The Factor Structure of the Cambridge Worry Scale in Early Pregnancy

Author: Jomeen, Julie; Martin, Colin R

Publication info: Journal of Prenatal & Perinatal Psychology & Health 20. 1 (Fall 2005): 25-48.

Abstract: None available.

Full Text: Headnote ABSTRACT: The current study sought to establish the psychometric properties of the Cambridge Worry Scale (CWS) in early pregnancy to determine the potential clinical usefulness of the sub-scales that comprise this measure. The CWS was administered to 129 women during early pregnancy at the antenatal booking clinic. Factor analysis revealed support for the socio-medical, health, socio-economic and relationships subscale domains. The CWS sub-scales were observed to assess dimensions distinct to those of anxiety and depression. In summary, the CWS is a valid and reliable measure of distinct domains of pregnancy-related worry. KEY WORDS: Pregnancy, anxiety, depression, worry, Cambridge Worry Scale.
INTRODUCTION The belief that emotions, behaviour and the physical and social environment of the pregnant woman may influence the development of the fetus is widely held and cross-cultural (Paarlberg, Vingerhoets, Passchier, Dekker &Van Geijn, 1995). Increasing attention has addressed the role of psychological stressors as determinants of obstetric problems (Chung, Lau, Yip, Chui &Lee, 2001; Crandon 1979; Nimby, Lundberg, Sveger &McNeil, 1999; Weisberg &Paquette, 2002), and the long term impact of anxiety during pregnancy on children beyond childbirth and infancy (Mulder, Robles de Medina, Huizink, Van deb Bergh &Buitlaar, 2001; O'Connor, Heron, Golding, Beveridge, &Glover, 2002). In summary, the strongest effect on infant development and behaviour were found for pregnancy-specific anxieties. The association between anxiety and adverse pregnancy outcomes are well documented, but evidence remains scant regarding the causes of pregnant women's anxieties, the clinical significance of this being that in order to allay women's anxieties health professionals make assumptions about causes (Green, Kafetsios, Statham &Snowden, 2003). Concerns expressed by pregnant women are predominantly about the baby's health, but include the delivery, miscarriage in early pregnancy and their own physical appearance. (Georgsson-Ohman, Grunewald &Waldenstrom, 2003; Glazer, 1980; Light &Fenster, 1974; Statham, Green &Kafetsios, 1997). An additional worry identified by Georgsson-Ohman and colleagues (2003) was worry about maternity services, which included shortage of beds and medical safety, although this may have been context specific. Interventions that utilise technologies intended to improve the pregnancy experience may also have an affect on women's anxieties. Ultrasound scanning has been linked with both a decrease and an increase in anxiety (Green, 1990). Women's worries seem to follow a U shaped distribution with a decrease in mid-pregnancy (Georgsson-Ohman, et al., 2003; Green et al., 2003), consistent with the characteristic U shaped curve for mood during pregnancy first described by Lubin, Gardner and Roth (1975). A range of experiential, attitudinal, personality and mood factors have been found to be related to baby worry (Statham et al., 1997). Further evidence suggests specific areas of pregnant women's concerns correlate with anxiety but still have unique predictive value for psychological health (Glazer, 1980) and mood (Green et al., 2003) outcomes. Other recent evidence has also demonstrated discrimination between non pathological worry and anxiety in the pregnant population (Stober &Muijs, 2001) this would suggest that worry has a certain content and is worthy of a independent assessment in pregnant women, in order to ascertain its associations with clinical and psychological outcomes regardless of anxiety. The Cambridge Worry Scale (CWS) Following the distinction of worry and anxiety as separate constructs, measures of worry in the general population were reported to measure degree of worry (Borkovec, Metzger &Pruzinsky, 1986) and the content of worry (Tallis, Eynsenck &Matthews, 1991). The Cambridge Worry Scale was developed for use in the Cambridge Prenatal Screening Study (Statham et al., 1997) in response to the lack of any specific scale to assess pregnant women's affect (Green et al., 2003). Its aim was to examine women's

