Mothers of IVF and spontaneously conceived twins: a comparison of prenatal maternal expectations, coping resources and maternal stress

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BACKGROUND: This study explores the differences in prenatal maternal expectations, coping resources and maternal stress between first time mothers of IVF twins and first time mothers of spontaneously conceived twins. The role of prenatal maternal expectations in the prediction of maternal stress was examined, as well as the mediating and moderating effect of coping resources on the association between pregnancy-type group and maternal stress.

METHOD: Mothers of twins from various regions in Israel were included in this prospective and cross-sectional study in which 88 mothers of IVF-conceived twins and 98 mothers of spontaneously conceived twins were interviewed twice. First, at 33–36 weeks of their pregnancy they completed a socio-demographic questionnaire and the maternal expectations questionnaire; then at 6 months after birth they completed a questionnaire regarding the delivery and medical condition of the infants, and their coping resources and maternal stress.

RESULTS: Compared with mothers who conceived spontaneously, IVF mothers had more positive prenatal maternal expectations, but poorer coping resources and higher levels of maternal stress 6 months after birth. Maternal expectations had no predictive power regarding maternal stress, although the mother’s coping resources were significantly related to maternal stress and mediated the association between pregnancy type and maternal stress.

CONCLUSIONS: IVF-pregnant women bearing twins should be considered a high-risk group. Early identification of these mothers is essential for timely psychosocial interventions in order to enhance their resources and decrease maternal stress. Further longitudinal studies are required to determine causality in more ethnically-diverse mothers of twins.

Key words: IVF / twins / maternal stress / coping resources / prenatal maternal expectations

Introduction

The uses of Assisted Reproductive Technologies (ART) are associated with consistently increasing rates of twin pregnancies and births. In the USA the number of ART twin births increased by 65% from 1998 to 2003 (Dickey, 2007). In Israel, where the current study was conducted and where norms to achieve motherhood are very strong (Remennick, 2000), the number of twin births increased by 240% from 1996 to 2006 (Central Bureau of Statistics, 2006).

Infertility and subsequent treatment by in vitro fertilization (IVF) are emotionally and physically stressful and are associated with increased levels of anxiety and depression during treatment (Verhaak et al., 2005). Researchers have been interested in long-term effects of ART, such as on the transition to parenthood. Yet, most studies have been conducted among couples with singleton babies (Hammarberg et al., 2008), and only a few have studied couples with twins. Olivennes et al. (2005) found that mothers of IVF twins experienced higher levels of parenting stress and were less likely to say they obtained pleasure from their child than mothers of singletons. Studies that included a comparison group of naturally conceived babies found that first time ART mothers of twins experienced lower psychosocial well-being and higher parenting stress than those conceiving spontaneously (Colpin et al., 1999, Baor et al., 2004).

Reactions to the stress of infertility may be viewed within the Stress and Coping theoretical model (Lazarus and Folkman, 1984). In this transactional model, cognitive appraisal of the stressors and availability of personal and support resources and coping strategies, act as mediators of the stress-response association. This framework

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Prenatal maternal expectations as cognitive appraisal

The desire to have a child is a major life goal and infertility is conceptualized as an experience of goal blockage. Thus, individuals who experience prolonged infertility may undergo an examination of their beliefs, values, and goals concerning parenthood and what it means for them (Clark et al., 1991, p.185). Researchers have raised a concern that mothers of IVF multiples may be more likely to experience a mismatch between their expectations and the reality of motherhood (Hjelmstedt et al., 2004; Sheard et al., 2007).

Coping resources

In this study, we focused on two personal and two social coping resources. Of the personal resources: (i) Sense of Coherence (SOC) is defined as a global orientation that one’s internal and external environments are predictable and that there is a high probability that life situations will work out as well as can be expected (Antonovsky, 1987) and this has been inversely related to stress reactions (Antonovsky, 1987). We did not, however, find any previous studies of SOC among IVF mothers (or couples); (ii) Maternal Self-Efficacy, a concept based on Bandura’s self-efficacy construct and defined as beliefs or judgments the mother has about her competence or her ability to succeed in the parenting role (Bandura, 1977). Maternal self-efficacy has been examined only among mothers of singletons (Gibson et al., 2000), showing lower levels of maternal self-efficacy among IVF mothers compared with non-IVF mothers. Social resources includes (i) perceived social support and (ii) perceived marital quality; these two measures, which are widely known to correlate with stress reactions (Schwarzer and Knoll, 2007), have yielded contradicting results in studies on parenting after ART (DeLongis and Holtzman, 2005; Repokari et al., 2007). Data on social resources and their association with parental stress among mothers of twins is scarce. One such study showed that marital quality was not associated with greater parental stress among ART parents than among non-ART parents (Baor et al., 2004). However, that study included mothers who underwent various ART and not only IVF.

