Exploration of a cognitive model to predict post-traumatic stress symptoms following childbirth

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Abstract

Women can suffer from post-traumatic stress disorder (PTSD) following childbirth. This study investigated the application of a cognitive model to PTS symptoms following childbirth and explored the addition of social support to the model.

Methods: Women (N=138) completed questionnaires in pregnancy, three-weeks and three-months after birth, measuring prior trauma, beliefs, and coping in pregnancy; and birth interventions, social support, post-traumatic cognitions, and PTS symptoms post-birth.

Results: Using structural equation modeling, a cognitive model explained 23% of the variance in PTS symptoms three-weeks postpartum. Three-months postpartum, the model explained only 9% of the variance in PTS symptoms. The addition of social support, partially mediated by post-traumatic cognitions, increased the variance to 16%.

Discussion: Results suggest that a cognitive model accounts for early PTS symptoms after birth. Social support after birth increases the explanatory power of the model at three months. A test of the model on a larger sample is warranted.

Keywords: Childbirth, PTSD, cognitions, social support.

1. Introduction

Childbirth is a stressful event which a majority of women experience at some point in their lives. The transition to parenthood, of which childbirth is a part, can involve substantial adjustment and is a vulnerable period for the development of psychological problems. It is now recognized that a small proportion of women can suffer from post-traumatic stress disorder (PTSD) following a difficult experience of childbirth. This disorder affects between 1 and 6% of women in the first year following the birth of their child. In addition to full clinical cases, around 30% of women rate their experience as traumatic (Creedy, Shochet, & Horsfall, 2000; Soet, Brack, & Dilorio, 2003), and a similar number meet symptom criteria on at least one of the PTSD symptom subscales (re-experiencing, avoidance, and hyperarousal; Maggioni, Margola, & Filippi, 2006). Given the large numbers of women who give birth every year (600,000 per year in the UK, (Richardson & Mmata, 2007)) the extent of post-traumatic stress responses in women following childbirth is notable. More research is needed to identify women at risk from the disorder and those who may need treatment.

Childbirth is a normal event in society and considered a positive experience by many women. Therefore some have questioned childbirth being classed as a trauma. However, since 1994 the American Psychiatric Association has defined a traumatic event as follows (APA, 1994, 2000): 1) an event during which the person experienced, witnessed, or was confronted by actual or threatened death or serious injury, or a threat to the physical integrity of self or others, and 2) during which the person's response involved intense fear, helplessness, or horror. Both of these criteria can be met by childbirth. Some women

experience events during childbirth that would be a trauma for almost anyone, such as life-threatening complications for themselves or their baby, or undergoing medical interventions without adequate pain relief. Other women may have a seemingly “normal” birth but may feel traumatized by aspects such as loss of control, loss of dignity, or the hostile, difficult or disrespectful attitudes of the people around them. The interpersonal environment during birth may be particularly important in determining trauma responses (Charuvastra & Cloitre, 2008; Cigoli, Gilli, & Saita, 2006; Creedy et al., 2000; Czarnocka & Slade, 2000; Ford & Ayers, 2009; Lyons, 1998; Maggioni et al., 2006; Soet et al., 2003; Wijma, Soderquist, & Wijma, 1997).

Risk factors for post-traumatic stress (PTS) symptoms after childbirth have been established in the literature. For example, prior psychiatric problems and previous trauma have been associated with PTS symptoms following birth (Cigoli et al., 2006; Cohen, Ansara, Schei, Stuckless, & Stewart, 2004; Czarnocka & Slade, 2000; Kennedy & MacDonald, 2002; Maggioni et al., 2006; Soderquist, Wijma, & Wijma, 2006; Soet et al., 2003; Wijma et al., 1997). During the birth, instrumental deliveries (e.g. use of forceps) and emergency caesarean sections (Creedy et al., 2000; MacLean, McDermott, & May, 2000; Ryding, Wijma, & Wijma, 1998; Soderquist, Wijma, & Wijma, 2002), a lack of control (Czarnocka & Slade, 2000), feeling powerlessness (Soet et al., 2003), experiencing a lack of communication from staff (Lyons, 1998), experiencing inadequate support and care (Cigoli et al., 2006; Creedy et al., 2000; Czarnocka & Slade, 2000; Maggioni et al., 2006; Wijma et al., 1997), and coping by using dissociation during the birth (Olde et al., 2005), have all been associated with having more PTS symptoms

following the birth. Following the birth, higher levels of symptoms have been associated with low social support (Cigoli et al., 2006; Lyons, 1998) and negative appraisals or beliefs (Czarnocka & Slade, 2000; Edworthy, Chasey, & Williams, 2008; Wijma et al., 1997).

