

POSTPARTUM DEPRESSION AMONG ADOLESCENT MOTHERS: EXAMINING AND
TREATING LOW-INCOME ADOLESCENTS WITH SYMPTOMS OF POSTPARTUM
DEPRESSION

by

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Postpartum Depression Among Adolescent Mothers: Examining and Treating Low-income
Adolescents with Symptoms of Postpartum Depression

Thesis directed by Professor Sona Dimidjian

Postpartum depression (PPD) among adult women is a prevalent and impairing problem, with evidence suggesting risk of adverse consequences for mothers and their infants. Few studies have investigated the problems of PPD among adolescents; however, both the emergence during adolescence of increased risk for depression among girls compared to boys and the prevalence of adolescent pregnancy suggest that this is a topic worthy of increased attention. The present thesis examines correlates of adolescent PPD, as well as an intervention for low-income adolescent mothers with symptoms of PPD. Study 1 investigated the relationship between depressive symptom severity and potential individual vulnerability and social context factors among a sample of adolescent mothers (N=102). Results indicate that adolescent PPD symptoms are associated with the number of negative life events, perceived discrimination, deficits in social support, anxiety symptom severity, perceived stress, impaired bonding and deficits in interpersonal effectiveness and emotion regulation. The best fitting model from the stepwise regression analyses indicated that perceived stress and anxiety symptom severity were the best predictors of adolescent PPD symptom severity. Study 2 examined the feasibility and preliminary outcomes of a behavioral skills training group intervention, based on Dialectical Behavioral Therapy (DBT), among adolescents with PPD (N=24) recruited from both a public health parent education program and a specialty obstetrics clinic for adolescent mothers. Findings suggest the intervention was both feasible and associated with improvement

in mental health and functional domains. Together these studies indicate that a number of domains are related to adolescent PPD symptoms, particularly anxiety symptom severity and perceived stress, and a DBT skills group may be effective in reducing symptoms of PPD, as well as other areas of difficulty for adolescent mothers.

To My Mother

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CHAPTER I

GENERAL INTRODUCTION

Background

Postpartum depression among adolescent mothers is an important public health problem. It is estimated that approximately 3.19% of young women in the United States give birth between the ages of 15 and 19 each year (Ventura & Hamilton, 2011). In addition, adolescent mothers are five times more likely to give birth to another child before the age of 20 than other adolescent girls (Ventura, Mathews, & Hamilton, 2001). Adolescent mothers, many of whom were disadvantaged before becoming pregnant (Mollborn & Morningstar, 2009), face an increased risk of many difficulties, including being less successful economically and academically, with only 40% of teenage mothers graduating from high school as compared to 75% percent of those who delay birth of their first child till the age of 20-21 (Hoffman, 2006). Moreover, adolescent mothers have a greater likelihood of experiencing unstable friendships and intimate relationships, and may be at higher risk for intimate partner violence than older mothers (Furstenburg, Brooks-Gunn, & Morgan, 1987; Gielen, O'Campo, & Faden, 1994). Multiple lines of evidence suggest that adolescent mothers may be at higher risk of depression when compared to a range of reference points. There exists an increased general risk for depression among girls as compared to boys that onsets during adolescence (Hankin & Abramson, 2001); moreover, emerging studies suggest that adolescent mothers experience an increased risk of depression compared to non-adolescent mothers and non-parenting adolescents (Cassidy, Zoccolillo, & Hughes, 1996; Zoccolillo & Rogers, 1991). Rates of postpartum depression (PPD) among adult women range from 6.5-12.9% during the immediate postpartum period (Gaynes et al., 2005); however, studies focusing on adolescent mothers have suggested much higher rates, with

estimates of nearly one to two thirds of adolescent mothers experiencing moderate to severe levels of depression symptoms (Leadbeater & Linares, 1992). Thus, although prevalence estimates suggest that neither childbearing nor postpartum depression following childbirth is rare among adolescent women, surprisingly few studies have examined the problem of depression and even fewer have examined interventions for this population. Basic questions regarding the phenomenology of postpartum depression among adolescent women and interventions that hold promise remain unanswered.

Current Studies

The present research addressed two primary aims in the context of two studies. Given the paucity of psychological research on adolescent PPD, the first aim was to identify correlates of depression among adolescent mothers on a number of domains, guided by a psychosocial theoretical perspective (Monroe, Slavich, & Georgiades, 2009). The second aim was to identify a promising intervention for adolescent PPD by examining the feasibility and preliminary mental health and functional outcomes associated with a behavioral skills training intervention designed to target the transactional relationship between hypothesized individual vulnerability correlates and social context factors among this population.

In Study 1, we used a cross sectional correlational design to examine the association between adolescent PPD and social context factors, including race and ethnicity, perceived discrimination, SES, social support, negative life events and stress, and between adolescent PPD and individual vulnerability factors, including anxiety and deficits in emotion regulation and interpersonal effectiveness. We also explored a correlational model in which significant social context and individual vulnerability correlates of adolescent PPD were considered together.

In Study 2, we examined the feasibility of and preliminary outcomes associated with a 12-week Dialectical Behavior Therapy (DBT) skills group intervention for adolescent mothers with PPD. This intervention was designed to target the transactional relationship between hypothesized skills deficits, other vulnerabilities and environmental/contextual factors among this population.

CHAPTER II

Introduction

Despite the recent increase in empirical and clinical attention to PPD among adult women, there is a paucity of research addressing the problem of PPD among adolescents. Research addressing factors that may contribute to PPD can be organized according to the theoretical perspective proposed by Monroe and colleagues (2009). This perspective specifies a transactional relationship between social context factors and individual vulnerability factors that helps to explain the onset and maintenance of depression. Although few studies have directly addressed social context or individual vulnerability correlates of PPD among adolescent mothers (see Table 1), findings from studies utilizing samples of adult mothers and non-childbearing adolescents can inform our understanding of this domain. This theoretical perspective has guided recent efforts to better understand adult PPD (Goodman & Tully, 2008). Evidence from studies of adult mothers, non-childbearing adolescents, and depressed postpartum adolescents suggests that a range of social context variables may be important, including race and ethnicity, perceived discrimination, socioeconomic status (SES), social support, negative life events and stress. Individual vulnerability factors that may be associated with adolescent PPD include anxiety and deficits in interpersonal effectiveness and emotion regulation.

Social Context Factors

Among studies addressing adolescent PPD, little attention has been devoted to the role of social context factors, such as race and ethnicity, perceived discrimination, SES, and negative life events; in contrast, more research has focused on the role of social support.

Race and Ethnicity. Very little is known about the prevalence of depression among specific ethnic and racial subgroups of adolescent mothers. This gap in our knowledge base is

surprising given that studies suggest clear racial and ethnic disparities in adolescent childbearing. Pregnancy rates for Latina and African American adolescents are higher than other ethnic and racial groups (Ventura, Moser, Curtin, Abma, & Henshaw, 2007). Overall, one in ten births in the United States in 2002 was to women who were Mexican immigrants (Camorota, 2005) and approximately 7.6% of those births were to adolescent mothers. With respect to adolescent PPD, one study found that African American adolescent mothers had lower rates of moderate to severe PPD symptoms than White and Mexican American adolescent mothers, but African American adolescent mothers experienced more stable PPD symptoms, with almost half who reported symptoms at 3 months also reporting symptoms at 48 months (Schmidt, Wiemann, Rickert, & Smith, 2006). Mexican American adolescent mothers were 2.6 times more likely at 1 year postpartum, and 2.2 times more likely at 24 months postpartum to report PPD symptoms as compared to African American adolescent mothers (Schmidt et al., 2006). Conversely, Leadbeater and Linares (1992) found no significant differences between African American and Puerto Rican adolescent mothers on PPD symptom rates. More research in this area is needed to evaluate racial and ethnic disparities among depressed adolescent mothers.

Perceived discrimination and stigma. One route by which social context may influence mental health status is the experience of discrimination, which among adolescent mothers could be related to race or ethnicity, but also could be related to parenting status. There is some evidence among general adolescent samples to suggest an association between perceived racial or ethnic discrimination and depression symptoms. For example, Latino adolescents' perceptions of societal discrimination has been significantly associated with depression symptoms (Behnke, Plunkett, Sands, & Bámaca-Colbert, 2011; Portes & Zady, 2002). Further, in samples of African American (Brody, Chen, Murray, Logan, & Luo, 2008; Mitchell et al., 2010) and Mexican-origin

adolescent mothers (Umana-Taylor, Updegraff, & Gonzalez-Backen, 2011) higher perceived discrimination has been associated with higher depression symptom severity. No studies have examined the experience of discrimination and stigma based on adolescent parenting status or the effect of such perceived discrimination on mental health.

Socioeconomic status. Meta-analytic studies suggest that SES is related to both the course and persistence of depression (Lorant et al., 2003), and among adult women, there is evidence to suggest a causal link between depression and low SES (Dohrenwend, 2000). Furthermore, for poor adolescents, high distress increased the probability of becoming an adolescent mother (Mollborn & Morningstar, 2009) and this association was not true for non-poor adolescents. No studies to date, however, have examined specifically the degree to which low SES is associated with adolescent PPD. Given that 60% of adolescent mothers live below the poverty line at the time of their child's birth (The Alan Guttmacher Institute, 1994), the importance of examining the possible association between low SES and adolescent PPD is clear.

Social support. Research supports a negative association between PPD and social support in an adolescent mother's environment. The majority of studies suggest that adolescent mothers have lower social support than samples of non-childbearing adolescents and adult postpartum women (Verzemnieks, 1999). Several specific sources of social support also, have been identified as relevant for adolescent mothers. These include grandparents (parent of the adolescent mother), father of child (FOC), and peers. One study found that, adolescents with PPD symptoms were more likely to have only one adult living at home rather than two or more (Lanzi, Bert, & Jacobs, 2009). Support from FOC may also play a role in symptoms of PPD. A mother's satisfaction with FOC involvement at 3 months postpartum was found to be negatively associated with PPD symptoms (Fagan & Lee, 2010). Furthermore, satisfaction with FOC was

associated with adolescents' parenting competence, which was also related to PPD symptoms (Fagan & Lee, 2010). Social isolation from peers also may be an important factor. One study found social isolation (in addition to self reported maternal self efficacy and weight/shape concerns) accounted for 38% of the variance in adolescent mothers' PPD symptoms (Birkeland, Thompson, & Phares, 2005).

Evidence also suggests that an adolescent's need for social support from these various sources may change across time. Leadbeater and Linares (1992) found that at 2 to 4 weeks postpartum, perceptions of higher social support from family and friends and acceptance from grandmother predicted lower PPD symptoms. At 6 to 7 months postpartum, the same variables showed the same pattern of association with PPD symptoms, as did perception of a grandmother's encouragement of the mother's independence. Finally, although not significant at earlier time points, at approximately a year postpartum, lower FOC support predicted higher PPD symptoms (Leadbeater & Linares, 1992). Another study found differences between social support and its correlation with symptoms of PPD from the end of pregnancy/early postpartum to approximately 1 year later. During the end of pregnancy/early postpartum period, grandmother support, grandmother problems, and partner problems were related to PPD symptoms; however, at 1 year postpartum, greater partner support (from the same partner) significantly predicted lower PPD symptoms while partner and grandmother difficulties and grandmother support were no longer significant (Gee & Rhodes, 1999). If the adolescent changed partners, the only significant predictor of PPD symptoms at 1 year postpartum was PPD symptoms at the first time point. In addition, lower social support for adolescent mothers may not necessarily be negative; using path analysis, one study found that more support from friends, family and others coupled

with low self esteem were predictors of PPD symptoms 6 weeks postpartum (Logsdon, Birkimer, Simpson, & Looney, 2005).

The majority of studies addressing adolescent PPD have focused on social support; however, important questions remain regarding the strength of this association, the type and source of social support (e.g., peer, parent, or partner), and the ways in which need for particular types of support may change over time. Overall, based on the above studies, it is possible that those adolescents with lower social support may exhibit higher levels of PPD symptoms.

Negative life events. Research among general adolescent samples suggests that negative life events are associated with depression symptom severity (Benson & Deeter, 1992; Vinokur & Selzer, 1975; Warheit, 1979), depression symptoms above clinical cutoff scores (Sawyer, Pfeiffer, & Spence, 2009), as well as onset of a depressive episode (Patton, Coffey, Posterino, Carlin, & Bowes, 2003). In the adult PPD literature, stressful life events during pregnancy and the early postpartum have been identified as strong predictors of subsequent PPD (Robertson, Grace, Wallington, & Stewart, 2004). Furthermore, controllable or dependent negative life events, such as failing a test, have been associated with depression symptom severity both cross-sectionally and longitudinally in an adolescent sample (although not when controlling for baseline functioning) (L. H. Cohen, Burt, & Bjorck, 1987). Furthermore, negative life events may not only be associated with the onset, but also the maintenance of depression symptoms. Among a sample of adolescent girls, initial depression symptoms were associated with dependent negative life events, negative thinking, and subsequent depression symptoms (Kercher, Rapee, & Schniering, 2009). For adolescent mothers, pregnancy itself may be seen as a negative life event, as adolescents may not feel prepared to handle the responsibility of parenting. This

extra stress during pregnancy and early postpartum may put adolescent mothers at higher risk for depression than their adult or non-childbearing counterparts.

Stress. Numerous studies have demonstrated a link between stress and depression symptom severity in adolescent samples (Hampel & Peterman, 2006; Martin, Kazarian, & Breiter, 1995), as well as adult postpartum samples (Gao, Chan, & Mao, 2009; Page & Wilhelm, 2007; Sarton, 2006). Furthermore, research has shown that stress is related to future depression symptom severity, even when controlling for baseline symptom severity (S. Cohen, 1986). Only one study to date has focused on the role of general stress in depression symptom severity among postpartum adolescents, with evidence suggesting that stress may play a key role in adolescent PPD. Logsdon and colleagues (2008) found that stress was the strongest predictor of adolescent PPD among a variety of variables including social support, community violence, mastery, self-esteem, and social network.

Stress related to day to day parenting tasks, such as a baby crying or being fussy, as well as negative perceptions of one's child is one domain that has received specific attention in research on PPD. In fact, the relationship between PPD and parenting stress has been studied extensively in adult samples showing a consistent relationship between PPD and parenting stress (Cornish et al., 2006; Field, Healy, Goldstein, & Guthertz, 1990; D. R. Forman et al., 2007). Similarly, studies have suggested that adolescent mothers experience higher parenting stress than their adult counterparts (Passino et al., 1993). Adolescent mothers' perceptions of parenting may be affected by PPD. Mothers' prenatal expectations regarding parenting, such as predicted maternal frustration and negative emotion when baby is fussy and crying, as well as perceived adequacy of family support were positively and negatively associated, respectively with PPD

symptoms 4 weeks postpartum (Secco et al., 2007). Furthermore, higher parenting stress was correlated with more symptoms of PPD (Spencer, Kalill, Larson, Spieker, & Gilchrist, 2002).

Although research regarding the relationship between stress and adolescent PPD is nascent, this may be an important variable in understanding the phenomenology of adolescent PPD. Adolescents endure a great deal of stress from normative academic and social demands, without the added stress of becoming a parent; thus, adolescent mothers may be at higher risk than their non-parenting counterparts for developing PPD symptoms. Also, the same objective events may cause a higher level of stress for adolescent mothers because they simply do not have the experience or resources to cope with the stressors they face. Examining the degree to which adolescent PPD and stress are associated is a first step toward understanding whether stress is a risk factor for the development of PPD. Both the perception of stress generally, as well as specific sources of stress such as parenting, merit additional attention.

