged than concurrent analyses. Future studies are needed with larger samples, looking at postpartum depression diagnosed women, with more frequent daily assessments, and using EMA-validated measures including other variables of interest.

REFERENCES

Altshuler, L. L., Hendrck, V., & Cohen, L. S. (1998). Course of mood and anxiety disorders during pregnancy and the postpartum period. *Journal of Clinical Psychiatry, 59(Suppl. 2)*, 29-33.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Arlington, VA: Author.

Beach, S. R. H., & Gupta, M. (2006). Directive and nondirective spousal support: Differential effects? *Journal of Marital and Family Therapy*, *32*(4), 465-477. doi: 10.1111/j.1752-0606.2006.tb01621.x.

Beck, A.T., Steer, R.A., & Brown, G.K. (1996). Manual for the Beck Depression Inventory-II. San Antonio, TX: Psychological Corporation.

Beck, C. T. (2001). Predictors of postpartum depression. *Nursing Research*, *50*(5), 275-285. doi: 10.1097/00006199-200109000-00004.

Benoit, C., Westfall, R., Treloar, A. E. B., Phillips, R., & Mikael Jansson, S. (2007). Social factors linked to postpartum depression: A mixed-methods longitudinal study. *Journal of Mental Health*, *16*(6), 719-730. doi: 10.1080/09638230701506846.

Ben-Zeev, D., Young, M., & Madsen, J. W. (2009). Retrospective recall of affect in clinically depressed individuals and controls. *Cognition & Emotion*, *23*(5), 1021-1040. doi: 10.1080/02699930802607937.

Boyce, P. M. (2003). Risk factors for postnatal depression: A review and risk factors in Australian populations. *Archives of Women's Mental Health*, *6 Suppl 2*, S43-50. doi: 10.1007/s00737-003-0005-9.

Boyce, P. M., Johnstone, S. J., Hickey, R., Morris-Yates, D., Harris, M. G., & Strachan, T. (2000). Functioning and well-being at 24 weeks postpartum of women with postnatal depression. *Archives of Women's Mental Health*, *3*(3), 91-97. doi: 10.1007/s007370070002.

Broderick, J. E., Schwartz, J. E., Shiffman, S., Hufford, M. R., & Stone, A. a. (2003). Signaling does not adequately improve diary compliance. *Annals of Behavioral Medicine*, *26*(2), 139-48. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2672206& tool=pmcentrez&rendertype=abstract.

Bromberg, M. H., Gil, K. M., & Schanberg, L. E. (2011). Daily sleep quality and mood as predictors of pain in children with juvenile polyarticular arthritis. *Health Psychology,26(2),* 139-148. doi: 10.1037/a0025075.

Brugha, T. S., Sharp, H. M., Cooper, S.-A., Weisender, C., Britto, D., Shinkwin, R., et al. (1998). The Leicester 500 Project. Social support and the development of postnatal depressive symptoms, a prospective cohort survey. *Psychological Medicine*, *28*(1), 63-79. doi: 10.1017/S0033291797005655.

Bylsma, L. M., Taylor-Clift, A., & Rottenberg, J. (2011). Emotional reactivity to daily events in major and minor depression. *Journal of abnormal psychology*, *120*(1), 155-67. doi: 10.1037/a0021662.

Cohen, S., & Williamson, G. M. (1988). Perceived stress in a probability sample of the United States. *In S. Spacapan & S. Oskamp (Eds.), The social psychology of health: Claremont Symposium on Applied Social Psychology* (pp. 31-67). Newburg Park, CA: Sage.

Collins, C. H., Zimmerman, C., & Howard, L. M. (2011). Refugee, asylum seeker, immigrant women and postnatal depression: Rates and risk factors. *Archives of Women's Mental Health*, *14*(1), 3-11. doi: 10.1007/s00737-010-0198-7.

Conrad, A., Wilhelm, F. H., Roth, W. T., Spiegel, D., & Taylor, C. B. (2008). Circadian affective, cardiopulmonary, and cortisol variability in depressed and nondepressed individuals at risk for cardiovascular disease. *Journal of Psychiatric Research*, *42*(9), 769-77. doi: 10.1016/j.jpsychires.2007.08.003.

Cox, J. L., Holden, J. M., & Sagoysky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. British Journal of Psychiatry, 150, 782-786. doi: 10.1192/bjp.150.6.782

Cox, J. L., Murray, D., & Chapman, G. (1993). A controlled study of the onset, duration, and prevalence of postnatal depression. *British Journal of Psychiatry, 163,* 27-31. doi: 10.1192/bip.163.1.27

Dennis, C.-L. E., Janssen, P. A., & Singer, J. (2004). Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatrica Scandinavica*, *110*(5), 338-46. doi: 10.1111/j.1600-0447.2004.00337.x.

Diaz, M., Le, H.-N., Cooper, B., & Muñoz, R. F. (2007). Interpersonal factors and perinatal depressive symptomatology in a low-income Latina sample. *Cultural Diversity & Ethnic Minority Psychology*, *13*(4), 328-36. doi: 10.1037/1099-9809.13.4.328.

Eberhard-Gran, M., Eskild, A., Tambs, K., Samuelsen, S. O., & Opjordsmoen, S. (2002). Depression in postpartum and non-postpartum women: prevalence and risk factors. *Acta Psychiatrica Scandinavica*, *106*(6), 426-433. doi: 10.1034/j.1600-0447.2002.02408.x.

Ebner-Priemer, U. W., & Trull, T. J. (2009). Ecological momentary assessment of mood disorders and mood dysregulation. *Psychological Assessment*, *21*(4), 463-75. doi: 10.1037/a0017075.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. (2002). Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Non-patient Edition. (SCID-I/NP) New York: Biometrics Research, New York State Psychiatric Institute.

Gavin, N. I., Gaynes, B. N., Lohr, K. N., Meltzer-Brody, S., Gartlehner, G., & Swinson, T. (2005). Perinatal depression: A systematic review of prevalence and incidence. *Obstetrics and Gynecology, 106,* 1071-1083.

Grussu, P., & Quatraro, R. M. (2009). Prevalence and risk factors for a high level of postnatal depression symptomatology in Italian women: A sample drawn from ante-natal classes. *European Psychiatry: The Journal of the Association of European Psychiatrists*, *24*(5), 327-33. doi: 10.1016/j.eurpsy.2009.01.006.

Hay, D. F., & Pawlby, S. (2003). Prosocial development in relation to children's and mothers' psychological problems. *Child Development*, *74*(5), 1314-1327. doi: 10.1111/1467-8624.00609.

Hay, D. F., Pawlby, S., Sharp, D., Asten, P., Mills, A., & Kumar, R. (2001). Intellectual problems shown by 11-year-old children whose mothers had postnatal depression. *Journal of Child Psychology and Psychiatry*, *42*(7), 871-889. doi: 10.1111/1469-7610.00784.

Hayes, D. K., Ta, V. M., Hurwitz, E. L., Mitchell-Box, K. M., & Fuddy, L. J. (2010). Disparities in self-reported postpartum depression among Asian, Hawaiian, and Pacific Islander women in Hawaii: Pregnancy Risk Assessment Monitoring System (PRAMS), 2004-2007. *Maternal and Child Health Journal*, *14*(5), 765-73. doi: 10.1007/s10995-009-0504-z.

Haynes, S. N., Smith, G. T., & Hunsley, J. D. (2011). Foundations of Clinical Science and Practice. New York, NY: Routledge/Taylor & Francis.

Henshaw, C., Foreman, D., & Cox, J. (2004). Postnatal blues: A risk factor for postnatal depression. *Journal of Psychosomatic Obstetrics & Gynecology*, *25*(3-4), 267-272. doi: 10.1080/01674820400024414.

Heron, J., O′ Connor, T. G., Evans, J., Golding, J., & Glover, V. (2004). The course of anxiety and depression through pregnancy and the postpartum in a community sample. *Journal of Affective Disorders*, *80*(1), 65-73. doi: 10.1016/j.jad.2003.08.004.

Holditch-Davis, D., White-Traut, R. C., Levy, J. A., O'Shea, T. M., Geraldo, V., & David, R. J. (2014). Maternally administered interventions for preterm infants in the NICU: Effects on maternal psychological distress and mother–infant relationship. *Infant Behavior and Development, 37(4)*, 695–710. doi:10.1016/j.infbeh.2014.08.005.

Honey, K., Morgan, M., & Bennett, P. (2003). A stress-coping transactional model of low mood following childbirth. *Journal of Reproductive and Infant Psychology*, *21*(2), 129-143. doi: 10.1080/0264683031000124082.

