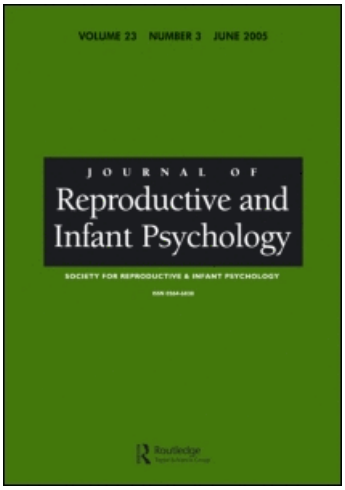

Journal of Reproductive and Infant Psychology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713435657

Assessing maternal anxiety in pregnancy with the State-Trait Anxiety Inventory (STAI): issues of validity, location and participation

M. D. Gunning[a]; F. C. Denison[b]; C. J. Stockley[c]; S. P. Ho[c]; H. K. Sandhu[c]; R. M. Reynolds[c]
[a] Centre for Integrated Healthcare Research, Queen Margaret University, Edinburgh, UK [b] Department of Reproductive and Developmental Sciences, Centre for Reproductive Biology, University of Edinburgh, UK [c] Endocrinology Unit, Centre for Cardiovascular Sciences, Queen's Medical Research Institute, University of Edinburgh, UK

First published on: 20 May 2010

To cite this Article Gunning, M. D. , Denison, F. C. , Stockley, C. J. , Ho, S. P. , Sandhu, H. K. and Reynolds, R. M.(2010) 'Assessing maternal anxiety in pregnancy with the State-Trait Anxiety Inventory (STAI): issues of validity, location and participation', Journal of Reproductive and Infant Psychology, 28: 3, 266 — 273, First published on: 20 May 2010 (iFirst)
To link to this Article: DOI: 10.1080/02646830903487300
URL: http://dx.doi.org/10.1080/02646830903487300

Journal of Reproductive and Infant Psychology
Vol. 28, No. 3, August 2010, 266–273

Routledge
Taylor & Francis Group

Assessing maternal anxiety in pregnancy with the State-Trait Anxiety Inventory (STAI): issues of validity, location and participation

M.D. Gunning*[a], F.C. Denison[b], C.J. Stockley[c], S.P. Ho[c], H.K. Sandhu[c] and R.M. Reynolds[c]

[a]*Centre for Integrated Healthcare Research, Queen Margaret University, Edinburgh, UK;* [b]*Department of Reproductive and Developmental Sciences, Centre for Reproductive Biology, University of Edinburgh, UK;* [c]*Endocrinology Unit, Centre for Cardiovascular Sciences, Queen's Medical Research Institute, University of Edinburgh, UK*

(*Received 18 September 2008; final version received 6 September 2009*)

The State Trait Anxiety Inventory (STAI) has been widely used in research with pregnant women. However, few studies have examined its validity for this group. In this paper the content validity of the STAI, the impact of location and consequences for further participation of higher STAI scores are investigated for 215 pregnant women who completed the STAI at hospital or community based clinics. The study participants answered the open ended question, 'How do you feel about your pregnancy?' and whether or not they would be willing to take part in further research. Results indicated that STAI state scores reflected the nature of women's spontaneous comments regarding their pregnancy, with lower anxiety related to more 'positive' comments. The state scores were also found to be sensitive to the risk level associated with the clinic where the inventory was completed; higher scores related to high-risk localities. Women with the highest levels of state or trait anxiety were also less likely to wish to take part in further research. The study concludes that the STAI does reflect the anxiety-related experiences of pregnant women and that its use with pregnant women is appropriate in this respect; however, we recommend that future research notes the issue of potential recruitment biases.

Keywords: pregnancy; anxiety; STAI

Introduction

The Spielberger State Trait Anxiety Inventory (STAI; Spielberg, Gorsuch, & Lushene, 1970; Spielberger, 1983) was developed over 25 years ago. It differentiates between the temporary condition of 'state anxiety' and the more general and long-standing quality of 'trait anxiety' using two separate 20-item self-report questionnaires. The STAI is considered to be well validated in the general population with Barnes, Harp and Jung (2002) reporting data on 816 research articles utilising the STAI between 1990 and 2000.