Individual Vulnerability Factors

Anxiety. Anxiety among adult postpartum women is increasingly recognized as an important correlate of depression, with estimates of prevalence varying from 6.1 to 27.9% (Britton, 2005; Reck, Stehle, Reinig, & Mundt, 2009; Stuart, Couser, Schilder, O'Hara, & Gorman, 1998; Wenzel, Haugen, Jackson, & Brendle, 2005) and rates of anxiety may be even higher among postpartum adolescents. Among one sample of adolescent mothers, researchers found that 41.7% of mothers exhibited elevated anxiety at 6 weeks postpartum and 46.8% at 6 months postpartum (Gilson & Lancaster, 2008). Furthermore, studies indicate that comorbidity between symptoms of anxiety and PPD are high. One study of adult postpartum women found that comorbidity rates between state anxiety and clinical levels of depression symptoms at 2-3 days post delivery at 36.5% and 27.5% at 3 months postpartum (Giakoumaki, Vasilaki, Lili,

Skouroliahou, & Liosis, 2009). This study also found an association between both state and trait anxiety and depression symptom severity (Giakoumaki et al., 2009). With regard to diagnosed PPD and postpartum anxiety, one study found that 33.9% of adult women diagnosed with PPD were diagnosed with a comorbid anxiety disorder (Reck et al., 2008). Anxiety symptoms may also have an impact on depression symptoms. One study indicated that a diagnosed anxiety disorder during pregnancy increases the risk of elevated postpartum depression symptom severity (Sutter-Dallay, Giaconne-Marcasche, Glatigny-Dallay, & Verdoux, 2004) and studies among the general population indicate that comorbid anxiety and depression is associated with increased medical utilization, higher symptom severity, longer symptom duration, and greater impairment overall (for review; Hirschfeld, 2001). Given the high rates of anxiety among postpartum adolescents, adolescent mothers may be more likely to develop depression symptoms, as well as more severe depression symptoms than their adult counterparts. In sum, rates of anxiety and depression symptoms and full diagnosis appear to be high in both adolescent and adult postpartum samples. Anxiety comorbidity may be common among adolescent mothers and may place them at increased risk of negative consequences, although more research is necessary to understand the relationship between anxiety and depression among adolescent mothers.

Emotion regulation. Studies with adults indicate that deficits in the ability to regulate emotion effectively may increase vulnerability to depression (Ehring, Fischer, Schnulle, Bosterling, & Tuschen-Caffier, 2008; Gross & Munoz, 1995); and research with adolescents has shown similar results. Yap and colleagues (2011) found that adolescents with more depressive symptoms reported having dysregulated expression and inhibition responses more frequently and used effective coping strategies less frequently than adolescents with fewer symptoms of

depression. Furthermore, studies show that depressed adolescents used emotion regulation strategies less often and have a smaller range of emotion regulation strategies from which to choose than their non-depressed counterparts (Garber, Braafladt, & Weiss, 1995; Garber, Braafladt, & Zeman, 1991). Overall, there appears to be a link between emotion regulation and depression in both adolescent and adult samples, thus adolescents with emotion regulation difficulties may be at risk for developing symptoms of PPD. Moreover, the importance of an adolescent mother regulating her own emotions is underscored by the demand on her also to help her infant develop self-regulation strategies. More research is necessary to examine the relationship between deficits in emotion regulation domains and PPD among adolescents.

Interpersonal effectiveness. A positive association between interpersonal difficulties and depression has been well documented in adult and adolescent samples (e.g., Hammen, 1991; Hammen, Shih, Altman, & Brennan, 2003; Hammen, Shih, & Brennan, 2004). Moreover, recent research shows that early interpersonal difficulties and clinical depression may put adolescent girls at high risk of becoming adolescent mothers (Hammen, Brennan, & Le Brocque, 2011). In this study, retrospective reports of depression prior to age 15 were associated with both interpersonal difficulties reported at age 15 and childbearing before the age of 20. Furthermore, interpersonal functioning mediated the relationship between early depression and early childbearing in this sample. Thus, adolescent mothers may begin motherhood with poor interpersonal skills and a past history of depression, both of which may increase vulnerability to PPD. Supporting this hypothesis, Promdromidis and colleagues (1994) found that social skills was an important correlate of adolescent PPD; specifically, 25% of the variance in PPD symptoms was accounted for by social skills, along with mental health and family relations. Problems with social skills may be prominent and important among adolescents with PPD.

Among adolescent mothers, interpersonal difficulties that arise within the context of parenting may be of particular salience. A large body of research has demonstrated a link between PPD and increased risk of problematic parenting behaviors among adult mothers (Murray, Cooper, & Hipwell, 2003), such as problems with responsivity to infants (D. R. Forman et al., 2007) and demonstration of affectionate contact behavior (Fleming, Ruble, Flett, & Shaul, 1988). Moreover, such work suggests an increased risk of subsequent impairment among children of depressed mothers in cognitive, emotional, social, and neuroregulatory domains (Kinsella & Monk, 2009; Milgrom, Westley, & Gemmill, 2004; Murray & Copper, 1997).

Five studies (including three unpublished dissertations) have used observational methods to examine the relationship between adolescent maternal parenting behaviors and PPD. Among the two published studies, one study employed a free play interaction and found that higher depression symptoms during the first year postpartum were associated with lower contingent responses between mother and child (Leadbeater, Bishop, & Raver, 1996). Furthermore, higher depression symptoms during the first year postpartum were related to more child problem behaviors during preschool as measured by the Child Behavior Checklist (Achenbach, 1992). Another study employed a coded interaction in each mother's home (mothers were asked to act as they normally would) and found that depression symptoms explained a significant portion of the variance in maternal contingent responsiveness, warmth and sensitivity as well as infants' attention and arousal. Furthermore, as depression increased, adolescent mothers and infants scored more negatively in each area (Lanzi et al., 2009).

Among the three unpublished dissertations, one study used observed free play interactions and found that self reported depression symptoms were negatively correlated with observed adolescent maternal role behavior (Lesser, 1997). Another used two observational

measures of parenting among adolescents rearing toddlers over time (Verzemnieks, 1999).

Parenting behaviors observed at one-year postpartum predicted lower depressive symptoms at 18 months. The findings show that adolescent mothers who were more depressed were more likely to have used specific parenting practices such as restricting infant behavior or using physical punishment. Using stepwise regression, the authors also found that infant difficulty and persistence rated by adolescent mothers at 12 months, and 18 month depression symptoms accounted for 18% of the variance in observed parenting at 18 months. Overall, a child that was rated as highly persistent and low on difficulty, coupled with an adolescent mother reporting fewer symptoms of depression had more positive observed parenting scores (Verzemnieks, 1999). In the third unpublished dissertation, maternal depression symptoms were associated with maternal detachment, intrusiveness and negative regard for child/infant in a study that employed a semi-structured free play interaction (Guner, 2008).

Depression also may be associated with endorsement of certain parenting techniques. In a sample of adolescent mothers ($N=94$) at 12 months postpartum, strength of belief in corporal punishment was associated with depression symptoms (Verzemnieks, 1999). In addition, lack of empathy, corporal punishment and parent child role reversal at 12 months postpartum predicted depression symptoms at 18 months postpartum. In another study of 142 postpartum mothers, results suggested that higher depression scores at 12 and 36 months postpartum were associated with mothers providing less supportive child care at 54 months postpartum (Luster, 1998), suggesting that the relationship between depression and parenting behaviors may be complex. It is not clear whether depression precedes problematic parenting, problematic parenting precedes depression, or both are influenced bidirectionally in a transactional relationship.

Despite such findings, evidence from an ethnographic interview study also suggests that currently depressed adolescent mothers can take on a maternal role despite their depression symptoms. Adolescent mothers' perceptions of maternal role identified using ethnographic interviews at 2 years postpartum suggested two themes: maternal protectiveness and reparation. Maternal protectiveness referred to behaving responsibly, such as attending classes to build a better life. Reparation referred to becoming the ideal mother the adolescents never had. Mothers in the study were selected for symptoms of perinatal depression or a suicide attempt the previous year (approximately 2 years postpartum) (Lesser, Koniak-Griffin, & Anderson, 1999). Although this study does not report PPD symptoms at the time of interview, it may provide suggestive evidence that the experience of depression does not necessarily inhibit adolescent mothers from taking on a parenting role.

In summary, PPD symptoms may be associated with interpersonal difficulties generally as well as within the specific parenting domain. These difficulties may affect not only the adolescent mother and increase her risk for developing PPD symptoms, but also her child and point to the need for appropriate and effective interventions with this population, as well as increased knowledge of the role that these factors play in adolescent PPD.

Table 1. Studies examining correlates of depression among adolescent mothers

Study	Sample Size	Assessment time point	Depression Outcome Measure	Findings
Birkeland et al. (2005)	n=149	3-12 months postpartum	EPDS	social isolation, weight/shape concerns and maternal self-efficacy explained 38% of the variance in depression symptoms
Cutrona (1989)	n=128	pregnancy, 6 weeks and 6 months postpartum	BDI	close informants' ratings of social support were the only predictor of PPD, not adolescent ratings
Fagan & Lee (2010)	n=100	5-9 months gestation and 3 months postpartum	CES-D	postpartum satisfaction with father involvement was significantly and negatively associated with symptoms of depression; parenting competence significantly related to symptoms of depression
Gee & Rhodes (1999)	n=375	end of pregnancy-early postpartum, approximately 1 year postpartum	SCL-90 depression subscale	at end of pregnancy/early postpartum, grandmother support and problems and partner problems related to symptoms of depression; at one year postpartum, partner support was a significant negative predictor of depression symptoms but previous association were no longer significant
Guner (2008)	n=319	baseline, 14, 24 and 36 months postpartum	CES-D	depression was related to maternal detachment, intrusiveness and negative regard for child/infant
Lanzi et al. (2009)	n=682	3rd trimester; 4, 6, and 8 months postpartum	BDI-II	adolescents with symptoms of depression were more likely to have only one adult living at home rather than two or more
Leadbeater & Linares (1992)	n=120	2-4 weeks, 6-7, 12-13, and 28-36 months postpartum	BDI	symptoms of depression were negatively correlated with perceived social support from family, friends and perceptions of grandmother's acceptance
Leadbeater et al. (1996)	n=63	3-4 weeks, 6, 12, 20, and 28-36 months postpartum	BDI	symptoms of depression related to level of mother's contingent responses; 16% of variance in child behavior problems explained by symptoms of depression and mother child interaction
Lesser (1997)	n=90	intake, 4-6 weeks, 6 and 12 months postpartum	CES-D	depression symptoms and maternal role behavior were negatively associated
Lesser et al. (1999)	n=15	2 years postpartum	ethnographic interview	themes from interviews with depressed mothers included maternal protectiveness and reparation
Logsdon et al. (2005)	n=128	32-26 weeks gestation and 6 weeks postpartum	CES-D	Path analysis showed that receiving more social support and having low self esteem were predictive of depression 6 weeks postpartum.
Luster (1998)	n=142	6, 12, 18 24, 36 and 54 months postpartum	CES-D	higher depression at 12 and 36 months postpartum were associated with mothers providing less supportive child care at the 54 month assessment
Secco et al. (2007)	n=78	third trimester and 4 weeks postpartum	BDI-II	depression symptoms were associated with prenatal expectations regarding frustrations with baby (i.e. crying or fussiness) and perceived adequacy of family support
Spencer et al. (2002)	n=190	6, 12 and 24 months postpartum	CES-D	depression symptoms were associated with parenting stress
Verzemnieks (1999)	n=94	intake, 12 and 18 months postpartum	CES-D	depression associated with belief in corporal punishment at 12 months postpartum; lack of empathy, belief in corporal punishment and belief in parent child role reversal predicted depression symptoms at 18 months postpartum; at 12 months observational measures of parenting were negatively associated with symptoms of depression at 18 months; at 18 months belief in corporal punishment and the Nurse Child Assessment Satellite Training Teaching Scale- Mother were associated with depression at 18 months postpartum; a child that is rated as highly persistent and low on difficulty, with a mother reporting fewer symptoms of depression had higher observed parenting scores

BDI=Beck Depression Inventory (Beck et al., 1967); BDI-II= Beck Depression Inventory II (Beck, Steer, & Brown, 1996); EPDS= Edinburgh Postnatal Depression Scale (Cox et al., 1987)

SCL-90=Symptom Checklist-90 (Derogatis, 1983)

Current Study

The current study aimed to investigate potential correlates of adolescent PPD. In a cross sectional design among adolescent mothers, we specifically examined three main hypotheses:

Hypothesis 1. Social context factors will be significantly associated with depressive severity.

1a. Adolescent mothers of racial and ethnic minority status will demonstrate higher depressive symptom severity than White and non-Hispanic adolescent mothers.

1b. Higher perceived discrimination, lower SES, lower social support, greater number of stressful life events, and higher perceived stress generally and specific to parenting will be associated with depression symptom severity among adolescent mothers.

Hypothesis 2. Individual vulnerability factors will be associated with depressive severity.

2a. Symptoms of anxiety will be positively associated with depressive severity.

2b. Ability to regulate emotion will be negatively associated with depressive severity.

2c. Deficits in interpersonal effectiveness including perceptions of relationship functioning and impaired mother/infant bonding will be negatively and positively associated respectively with depression symptoms severity.

Hypothesis 3. As an exploratory aim, variables found to have significant relationships with PPD severity will be entered into a model to explore the association among social context and individual vulnerability factors and adolescent PPD when considered together.

Methods

Recruitment and Participants

Participants were women aged 15-21 recruited from two Boulder County and Denver organizations. We included mothers through the age of 21 based on the definitions used in the settings in which we were working and the varying upper thresholds for adolescence in the field (American Psychological Association, 2002). GENESIS is a Boulder County Public Health program that provides parenting support for adolescent mothers as well as help in connecting with services, including health and mental health care, shelter, and food. The Colorado Adolescent Maternity Program/Young Mother's Clinic (CAMP/YMC) at The Children's Hospital Colorado is a comprehensive, multidisciplinary, prenatal, delivery, and postnatal care program that serves a low-income population.

Participants were recruited with flyers posted at GENESIS and CAMP/YMC, by provider referral, or were approached in the waiting room by a research assistant and asked to participate. We assessed inclusion criteria through phone screening or questioning in waiting rooms prior to enrollment. Inclusion criteria were: a) women between the ages 15-21, b) adolescent mothers of children aged 12 months of age or younger attending GENESIS or CAMP/YMC. Participants completed questionnaires individually in private rooms at GENESIS or the Children's Hospital Colorado.

Among the 117 women referred to the study, eight participants were excluded for the following reasons: participant age (N=2), currently pregnant (N=4), or child age (N=2). Additionally, seven participants missed their appointment and could not be contacted to reschedule. Participants provided informed consent and all study procedures were approved by

the University of Colorado Boulder Institutional Review Board and the Colorado Multiple Institutional Review Board.

Procedures

After providing informed consent, participants filled out questionnaires on a computer. At the end of the session, all participants at GENESIS received psychiatric referral information, and those at Children's were referred to CAMP/YMC services. Participants received a \$15 Target gift card after completing the measures.

Measures

Depressive symptom severity. The 10-item *Edinburgh Perinatal Depression Screen* (EPDS; Cox, Holden, & Sagovsky, 1987). The EPDS is the most widely used self-report measure of perinatal depression; 10 items range from 0-3, with higher scores indicating greater severity of depression, rated over the prior week period.