Jacobs, N., Myin-Germeys, I., Derom, C., Delespaul, P., Os, J. van, & Nicolson, N. (2007). A momentary assessment study of the relationship between affective and adrenocortical stress responses in daily life. *Biological Psychology*, *74*(1), 60-6. doi: 10.1016/j.biopsycho.2006.07.002.

Janicki, D. L., Kamarck, T. W., Shiffman, S., & Gwaltney, C. J. (2006). Application of ecological momentary assessment to the study of marital adjustment and social interactions during daily life. *Journal of Family Psychology*, *20*(1), 168-72. doi: 10.1037/0893-3200.20.1.168.

Johnstone, S. J., Boyce, P. M., Hickey, A. R., Morris-Yates, A. D., & Harris, M. G. (2000). Obstetric risk factors for postnatal depression in urban and rural community samples. *Australian and New Zealand Journal of Psychiatry, 35,* 69-74.

Karam, F., Berard, A., Sheehy, O., Huneau, M., Briggs, G., Chambers C. … OTIS Research Committee (2012). Reliability and validity of the 4-item Perceived Stress Scale among pregnant women: Results from the OTIS antidepressants study. Research in Nursing & Health, 35, 363-375. doi: 10.1002/hur.21482

Karim, J., Weisz, R., & Rehman, S. U. (2011). International positive and negative affect schedule short-form (I-PANAS-SF): testing for factorial invariance across cultures. *Procedia Social and Behavioral Sciences, 15*, 2016–2022. doi:10.1016/j.sbspro.2011.04.046

Kendall-Tackett, K. A. (2007). Violence against women and the perinatal period: The impact of lifetime violence and abuse on pregnancy, postpartum, and breastfeeding. *Trauma, Violence and Abuse*, *8*(3), 344-53. doi: 10.1177/1524838007304406.

Kreindler, D. (2003). Portable mood mapping: The validity and reliability of analog scale displays for mood assessment via hand-held computer. *Psychiatry Research*, *120*(2), 165-177. doi: 10.1016/S0165-1781(03)00196-3.

Lindahl, V., Pearson, J. L., & Colpe, L. (2005). Prevalence of suicidality during pregnancy and the postpartum. *Archives of Women's Mental Health*, *8*(2), 77-87. doi: 10.1007/s00737-005-0080-1.

Logsdon, M. C., Birkimer, J. C., & Usui, W. M. (2000). The link of social support and postpartum depressive symptoms in African-American women with low incomes. *The*

American Journal of Maternal/Child Nursing, *25*(5), 262-266. doi: 10.1097/00005721-200009000-00009.

Logsdon, M. C., & Usui, W. (2001). Psychosocial predictors of postpartum depression in diverse groups of women. *Western Journal of Nursing Research*, *23*(6), 563-574. doi: 10.1177/019394590102300603.

Logsdon, M. C., Usui, W., Birkimer, J. C., & McBride, A. B. (1996). The Postpartum Support Questionnaire: Reliability and validity. *Journal of Nursing Measurement, 4,* 129-142.

Matthey, S., Barnett, B., Howie, P., & Kavanagh, D. J. (2003). Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? *Journal of Affective Disorders*, *74*(2), 139-147. doi: 10.1016/S0165-0327(02)00012-5.

Milgrom, J., Gemmill, A. W., Bilszta, J. L., Hayes, B., Barnett, B., Brooks, J., et al. (2008). Antenatal risk factors for postnatal depression: A large prospective study. *Journal of Affective Disorders*, *108*(1-2), 147-57. doi: 10.1016/j.jad.2007.10.014.

Milgrom, J. & McCloud, P. (1996). Parenting stress and postnatal depression. *Stress Medicine, 12*, 177-186. doi: 10.1002/(SICI)1099-1700(199607)12:3%3C177::AID-SMI699%3E3.0.CO;2-W

Moullec, G., Maïano, C., Morin, A. J. S., Monthuy-Blanc, J., Rosello, L., & Ninot, G. (2011). A very short visual analog form of the Center for Epidemiologic Studies Depression Scale (CES-D) for the idiographic measurement of depression. *Journal of Affective Disorders, 128*(3), 220-34. Elsevier B.V. doi: 10.1016/j.jad.2010.06.006.

Murray, L., & Cooper, P. J. (1996). The impact of postpartum depression on child development. *International Review of Psychiatry*, *8*(1), 55-63. doi: 10.3109/09540269609037817.

Murray, L., & Cooper, P. J. (1997). Postpartum depression and child development. *Psychological Medicine, 27*(2), 253-60. doi: 10.1017/S0033291796004564.

Murray, L., Cooper, P., & Hipwell, A. (2003). Mental health of parents caring for infants. *Archives of Women's Mental Health, 6(Suppl 2),* S71-7. doi: 10.1007/s00737-003-0007-7.

Murray, L., Sinclair, D., Cooper, P., Ducournau, P., & Turner, P. (1999). The socioemotional development of 5-year-old children of postnatally depressed mothers. *Journal of Child Psychology and Psychiatry, 40*(8), 1259-1271. doi: 10.1111/1469-7610.00542.

Myin-Germeys, I., Peeters, F., Havermans, R., Nicolson, N. A., deVries, M. W., Delespaul, P., & van Os, J. (2003). Emotional reactivity to daily life stress in psychosis and affective disorders: An experience sampling study. *Acta Psychiatrica Scandinavica, 107,* 124-131. doi: 10.1034/j.1600-0447.2003.0202J.x.

O'Hara, M. W. (2009). Postpartum depression: What we know. *Journal of Clinical Psychology, 65*(12), 1258-1269. doi: 10..1002/jclp.20644.

O'Hara, M. W. & Swain, A. M. (1996). Rates and risk of postpartum depression: A meta-analysis. *International Review of Psychiatry, 8,* 37-54. doi: 10.3109/09540269609037816.

Onoye, J. M., Goebert, D., Morland, L., Matsu, C., & Wright, T. (2009). PTSD and postpartum mental health in a sample of Caucasian, Asian, and Pacific Islander women. *Archives of Women's Mental Health, 12*(6), 393-400. doi: 10.1007/s00737-009-0087-0.

Oppo, A., Mauri, M., Ramacciotti, D., Camilleri, V., Banti, S., Borri, C., et al. (2009). Risk factors for postpartum depression: The role of the Postpartum Depression Predictors Inventory-Revised (PDPI-R). Results from the Perinatal Depression-Research & Screening Unit (PNDReScU) study. *Archives of Women's Mental Health, 12*(4), 239-49. doi: 10.1007/s00737-009-0071-8.

Page, M., & Wilhelm, M. S. (2007). Postpartum daily stress, relationship quality, and depressive symptoms. *Contemporary Family Therapy*, *29*(4), 237-251. doi: 10.1007/s10591-007-9043-1.

Patel, V., Rodrigues, M., & DeSouza, N. (2002). Gender, poverty, and postnatal depression: A study of mothers in Goa, India. *American Journal of Psychiatry*, *159*(1), 43-47. doi: 10.1176/appi.ajp.159.1.43.

Peeters, F., Nicolson, N., Berkhof, J., Delespaul, P., & DeVries, M. (2003). Effects of daily events on mood states in major depressive disorder. *Journal of Abnormal Psychology*, *112*(2), 203-211. doi: 10.1037/0021-843X.112.2.203.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*, 385-401. doi: 10.1177/014662167700100306.

Records, K., & Rice, M. J. (2005). A comparative study of postpartum depression in abused and non-abused women. *Archives of Psychiatric Nursing*, *19*(6), 281-90. doi: 10.1016/j.apnu.2005.07.010.

Ritter, C., Hobfoll, S. E., Lavin, J., Cameron, R. P., & Hulsizer, M. R. (2000). Stress, psychosocial resources, and depressive symptomatology during pregnancy in low-income, inner-city women. *Health Psychology*, *19*(6), 576-585. doi: 10.1037/0278-6133.19.6.576.

Robertson, E., Grace, S., Wallington, T., & Stewart, D. E. (2004). Antenatal risk factors for postpartum depression: A synthesis of recent literature. *General Hospital Psychiatry*, *26*(4), 289-95. doi: 10.1016/j.genhosppsych.2004.02.006.

Ross, L. E., Campbell, V. L. S., Dennis, C.-L., & Blackmore, E. R. (2006). Demographic characteristics of participants in studies of risk factors, prevention, and treatment of

postpartum depression. *Canadian Journal of Psychiatry, 51*(11), 704-10. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/17121169.

