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Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum

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Abstract
This study examined stability and change in maternal anxiety, stress and depression both during the second half of pregnancy and from pregnancy to six weeks and two years postpartum. Self-report measures included those designed to measure mood and state as well as more persistent attributes. Longitudinal data were collected from 137 women during pregnancy, 120 at six weeks, and 97 at two years. There was significant individual stability in scores on specific measures during pregnancy (range in Pearson $r = 0.30–0.86$) and from pregnancy through two years postpartum ($r = 0.30–0.74$). Comparable levels of convergence among measures of different constructs both within pregnancy and over time were also demonstrated, suggesting lack of precision in measurement instruments designed for specific constructs. Despite intra-individual stability, changes in mean levels were also observed over time with somewhat different patterns for each variable. However, maternal parity was an important contributor to both level and trajectory. A summary composite score showed an elevated level of psychological distress during pregnancy in multiparous women, followed by a decline through two years postpartum; primiparous women displayed a gradual increase in distress [main effect $F (1,87) = 3.97, p < 0.05$; time interaction $F (2,174) = 7.15, p < 0.001$] to multiparous levels by two years. Results are discussed in terms of a “motherhood” effect on psychological distress.

Keywords: Pregnancy, stress, anxiety, depression, psychological distress, parity, CES-D, PSS, POMS, STAI

Introduction
The manner and degree to which women’s psychological and emotional functioning affects their children has assumed greater prominence in clinical and academic developmental sciences as investigators seek to understand how mothers influence the development of their offspring both before and after birth. The role of biologically mediated influences conferred by maternal psychological distress during pregnancy on adverse pregnancy and child outcomes is a topic of significant interest and debate [1,2], and there is general consensus regarding the disruptive effects of maternal psychological difficulties, primarily depression, on child behavioral development, emotional regulation, and maternal–child interaction [3,4]. In addition, investigators have sought to identify early indicators of vulnerabilities to more persistent psychological problems that may become manifest in the perinatal period [5]. Most of this literature is generated from studies that rely on maternal self-report of psychological indicators, rather than clinical appraisal. Despite the level of interest, relatively few sources of data provide information on the normative progression of maternal psychological functioning commencing in pregnancy and extending into motherhood.

The most commonly investigated components of psychological distress include anxiety, stress, and depression. A small number of studies have documented changes in one or more of these constructs in non-clinical samples over the course of pregnancy, during the transition from pregnancy to motherhood, or during the early postpartum year(s). Results indicate that as gestation advances, women report increasingly higher levels of state anxiety [6,7] and general mood disturbance [8]. A report of a large cohort study found a parallel increase in depression from the second to third trimesters [9]. In contrast, there is inconsistency among studies of stress appraisal during pregnancy with evidence of increasing general or pregnancy-specific stress appraisal from earlier to later gestation in some reports [7,10] but not in others across similar time periods [7,11].
Despite general impressions that there is a spike in depressive symptomatology following the birth of a child, a number of studies based on a broad range of cultural and demographic groups have demonstrated a decline in depression scale scores from late pregnancy to 6–8 weeks postpartum or beyond [9,12–15]. Similar reduction has been noted for anxiety [14]. Depressive symptoms continue to decrease from eight weeks postpartum to the end of the first year [16]. We were unable to find comparable data for changes in perceived stress measures from the prenatal to postpartum periods although there is a single report of increasing stress from the first through fifth postpartum week, based on a scale designed to measure psychological stressors specific to the postpartum period [17].

Although changes in mean levels have been documented, so too has within-individual stability in ordering of depression, anxiety and/or stress scale scores when assessed at multiple gestational ages during pregnancy [7,18], from pregnancy to the postpartum [14,19], and from the early postnatal period through the first postpartum year [16,20]. Most other studies that follow women over time report consistency only in the percentage of women who exceed a score threshold, not correlational information using the full scale range. Such information is valuable in understanding the degree to which features of maternal psychological functioning provide a continuing context for childrearing and whether earlier measures are useful proxies or predictors of later functioning in non-clinical samples.