Social context factors. *Perceived discrimination.* The *Perceived Discrimination Scale* (PDS; T. A. Forman, Williams, & Jackson, 1997) is a 10-item scale assessing a person's perception of the frequency of everyday instances of discrimination using a likert scale, ranging from 1 to 6. For example, participants rate how often they are treated with less respect than others or received poorer service than others in restaurants or stores. Additionally, participants were asked which type of discrimination they perceived as most impactful. The scale has an alpha of .88 (T. A. Forman et al., 1997). Higher scores indicate more perceived discrimination.

Demographic information/SES. The *Demographic and Contact Questionnaire* was a project-designed measure used to gather descriptive information about basic demographic variables. For example, to examine SES, the demographic questionnaire inquired about yearly income before taxes in increments of 10,000 (i.e. 0-9,999; 10,000-19,999).

Social support. The *Postpartum Support Questionnaire* (Logsdon, 2002; Logsdon, Foltz, Stein, Usui, & Josephson, 2010; Logsdon & Usui, 2006) is a 34-item questionnaire examining participants' need and acquisition of social support in four different domains: emotional, informational, material, and comparison during the postpartum period. Furthermore, an overall support received and support importance scores are calculated. This measure has been used with adolescent mothers to assess social support (Logsdon et al., 2005; Logsdon, Usui, Pinto-Foltz, & Rakestraw, 2009).

Life events. The *Short Life Events Questionnaire* (SLE; Alloy & Clements, 1992; Needles & Abramson, 1990) is a subset of the 154-item *Life Events Questionnaire* aimed at capturing negative events that may have occurred in the past 3 months. The 10-item subset of the Life Events Questionnaire was used to capture negative events particularly relevant for adolescents. The items were chosen by the author and two colleagues based on studies indicating high occurrence of particular negative events among adolescents, as well as high undesirability of the events (i.e. Swearingen & Cohen, 1985; Williamson et al., 2003). The categories of interpersonal problems, injury/death of family members or friends, academic difficulties, family disruption and financial difficulties are represented. For example, participants were asked if they experienced a "significant fight or argument with boyfriend/girlfriend/spouse OR Final breakup of relationship with boyfriend/girlfriend/spouse".

General perceived stress. The Perceived Stress Scale (PSS; S. Cohen, Kamarck, & Mermelstein, 1983) is a 14-item self-report inventory used to measure the degree to which participants considered experiences to be stressful during the preceding month. The PSS has adequate validity, internal consistency, and good test-retest reliability (S. Cohen et al., 1983) and has been used widely with adolescent samples (Martin et al., 1995).

Parenting stress. The *Parenting Stress Index Short Form* (PSI-SF; Abidin, 1995) is a 36-item questionnaire aimed at measuring the level of stress parents experience regarding parenting. The PSI-SF has an overall scale, as well as three subscales of interest: parental distress, parent-child dysfunctional interaction and difficult child. The PSI-SF has shown adequate validity and reliability (McKelvey et al., 2009; Whiteside-Mansell et al., 2007). The PSI-SF has been used frequently with samples from varied ethnic and racial backgrounds and symptom pictures (McKelvey et al., 2009; Whiteside-Mansell et al., 2007).

Individual vulnerability factors. Anxiety. The *My Mood Monitor* (M3; Gaynes et al., 2010) is a 23-item self-report symptom checklist that assesses the past two weeks for symptoms of a range of psychiatric disorders and impairment. The M3 has two subscales used to assess anxiety, based on reported symptom severity, including the Anxiety subscale (assess symptoms of Generalized Anxiety Disorder, Panic Disorder, Social Anxiety Disorder and Obsessive Compulsive Disorder), and the PTSD subscale. The PTSD subscale assesses for symptoms such as, nightmares or flashbacks, startling easily, avoiding places that would remind the participant about a bad experience, or feelings of numbness or detachment. The M3 has shown sensitivity and specificity for anxiety and mood disorders comparable to single disorder screening tools (B. N. Gaynes, et al., 2010).

Emotion Regulation. The *Difficulties in Emotion Regulation Scale* (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire that assessed the level of difficulty in regulating affect. The DERS has six subscales focused on different facets of emotion regulation difficulties: non-acceptance of emotional responses, difficulties engaging in goal directed behavior, impulse control difficulties, limited access to emotion regulation strategies, lack of emotional awareness, and lack of emotional clarity. This measure has been shown to have high

internal consistency, good test-retest reliability and adequate predictive and construct validity in both adolescent and adult samples (Gratz & Roemer, 2004; Neumann, van Lier, Gratz, & Koot, 2010).

Interpersonal effectiveness- relationship functioning. One item from the *Dyadic Adjustment Scale* (Spanier, 1976) was used to assess level of satisfaction in a romantic relationship. Participants were asked to rate on a scale of 0 to 6 how happy they were in their romantic relationship. Higher scores indicate more happiness in their relationship.

Interpersonal effectiveness- bonding. The *Postpartum Bonding Instrument* (PBI; Brockington et al., 2001) is a 22-item questionnaire designed to examine parents' perception of bonding between parent and child. Three subscales comprise the measure: impaired bonding, rejection and anger, and anxiety about care. The PBI has been used in samples of depressed postpartum women (Moehler, Brunner, Wiebel, Reck, & Resch, 2006). Higher scores on this scale indicate more distress.

Data analyses

To examine the association between social context and individual vulnerability factors and depression symptom severity, each variable was entered into a separate linear regression model predicting depressive severity. One-way ANOVAs were used to examine race, ethnicity, SES and educational differences in depression symptom severity. Next, stepwise regression was used to explore the association with PPD of all variables that demonstrated significant bivariate associations with PPD. To reduce the number of correlates entered into the model, if full-scale scores were available, they were entered into the model rather than individual subscale scores. If full-scale scores were not available, subscale scores were entered. After each model was tested, the least significant variable was removed ($p > .10$) and variables were retained if they remained

significant ($p < .05$). The next model was then run to determine the best fitting model. Proportion of total variance of the EPDS, as well as R^2 values are reported. All data was analyzed using SPSS 21.

Results

Sample Characteristics

Sample demographics are presented in Table 2. Participants on average were between 18 and 19 years of age, had one child, had a household income of \$0-\$9,999, and were Latina or Non-Latina/White. Approximately, one third of the sample had a high school diploma and approximately half were living with immediate family.

Table 2. Sample demographics (N=102).

Age (Mean)	18.83
Income (Median)	\$0-\$9,999
Child Age in Months (Mean)	5.65 months
Number of Children (%)	
One	67%
Two	17%
Three	1%
Race/Ethnicity (%)	
White/Non-Latina	73%
Native American or Alaskan Native	1%
African American	19%
Native Hawaiian or Pacific Islander	6%
Other	1%
Ethnicity (%)	
Latina	61%
Not Latina	39%
Religious Affiliation (%)	
Catholic	44%
Protestant	3%
Buddhist	1%
None	26%
Other	27%
Education Level (%)	
8th grade or less	16%
Currently in High School	28%
High School Diploma or Equivalent	37%
Any college or technical school	19%
Other	1%

Currently Enrolled in School (%)	
Yes	48%
No	52%
Marital Status (%)	
Never Married	39%
Living with Significant Other	34%
Married	15%
Other	12%
Parents born in USA (%)	
Yes	54%
No	47%
Living Arrangements (%)	
Living on Own	13%
Living with Significant Other Only	18%
Living with Immediate Family	45%
Living with Others Outside of Immediate Family	25%

Correlates of Adolescent PPD

Examination of the relationships between social context variables and adolescent PPD symptom severity suggested that some, but not all, predictions were supported as examined with separate linear regressions. Specifically, in contrast to hypotheses, there was no evidence of a significant association between race, ethnicity, SES, education, social support received and depression symptom severity among adolescent mothers. In line with hypotheses, however, there was support for a significant and strong association between perceived discrimination, negative life events, perceived general and parenting specific stress and depression symptom severity.

Examination of the relationships between individual vulnerability variables and adolescent PPD severity provided support for all predictions. Depression symptom severity was related to anxiety, difficulties regulating emotion, and deficits in interpersonal effectiveness including perceptions of relationship functioning and impaired mother-infant bonding. Results from planned ANOVA analyses are presented with their means in Table 3. Results of planned regression analyses, including means, standard deviations, B, standard error, R^2 , and F values, are presented in Table 4.

Table 3. ANOVA analyses (N=102).

	Mean (SD) EPDS	F	df	p-value
Race		0.45	4, 90	0.77
White	6.87 (5.86)			
Native American or Alaskan Native	7.40 (3.78)			
African American	5.83 (6.38)			
Native Hawaiian or Pacific Islander	9.00 ()			
Other	13.00 ()			
Ethnicity		0.05	1, 92	0.83
Latina	6.71 (5.64)			
Not Latina	6.97 (6.19)			
Education Level		1.70	3, 92	0.17
8th grade or less	7.13 (6.62)			
Currently attending High School	8.04 (5.27)			
High School Diploma or Equivalent	5.00 (5.42)			
Any College	7.65 (6.48)			
SES		0.13	3, 85	0.94
\$0-9,999	6.26 (5.30)			
\$10,000-19,999	7.22 (6.41)			
\$20,000-29,999	6.83 (6.73)			
\$30,000 +	6.84 (6.31)			

()- Standard deviation missing as only one person in the cell

Table 4. Regression analyses (N=102).

Measure (N=102)	Mean (SD)	B (SE)	R ²	F
Depression Symptom Severity (EPDS)	6.67 (5.82)			
<i>Social Context Factors</i>				
Negative Life Events (SLE) (n=86)	1.82 (2.04)	1.50 (.26)	0.29	34.10***
Perceived Discrimination (PDS)				
Perceived Discrimination Scale Sum (n=91)	16.06 (8.10)	.49 (.06)	0.46	76.13***
Perceived Stress				
PSS (n=90)	13.93 (8.37)	.59 (.04)	0.72	224.94***
PSI				
Overall stress subscale (n=81)	75.42 (16.29)	.19 (.04)	0.27	29.19***
Parental distress subscale (n=89)	29.03 (9.94)	.40 (.05)	0.45	70.39***
Parent child dysfunctional interaction subscale (n=93)	20.82 (5.94)	.20 (.10)	0.04	3.71
Difficult Child subscale (n=89)	25.67 (5.21)	.18 (.12)	0.03	2.26
Support (Postpartum Support Scale)				
Overall support importance (n=92)	4.32 (1.94)	1.39 (.30)	0.21	21.36***
Material support importance subscale (n=92)	4.36 (2.02)	.17 (.03)	0.21	23.67***

Emotional support importance subscale (n=93)	4.23 (2.17)	0.18 (.03)	0.28	34.73***
Informational support importance subscale (n=94)	4.59 (2.27)	0.08 (.03)	0.08	7.69**
Comparison support importance subscale (n=92)	3.67 (2.24)	0.16 (.07)	0.06	5.86*
Overall support received (n=91)	4.33 (1.93)	-.02 (.35)	0.00	0.00
Material support received subscale (n=94)	4.19 (2.00)	-.03 (.04)	0.01	0.42
Emotional support received subscale (n=91)	4.09 (1.99)	-0.04 (.04)	0.01	0.75
Informational support received subscale (n=94)	4.83 (2.29)	0.03 (.03)	0.01	0.71
Comparison support received subscale (n=93)	4.13 (2.33)	0.04 (.07)	0.00	0.36
<i>Individual Vulnerability Factors</i>				
Anxiety (M3)				
Anxiety subscale (n=96)	4.00 (5.14)	.46 (.04)	0.58	128.73***
PTSD subscale (n=97)	1.49 (1.94)	1.09 (.12)	0.46	81.20***
Emotion Regulation (DERS)				
Total (n=83)	71.28 (25.73)	0.18 (.02)	0.60	120.85***
Non-acceptance of emotional responses subscale (n=94)	10.81 (5.44)	0.65 (.09)	0.37	54.92***
Difficulties engaging in goal directed behavior subscale (n=95)	10.71 (4.59)	0.72 (.11)	0.33	45.55***
Impulse control difficulties subscale (n=95)	9.67 (4.22)	0.63 (.13)	0.22	25.45***
Limited access to emotion regulation strategies subscale (n=92)	14.42 (6.90)	0.63 (.06)	0.56	113.04***
Lack of emotional awareness subscale (n=92)	15.32 (5.81)	0.53 (.09)	0.28	36.45***
Lack of emotional clarity subscale (n=95)	10.00 (4.53)	0.79 (.10)	0.39	58.50***
Interpersonal Effectiveness				
PBI				
Impaired bonding subscale (n=90)	5.09 (3.46)	.74 (.16)	0.19	20.25***
Anxiety about care subscale (n=95)	1.60 (1.85)	.88 (.33)	0.07	6.88**
Rejection and Anger subscale (n=94)	1.26 (2.03)	.59 (.29)	0.04	4.13*
Dyadic Adjustment Scale (n=94)	3.64 (1.59)	-1.00 (.37)	0.07	7.33**

Key: * < .05 ** < .01 *** < .001

Exploratory Model of Correlates of Adolescent PPD

Variables that demonstrated bivariate association with adolescent PPD were entered into stepwise regression analyses, including perceived stress, difficulty regulating emotions (DERS total score), postpartum support (importance overall subscale), postpartum bonding (impaired bonding, rejection and anger and anxiety about care), anxiety (M3 Anxiety and PTSD subscales), parenting stress overall score, perceived discrimination, negative life events, and relationship

satisfaction. Correlations among the variables are shown in Table 5. The final model contained two of the thirteen predictors and was reached in eleven steps. The model was statistically significant, $F(2, 69)=112.24$, $p<.001$ and accounted for approximately 77% of the variance in depression symptom severity ($R^2=.77$, Adjusted $R^2=.76$). Depression symptom severity was predicted by anxiety symptom severity and perceived stress. The raw and standardized regression coefficients of the predictors together with their squared semi-partial correlations are presented in Table 6. With the sizeable correlations between the predictors, the unique variance explained by each of the variables indexed by the squared semi-partial correlations, was high: anxiety symptom severity 41% and perceived stress 67%. Thus, R^2 would decrease by 41% if anxiety symptom severity were dropped from the model and 67% if perceived stress were dropped.

Table 5. Correlations of Variables in Stepwise Regression.

Variable (n=102)	2	3	4	5	6	7	8	9	10	11	12	13
1. EPDS	0.85***	0.77***	0.46***	0.43***	0.21*	0.26**	0.76***	0.68***	0.52***	0.68***	0.54***	.27**
2. PSS Total	-	0.85***	0.44***	0.52***	0.21	0.26*	0.72**	0.66***	0.58***	0.66***	0.54***	- 0.26**
3. DERS Total		-	0.31**	0.52***	0.24**	0.25***	0.68***	0.66***	0.64***	0.65***	0.42***	.24**
4. PPS Support Importance			-	0.22*	-0.33	-0.002	0.42***	0.33***	0.27**	0.29**	0.31**	-.08
5. PBI Impaired Bonding				-	0.35***	0.29**	0.44***	0.44***	0.46***	0.45***	0.22*	-.20*
6. PBI Rejection and Anger					-	0.29**	0.22*	0.23*	0.27**	0.26**	0.21*	.07
7. PBI Anxiety about Care						-	0.27**	0.32***	0.52***	0.21*	0.15	-0.06
8. M3 Anxiety							-	0.93***	0.58***	0.67***	0.56***	-.27**
9. M3 PTSD								-	0.57***	0.66***	0.58***	-.23*
10. PSI-SF Total									-	0.54***	0.29**	.18
11. PDS										-	0.63***	-.25**
12. SLE Questionnai re											-	-.25*
13. 1 item DAS												-

Key: * < .05 ** < .01 *** < .001

EPDS=Edinburgh Postnatal Depression Scale; PSS= Perceived Stress Scale; DERS=Difficulties in Emotion Regulation Scale; PPS= Postpartum Support Scale; PBI=Postpartum Bonding Instrument; M3= My Mood Monitor; PSI-SF=Parenting Stress Index; PDS= Perceived Discrimination Scale; SLE=Short Life Events Questionnaire; DAS= Dyadic Adjustment Scale

Table 6. Stepwise Regression Results.

