

Negative self-schemas and the onset of depression in women: longitudinal study

JONATHAN EVANS, JON HERON, GLYN LEWIS, RICARDO ARAYA and DIETER WOLKE on behalf of the ALSPAC study team

Background Beck's cognitive theory of depression has received little empirical support.

Aims To test whether those with negative self-schemas were at risk of onset of depression.

Method Data were collected by postal questionnaire from 12 003 women recruited during early pregnancy; questionnaires included measures of depressive symptoms and negative self-schemas. Regular questionnaires were sent during pregnancy and following childbirth.

Results Of 8540 women not depressed when recruited, 8.6% (95% CI 8.0–9.2) became depressed 14 weeks later. Those in the highest tertile for negative self-schema score were more likely to become depressed than those in the lowest tertile (odds ratio 3.04, 95% CI 2.48–3.73). The association remained after adjustment for baseline depressive symptoms and previous depression (OR 1.6, 95% CI 1.27–2.02) and was of similar magnitude for onset 3 years later.

Conclusions Holding a negative self-schema is an independent risk factor for the onset of depression in women. This finding supports a key element of Beck's cognitive theory. Understanding more about how negative self-schemas arise should help inform preventive policies.

Declaration of interest J. E. has received fees for lecturing from several pharmaceutical companies that market antidepressant medication.

Negative beliefs about the self, the world and the future are common during an episode of depression. According to Beck's influential cognitive theory, individuals who hold negative self-schemas when otherwise well are vulnerable to developing depression in the future (Beck, 1967). However, results from studies investigating negative self-schemas and depression have been conflicting. Cross-sectional studies have found a robust association, but negative self-schema scores improve when people with depression recover (Haaga *et al*, 1991; Scott *et al*, 1995). One explanation, that negative self-schemas are only elicited during a period of normal lowering of mood (Teasdale & Cox, 2001), is supported by experimental mood induction studies (Kelvin *et al*, 1999). However, as no large prospective study of negative self-schemas has been conducted in non-depressed populations, the need for this modification of cognitive theory is uncertain. In this investigation, we examine whether holding negative self-schemas is an independent risk factor for the onset of depression during pregnancy in a large, representative sample of non-depressed women.

METHOD

We used data collected as part of the Avon Longitudinal Study of Parents and Children (ALSPAC); this study enrolled women resident in Avon, in the west of England, who were in the early stages of pregnancy with an expected date of delivery between 1 April 1991 and 31 December 1992 (further details of the study aims and design are available at <http://www.alspac.bris.ac.uk>). Ethical approval was obtained from the ALSPAC ethics committee and local ethics committees. A total of 14 541 women were enrolled and 12 003 (82.5%) completed a depression scale at 18 weeks of pregnancy.

Participants completed the Edinburgh Postnatal Depression Scale (EPDS; Murray

& Cox, 1990) as part of a series of postal questionnaires. This scale focuses on the cognitive and affective features of depression rather than somatic symptoms; although it was developed to screen for depression in women following childbirth, it is also useful in women outside the postnatal period (Cox *et al*, 1996), and is the only self-administered scale to have been validated for use both postnatally and during pregnancy (Murray & Cox, 1990). The scale can be used either as a continuous score or, when the score exceeds 12, to define a case of depression. A sensitivity of 86% and specificity of 78% when compared with a semi-structured diagnostic interview has been reported in ALSPAC (Thorpe, 1993). There is a close relationship between changes in the proportion reaching case definitions and mean score in populations, so categorical or continuous approaches to analysis of data such as these can be used interchangeably (Anderson *et al*, 1993). As questionnaires were not completed precisely at 18 weeks and 32 weeks of pregnancy, we excluded data from participants who returned the questionnaires less than 8 weeks apart. We included an adjustment for the time between questionnaires in the analyses. Incorporated in the postal questionnaire were three of the six sub-scales of the Crown-Crisp Experiential Index, a validated self-rating inventory (Crisp *et al*, 1978); these sub-scales measured free-floating anxiety, depression and somatic anxiety. In this sample the internal consistency of these items exceeded 0.8.