A limitation of the existing literature is the unidimensional focus in most studies on a single psychological construct, most commonly depression, despite the well-known empirical and conceptual comorbidity among indicators of distress. Isolation of individual constructs can overestimate their importance relative to other aspects of psychological disturbance; this point has been recently reiterated with respect to measurement during the postnatal period [21]. The primary objectives of the current report are to document both change over time and stability in the most prominent indicators of maternal psychological distress (i.e., anxiety, stress, and depressive symptoms) from the prenatal period to the immediate postnatal period (i.e., six weeks) and again two years later. Inclusion of scales designed to measure both trait and state aspects of functioning allows examination of an important methodological consideration: the degree to which various measurement tools adequately distinguish episodic from persistent aspects of psychological functioning.

A secondary goal of the current report is to examine the potentially moderating effect of maternal parity on psychological parameters. Existing studies of maternal distress are often limited to primiparous women; those that include groups of women who have previously given birth generally do not report results based on parity. However, parity has been shown to moderate physiologic adaptation during pregnancy [8] and beyond [22,23] and negatively affect health-related behaviors [24]. Thus it is reasonable to expect that the competing demands placed on a pregnant or postpartum woman as a result of the need to care for other children provide a potential source of disparity in maternal psychological state both before and after pregnancy.

Methods

Participants

Participants were followed longitudinally from mid-pregnancy through the child's second birthday as part of a larger study on fetal neurobehavioral development. Recruitment was restricted to low risk, non-smoking women at least 20 years old with singleton pregnancies and consistent pregnancy dating validated by early first trimester pregnancy testing, examination, and/or ultrasound. Eligibility for participation in the study reported here was limited to the 137 participants with uncomplicated pregnancies who gave birth to healthy infants at term, thereby eliminating potential confounds due to lack of maternal or child physical well-being. This sample represents a population of healthy, relatively well-educated, mature, and employed women (M years education = 16.7, sd = 2.1, range 12–20; M age = 31.3, sd = 4.1, range 21–39). Most (94.2%) were married and 54.7% were primiparous. The racial/ethnic distribution was as follows: non-Hispanic white (84.7%), African-American (12.4%), and Asian (2.9%). Child characteristics included normal birth weight, M = 3520 g; SD = 440, delivery close to 40 weeks gestation, M = 39.4 weeks; SD = 1.2, and normal 5-minute Apgar scores, M = 8.9; SD = 0.5. Fifty percent of the children were girls.

Of the original sample, 120 (87.6%) completed the follow-up questionnaires at six weeks and 97 (80.8%) at 24 months postpartum; 8.8% failed to provide data at either time. Women who did not complete either follow-up were significantly younger, M = 27.8 versus 31.6 years, t (135) = −3.15, p < 0.01, and less educated, M = 14.3 versus 16.9 years, t (135) = −4.20, p < 0.001, than those that did.

Maternal psychological measures

Maternal psychological assessments began mid-pregnancy and were administered at 24, 28, or 32 weeks gestation and, with the exception of one scale, again at 36 or 38 weeks. The schedule of administration was designed to provide maximum breadth and depth of psychological measurement while minimizing participant burden and maintaining
compliance. Note that the sample size for scales administered at 38 weeks is reduced to \( n = 91 \); 33% of participants did not attend their 38 week visit as a result of delivery or imminent delivery prior to the scheduled visit. Administration of prenatal assessments was done in conjunction with fetal neurobehavioral and maternal physiological monitoring sessions of the parent study, results of which are detailed elsewhere [8,25]. Participants were asked to complete the scales immediately prior to their scheduled visit. Postnatal questionnaires were provided through the mail, and mothers were asked to return them at a laboratory-based developmental testing session. Some women \((n = 8 \text{ at six weeks and } n = 12 \text{ at 24 months})\) did not participate in the laboratory visit but returned completed questionnaires through the mail.