Rubertsson, C., Wickberg, B., Gustavsson, P., & Rådestad, I. (2005). Depressive symptoms in early pregnancy, two months and one year postpartum-prevalence and psychosocial risk factors in a national Swedish sample. *Archives of Women's Mental Health, 8*(2), 97-104. doi: 10.1007/s00737-005-0078-8.

Sharp, D., Hale, D. F., Pawlby, S., Schmucker, G., Allen H, & Kumar, R. (1995). The impact of postnatal depression on boys' intellectual development. *Journal of Child Psychiatry and Psychology, 36,* 1315-1326. doi: 10.1111/j.1469.7610.1995.tb01666.x

Smyth, J. M., Wonderlich, S. A., Sliwinski, M. J., Crosby, R. D., Engel, S. G., Mitchell, J. E., et al. (2009). Ecological momentary assessment of affect, stress, and binge-purge behaviors: Day of week and time of day effects in the natural environment. *International Journal of Eating Disorders, 42*(5), 429-436. doi: 10.1002/eat.v42:510.1002/eat.20623.

Steiner, M., Streiner, D. L., & Pham, B. (2005). Validation of a revised visual analog scale for premenstrual mood symptoms: results from prospective and retrospective trials. *Canadian Journal of Psychiatry, 50*(6), 327-32. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15999948.

Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the positive and negative affect schedule (PANAS). *Journal of Cross-Cultural Psychology, 38(2),* 227-242. doi: 10.1177/0022022106297301.

Ugarizza, D. N. & Schmidt, (2006). Telecare for women with postpartum depression. *Journal of Psychosocial Nursing, 44,* 37-45.

Vesga-López, O., Blanco, C., Keyes, K., Olfson, M., Grant, B. F., & Hasin, D. S. (2008). Psychiatric disorders in pregnant and postpartum women in the United States. *Archives of General Psychiatry*. doi: 10.1001/archpsyc.65.7.805.

Wenze, S. J., & Miller, I. W. (2010). Use of ecological momentary assessment in mood disorders research. *Clinical Psychology Review*, *30*(6), 794-804. doi: 10.1016/j.cpr.2010.06.007.

Whisman, M., Davila, J., & Goodman, S. H. (2011). Relationship adjustment, depression, and anxiety during pregnancy and the postpartum period. *Journal of Family Psychology*, *25*(3), 375-83. doi: 10.1037/a0023790.

Zajicek-Farber, M. L. (2008). Postnatal depression and infant health practices among high-risk women. *Journal of Child and Family Studies*, *18*(2), 236-245. doi: 10.1007/s10826-008-9224-z.

LIST OF APPENDICES

Page

Appendix A: Recruitment Flyer……..…114

Appendix B: Eligibility Checklists…….115

Appendix C: Informed Consent Forms...……117

Appendix D: Initial Meeting Script……123

Appendix E: Palm Pilot Training Guide…….124

Appendix F: Demographic Information Form……..……..127

Appendix G: Evaluation of Palm Pilot Study...……...129

Appendix H: I-PANAS-SF (EMA version)……..……..130

Appendix I: I-PANAS-SF (Weekly version)……..134

Appendix J: Mood Visual Analog Scale (EMA)……..……..……135

Appendix K: Mood Visual Analog Scale (Weekly version)……..137

Appendix L: CES-D……..……..…….138

Appendix M: CES-D-VAS-VS……..…….139

Appendix N: Postpartum Support Questionnaire……...……141

Appendix O: Social Support VAS (EMA version)……..……...144

Appendix P: Social Support VAS (Weekly version)……..……..……146

Appendix Q: Perceived Stress Scale……...……147

Appendix R: Daily Stressful Events Scale…..……148

APPENDIX A

Postpartum Women's Palm Pilot Study

Recruitment Flyer Text

A Research Study on Mood in New Moms

What is this study about?
This study is looking at mood, social support, and stress in women up to one year after childbirth.

Would the study be a good fit for me?
This study might be a good fit for you if:

- You're at least 18 years old
- Are Native Hawaiian or live in a rural, Native Hawaiian community
- Have a baby 1-12 months old
- Live with an adult (e.g., husband, parent, friend, etc)
- Have had low mood during your recent pregnancy or after childbirth or if you've ever been depressed

What would happen if I took part in the study?
If you decide to take part in the research study, you would:

- Attend 3 in-person visits to complete paper-and-pencil questionnaires on your mood, social support, and stress (about 90 minutes 1st visit, 30 minutes for 2nd and 3rd visits)
- Receive training on how to use a hand-held computer (i.e., Palm Pilot) to complete similar questionnaires
- Complete brief Palm Pilot questionnaires (about 5 minutes each) 2x/day for 2 weeks during your normal daily routine

Participants who take part get a minimum $10 grocery store gift card at each in-person weekly visit as a thank you for your time.

There may be possible benefits if you take part in the study.

- Option of receiving an informational session on depression in new moms at your last visit
- Possibility of helping new moms in the future by adding to existing research on Native Hawaiian women and women living in rural, Native Hawaiian communities

To take part in this study or for more information, please contact:
Michelle Kawasaki, M.A.
Principal investigator & Ph.D. Candidate in Clinical Psychology
(808) 256-7031 or womenspalmpilotstudy@gmail.com

This research is supervised by Stephen Haynes, Ph.D. at the University of Hawai'i at Mānoa.

APPENDIX B

Postpartum Women's Palm Pilot Study

WCCHC Eligibility Checklist

Client's Name: _____

Instructions: Please circle "Yes" or "No" for each item. ***The aforementioned client:***		
1. Is currently a Women's Health Clinic Client	Yes	No
2. Is at least 18 years of age	Yes	No
3. Is between 1 to 12 months postpartum	Yes	No
4. Speaks and understands English	Yes	No
5. Received CES-D $\geq$ 16 or self-reported distress due to depressive symptoms during most recent pregnancy/postpartum	Yes	No
6. Has documented treatment for a depressive disorder	Yes	No
7. Is currently living with another adult (e.g., family member, spouse, boyfriend, friend, roommate, etc.)	Yes	No
8. Has a history of a Schizophrenia-spectrum Disorder	Yes	No
9. Has a history of Bipolar Disorder	Yes	No
10. Has a current Substance Use Disorder	Yes	No
11. Currently reports suicidal or homicidal ideation	Yes	No

Provider's Name: _____ Date: _____

Phone Number: _____ Email: _____

_____ Notified provider about client's participation

Thank You! Please contact Michelle Kawasaki at (808) 256-7031 or womenspalmpilotstudy@gmail.com for any questions about this study.

Postpartum Women's Palm Pilot Study

General Eligibility Checklist

Name: _____

Instructions: Please circle "Yes" or "No" for each item. ***The prospective participant:***		
1. Is Native Hawaiian and/or lives in a rural, Native Hawaiian community	Yes	No
2. Has a current healthcare provider and provided contact information	Yes	No
3. Is at least 18 years of age	Yes	No
4. Is between 1 to 12 months postpartum	Yes	No
5. Speaks and understands English	Yes	No
6. Received CES-D $\geq$ 16 or self-reported distress due to depressive symptoms during most recent pregnancy/postpartum	Yes	No
7. Has documented treatment for a depressive disorder	Yes	No
8. Is currently living with another adult (e.g., family member, spouse, boyfriend, friend, roommate, etc.)	Yes	No
9. Has a history of a Schizophrenia-spectrum Disorder	Yes	No
10. Has a history of Bipolar Disorder	Yes	No
11. Has a current Substance Use Disorder	Yes	No
12. Currently reports suicidal or homicidal ideation	Yes	No

Provider's Name: _____ Date: _____

Phone Number: _____ Email: _____

_____ Notified provider about client's participation

Thank You! Please contact Michelle Kawasaki at (808) 256-7031 or womenspalmpilotstudy@gmail.com for any questions about this study.

APPENDIX C
Informed Consent Form
WCCHC Version

AGREEMENT TO PARTICIPATE IN
Postpartum Women's Palm Pilot Study

Principal Investigator: Michelle Kawasaki
Sakamaki Hall C-400, 2530 Dole Street, Honolulu, HI 96822
Phone: (808) 256-7031
E-mail: womenspalmpilotstudy@gmail.com

Description of Project: This research project will look at mood, stress, and social support in women during the first two to 12 months after childbirth.