Recent years have seen a burgeoning of literature utilising the inventory in pregnant populations. It has been used as an explanatory variable in studies of women's birth choices for intra-partum care (e.g. Gamble & Creedy, 2001; Hundley, Gurney, Graham,

*Corresponding author. Email: mgunning@qmu.ac.uk

ISSN 0264-6838 print/ISSN 1469-672X online

DOI: 10.1080/02646830903487300
http://www.informaworld.com

& Rennie, 1998) and to investigate the effect of factors including antenatal screening (Miedzybrodzka, Hall, & Mollison, 1995, Thornton, Hewison, & Lilford, 1995), hypertensive disorders of pregnancy (Cartwright, Dalton, Swindells, Rushant, & Mooney, 1992) and in vitro fertilisation (Csemiczky, Landgren, & Collins, 2000) on maternal psychological variables. More recently, the scale has been employed as a measure of anxiety in pregnancy with a focus on the effects of anxiety on the developing foetus (Monk et al., 2004), the transfer of psychological effects from mother to foetus via physiological routes (Sjostrom, Valentin, Thelin, & Marsal, 2002; Tiexeria, Fisk, & Glover, 1999), interventions to reduce stress in pregnancy (Sevenri et al., 2005) and the longitudinal effects of maternal anxiety on birth outcome (Rondó et al., 2003) and infant/child development (Bergman, Sarkar, O'Connor, Modi, & Glover, 2007).

Thus, the STAI is used routinely in pregnancy research, and in a recent meta-analysis of maternal anxiety and birth outcome, it was stated that 'the STAI was by far the most frequently used measure of state and trait anxiety' (Littleton, Breitkopf, & Berenson, 2006). Where previous papers have reported STAI validity data (e.g. Figueiredo et al., 2008), they have done so using the data published by Spielberger et al. (1970). In this original paper, Spielberger states that the STAI has adequate concurrent validity and internal consistency ($r = 0.86$). Content validity has been demonstrated by the convergence of DSM-IV diagnosis of generalised anxiety disorder and STAI items (Okun, Stein, Bauman, & Silver, 1996), while construct validity has been demonstrated by the consistent finding of increased state scores in exam stress situations and decreasing scores in relaxation conditions (Spielberger, 1983). However, studies such as these have to date been based on non-pregnant populations. Studies explicitly addressing STAI validity and reliability with pregnant women were not found in our literature search; however, score stability has been investigated. For example, a study by Hundley et al. (1998) found that although antenatal to postnatal trait scores were correlated ($n = 217$; $r = 0.37$–0.52), the scores were significantly different. In contrast to this, the original test–re-test analysis by Spielberger (1983) showed stability coefficients that ranged from 0.73 to 0.86, indicating that the assumption of stability of trait anxiety using the STAI for pregnant women may not be well founded. Given the prevalence of this instrument in research with pregnant women and the paucity of validity studies, further examination of the STAI's suitability for this population is overdue.

The aim of this study was, therefore, to explore some of these as yet unanswered validity issues on the use of the STAI in pregnancy and to investigate the effect of recruitment location and refusal to participate in research studies on STAI anxiety scores.

Methods

Patient recruitment

Two hundred and fifteen pregnant women were recruited from hospital clinics at the Simpson Centre for Reproductive Health, Edinburgh Royal Infirmary ($n = 143$) and local community antenatal clinics ($n = 72$). Women were invited to complete the STAI (Form Y) and were asked two supplementary questions: an open-ended question intended to explore their feelings about their current pregnancy and whether they would be willing to participate in a further research study during this pregnancy. The STAI is comprised of separate State and Trait scales, each with 20 4-point items and summarised by a score ranging from 20 to 90; higher scores indicate higher anxiety. The State Anxiety Inventory, completed first (as per Spielberger & Reheiser, 2004),

asks the respondent to rate how he/she feels *right now, at this moment* in terms of intensity ('not at all' to 'very much so'). Characteristic items include 'I feel at ease', 'I feel upset'. The Trait scale assesses how the subject *generally* feels in terms of frequency ('almost never' to 'almost always'), e.g. 'I am a steady person' and 'I lack self-confidence'.