Model (n=92)	b	SE-b	Beta	sr ²
Constant	-1.11	0.67		
Perceived Stress Scale	0.43	0.09	0.62	0.67
M3 Anxiety	0.19	0.05	0.31	0.41

Note. The dependent variable was EPDS score. $R^2 = .77$, Adjusted $R = .76$.
sr² is the squared semi-partial correlation.

Discussion

Consistent with the theoretical perspective emphasizing the importance of both social context and individual vulnerability factors in understanding the nature of depression (Monroe et al., 2009), results suggested that both social context and individual vulnerability factors are associated with postpartum depression among adolescents.

Stepwise regression analyses revealed perceived stress and anxiety symptom severity accounted for 77% of the variance in depression symptom severity among adolescent mothers. Postpartum anxiety symptom severity and perceived stress may be especially important in understanding adolescent PPD. Given the high correlations between perceived stress, anxiety and many of the variables from other domains of interest, it is possible that perceived stress and anxiety are part of a pathway to depressive symptom severity that accounts for difficulties in other areas. While there is some overlap between questions regarding symptoms of anxiety and depression on the M3 (Gaynes et al., 2010) and EPDS (Cox et al., 1987) (i.e. EPDS- “I have felt scared or panicky for no very good reason” and “I have been worried or anxious for no good reason”; M3- “I feel worried or fearful” and “I have attacks of anxiety or panic”), the two measures do appear, for the most part, to target two separate sets of symptoms. Thus it cannot be assumed that the large amount of variance accounted for by anxiety symptom severity in depression symptom severity was due solely to examination of the same set of symptoms.

Future research is necessary to understand the exact relationship between all of the variables found to be significant, as well as their relationship with perceived stress and anxiety and whether they precede or are a consequence of PPD symptoms. In addition, future studies may explore a conceptual model rather than a stepwise model to account for potential redundancy issues.

As expected, higher anxiety symptom severity (general and PTSD specific anxiety) was associated with greater depression symptom severity. This finding is in line with research among adult mothers indicating high comorbidity between adult anxiety and PPD symptom severity (Giakoumaki et al., 2009; Reck et al., 2008). While direction cannot be determined due to the cross-sectional design of the present study, future research may focus on determining whether postpartum anxiety tends to precede depression symptoms, vice versa or if there is a transactional relationship between the two throughout the perinatal period.

As predicted, with respect to social context factors, higher depression symptom severity was related to more negative life events, more perceived discrimination, and higher importance of support overall, as well as specific types of support, including emotional, informational, material and comparison support.

Contrary to predictions, depression symptom severity was not related to SES or racial/ethnic status; however, these findings should be interpreted with caution. The SES distribution in our sample was highly restricted, as 73% of our sample had a household income of \$19,999 or less. This lack of variability may have limited our ability to detect a significant relationship between SES and depression symptoms. Future work, employing a larger sample, is needed to determine whether SES is related to depression symptom severity among adolescent mothers. The lack of significant association between PPD and racial or ethnic minority status is surprising

in light of some evidence to suggest that Mexican American adolescent mothers are more likely to report symptoms of depression than African American adolescent mothers (Schmidt et al., 2006); however, more research is needed with a larger sample to determine the role of race and ethnicity in adolescent PPD symptoms.

Results also suggest the importance of considering a nuanced definition of social support. As predicted, adolescent PPD was associated with importance of support. However, there was no evidence that a mother's perception of support received was associated with her depression symptom severity. This finding contrasts with research conducted by Logsdon and colleagues (2005), which suggested that more social support received (measured with the same scale) was related to depression symptom severity; however, our findings are in line with Secco and colleagues (2007) who did not find a relationship between social support and PPD symptoms. It is possible that perception of support received is not as important as the perception of the importance of support. The more support a person believes they will need signals an increase in distress, despite the perception of whether or not support is received. More research is needed to determine the relationship between social support received and depression symptom severity. Furthermore, future research may employ a measure of satisfaction with support system, as well as who is providing support, as previous studies have suggested that the type and source of social support influence the relationship between social support and PPD (i.e. Gee & Rhodes, 1999; Leadbeater & Linares, 1992). It may be that receiving satisfactory support from a particular person is more important than support received generally, future research may examine such predictions.

A noteworthy percentage of mothers in the present study reported they perceived they were discriminated against in some way often or very often. Overall, the most endorsed type of

discrimination in the present study was others acting as if they were better than them often or very often. Additionally, more than half of adolescent mothers in our sample reported that they believe they are discriminated against the most for being an adolescent mother. Taken together, these findings indicate that a sizeable portion of adolescent mothers perceive that they are being discriminated against often or very often. Furthermore, no studies to date have examined the effect of this stressor on adolescent PPD. More research is needed to understand the exact experience of discrimination on adolescent mothers; however, it appears that adolescent motherhood itself may be the largest source of discrimination for more than half of our sample.

Deficits in emotion regulation and interpersonal effectiveness (as indexed by relationship satisfaction) were all related to greater depression symptom severity. These findings point to a potential source for intervention with adolescent mothers with symptoms of PPD. For example, DBT specifically focuses on deficits in the domains of interpersonal effectiveness and emotion regulation and thus may be good fit for the needs of adolescent mothers with symptoms of PPD. Additionally, while our study did not examine the role of mindfulness on adolescent PPD, future work may investigate its role, if any, in adolescent PPD symptoms.

As expected there was a positive relationship between impaired bonding, anxiety about care, and rejection and anger with depression symptom severity, such that higher bonding difficulty was associated with higher depression symptom severity. As compared to adult mothers, the mothers in our study had a mean impaired bonding score of 5.09 and a mean rejection and anger score of 1.26, both of which are lower than “normal” adult mothers (impaired bond=6.1; rejection and anger=3.1) in Brockington and colleagues’ (2001) study validating the PBI. On the other hand, the mothers in our study had much higher anxiety about care scores, more similar to mothers with severe bonding disorders ($M=1.78$) than “normal” ($M=0$),

depressed normally bonded ($M=.24$) and mild bonding disorder adult mothers ($M=0$). It is possible that adolescents have much more anxiety about care than their adult counterparts and comparable bonding and rejection and anger scores. More research is necessary to understand facets of bonding among adult and adolescent mothers, especially differences and similarities among the groups. Surprisingly, depression symptom severity was not related to parent child dysfunctional interaction and difficult child subscales of the Parenting Stress Index (Abidin, 1995). Based on the adult PPD literature, it would be expected that depression symptom severity would be related to parent child dysfunctional interactions and perceiving a child as difficult. More research is needed to untangle the relationship between bonding and mother-infant interaction and their relationship with PPD among adolescent mothers. Future studies may employ observational coding, as it may be a better measure of mother infant bonding and interaction than self-report. Furthermore, high anxiety about care scores may be pointing to a lack of maternal efficacy, thus future studies may include a measure of this domain to help tease apart the relationships between these variables.

Our study had several limitations. First, this study relied on a single time point of assessment. No casual conclusions may be made from the findings of the present study; however, these findings may inform future work assessing adolescent mothers throughout several points in the postpartum period. Furthermore, the present study used self-report measures to assess all variables. Future studies may employ multimodal assessments including observation of mother infant interaction, as well as diagnostic interviews assessing PPD symptoms. Finally, this study had a relatively small sample size that may have underpowered the stepwise regression analyses. Although steps were taken to increase power (i.e. when possible, using full-scale scores only rather than multiple subscale scores), it possible that a larger sample may yield more stable

results. Additionally, given that participants were recruited through two specialty programs, these findings may not be indicative of all adolescent mothers. Findings should be considered with caution and future studies recruiting a larger sample of adolescent mothers, within and outside of specialty programs, should be conducted to allow more confidence in our findings, and ensure their generalizability.

Overall, our results indicate that depression symptom severity among postpartum adolescent mothers is associated with variables in a number of domains including social context factors such as perceived discrimination, importance of support, negative life events, perceived general and parenting stress, as well as deficits in emotion regulation and interpersonal effectiveness. When included in an overall model, perceived stress and anxiety symptom severity were found to be the best predictors of adolescent postpartum depression symptom severity, above other variables found to be significant in linear regression analyses. Future work may focus on the use of multimodal assessments across several time points, with a larger sample of postpartum adolescent mothers. Additionally, interventions with adolescent mothers with symptoms of PPD may focus efforts on reducing symptoms of postpartum anxiety and perception of stress.

CHAPTER III

STUDY 2

Introduction

Very little research has examined interventions for adolescent postpartum depression. This gap in our knowledge base is surprising given evidence that postpartum depression among adolescent mothers is both common and unlikely to remit spontaneously (Leadbeater et al., 1996; Leadbeater & Linares, 1992; Schmidt et al., 2006; Spencer et al., 2002). Moreover, studies of PPD among adult women suggest that such symptoms are associated with negative correlates and consequences for both mother and child (Cornish et al., 2006; Field et al., 1990; Kinsella & Monk, 2009; Murray, Fiori-Cowley, Hooper, & Cooper, 1996; O'Hara, 1995). In this section we will review studies examining the prevalence and course of adolescent PPD, interventions for adolescent PPD, and the evidence base for Dialectical Behavior Therapy (DBT; Linehan, 1993), which is proposed as a promising intervention for adolescents with PPD symptoms.

What is the prevalence and course of PPD among adolescent mothers?

One large study of adolescent mothers found that 57% of the sample ($N = 638$) reported moderate to severe PPD symptoms over the 4-year study period (Schmidt et al., 2006). Two studies compared depression among adolescent and adult mothers, with evidence from both suggesting that prevalence of depression among adolescent mothers is higher than among adult mothers. In a study conducted by Lanzi, Bert and Jacobs (2009), 396 adolescent mothers were compared to 169 lower resource (less than 2 years of college) and 117 higher resource mothers aged 21 years or older. Results suggested that the adolescent mothers had significantly higher mean depression scores at prenatal and 6 month postpartum than both higher and lower resource adult mothers (Lanzi et al., 2009). In addition, as compared to both adult groups, adolescent

mothers were more likely to have consistent depression symptoms from the prenatal to postpartum period. Another study, conducted by Figueiredo and colleagues (2006), compared a sample of Portuguese adolescent mothers, 18 years of age or younger ($n = 54$), and adult mothers over age 18 ($n=54$), on depression symptoms. Adolescent mothers were significantly more likely than adult mothers to score above 12 on the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987), which has been shown to indicate possible clinical levels of PPD symptoms and to exhibit higher depression symptom severity scores during both pregnancy and the postpartum period. In this study, age was the only predictor of PPD severity, with younger mothers evidencing higher severity than older mothers.

Only one study to date has examined whether the rate of diagnosed depression differs between adolescent mothers and non-childbearing adolescents (Troutman & Cutrona, 1990). Adolescent mothers ($n=128$) were matched to control adolescents ($n=114$) and interviewed at approximately 28 weeks gestation and 6 months and 1 year postpartum using the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978). Adolescent mothers and non childbearing adolescents did not differ significantly at any of the time points on rates of major or minor PPD diagnoses; however, according to self report on the Beck Depression Inventory (BDI; Beck, 1967), adolescent mothers experienced significantly more somatic PPD symptoms than non-childbearing adolescents. The authors note that there was a higher prevalence of insomnia during pregnancy among childbearing adolescents and a higher prevalence of fatigue at during both pregnancy and postpartum in the childbearing sample as compared to controls. These findings should be taken with caution given the method of recruitment for the control group. Specifically, the adolescent mothers in the study nominated potential participants for the control group; thus, it is possible that selection factors may have

biased results. More research is needed to examine differences in depression among non-childbearing and childbearing adolescents.

Finally, one study examined a large sample of both adolescent and adult mothers, focusing on depression symptom severity (Mollborn & Morningstar, 2009). This study utilized data from two large nationally representative longitudinal studies, the National Longitudinal Study of Adolescent Health and the Early Childhood Longitudinal Study- Birth Cohort ($N=6,391$). Results showed that adolescent mothers were more distressed than adult mothers aged 20 and older, more distressed than non-childbearing adolescents, and continued to be more distressed than both individuals who did not give birth in their teens and adult mothers at early and middle adulthood time points.

Four studies to date have examined the course of adolescent PPD (considered as up to one year postpartum) using longitudinal designs (Leadbeater et al., 1996; Leadbeater & Linares, 1992; Schmidt et al., 2006; Spencer et al., 2002). One longitudinal study suggests that PPD symptoms appear to be fairly stable. In a sample of 190 adolescent mothers, Spencer and colleagues (2002) reported similar average depression symptoms at 6, 12, and 24 months postpartum. Other studies show that PPD symptoms decline overall, but may be stable for a subset of mothers. In a large study of 638 adolescent mothers, the rate of PPD symptoms peaked at 3 months postpartum and declined from that time point until the end of the study assessment period at 48 months (Schmidt et al., 2006). In addition, the study found that of adolescent mothers reporting PPD symptoms at 3 months postpartum, over 80% reported similar symptoms on two or more additional time points collected 8-12 months later. Similar results were found in a sample of African American and Puerto Rican adolescent mothers ($N=120$; Leadbeater & Linares, 1992). This study found that adolescent mothers' PPD symptoms peaked at 4-6 weeks

postpartum and declined at each subsequent time point (6, 12, 18 and 24 months postpartum) (Leadbeater & Linares, 1992). Using a cut-off score of 16 on the BDI (Beck, 1967), over 65% of mothers remained in the same diagnostic category (either depressed or not depressed) over the study period of 36 months. Approximately 11% had moderate to severe symptoms at every time point, starting at 2-4 weeks with the last time point at 28-36 months postpartum. Approximately one quarter of the sample was above the BDI cutoff at 2 or 3 time points, and approximately half of the sample was consistently below the threshold over the course of the study (Leadbeater & Linares, 1992). The duration of depression symptoms may depend on the number of PPD symptoms reported. Leadbeater, Bishop and Raver (1996) found that adolescent mothers who reported statistically more symptoms of PPD at 3-4 weeks postpartum also reported more symptoms at 28-36 months postpartum.

In summary, the high rates of PPD among adolescent mothers highlight the public health significance of this problem. Studies indicate the prevalence of PPD is higher among adolescent mothers than adult mothers. In addition, although some studies suggest PPD symptoms peak for adolescent mothers between 1 and 6 months postpartum and then decline, there is accumulating evidence that mothers who reported higher PPD symptom severity in the first year postpartum are more likely to report symptoms up to 3 years later (Leadbeater et al., 1996). These data underscore the importance of intervention among this vulnerable population.

What Interventions Hold Promise for Adolescent PPD?