One major limitation of previous studies is the comparison made between women who conceived via IVF, often carrying twins or more babies, and women with singleton births, making it difficult to separate the effects of the infertility treatments from those of the number of babies. Moreover, to the best of our knowledge, past studies that examined prenatal maternal expectations included only mothers of singleton babies, were cross-sectional, and examined maternal expectations retrospectively. The design of the present study was planned to overcome these limitations.

The study aimed to examine: (i) the difference between the two pregnancy-type groups in prenatal maternal expectations, coping resources and maternal stress; (ii) the role of prenatal maternal expectations in predicting maternal stress, and in mediating the association between pregnancy type group and maternal stress; and (iii) the mediating and moderating effects of coping resources on the association between pregnancy type group and maternal stress.

Materials and Methods

Procedure and participants

Married women who were at least 7 months pregnant with twins, expecting their first babies, Hebrew speaking, with no severe physical, psychological or psychiatric problems were eligible for inclusion in this study.

The women were recruited from 28 maternity clinics in all regions of Israel during the years 2003–2005. Eligibility to the study was determined by medical or nursing staff in each clinic. The women were first approached by one of the clinic’s staff asking for their consent to participate. The study was approved by the ethical review boards of the participating agencies. After obtaining informed consent, the women were referred to one of the authors (L.B.) and interviewed face-to-face at 33–36 weeks of their pregnancy, in the clinic or in another location according to their preference. In this first interview they completed socio-demographic information and the maternal expectations questionnaire. They were contacted again 6 months after birth, and interviewed face-to-face using a questionnaire on the delivery and the medical conditions of the infants, their employment status, their coping resources and level of parenting stress.

A total of 202 (93%) women agreed to participate; 15 refused (mainly for fear of loss of confidentiality). Of the participants, 16 women (15 IVF and one spontaneous) were lost in follow-up: six became ineligible due to abortion, fetal abnormality, death of one baby or couple divorce, although the rest could not be located (n = 10). Of the final sample (N = 186), 98 women conceived spontaneously and 88 conceived through IVF.

Measures

Maternal Stress was measured by the 36-item well-validated Parenting Stress Index—Short Form (SF PSI) (Abidin, 1983). The Likert-scale response categories for each item (1 = strongly agree, 5 = strongly disagree) are summed to produce a total score of the overall level of parenting stress, as well as three subscale scores (parental distress, parent-child dysfunctional interaction and difficult child). High scores are considered to be scores at or above the 85th percentile. Only the total score was used for the current analysis with Cronbach’s alpha of 0.93. The questionnaire was translated into Hebrew by its author (R. Abidin) who gave his approval (personal communication) to adapt the responses for twins by adding ‘twin I’ and ‘twin II’ for each question. In this way, the mother could better describe each of her twins rather than a joint response. According to Abidin’s guidelines for adaptation of the scale for twins, the higher scores that were given for one of the twins were used, assuming that the score denoting frustration or stress regarding even one of the twins represents the mother’s feeling of stress at that moment.

Prenatal Maternal Expectations Scale (PMES; Coleman et al., 1999). This 46-item Likert-scale questionnaire (1 = strongly agree, 5 = strongly disagree) was designed to assess the nature of prenatal expectations regarding the infant and the maternal role among primiparous women. The scale was adapted for the first time in this study to women carrying twins and they were asked to address their expectations from the two babies. High scores (above 178) indicate unrealistically positive expectations; low scores (below 161) indicate unrealistically negative expectations, while scores falling in the middle range (162–177) denote realistic expectations. The PMES may be divided into five sub-components of the larger domain of maternal expectations but only the total score was used for the current analysis, with Cronbach’s alpha value of 0.87.

SOC (Antonovsky, 1987) was measured by the short version, a 13-item seven- point Likert scale (1 = never to 7 = always) questionnaire that has

Guided the current study, which focused on women’s cognitive appraisal and coping resources in their transition to motherhood of twins.

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demonstrated satisfactory reliability values (Antonovsky et al., 1994). Higher scores represent a higher SOC. Cronbach’s alpha value in this study was 0.87.