The Interpersonal Sensitivity Measure (Boyce & Parker, 1989) was included with the postal questionnaires on a single occasion, at 18 weeks of pregnancy. This was devised to investigate vulnerability to depression, and includes items relating to negative beliefs about the self. We selected *a priori* items from this measure that we judged to measure negative self-schemas; G.L. and J.E. chose these items independently and differences were resolved at a consensus meeting. We excluded all items that included words related to mood, such as 'worry' or 'feel', as these were most likely to be confounded by current mood state. Six of the 36 items were selected in this way (see Table 1). These items relate to Beck's sociotropic schematic subtype, those who value closeness and security in relationships (Beck, 1983). Each item is rated on a four-point Likert scale: 'very like me', 'moderately like me', 'moderately

unlike me' and 'very unlike me' (Boyce & Parker, 1989). We summed the scores from the six items to produce a total negative self-schema score that could range between 0 and 18 for each participant. We assessed internal consistency of these items by calculating Cronbach's alpha coefficient. For this we included all those who had completed the six items, whether depressed or not at 18 weeks of pregnancy. We used the derived negative self-schema scale score as the main explanatory variable, and grouped the women into tertiles based on their score on this measure.

Statistical methods

For the main analyses using these prospective data we selected only women who were not depressed (defined as an EPDS score below 13) at 18 weeks of pregnancy. We investigated the onset of depression 14 weeks later, when the women completed the EPDS again at 32 weeks of pregnancy. Onset of depression was defined as a non-case score at 18 weeks of pregnancy becoming a case score at 32 weeks of pregnancy. This definition missed those with onset and recovery of depression between the two measurement times, but we do not consider that this introduced a serious bias, as longer-duration illness would still have been detected.

We used logistic regression analyses to investigate the association between the total score from the negative self-schema scale grouped in tertiles and onset of depression by 32 weeks of pregnancy. We adjusted for EPDS score at baseline and then adjusted for the potential confounding factors shown in Table 2 and also time between measures. These variables were all collected from the self-report postal questionnaires completed by the women at

recruitment. As there were more missing data on maternal and paternal history of depression than for other variables we included a 'missing' category as a dummy variable in the multivariable analysis for these two variables. As any association could have been due to residual confounding by current mood state, we repeated the analyses with additional adjustment for total score on the Crown-Crisp index, thus attempting to remove the confounding effect of symptoms of both anxiety and depression. We repeated the analyses with depression as a continuous outcome, including all participants whether depressed or not at 18 weeks of pregnancy. This method of analysis produced very similar results and did not alter our conclusions, so for simplicity these results are omitted (further details available from the author upon request). Finally, we tested the stability of negative self-schema in predicting onset of depression over time. We selected women who were not depressed at 18 weeks of pregnancy and investigated the association between negative self-schemas and the onset of postnatal depression at 8 weeks, 8 months, 21 months and 33 months after childbirth.

RESULTS

Of the 12 003 women who completed the EPDS at 18 weeks of pregnancy, 10 335 (86.1%) were not depressed at that point. Of these, 9525 (92.2%) also completed the EPDS at 32 weeks of pregnancy. We excluded 442 (4.6%) from further analysis because their questionnaires were completed less than 8 weeks apart. Of the remaining 9083 participants, 790 (8.7%, 95% CI 8.1–3) became depressed by 32 weeks of pregnancy. Of those with two EPDS scores, 8540 (94%) also completed

all six selected items in the negative self-schema measure, of whom 736 (8.6%, 95% CI 8.0–9.2) had onset of depression between 18 weeks and 32 weeks of pregnancy. Each of the six items together with the response frequencies are shown in Table 1. The distribution of the total negative self-schema score was skewed to the left, with a mean score of 4.58 (s.d.=3.39, median 4, interquartile range 2–7). We found good internal consistency for the six-item measure (Cronbach's $\alpha=0.77$). This coefficient was calculated from the complete sample without restriction according to EPDS score at 18 weeks ($n=12\ 146$).

Comparison of participants scoring in the highest tertile on the six items of the Interpersonal Sensitivity Measure with those in the lowest two tertiles (combined) is shown in Table 2. High scorers were more likely to have higher EPDS scores, children, a family history of depression and a previous history of severe depression, and were older. The risk of depression onset increased with each unit increase in negative self-schema score (OR=1.16, 95% CI 1.14–1.19; $P<0.001$). Adjusting for EPDS depression score at baseline attenuated the association (OR=1.07, 95% CI 1.05–1.09; $P<0.001$), but it remained highly statistically significant. There was little further change when also adjusting for other potential confounders (OR=1.07, 95% CI 1.05–1.10; $P<0.001$, $n=7845$). To illustrate the size of the effect, a comparison of the proportion becoming depressed in each tertile for the negative self-schema score along with the odds ratios before and after adjustment are shown in Table 3.