Given the prevalence and course of adolescent PPD, a surprisingly small number of studies have examined interventions to treat or prevent adolescent PPD. Only eight studies (see Table 7) have examined interventions for adolescent PPD (Field et al., 2000; Logsdon et al., 2005; Mercado, 2004; Miller, 2004; Oswalt, Biasini, Wilson, & Mrug, 2009; Phipps, Raker,

Ware, & Zlotnick, 2012; Popova, 2006; Silfven, 1990). Seven of these have employed random assignment using a treatment as usual (TAU) control condition, one was quasi-experimental and one utilized a case study format.

Two studies examined the effects of a psychoeducational program focused on social support based interventions in the prevention and treatment of adolescent PPD. In a study of social support based prevention of PPD; adolescent mothers were randomly assigned to either 1) read a pamphlet regarding social support ($n = 32$), 2) watch an 8 minute video with very similar content to the pamphlet ($n=27$), 3) read the pamphlet and watch the video ($n=32$), or 4) a no treatment control condition ($n=24$). Each intervention (pamphlet or video) reviewed several points regarding social support among postpartum adolescents such as identifying support in their environment, explaining different types of support, and learning how to ask for help. Logsdon and colleagues (2005) found that there were no differences between groups in the prevention of adolescent PPD at 6 weeks postpartum, suggesting that a short-term psychoeducational program focused on social support may not be sufficient to prevent PPD.

Another study targeting social support and education examined an intervention using community volunteers, diverse with respect to marital status, age, ethnic and racial background, as “mentors” to adolescents with PPD. Each mentor attended a 6-week training before meeting with a mentee. Adolescent mothers were assigned to a mentor ($n=53$) or a control condition ($n=57$) (Silfven, 1990). Mentors educated adolescent mothers and their families about pregnancy and pregnancy prevention, parenting skills, and community resources. Results indicated no differences on PPD symptoms between adolescents in the mentor and control conditions at 4-weeks and 3 months postpartum.

Some promising results have emerged from studies of multicomponent treatment packages emphasizing life skills, albeit findings are mixed. In a study of pregnant and postpartum adolescents with PPD symptoms, mothers were in either a treatment condition ($n=100$) or a control condition ($n=53$). Conditions assigned based on attendance at particular schools. Those in the treatment condition were given a multicomponent treatment package including case management, life skills, substance abuse intervention and prevention, individual and family counseling, and education regarding parenting, academics, and vocational pursuits (Mercado, 2004). Results indicated that those in the treatment group were significantly less depressed over time, in contrast to participants in the control condition. In contrast, a less comprehensive life skills based intervention reported mixed results. In this study, adolescent mothers were taught life skills, prenatal and postpartum health and wellness, nutrition, and lactation support. As compared to a control condition ($n=30$), mothers in the treatment condition ($n=37$) did not differ significantly on PPD symptoms at post intervention, although there was some evidence of significant improvement over time among the participants in the treatment group (Popova, 2006). Although speculative given the paucity of data, these studies may suggest that more comprehensive treatment approaches are necessary to intervene effectively with depressed adolescent mothers.

Two case reports suggest promise for Interpersonal Psychotherapy (IPT) for adolescent PPD (Miller, 2004). The intervention focused on clarifying the adolescent's transition to motherhood, identifying the adolescent's social and material resources, and helping establish support from experienced mothers. In both cases presented, the mothers no longer met criteria for PPD following IPT intervention. These findings are consistent with encouraging results from two studies of IPT with depressed pregnant adolescent mothers (Miller, Gur, Shanok, &

Weissman, 2008). Following a 12-week course of IPT group therapy, pregnant adolescents (Study 1: $N=14$; Study 2: $N=11$) evidenced a significant decrease in depression severity at post intervention.

Another study, involving a interpersonally oriented intervention, Relaxation Encouragement Appreciation Communication Helpfulness, showed positive results in the prevention of PPD among adolescent mothers (Phipps et al., 2012). In this study, adolescent mothers were randomly assigned to either five sessions of individual therapy, with one postpartum booster session ($n=54$) or a dose matched attention control condition ($n=52$). Results showed that participants in the treatment condition were significantly less likely to be diagnosed with PPD than those in the control condition.

Another study involving an infant massage intervention was associated with positive results in PPD symptom reduction among African American mothers attending school through a Young Mother's Program (Oswalt et al., 2009). Adolescents were assigned to either an intervention condition ($n=16$) or a control condition ($n=9$). Adolescents in the intervention condition were taught the "Baby's First Massage" curriculum, which focuses on massage strokes and attention to infant cues. At post intervention, adolescents in the treatment condition had significantly lower PPD scores than those in the control condition.

Finally, one study examined a intensive, 3-month intervention in which adolescent mothers participated in a variety of activities including mornings focused on vocational training and afternoons devoted to social/vocational rehabilitation involving relaxation and massage therapy, mood induction, mother-infant interaction coaching for the mothers, as well as massage for the infant (Field et al., 2000). Adolescent mothers with BDI (Beck, 1967) scores over 12 were randomly assigned to either the intervention condition ($n=48$) or a control condition ($n=48$).

Adolescent mothers with BDI less than 9 (n=62) were also included in the control condition as a comparison group. At post-intervention and 6 month follow up, participants in the intervention condition had significantly lower depression symptom severity scores than those in the control condition; however, their depression symptom severity scores were still higher than non-depressed controls.

In summary, only four out of six of the studies reported positive results with regard to intervening in adolescent PPD. Of those four, one was a case presentation of two group participants, one was a complex intervention at an alternative high school, another was a less complex life skills intervention and the last was a massage intervention. More broadly, two pilot studies also showed promising results with adolescent perinatal depression. The paucity of clinical research with this population highlights the need for intervention development and investigation.

The Use of Evidence Based Treatments with Adolescents with PPD?

Surprisingly little research has examined evidence-based treatments studied among general adolescent samples with adolescent mothers. There is evidence to suggest that cognitive behavioral therapy (CBT), pharmacotherapy, and combined CBT and pharmacotherapy treatment successfully treat MDD among adolescents (Vitello, 2009; Yu, Kroatochvil, Weller, Mooreville, & Weller, 2010). Furthermore, among adolescents with treatment resistant depression, CBT has been shown to have positive effects on depression as compared to switching to another SSRI or another medication (Brent et al., 2008). Given the positive results with CBT among the general adolescent population, CBT interventions may be effective among adolescent mothers with PPD.

DBT is a specific form of CBT that includes individual therapy, phone coaching, therapist consultation and group behavioral skills training. The behavioral skills training component is comprised of four modules, mindfulness, distress tolerance, emotion regulation and interpersonal effectiveness. DBT has been examined with adolescents, including adolescents with complex clinical presentations, thus there is a strong conceptual, practical, and empirical basis on which to predict the potential benefit of this approach for adolescents with PPD. Initially examined as a treatment for adults (with over seven RCTs; Lynch, Trost, Salsman, & Linehan, 2007), DBT has also been examined specifically among adolescents in seven studies including samples of inpatient and outpatient suicidal and self injurious adolescents and adjudicated youth. These studies have shown that DBT has been associated with reduced suicidal ideation, fewer psychiatric hospitalizations, and an overall significant improvement in functioning in several domains, including interpersonal relationships and emotion regulation (Fleischhaker et al., 2011; Hashim, Vadnais, & Miller, 2013; James, Taylor, Winmill, & Alfoadari, 2008; Katz, Cox, Gunasekara, & Miller, 2004; Rathus & Miller, 2002; Ricard, Lerma, & Heard, 2013; Sunseri, 2004; Trupin, Stewart, Beach, & Boesky, 2002; Uliaszek, Wilson, Mayberry, Cox, & Maslar, 2013; Woodberry & Poenoe, 2008). See Table 8 for a list of DBT studies involving adolescents. Although none of these studies examined application to adolescent depression, there is emerging evidence among adults of the beneficial impact of DBT on depression symptoms (Axelrod, Pereplechikov, Holtzman, & Sinha, 2011; Lynch et al., 2007). Moreover, among samples selected for depression diagnoses or symptom severity, the skills training component of DBT has been shown to be of benefit (Harley, Sprich, Safren, Jacobo, & Fava, 2008; Lynch, Morse, Mendelson, & Robins, 2003).

In summary, DBT may be particularly relevant for adolescent mothers with symptoms of PPD given that it directly focuses on teaching skills in domains that have been found to contribute to depression. Additionally, DBT has been shown to be effective in both adolescent and adult samples for a variety of disorders, and specifically in reducing symptoms of depression.

Table 7. Studies examining clinical interventions with adolescent mothers.

Study	Intervention	Control	Length of intervention	Outcome Measure	Findings	Limitations
Field et al. (2000)	Intervention/Prevention: Vocational high school in the morning and social/vocational rehabilitation activities in the afternoon; relaxation and massage therapy, mood induction, interaction coaching, and infants received massage therapy; mother spent 1 hour/day with infants in nursery (n=48)	TAU (n=48 depressed; n=62 not depressed)	3 months	BDI	directly following intervention and at 6 month follow up depression symptom severity scores lower in intervention condition than control; however, depression severity was higher than non-depressed control participants	large intervention with multiple components; control condition not described
Logsdon, et al. (2005)	Prevention: pamphlet regarding social support (n=32); 8 min video regarding social support (n=27); video and pamphlet (n=32)	TAU (n=27)	length of pamphlet or 8 min video	CES-D	no significant differences between groups	possible cross-contamination between conditions; very short intervention; wide age range (13-19)
Mercado (2004)	multi-component treatment at an alternative high school (n=100): life skills, case management, substance abuse intervention and prevention, individual and family counseling, mental health services, and education regarding parenting, academics, and vocational pursuits	TAU recruited from 2 traditional high schools (n=53)	intake: 4 to 39 weeks gestation to 12 months postpartum	BSI	significant decrease in depression in intervention group, but not in control; no differences between groups reported	no randomization; hard to replicate; no group differences reported
Miller (2004)	Group Interpersonal Psychotherapy (n=14; 2 case studies reported)	none	unknown	HAM-D	Both cases no longer met criteria for PPD post intervention	case study design
Oswalt et al. (2009)	Baby's First Massage (n=16): learn massage strokes with a focus on infant cues	TAU (n=9)	30 minute individual training session; asked to massage infants daily for 2 months	BDI-II	intervention group had significantly lower depression symptom severity than control group	small n; non mental health focused intervention
Phipps et al. (2012)	Prevention: Interpersonally oriented short term treatment REACH program (n=54)	attention and dose-matched control (n=52)	5 one hour sessions with 1 postpartum booster session	KID-SCID	Fewer participants in the REACH program were diagnosed with PPD than those in the control condition	small sample size; attrition
Popova (2006)	education prenatal and postpartum health and wellness, nutrition, lactation support, and life skills counseling (n=37)	TAU (n=30)	unknown	EPDS	no significant differences between groups	non mental health focused intervention
Silfven (1990)	community mentor (n=53) educated teen pregnancy, promote parenting skills, increase life options, and increase utilization of community resources	TAU (n=57)	3 hours a week; time period not stated 3 months alluded to	BDI, CDI, MMPI, EPDS	no significant differences between groups at 4 weeks postpartum and 3 months postpartum	intervention initiated late in pregnancy; non-professionals administered intervention

BDI=Beck Depression Inventory (Beck et al., 1967); BDI-II= Beck Depression Inventory II (Beck, Steer, & Brown, 1996); BSI=Brief Symptom Inventory (Derogatis, 1975); CDI= Children's Depression Inventory (Kovacs, 1981); EPDS= Edinburgh Postnatal Depression Scale (Cox et al., 1987); HAM-D= Hamilton Rating Scale for Depression; KID-SCID= Structured Clinical Interview for the DSM Child Disorders; MMPI=MMPI depression scale (Dahlstrom, Welsh, & Dahlstrom, 1972)

Table 8. Studies examining DBT interventions with adolescents.

Study	Sample	Control	Description of Intervention	Findings	Limitations
Fleischhaker et al. (2011)	Adolescent females (n=12) 13-19 years-old with non-suicidal, self-injurious and/or suicidal behavior within 16 weeks of treatment start and 3 + BPD criteria met	None	16 to 24 weeks of full DBT; each modality once a week	Non-suicidal self injurious behavior reduced significantly; no suicide attempts reported at 1 year follow up; improvement in Global Level of Functioning and self reported depression scores	no randomization; severely depressed individuals excluded; small n
Hashim, Vadhais, & Miller (2013)	Adolescents (n=7) with end stage renal disease	None	9 session	Significant decrease in depression and increase in adherence for kidney disease	no randomization to groups; no control group
James, Taylor, Winnill, & Alfordari (2008)	Adolescent females (n=16) 15-18 years-old with severe and persistent non-suicidal, self-injurious behavior lasting longer than 6 months	None	1 year of full DBT; each modality once a week	Significant reduction in self reported depression, hopelessness, self injurious behavior and increase in general functioning	no randomization; small n
Katz, Cox, Gunasekara, & Miller (2004)	Adolescents (n=62) 14-17 years-old admitted to a psychiatric inpatient unit for a suicide attempt or suicidal ideation severe enough to warrant admission	TAU inpatient (individual psychodynamic psychotherapy at least once a week and psychodynamically oriented milieu)	Approximately 18 days of 10 daily DBT skills group sessions; individual DBT twice a week; DBT milieu	Significant decrease in behavioral incidents (i.e. violence toward self or others) as compared to TAU; no significant differences between groups on self reported depression, suicidal ideation and hopelessness	no randomization to groups; participants included in treatment groups based on bed availability; difference between number of sessions attended each week between groups; different inclusion criteria for treatment v. control;
Rathus & Miller (2002)	Adolescents (n=111) mean age 16.1 in the DBT group and 15.0 in the control group; DBT group participants had a suicide attempt within the last 16 weeks and met 3+ BPD criteria	TAU twice weekly supportive-psychodynamic individual therapy and family therapy; Participants were triaged to the TAU group if they met only one or the other entry criteria for the DBT group, but not both	12 weeks of twice weekly full DBT	DBT group participants had significantly fewer psychiatric hospitalizations and a higher completion rate than TAU; DBT group participants had decreased self reported suicidal ideation, depression, anxiety, interpersonal sensitivity and obsessive compulsive symptoms	no randomization to groups; different inclusion criteria for treatment v. control; differences in sample sizes between groups (DBT n=29, psychodynamic n=82); some measures not administered to TAU group
Ricard, Lerma, & Heard (2013)	Adolescents enrolled in disciplinary program at school either in a DBT infused group (n=125) or control group (n=178)	No treatment control	Twice weekly for 4 weeks	significant improvement in both groups; however, symptoms of aggression, distress, and conduct beyond those in control	no randomization to groups; TAU not described
Sunseri (2004)	Adolescent females (n=68) 12-18 years-old, admitted to a residential treatment facility after DBT was implemented	TAU not described	Average length of stay 18 months; Full DBT	Significant decrease in premature terminations due to suicidality, and number of days hospitalized for self-injurious behavior, and time spent in restraints and in seclusion	no randomization to groups; TAU not described
Trupin, Stewart, Beach, & Boesky (2002)	Adolescent females incarcerated in a mental health unit (MHU) or 1 of 2 general population units (GPU) (n=60); mean ages in units 14.8-15.5 years-old	TAU behavioral modification program in GPU	Length of stay not reported; skills group once or twice weekly; DBT milieu/skills coaching	Significant decrease in behavioral problems and punitive actions in MHU, but not in GPU's	no randomization to groups; uneven cell sizes (DBT n=45, TAU n=15); variability in DBT training between units

Uliaszek, Wilson, Mayberry, Cox, & Maslar (2013)	Adolescents (n=13) and caregivers (n=16); adolescents between 13 and 17 seeking treatment for borderline and externalizing pathology	None	16 week multifamily skills group	adolescents did not report a significant decrease in symptoms; however, caregivers reported decreases in internalizing and externalizing behaviors	no randomization to groups; no control group
Woodberry & Poenoe (2008)	Adolescents (n=46) 13-18 years-old with suicide attempts, self-injurious behavior and/or intense and unstable affect or relationships willing to engage in 15 weeks of treatment	None	15 weeks of weekly full DBT	Significant decrease in reported self-injurious and suicidal ideation; significant improvement in self reported anger, depression symptom severity, anxiety, dissociative symptoms, impairment, and impulsive/addictive behavior	no randomization to groups; no control group

BPD= Borderline Personality Disorder

Current Study

The present study aimed to evaluate the feasibility and preliminary outcomes of a 12-week modified Dialectical Behavior Therapy (DBT) skills group intervention for adolescent mothers with symptoms of PPD. We specifically examined three hypotheses:

Hypothesis 1. It will be feasible to identify, enroll, and retain participants in the study, as evidenced by high rates of enrollment, group attendance, and homework completion. In addition, treatment will be perceived to be credible and satisfactory.