Parenting Sense of Competence (Gibaud-Wallston and Wandersman, 1978) was measured in a 17-item six-point Likert-scale (1 = strongly agree, 6 = strongly disagree) questionnaire designed to assess the mother’s perceived ability to deal with the demands of parenting. The scale has demonstrated good validity and reliability (Johnson and Mash, 1989). Higher scores represent higher parenting competence. Cronbach’s alpha value in this study was 0.87.

Scale of Perceived Social Support (Zimmet et al., 1988) is a 12 item seven-point Likert scale (1 = strongly agree to 7 = strongly disagree) questionnaire that has been extensively used to assess a person’s perceived social support from family, friends and significant others. Higher scores represent higher perceived social support. Cronbach’s alpha value in this study was 0.88.

Israeli Marital Quality Scale (Lavee, 1995) uses an 11-item, seven-point Likert scale questionnaire (ranging from strongly agree to strongly disagree, interchangeably) developed to assess marital quality, based on the ENRICH marital inventory (Olson et al., 1986). This instrument assesses problem areas and strengths of the marital relationship across 10 dimensions (personality issues, communication, conflict resolution, financial management, leisure activities, sexual relationship, children and parenting, extended family and friends, gender role and marital satisfaction). Higher scores represent better marital quality. Cronbach alpha value in this study was 0.84.

Control variables included (i) socio-demographic background of the mother: age, country of birth, education and religiosity as well as employment at 6-months and (ii) medical data: delivery and medical parameters of each of the newborn twins (gestational age, birthweight and neonatal complications).

Data analysis

The differences between the groups were examined using χ², t-test, ANOVA or MANOVA as required. In preparation for the multivariate analysis, the bivariate associations of maternal expectations or coping resources with maternal stress were examined in order to determine their potential role as mediators (Baron and Kenny, 1986). To include the medical data as a control variable, we adopted the same approach that was administered for the PSI, inasmuch that data on the twin with poorer status were selected. Hierarchical linear regression models (in Enter mode) were used to examine the direct and mediating effects of maternal expectations and coping resources, controlling for socio-demographic and medical variables. To avoid collinearity problems, two procedures were conducted: (i) of the medical variables, the three variables of the medical condition of the babies (birthweight, neonatal complications and receiving treatment 6 months after birth) that were highly correlated, were considered together to form one variable called ‘baby’s complications’. A score of +1 was given if one of the babies was either premature, or suffered from a neonatal complication, or needed further medical treatment, and (ii) group affiliation and socioeconomic variables were also transformed as dichotomy variables with (−1) and (+1) values (group: IVF −1, spontaneous +1; employment at 6 month: not working −1, working +1; delivery mode: Cesarean −1, vaginal +1; baby’s complications: does not exist −1, exists +1) (Cohen and Cohen, 1983). It should be noted that for brevity only control variables that reached a significant difference between the two study groups and were also significantly associated with the outcome variable (maternal stress) were selected for inclusion in the multivariate analysis and are shown in the tables, i.e. employment, delivery mode and neonatal complications.

Results

Sample characteristics

The two study groups differed in several socio-demographic background variables and in delivery mode, neonatal complications and medical status at birth. The women in the IVF group compared with those in the spontaneous pregnancy group, were significantly older (30.4±3.4 and 28.4±3.3 years, respectively, P < 0.001), had been married longer (4.7±2.1 and 3.1±1.5 years, respectively, P < 0.001) and a lower proportion were working at 6 months after birth (28 and 49%, respectively, P < 0.01). The two groups did not differ in the mother’s educational level (64% had studied 12 or more years), religiosity (63% were not religious), and in father’s country of origin (39% were born in Israel, 27% in Europe and America and 34% in Asia and Africa). In the IVF group compared with the spontaneous pregnancy group, the rate of Cesarean section was significantly higher (71 versus 51%, respectively, P < 0.01), the proportion with gestational age >37 weeks was significantly lower (36 versus 58%, respectively, P < 0.01), the proportion with birthweight >2000 g was lower (14 versus 31%, respectively, P < 0.01), and more babies had neonatal complications requiring medical treatment 6 months after birth (17 versus 7.1%, respectively, P < 0.05).

Differences between the two groups

To examine differences between the two study groups in prenatal maternal expectations, coping resources and maternal stress, a MANOVA test was performed, showing significant differences between the two groups in all measures: IVF mothers had significantly higher (more positive) prenatal maternal expectations, lower levels of coping resources and experienced significantly higher levels of maternal stress than mothers who conceived spontaneously (Table I).