**Anxiety.** Maternal prenatal state anxiety was assessed in two ways. The Anxiety subscale of the shortened Profile of Moods Scale (POMS) [26,27] was used at 24 and 36 weeks gestation. The shortened version contains 37 of the original 65 adjectives (e.g., Discouraged, Cheerful) rated on five-point scales from 0 (not at all) to 5 (extremely) based on mood during the current day. The Anxiety subscale is comprised of the mean for six items (e.g., tense, on edge). At 28 and 38 weeks the Spielberger State-Trait Anxiety Scales (STAI) [28] were administered. The STAI is comprised of two 20-item scales; each item is scored on a four-point scale. Items on the State anxiety (Y-1 form) scale are worded in current terms (e.g., “I feel upset”, “I am worried”). The trait anxiety (Y-2 form) includes items describing more persistent attributes (e.g., “I have disturbing thoughts”) and was administered in tandem with the state scale. Postnatal anxiety was assessed at both six weeks and 24 months using both STAI scales. Both scales have been widely used and extensively validated in non-clinical samples. Sample results validating its use during pregnancy [29] and the early postpartum period [30] reflect high internal consistency for both state and trait scales (\( \alpha = 0.94 \) and \( 0.88-0.90 \), respectively).

**Stress.** Transient perceived stress was assessed by the Daily Stress Inventory (DSI) [31] at 24 and 36 weeks gestation. The DSI lists 58 potential sources of stress that may have been experienced in the last 24 hours (e.g., “Spoke in public”, “Had car trouble”), each scored on a seven-point scale of stressfulness. The DSI yields an intensity measure (sum of scores divided by the number of nominated items), with higher scores indicating higher perceived stress. The scale has good psychometric properties [31] and has been validated against measures of autonomic responsiveness and somaticism [32]. Stress was also measured at 28 and 38 weeks gestation with the Perceived Stress Scale (PSS) [33]. Fourteen items are rated on a five-point (0–4) scale to assess how stressful life has been during a specified period; in this case the questions were framed “Since you became pregnant how often have you . . .”. Examples include “. . . found that you could not cope with all the things you had to do”; “. . . felt nervous and stressed”. Postnatal stress at six weeks and 24 months was assessed using the PSS. The PSS has been used and validated in a number of antepartum [34,35] and postpartum studies [36]; \( \alpha \) values consistently meet or exceed 0.90.

**Depression.** Depressed mood was assessed at 24 and 36 weeks gestation with the Depression subscale of the abbreviated Profile of Moods Scale (POMS) [26,27], which is based on mean values for eight adjectives (e.g., Miserable, Hopeless). Depressive symptomatology was assessed using the Center for Epidemiological Studies Depression Scale (CES-D) [37] administered at 32 weeks only. The CES-D includes 20 depressive symptoms evaluated along four-point (0–3) scales (e.g., “I felt depressed”, “I had crying spells”) reported for the period of the prior week. Postnatal depression at six weeks and 24 months was assessed with the CES-D. The CES-D was originally developed and validated on a community sample but has been used in numerous studies of pregnancy and the postpartum. Cronbach \( \alpha \) results ranging from 0.83 to 0.88 reflect high internal reliability during pregnancy and the postpartum period [38–40]. Direct comparison between this scale and another commonly used measure, the Edinburgh Postnatal Depression Scale (EPDS), indicates that the CES-D generates slightly higher ascertainment scores during pregnancy [39].

**Social desirability bias.** The tendency to nominate socially desirable responses on self-report measures can impart a threat to validity. The Marlowe–Crowne Social Desirability Scale [41], designed to evaluate this source of bias, includes 20 (short form) true-false items and is scored by counting the number of items endorsed as True that are unlikely to be accurate (e.g., “I always practice what I preach”). The scale was administered at 36 weeks.