concerns about the health of their baby within the context of other concurrent worries, both pregnancy-related and more general (Green et al., 2003). The CWS was developed to assess both the content and the degree of pregnant women's worries (Green et al., 2003). The scale consists 16 items rated on a Likert scale ranging from 0-5 with the verbal anchors (O = not a worry, 5 = major worry), although Green and colleagues (2003) found no item that was not a worry to anyone. The scale is intended to be used throughout pregnancy and the postnatal period so although the majority of items appear on all occasions, additional context specific items can be added or subtracted as appropriate. Assessment of the psychometric properties of this instrument, appear to demonstrate that the CWS is a reliable and valid tool for assessing the extent and content of worries in pregnant women. Exploratory factor analysis of the CWS revealed a four factor structure (Green et al., 2003); socio-médical aspects of having a baby (4 items); socio-economic issues (3 items); health of the mother and baby (4 items); relationships (2 items). Three items (problems with the law; giving up work; and whether partner will be at the birth) were excluded from the factor analysis as they had low communalities. Green et al. (2003) suggest that the raw scores can be used in a variety of ways, as single-item scores, as total or as factor scores with higher scores indicating greater worry. Green and colleagues (2003) however suggest a note of caution 'when using mean scores from rating scales with a skewed distribution of responses' (p. 762) and suggest that other scoring methods may be statistically preferable. However, the six-point Likert scoring method used in the original instrument represents in effect, a forced-choice format, since it is impossible for women to report a perceived 'average' or a 'normal level' of worry. Green et al. (2003) were keen to highlight that the CWS was designed as a measure and dimension of worry that need not be pathological in any way. Under this pretext the use of a 5-point Likert scoring to facilitate the option of a perceived 'average' or 'normal' level of worry would seem ethnologically valid, but has yet to be used with this measure. The CWS has been utilized in several other studies with pregnant women as both a modified and unmodified version and demonstrated satisfactory reliability (Georgsson-Ohman, et al. 2003; Hilvingsson, Radestad, Rubertsson, &Waldenstrom, 2002; Homer, Farrell, Davis &Brown, 2002; Sikorski, Wilson, Clement, Das &Smeaton, 1996). Other studies have adapted the CWS for use with other populations, such as parents of disabled children (Green &Murton, 1993) and women with a family history of cancer (Collins, Halliday, Warren &Williamson, 2000). No further studies have explored the psychometric properties of the CWS in pregnancy which, given its potential to gain insights into the contextual worry of a defined group, represents an important health psychology omission within the field of pregnancy research. The present study sought to extend the observations of Green et al. (2003) by determining whether the CWS comprises four sub-scales in early pregnancy. The current study will use exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), a more advanced factor analysis technique, which allows a factor model to be apriori specified and then tested against data. Theoretically and research-derived factor models can be evaluated and compared to determine how well the model fits the data. CFA therefore specifies the predicted relationship between variables and latent structures. To date, no study has examined the factor structure of the CWS using CFA by evaluating competing contemporary empirically-derived factor structures in early pregnancy. The present study addresses four research questions: 1. Is the factor structure of the CWS identified by Green et al. (2003) replicable in early pregnancy? 2. Do EFA and CFA techniques concord in describing the most parsimonious fit to CWS data in early pregnancy? 3. Are the CWS sub-scales internally reliable in early pregnancy? 4. Do the CWS sub-scales discriminate between psychiatric caseness classification in anxiety and depression? METHOD Participants One hundred twenty-nine women recruited from two hospital antenatal clinics and a community antenatal clinic participated in the current investigation. Participants were eligible for study inclusion if they were at least 18 years of age and presented with no apparent medical or obstetric centra-indications. All participants were volunteers and signed a written informed consent statement prior to taking part in the study. The mean age of women participating in the study was 28.35 years (SD = 5.05). Sixty-four women (50%) were married, 57 women (44%) were with a partner and 8 women (6%) were single. Forty-four (34%) of the study participants were primiparous. The mean length of gestation at

booking was 13.76 weeks (SD = 2.54). Design The study used a cross-sectional design with all observations taken at the antenatal booking clinic. To address the research questions exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and reliability analysis methods were conducted using a pooled CWS data set from all participants. Hull and East Yorkshire Hospitals Local Research Ethics Committee (LREC) approved the investigation. Procedure Participants that met the inclusion criteria for the study were given an information leaflet about the study on attending for antenatal booking scan, a week prior to the antenatal booking interview. The women were then approached when they attended the antenatal clinic, they were invited to ask questions about the nature of the study and asked if they were willing to participate. Participants completed the CWS questionnaire whilst waiting for their antenatal appointment. The CWS administered was scored using a 5-point Likert scoring method to allow a mid-point response. The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) and the Hospital Anxiety and Depression Scale (HADS; Zigmond &Snaith, 1983) were simultaneously administered at this point. Statistical Analysis /Reliability Analysis A reliability analysis of the CWS total scale and CWS sub-scales were conducted to ensure that the measures satisfied the criteria for clinical and research purposes using the Cronbach coefficient alpha (Cronbach, 1951) statistical procedure. A Cronbach's alpha reliability statistic of 0.70 is considered to be the minimum acceptable criterion of instrument internal reliability (Kline, 1993; 2000). CWS Total and Sub-Scale Scores and Affective Status A comparison of the 16-item CWS total scale (CWS-TS) and CWS sub-scale scores were conducted based on two levels of the EPDS identified caseness (non-depression/minor and major depression and non-depression/major depression) using the thresholds recommended for screening by Cox and Holden (2003). The EPDS has been validated for use in non-postnatal women (Cox et al., 1996; Jomeen &Martin, 2004á). Further comparisons of CWS total and CWS sub-scale scores were conducted based on the HADS anxiety (HADS-A) sub-scale scores using the criteria specified by Snaith and Zigmond (1994) of possible and probable clinically relevant levels of anxiety. The HADS has been evaluated for screening and research in early pregnancy (Karimova &Martin, 2003; Jomeen &Martin, 20046). Comparisons between groups were conducted using the between-subjects t-test.1 Correlational Analysis Pearson's r correlation coefficients were computed between CWS total and CWS sub-scale scores and EPDS and HADS-A sub-scale scores. Given that the level of p is influenced by sample size in correlational analysis, the amount of common variance explained (CVE) were also reported. Exploratory Factor Analysis Exploratory factor analysis (EFA) was performed on the CWS scale with the three items 'problems with the law,' 'giving up work' and 'whether partner will be at the birth' removed as suggested by Green et al. (2003) as these items did not apply equally to all participants, and in order to be consistent with Green and colleagues (2003) original factor analysis of the CWS. The criterion chosen to determine that an extracted factor accounted for a reasonably large proportion of the total variance was based on an eigenvalue greater than 1. A principal components factor extraction procedure followed by oblique rotation was chosen which is consistent with previous research (Green et al., 2003). The arbitrary determination of a indicative item factor loading was set at a coefficient level of 0.30 or greater, this level based on a rationale of maximising the possible number of items loading on emerging factors in order to generate a more complete psychological interpretation of the data set, this being a level consistent with investigators who have utilized EFA (Jomeen &Martin, 20046; Karimova &Martin, 2003; Martin &Thompson, 1999, 2000; Martin, Tweed &Metcalfe, 2004). Confirmatory Factor Analysis Confirmatory factor analysis was conducted using the Analysis of Moment Structures (AMOS) version 5 (Arbuckle &Wothke, 1999) statistical software package. Four models derived from Green et al.'s (2003) original validation research were tested. These were three versions of Green et al.'s (2003) four-factor model based on the original 13-item factor analysis and a single-factor model to determine the concept of a general dimension of worry. The variations between Green et al.'s (2003) four-factor models is based on a small number of item-factor loading differences observed when the CWS was administered over different stages of pregnancy gestation (time (T1) = <16 weeks, T2 = 22 weeks and T3 = 35 weeks). The four-factor models were evaluated in relation to correlated latent variables since the factors extracted in Green et al.'s (2003) study were highly