The associations of maternal expectations and coping resources with maternal stress

The predictive power of prenatal maternal expectations on maternal stress was examined by a hierarchical multivariate regression model. Maternal expectations were not associated with maternal stress (Step 1, Table II) in either group, as shown by the non-significant interaction term (Step 2, Table II). The association of group affiliation (IVF versus spontaneous conception) with maternal stress remained highly significant. These results suggest that maternal expectations are not potential mediators of the association between group affiliation and maternal stress. However, due to the prospective nature of the study, and in order to examine their role once medical data and coping resources are entered, maternal expectations were included in further multivariate analyses.

In preparation for the multivariate analysis, the bivariate associations of the coping resources with maternal stress were examined using Pearson’s correlations. All the coping resources were significantly associated with maternal stress confirming their potential role as mediators (data not shown). Similarly, the associations of the control variables with maternal stress were examined. Employment status at 6-months, delivery mode and baby’s complications were the only control variables that were significantly associated with maternal stress (data not shown).
Maternal stress after IVF or spontaneous conception

Multivariate analysis using a hierarchical linear regression model was conducted in four steps. Group affiliation together with employment status and medical control variables (only those which differed significantly between the groups and were related to maternal stress) were entered first, followed by maternal expectations in the second step (Table III). In Step 1, group affiliation, employment and the medical variables were significantly associated with maternal stress. The addition of maternal expectations in Step 2, contributed negligibly to the variance, and group affiliation remained significantly associated with maternal stress, confirming that maternal expectations had neither a direct nor a mediating effect. It should be noted at this stage that in addition to group affiliation, the mother’s employment status (not working) and the babies’ neonatal complications were strongly associated with higher maternal stress (Table III, Step 2).

To examine the association between coping resources and maternal stress whereas controlling for socio-demographic and medical variables and for maternal expectations, the coping resources variables were included in the third step of the regression model and their interactions with group affiliation in the final, fourth step. The coping resources added a significant 32% to the overall variance, and the association of group affiliation with maternal stress became non-significant, suggesting that coping resources (except for marital quality) mediate this association (Table III, Step 3). Maternal self-efficacy had the strongest association with maternal stress, meaning that the higher the maternal self-efficacy the lower the maternal stress. In the final model (Table III, Step 4), marital quality was found to moderate the association between group affiliation and maternal stress. When the source of this interaction was examined, it was found that while in the spontaneously conceived group marital quality was significantly and positively related to maternal stress, this association was not significant among the IVF mothers. This interaction added 2% and the overall variables accounted for 71% of the variance in maternal stress.

Table I Analysis of variance for group difference.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Spontaneously conceived M</th>
<th>SD</th>
<th>IVF M</th>
<th>SD</th>
<th>F (1, 184)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal expectations</td>
<td>170.01</td>
<td>20.82</td>
<td>184.08</td>
<td>17.1</td>
<td>25.01***</td>
</tr>
<tr>
<td>SOC</td>
<td>70.59</td>
<td>12.66</td>
<td>61.88</td>
<td>12.46</td>
<td>22.30***</td>
</tr>
<tr>
<td>Maternal self-efficacy</td>
<td>81.24</td>
<td>10.12</td>
<td>71.82</td>
<td>13.89</td>
<td>28.27***</td>
</tr>
<tr>
<td>Social support</td>
<td>5.94</td>
<td>0.88</td>
<td>5.39</td>
<td>1.08</td>
<td>14.44***</td>
</tr>
<tr>
<td>Marital quality</td>
<td>59.54</td>
<td>7.62</td>
<td>56.47</td>
<td>9.54</td>
<td>5.90**</td>
</tr>
<tr>
<td>Maternal stress</td>
<td>66.77</td>
<td>13.81</td>
<td>82.63</td>
<td>21.53</td>
<td>5.90**</td>
</tr>
</tbody>
</table>

**P < 0.01, ***P < 0.001.

Table II Summary of hierarchical regression analysis for variables predicting maternal stress (n = 186).

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Step 1</th>
<th></th>
<th>Step 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td></td>
<td>β</td>
<td></td>
</tr>
<tr>
<td>Group affiliation</td>
<td>−0.38***</td>
<td></td>
<td>−0.39***</td>
<td></td>
</tr>
<tr>
<td>Maternal expectations</td>
<td>0.07</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group affiliation × Maternal expectations</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.17***</td>
<td></td>
<td>0.18***</td>
<td></td>
</tr>
<tr>
<td>ΔR²</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P < 0.05, ***P < 0.001.