**Data analysis**

Questionnaires were scored based on standard techniques specific to each scale. Stability within the prenatal period and from the prenatal to postnatal periods was evaluated using Pearson correlations. Change over time was evaluated using repeated measures Analysis of Variance (ANOVA); maternal parity was included as a potential modifier with an interaction term. Post hoc contrasts were used to determine the nature of trends over time.
Results

Change and stability during pregnancy

Table I presents values for the full sample of prenatal measures. The underlying construct for each is presented in the first column to better distinguish between those scales that are expected to differentiate longer-term attributes from more transient states. Repeated measures ANOVAs revealed no change in level of reported stress (PSS or DSI), depressed mood (POMS), or STAI trait anxiety over the course of the sampling span of either 10 or 12 weeks. However, women reported feeling significantly more anxious from 28 to 38 weeks on the STAI state scale, $F(1,90) = 10.26, p < 0.001$, and moderately so on the POMS state anxiety scale, $F(1,134) = 3.47, p < 0.10$.

There were no significant interactions with parity; however multiparous women reported significantly higher PSS scores, $F(1,88) = 6.27, p < 0.01$ over time as well as higher CES-D scores at its single administration, $t(134) = −2.05, p < 0.05$.

Correlations indicating stability over time were significant for all measures (all $p$s $< 0.001$). Results are as follows: 28–38 weeks gestation STAI state anxiety, $r(89) = 0.64$ and STAI trait anxiety, $r(89) = 0.86$; 24–36 week POMS mood anxiety, $r(135) = 0.40$; 28–38 week PSS perceived stress, $r(89) = 0.58$; 24–36 week DSI daily stress, $r(135) = 0.52$; and 24–36 week POMS depressed mood, $r(89) = 0.30$.

Table II presents convergence among the first administration of each measure during the prenatal period. Correlations ranged from a high of $r(135) = 0.73$, $p < 0.0001$, for the association between STAI measured state and trait anxiety, to a low of $r(135) = 0.19$, $p < 0.05$, for the association between POMS depressed mood and STAI state anxiety. There is no obvious pattern of higher correlations among those variables that measure the same construct as compared to cross-construct associations.

Change and stability from the prenatal to postnatal periods

Table III presents descriptive information for the four psychological indicators measured longitudinally. Twenty-seven participants completed scales at six weeks but not 24 months; four completed scales at 24 months but not six weeks; the remainder ($n = 93$) participated at both times. Repeated measures analyses were conducted for the four scales (STAI State and Trait, PSS, and CES-D) that were administered at each period (between 24 and 32 weeks gestation, six weeks postpartum, 24 months postpartum). Parity (primiparous versus multiparous) was included as a potential moderator. Only the first administration of each prenatal measure was used in order to avoid the reduction in sample size.

### Table I. Descriptive data for maternal psychological measures in the prenatal period ($n = 137$).

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
<th>24 weeks</th>
<th>28 weeks</th>
<th>32 weeks</th>
<th>36 weeks</th>
<th>38 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Anxious mood</td>
<td>POMS</td>
<td>.71</td>
<td>.67</td>
<td>.83</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>Recent stress</td>
<td>DSI</td>
<td>2.82</td>
<td>.92</td>
<td>2.89</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>Depressed mood</td>
<td>POMS</td>
<td>.29</td>
<td>.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive symptoms</td>
<td>CES-D</td>
<td>13.32</td>
<td>8.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State anxiety</td>
<td>STAI</td>
<td>35.80</td>
<td>10.26</td>
<td></td>
<td></td>
<td>37.81</td>
</tr>
<tr>
<td>Trait anxiety</td>
<td>STAI</td>
<td>35.80</td>
<td>8.93</td>
<td></td>
<td></td>
<td>36.35</td>
</tr>
<tr>
<td>Persistent stress</td>
<td>PSS</td>
<td>22.70</td>
<td>8.08</td>
<td></td>
<td></td>
<td>22.61</td>
</tr>
</tbody>
</table>

*38-week data based on $n = 91$.