correlated. For all models, independence of error terms was specified and the maximum likelihood method of estimation was used. Multiple goodness of fit tests (Bentler &Bonett, 1980) were used to evaluate the four models, these being the Comparative Fit Index (CFI; Bentler, 1990), the Normed Fit Index (NFI; Bentler &Bonnett, 1980), the Goodness of Fit Index (GFI, Joreskog &Sorbom, 1993), the Akaike Information Criterion (AIC; Akaike, 1987), the Consistent Akaike Information Criterion (CAIC; Bozdogan, 1987) and the Root Mean Squared Error of Approximation (RMSEA). A CFI greater than 0.90 indicates a good fit to the data (Kline, 1998). A GFI and NFI greater than 0.90 indicates a good fit to the data (Marsh, Balla &McDonald, 1988). A RMSEA with values of less than 0.08 indicates a good fit to the data (Brown &Cudeck, 1993), while values greater than 0.10 suggest strongly that the model fit is unsatisfactory. The AIC and CAIC are useful fit indices for allowing comparison between models (Dunbar, Ford, Hunt &Der, 2000). The Chi-square goodness of fit test was also used to allow models to be compared and to determine the acceptability of model fit. A statistically significant χ^sup 2^ indicates a significant proportion of variance in the data remains unexplained by the model (Bentler &Bonett, 1980), however trivial variations in data and sample size can account for a significant χ^sup 2^ (Hu &Bentler, 1995) and consequently the ratio of the χ^sup 2^ to its expected value (χ^sup 2^/df) is often used as a measure of model fit adequacy with a ratio of 2 to 1 or less being indicative of acceptable model fit (Carmines &McIver, 1981; Kline, 1998). Posteriori Exploratory Factor Analysis The best fitting model derived from CFA can be evaluated further by determining if additional item-factor loadings may enhance the fit to data. This can be especially useful if two or more CFA models evaluated produce similar model fit statistics, therefore a better model fit may result by evaluating an amalgam of the two (or more) best-fit models. This approach requires a specification search where the path between the observed and latent variable is optional in relation to the discrepant items between competing best-fit models. Using this approach all permutations of the factor model can be evaluated. However, since the relationship between the observed and latent variables in question is not apriori specified, this cannot be described as a CFA, though it remains a structural equation modelling approach to the data. An appropriate description of this approach is therefore to ascribe it as a special case of exploratory factor analysis and within the context of the current investigation may be more accurately described as a posteriori exploratory factor analysis (PEFA). An evaluation of the full 16-item CWS including the items removed from Green et al.'s original validation factor analysis will also be examined by adding the 3 removed items to the best-fit 13-item model and conducting a PEFA to determine any contribution or deterioration to model fit.

Table 1
Mean, Standard Deviation and Range of CWS-TS and CWS Sub-Scale Scores

Variable	*Mean*	*SD*	*Range*
CWS-TS	30.28	8.42	48
Socio-medical	9.15	3.62	15
Health	9.01	3.03	15
Socio-economic	5.56	2.79	12
Relationships	2.69	1.29	7

RESULTS The mean scores of participant's ratings on the CWS-TS and CWS sub-scales are shown in Table 1. The mean scores of participant's ratings on the EPDS were 7.19 (SD 4.37) with a range of 0-20. Using Cox and Holden's (2003) interpretation of EPDS scores at the cut-point of 9/10 for screening for postnatal depression, 33 participants (26%) were identified as cases of minor/major depression (Cox et al., 1987). Using the more conservative criterion of a cut-point of 12/13 recommended for use in primary care settings (Cox &Holden, 2003) 17 participants (13%) were identified as cases of major depression (Cox et al., 1987). The mean scores of participant's ratings on the HADS-A were 6.53 (SD 3.11) with a range of 1-16. Using Snaith and Zigmond's (1994) interpretation of HADS-A scores of 8 or over, 42 participants (33%) demonstrated possible clinically relevant levels of anxiety. Adopting Snaith and Zigmond's (1994) higher threshold for sensitivity of HADS-A