We stratified the analysis of the relationship between negative self-schema and depression according to the baseline score on the EPDS. Although the association

Table 1 Response frequencies for the negative self-schema scale¹

	'Very like me'		'Moderately like me'		'Moderately unlike me'		'Very unlike me'	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
I avoid saying what I think for fear of being rejected	840	(6.5)	3007	(23.4)	3250	(25.3)	5748	(44.7)
If others knew the real me they would not like me	253	(2.0)	821	(6.5)	2313	(18.2)	9334	(73.4)
If other people knew what I am really like they would think less of me	400	(3.2)	1320	(10.5)	3930	(31.3)	6891	(54.9)
I always expect criticism	933	(7.4)	3006	(23.8)	4199	(33.2)	4513	(35.7)
I don't like people to really know me	693	(5.5)	1959	(15.6)	3857	(30.7)	6068	(48.2)
My value as a person depends enormously on what others think of me	1471	(11.7)	3806	(30.2)	3782	(30.0)	3547	(28.1)

¹ *n* varies from 12 541 to 12 845 for individual items owing to missing data.

Table 2 Comparison of participants with scores in the highest tertile on the negative self-schema scale with those in the lowest two tertiles¹

	Highest tertile		Lowest two tertiles		P
	n	(%)	n	(%)	
Total	3066	(35.9)	5474	(64.1)	
Clinical variables					
EPDS score					
0–9	2291	(74.7)	4912	(89.7)	<0.001
10–12	775	(25.3)	562	(10.3)	
Maternal history of depression					
Missing	141	(4.6)	220	(4.0)	0.001
Yes	625	(20.4)	949	(17.3)	
No	2300	(75.0)	4305	(78.6)	
Paternal history of depression					
Missing	206	(6.7)	341	(6.2)	0.001
Yes	247	(8.0)	330	(6.0)	
No	2613	(85.2)	4803	(87.7)	
Own history of severe depression					
Yes	260	(8.8)	270	(5.1)	<0.001
No	2680	(91.2)	5038	(94.9)	
Demographic variables ²					
Maternal age at delivery, years					
Teenage	68	(2.2)	166	(3.0)	0.001
20–34	2621	(85.6)	4758	(87.0)	
35+	374	(12.2)	547	(10.0)	
Parity					
0	1299	(42.9)	2468	(45.7)	0.020
1	1112	(36.7)	1944	(36.0)	
2 or more	615	(20.3)	988	(18.3)	

EPDS, Edinburgh Postnatal Depression Scale.

1. n varies owing to missing data.

2. Maternal age at delivery, maternal educational achievement, marital status in early pregnancy, housing tenure and car ownership did not differ significantly between those in the highest and lowest two tertiles.

of negative self-schema score was stronger at higher levels of sub-threshold EPDS score, this interaction was not statistically significant within the logistic regression

model (likelihood ratio test, $\chi^2=0.05$, d.f.=1, $P=0.82$). To test whether association was still present in those with minimal baseline depressive symptoms, we repeated

the analyses for those women scoring 8 or below on the EPDS at baseline. The results were similar although the association was weaker; the risk of depression onset increased with each unit increase in negative self-schema score (OR=1.11, 95% CI 1.07–1.15; $P<0.001$). Adjusting for EPDS depression score at baseline attenuated the association (OR=1.06, 95% CI 1.02–1.10; $P<0.002$), but it remained highly statistically significant. There was little further change when also adjusting for other potential confounders (OR=1.06, 95% CI 1.02–1.11; $P=0.002$, $n=6104$). Additional adjustment for mood using the Crown–Crisp index made no substantial difference to the results: the adjusted odds ratio for onset of depression for those in the highest tertile of the six-item negative self-schema score was 1.42 (95% CI 1.11–1.80, $P=0.008$, $n=7540$). As the requirement for complete data on these additional measures meant a further 305 cases were excluded, we have not included these results in this paper.

The size of the association between negative self-schema score at baseline (adjusted for baseline depression score) and the later onset of depression at 8 weeks, 8 months, 21 months and 32 months post-partum remained relatively constant. In comparison, the association between baseline depressive symptom score (adjusted for negative self-schema score at this time) and the later onset of depression diminished over time (Table 4).