Discussion

This study contributes to our understanding of differences in adjustment to the maternal role among mothers of twins in several important ways. It demonstrates that, compared with mothers conceiving spontaneously, IVF mothers had more positive prenatal maternal expectations, but poorer coping resources and higher levels of maternal stress 6 months after birth. The findings also show that maternal expectations have no predictive power for maternal stress. The mother’s coping resources, however, are significantly related to maternal stress and mediate the association between pregnancy type and maternal stress.

Differences between the two groups

The higher level of maternal expectations prior to birth of the mothers of twins conceived via IVF is not surprising. They may possibly be a reflection of these mothers’ wish to compensate themselves for their experience of lengthy procedures and fruitless attempts to achieve pregnancy. As this study was the first one to examine maternal expectations among mothers of twins, the question of whether these expectations are unrealistic, particularly in light of these mothers’ depleted coping resources warrants further exploration.

Regarding the personal coping resources, the findings suggest that 6 months after birth the mothers of twins conceived via IVF continue to be more vulnerable in many ways than mothers of twins conceiving spontaneously. In accordance with previous research (McMahon et al., 1997; Gibson et al., 2000), their lower sense of maternal efficacy, may stem from the effects of the IVF experience on the component of past achievements and failures of the self-efficacy concept (Bandura, 1977). The woman may interpret success in the IVF procedure as the medical staff’s success and not her own, leading to her devaluing her capacities to cope independently with maternal difficulties. Similarly, yet in the absence of prior studies of SOC in the context of IVF motherhood, we can speculate that these past
experiences may have undermined the comprehensibility, manageability and meaningfulness components of the SOC of these mothers. Regarding the social coping resources, the findings show that the consequences of infertility and fertility treatments are also expressed in inter-personal relations after birth. During treatment, couples are often reluctant to disclose their intimate problems to others and often minimize their social ties (Abbey, 2000). After the birth of twins, when support is most needed, they may find these ties hard to resume. Among our participants, the excessive tensions during infertility period and IVF and the mothers’ relative social isolation may also take a toll on marital quality. However, their poorer marital quality is in contrast to previous reports of no differences between IVF mothers and mothers conceiving spontaneously (Colpin et al., 1995; Baor et al., 2004). Furthermore, our assumptions that the differences in coping resources express longer term effects of the IVF treatment should be taken with caution as we did not evaluate the women’s coping resources before the pregnancy but only after the transition to motherhood. It is reasonable to assume that the combination of parenting difficulties with the preceding experience of infertility and its treatments are the factors destabilizing these resources among IVF mothers.

Consistent with previous studies (Colpin et al., 1995; Baor et al., 2004; Glazebrook et al., 2004), primiparous mothers of IVF twins reported higher maternal stress than mothers conceiving spontaneously. This difference was not confounded by the poorer medical condition of the IVF twins as was shown in the multivariate model.

### Coping resources and maternal stress

In accordance with previous studies on the direct and mediating role of coping resources in adjusting to the parental role (Gibson et al., 2000), our findings also provide further support for the theoretical model of the current study and for empirical evidence of the effects of coping resources on stress reactions (Lazarus and Folkman, 1984; Thoits, 1995; Moos and Holahan, 2003). The complete mediation of the association of group affiliation with maternal stress by coping resources reflects their specific relevance to the context of motherhood after IVF treatment. Self-efficacy has a major role in lowering the perception of threat in stress situations and thus in decreasing the stress reaction (Bandura, 1997). This finding conforms with those showing that infertility-specific cognition was inversely related to stress during infertility treatment cycles (Verhaak et al., 2005), and after transition to parenthood, when parents with high self-efficacy are empowered in their parental role and experience less psychological distress (Kwok and Wong, 2000). Similarly, the significant contribution of a SOC to the variance of maternal stress conforms to the Salutogenic Model (Antonovsky, 1979). A high SOC evokes one’s general resistance resources, and thus improves the ability to cope efficiently with stressors.

In the presence of maternal self-efficacy and SOC, the social resources had a minor contribution to maternal stress. The significant but weaker association of social support with maternal stress accords with previous evidence (Thoits, 1995). Mothers who enjoy instrumental and emotional support feel greater satisfaction in their maternal role and experience less maternal stress (Crockenberg, 1988). On the other hand, in contrast to previous research (Lavee et al., 1996), marital quality did not contribute directly to maternal stress. The finding of the moderating effect of marital quality, showing a positive association of marital quality with maternal stress among spontaneously conceived mothers is surprising. It may be partially explained by the cross-sectional design of this part of the study. The direction of the association could well be bi-directional; that is, the high maternal stress of parenting twins may bring the couple closer, generating feelings of good marital quality. The question of why this was found only among mothers conceiving spontaneously remains a subject for further inquiry.