Participant details including maternal age, parity, gestation, past obstetric and medical history, and smoking habits were recorded at the time of recruitment and completion of the questionnaire. Neonatal details including birth weight, gestation and mode of delivery were recorded after delivery. Ethical approval was obtained from the local research ethics committee and all women gave written informed consent.

Data analysis

t-Tests were used where the normality assumption was satisfied and Mann–Whitney tests where it was not. For the analysis of state and trait scores by trimester non-parametric Kruskal–Wallis tests were used to accommodate the small '*n*' in the first trimester group. The associations between the maternal factors of age, parity and number of live births and STAI state and trait anxiety scores were investigated using parametric and non-parametric tests of association.

Interpretation of the open-ended question was carried out using a thematic analysis approach. Ten themes were identified from the responses and collapsed into three summary themes including either 'positive comments' (e.g. 'Feel great being pregnant'; $n = 101$), 'pregnancy and baby anxiety' (e.g. 'Happy but tired. Concern about labour and birth'; $n = 51$), or 'general anxiety' (e.g. 'Extremely happy and excited, but feel nervous and under pressure'; $n = 23$; 40 women either did not complete the open-ended question or provided unreadable responses). Inter-rater reliability was high for the three summary themes at kappa = 0.870. ANOVA was used to investigate mean state and trait anxiety scores and open-ended question theme group differences. Data were analysed using SPSS (Statistical Package for the Social Sciences) Version 13. Data are expressed as mean (SD), with significance $p < 0.05$.

Results

Demographic and overall STAI state and trait anxiety scores

Women who completed the STAI were of mean age 31 (6.2) years. Of the sample, 14.8% were current smokers. Most women had standard vaginal deliveries (50.6%), 37.2% had C-sections while 12.2% had instrumental deliveries. The mean birth weight was 3272 g (SD = 651.57).

The mean gestation of women completing the questionnaire was 217 (53.4) days. The majority of respondents completed questionnaires during the third trimester (24–40 weeks gestation; 76.6%) with fewer during the second (12–<24 weeks gestation; 19.2%) and first (<12 weeks gestation; 4.2%) trimesters. The overall mean scores for state and trait anxiety were 35.3 (10.6) and 37.3 (9.6), respectively.

Impact of location and gestation on STAI state and trait anxiety scores

Table 1 shows that state scores were higher for those attending hospital clinics than those attending community clinics ($t(213) = 2.47$, $p = 0.014$). State scores were found to be higher for women in their third trimester relative to their second ($z = -2.12$,

Table 1. STAI state and trait scores according to location and trimester.

	All (n = 215)	Hospital (n = 143)	Community (n = 72)
STAI state score			
1st trimester	30.2 (6.6)	32.9 (3.9)	21.0 (1.4)
2nd trimester	32.9 (11.5)[b]	34.8 (11.4)	29.9 (11.4)
3rd trimester	36.2 (10.5)[b]	37.2 (9.8)	32.7 (11.6)
Overall score	35.3 (10.6)	36.6 (9.9)[a]	32.7 (11.6)[a]
STAI trait score			
1st trimester	35.3 (6.4)	35.6 (7.3)	34.5 (2.1)
2nd trimester	36.0 (10.1)	35.3 (9.4)	37.1 (11.5)
3rd trimester	37.8 (9.7)	37.2 (8.9)	38.9 (11.0)
Overall score	37.3 (9.6)	36.8 (8.9)	38.4 (10.9)

[a]$p < 0.01$, [b]$p < 0.05$; values are mean (SD).

$p = 0.03$). Trait scores were similar in either setting and did not differ within trimesters (Table 1). This indicates that completing the STAI questionnaire in a hospital-based clinic is associated with higher state anxiety scores, with some suggestion that this may be particularly so for women in their third trimester.