Procedure and Expected Length of Involvement in the Project: You will be asked to attend a total of three in-person appointments with the principal investigator (PI) at the Wai'anae Coast Comprehensive Health Center's (WCCHC) Women's Health Clinic. At the first appointment, the project will be explained and consent forms and waivers will be reviewed. If you decide to participate, you will receive training on how to use a small hand-held computer (Palm Pilot) to answer short surveys during the day about your mood, stress, and social support. After the training, you will complete several paper-and-pencil surveys about your mood, stress, and social support. The first appointment is expected to take about 1 to 1 ½ hours. You will also schedule the rest (two) of your weekly appointments to be held at the Women's Health Clinic with the PI.

Each set of Palm Pilot surveys is expected to take about five minutes. You will be asked to complete a set of these surveys two to three times a day (8:00am-8:00pm), when alerted to by an alarm on the Palm Pilot, for two weeks during your normal daily routine at home. You are expected to have the Palm Pilot near you at all times (i.e., be able to hear the alarm) during your participation in this project; however, if you are in a situation where completing the survey is unsafe or inappropriate (e.g., driving, working, etc.), please wait until a more appropriate time to use the Palm Pilot.

The PI will call you on Day 2 to talk about any problems you might have in completing the Palm Pilot surveys. The PI will also call you the day before each scheduled weekly appointment to confirm that you will attend. Please bring your Palm Pilot to all weekly appointments. At these appointments, the PI will collect the answers you entered into the Palm Pilot onto a laptop computer and you will again complete several paper-and-pencil surveys about your mood, daily stress, and social support. Each weekly appointment is expected to take about 30 minutes. You are being asked to participate in this study for the two weeks. You may participate for up to two more weeks (total of one month) if you are interested, but this is not a requirement. At your last weekly appointment, you will return your Palm Pilot.

Risks and Inconveniences: We do not expect any major risk by your participation in this project. There is the chance that some survey questions may make you feel uncomfortable as they ask you to think about, for example, negative mood or stress. In addition, answering surveys at unexpected times of the day for two weeks may be hard for new mothers. Because of

this, we've tried to make the Palm Pilot surveys as short as possible. There is a chance that others may see your responses to survey questions while you are entering them. To reduce this risk, please complete your surveys in a private location.

You are encouraged to tell the PI about discomforts during weekly appointments. If any issues arise, the PI will first discuss any concerns with you. When appropriate, the PI will also consult with a behavioral health provider on-staff at the Women's Health Clinic and/or your referring provider. If you are not currently receiving behavioral health services, you will be encouraged to consider a referral for behavioral health services, if appropriate.

During the weekly visits only you and the PI will be in the room. However, since the appointments are held in a Women's Health Clinic office, the PI will have access to psychologists, social workers, physicians, and nurses on-staff if any issues arise.

Benefits: Your participation in this project may not benefit you directly. If you are interested, you can receive an informational session on depression in new mothers at your last appointment. This research may provide new information and may be used to help other new mothers in the future. The results of this study will be made available to you.

Confidentiality: Your participation in this project will be kept strictly confidential to the extent allowable by law. The Palm Pilot you will be assigned to will be password-protected so that only you and the PI will have access to the information you enter. We will not link your name to any of your survey answers in this project. However, if your scores on questionnaires indicate that you are experiencing significant depressive symptoms or if you report potential harm to yourself or others, the PI will report this information to your referring provider for consultation and potential referral to behavioral health services. A unique identification number will be used in place of your name on all surveys to protect your confidentiality. All information about this study that contains your name or any other personally identifiable information will be kept in a locked file cabinet that can only be accessed by the PI. Research data may be reviewed by the University of Hawai'i's Human Studies Program or the WCCHC's Institutional Review Board as part of their routine procedures.

Compensation: You will receive a $10 gift card to Foodland/Sack-n-Save at the beginning of each in-person weekly appointment as a thank you for your time.

If you complete at least 70% of the assessments on-time during the week before your appointment, you will receive a $5 bonus for 2x/day assessments (i.e., at least 10 of 14) or a $10 bonus for 3x/day assessments (i.e., at least 15 of 21). If you complete 100% of the assessments on-time during the week before your appointment, you will receive a $10 bonus for 2x/day assessments (i.e, all 14) or a $20 bonus for 3x/day assessments (i.e., all 21).

If your Palm Pilot is lost, damaged, or stolen, you will not be held financially responsible. However, your participation in this project will end and you will not receive any further compensation.

Voluntary Participation: The choice to participate in this project is completely up to you. Whatever you decide will not affect your current services or any future services you may receive at WCCHC. You are free to end your participation at any time and will not be penalized for ending early.

However, if you do not complete the minimum number of Palm Pilot surveys (at least 10 for 2x/week or at least 15 for 3x/day assessments) on-time during any one-week period, you will not be able to continue to participate in this study.

I choose to complete (check one): _____ 2x/day Palm Pilot assessments for at least 2 weeks
_____ 3x/day Palm Pilot assessments for at least 2 weeks

I certify that I have read and that I understand the foregoing, that I have been given satisfactory answers to my inquiries concerning project procedures and other matters and that I have been advised that I am free to withdraw my consent and to discontinue participation in the project or activity at any time without prejudice.

I herewith give my consent to participate in this project with the understanding that such consent does not waive any of my legal rights, nor does it release the principal investigator or the institution or any employee or agent thereof from liability for negligence.

Participant Name (Print): _____

Participant Signature: _____ Date: _____

If you cannot obtain satisfactory answers to your questions or have comments or complaints about your treatment in the study, contact: Human Studies Program, 1960 East-West Road - Biomed B-104, Honolulu, HI 96822. Phone: 808-956-5007 or the Waiʻanae Coast Comprehensive Health Center's Institutional Review Board, 86-260 Farrington Highway, Waiʻanae, Hawaii 96792. Phone: 808-697-3457.

c: Signed copy to participant

Informed Consent Form
General Version

AGREEMENT TO PARTICIPATE IN
Postpartum Women's Palm Pilot Study

Principal Investigator: Michelle Kawasaki
Sakamaki Hall C-400, 2530 Dole Street, Honolulu, HI 96822
Phone: (808) 256-7031
E-mail: womenspalmpilotstudy@gmail.com

Description of Project: This research project will look at mood, stress, and social support in women during the first two to 12 months after childbirth.

Procedure and Expected Length of Involvement in the Project: You will be asked to attend a total of three in-person appointments with the principal investigator (PI) at the University of Hawai'i or I Ola Lāhui Behavioral Health Services (677 Ala Moana Blvd. Ste. 904 Honolulu, HI 96813). At the first appointment, the project will be explained and consent forms and waivers will be reviewed. If you decide to participate, you will receive training on how to use a small hand-held computer (Palm Pilot) to answer short surveys during the day about your mood, stress, and social support. After the training, you will complete several paper-and-pencil surveys about your mood, stress, and social support. The first appointment is expected to take about 1 to 1 ½ hours. You will also schedule the rest (two) of your weekly appointments to be held at the University of Hawai'i with the PI.

Each set of Palm Pilot surveys is expected to take about five minutes. You will be asked to complete a set of these surveys two to three times a day (8:00am-8:00pm), when alerted to by an alarm on the Palm Pilot, for two weeks during your normal daily routine at home. You are expected to have the Palm Pilot near you at all times (i.e., be able to hear the alarm) during your participation in this project; however, if you are in a situation where completing the survey is unsafe or inappropriate (e.g., driving, working, etc.), please wait until a more appropriate time to use the Palm Pilot.

The PI will call you on Day 2 to talk about any problems you might have in completing the Palm Pilot surveys. The PI will also call you the day before each scheduled weekly appointment to confirm that you will attend. Please bring your Palm Pilot to all weekly appointments. At these appointments, the PI will collect the answers you entered into the Palm Pilot onto a laptop computer and you will again complete several paper-and-pencil surveys about your mood, daily stress, and social support. Each weekly appointment is expected to take about 30 minutes. You are being asked to participate in this study for the two weeks. You may participate for up to two more weeks (total of one month) if you are interested, but this is not a requirement. At your last weekly appointment, you will return your Palm Pilot.

Risks and Inconveniences: We do not expect any major risk by your participation in this project. There is the chance that some survey questions may make you feel uncomfortable as they ask you to think about, for example, negative mood or stress. In addition, answering surveys at unexpected times of the day for two weeks may be hard for new mothers. Because of

this, we've tried to make the Palm Pilot surveys as short as possible. There is a chance that others may see your responses to survey questions while you are entering them. To reduce this risk, please complete your surveys in a private location.

You are encouraged to tell the PI about discomforts during weekly appointments. If any issues arise, the PI will first discuss any concerns with you. When appropriate, the PI will also consult with a licensed psychologist at I Ola Lāhui and/or your referring provider. If you are not currently receiving behavioral health services, you will be encouraged to consider a referral for behavioral health services, if appropriate.