Risk factors for PTS symptoms following childbirth therefore overlap with risk factors for PTSD following other events (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003). However, the current state of the research into PTSD following childbirth lacks a theoretical basis. It is not clear if established multivariate models for PTSD can explain symptoms of the disorder following childbirth. This study therefore aimed to apply a well-established cognitive model of PTSD to childbirth to ascertain if it could predict PTS symptoms following birth. In a review of current PTSD theories, Brewin and Holmes (2003) concluded that the model proposed by Ehlers and Clark (2000) was "currently the most detailed account of the maintenance and treatment of PTSD" (p 364). In this cognitive model, it is proposed that persistent PTSD occurs if individuals process the traumatic event or its sequelae in a way that produces a sense of current threat. It is suggested that a sense of threat arises as a consequence of individual vulnerability (prior beliefs, experiences, and coping style), the characteristics of the trauma and its sequelae, excessive negative appraisals of the trauma, and due to a disturbance of autobiographical memory. There is much empirical support for this theoretical model of PTSD and several studies link negative cognitions and appraisals to a higher risk of developing PTSD after health events, such as spinal cord injury (Agar, Kennedy, & King, 2006), stroke (Field, Norman, & Barton, 2008), myocardial infarction

(Ayers, Copland, & Dunmore, in press) and pre-eclampsia in pregnancy (Engelhard et al., 2002). This model suggests that the relationships between individual vulnerabilities, trauma characteristics and PTS symptoms are mediated by these negative appraisals (Ehlers & Clark, 2000, p321).

As mentioned above, social factors may be particularly important in determining trauma responses to childbirth (Cigoli et al., 2006; Creedy et al., 2000; Czarnocka & Slade, 2000; Ford & Ayers, 2009; Lyons, 1998; Maggioni et al., 2006; Soet et al., 2003; Wijma et al., 1997), but are often not represented in cognitive models. Social support has been found to be a consistent protector against PTSD following traumatic events (Brewin et al., 2000; Charuvastra & Cloitre, 2008; Ozer et al., 2003). Following health events those with poor social support or who had negative interactions with health-care staff were more at risk of developing PTSD (Tedstone & Tarrier, 2003). Low postnatal social support has been associated with higher risk of PTSD (Cigoli et al., 2006; Lyons, 1998) and depression in postnatal women (Felice, Saliba, Grech, & Cox, 2004; Heh, Coombes, & Bartlett, 2004; Wang, Jiang, Jan, & Chen, 2003). A second aim of the current study was therefore to examine whether the addition of social support strengthens the predictive power of a cognitive model in this particular population.

This study therefore had the following aims: (1) to use a theoretical framework, incorporating aspects of Ehlers and Clark's cognitive model, to predict PTS symptoms following childbirth, concentrating on the role of cognitive appraisals and (2) to examine whether social support adds to the predictive utility of this model in this population. It was hypothesized therefore, that (1) the cognitive model would predict PTS symptoms

following childbirth and (2) adding social support to the model would improve its predictive power. As there was no theoretical basis to determine how social support should be included in the model, this variable was explored as a direct predictor of PTSD and as fully and partially mediated by post-traumatic cognitions. Of note, symptoms of post-traumatic stress (PTS) were measured as the outcome rather than clinical cases because of the low incidence of the disorder. The implications of this are discussed later in this paper. To establish direction of causation, these predictors were measured in a longitudinal postal survey of women from the last trimester of pregnancy to three months after birth, with PTS symptoms measured at two time points postpartum. The models were analyzed using structural equation modeling.