scores of 11 or over, 15 participants (12%) demonstrated probable clinically relevant levels of anxiety. The mean of participant's CWS-TS and CWS sub-scale scores as a function of EPDS and HADS-A case classification is reported in Table 2. Reliability Analysis Calculated Cronbach's alpha of the CWS-TS was 0.80, and the sociomedical sub-scale was 0.78, therefore exceeding Kline's (1993) criterion for acceptable instrument internal reliability. The heath subscale, socio-economic sub-scale and relationships sub-scales performed less well with Cronbach's alpha levels of 0.60, 0.68 and 0.62 respectively, below Kline's (1993) criterion. CWS-TS and Sub-Scale Scores and Affective Status The findings observed from the comparisons between groups stratified by anxiety and depression classification are reported in Table 2. It was observed that the depressed group scored significantly higher on the CWS-TS, socio-medical sub-scale and socio-economic sub-scale at both levels of caseness (minor/major depression and major depression). Additionally, the depressed group scored significantly higher on the health-sub-scale at the lower EPDS cut point (minor/major depression). The anxious group scored significantly higher on the CWS-TS, health sub-scale and socio-economic sub-scale at the lower HADS-A sub-scale threshold of possible depression. The anxious group scored significantly higher on the CWS-TS, socio-medical subscale and socio-economic sub-scale at the higher HADS-A sub-scale threshold of probable depression. The anxious group at the higher HADS-A sub-scale threshold also scored higher on the health sub-scale though this was statistically borderline (p = 0.06). Correlational Analysis The findings from the correlational analysis are summarised in Table 3. All CWS sub-scales were highly significantly and positively correlated (p <0.01). The CWS-TS and CWS sub-scales were also observed to be highly significantly and positively correlated with EPDS scores (p <0.01). The CWS-TS and CWS sub-scales were further observed to be highly significantly and positively correlated with HADS-A scores (p <0.01) with the single exception of the relationship sub-scale where no association was observed (p = 0.18). There was no evidence of any significant correlations between the CWS-TS/CWS sub-scales and age. Examination of the significant correlations between the CWS-TS and CWS sub-scales revealed shared variance (CVE) of between 5-58%.

Table 2
Comparison of CWS-TS and CWS Sub-Scale Scores between EPDS-Defined Non-Depressed and Depressed and HADS-A Subscale Defined Non-Anxious and Anxious Participants

	Affective status			
Variable	*Non-depressed*	*Depressed*	*t*	*p*
CWS-TS*	28.47 (7.58)	35.54 (8.65)	4.46	<0.001
Socio-medical*	8.63 (3.34)	10.64 (4.02)	2.81	<0.01
Health*	8.66 (2.79)	10.06 (3.48)	2.34	0.02
Socio-economic*	4.86 (2.35)	7.58 (3.01)	5.30	<0.001
Relationships*	2.57 (1.18)	3.03 (1.53)	1.78	0.08
CWS-TS**	28.99 (7.51)	38.76 (9.40)	4.83	<0.001
Socio-medical**	8.69 (3.24)	12.18 (4.56)	3.04[a]	<0.01
Health**	8.84 (3.00)	10.18 (3.09)	1.71	0.09
Socio-economic**	5.12 (2.40)	8.41 (3.50)	4.92	<0.001
Relationships**	2.61 (1.18)	3.23 (1.79)	1.40[a]	0.18
	Non-Anxious	*Anxious*		
CWS-TS†	28.68 (7.31)	33.59 (9.64)	3.22	<0.01
Socio-medical†	8.83 (3.27)	9.81 (4.21)	1.33[a]	0.15
Health†	8.37 (2.72)	10.36 (3.24)	3.66	<0.001
Socio-economic†	5.05 (2.35)	6.62 (3.32)	2.76[a]	<0.01
Relationships†	2.60 (1.25)	2.88 (1.35)	1.17	0.24
CWS-TS‡	29.46 (8.31)	36.47 (6.71)	3.13	<0.01
Socio-medical‡	8.86 (3.39)	11.33 (4.61)	2.54	0.01
Health‡	8.83 (2.99)	10.40 (3.04)	1.90	0.06
Socio-economic‡	5.28 (2.60)	7.67 (3.33)	3.23	<0.01
Relationships‡	2.65 (1.27)	3.00 (1.41)	0.99	0.32

Note: *denotes EPDS cut-point of 9/10. **denotes EPDS cut-point of 12/13. †denotes HADS-A cut-point of 7/8. ‡denotes HADS-A cut-point of 10/11. Standard deviations in parentheses. Degrees of freedom (df) = 127. [a] indicates recalculated *t* and modified df following significant Levene's test for equality of variances.

Table 3
Correlations between CWS-TS and CWS Sub-Scale Scores and Anxiety, Depression and Age

Variable	*CWS-TS*	*Socio-medical*	*Health*	*Socio-economic*	*Relationships*	*Anxiety*	*Depression*	*Age*
CWS-TS	—	0.76 (58)**	0.70 (49)**	0.73 (53)**	0.57 (32)**	0.38 (14)**	0.53 (28)**	−0.11 (1)
Socio-medical		—	0.38 (14)**	0.35 (12)**	0.23 (5)**	0.25 (6)**	0.35 (12)**	−0.08 (1)
Health			—	0.32 (10)**	0.32 (10)**	0.36 (13)**	0.31 (10)**	−0.09 (1)
Socio-economic				—	0.41 (17)**	0.35 (12)**	0.55 (30)**	−0.11 (1)
Relationships					—	0.12 (1)	0.27 (7)**	−0.06 (1)
Anxiety						—	0.72 (52)**	−0.03 (1)
Depression							—	−0.13 (2)
Age								—

Note: *denotes $p < 0.05$. **denotes $p < 0.01$. Percentage of common variance explained are in parentheses.