STAI state and trait anxiety scores by maternal and perinatal factors

There was no association of state scores with maternal age; however, greater maternal age was associated with lower trait scores ($r = –0.215$, $p = 0.002$). Having experienced a greater number of previous live births was also associated with lower state (rho = –0.181, $p = 0.04$) but not trait scores (rho = –0.054, p = ns).

It was considered possible that women attending hospital appointments may well have had higher state anxiety scores not because of the hospital setting, but rather due to a higher rate of problematic obstetric history in this group. Obstetric data were available for 175 participants. The number of live births was subtracted from parity to describe a history of previous pregnancy that had not resulted in a live birth and was utilised as a potential confounding factor. Even for women with such a history, state anxiety scores were higher for those who were assessed in hospital-based clinics (35.9 (9.1) vs. 31.9 (7.4); $z = –2.01$; $p = 0.045$).

In terms of perinatal outcomes, state and trait scores during pregnancy were not related to subsequent mode of delivery (spontaneous vaginal delivery vs. instrumental, vs. caesarean section), gestation or birthweight at delivery.

STAI state/trait anxiety scores and willingness to participate in further research

Women who were unwilling to agree to participate in further research studies during pregnancy scored higher on the STAI state (37.3 (12.0) vs. 34.1 (9.5); $t(137.1) = 2.03$, $p = 0.044$) but not the trait inventory (37.3 (9.8) vs. 37.3 (9.4), p = ns).

STAI state/trait anxiety and validity in pregnancy

The open-ended question ‘how do you feel about your pregnancy?’ was answered by 175 of the 215 women who completed the questionnaire. Thirty-nine women did not

Table 2. Relationship between STAI state and trait scores and open-ended question theme.

	Open-ended question theme		
	Positive	Pregnancy/baby anxiety	General anxiety
STAI state score	32.4 (9.9) [a, b]	38.0 (9.8)[a]	41.3 (13.4)[b]
STAI trait score	35.2 (8.3)[b]	38.5 (9.7)	44.1 (13.1)[b]

[a]$p < 0.01$, [b]$p < 0.005$.

complete this section, and one woman gave an uninterpretable answer. As for the STAI state/trait inventory findings, the open-ended question themes ('positive comments', 'pregnancy and baby anxiety' or 'general anxiety') did not differ according to trimester. Investigation of mean state and trait anxiety scores and open-ended question theme group differences indicated a main effect for both state anxiety scores and open-ended theme group ($F(2, 174) = 9.699$; $p < 0.001$) and trait scores ($F(2, 174) = 8.877$; $p < 0.001$) (Table 2). Post-hoc tests indicated that women who made 'positive comments' had lower state anxiety scores than those who expressed 'pregnancy or baby anxieties' and those who expressed 'general anxieties'. The trait scores of women who made positive comments versus those who made 'pregnancy or baby anxiety' remarks did not differ.

Discussion

Our findings suggest that the STAI may be used during pregnancy with some confidence regarding its validity for pregnant women. The STAI state scale reflects situation specific anxiety and was found to be sensitive to the risk level associated with the antenatal clinic in which it was completed, with higher scores related to high-risk localities. Trait scores, reflecting more general anxiety levels, were not different by clinic risk level. This indicates that the STAI shows construct validity, discriminating between pregnant women who show raised state anxiety in the high-risk clinic situation with no change in their general trait anxiety levels. The use of an open-ended question indicated the content validity of the STAI in that the state scale reflected the nature of women's spontaneous comments regarding their current pregnancy, with women with lower anxiety scores reporting more 'positive' comments.