2. Methods

2.1. Design

This study was a repeated-measures longitudinal survey with questionnaires completed at three time points: 36 weeks of pregnancy (time one: mean 36.5 weeks, SD 10 days), three weeks after the birth (time two: mean 20 days; SD 11 days), and three months after the birth (time three: mean 3.4 months; SD 21 days). The cognitive model proposed that the characteristics of the trauma and its sequelae, and the individual's prior experiences, beliefs and coping state will feed into negative appraisals of the trauma, which will in turn predict symptoms of PTSD (Ehlers & Clark, 2000, p 321). Birth characteristics were measured using a weighted sum of obstetric interventions, prior experiences were represented by participants trauma history, prior beliefs by a dysfunctional belief scale, and coping style using a self-efficacy scale. The following measures were taken at each time point:

- Pregnancy: demographic information, trauma history, PTS symptoms, dysfunctional attitudes & beliefs, self-efficacy.
- Three weeks after birth: PTS symptoms, experience of birth, post-traumatic cognitions, social support.
- Three months after birth: PTS symptoms.

2.2. Sample

Pregnant women were recruited from public UK hospital and community antenatal clinics. Women were eligible if they were between 33 and 37 weeks pregnant. Women were excluded if they were under 18 years of age, if their level of English was not sufficient to understand the questionnaires, or if the midwife indicated that it would not be appropriate to approach them (for example, one woman was not approached because her baby was going to be put on the child protection register).

Two hundred and fifty nine women were identified as eligible for the study and 244 women were approached and invited to take part. Of these 215 (83%) agreed and took home questionnaires. Overall 138 women sent back questionnaires (64% of those who agreed to take part) and among these women, retention rates were high: In pregnancy 136 participants returned questionnaires (63%); at time two 125 participants returned questionnaires (58%); and at time three 109 women (51%) returned their questionnaires. Demographic, psychological, and obstetric differences were calculated where possible between women who filled in all three questionnaires (completers) and those who only completed one or two questionnaires (non-completers). The only differences found were

that non-completers were more likely to be single (χ^2 (1) = 6.48, p< .025) and have more children (χ^2 (2) = 6.35, p< .05).

2.3. Measures

2.3.1. Demographic information

Participants were asked to provide information on their age, marital status, accommodation, ethnic group, educational attainment, job, and obstetric history.

2.3.2. PTS symptoms and Trauma History

PTS symptoms and trauma history were measured using the PTSD diagnostic scale (PDS) (Foa, Cashman, Jaycox, & Perry, 1997). The PDS measures trauma history with a checklist of 11 traumatic events, plus a space for recording other events. Trauma history was calculated as the number of previous traumatic events experienced.

PTS symptoms were measured according to DSM IV criteria for PTSD. The PDS asks about the three DSM symptom criteria, and symptoms are rated on a four-point scale of frequency of occurrence. The PDS is shown to have internal consistency alphas of .92 for total symptom severity; .78 for re-experiencing; .84 for avoidance and .84 for arousal. Test-retest reliability scores were .83 (total); .77 for re-experiencing; .81 for avoidance; and .85 for arousal, with percentage agreement in diagnosis between the two time-points as 87%. The sensitivity of the PDS was .89, with a specificity of .75 with diagnoses obtained from the standardized diagnostic interview (Foa et al., 1997).

So that the PDS was answered in relation to childbirth at following birth, participants were instructed to answer all PTS symptom questions about their experience of birth. Symptom questions were rephrased with “the birth” replacing “the event.”

2.3.3. Prior Beliefs and Coping

Prior beliefs were measured by the Dysfunctional Attitude Scale (DAS) (Weissman, 1979). Responses were indicated on a seven point Likert scale, with higher scores indicating more distorted thinking. The 9-factor structure of this 66-item scale was found to be invariant with respect to gender and to have interfactor alphas all $\geq$ .70. (Beck, Brown, Steer, & Weissman, 1991).

Prior coping was measured using the Self-efficacy Scale (SES). This scale consisted of 17 items from the general self-efficacy factor of the full scale. Participants endorsed each item on six point Likert scale, chosen instead of the published 14-point Likert scale (strongly agree to strongly disagree) for quickness of response. This 17-item factor accounted for 26.5% of the variance, and has a Cronbach's alpha reliability coefficient of .86 (Sherer et al., 1982).