Exploratory Factor Analysis The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett Test of Sphericity (BTS) were conducted on the data prior to factor extraction to ensure that the characteristics of the data set were suitable for the factor analysis to be conducted. KMO analysis yielded a index of 0.76, and in concert with a highly significant BTS, χ^sup 2^^sub (df=78)^ = 451.45, p <0.001, confirmed that the data distribution satisfied the psychometric criteria for the factor analysis to be performed. Following factor extraction and oblique rotation, five-factors with eigenvalues greater than 1 emerged from analysis of the complete CWS data set accounting for 69% of the total variance. The factor loadings of the individual CWS items in relation to the five-factor solution are reproduced in Table 4. Confirmatory Factor Analysis The factor models tested and accompanying fit indices are shown in Table 5. The χ^sup 2^ goodness of fit analyses revealed two of the four-factor models evaluated (T2 and T3) to offer a good fit to the data since p did not reach statistical significant suggesting both of these models accounted for most of the variance in the data set. Examination of the fit indices for each model revealed that in terms of consistency across fit indices, the four-factor (T2 and T3) models again offered the best-fit to the data, though it is worthy of note that the four-factor (T1) model provided an equal best-fit to the data on two of the fit indices (RMSEA, GFI) and a best-fit to the data using the CAIC. The single factor model provided a poor fit to the data on all measures of model fit. Posteriori Exploratory Factor Analysis A PEFA based on the two best-fit four factor models was performed to evaluate the optimal fit of the 13-item CWS. An improved model fit was found with item-9 loading on the socio-medical factor (in addition to the health factor) and item-7 loading on the relationships factor (in addition to the health factor). Details of the best-fit four-factor model are shown in Figure 1. Finally, a PEFA was performed on the full CWS (all 16-items) to determine if the three items excluded in Green et al.'s (2003) original factor analysis may contribute to a satisfactory model fit when included in the best-fit model. The results of the PEFA of the 16-item CWS offered a

comparatively poorer fit compared to all other fourfactor models evaluated in the current investigation. The statistical findings from both post-hoc analyses are also summarized in Table 5.

Table 4
Factor Loadings of the CWS Scale Items Following Principal Components Factor Extraction with Oblique Rotation

CWS Scale item	*Factor 1*	*Factor 2*	*Factor 3*	*Factor 4*	*Factor 5*
(1) Housing	0.08	0.03	0.07	−0.07	**−0.83**
(2) Money problems	0.01	−0.08	0.10	0.11	**−0.84**
(4) Relationship with husband/partner	−0.16	**0.72**	0.19	0.11	−0.17
(5) Relationship with friends/family	0.20	**0.85**	0.03	−0.07	0.07
(6) Own health	0.15	−0.08	**0.46**	**0.54**	−0.08
(7) Health of someone close	0.01	0.02	−0.15	**0.91**	−0.01
(8) Employment problems	0.02	**0.34**	−0.18	0.04	**-0.50**
(9) Something wrong with baby	0.02	−0.01	**0.84**	−0.06	−0.17
(10) Going to hospital	**0.78**	0.12	0.09	−0.01	0.01
(11) Internal examinations	**0.74**	−0.13	−0.04	−0.11	−0.25
(12) Giving birth	**0.83**	−0.08	0.08	0.04	0.09
(13) Coping with new baby	**0.67**	0.18	−0.07	0.14	0.01
(16) Possibility of miscarriage	0.03	0.16	**0.83**	−0.04	0.09

Note: Bold indicates that item loading on a factor is 0.30 or above.

DISCUSSION The findings from the current investigation have revealed additional insights into the factor structure of the instrument that extend the observations of Green et al.'s (2003) original instrument development and validation of the CWS.

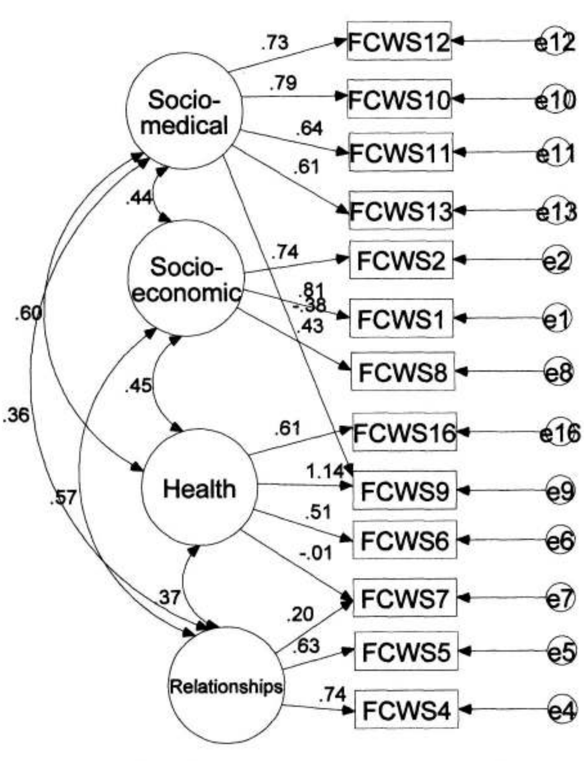
Table 5
Factor Structure of the CWS Determined by Testing the Fit of Models Derived from Factor Analysis

Model	χ^2	*(df)*	*p*	χ^2/df	*RMSEA*	*CFI*	*CAIC*	*AIC*	*GFI*	*NFI*	*AGFI*	*TLI*
Confirmatory factor analysis												
Four factor (T1)	78.39	59	0.04	1.33	**0.05**	0.95	**265.91**	142.39	**0.92**	0.83	0.87	0.93
Four factor (T2)	74.81	57	**0.06**	1.31	**0.05**	0.95	274.04	142.81	**0.92**	**0.84**	**0.88**	**0.94**
Four factor (T3)	**74.00**	57	**0.06**	**1.30**	**0.05**	**0.96**	273.24	**142.00**	**0.92**	**0.84**	0.87	**0.94**
Single factor	201.79	65	<0.001	3.10	0.13	0.65	354.15	253.79	0.79	0.57	0.71	0.58
Posteriori exploratory factor analysis												
Four factor best-fit (13 item)	**72.26**	57	**0.08**	**1.27**	**0.05**	**0.96**	**271.50**	**140.26**	**0.92**	**0.85**	**0.88**	**0.95**
Four factor best-fit (16 item)	171.68	93	<0.001	1.85	0.08	0.84	423.65	257.68	0.86	0.73	0.80	0.80

Note: The best model fit indices are indicated in bold. T1, T2 and T3 refer to variations in the four-factor model identified by Green et al. (2003).