### Table II. Convergence among prenatal indicators of psychological distress.

<table>
<thead>
<tr>
<th>Prenatal measure</th>
<th>POMS-A</th>
<th>STAI-S</th>
<th>STAI-T</th>
<th>DSI</th>
<th>PSS</th>
<th>POMS-D</th>
<th>CES-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>POMS Anxiety</td>
<td>–</td>
<td>.31</td>
<td>.38</td>
<td>.56</td>
<td>.26</td>
<td>.62</td>
<td>.30</td>
</tr>
<tr>
<td>STAI State Anxiety</td>
<td>–</td>
<td>–</td>
<td>.73</td>
<td>.33</td>
<td>.46</td>
<td>.19*</td>
<td>.49</td>
</tr>
<tr>
<td>STAI Trait Anxiety</td>
<td>–</td>
<td>–</td>
<td>.45</td>
<td>.61</td>
<td>.34</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>DSI Daily Stress</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.28</td>
<td>.56</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>PSS Perceived Stress</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.28</td>
<td>.56</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>POMS Depression</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.45</td>
<td>.61</td>
<td>.34</td>
<td></td>
</tr>
<tr>
<td>CES-D Depression</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.28</td>
<td>.56</td>
<td>.31</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05. All other correlations, $p < 0.001$. 

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that would accompany incorporation of 38-week data into repeated measures analysis. Over time, there was a trend towards decline in levels of reported state anxiety, \( F(2,182) = 2.53, p < 0.10 \), from pregnancy through 24 months, but not trait anxiety. There was a significant time effect for maternal perception of stress, \( F(2,180) = 3.27, p < 0.05 \); post hoc contrasts revealed that this effect was localized to a significant decline between the first and second postpartum assessments. There was also a significant time effect for depressive symptoms, \( F(2,178) = 8.78, p < 0.001 \), which decreased linearly and significantly between each subsequent time period.

However, interpretation of equations for trait anxiety, stress and depression is moderated by significant interactions between parity and time with main effects for parity in two of these; main effects and interaction results of the repeated measures ANOVA are presented in Table III. Post hoc comparisons revealed that for trait anxiety, the significant interaction was focused on the period from six weeks to 24 months, during which time primiparous women experienced an increase in anxiety while multiparous women displayed a decline, \( F(1,90) = 5.79, p < 0.05 \). In contrast, the initial two points contained the significant interaction for perceived stress such that from the prenatal to early postnatal period primiparous women exhibited an increase in stress while multiparous women displayed a decline, \( F(1,90) = 5.79, p < 0.05 \). Stress appraisal for both groups declined from the early postpartum period to when children were two years old, \( F(1,90) = 8.38, p < 0.01 \). The pattern for depressive symptoms was somewhat different with non-significant reductions in CES-D levels for both groups from the prenatal to early postnatal period, followed by a significant decline through 24 months postpartum only for multiparous women, \( F(1,90) = 6.26, p < 0.01 \).

Most (72%) multiparous women had only one other child when they were pregnant during this study; 21% had two children, 7% had three. Correlations revealed no linear effect between the number of children for STAI, PSS, or CES-D scores with two exceptions: during the prenatal period only, having more children was associated with more depressive symptoms, \( r(134) = 0.24, p < 0.01 \), and a trend towards greater stress, \( r(135) = 0.16, p < 0.06 \).

Stability correlations from the prenatal to postnatal period, as well as cross-measure convergence information, are presented in Table IV. Correlations were computed using the maximum sample available for each pair of assessment periods. Note that all correlation coefficients are significant at the 0.05 or higher level with the exception of those denoted as otherwise. The final column indicates the average correlation observed for each prenatally administered scale from six weeks to 24 months. Stability between six weeks and two years is as follows: STAI – state, \( r(93) = 0.41 \); STAI trait, \( r(93) = 0.67 \); PSS, \( r(92) = 0.46 \); and CES-D, \( r(92) = 0.38, ps < 0.001 \).