Hypothesis 2. Participants will evidence significantly improved depressive symptom severity and depression diagnosis from baseline to post intervention.

Hypothesis 3. Participants will evidence significantly improved anxiety, functional impairment and other mood symptoms, as well as functioning in the skills targeted by the intervention: interpersonal effectiveness (as indexed by support received, relationship satisfaction and bonding), emotion regulation (as indexed by ability to regulate emotion, perceived general and parenting stress), and distress tolerance (as indexed by coping skill).

Methods

Participants

Study participants were 24 adolescent mothers between 15 and 21 years of age. We included mothers through the age of 21 based on the definitions used in the settings in which we were working and the varying upper thresholds for adolescence in the field (American Psychological Association, 2002). Participants were recruited through two area organizations. The first, GENESIS, is a Boulder County Public Health program that provides parenting support for adolescent mothers as well as help in connecting with services, including health and mental health care, shelter and food. The Colorado Adolescent Maternity Program/Young Mother's Clinic (CAMP/YMC) at The Children's Hospital Colorado is a comprehensive,

multidisciplinary, prenatal, delivery, and postnatal care program that serves a low-income population. Participants were recruited through screening at postpartum obstetrics visits at CAMP/YMC (n=6) or by Parent-Educator referral through GENESIS (n=24). This study was approved by the University of Colorado Institutional Review Board and the Colorado Multiple Institutional Review Board.

During the initial visit, participants signed a written consent form, and were screened for inclusion and exclusion criteria and completed baseline questionnaires on a computer. Inclusion criteria included: adolescent mothers between the ages of 15 and 21 currently experiencing clinically significant depression, defined as presence of Major Depressive Episode, depressive symptoms (i.e., score of 10 or higher on the EPDS (Cox et al., 1987) and/or a score of 5 or higher My Mood Monitor (M3; Gaynes et al., 2010)). Exclusion criteria included: psychosis, developmental delays, cognitive or linguistic impairment, unavailability during group time, living outside the area served GENESIS or CAMP/YMC and non-English speakers. If a participant was eligible, she was interviewed using the Mini International Neuropsychiatric Interview-KID (MINI-KID; Sheehan et al., 2010), either in person or a separate phone appointment was scheduled and conducted within one week. Eligible participants were invited to participate in the 12 week DBT skills group. Within one week of completion of the 12th skills group, participants completed the post-treatment diagnostic interview, and self-report questionnaires during a final group meeting.

Intervention. The skills training component of DBT was modified for the purposes of this study. Modifications included group length (6 months to 12 weeks) and time (2.5 to 2 hours), as well as teaching a subset of the original skills selected for their application to adolescent PPD. Additionally, participants who completed the group were invited back as

“mentors”. Mentors attended group each week and assisted with the group by sharing their own examples and experiences of skill use, especially when other participants expressed difficulty with a particular skill. DBT skills groups selectively target the interactions between the individual and environment, teaching clients new skills for interacting more effectively within their environment. The skills were designed to assist adolescent mothers in effectively dealing with the stressors that they face both as parents and in daily life. The groups included a focus on regulating emotions, tolerating challenges and crises, and engaging effectively with others and a focus on mindfulness skills to support all other coping skills.

Four advanced graduate students, including the author, provided the DBT skills intervention. The therapists on average had three years of clinical experience and two therapists had led one or more DBT skills group prior to study commencement. Therapists who had not previously taught DBT skills groups completed an online course designed by Marsha Linehan, Ph.D. and were trained by Sona Dimidjian, Ph.D. Additionally, Sona Dimidjian, Ph.D. provided weekly supervision to all study therapists. The DBT skills group met for 2 hours a week. Participants were in the skills group for 12 weeks total to complete all four modules of the intervention, as well as one final week for graduation and questionnaire completion. Table 9 lists the curriculum by week. Treatment completers were defined as participants who attended at least six groups and completed post intervention measures. The group was both didactic and experiential in nature, and involved discussion and practice of all skills learned, practice/homework assignments, and review. To generalize skills use, participants were given the option to text or call group leaders for skills coaching. Study staff contacted each skills group member in advance of each group session and follow-up session to remind them of their upcoming appointment to increase attendance and participant retention. To minimize potential

participant dropout, the group utilized rolling admission, and participants could enter the skills group once a month during the mindfulness module. In addition, participants were allowed to continue with any form of mental health treatment throughout the duration of the study.

Participants received \$15 in a Target gift card following completion of baseline measures, interview, and half of the group, as well as another \$15 gift card for the 2nd half of group, 2nd interview, and post intervention measures. Participants received diapers for each skills group they attended. In addition, study staff provided childcare during all portions of the study.

Table 9. Skills taught by week.

Week	Skills Taught
1	Mindfulness: Wise Mind, What and How Skills
2	Interpersonal Effectiveness: Myths/Priorities
3	Interpersonal Effectiveness: DEAR MAN/GIVE
4	Interpersonal Effectiveness: FAST/Troubleshooting
5	Mindfulness: Wise Mind, What and How Skills
6	Emotion Regulation: Check the Facts/Opposite Action
7	Emotion Regulation: Accumulating Positive Emotions Short & Long Term
8	Emotion Regulation: BC PLEASE
9	Mindfulness: Wise Mind, What and How Skills
10	Distress Tolerance: STOP/TIP/Distract
11	Distress Tolerance: Self Soothe/Pros and Cons
12	Distress Tolerance: Radical Acceptance/Willingness
13	Graduation

Measures

All measures were administered at baseline and post intervention with the exception of the following measures: the Edinburgh Postnatal Depression Scale and Perceived Stress Scale (administered weekly), the Treatment Credibility Scale (administered during the first DBT skills group session), and the Client Satisfaction Questionnaire (administered post intervention only).

All measures administered at group sessions were administered following group. Participants were asked to answer honestly to give the research team information to modify the treatment as needed. Additionally, research assistants, rather than group leaders, administered the questionnaires to reduce potential bias.

Depression diagnostic status and history. The *Mini International Neuropsychiatric Interview- KID* (MINI-KID; Sheehan et al., 2010) is a structured interview that yields DSM-IV diagnoses in children and adolescents. Current and past depression was assessed with this measure. It served as the primary clinical diagnostic instrument and was administered at baseline and post intervention. The MINI-KID has high sensitivity, specificity and test-retest reliability (Sheehan et al., 2010). One graduate student (author) and two post-baccalaureate research assistants administered all MINI-KID (Sheehan et al., 2010) interviews. The two post-baccalaureate interviewers were trained by the author using audio-recorded coding and reliability meetings. To graduate from training, interviewers had to have perfect agreement on three consecutive rated interviews. A subset of taped clinical interviews (n= 8) were cross rated by the other interviewers for reliability, with complete agreement across the original and reliability ratings for all diagnoses.

Depressive and Anxiety Symptom Severity and Functional Impairment. Two measures were used to assess depression symptom severity. The 10-item *Edinburgh Perinatal Depression Screen* (EPDS; Cox et al., 1987) was used to assess symptoms of depression. Participants rated questions on a scale of 0-3 based on the past week with higher scores indicating greater severity of depression. It is the most widely used self-report measure of perinatal depression and this measure has been validated for use with postpartum adolescents (Logsdon, Usui, & Nering, 2009). This measure was also administered weekly at each group session. The *My Mood Monitor* (M3; Gaynes et al., 2010) is a 23-item self-report symptom checklist that assesses the

past two weeks for symptoms of Major Depressive Disorder, Generalized Anxiety Disorder, Panic Disorder, Social Anxiety Disorder, Post-Traumatic Stress Disorder, Obsessive Compulsive Disorder, and queries for a lifetime history of symptoms of Bipolar Spectrum Disorder, as well as impairment. The measure has several subscales, the Depression subscale, Anxiety subscale (assess symptoms of Generalized Anxiety Disorder, Panic Disorder, Social Anxiety Disorder and Obsessive Compulsive Disorder), the PTSD subscale and the Impairment subscale. The PTSD subscale assesses for symptoms such as, nightmares or flashbacks, startling easily, avoiding places that would remind the participant about a bad experience, or feelings of numbness or detachment. Additionally, the impairment subscale assesses whether symptoms have affected work or school, relationships, or led to drug or alcohol use. The M3 has shown sensitivity and specificity for anxiety and mood disorders comparable to single disorder screening tools (Gaynes, et al., 2010).

Outside services utilized. *The Services Screen* is a study-designed brief survey regarding the types of psychological services that participants may have used since the last follow-up (or in the past 3 months for the baseline time point). For example, participants were asked if they had been admitted to the hospital for any emotional reason, had seen a counselor inside or outside of school or had been taking medications for emotional reasons. Participants were not restricted in their use of other interventions during the course of the study. This measure allowed us to assess for other treatments used in conjunction with the DBT skills group and was administered at baseline and post intervention.

Perceived stress. *The Perceived Stress Scale* (PSS; S. Cohen et al., 1983) is a 14-item self-report inventory used to measure the degree to which participants considered experiences to be stressful during the preceding month. The PSS has adequate validity, internal consistency, and

good test-retest reliability (S. Cohen, et al., 1983) and has been used widely with adolescent samples (Martin et al., 1995). This scale was also administered weekly at each group session.

Parenting stress. The *Parenting Stress Index Short Form* (PSI-SF; Abidin, 1995) is a 36-item questionnaire aimed at measuring the level of stress parents experience regarding parenting. The PSI-SF has an overall scale, as well as three subscales of interest: parental distress, parent-child dysfunctional interaction and difficult child. The PSI-SF has shown adequate validity and reliability (McKelvey et al., 2009; Whiteside-Mansell et al., 2007). The PSI-SF has been used frequently with samples from varied ethnic and racial backgrounds and symptom pictures (McKelvey et al., 2009; Whiteside-Mansell et al., 2007).

Coping. The *DBT Ways of Coping Checklist* (DBT-WCCL; Neacsiu, Rizvi, & Linehan, 2010) is an adaptation of the Revised Ways of Coping Checklist (Vitaliano, Russo, Carr, Maiuro, & Becker, 1985) to incorporate specific coping skills taught in DBT. The measure is comprised of three subscales: the DBT skill subscale, the General Dysfunctional coping, and the Blaming Dysfunctional coping subscale. The DBT-WCCL has excellent internal consistency, test-retest reliability and criterion validity for skills acquisition in DBT skills training (Neacsiu, Rizvi, & Linehan, 2010; Neacsiu, Rizvi, Vitaliano, Lynch, & Linehan, 2010).

Social support. The *Postpartum Support Questionnaire* (Logsdon, 2002; Logsdon et al., 2010; Logsdon & Usui, 2006) is a 34-item questionnaire examining participants' need and acquisition of social support in three different domains: emotional, informational, and instrumental during the postpartum period. This measure has been frequently used with adolescent mothers to assess social support (Logsdon et al., 2005; Logsdon, Usui, Pinto-Foltz, et al., 2009).

Relationship Functioning. One item from the *Dyadic Adjustment Scale* (Spanier, 1976) was used to assess level of satisfaction in a romantic relationship. Participants were asked to rate

on a scale of 0 to 6 how happy they were in their romantic relationship. Higher scores indicate more happiness in their relationship.

Bonding. The *Postpartum Bonding Instrument* (PBI; Brockington et al., 2001) is a 22-item questionnaire designed to examine parents' perception of bonding between parent and child. Three subscales comprise the measure: impaired bonding, rejection and anger, and anxiety about care. The PBI has been used in samples of depressed postpartum women (Moehler et al., 2006). Higher scores on this scale indicate more distress.

Emotion regulation. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire that assessed the level of difficulty in regulating affect. The DERS has six subscales focused on different facets of emotion regulation difficulties: non-acceptance of emotional responses, difficulties engaging in goal directed behavior, impulse control difficulties, limited access to emotion regulation strategies, lack of emotional awareness, and lack of emotional clarity. This measure has been shown to have high internal consistency, good test-retest reliability and adequate predictive and construct validity in both adolescent and adult samples (Gratz & Roemer, 2004; Neumann et al., 2010)

Treatment Credibility. The *Treatment Credibility Scale* (Devilly & Borkovec, 2000). The Treatment Credibility Scale is measure of cognitively based credibility and affective expectancy with treatment. This measure has high internal consistency and test-retest reliability and all scores range from 1-9, higher scores indicating higher credibility or expectancy.

Client satisfaction. The *Client Satisfaction Questionnaire* (CSQ-8) is a study-designed measure to assess participant satisfaction with the intervention. The CSQ-8 was designed to yield a homogeneous estimate of general satisfaction. Participants rate items on a scale of 1-4, higher scores indicate more satisfaction.

Data Analyses

First, baseline demographic characteristics were analyzed with t-tests for continuous variables and with chi-square tests for categorical variables to test differences between completers, those who dropped out and those excluded from the study. For hypothesis 1, we examined descriptively rates of recruitment, retention, homework completion, attendance, adverse events, credibility and satisfaction with treatment. For hypothesis 2 and 3, we used planned paired t-tests comparing all measures from baseline and post-intervention in SPSS 21. Additionally, we used hierarchical linear modeling to examine rate of change over the intervention in depression and perceived stress as measured at each session using the EPDS and PSS, respectively. We analyzed data from an intent-to-treat sample. Given the importance of conducting and utilizing pilot studies to test the feasibility of a particular study or treatment (van Teijlingen & Hundley, 2001), we focus not only on significance, but also estimates of effect size to guide future work in the area.