Figure 1

Best-fit Four-factor Correlated Model. Note. Parameter Estimates are Standardized. Abbreviation: Factor-indicating Cambridge Worry Scale (FCWS) Item



The findings from the internal reliability analysis of the CWS-TS and socio-medical sub-scale revealed that these two measures were acceptable, however, the health, socio-economic and relationships sub-scales did not reach Kline's (1993) criterion of internal reliability. However, it should be mentioned that in the case of the socio-economic sub-scale alpha was only marginally below Kline's (1993) criterion and indeed the health and relationships sub-scales achieved an alpha of at least 0.60, which is impressive given the small number of items constituting each of these sub-scales. Internal reliability estimations are influenced by sample size with lower number of items generally deflating alpha. Recognizing this, and the desirability for less burdensome questionnaires, short sub-scales have been deemed acceptable for clinical use with Cronbach alpha's as low as 0.60 (McKinley, Manku-Scott, Hastings, French &Baker, 1997). Green et al. (2003) did not report Cronbach alpha's of the four sub-scales, therefore this data provides a reference point for further investigation of both the internal reliability and utility of the four sub-scales. Observations from the correlational analysis revealed that the intercorrelations between the CWS sub-scales was similar to that observed in Green et al.'s (2003) study with all sub-scales significantly and positively correlated with a comparable percentage of variance explained. It was further observed that, with the exception of the relationships sub-scale, CWS-TS and CWS sub-scales correlated significantly and positively with anxiety, as assessed by the HADS-A sub-scale, which is consistent with the observations of Green et al. (2003), though Green and colleagues (2003) used an alternative questionnaire-based measure of anxiety and did find a significant positive correlation between their anxiety measure and the relationships sub-scale. Importantly, the observation of relatively low amounts of common variance shared between CWS-TS and CWS sub-scales and anxiety scores offers confidence in Green et al.'s (2003) assertion that the CWS does indeed measure constructs distinct to that of anxiety. Additionally, it was observed that CWS sub-scales scores were significantly and positively correlated with EPDS scores. Given the high levels of depression generally reported antenatal, the relationship of worry to depression may be usefully explored in future research using the CWS, this also offering potential to explore the predictive ability of the instrument to determine later antenatal and postnatal depression. Interestingly, Green et al. (2003) reported highly significant negative correlations between age and socio-medical and socio-economic sub-scales, however within the current study, no significant associations between age and any of the CWS sub-scales was evident. It is worthy of note that the value of p within a correlation matrix is largely a function of sample size and Green et al. (2003) report their correlations as 'small but consistent negative correlations between age and each of the worry factors' (p. 760). We observed greater common shared variance between age and CWS health and relationship sub-scales and similar levels of common shared variance between age and the socio-medical sub-scale to those reported by Green et al. (2003). A consistent feature of both Green et al.'s (2003) investigation and the current report is that, with the exception of age and the socio-medical sub-scale in Green et al.'s (2003) study, there is little shared variance between age and CWS sub-scales, typically 2% or less, therefore in terms of clinical applicability, age is not an important factor to account for in administering and interpreting the CWS. The use of the CWS as a valid and reliable clinical research instrument has been mooted (Green et al., 2003). There can be little doubt that an ideal potential research application of the CWS would be in determining the utility of the tool across the antenatal period in developing the evidence-base in relation to prediction and understanding antenatal anxiety and depression, postnatal depression, baby blues and puerperal psychosis. Recent clinical guidelines on routine antenatal care (National Institute for Clinical Excellence, 2003) do not recommend the routine screening of pregnant women in the antenatal period to detect postnatal depression, based on the current evidence that suggests no instrument currently available achieves satisfactory predictive value. Indeed, clinical guidelines remain ambiguous at to whether screening for antenatal depression and anxiety is considered clinically relevant (National Institute for Clinical Excellence, 2003). Antenatal depression is a health problem as prevalent as postnatal depression (Evans, Heron, Francomb, Oke &Golding, 2001; Green, 1998; Rubertsson et al., 2003) with clinical implications for the expectant mother and infant (Glover, 1997). The