Attention should be drawn to the significant associations between the two control variables, mother’s employment (measured at 6 months) and baby’s complications, with maternal stress. Although

### Table III Summary of hierarchical regression analysis for variables predicting maternal stress ($n = 186$).

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Step 1 $\beta$</th>
<th>Step 2 $\beta$</th>
<th>Step 3 $\beta$</th>
<th>Step 4 $\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group affiliation</td>
<td>$-0.22^{***}$</td>
<td>$-0.21^{***}$</td>
<td>$-0.06$</td>
<td>$-0.05$</td>
</tr>
<tr>
<td>Employment</td>
<td>$-0.34^{***}$</td>
<td>$-0.34^{***}$</td>
<td>$-0.18^{***}$</td>
<td>$-0.18^{***}$</td>
</tr>
<tr>
<td>Delivery mode</td>
<td>$-0.13^*$</td>
<td>$-0.13^*$</td>
<td>$0.01$</td>
<td>$0.01$</td>
</tr>
<tr>
<td>Baby’s complication</td>
<td>$0.25^{***}$</td>
<td>$0.25^{***}$</td>
<td>$0.11^{**}$</td>
<td>$0.12^{**}$</td>
</tr>
<tr>
<td>Maternal expectations</td>
<td>$0.01$</td>
<td>$0.01$</td>
<td>$0.04$</td>
<td></td>
</tr>
<tr>
<td>Marital quality</td>
<td></td>
<td></td>
<td>$-0.02$</td>
<td>$0$</td>
</tr>
<tr>
<td>Maternal self-efficacy</td>
<td></td>
<td></td>
<td>$-0.45^{***}$</td>
<td>$-0.47^{***}$</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td></td>
<td>$-0.11^*$</td>
<td>$-0.11^*$</td>
</tr>
<tr>
<td>SOC</td>
<td></td>
<td></td>
<td>$-0.18^*$</td>
<td>$-0.17^{**}$</td>
</tr>
<tr>
<td>Group affiliation × Marital quality†</td>
<td>0.32^{***}</td>
<td>0.32^{***}</td>
<td>0.71^{***}</td>
<td>0.71^{***}</td>
</tr>
</tbody>
</table>

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

†Only significant interactions are exhibited.
fewer IVF mothers were working and more IVF twins suffered from neonatal complications and required further medical treatment at 6 months, these were insufficient to explain the association of group affiliation with maternal stress as shown in the first step of the regression model. Moreover, these variables remained significant even after the inclusion of the coping resources in the regression analysis, suggesting that having babies with medical complications and being unemployed are independently associated with maternal stress irrespective of group affiliation and coping resources. Employment can be viewed as a coping resource (Lazarus and Folkman, 1984), by elevating the sense of competence in the maternal role thus resulting in lower maternal stress. The significant association of the babies’ complications with maternal stress is obvious and consistent with other studies (DeMier and Hynan, 2000; Davis et al., 2003; Singer et al., 2003).

Prenatal maternal expectations and maternal stress

One last note relates to our attempt to evaluate the predictive power of maternal expectations. Its non-significant association with maternal stress is inconsistent with the theoretical assumption that stress reactions may be shaped by how current experiences match our expectations (Kelley and Thibaut, 1978), and contradicts previous studies (Belsky et al., 1986a, b; Hackle and Ruble, 1992). This discrepancy could be explained by the retrospective design of those studies and in their inclusion of singleton births only, in comparison to our prospective study design of mothers of twins. We may assume that the daily reality of parenting twins 6 months later, overshadows their past cognitive expectations and current resources are those that matter.

Implications

Although all twin births are risky and associated with many social, psychological and economic difficulties (Olivennes et al., 2005), our findings demonstrate the higher vulnerability of IVF mothers of twins. Their higher levels of maternal stress completely explained by their more limited coping resources, suggest that they, as well as mothers of spontaneously conceived twins with poor coping resources, unemployed mothers and those whose one or both babies suffered from medical complications should be considered high-risk populations. Early identification is essential for timely interventions in order to enhance the resources of these mothers of twins. Such interventions may decrease the maternal stress they experience and consequently improve their children’s development and well-being.

Authors’ Roles

L.B.: study design, data collection, analysis and interpretation of data, drafting the article; V.S.: study design, interpretation of data, revision of the article, approval of final version.

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