2.3.4. Trauma Characteristics

The extent of birth intervention was measured using the Intrapartum Intervention Score (Clement, Wilson, & Sikorski, 1999) from self-reported information on intervention during birth. A score was calculated for each participant giving a weighted estimate of how much intervention she had experienced during birth. The weighted sum was taken of the following interventions: pethidine; epidural; entonox; transcutaneous electrical nerve

stimulation (TENS); oxytocin drip; external heartbeat monitor; internal heartbeat monitor; episiotomy; tearing; forceps; caesarean. The range of the intervention score in this study was 0-45 (mean intervention score 17.1, SD 10.49).

2.3.5. Post-traumatic Cognitions:

Post-traumatic cognitions were measured using the Post-traumatic Cognitions Inventory (PTCI). This is a scale of trauma-related thoughts and beliefs developed from cognitive theories of post-trauma psychopathology. It consists of 36 items, which are answered on a Likert scale of seven points (totally disagree – totally agree). It measures three dimensions of traumatic thoughts: negative cognitions about the self; about the world; and self blame, and these three factors were found to account for 55.9% of the variance in the data. Cronbach's alphas for the total scale and three subscales were: .97 for the total scale; .97 for negative cognitions about self; .88 for negative cognitions about the world; .86 for self-blame, and test-retest reliabilities were: .74 for the total scale; .75 for negative cognitions about self; .89 for negative cognitions about the world; .89 for self-blame (Foa, Ehlers, Clark, Tolio, & Orsillo, 1999).

2.3.6. Social Support

Social support was measured using the Medical Outcomes Study Social Support Survey (SSS), a 19-item multi-dimensional scale asking about different types of everyday support available to participants. Each item is endorsed on a five-point scale from none of the time to all of the time. Internal-consistency reliability for the subscales ranges from .91-.97 and one-year stability coefficients range from .72-.78 (Sherbourne & Stewart, 1991).

2.4. Procedure

Ethical approval was received from the University Research Governance committee and the NHS Local Research Ethics Committee. The researcher attended four hospital and four community antenatal clinics per week over a 14-week period and approached eligible women. If the women were interested, the study was explained using an information sheet, and if women were willing, informed consent was obtained, and participants took away the first questionnaire. Birth records at the hospital provided information about delivery dates and time two questionnaires were sent out as soon as it was established mother and baby had been discharged home safely, but not less than one week after the birth. Three months from the date of the baby's birth, the third questionnaire was sent. At each time point, if the questionnaire was not returned after two weeks, a reminder was sent, and this was followed up by one or more telephone calls, as necessary.

3. Results

3.1. Data Screening

Missing data ranged from 0 to 6% of items and subscales. Randomly missing data were replaced with the individual's mean for that subscale (Tabachnick & Fidell, 2001). A number of variables were skewed so correlations were performed using Spearman's Rho. For structural equation models data were transformed by logarithm if positively skewed and by square root of the reverse score if negatively skewed. In the structural equation models, analyses were performed on the raw data and the transformed data. The results (in terms of significance and fit indices) were not different, so the

analyses with the raw data are presented, as it is conceptually more meaningful (Tabachnick and Fidell 2001).

3.2. Sample characteristics

Demographic characteristics of participants are shown in Table 1. Participants were predominantly of White European origin (92.6%) and married or cohabiting with a partner (90.1%). This was also a highly educated sample, with 56% having continued education after age 18 and 55.2% having a degree or professional qualification. Sixty-three percent of participants already had one or more children.

- insert Table 1 about here -

3.3. Prevalence of PTSD

The prevalence of PTSD, and the levels of PTS symptoms in this sample are shown in Table 2. In pregnancy, 52 women reported previously experiencing a traumatic event and symptoms of PTS. Ten women (7.2% of total sample) fulfilled DSM IV criteria for having had full PTSD caseness at some point in their past. Following the birth, PTS symptoms were only measured in relation to their experience of birth. Three weeks after birth one woman (0.8%) fulfilled all DSM IV criteria for PTSD related to birth (except duration of symptoms). Three months after birth one woman (0.9%) fulfilled all DSM IV criteria for PTSD related to birth (this was a different woman from the earlier time-point).