During the weekly visits only you and the PI will be in the room. However, if your appointment is at I Ola Lāhui, the PI will have access to licensed psychologists on-staff if any issues arise. If your appointment is at the University of Hawai'i, the PI will contact your referring provider and/or a licensed psychologist at I Ola Lāhui for consultation, if appropriate.

Benefits: Your participation in this project may not benefit you directly. If you are interested, you can receive an informational session on depression in new mothers at your last appointment. This research may provide new information and may be used to help other new mothers in the future. The results of this study will be made available to you.

Confidentiality: Your participation in this project will be kept strictly confidential to the extent allowable by law. The Palm Pilot you will be assigned to will be password-protected so that only you and the PI will have access to the information you enter. We will not link your name to any of your survey answers in this project. However, if your scores on questionnaires indicate that you are experiencing significant depressive symptoms or if you report potential harm to yourself or others, the PI will report this information to your referring provider for consultation and potential referral to behavioral health services. A unique identification number will be used in place of your name on all surveys to protect your confidentiality. All information about this study that contains your name or any other personally identifiable information will be kept in a locked file cabinet that can only be accessed by the PI. Research data may be reviewed by the University of Hawai'i's Human Studies Program as part of their routine procedures.

Compensation: You will receive a $10 gift card to Foodland/Sack-n-Save at the beginning of each in-person weekly appointment as a thank you for your time.

If you complete at least 70% of the assessments on-time during the week before your appointment, you will receive a $5 bonus for 2x/day assessments (i.e., at least 10 of 14) or a $10 bonus for 3x/day assessments (i.e., at least 15 of 21). If you complete 100% of the assessments on-time during the week before your appointment, you will receive a $10 bonus for 2x/day assessments (i.e, all 14) or a $20 bonus for 3x/day assessments (i.e., all 21).

If your Palm Pilot is lost, damaged, or stolen, you will not be held financially responsible. However, your participation in this project will end and you will not receive any further compensation.

Voluntary Participation: The choice to participate in this project is completely up to you. You are free to end your participation at any time and will not be penalized for ending early.

However, if you do not complete the minimum number of Palm Pilot surveys (at least 10 for 2x/week or at least 15 for 3x/day assessments) on-time during any one-week period, you will not be able to continue to participate in this study.

I choose to complete (check one): _____ 2x/day Palm Pilot assessments for at least 2 weeks
_____ 3x/day Palm Pilot assessments for at least 2 weeks

I certify that I have read and that I understand the foregoing, that I have been given satisfactory answers to my inquiries concerning project procedures and other matters and that I have been advised that I am free to withdraw my consent and to discontinue participation in the project or activity at any time without prejudice.

I herewith give my consent to participate in this project with the understanding that such consent does not waive any of my legal rights, nor does it release the principal investigator or the institution or any employee or agent thereof from liability for negligence.

Participant Name (Print): _____

Participant Signature: _____ Date: _____

If you cannot obtain satisfactory answers to your questions or have comments or complaints about your treatment in the study, contact: Human Studies Program, 1960 East-West Road - Biomed B-104, Honolulu, HI 96822. Phone: 808-956-5007.

c: Signed copy to participant

APPENDIX D

Initial Meeting Script

Hi, nice to meet you! My name is Michelle. I'm a graduate student in Clinical Psychology at UH Mānoa and I'm interested in women's health during pregnancy and postpartum. I'm conducting a research study (here at the Women's Health Clinic) for my dissertation which will look at mood, social support and stress in new mothers.

(If don't already know) How did you hear about this study?

Did you have any specific questions? (Answer questions or if no questions, go to eligibility criteria.)

I know your provider probably already asked you these, but I just want ask you a few questions to make sure you're a good fit for this study. (Ask eligibility questions. If eligible, continue. If not, thank them for their interest and let them know they're not a good fit at this time. Give them a $10 gift card & have them complete log.)

Great, well it looks like you're a good fit, are you interested in hearing more about the study? (If yes, review the Informed Consent Form. If interested, give them a copy of the ICF, $10 gift card, have them complete log and continue. If have questions, answer them. If not interested, thank them for their time and give them a $10 gift card and have them complete log.)

I have some background questions to ask you… (ask Demographic Information form items).

Now I'd like to have you complete these questionnaires. Please let me know if you have any questions. (Provide initial questionnaires with pen and clipboard. Ask participant not to write their name on any questionnaires. While they're completing the questionnaires, assign participant number, Palm Pilot number, set up practice alarm and alarms for the rest of the week.)

Great. Thank you. Now I'd like to show you how to use a Palm Pilot. Have you ever used one before? It's pretty simple once you get used to it but it might take some practice so we're going to practice completing a Palm Pilot survey right now so you have a good idea of what it will be like when you're doing this at home. (Go over Palm Pilot Training Guide. Review until participant understands what she's supposed to do. Answer any questions.)

Your first alarm will go off (sometime today, tomorrow etc.). I will give you a call tomorrow to see how things are going with using the Palm Pilot.

If there aren't any more questions, that's all for today. Thank you SO much for participating and I'll speak with you tomorrow!

APPENDIX E

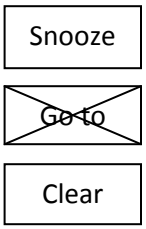
Palm Pilot Training Guide

1. Assignment of Palm Pilot
    a. Palm Pilot is your responsibility during your participation in the study
    b. Please keep in near you at all times
    c. An alarm will sound 2-3 times a day between 8:00 am – 8:00 pm
    d. Complete the "PANAS" survey as soon as possible after the alarm sounds
    e. Please bring the Palm Pilot with you to all weekly in-person appointments

2. Palm Pilot Overview
    a. On/Off– green button on top right
    b. Stylus – slide out from the top right side
    c. All – the top right of the screen should say "All" meaning all icons will be visible
    d. Scroll – on the right of the screen. Use stylus to scroll up and down.
    e. Home – House in a circle at the bottom left corner brings you to the main screen
    f. Typing Letters – small "ABC" at the bottom left
    g. Typing Numbers – small "123" at the bottom right
    h. Battery level – blue is full/gray is empty (top of screen)
    i. Daily Survey – Icon of a notebook that says "PANAS" (not pictured below)

3. Your Password
    a. Selecting a Password
        i. Choose a password that:
            1. Is preferably all numbers (4-5 numbers long)
            2. Is easy for you to remember
            3. That only you know
            4. Hint – word or phrase to help you remember
    b. Using your Password
        i. You will use your password to unlock the Palm Pilot when the alarm sounds to complete your surveys (see #4 for instructions on completing surveys)
        ii. When you turn on the Palm Pilot, the screen will prompt you to Enter Password – Use stylus to enter password and press "OK" (or "Hint" if you forgot your password your hint word or phrase will come up)
        iii. (If you are not on the "Home" screen, press the Home button.)
    c. Only you and I will know your password so:
        i. Do not share your password with anyone
        ii. Contact me immediately if your hint word/phrase does not help you remember your password

4. Completing the Surveys
    a. When the alarm sounds (only 3 beeps, not continuous alarm)



i. Press "snooze" (or nothing at all) if unable to immediately complete survey (alarm will sound again in 5 minutes for 15 minutes)

ii. (Please do not use the "Go to" button.)

iii. Press "Clear" if ready to complete survey
    1. Enter your password "_____" then press "OK"
    2. Press "Home" button (picture of house)
    3. Use stylus to scroll down
    4. Press "PANAS" icon
        a. Enter your code by tapping the blank space with your stylus so your cursor is there
        b. Then press "123" to type in your password (or "ABC") if your password is a word
        c. Press "Next"
        d. Enter responses & Press "Next" until last item which says "Done" (Survey will close automatically)
        e. Turn off Palm when finished by pressing button on top right

5. Using the Palm Pilot
    a. Complete surveys in private place if possible
    b. Do not use Palm Pilot in unsafe (e.g., driving) or inappropriate (e.g., at work) situations

c. Any privacy concerns?

d. Where will Palm Pilot be kept?