value of opportunistic screening to identify those women with risk factors for antenatal anxiety and depression appears difficult to dispute. If the assessment of worry can be consistently associated with elevated anxiety and/or subsequent depression either antenatal or postnatal, then the utilization of this short user-friendly measure administered during routine care to identify those women potentially at risk, facilitating appropriate intervention strategies would appear pertinent. It was observed that participants categorized as depressed on the basis of EPDS scores had significantly higher CWS-TS and sociomedical, health and socio-economic sub-scale scores compared to those ascribed non-depressed status. This observation was consistent at both thresholds of EPDS caseness. This demonstrates that these CWS subscales are sensitive to depression status and consequently have utility in developing insight into the relationship between worry and depression. The finding of no difference between depressed and nondepressed participants on the relationships sub-scale is also of profound interest, particularly as the factors consistently associated with antenatal emotional disturbance include, inadequate social support and poor marital adjustment (Rubertsson et al., 2003). These associations are mirrored in the contemporary literature regarding postnatal depression (Beck, 2001). Green et al. (2003) found that the relationships factor became more significant when the CWS was administered later in pregnancy, which may afford some explanation of the results of this study, which only presents results obtained in early pregnancy. One possible explanation is that women accessing maternity care for the first time are predominantly focused on events related to their pregnancy and their own health, with concerns around the impact a baby will have on their lives in terms of practical issues such as financial pressures and housing. A similar finding in differences in CWS-TS and CWS sub-scale scores was observed when participants were categorized as either anxious or non-anxious based on HADS-A sub-scale screening scores. Those classified as anxious had significantly higher CWS-TS and health and socio-economic sub-scale scores compared to non-anxious participants at the lower screening threshold of possible anxiety. Using the higher threshold of probable anxiety, a similar pattern was observed with, in addition, anxious participants scoring significantly higher than nonanxious participants on the socio-medical sub-scale. This again raises the issue of the potential utility of the CWS within clinical research endeavour in unpacking the relationship between worry and the cooccurrence or later development of significant psychological distress. The finding that, again, no significant difference between groups was found with regard to the relationships sub-scale scores demands answers to the issue of both importance and relevance of significant relationships to the occurrence of significant psychopathology. This raises the issue of understanding and indeed, evaluating any psychologically protective role that significant relationships offer during the antenatal period, beyond practical and resource provision. A further explanation could be the continued infusion of the medical model within maternity care, which depersonalizes women and continues to focus on the physical status of the woman and the baby with very little reference to external relationships or recognition of their value. Women therefore experience their pregnancy within that context and as passive recipients of care, making external relationships irrelevant when asked about worries within a pregnancy context. It is not therefore that relationships are not important to women during pregnancy, but that systems of care continue to render them irrelevant. The results of the EFA and CFA offer additional insights into the psychometric properties of the CWS, additionally, the findings from the PEFA inform further possibilities regarding the future development of this measure. The EFA revealed a five-factor solution that in many respects was comparable with the four-factor structure identified by Green et al. (2003). It was found that both the socio-medical factor and socio-economic factor was entirely consistent with that of Green et al. (2003). Further, the relationship factor was again consistent with that of Green et al. (2003) with the additional loading of item-8 'employment problems' on this factor. However, item-8 was split-loaded on the socioeconomic factor to a greater degree, which is the appropriate factor for this item to identify (Green et al., 2003). The only inconsistency noted between the current EFA and that of Green et al. (2003) concerns the health factor that had been identified as a single factor. However in the current study, the health sub-scale items were observed to load onto two distinct factors which appear to be commensurate with two health concepts, those of health of

baby (items 9 and 16) and those of other health or non-baby health (items 6 and 7). Interestingly, since the health of baby concept is implicitly related to own health, the observation that item-6 loads nearly equally on the health of baby factor and other health/non-baby health makes rationale sense within the data. The current social context of maternity care continues to remind mothers by 'behave yourself campaigns in pregnancy such as 'anti smoking,' 'anti drinking1 and 'healthy eating' of their role in maintaining a healthy pregnancy and producing a healthy baby, and would appear to reflected in the above finding. The findings from the CFA revealed a good fit to the data of all the four-factor models tested with evidence for the T2 and T3 four-factor models offering the better fit. This is clear evidence of the underlying factor structure of the CWS comprising four distinct, but related, factors. The finding that the T2 and T3 factor models offered a better fit to the data than the T1 four-factor model is of interest because the T2 and T3 models were developed from Green et al.'s (2003) factor analysis of the instrument in later pregnancy. This is actually reassuring as it offers confidence that the factor structure of the instrument is relatively stable across time and that variation in the factor structure of the instrument is largely trivial and clinically irrelevant. The comparatively poor fit of the single-factor model furnishes convincing support for the notion that worry, as assessed by the CWS, represents a multi-faceted construct and not a unidimensional concept. Researchers using the CWS for clinical research purposes should be reassured that the instrument comprises four robust sub-scales measuring dimensions of socio-medical, health, socio-economic and relationship domains. The PEFA revealed that further improvement in model-fit was possible based on developing the T2 and T3 models, however, though this is interesting from a research perspective and offers additional scope for development of the instrument in future research, it must also be conceded that the best-fit EFA model offered only a very modest improvement over the T2 and T3 models and further evaluation would be required to determine if this represents a consistently better factor structure, or is specific to the data characteristics of the current study cohort. Though this remains a question that can only be addressed by further research, it is clear that the essential stability and replicability of the four-factor structure supports the use of the instrument within clinical practice currently. It was also observed during the PEFA that using the CWS as a 16-item instrument reduced the comparative model fit dramatically, this observation confirming the recommendation of Green et al. (2003) that items 3, 14 and 15 do apply equally to all respondents and should not therefore be incorporated into the CWS sub-scale domains. Given the factor stability of the instrument and the focus of the instrument across a broad range of worries which need not be pathologized, there is a good rationale for using the CWS as a four sub-scale instrument using sum sub-scale and total CWS scores in addition to its current use at the item level of analysis (Green et al., 2003). Consistent with this, the notion of 'average worry' or 'normal amount of worry' represents non-pathological social language constructions, which have been incorporated into the use of the instrument in the current study as a 5-point Likert scored instrument. We would suggest that, given the utility of the four CWS sub-scales, a 5-point scoring protocol is adopted in preference to the original 6-point scoring method that represents, in reality, a forced-choice format, where the notion of 'average worry' cannot be easily represented. There were a small number of limitations in the current investigation. The sample size (N = 129) represents a minimum for the conduct of a factor analysis, Kline (1993) specifying an absolute minimum of N = 100. However, our study has demonstrated consistency and replicability of the factor structure of the CWS in the current cohort that is comparable with that of Green et al. (2003) who utilized a much larger cohort of women (N >1200). The finding that the original factor structure of the instrument could be replicated in a significantly smaller sample than that of the original validation is reassuring and offers confidence in the psychometric reliability of the current study. However, further evaluation of the psychometric properties of the CWS in later pregnancy would be desirable to determine the test-retest reliability of the sub-scales and to determine the factor stability of the instrument comprehensively to confirm the instrument is suitable for use throughout the whole period of pregnancy. In conclusion, the current investigation has explored the psychometric properties of the CWS in early pregnancy. Using EFA, CFA and PEFA, a four-factor correlated model was observed to offer the best fit to the data, a finding consistent with