- insert Table 2 about here -

3.4. Associations between predictors and PTS symptoms

Bivariate correlation coefficients of the associations between the six predictors and PTS symptoms can be found in Table 3. Of the risk factors proposed in the cognitive model, dysfunctional attitudes, self-efficacy, and post-traumatic cognitions correlated significantly with the outcome of PTS symptoms at three weeks postpartum and three months postpartum, with medium effect sizes. Social support also correlated significantly with PTS symptoms. However, trauma history and the intrapartum intervention score representing birth characteristics did not correlate significantly with PTS symptoms at either time point.

- insert Table 3 about here -

3.5. Structural Equation Models

The hypothesized model was tested statistically using structural equation modeling, with and without the additional variable of social support. This technique was used to explore the fit of the proposed models on the data, and model fit was evaluated using the following indices: Chi-Square, which assumes the perfect fit of the model, so a significant difference indicates a poor model; Root mean square error of approximation (RMSEA), where values under .10 are acceptable, <.08 is better, and <.05 is good; Comparative fit index (CFI), where values >.9 are acceptable; and standardized Root Mean Residual (RMR) which looks at the residuals of the model to estimate fit and should be <.10. After removing cases with missing data, 116 cases were included in the analysis for outcomes three weeks after birth and 102 were included in the analyses predicting outcomes at three months after birth.

Four models were tested at each time point to ascertain the best model predicting PTS symptoms three weeks and three months after birth. To test the first hypothesis the model was examined at each time point without social support. Following this, social support was included in three ways: fully mediated by post-traumatic cognitions; partially mediated by post-traumatic cognitions; and as a direct predictor of PTS symptoms. Independent variables were allowed to covary but only significant covariances were retained in the final models. Fit indices for all these models are shown in Table 4. The best model was chosen on the basis of the model chi-square, R^2, and parsimony.

- insert Table 4 about here –

3.5.1. Three weeks after birth

The first hypothesis that the cognitive model described by Ehlers and Clark (2000) would be a good predictor of women experiencing PTS symptoms after childbirth was supported. The effects on PTS symptoms of birth characteristics, and prior beliefs, coping and experiences were fully mediated by post-traumatic cognitions which was found to have a direct effect on PTS symptoms. This model was a good fit of the data and is shown in Figure 1, with significant paths indicated by an asterisk. This model explained 23% of the variance in PTS symptoms three weeks after birth.

The second hypothesis that social support would increase the predictive power of the model was not supported at this time point. The addition of support did not improve the fit of the model and only slightly increased the variance in PTS symptoms explained by

the model (by 2%). However, it gave a less parsimonious model so the original cognitive model was accepted as the best predictive model of PTS symptoms at this time-point.

- insert Figure 1 about here –

3.5.2. Three months after birth

PTS symptoms were measured again three months postpartum. The predictors measured in pregnancy and directly after the birth were added to the model to predict PTS symptoms at three months postpartum. The cognitive model was found to be a good fit to the data at this time point but only explained 9% of the variance in PTS symptoms, therefore hypothesis one was only partially supported. The addition of social support improved the model when it was added as partially mediated by post-traumatic cognitions. The chi-square of the two models was equivalent but the model which included social support explained an extra 7% of the variance in PTS symptoms at this time point. Therefore the second hypothesis was supported by the data three months after birth, when it was found that the addition of social support increased the variance in symptoms explained by the cognitive model. The partial-mediation model including support was accepted as the best predictive model at this time-point and is shown in Figure 2 with significant paths indicated by asterisks. This model explained 16% of the variance in PTS symptoms at three months after the birth.

- insert Figure 2 about here -

4. Discussion

The aim of this study was to examine a well-established cognitive model for its ability to predict PTS symptoms following childbirth. The study had two hypotheses, firstly that a cognitive model of PTSD would explain PTS symptoms following childbirth, and secondly that the addition of social support would strengthen the model in this population. Three weeks after birth, the first hypothesis was supported by the data and the cognitive model explained 23% of the variance in PTS symptoms. The addition of social support as a predictor did not improve or reduce the fit of the model. A cognitive model therefore stands alone as a good predictor of the development of PTS symptoms within the first month of birth. Three months after the birth, the cognitive model was a good fit to the data but explained much less of the variance in PTS symptoms. The addition of social support as a predictor, partially mediated by post-traumatic cognitions, resulted in a model that fitted the data equally well and increased the total variance explained by this second model to 16%. Social support therefore made a valuable addition to the model when predicting PTS symptoms three months after birth. This confirms that PTS symptoms following childbirth are likely to be explained by the same factors as PTSD following other traumatic events, and the exploration of established PTSD theoretical models in this population is warranted.