Given the high degree of correspondence between these three measures, a composite Distress score was constructed for the prenatal, six week, and 24 month values by Z-scoring and summing the three measures, using only one of the STAI scales (i.e., trait anxiety) to minimize redundancy in that construct. Associations between prenatal and postnatal Distress were \( r(114) = 0.58 \) and \( r(94) = 0.61, ps < 0.001 \) at six weeks and 24 months, respectively. To further illustrate the preservation of maternal distress or lack of it, a categorical high/low prenatal distress variable was constructed using Distress = 0 as the demarcation; these results are presented in Figure 1. One-way ANOVA results revealed a high degree of consistency: women who scored low on this composite continued to score low on distress at six weeks, \( F(1,114) = 30.30, p < 0.0001 \), and two years postpartum, \( F(1,94) = 47.13, p < 0.0001 \), and vice versa.

Table III. Change in psychological measures over time and by maternal parity (n = 93).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Prenatal</th>
<th>6-week</th>
<th>24-month</th>
<th>Parity F (df)</th>
<th>Interaction F (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAI – State</td>
<td>35.3</td>
<td>34.3</td>
<td>32.9</td>
<td>1.28 (1,91)</td>
<td>.97 (2,182)</td>
</tr>
<tr>
<td>Primiparous</td>
<td>33.8</td>
<td>33.4</td>
<td>32.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiparous</td>
<td>37.3</td>
<td>35.5</td>
<td>33.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAI – Trait</td>
<td>35.4</td>
<td>34.9</td>
<td>34.5</td>
<td>3.40* (1,91)</td>
<td>3.48* (2,182)</td>
</tr>
<tr>
<td>Primiparous</td>
<td>33.7</td>
<td>33.1</td>
<td>34.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiparous</td>
<td>37.7</td>
<td>37.4</td>
<td>35.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSS</td>
<td>22.4</td>
<td>23.9</td>
<td>21.6</td>
<td>2.04 (1,90)</td>
<td>5.81** (2,180)</td>
</tr>
<tr>
<td>Primiparous</td>
<td>20.1</td>
<td>23.6</td>
<td>21.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiparous</td>
<td>25.4</td>
<td>24.3</td>
<td>21.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CES-D</td>
<td>13.3</td>
<td>11.1</td>
<td>9.9</td>
<td>8.25** (1,89)</td>
<td>6.80** (2,178)</td>
</tr>
<tr>
<td>Primiparous</td>
<td>10.2</td>
<td>9.9</td>
<td>9.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiparous</td>
<td>16.6</td>
<td>14.6</td>
<td>10.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.10; *p < 0.05; **p < 0.01.
Evaluation of the role of parity in moderating change over time in this composite variable revealed both a significant main effect for parity, \(F\ (1,87) = 3.97, \ p < 0.05\), and a parity \(\times\) time interaction, \(F\ (2,174) = 7.15, \ p < 0.001\). These data are presented in Figure 2. The overall pattern of results indicates a general decline in psychological distress in multiparous women from the prenatal to 24 month period, \(F\ (2,74) = 2.83, \ p < 0.06\), and a general increase in distress in primiparous women, \(F\ (2,100) = 5.43, \ p < 0.01\), during this period. Maternal age and education were examined as potential mediating variables of this association. Neither generated significant regression results. However, maternal education level was negatively associated with distress during pregnancy, \(r\ (133) = −0.18, \ p < 0.05\), and maintained the same, but not significant, level of association at two years postpartum, \(r\ (95) = −0.18, \ p < 0.10\).