Studies utilising the STAI in pregnancy to date have tended to recruit women from a variety of antenatal care settings. In a meta-analysis of 48 studies, Littleton et al. (2006) commented that 'These studies most often recruited women from prenatal clinics or other medical settings that provided prenatal care'. However, we found that the location at which participants completed the STAI had a significant impact on state scores. Women who completed the questionnaires at a 'high-risk', hospital-based clinic, particularly if they were in their third trimester, had raised state anxiety scores relative to those approached at 'low-risk', community-based clinics. Trait scores were not found to differ by locality in this way. This suggests that the STAI state scale was sensitive to the situation specific stress of attending a high-risk clinic while trait anxiety assessed by the trait inventory was not affected by this situation. Sampling site may therefore be a factor to consider in study design or as a factor for analysis when working with pregnant populations.

We found that women who were older and who had had more live births showed a lower state anxiety score than younger women with fewer live births, while trait

anxiety levels did not differ. This suggests that the STAI state anxiety inventory is sensitive enough to detect the benefits of having experienced pregnancy and birth before as a way of mitigating pregnancy specific anxiety levels. In contrast to other studies, we failed to detect an association between high levels of anxiety in pregnancy and reduced gestation or birth weight, perhaps due to the relatively small sample size.

Although the STAI is extensively validated and reliable for general populations, studies investigating the validity of the measure for pregnant populations are lacking, although there are studies of trait score stability which have reported negative results (Hundley et al., 1998). The construct validity of the STAI is generally illustrated with reference to Spielberger (1983), who demonstrated that state scores increase in stressful situations and decrease in relaxation conditions. In showing how state anxiety (and not trait anxiety) is increased in high-risk antenatal clinic settings, we have demonstrated a related form of real-world construct validity specific to pregnancy. We also asked women an open-ended question about how they felt about their pregnancy in order to test whether STAI anxiety scores reflected the spontaneously generated anxieties of this sample of pregnant women. Findings indicated that women who made positive comments had lower state and trait scores than women who made anxious comments, but that only the state scale showed a differentiation between positive comments and anxious comments specific to the pregnancy or baby. This indicates that the STAI state anxiety score has some capacity to reflect the present pregnancy related anxieties of women, whereas the trait score, which represents a stable trait for being generally anxious or not, does not detect this situation specific anxiety.

Finally, we found that women who self-report the highest levels of state or trait anxiety are less likely to wish to take part in further research. This has implications for the recruitment of representative samples of women for pregnancy anxiety-related research. It is possible that the effects of pregnancy-related anxiety may be underestimated due to self-selection by participants. Further qualitative work may be necessary to ensure that recruitment strategies are sensitive to the needs of this particular population in order that the participation of a representative sample is maximised.

Conclusion

This study set out to explore the validity of the STAI for use with pregnant women. Two hundred and fifteen women completed the STAI at high- and low-risk antenatal clinics and answered an open-ended question about their feelings about their pregnancy, and a further question regarding whether they would take part in further research. The results indicated that the questionnaire was sensitive to the risk level of antenatal clinics and reflected the anxiety expressed in women's spontaneous comments about their pregnancy, supporting the validity of the STAI for use with pregnant women. However, the study also raised some methodological issues. First, women recruited in different clinics are experiencing significantly different degrees of state anxiety which has implications for study design and analysis. Second, women with high STAI scores are less likely to take part in research which may lead to underrepresentation of the most anxious women in this area of investigation. These issues should be taken into account when using the STAI questionnaire for studies in pregnant women.

Acknowledgements

We would like to thank the women who participated in this study. C.J. Stockley and S.P. Ho received Summer Vacation Bursaries from the University of Edinburgh Medical School for carrying out this project.

References

Barnes, L.B.L., Harp, D., & Jung, W.S. (2002). Reliability generalization of scores on the Spielberger State–Trait Anxiety Inventory. *Educational and Psychological Measurement, 62*(4), 603–618.

Bergman, K., Sarkar, P., O'Connor, T.G., Modi, N., & Glover, V. (2007). Maternal stress during pregnancy predicts cognitive ability and fearfulness in infancy. *Journal of the American Academy of Child & Adolescent Psychiatry, 46*(11), 1454–1463.