6. Frequently Asked Questions (FAQs)

a. What do I do if my Palm Pilot doesn't turn on?

i. The Palm Pilot may not be charged. Try charging the Palm Pilot for a few hours or overnight with the power cord. Plug in the power cord to the small hole in the bottom of the Palm Pilot (hole closest to the right).

b. What do I do if I can't find the PANAS icon to complete my survey?

i. Always go to the Home Screen by pressing the picture of the house in the circle on the bottom of the screen. Then use your stylus to scroll down (scroll is on the right of the screen) to find the icon of a picture of a notepad that says "PANAS."

c. I accidentally entered the wrong number into my password. How do I delete it?

i. It depends what screen you are on. Pressing the "clear" button will delete the entire password, so you can just retype the correct password. If you have a picture of a keyboard, press the backspace button (picture of an arrow pointing left) to delete number/letter by number/letter.

d. I accidentally entered the wrong answer on one of my survey questions but I pressed "next". Can I go back to change my answer?

i. Unfortunately no. The program doesn't allow you to go back to the previous question after you press "Next." Please read each question carefully each time you complete the survey, even though you may have already completed the survey several times, to avoid any mistakes before pressing the "Next" button.

e. What if I have a question that isn't covered here?

i. Call Michelle at 256-7031 or email her at womenspalmpilotstudy@gmail.com

APPENDIX F

Palm Pilot Study for Postpartum Women

Demographic Information Form
(Administered by Researcher)

Age: _____ **Participant ID**: _____

Ethnic Background (check all that apply):

____ African American ____ Caucasian ____ Chinese

____ Filipino ____ Japanese ____ Korean

____ Korean ____ Native American ____ Native Hawaiian

____ Portuguese ____ Other Pacific Islander: _____

____ Other: _____

Which ethnicity do you most strongly identify (check one):

____ African American ____ Caucasian ____ Chinese

____ Filipino ____ Japanese ____ Korean

____ Korean ____ Native American ____ Native Hawaiian

____ Portuguese ____ Other Pacific Islander: _____

____ Other: _____

Highest Education (check one):

____ Some High School ____ High School Degree/GED ____ Technical School

____ Some College ____ College Degree ____ Graduate Degree

Employment Status (check all that apply):

Full-Time: ____ Currently ____ Before Baby ____ After Maternity Leave

Part-Time: ____ Currently ____ Before Baby ____ After Maternity Leave

Student: ____ Currently ____ Before Baby ____ After Maternity Leave

None: ____ Currently ____ Before Baby ____ After Maternity Leave

Annual Household Income (check one):

____ Under $20,000 ____ $20,000 - $35,000 ____ $35,001 - $50,000

____ $50,001 - $75,000 ____ Over $75,000

Current Marital Status (check one):

____ Never Married ____ Married ____ Separated

____ Divorced ____ Widowed ____ Other: _____

Current Living Situation (check all that apply):

____ Father of Baby ____ Baby ____ Other Biological Children

____ Parent(s) ____ Grandparents ____ Partner/Not Father of Baby

____ Sibling(s) ____ Friend(s) ____ Roommate(s)

____ Other: _____

Number of Children, Ages & Gender (circle M, F, or I):

Baby: Age at Birth: _____ weeks Current Age: _____ Male (M) Female (F) Inter-sexed (I)

2nd Youngest Age: _____ M F I 3rd Youngest Age: _____ M F I

4th Youngest Age: _____ M F I 5th Youngest Age: _____ M F I

Recent Delivery Type (check one):

____ Vaginal Delivery ____ Planned C-Section

____ Unplanned C-Section

Complications: _____

Participant's Breastfeeding Status (check one):

____ Breastfeeding Only ____ Breast- & Formula-feeding ____ Formula-feeding Only

Psychiatric History (from provider):

Current Diagnoses: _____

Current Psychotherapy: No Yes What for? _____

Current Psychotropic Medication(s): _____

Past Diagnoses: _____

Past Psychotherapy: No Yes What for? _____

Past Psychotropic Medication(s): _____

Time(s) Unavailable for EMA (8:00am-8:00pm): _____

Week 1 Appointment: _____ **Week 2 Appointment**: _____

Week 3 Appointment: _____ **Week 4 Appointment**: _____

APPENDIX G

Palm Pilot Study for Postpartum Women

Evaluation of Palm Pilot Study

Please circle the response that best fits your experience with participation in this study.

1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree

1. The Palm Pilot was easy to use.	**1**	**2**	**3**	**4**
2. The questions on the Palm Pilot were easy to understand.	**1**	**2**	**3**	**4**
3. The Palm Pilot alarms sounded at times that were inconvenient for me.	**1**	**2**	**3**	**4**
4. It took too long to complete the questions on the Palm Pilot.	**1**	**2**	**3**	**4**
5. It would have been convenient for me to complete more than 2 assessments a day (e.g., 3 or 4 times a day).	**1**	**2**	**3**	**4**
6. I needed more technical help to use the Palm Pilot.	**1**	**2**	**3**	**4**
7. If given the chance, I would participate in a similar study in the future.	**1**	**2**	**3**	**4**
8. One month was too long to participate in this study.	**1**	**2**	**3**	**4**
9. I enjoyed using the Palm Pilot.	**1**	**2**	**3**	**4**
10. The questions on the Palm Pilot were too confusing.	**1**	**2**	**3**	**4**
11. I would recommend participating in this study to a friend.	**1**	**2**	**3**	**4**
12. My participation in this study was inconvenient to others (e.g., family, friends).	**1**	**2**	**3**	**4**

Please write in your response to the following questions.

13. What did you like most about participating in this study?

14. What did you like least about participating in this study?

APPENDIX H

Palm Pilot Study for Postpartum Women

I-PANAS-SF

Thompson (2007)

EMA Instructions:

(Item 1 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

upset ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 2 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

hostile ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 3 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

alert ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 4 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

ashamed ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 5 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

inspired ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 6 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

nervous ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 7 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

determined ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 8 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

attentive ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

(Item 9 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

afraid ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

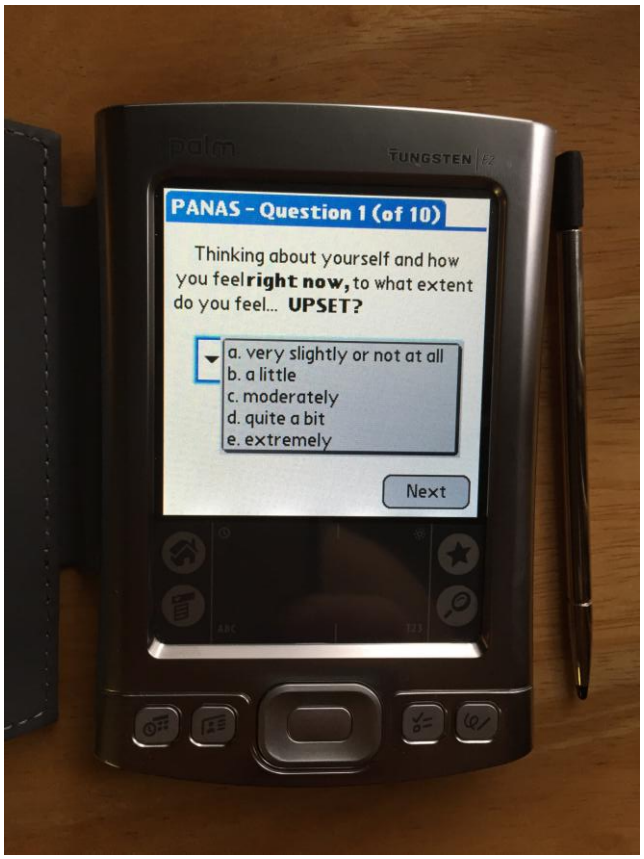
(Item 10 of 10) *Thinking about yourself and how you feel right now, to what extent do you feel…*

active ☐

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

I-PANAS-SF

Palm Pilot Example Item



APPENDIX I

Palm Pilot Study for Postpartum Women

I-PANAS-SF

Thompson (2007)

Weekly Instructions:

Thinking about yourself and how you've felt <u>*this past week*</u>*, to what extent did you generally feel…*