### Evaluation of social desirability bias

Social Desirability Scale scores ranged from 1 to 17, \(M = 7.64, \ SD = 3.8\). Both state and trait anxiety, as measured by the STAI at 28 weeks gestation, were significantly associated with levels of social desirability, \(r\ (133) = −0.25\) and \(−0.21, \ p < 0.01\), suggesting that women who have greater impetus towards socially desirable responses are less likely to report features of anxiety. Correlations for anxious mood, depressed mood or symptomatology, and perceived stress did not exceed \(r = 0.13\) (\(p > 0.10\)). No significant associations emerged at six weeks postpartum, but at 24 months prenatally reported social desirability was significantly associated with CES-D, \(r\ (94) = −0.21\), and PSS, \(r\ (94) = −0.22, \ p < 0.05\), and there was a trend association with trait anxiety, \(r\ (94) = −0.18, \ p < 0.10\). Inclusion of Marlowe–Crowne scores as a covariate in either correlational or repeated measures

### Table IV. Stability in psychological measures from the prenatal to postnatal period.

<table>
<thead>
<tr>
<th></th>
<th>6 weeks postpartum</th>
<th></th>
<th></th>
<th></th>
<th>24 months postpartum</th>
<th></th>
<th></th>
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Note: Bold indicates stability values for same scale. *\(p > 0.05\); all others \(p < 0.05\) or higher.

Figure 1. Pregnant women who are categorized as either low or high on a composite psychological distress score continue to differ significantly on this dimension at six weeks and two years postpartum (\(p < 0.0001\)).

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**Table IV. Stability in psychological measures from the prenatal to postnatal period.**
analyses did not lessen the reported associations over time or among measures. The small number of detected effects suggested a suppressive effect of social desirability bias. For example, the near-significant $F$-value for parity in the repeated measures analysis for trait anxiety presented in Table III became significant, $F(1,89) = 3.99, p < 0.05$, when controlling for Marlowe–Crowne scores during pregnancy.

**Discussion**

These results both extend and confirm a number of existing findings concerning change and stability in self-report measures of maternal psychological functioning. Women reported increasing levels of state anxiety as pregnancy advanced without corresponding increases in depressed mood or stress appraisal. Levels of anxiety, stress and depression declined from pregnancy through 24 months postpartum, although characteristics of the trajectory varied on the basis of parity. In general, women with other children reported higher levels of psychological distress during pregnancy but equilibration between first and later-time mothers was observed by two years postpartum. The differential trajectory is most clearly illustrated in Figure 2 by the composite distress measure which shows decreasing distress from pregnancy to two years postpartum for multiparous women but increasing distress for primiparous women.

The etiology of this disparity is not clear, but we propose that it reflects differential adaptation to the pregnancy and demands of caregiving. Most women in the study sample were relatively affluent, well-educated, and employed. The physical demands of advancing pregnancy are likely to take a greater toll on women who are already juggling family and work responsibilities. Women experiencing second and third pregnancies may also have the unfortunate benefit of hindsight in recognition of the potential hazards of childbirth and demands of caring for newborn infants. Primiparous women may be less appreciative of the consequences of the impending delivery and thus evidence lower levels of distress. A similar explanation has been offered for the observation of increased psychological distress in fathers during a spouse's second pregnancy [42]. In contrast, after birth multiparous women may adapt more easily to the role demands imparted by new motherhood since they had previously developed the psychological and social resources to do so while primiparous women are faced with perhaps unexpected challenges in this transition. Additional measurement points would be necessary to ascertain at what point during this period the "motherhood effect" on psychological state is established.

The second aim of this study involved examination of stability over time in rank ordering of women along the psychological dimensions studied. All measures showed high levels of within-individual stability. Women who reported either relatively higher or lower levels of psychological distress along each dimension during pregnancy tended to do the same two years after pregnancy. Equally notable is the lack of differences in the magnitude of the correlations between pregnancy and six weeks postpartum and pregnancy and 24 months postpartum. For example, stability correlations of $r = 0.48$ were found for the CES-D whether measured approximately 14 weeks apart (i.e., 32nd week gestation to six weeks postpartum) or 112 weeks apart (i.e., at 24 months...
postpartum). Similar concordance in stability levels was found across each interval for both STAI scales and the PSS. This suggests that these self-report instruments, regardless of how carefully they are worded in terms of response parameters (e.g., “within the last week”; “since you became pregnant”; “today”), are more inclined to measure psychological attributes, not states. As expected, stability correlations for STAI trait values over time are the highest of all measures, but are not significantly different from associations between many other pairs. Moreover, the STAI trait scale, designed specifically to ascertain dispositional attributes, changed significantly over time, while the state version of the scale, designed to be sensitive to transient feelings, did not. Of all the instruments used, only the POMS mood scale for depression shows low and non-significant patterns of stability over time, suggesting that it alone may be measuring transient affect.