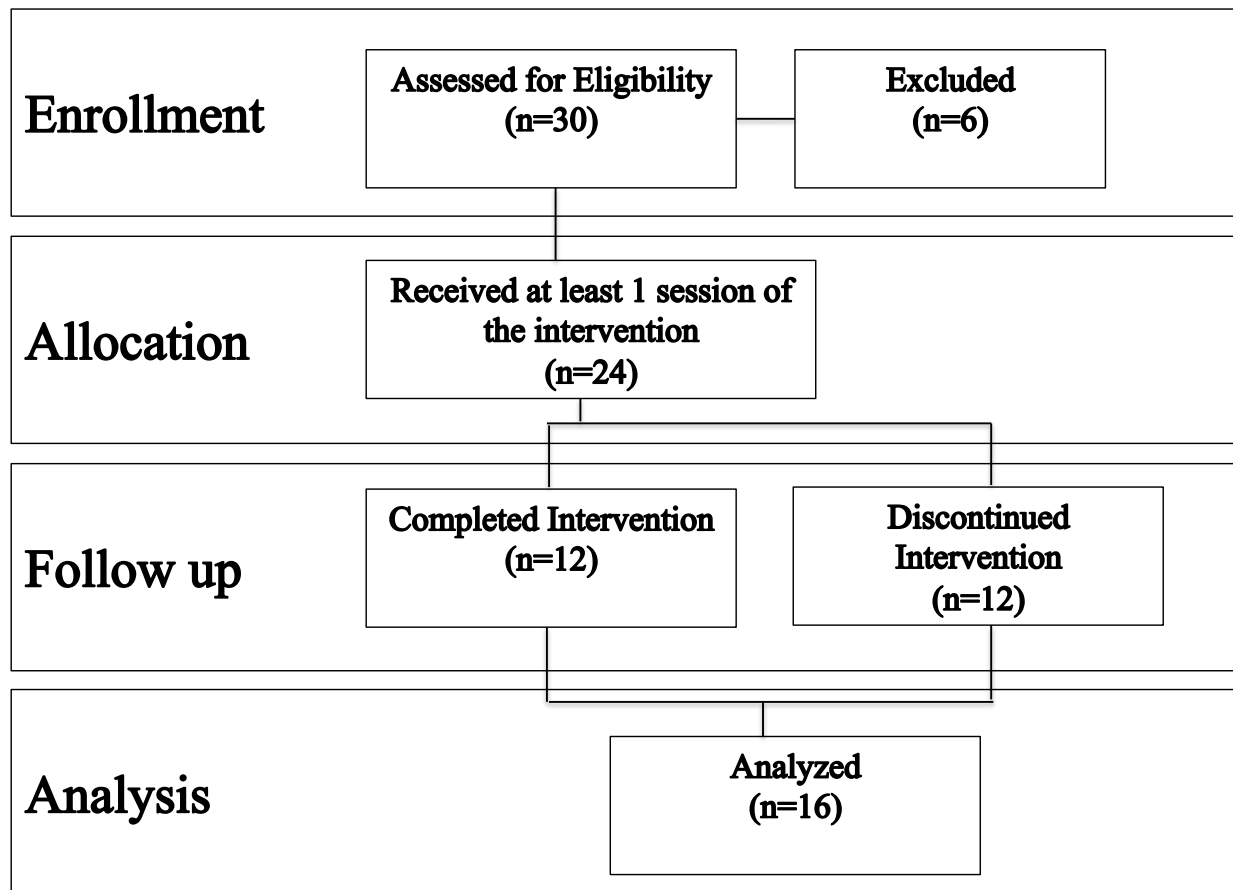
Results

Participant Flow

Figure 1 details participant enrollment and treatment completion. Sixty-three individuals were referred to the study. Of those, 33 did not attend the first assessment for the following reasons: availability during group time (N=11), phone disconnected or no response (N=15), moved out of area (N=3), family member in hospital (N=1), no longer interested (N=1) and child over age (N=2). Of the 30 participants assessed for eligibility, six were excluded for the following reasons: availability during group time (N=5) or participant age (N=1). Twenty-four participants participated in at least one session of the intervention. Of those, 12 completed the intervention, and 12 participants dropped out of the intervention before completion. Reasons for attrition included: moved out of geographical area (N=2), work schedule conflicts (N=6), domestic violence situation necessitating move to safe house or other residence, thus unable to

attend for transportation and safety concerns (N=3), and other (N=1). Of the 12 participants who discontinued the intervention, eight participants could not be contacted for the follow up assessment. Participants reported no adverse events during study participation.

Figure 1. Participant flow chart.



Baseline Demographic and Clinical Characteristics

Demographics for the full sample are presented in Table 10. Furthermore, more than half of the sample had parents born outside of the United States. Approximately, one quarter of participants had experienced more than one episode of Major Depressive Disorder (MDD) in the past, while 13.30% had experienced one past episode. Baseline diagnostic status of participants is presented in Table 11.

Table 10. Baseline demographic information.

	Intent to Treat (n=24)
Age (Mean)	19.13
Child Age (Mean)	1.48 months
Income (Median)	\$10,000-\$19,999
Number of Children (%)	
Pregnant	4%
One	71%
One and pregnant	4%
Two	21%
Race (%)	
White	77%
Native American or Alaskan Native	3%
African American	13%
Native Hawaiian or Pacific Islander	0%
Other	7%
Ethnicity (%)	
Latina	50%
Not Latina	50%
Religious Affiliation (%)	
Catholic	33%
Protestant	4%
Buddhist	0%
None	33%
Other	29%
Education Level (%)	
8th grade or less	17%
High School Diploma	42%
Graduate Equivalency Exam	0%
College but no degree	17%
Associate's Degree	8%
Other	17%
Currently Enrolled in School (%)	
Yes	42%
No	58%
Marital Status (%)	
Never Married	50%
Living with Significant Other	25%

Married	8%
Other	17%
Parents born in USA (%)	
Yes	58%
No	42%
Living Arrangements (%)	
Living on Own	21%
Living with Significant Other Only	21%
Living with Immediate Family	46%
Living with Others	
Outside of Immediate Family	13%

Table 11. Baseline Diagnostic Status (N=24)

Mini Diagnosis	Baseline (%)
Major Depressive Disorder (Current)	20.00%
Dysthymia (Current)	13.30%
Adjustment Disorder (Current)	13.30%
Bipolar I Disorder	6.70%
Bipolar II Disorder	0.00%
Any Anxiety Disorder	33.30%
Panic Disorder (Current)	6.70%
Generalized Anxiety Disorder (Current)	13.30%
Agoraphobia (Current)	13.30%
Social Phobia (Current)	6.70%
Specific Phobia (Current)	13.30%
Obsessive Compulsive Disorder (Current)	6.70%
Post Traumatic Stress Disorder (Current)	6.70%
Alcohol Abuse or Dependence (Last 12 months)	6.70%
Substance Abuse or Dependence (Last 12 months)	6.70%
ADHD (Any type- Current)	6.70%
Conduct Disorder (Last 12 months)	6.70%
Oppositional Defiant Disorder (Past 6 months)	0.00%
Eating Disorder (Current)	0.00%

Other Services Utilized

With regard to psychological services utilized outside of the study, participants did not report being admitted to the hospital for emotional reasons or talking to a spiritual leader,

including clergy or religious counselors, during the study. Approximately, one third of participants sought services with counselors outside of school (31.30%). Of those, participants saw a counselor once or twice (20.00%), monthly (20.00%) or weekly (60.00%). One quarter of participants spoke with a school counselor, nurse, or teacher about their feelings, once or twice (25.00%) or weekly (75.00%). A small percentage of our sample (6.70%) took medication for emotional reasons or engaged in weekly drug or alcohol treatment (6.70%).

Class Attendance and Homework Completion

Among completers, participants attended most groups ($M=9.20$, $SD=2.09$) and completed more than half of the homework assigned ($M=7.34$, $SD=2.29$). On the other hand, participants who dropped out attended approximately three groups ($M=2.83$, $SD=1.98$) and completed less than two homework assignments ($M=1.65$, $SD=1.31$).

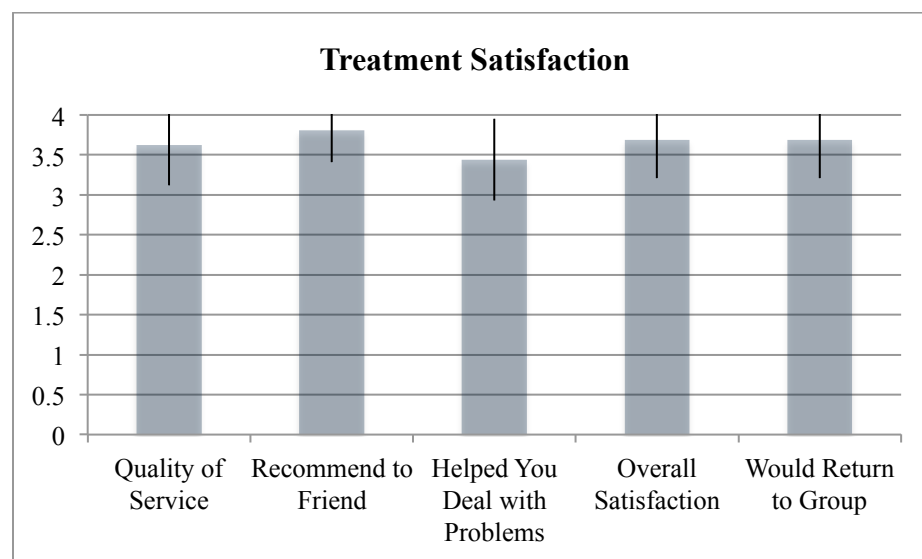
There were no significant differences on clinical characteristics comparing those who completed and those who dropped out; however, there were trends toward significant differences on the demographic variables of school enrollment and religious affiliation. Specifically, participants who completed the DBT skills group were less likely to be enrolled in school than those who dropped out of the DBT skills group ($\chi^2(1)=3.77$, $p=.052$), and participants who completed the group were less likely to be affiliated with a religion than those who dropped out of the DBT skills group ($\chi^2(1)=3.81$, $p=.051$). There were no significant differences on clinical characteristics or demographic variables between those included and excluded from the study.

Treatment Credibility, Expectancy, and Satisfaction

At baseline, on average, participants found the group to be credible based on ratings on the Treatment Credibility Scale (Devilly & Borkovec, 2000). Specifically participants found the group very logical ($M=7.78$, $SD=1.28$), thought it would be successful in reducing sadness ($M=7.22$, $SD=1.65$), and were confident recommending the group to a friend with similar

experiences ($M=7.83$, $SD=1.53$). Participants also reported positive expectancies for the group. Specifically, they believed that they would have between a 60 and 70% reduction in symptoms ($M=67\%$, $SD=2.34$), that the group would reduce sadness ($M=7.04$, $SD=1.85$), and that they would experience a 60 to 70% improvement in symptoms ($M=68\%$, $SD=2.56$). At the end of the group, participants reported high treatment satisfaction on the Client Satisfaction Questionnaire, as illustrated in Figure 2.

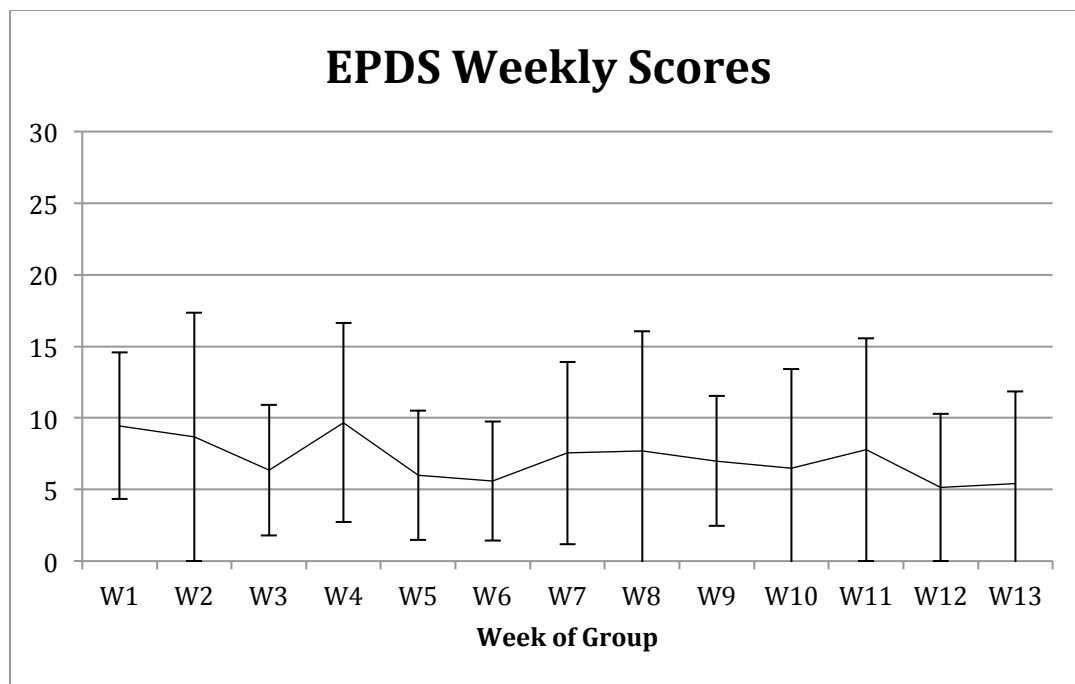
Figure 2. Treatment satisfaction (N=16).



Primary Outcomes: Depression Diagnosis and Symptom Severity

On the MINI, among those diagnosed with MDD, Dysthymia or Adjustment Disorder at baseline, 100% no longer met criteria for those disorders. There was a significant decrease in depression symptom severity across each week of treatment ($\gamma_{01}=-.33$, $t=-2.21$, $p=.047$, $d=1.05$; see Figure 3 for EPDS scores by week). Also, there was a significant difference in depressive severity from baseline to post-intervention the M3 Depression subscale ($t(12)=7.02$, $p<.001$, $d=1.95$). See Table 12 for all primary and secondary outcome means and standard deviations.

Figure 3. Weekly EPDS scores and standard error (N=24).



Secondary Outcomes

See Table 12 for *t*-value, degrees of freedom, *p*-value and Cohen's *d* for all secondary outcomes. Participants evidenced significant reductions in symptom severity on the M3 Anxiety subscale and the M3 PTSD subscale, as well as M3 Bipolar subscale and M3 Impairment subscale. There was no evidence of a significant decrease in perceived stress across each week of treatment ($\gamma_{01} = -.11$, $t = -.71$, $p = .50$, $d = .35$). Participants did evidence significant decreases in parenting stress on the PSI-SF baseline to post intervention (PSI-SF overall parenting stress subscale), as well as specifically in parental distress, parent child dysfunctional interaction, and the difficult child subscales. Participants evidenced a significant increase in the use of adaptive coping skills on the DBT-WCCL particularly a decrease in general dysfunctional coping baseline to post intervention, but no change was evident in blaming coping. Participants also evidenced an overall decrease in difficulties regulating emotion on the DERS. With regard to support, there was no evidence that participants perceived significant increases in support from their

environment or increases in romantic relationship functioning on the Dyadic Adjustment Scale or bonding, aside from the rejection and anger subscale was significantly lower baseline to post intervention.

Table 12. Baseline and post intervention means, standard deviations and t-tests for secondary analyses.