DISCUSSION

This is the first study we are aware of to report that negative self-schemas that are associated with a future onset of depression

Table 3 Odds ratios of becoming depressed by tertiles of negative self-schema score: unadjusted, adjusted for depression (EDPS) score at 18 weeks (Adjustment 1) and adjusted for other confounders (Adjustment 2)

	n	Prevalence of depression (%)	OR (95% CI)	Adjustment 1 OR (95% CI)	Adjustment 2 OR (95% CI)
Negative self-schema score					
First tertile (0–2)	2702	4.8	1.00	1.00	1.00
Second tertile (3–5)	2772	7.0	1.48 (1.18–1.86)	1.16 (0.91–1.46)	1.24 (0.96–1.60)
Third tertile (6–18)	3066	13.4	3.04 (2.48–3.73)	1.56 (1.26–1.93)	1.60 (1.27–2.02)
			$P<0.001$	$P<0.001$	$P<0.001$
Sample size	8540		$n=8540$	$n=8540$	$n=7845$

EPDS, Edinburgh Postnatal Depression Scale.

1. Adjusted for past history of depression, parental history of depression, smoking, housing tenure, crowding in household, marital status, education, age, car ownership, unemployment in partner, parity and also time between measures.

Table 4 Odds ratios for onset of depression at various times according to negative self-schema score measured at 18 weeks of pregnancy

Outcome	Sample size ¹ n	Women with depression who were not depressed at previous time points n (%)	Not depressed n	Odds ratios	
				Negative self-schema score at 18 weeks of pregnancy ² OR (95% CI)	EPDS score at 18 weeks of pregnancy ³ OR (95% CI)
Depression onset at 32 weeks of pregnancy	8539	736 (8.6)	7803	1.07 (1.05–1.10)	1.36 (1.32–1.40)
Depression onset 8 weeks post-partum	7249	320 (4.4)	6929	1.07 (1.04–1.11)	1.21 (1.17–1.26)
Depression onset 8 months post-partum	6505	196 (3.0)	6309	1.10 (1.05–1.14)	1.20 (1.14–1.26)
Depression onset 21 months post-partum	5719	207 (3.6)	5512	1.11 (1.07–1.16)	1.16 (1.11–1.21)
Depression onset 33 months post-partum	5008	212 (4.2)	4796	1.10 (1.06–1.14)	1.18 (1.13–1.23)

EPDS, Edinburgh Postnatal Depression Scale.

1. Sample size refers to the number of participants who were not depressed at baseline or any subsequent assessments before the outcome was measured.

2. Adjusted for depressive symptom score at 18 weeks of pregnancy.

3. Adjusted for negative self-schema score at 18 weeks of pregnancy.

All *P* values are <0.001.

can be identified in individuals who are otherwise well. Although this association was strongest in women with concurrent depressive symptoms, it was still present after adjusting for mood at the time of rating cognitions and previous depression. We cannot, however, be certain that we have removed any confounding effect of current mood state. We found the association to be stable over time, predicting onset of depression more than 3 years later equally strongly, suggesting that negative self-schemas represent a long-lasting vulnerability to depression rather than being part of the prodrome of a depressive episode. These observations support a crucial component of the cognitive theory of depression, which states that negative self-schemas are stable patterns of thinking that confer long-term vulnerability to developing depression (Beck, 1967). Although this theory has had a strong influence on the development of psychological treatment of depression, to date empirical evidence to support this aspect of the theory has been lacking (Haaga *et al*, 1991).

Methodological issues

This is a large, longitudinal study of women drawn from a representative population with a relatively small proportion of missing data and extensive data on potential confounders. These strengths increase the generalisability of its findings. In this large study we were also able to adjust for a number of confounding variables, the

most important of which was the degree of mood disturbance at baseline. The possibility of some residual confounding by mood at the time of rating the cognitions can never be excluded, but the finding that the increased risk associated with negative self-schemas was still present 3 years later suggests that our scale was measuring a relatively stable construct.

One limitation of the study is that we derived a measure of negative self-schemas from a questionnaire designed to measure personality in general, rather than cognitions specifically. However, negative self-schemas constitute one aspect of personality. The items selected are similar to items in the dysfunctional attitude scale relating to vulnerability and need for approval (Beck *et al*, 1991). The six items selected in this study in order to measure negative self-schemas concern the importance attached to other people's opinions of the self; however, a number of potentially important dysfunctional beliefs were not included in the limited measure used in this study (Power *et al*, 1994). Another limitation is that there might have been some misclassification between cases and non-cases of depression, because we relied on a brief self-report scale for identifying depression rather than a more detailed, observer-rated measure. This misclassification would probably have been a source of random rather than systematic bias, and if anything should have reduced the strength of the association we found. We might also have misclassified individuals with onset of depression between 18 weeks

and 32 weeks of pregnancy who have recovered by 32 weeks. Depression is rarely this short-lived and we would have included all the longer-duration episodes as cases. All women were under the potential stress of pregnancy and it is notable that there was a marked rise in self-reported depressive symptoms between the two measures. We have reported this finding previously, and we also found that depressive symptoms did not differ in other ways during pregnancy (Evans *et al*, 2001). It is possible to argue that these findings might not be generalisable to measuring negative self-schemas at other times, as the potential stress of pregnancy might be required to evoke them. This seems less likely because the association remained following adjustment for anxiety symptoms, but we cannot exclude this possibility.