Cartwright, W., Dalton, K.J., Swindells, H., Rushant, S., & Mooney, P. (1992). Objective measurement of anxiety in hypertensive pregnant women managed in hospital and in the community. *British Journal of Obstetrics and Gynaecology, 99*(3), 182–185.

Csemiczky, G., Landgren, B.M., & Collins, A. (2000). The influence of stress and state anxiety on the outcome of IVF-treatment: Psychological and endocrinological assessment of Swedish women entering IVF-treatment. *Acta Obstetricia et Gynecologica Scandinavica, 79*(2), 113–118.

Figueiredo, B., Field, T., Diego, M., Hernandez-Reif, M., Deeds, O., & Ascencio, A. (2008). Partner relationships during the transition to parenthood. *Journal of Reproductive and Infant Psychology, 26*(2), 99–107.

Gamble, J.A., & Creedy, D.K. (2001). Women's preference for a cesarean section: Incidence and associated factors. *Birth, 28*(2), 101–110.

Hundley, V., Gurney, E., Graham, W., & Rennie, A.M. (1998). Can anxiety in pregnant women be measured using the State–Trait Anxiety Inventory? *Midwifery, 14*(2), 118–121.

Littleton, H., Breitkopf, C., & Berenson, A. (2006). Correlates of anxiety symptoms during pregnancy and association with perinatal outcomes: A meta-analysis. *American Journal of Obstetrics and Gynecology, 196*(5), 424–432.

Miedzybrodzka, Z.H., Hall, M.H., & Mollison, J. (1995). Antenatal screening for carriers of cystic fibrosis: Randomised trial of stepwise v couple screening. *British Medical Journal, 310,* 353–357.

Monk, C., Sloan, R., Myers, M., Ellman, L., Werner, E., Jeon, J., et al. (2004). Fetal heart rate reactivity differs by women's psychiatric status: An early marker for developmental risk? *Journal of the American Academy of Child and Adolescent Psychiatry, 43*(3), 283.

Okun, A., Stein, R.E., Bauman, L.J., & Silver, E.J. (1996). Content validity of the Psychiatric Symptom Index, CES-depression Scale, and State–Trait Anxiety Inventory from the perspective of DSM-IV. *Psychological Reports, 79*(3), 1059–1069.

Rondó, P.H., Ferreira, R.F., Nogueira, F., Ribeiro, M.C., Lobert, H., & Artes, R. (2003). Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *European Journal of Clinical Nutrition, 57,* 266–272.

Sevenri, F.M., Prattichizzo, D., Casarosa, E., Barbagli, F., Ferretti, C., Altomare, A., & Vicino, A. (2005). Virtual fetal touch through a haptic interface decreases maternal anxiety and salivary cortisol. *Reproductive Sciences, 12,* 37–40.

Sjostrom, K., Valentin, L., Thelin, T., & Marsal, K. (2002). Maternal anxiety in late pregnancy: Effect on fetal movements and fetal heart rate. *Early Human Development, 67*(1), 87–100.

Spielberger, C.D. (1983). *Manual for the State–Trait Anxiety Inventory: STAI (Form Y).* Palo Alto, CA: Consulting Psychologists Press.

Spielberger, C.D., Gorsuch, R.L., & Lushene, R.E. (1970). *STAI: Manual for the State–Trait Anxiety Inventory (STAI).* Palo Alto, CA: Consulting Psychologists Press.

Spielberger, C.D., & Reheiser, E.C. (2004). Measuring anxiety, anger, depression, and curiosity as emotional states and personality traits with the STAI, STAXI, and STPI. In M.J. Hilsenroth & D.L. Segal (Eds.), *Comprehensive handbook of psychological assessment: Personality assessment.* Hoboken, NJ: John Wiley and Sons.

Thornton, J.G., Hewison, J., & Lilford, R.J. (1995). A randomised trial of three methods of giving information about prenatal testing. *British Medical Journal, 311,* 1127–1130.
Tiexeria, J., Fisk, N.M., & Glover, V. (1999). Association between maternal anxiety in pregnancy and increased uterine artery resistance index: Cohort based study. *British Medical Journal, 318,* 153–157.