	Baseline (n=16)	Post Intervention (n=16)	<i>t</i>	df	<i>p</i> -value	<i>d</i>
Depression Symptom Severity						
M3 Depression subscale	7.31 (2.98)	1.23 (1.54)	-	-	-	-
Anxiety and Other Mood Symptoms						
M3 Anxiety subscale	8.00 (5.43)	1.88 (2.58)	4.73	15	<.001	1.18
M3 PTSD subscale	2.81 (1.94)	.38 (1.09)	5.97	15	<.001	1.43
M3 Bipolar subscale	2.56 (1.79)	1.25 (2.05)	2.37	15	0.03	0.59
Functional status (M3 Impairment subscale)	1.75 (1.34)	.81 (.41)	1.82	15	0.04	0.59
Perceived Stress						
PSS	18.73 (8.25)	15.53 (8.79)	-	-	-	-
PSI						
Overall stress subscale	86.93 (14.02)	71.79 (14.36)	4.1	13	0.001	1.1
Parental distress subscale	35.86 (9.36)	27.93 (8.43)	3.92	13	0.002	1.05
Parent child dysfunctional interaction subscale	23.21 (6.60)	18.71 (4.58)	2.77	13	0.02	0.74
Difficult Child subscale	27.86 (5.40)	25.14 (5.96)	2.41	13	0.03	0.64
Emotion Regulation (DERS)						
Total	92.52 (31.49)	70.38 (16.97)	3.14	12	0.009	0.87
Non-acceptance of emotional responses subscale	15.19 (8.26)	11.50 (5.27)	2.33	15	0.03	0.58
Difficulties engaging in goal directed behavior subscale	13.67 (5.55)	11.40 (3.72)	1.61	14	0.13	0.41
Impulse control difficulties subscale	12.80 (5.98)	9.93 (3.73)	2.04	14	0.06	0.53
Limited access to emotion regulation strategies subscale	20.13 (9.01)	13.27 (4.28)	3.27	14	0.006	0.85
Lack of emotional awareness subscale	16.94 (4.74)	14.31 (4.21)	2.08	15	0.06	0.58
Lack of emotional clarity subscale	12.47 (5.30)	9.40 (2.90)	2.75	14	0.02	0.71
Interpersonal Effectiveness						
Support (Postpartum Support Scale)						
Support Received Overall	4.10 (1.83)	3.42 (1.78)	1.2	12	0.26	0.33
Material support received subscale	3.69 (1.94)	3.09 (1.54)	1.11	13	0.29	0.23

Emotional support received subscale	3.51 (1.99)	3.38 (1.87)	0.51	12	0.62	0.14
Informational support received subscale	4.16 (2.08)	3.65 (2.11)	0.85	13	0.41	0.23
Comparison support received subscale	3.79 (2.31)	3.34 (1.82)	0.71	13	0.49	0.19
Bonding (PBI)						
Impaired bonding subscale	6.00 (2.18)	4.43 (3.25)	-1.82	13	0.09	0.49
Anxiety about care subscale	2.43 (2.65)	1.29 (1.38)	-1.8	13	0.1	0.48
Rejection and Anger subscale	1.43 (1.55)	.64 (1.45)	-2.35	13	0.04	0.63
Relationship Functioning (Dyadic Adjustment Scale)	2.56 (1.15)	3.06 (1.57)	-1.83	15	0.09	0.45
Distress Tolerance (DBT-WCCL)						
DBT Coping subscale	64.81 (15.55)	75.06 (17.31)	-3.26	15	0.005	0.82
Dysfunctional Coping subscale 1	27.00 (11.54)	1.50 (.63)	9.18	15	<.001	2.3
Dysfunctional Coping subscale 2	8.06 (5.50)	6.25 (4.36)	1.64	15	0.12	0.41

Discussion

The present study is one of the first studies to examine an empirically supported treatment for adolescent mothers with symptoms of PPD. The findings from the study show preliminary evidence to suggest that a modified DBT skills group for adolescent mothers with symptoms of PPD is feasible, acceptable, and shows promising change in both mental health and functional outcomes relevant to adolescent mothers.

Specifically, participants evidenced clinical improvement across a number of domains including depression and anxiety symptom severity, impairment, difficulties in emotion regulation, rejection and anger toward their infants, dysfunctional coping and parenting stress. Participants also evidenced increases in functional coping. Furthermore, with respect to credibility and satisfaction, adolescent mothers perceived the modified DBT skills group as highly credible (ratings were similar to the measure's validation study (Deville & Borkovec, 2000)) and those who completed the skills group reported high satisfaction. At baseline, participants reported, on average, that they found the group acceptable and believed that the group would help them handle their problems. At the end of the study, all of the participants who

completed the group reported that they were very satisfied with the quality of service, would highly recommend the group to a friend, would return to group, and felt that the group helped them deal with their problems.

On the other hand, there was no evidence that participation in the group was significantly associated with improvement in other key domains such as social support, perceived stress, or interpersonal effectiveness (with the exception of rejection and anger toward infant); however, effect sizes in these domains were in the small to medium range and in the expected direction. Surprisingly, participants' perception of stress did not change, which may indicate that the perception of stress may be difficult to change, but learning effective ways of handling stress may be most beneficial. With regard to relationship functioning, future research may include a measure of relationship functioning with more than one question, as the small question pool comprising the scale may have limited the ability to observe change on this measure. Further, larger sample size might evidence significant changes in these domains. Additionally, while there was an explicit focus on linking the DBT skills learned in group to parenting, Impaired Bonding and Anxiety about Care subscales of the PBI (Brockington et al., 2001), did not show significant improvement. Mean scores on the Impaired Bonding and Anxiety about Care were low (6.00 and 2.43, respectively), possibly leaving little room for improvement on either scale, though it is also possible that bonding was not an area that the DBT skills change or a larger sample size is needed. Finally, support received did not change significantly baseline to post intervention. This is surprising given that DBT skills groups explicitly focus on teaching individuals how to ask for what they need or want in an effective manner and anecdotally, many participants reported that the interpersonal effectiveness skills were the most helpful. It is possible our sample was already receiving all of the support they needed; however, the skills may have helped them become more effective in asking for said support (i.e., a yelling match

over who takes care of the baby vs. asking skillfully and calmly). Future research may use other measures to deduce interpersonal effectiveness, as support received may not be the best measure of skill acquisition and use. Further, other functional outcomes may be assessed in future studies, such as school attendance, grades, and job acquisition and attendance. Additionally, these findings should be taken with caution, as it is possible that our study was underpowered due to the small sample size.

Regarding study retention rates, half of the participants in our study completed treatment, and among those, participants attended approximately 9 out of 12 sessions and completed approximately half of the assigned practices. Our retention rate is similar to one study of a school-based therapy group for pregnant adolescents, which evidenced a 58% retention rate and 8.8 out of 12 session attendance rate in one group of the study (another group in the same article evidenced a 100% retention rate and a lower attendance rate than the present study) (Miller, et al., 2008). It may be important for intervention development efforts to explore ways to overcome logistical barriers to treatment. In our study, several measures were taken to increase participation. For example, free childcare was provided throughout the study, including all assessment time points and throughout the DBT skills group. Addressing this barrier helped retain adolescent mothers, who would not have been able to attend the group without this support. Additionally, study staff text messaged or called participants before each group session to remind them of their upcoming appointment. However, additional supports may be required. For example, it may important to problem solve difficulties such as transportation and work or school scheduling conflicts. A major barrier to group attendance was dependence on friends, family members, or public transport for transportation to groups. Future studies may include transportation for group members, such as busing by staff or another private transportation source. Finally, groups in this study were scheduled for weekday afternoons. Timing of future

groups may include the option of weekend or nighttime groups so adolescents with jobs or other scheduling concerns may attend. Alternatively, a shorter-term group or one-session intervention may be considered, as adolescent mothers are a highly mobile group, often with unpredictable schedules, making a 12-week group impractical for at least a subset of mothers. Future studies may examine whether the number of sessions attended predicts treatment outcome and whether a full 12-week course is necessary to produce a positive response. Additionally, future work may examine whether skill acquisition moderates the effect of life stress on depression levels, and whether participant depression level affects treatment outcome.

The open trial design is a methodological limitation that precludes our ability to interpret any clinical improvement as a function of the DBT group training. The emphasis on feasibility is justified given the focus on treatment development with an underserved and understudied population (Onken, Blaine, & Battjes, 1997; Rounsaville, Carroll, & Onken, 2001). It will be essential for future research to examine potential outcomes of DBT skills training among adolescents with PPD in the context of randomized controlled trials. Additionally, given that participants were recruited through two specialty programs, these findings may not be indicative of all adolescent mothers. Another limitation of this study is its reliance on self-report measures. Although diagnostic interviews were administered to assess psychopathology at baseline and post-treatment, all other study measures relied exclusively on self-report. The importance of a multimodal assessment approach with this population cannot be overstated. Moreover, it is important to examine outcomes over a longer duration. Project resources limited the length of follow-up in this study; however, it will be important for future studies to extend follow up length as depression has been found to be persistent among at least a subset of adolescent mothers (Leadbeater et al., 1996; Leadbeater & Linares, 1992; Schmidt et al., 2006; Spencer et al., 2002). Finally, although the restriction to English speaking mothers is a limitation, the inclusion of a

racially and ethnically diverse sample that is representative of adolescent mothers nationally is an important strength. The use of bilingual and bicultural study clinicians and materials is an aim of future studies.

In summary, a modified DBT skills group appears to be a feasible, credible, and acceptable intervention for adolescent mothers with symptoms of PPD. Furthermore, participants evidenced improvement in multiple domains in addition to depression including anxiety symptom severity, coping, ability to regulate emotion regulation, and parenting stress. Future work may place an increase focus on methods that assist participants in completing the skills group, as well as expand to randomized controlled trials with a longer follow up period. This research is the first step in a line of research to examine this promising intervention for adolescent PPD.

CHAPTER IV

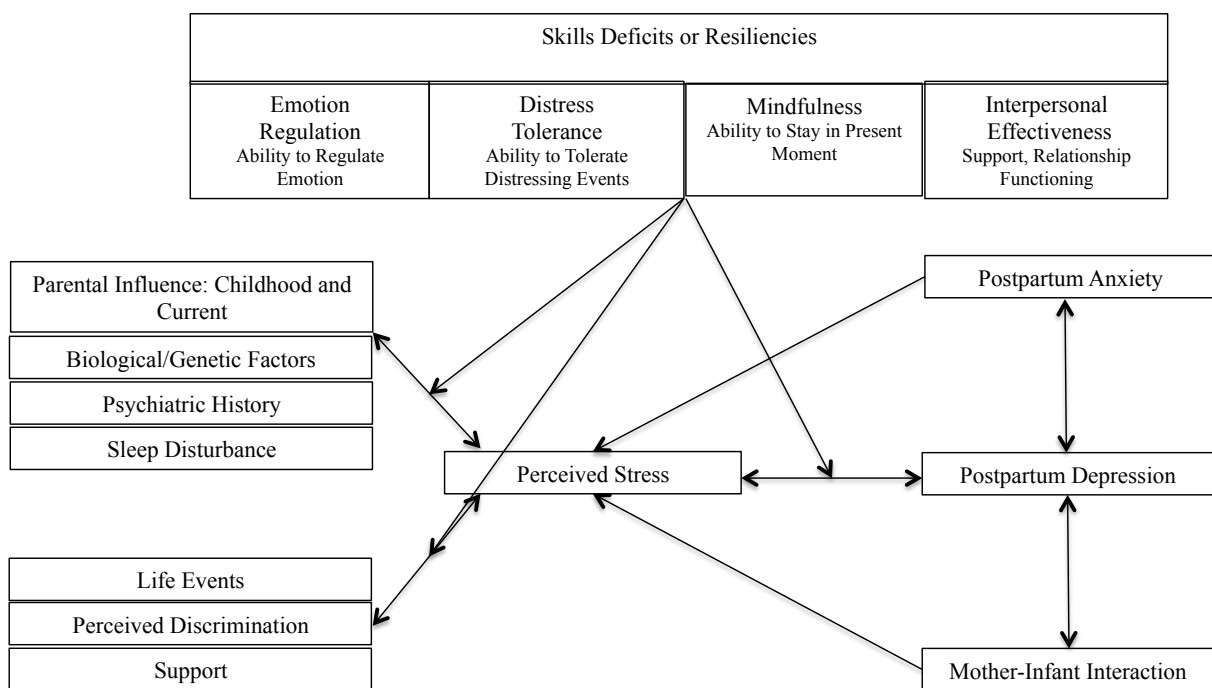
GENERAL DISCUSSION

Adolescent PPD is an important problem; however to date there is little research with this population. Symptoms of PPD in adolescents are associated with variables from multiple domains including social context and individual vulnerability factors. DBT is an intervention that addresses both social context and individual vulnerability factors by teaching behavioral skills that are designed to remediate individual factors and increase an individual's ability to interact with their environment in adaptive ways. Depression symptom severity, as well as social context and individual vulnerability factors appear to improve following participation in a modified DBT skills group.

Based on our findings, as well as the adult PPD literature, we propose an exploratory, working model of adolescent PPD as a guide for future research. This model posits that social context factors found to be significantly related to PPD symptoms in study 1 such as perceived discrimination, negative life events, and support, as well as influences not studied in the present studies, but potentially associated with adolescent PPD such as parental influences (how the adolescent was and is currently being parented), individual vulnerabilities such as psychiatric history, particularly prenatal anxiety and depression, biological/genetic factors, and sleep disturbances increase an adolescent mother's perceived stress and parenting stress and make her more vulnerable to PPD. Skill deficits in the domains of distress tolerance and emotion regulation as seen in study 1, as well as interpersonal effectiveness and mindfulness potentially moderate the relationship between social context factors, non-skill based individual vulnerabilities and perceived stress, as well as the relationship between perceived stress and adolescent PPD. Additionally, we propose that impaired mother infant bonding as seen in study 1, including infant temperament and postpartum anxiety can be/are both consequences of PPD, as

well as contributing factors to PPD. Figure 4 is a visual representation of our proposed tentative model. Future work may examine the relationship between variables not examined in the present study such as individual vulnerabilities including biological/genetic factors, parental influence, sleep disturbance, psychiatric history and deficits in mindfulness their relationship with adolescent PPD. Several questions may be examined in future research. For example, does perceived stress mediate the effect of social context factors and individual vulnerabilities on adolescent PPD? Do skills deficits and resiliencies moderate the effect of social context factors and individual vulnerabilities on perceived stress, as well as the relationship between perceived stress and adolescent PPD? What role does mindfulness play in adolescent PPD?

Figure 4. Proposed model of adolescent PPD



In study 2, we found that from baseline to post intervention, adolescents with symptoms of PPD had decreases in a number of domains of interest including, depression and anxiety symptom severity, difficulties with emotion regulation and perceived general and parenting

stress, as well as increases in coping. Moreover, adolescents found the DBT skills group to be credible, acceptable and satisfactory. Future work in this area should expand to a randomized controlled trial with a larger sample size, as well as focus on the specific role of skill acquisition in mitigating adolescent PPD. Additionally, studies should focus on increasing participant retention, and understanding factors related to participant drop out.

Given that anxiety symptom severity is one of the best predictors of depression symptom severity among adolescent mothers according to Study 1, it is encouraging to see a decrease in anxiety symptom severity from baseline to post intervention in Study 2. Interestingly, the other strongest predictor of depression symptom severity in Study 1, perceived stress, did not decrease over the course of Study 2, although depression symptom severity did decrease. These findings indicate that it may be more difficult to influence an adolescent mother's perception of stress, even if she acquires and uses new skills to manage it. It may not be important to change perception of stress among this population, but rather increase skills to manage the stress. Additionally, these findings may indicate that a longer intervention is necessary to assist adolescent mothers in applying skills over the long term to reduce their perception of stress or that a longer follow up period is necessary to see changes in stress perception.

In conclusion, these research studies examined correlates of adolescent PPD and an intervention for adolescents with symptoms of PPD. Together these studies point to areas associated with depression symptom severity in adolescents mothers, as well as domains ripe for intervention with this population. It will be important for future work to build on these findings to expand our understanding of the nature of adolescent PPD and test promising interventions among vulnerable adolescent mothers to support their optimal functioning.

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