It is interesting that there was a difference in the models predicting symptoms at each time-point after birth. With the inclusion of these two time-points, it may be possible to make a distinction between risk factors for symptom-onset and symptom-maintenance. Results suggest that the cognitive model is effective at explaining symptom-onset directly following birth. At this time point over 30% of women reported birth as being traumatic

and around 45% had at least one negative re-experiencing symptom. It may be that PTS-type reactions are part of a normal process of recovery from the stresses of birth, and the cognitive model may better explain acute stress reactions than longer-term symptoms in this population.

Results suggest that the cognitive model predicted variance in long-term symptoms to a much lesser extent. However, social support in the early postnatal period increased the amount of variance explained in long-term PTS symptoms. Early support may facilitate recovery from initial symptoms, or a lack of support may increase the stress experienced in the postnatal period. It is not clear from current research whether increased social support acts as a buffer, enabling women to recover from a traumatic birth, or whether a lack of social support acts as a subsequent stressor, thus maintaining symptoms. More research is needed to tease out why early postnatal social support appears to be important over the longer term in PTS symptoms following birth.

The models examined in this study explained 23% and 16% of variance in PTS symptoms, and therefore a large proportion of variance in PTS symptoms remains unexplained by these predictors. The aim of this study was to test the applicability of a cognitive theoretical framework to childbirth, exploring the addition of social factors, and not to explain the highest amount of variance possible. There is no doubt that other variables would increase the amount of variance explained. However, this level of variance compares well with other studies which have looked at predictors of PTS symptoms, anxiety or psychological distress during the same period after the birth. The

regression models in these similar studies have tended to account for 14% to 29% of the variance in the outcome (Czarnocka & Slade, 2000; Edworthy et al., 2008; Skari et al., 2002; Wenzel, Haugen, Jackson, & Brendle, 2005).

A further finding of interest in this study is that in contrast to previous literature showing type of birth is related to PTS symptoms (Creedy et al., 2000; MacLean et al., 2000; Ryding et al., 1998; Soderquist et al., 2002), a weighted sum of birth interventions was not associated with PTS symptoms. When examined separately, forceps delivery was associated with PTS symptoms, but no other associations were found with obstetric variables. Combined measures of intervention in birth account for the fact that obstetric complications/intervention are varied and although single interventions may not influence outcomes, the combined experience may. The fact that birth intervention was not found to be associated with PTS symptoms means that it may be harder than thought to identify women who have may trauma symptoms as a result of a distressing birth. Work on developing screening methods for PTS symptoms should take into account that individual perceptions of and reactions to birth events may determine symptom outcomes rather than the particular interventions undergone.

A caveat is that this study examined PTS symptoms rather than cases of PTSD. This was for two reasons: the expected incidence of cases of PTSD was very low, and the modeling technique required a continuous outcome variable. It would be of interest to examine the same predictors in a model using cases of PTSD as an outcome in a larger sample. It should be noted that some symptoms of PTSD correspond to ordinary

experiences in the postnatal period, for example, having trouble staying asleep, or feeling irritable. Therefore, some of the variance in PTS symptoms in this study will be accounted for by ordinary postnatal reactions, as well as non-specific distress. It is of note that the cognitive model still fits the data well, despite this caveat, and again suggests that the model is useful for predicting acute stress reactions. Further studies which look at both a continuous symptom score and cases would illuminate the issue of whether using PTS symptoms as a proxy for PTSD cases is an acceptable method of study in this area.

Another issue to note is that PTSD diagnostic criteria (APA, 1994) require one month duration before a diagnosis can be made, so three weeks after birth only initial or acute stress reactions are being predicted. This time-point was chosen because participants' experience of birth was self-reported and the aim was to gather this information as close in time to the birth as possible. This problem of the duration criterion for PTSD was partially resolved by including a three-month follow-up. There is evidence that there is still some spontaneous resolution of PTSD symptoms after one month but that cases presenting at three months post-event will generally be chronic (Koren, Arnon, & Klein, 1999; Rothbaum, Foa, Riggs, Murdock, & Walsh, 1992). Therefore, the results from the third time point can be assumed to show risk factors predicting more chronic PTS symptoms (but not cases).