1 = Very Slightly or Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

_____ upset

_____ hostile

_____ alert

_____ ashamed

_____ inspired

_____ nervous

_____ determined

_____ attentive

_____ afraid

_____ active

APPENDIX J

Palm Pilot Study for Postpartum Women

Mood Visual Analog Scale

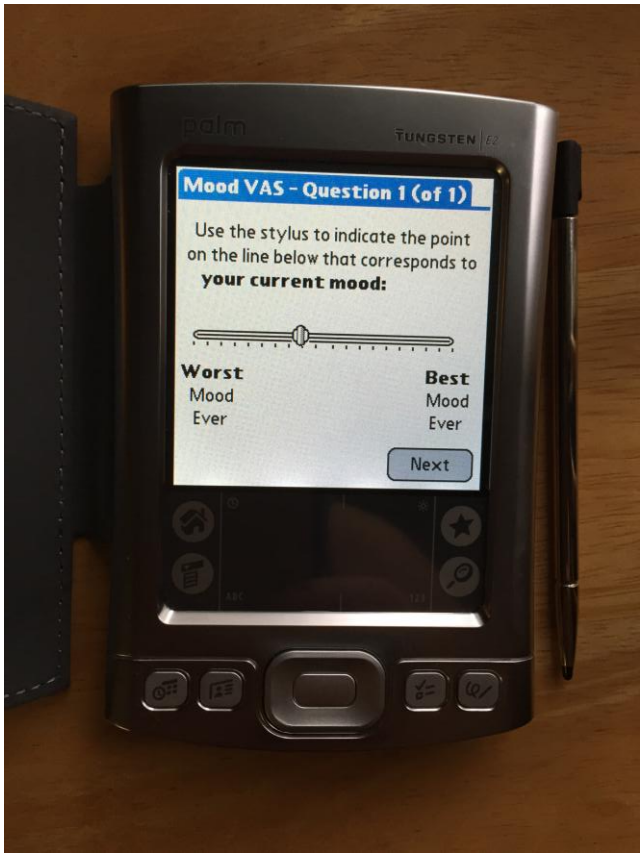
EMA Instructions:

(Item 1 of 1) *Use the stylus to indicate the point on the line below that corresponds to your current mood*.

Worst Mood Ever	Best Mood Ever

Mood Visual Analogue Scale

Palm Pilot



APPENDIX K

Palm Pilot Study for Postpartum Women

Mood Visual Analog Scale

Weekly Instructions:

Use a pen to indicate the point on the line below that corresponds to your mood over the past week.

_____

Worst Mood Ever — Best Mood Ever

APPENDIX L

Palm Pilot Study for Postpartum Women

CES-D

Instructions: *Below is a list of some of the ways you may have felt or behaved. Please indicate how often you've felt this way during the past week. Please respond to all items.*

Mark (X) the appropriate column. **During the past week…**	**Rarely or none of the time (less than 1 day)**	**Some or a little of the time (1-2 days)**	**Occasionally or a moderate amount of time (3-4 days)**	**All of the time (5-7 days)**
1. I was bothered by things that usually don't bother me.				
2. I did not feel like eating; my appetite was poor.				
3. I felt that I could not shake off the blues even with help from my family.				
4. I felt that I was just as good as other people.				
5. I had trouble keeping my mind on what I was doing.				
6. I felt depressed.				
7. I felt that everything I did was an effort.				
8. I felt hopeful about the future.				
9. I thought my life had been a failure.				
10. I felt fearful.				
11. My sleep was restless.				
12. I was happy.				
13. I talked less than usual.				
14. I felt lonely.				
15. People were unfriendly.				
16. I enjoyed life.				
17. I had crying spells.				
18. I felt sad.				
19. I felt that people disliked me.				
20. I could not "get going."				

Source: Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement, 1: 385-401.

APPENDIX M

Palm Pilot Study for Postpartum Women

CES-D-VAS-VS

Moullec et al. (2011)

Instructions:

(Item 1 of 4) *Use the stylus to indicate the point on the line below that corresponds to the following statement for you right now.*

I am happy.

_____

Not at all Absolutely

(Item 2 of 4) *Use the stylus to indicate the point on the line below that corresponds to the following statement for you right now.*

I have crying spells or feel like it.

_____

Not at all Absolutely

(Item 3 of 4) *Use the stylus to indicate the point on the line below that corresponds to the following statement for you right now.*

I feel that people dislike me.

_____

Not at all Absolutely

(Item 4 of 4) *Use the stylus to indicate the point on the line below that corresponds to the following statement for you right now.*

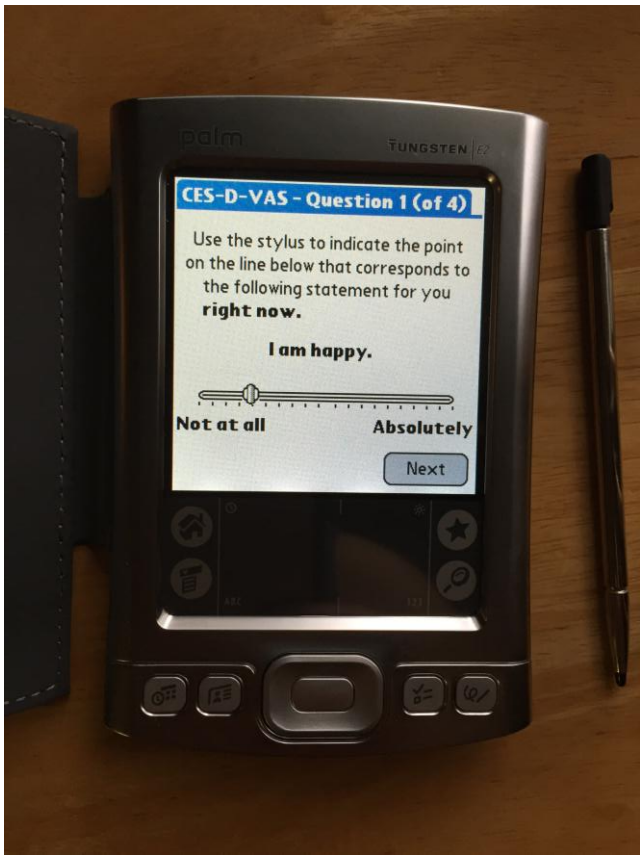
I talk less than usual.

_____

Not at all Absolutely

CES-D-VAS

Palm Pilot Example Item



APPENDIX N

Palm Pilot Study for Postpartum Women

Postpartum Support Questionnaire

Logsdon et al. (1996)

Instructions: The following questions ask about ways in which you have needed help since your baby was born. First, each question asks you to indicate how *IMPORTANT* this type of help was for you. Then, you are to indicate *HOW MUCH* help you received with this item. Please circle the number of the response that best describes your feeling or opinion.

	IMPORTANT NEED Not important 0							Very important 7	HELP RECEIVED No help 0							Lot of help 7
1. Needed help with cooking meals.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
2. Needed to be reassured that I was more than just someone's mother.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
3. Needed to have information on taking care of my own body as it heals following the birth of my baby.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
4. Needed to talk to another new mother about my baby's behavior.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
5. Needed help with laundry.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
6. Needed to have information on which skin rashes were normal for the baby to have.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
7. Needed to know if my baby's sleeping patterns were normal.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
8. Needed help in taking care of my baby so that I could take a shower, eat, or have some time to myself.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
9. Needed to have time for friends and activities (exercise, sports, clubs, parties) I used to enjoy.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

10. Needed for others to act as if I am special.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
11. Needed help in cleaning the house/apartment.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
12. Needed for others to appreciate my care of the baby.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
13. Needed to have others act as if my ideas, decisions, and ways of doing things were right or acceptable.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
14. Needed to have information on what my baby's bowel movements should look like.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
15. Needed for others to act like it is okay for me to need help.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
16. Needed to talk with another new mother about how to do baby care.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
17. Needed to have information on resuming sex and/or birth control.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
18. Needed to talk with another new mother about how I was adjusting to the role of mother.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
19. Needed help in obtaining more sleep for me.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
20. Needed for someone to talk with me and listen to me about is interesting and important to me.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
21. Needed to have information on breastfeeding.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
22. Needed help in going to the grocery or drugstore.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7

23. Needed for someone to watch my baby so that I could have time alone together with my partner/boyfriend.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
24. Needed to have information on my baby's crying (why the baby cries and how to comfort him/her).	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
25. Needed for others to take my worries and concerns seriously.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
26. Needed to have information on handling stress and/or discomfort.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
27. Needed for others to reassure me that I was not alone in being responsible for my baby.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
28. Needed to have information on how to care for my baby's umbilical cord (navel, belly button).	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
29. Needed to talk with another new mother about the best places to get baby care supplies, clothing, etc., needed.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
30. Needed money for baby equipment, supplies, or bills that go along with having my baby.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
31. Needed to have information on my baby's hiccups (why the baby hiccups and what to do).	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
32. Needed to talk with another new mother about my labor and delivery experience.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
33. Needed for others to touch, kiss, and hug me.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
34. Needed to have others treat me like I am responsible and competent.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7

APPENDIX O

Palm Pilot Study for Postpartum Women

Social Support VAS

EMA Instructions: *Use the stylus to indicate the point on the line below that corresponds to the blank space in the following statement.*

(Item 1 of 4) Since the last beep, I have received _____ support with gifts or money, running errands, doing household chores, etc.