previous research with this instrument. The potential utility of the CWS as a measure of worry should continue to be evaluated within and across pregnancy. Valuable future research could assess worry in groups accessing differing models of maternity care identifying the most effective care systems to allay women's worries in pregnancy. In light of the CWS's strong correlations with anxiety and depression, future studies could contribute to the debate on reliable antenatal screening instruments to predict antenatal or postnatal psychological sequella. Footnote 1 All statistical analyses reported are two-tailed with alpha set at 0.05. References REFERENCES Akaike, H. (1987). Factor analysis and the AIC. Psychometrika, 52, 317-332. Arbuckle, J.L. &Wothke, W. (1999). AMOS 4.0 Users Guide, Smallwaters, Chicago. Beck, C.T. (2001). Predictors of postpartum depression: an update. Nursing Research, 50, 275-285. Bentler, P.M. &Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. Psychological Bulletin, 88, 588-606. Bentler, P.M. (1990). Comparative fit indexes in structural models. Psychological Bulletin, 107, 238-246. Bozdogan, H. (1987). Model selection and Akaike's information criterion (AIC): The general theory and its analytical extensions. Psychometrika, 52, 345-370. Browne, M.W. &Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen &J.S. Long (Eds.), Testing Structural Equation Models. Newbury Park, CA: Sage Publications. Borkovec, T.D., Metzger, R.L., &Pruinsky, T. (1986). Anxiety, worry and the self. In L. Hartman &K.R. Blackstein (Eds.), Perception of Self in Emotional Disorder and Psychotherapy. New York: Plenum. Carmines, E.G. &Mciver, J.P. (1981). Analyzing models with unobserved variables: Analysis of covariance structures. In G.W. Bohmstedt &E.F. Borgatta (Eds.), Social Measurement. Thousand Oaks, CA: Sage Publications. Chung, T.K., Lau, T.K., Yip, A.S., Chiu, H.F., &Lee, D.T. (2001). Antepartum depressive symptomology is associated with adverse obstetric and neonatal outcomes. Psychosomatic Medicine, 63, 830-834. Collins, V., Halliday, J., Warren, R., &Williamson, R. (2000). Cancer worries, risk perceptions and associations with interest in DNA testing and clinic satisfaction in a familial colorectal cancer clinic. Clinical Genetics, 58, 460-468. Cox, J.L., Chapman, G., Murray, D. &Jones, P. (1996). Validation of the Edinburgh Postnatal Depression Scale (EPDS) in non-postnatal women. Journal of Affective Disorders, 39, 185-189. Cox, J.L., Holden, J.M. &Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. British Journal of Psychiatry, 150, 782-786. Cox, J.L. &Holden, J.M. (2003). A guide to the Edinburgh Postnatal Depression Scale. London: Gaskell. Crandon, A.J. (1979). Maternal anxiety and obstetric complications. Psychosomatic Research, 23, 109-111. Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16, 297-334. Dunbar, M., Ford, G., Hunt, K. &Der, G. (2000). A confirmatory factor analysis of the Hospital Anxiety and Depression scale: comparing empirically and theoretically derived structures. British Journal of Clinical Psychology, 39, 79-94. Evans, J., Heron J., Francomb, J., Oke, S. &Golding, J. (2001). Cohort study of depressed mood during pregnancy and after childbirth. British Medical Journal, 323, 257-260. Gebhardt, W.A. &Brosschot, J.F. (2002). Desirability of control: Psychometric properties and relationships with locus of control, personality, coping and mental and somatic complaints in three Dutch samples. European Journal of Personality, 16, 423-438. Georgsson-Ohman, S., Grunewald, C., &Waldenstrom, U. (2003). Women's worries during pregnancy: testing the Cambridge Worry Scale on 200 Swedish women. Scandinavian Journal of Caring Sciences, 17, 148-152. Glazer, G. (1980). Anxiety levels and concerns among pregnant women. Research in Nursing and Health, 3, 107-113. Glover, V. (1997). Maternal stress or anxiety in pregnancy and emotional development of the child. British Journal of Psychiatry, 171, 105-106. Green, J.M. (1998). Postnatal depression or perinatal dysphoria? Findings from a longitudinal community-based study using the Edinburgh Postnatal Depression Scale. Journal of Reproductive &Infant Psychology, 16, 143-55. Green, J. (1990). Calming or Harming? A critical review of psychological effects of fetal diagnosis of pregnant women. Gallon Institute, Occasional Papers, second series, No 2. London: Galton Institute. Green, J., Kafetsios, K., Statham, H., &Snowden, C. (2003). Factor Structure, validity and reliability of the Cambridge Worry Scale in a pregnant population. Journal of Health Psychology, 8, 753-764. Green, J.M., &Murton, F.E. (1993). Duchenne Muscular Dystrophy: Families responses to diagnosis and

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Publication title: Journal of Prenatal&Perinatal Psychology&Health

Volume: 20

Issue: 1

Pages: 25-48

Number of pages: 24

Publication year: 2005

Publication date: Fall 2005

Year: 2005

Publisher: Association for Pre&Perinatal Psychology and Health

Place of publication: Forestville

Country of publication: United States

Journal subject: Medical Sciences--Obstetrics And Gynecology, Psychology, Birth Control

ISSN: 10978003

Source type: Scholarly Journals

Language of publication: English

Document type: General Information

ProQuest document ID: 198698175

Document URL: http://search.proquest.com/docview/198698175?accountid=36557

Last updated: 2010-06-06

Database: ProQuest Public Health