Finally, this study is limited by a small sample size so lacks statistical power. Sample size calculations performed before the study suggested the sample was adequate to find significant effects in univariate analyses. However, following attrition the sample was

just sufficient for using modeling techniques, as models had around six participants per parameter which is just adequate according to Field (2005). The final sample also represents just 39% of all eligible women identified during the study period. Women who dropped out of the study did not differ from those who stayed in except on family size and marital status, so it is likely that dropout was for practical reasons. Future studies using larger samples, and planning adequately for attrition and missing data, are warranted following the significant results found in this preliminary study.

Despite these limitations, this study suggests that a cognitive model of PTSD does account for variance in initial PTS symptoms following childbirth. Results suggest, however, that this model alone is not adequate for explaining later symptoms, three months after the birth. Over the longer term, it appears that additional factors account for maintenance of PTS symptoms. One of these variables is early postnatal social support. As longer term symptoms are more likely to be reflective of an ongoing problem, it would seem that exploring variables which predict later symptoms would be a profitable future direction. This study suggests that social variables warrant further investigation. If these findings are replicated, they have clinical implications for professionals caring for postnatal women, in terms of both identifying those who are at risk of PTSD and in providing support to those with symptoms in order to help recovery. The finding that early social support potentially reduces later PTS symptoms suggests a potential avenue for intervention in the early postnatal period with women who have experienced a traumatic birth. The addition of support at this moment may increase the likelihood of recovery from initial symptoms. The findings also have theoretical implications,

suggesting that the field of research into PTS symptoms following childbirth would benefit from further exploration of established theoretical models of PTSD. Further, it seems likely that the addition of social risk factors may strengthen cognitive models when studying the maintenance of PTS symptoms. The importance of social factors may particularly be revealed in longitudinal work predicting recovery from initial symptoms.

4.1. Conclusions

In summary, aspects of a cognitive model of PTSD, in particular negative post-traumatic cognitions, appear to be predictive of the early development of PTS symptoms after childbirth. The application of the model to childbirth is therefore supported partially by these results. However, three months after the birth, early postnatal social support explained longer-term symptoms. Postnatal social support appeared to be more influential in determining symptoms than post-traumatic cognitions, three months after the birth. Further investigation of the role of this cognitive model, as well as other established theoretical models of PTSD, in predicting PTS symptoms following childbirth is warranted.

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Table 1: Participant Characteristics (N = 138)

Characteristic	N	%
Age	Mean: 32.12 years	SD: 5.57 years
Marital Status: Married	81	58.7
Living with partner	42	30.4
Separated	1	0.7
Divorced	3	2.2
Single	11	8.0
Ethnic Origin: White European	127	92.6
African	3	2.1
Indian	2	1.4
Filipino	2	1.4
Latin American	1	0.7
Nepali	1	0.7
Other	1	0.7
Level of Education: none	4	2.9
GCSE (at 16 years)	21	15.4
A level (at 18 years)	14	10.3
Diploma	22	16.1
Degree	30	22.1
Higher Degree	6	4.4
Professional Qualification	39	28.7
Other Children: 0	51	37.0
1	68	49.3
2	14	10.1
3 or more	5	3.5

Table 2: PTSD symptom profile in pregnancy, three weeks, and three months after birth

	Pregnancy N (%) N = 52[1]	**3 weeks after birth[2] N (%) N = 124**	**3 months after birth[2] N (%) N = 109**
Criterion A			
Perceived threat of Physical injury etc ≥ 1	40 (78.4%)	39 (31.7%)	29 (26.6%)
Response of Helpless/terrified ≥ 1	47 (92.2%)	40 (32.5%)	34 (31.2%)
Symptom criteria			
B Re-experiencing ≥ 1	44 (84.6%)	56 (45.2%)	37 (33.9%)
C Avoidance ≥ 3	26 (50.0%)	16 (12.9%)	17 (15.6%)
D Hyperarousal ≥ 2	34 (65.4%)	41 (33.1%)	42 (38.5%)
All PTSD symptoms (B, C & D)	24 (46.4%)	15 (12.1%)	7 (6.4%)
Full PTSD syndrome (+ E & F)	10 (18.3%)	1 (0.8%)[3]	1 (0.9%)
Mean Symptom Score	16.4 (SD: 14.1)	4.1 (SD: 6.0)	4.2 (SD: 5.6)

1. Questionnaire only completed if women had experienced trauma, not all respondents were experiencing symptoms at this time.