Neuroticism and negative self-schemas

A number of studies have reported association between other aspects of personality, such as interpersonal sensitivity or neuroticism, and the onset of depression (Boyce *et al*, 1991; Kendler *et al*, 2002). Some argue that neuroticism can affect cognitions, and one twin study reported that association between low self-esteem and vulnerability to the onset of depression is largely explained by neuroticism (Roberts & Kendler, 1999). It is possible that neuroticism is a vulnerability factor for developing negative self-schemas, but we were

unable to examine this relationship using the ALSPAC data.

Cognitive vulnerability to depression

Negative self-schemas are to be distinguished from automatic negative thoughts that arise during a period of depression. This distinction is important if these negative self-schemas represent a true vulnerability to depression rather than just state-dependent symptoms of a depressive episode.

Other prospective studies have found no effect of negative self-schemas (Haaga *et al*, 1991; Lewinsohn *et al*, 2001), although one has reported an association with the onset of common mental disorder (Weich *et al*, 2003). These studies were too small to confidently exclude important association. The cognitive items selected for our study mostly referred to what the participant believed others thought or would think about her. It is likely that other schemas might be identified in large prospective studies that are associated with the onset of depression. Beck (1983) hypothesised that individuals who attach importance to independence, self-standards and achievement – so-called autonomous individuals – would also be prone to depression. Originally Beck suggested that negative self-schemas might be latent and therefore not directly accessible to questioning. This has been used to explain the negative findings of previous studies. Teasdale has suggested that these negative self-schemas are only evoked in response to a small drop in mood in those prone to depression (Teasdale, 1988). We found that negative self-schemas had an independent association with depression, but are much more common in those who also report depressive symptoms, consistent with Teasdale's hypothesis. It is possible that using mood induction to elicit negative self-schemas (Kelvin *et al*, 1999) or measuring cognitions during natural mood fluctuations (Teasdale & Cox, 2001) would lead to an even stronger association between negative self-schemas and depression.

Implications

Our findings support the hypothesis that individuals who have negative self-schemas are more vulnerable to developing depression. The origins of these negative self-schemas have not been investigated. It is thought that they might arise from adverse

CLINICAL IMPLICATIONS

- Individuals who hold negative self-schemas have an increased risk of becoming depressed.
- These negative self-schemas are not early symptoms of depression but represent a vulnerability that persists over time.
- Understanding how negative self-schemas develop should lead to opportunities to prevent depression.

LIMITATIONS

- Diagnostic interviews could not be used in this study.
- Measurement of negative self-schemas was not comprehensive or repeated.
- Personality was not measured in this study and might be a confounding variable for the relationship between negative self-schemas and onset of depression reported here.

JONATHAN EVANS, Division of Psychiatry, JON HERON, Unit of Paediatric and Perinatal Epidemiology, Division of Child Health; GLYN LEWIS, RICARDO ARAYA, Division of Psychiatry; DIETER WOLKE, Unit of Paediatric and Perinatal Epidemiology, Division of Child Health, University of Bristol, Bristol, UK

Correspondence: Dr Jonathan Evans, Division of Psychiatry, University of Bristol, Cotham House, Cotham Hill, Bristol BS6 6JL, UK. Tel: 0117 954 6666; fax: 0117 954 6672; e-mail: j.evans@bristol.ac.uk

(First received 15 April 2004, final revision 4 October 2004, accepted 9 October 2004)

experiences, particularly during childhood when social schemas relating to the self are first formed. Understanding how individuals develop these negative self-schemas could lead to preventive interventions that might reduce the population burden of depression.

ACKNOWLEDGEMENTS

We are extremely grateful to all the mothers and fathers who took part and to the midwives for their cooperation and help in recruitment. The whole ALSPAC study team comprises interviewers, computer technicians, laboratory technicians, clerical workers, research scientists, volunteers and managers who continue to make the study possible. Financial support was provided by the Medical Research Council, the Wellcome Trust, the Department of Health, the Department of the Environment, and various charitable organisations and commercial companies. The ALSPAC study is part of the European Longitudinal Study of Pregnancy and Childhood initiated by the World Health Organization.

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