Self-report data always raise concerns regarding a variety of response biases. Here we were able to largely rule out the impact of one of these, social desirability, as an important factor. At best, dispositional tendency to nominate socially desirable responses contributed, at most, 4.8% of the variance to anxiety scores and controlling for this factor did not affect results. Nonetheless, this study cannot ascertain the degree to which nominated responses on paper and pencil instruments actually reflect reliable differences in psychological functioning.

A final consideration is the high degree of convergence both during pregnancy and over time, as presented in Tables II and IV, among measures of anxiety, depression, and stress. Our findings of the high degree of inter-relatedness both during pregnancy and across the postnatal periods are comparable to those reported in other sample-based studies for some of these measures [18,43]. Moreover, these findings are consistent with results of a recent meta-analysis of studies focused on maternal anxiety. The mean weighted correlation between concurrent measures of anxiety and perceived stress was determined to be $r = 0.40$, and between anxiety and depressive symptoms, $r = 0.66$, based on six and 14 studies, respectively [2]. This pattern of results can be interpreted in two ways. The first is that convergence is the expected manifestation of true comorbidity between these three relatively distinct psychological dimensions. The second is that self-report scales cannot adequately distinguish between the three dimensions due to lack of precision in the scale items, lack of precision in the constructs, or both. Despite extensive validation of the scales used in this study, there is considerable overlap of items. For example, both stress scales include items related to nervousness or worrying, a core component of anxiety, while the STAI and CES-D share items regarding fearfulness. The persistence of the correlations over the next two years indicates that these instruments measure dispositional response tendencies to react with negative emotions, despite differences in the response demands of the various scales.

Given these measurement issues, we suggest that it may be more empirically and conceptually appropriate to consider the entire constellation of negative psychological attributes during pregnancy under the rubric of “prenatal distress” rather than attempting to distinguish specific components. This has been previously suggested as a more effective approach in the measurement of postnatal psychological morbidity [21]; the current results support applying this approach to the prepartum period as well. Compiling anxiety, stress, and depression scores into a single composite measure resulted in stability correlations and trend data that provide more stable and readily interpretable data then provided by individual measures.

It is important to note that these results were generated by a sample of well-educated, financially stable women and may not be generalizable to more disadvantaged populations that face multiple additional sources of physical and psychological strain. Nonetheless, the high level of current academic and clinical interest in maternal psychological functioning during pregnancy warrants better understanding of the strengths and limitations of measurement of psychological constructs using paper and pencil instruments. The current results provide normative information on the natural progression of continuous measures of psychological functioning over time in a low risk sample, demonstrate its stable nature within individuals, and suggest that consideration of maternal parity is requisite to understanding how women respond to pregnancy and the postpartum.

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**References**


Current knowledge on this subject

- There is general consensus that maternal psychological difficulties can disrupt child development and maternal–child interaction.
- Relatively few sources of data exist that describe the normative progression of maternal psychological functioning during pregnancy and beyond the first postpartum months.
- Constructs such as anxiety, depression, and stress are generally treated as separate psychological entities.

What this study adds

- Information on the trajectory of self-reported maternal anxiety, stress, and depression from midway in pregnancy through two years postpartum.
- Evidence of high levels of within-individual stability of these measures during this time period.
- Illustration of the significant role of parity in maternal psychological function during pregnancy and beyond.
- Demonstration of the degree of inter-relatedness among self-report measures of anxiety, stress, and depression.