_____

No A lot of

(Item 2 of 4) Since the last beep, I have received _____ support that I am responsible, appreciated for caring for baby, have someone to talk to, listen to me, take my worries seriously, etc.

_____

No A lot of

(Item 3 of 4) Since the last beep, I have received _____ support with information on baby's crying, sleeping, health, and on taking care of myself, etc.

_____

No A lot of

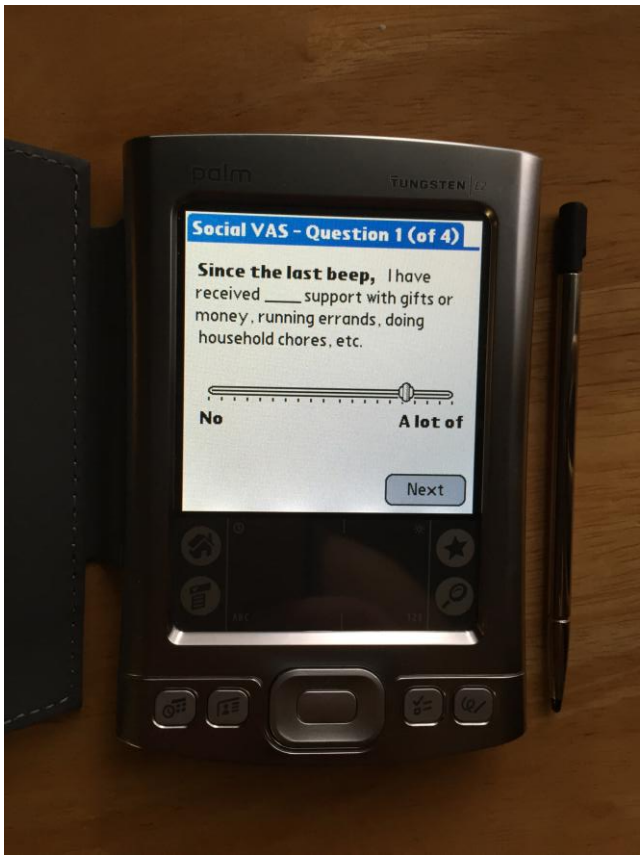
(Item 4 of 4) Since the last beep, I have received _____ support by talking to other (new) mothers about their experiences with baby care and behavior, and about my own experiences as a new mother.

_____

No A lot of

Social Support VAS

Palm Pilot Example Item



APPENDIX P

Palm Pilot Study for Postpartum Women

Social Support VAS

Weekly Instructions: *Use a pen to indicate the point on the line below that corresponds to the blank space in the following statement.*

1. During the past week, I have received _____ support with gifts or money, running errands, doing household chores, etc.

   _____

   No A lot of

2. During the past week, I have received _____ support that I am responsible, appreciated for caring for baby, have someone to talk to, listen to me, take my worries seriously, etc.

   _____

   No A lot of

3. During the past week, I have received _____ support with information on baby's crying, sleeping, health, and on taking care of myself, etc.

   _____

   No A lot of

4. During the past week, I have received _____ support by talking to other (new) mothers about their experiences with baby care and behavior, and about my own experiences as a new mother.

   _____

   No A lot of

APPENDIX Q

Palm Pilot Study for Postpartum Women

Perceived Stress Scale

Cohen & Williamson, 1988

The questions in this scale ask you about your feelings and thoughts **during the last week**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last week, how often have you been upset because of something that happened unexpectedly?	**0**	**1**	**2**	**3**	**4**
2. In the last week, how often have you felt that you were unable to control the important things in your life?	**0**	**1**	**2**	**3**	**4**
3. In the last week, how often have you felt nervous and "stressed"?	**0**	**1**	**2**	**3**	**4**
4. In the last week, how often have you felt confident about your ability to handle your personal problems?	**0**	**1**	**2**	**3**	**4**
5. In the last week, how often have you felt that things were going your way?	**0**	**1**	**2**	**3**	**4**
6. In the last week, how often have you found that you could not cope with all the things that you had to do?	**0**	**1**	**2**	**3**	**4**
7. In the last week, how often have you been able to control irritations in your life?	**0**	**1**	**2**	**3**	**4**
8. In the last week, how often have you felt that you were on top of things?	**0**	**1**	**2**	**3**	**4**
9. In the last week, how often have you been angered because of things that were outside of your control?	**0**	**1**	**2**	**3**	**4**
10. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?	**0**	**1**	**2**	**3**	**4**

Mind Garden, Inc.
1690 Woodside Road, Suite #202, Redwood City, CA 94061 USA
Phone: (650) 261-3500 Fax: (650) 261-3505 e-mail: mindgarden@msn.com www.mindgarden.com

APPENDIX R

Palm Pilot Study for Postpartum Women

Daily Stressful Events Scale

(Item 1 of 10) *What are you doing right now?*

Drop-down menu:

paid work
studying, schoolwork
commuting (car, bus, etc.)
shopping
housework, chores
eating or cooking
watching TV
reading
socializing
napping/resting
exercising
on computer
taking care of children
praying or meditating
grooming/self-care
errands
other

(Item 2 of 10) *Do you consider this event/activity positive or negative?*

Drop-down menu:

positive
negative

(Item 3 of 10) *Use the stylus to indicate the point on the line below that corresponds to the* ***pleasantness*** *of this event/activity.*

Extremely Unpleasant	_____	Extremely Pleasant

(Item 4 of 10) *Use the stylus to indicate the point on the line below that corresponds to the* ***importance*** *of this event/activity.*

Extremely Unimportant	Extremely Important

(Item 5 of 10) *Use the stylus to indicate the point on the line below that corresponds to the* ***stressfulness*** *of this event/activity.*

Extremely Unstressful	Extremely Stressful

(Item 6 of 10) *What was the most significant event/activity that happened to you* *since the last beep?*

Drop-down menu:

paid work
studying, schoolwork
commuting (car, bus, etc.)
shopping
housework, chores
eating or cooking
watching TV
reading
socializing
napping/resting
exercising
on computer
taking care of children
praying or meditating
grooming/self-care
errands
other

(Item 7 of 10) *Was this event/activity positive or negative?*

Drop-down menu:

positive
negative

(Item 8 of 10) *Use the stylus to indicate the point on the line below that corresponds to the* ***pleasantness*** *of this event/activity.*

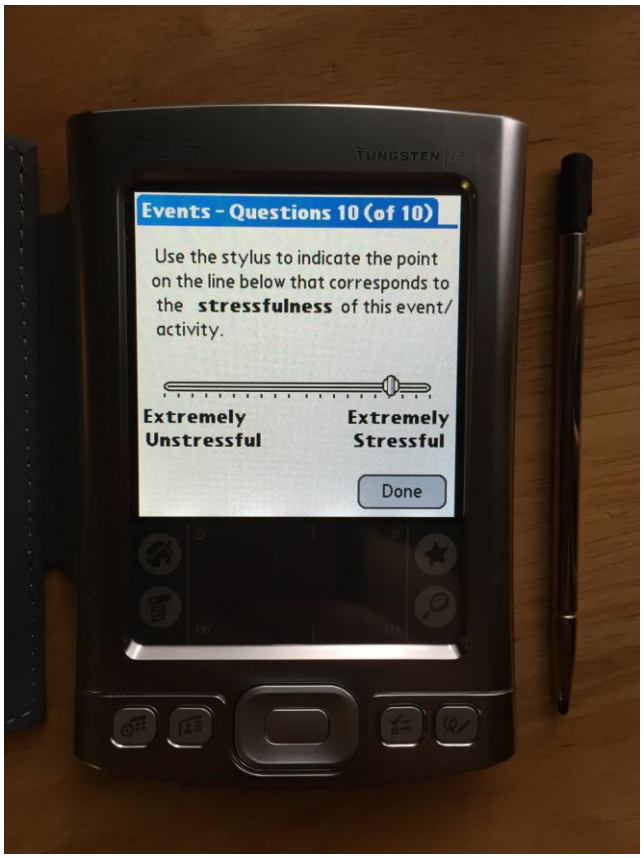
Extremely Unpleasant	Extremely Pleasant

(Item 9 of 10) *Use the stylus to indicate the point on the line below that corresponds to the* ***importance*** *of this event/activity.*

Extremely Unimportant	Extremely Important

(Item 10 of 10) *Use the stylus to indicate the point on the line below that corresponds to how* ***stressfulness*** *of this event/activity.*

Extremely Unstressful	Extremely Stressful

Daily Stressful Events Scale

Palm Pilot Example Item