2. PTSD measured only in relation to birth

3. Did not meet duration criteria

Table 3: Correlations between predictors and PTS symptoms

	Three weeks after birth N = 124 PTSD	**Three months after birth N = 109 PTSD**
Time 1		
Trauma History	.07	.12
Prior beliefs	.34(**)	.26(**)
Prior coping	-.23(*)	-.26(**)
Time 2		
Birth Interventiosn	.12	.05
Social Support	-.45(**)	-.41(**)
Post-traumatic Cognitions	.35(**)	.31(**)

* p< 0.05 (2-tailed); ** p< 0.01 level (2-tailed).

Table 4: Fit Indices for Structural Equation Models

	Chi square	d.f.	p	Standardized CFI	Standardized RMR	Standardized RMSEA	R^2
PTS symptoms three weeks after birth (N=116)							
Cognitive Model	12.94	9	0.17	0.96	0.09	0.062	0.227
Addition of support:							
- Fully mediated by post-traumatic cognitions	15.89	10	0.10	0.96	0.08	0.072	0.227
- Direct predictor of PTS symptoms	44.47	10	<0.001	0.79	0.11	0.173	0.209
- Partially mediated by post-traumatic cognitions	12.33	9	0.20	0.98	0.08	0.057	0.249
PTS symptoms three months after birth (N=102)							
Cognitive Model	11.66	9	0.23	0.96	0.093	0.054	0.091
Addition of support:							
- Fully mediated by post-traumatic cognitions	18.84	11	0.64	0.93	0.098	0.084	0.092
- Direct predictor of PTS symptoms	34.14	11	<0.001	0.80	0.111	0.144	0.137
- Partially mediated by post-traumatic cognitions	10.67	10	0.38	0.99	0.086	0.025	0.161

Figure 1: Path coefficients for cognitive model three weeks after birth (N=116)

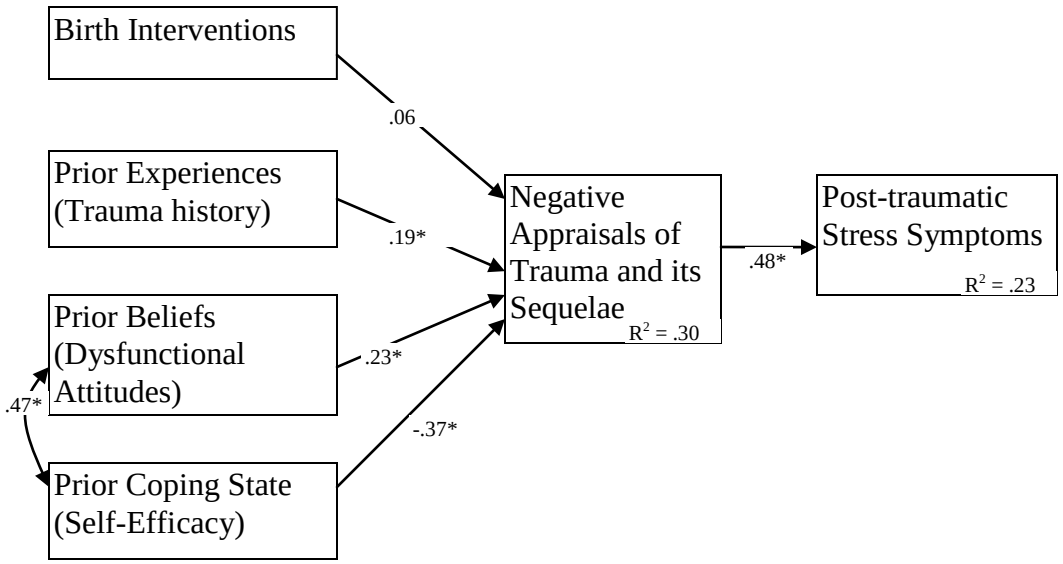

Figure 2: Path coefficients for cognitive model three months after birth (N=102)