CHAPTER 8

RESULTS AND DISCUSSION

8.1 Introduction

This chapter presents the descriptive statistics for the English and Afrikaans samples. Frequency distributions and means are reported along with Pearson Chi-square statistics where significant differences were present between the English and Afrikaans samples.

This is followed by the results of the Rasch analysis. The performance of the PDSS and Afrikaans PDSS was analysed using Rasch analysis to evaluate how well the items contributed to the underlying construct of PPD. The same analysis was also performed with the scales' dimensions. Dimensionality was examined using item fit statistics and principal component analysis (PCA) of standardized residuals. Reliability of the PDSS, the Afrikaans PDSS, and their dimensions were determined by the person reliability estimates and Cronbach alpha. The appropriateness of item difficulty was determined by examining the item-person map and person reliability estimates. The category functioning was also evaluated to determine the effectiveness of the Likert response categories of the PDSS and Afrikaans PDSS. Finally, differential item functioning (DIF) was examined to compare the estimates across the English and Afrikaans samples to determine whether the items have significantly different meanings for the two groups.

The results of the multiple regression analysis, using the stepwise selection method, are presented next. This statistical method was used to analyse the relationship between known risk factors for PPD and scores on the PDSS.

Finally the results of the Pearson correlation are presented. This analysis was performed to determine the relationship between participants' scores on the PDSS, the EPDS, and the QIDS-SR16.

8.2 Descriptive Statistics

Frequency distributions were used to summarise the data and means were calculated where appropriate. Pearson Chi-square statistics were used to determine if significant differences were present between the English and Afrikaans samples. All the *p*-values were two-tailed and *p*-values <0.05 were considered statistically significant.

All participants in the study were South African citizens. One participant, although a South African citizen, completed the research questionnaire from abroad. It was determined that she had only lived overseas for a short while and was therefore not excluded from participation. All other participants were resident in South Africa at the time.

Participants' home language is indicated in Table 9. The majority of participants (96.1%) who completed the questionnaires in Afrikaans and the majority of participants who completed the questionnaires in English (92.5%) indicated that they were

completing the questionnaires in their home language. A small number of participants (4.7%) indicated that their home language was neither English nor Afrikaans.

All participants who completed the English PDSS had English as a subject at school. One hundred and sixty four participants (87.7%) had English as a first language, and 23 participants (12.3%) had English as a second language. The participants were asked whether they considered themselves fluent in English. Fluency in the language of test administration was a requirement for participation in this study. One participant indicated that she did not consider herself fluent in English. She did however complete grade 12 with English as a first language at high school. As the researcher had also conversed with her successfully in English, it is believed that she judged her English language ability harshly and she was not excluded from participating in the study.

All the participants who completed the Afrikaans PDSS had Afrikaans as a language taught at high school – 167 participants (93.8%) had Afrikaans as a first language, and 11 participants (6.2%) had Afrikaans as a second language. As with the English-speaking participants, the Afrikaans-speaking participants were requested to indicate on the participant information form whether they considered themselves fluent in Afrikaans. All the participants who completed the Afrikaans PDSS considered themselves fluent in Afrikaans.

The demographic characteristics of the mothers are shown in Table 9. Most mothers were White (84.9%), followed by Black (5.2%), Asian (4.9%) and Coloured (4.7%) mothers. The imbalance in the race/ethnic group of the mothers may be attributed to the nature of the study – i.e. the sampling requirement that mothers should be fluent in

English or Afrikaans, the fact that many mothers were recruited from clinics in urban areas and from magazine articles, and that participation could be done online requiring internet access.

As can be seen in Table 9, most of the sample was married (88.8%) or in a de facto relationship (4.1%). All the participants were below 45 years of age. The majority of participants were between the ages of 26 and 35 (78.8%). The mean age of the participants was 30.11 with a standard deviation of 4.17. No significant differences in marital status and age were noted between the English and Afrikaans mothers.

The education level and employment status of the participants are presented in Table 10. Close to a quarter (23.6%) completed grade 12, just over two thirds of the participants (67.4%) either had a degree or a diploma, and 4.4% a trade certificate. No significant differences were noted between the English and Afrikaans samples. Almost half of the participants worked full-time (49.3%), 27.1% were unemployed, followed by 13.2% who were self-employed, and 10.4% who were employed part-time.

Table 9 Demographic Characteristics Stratified by Questionnaire Language: Home Language, Race/Ethnic Group, Marital Status and Age

Demographic Characteristics	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Home language									
English	177	48.5	4	2.2	173	92.5			
Afrikaans	171	46.8	171	96.1	0	0			
Xhosa	7	1.9	2	1.1	5	2.7			
Zulu	5	1.4	1	0.6	4	2.1			
Northern Sotho	2	0.5	0	0	2	1.1			
Southern Sotho	1	0.3	0	0	1	0.5			
Chinese	1	0.3	0	0	1	0.5			
Other	1	0.3	0	0	1	0.5			
Race/ethnic group									
White	310	84.9	160	89.9	150	80.2			
Black	19	5.2	5	2.8	14	7.5			
Asian	18	4.9	0	0	18	9.6			
Coloured	17	4.7	13	7.3	4	2.1			
Other	1	0.3	0	0	1	.5			
Marital status							3.06	3	0.383
Married	324	88.8	163	91.6	161	86.1			
Unmarried	24	6.6	8	4.5	16	8.6			
De Facto Relationship	15	4.1	6	3.4	9	4.8			
Divorced	2	0.5	1	0.6	1	0.5			
Age (in years)							18.07	24	0.800
18-20	6	1.7	2	1.2	4	2.1			
21-25	38	10.5	17	9.5	21	11.2			
26-30	151	41.3	75	42.2	76	40.8			
31-35	137	37.5	70	39.3	67	35.8			
36-40	28	7.6	13	7.3	15	8.1			
40-44	4	1.1	1	0.6	3	1.6			
Missing data	1	0.3			1	0.5			
M	30.11 years		30.21 years		30.01 years				
SD	4.17		4.384		3.943				

Table 10 Demographic Characteristics Stratified by Questionnaire Language: Education Level and Employment Status

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Education level							5.75	7	0.569
Degree or Diploma	246	67.4	117	65.7	129	69.0			
Trade Certificate	16	4.4	10	5.6	6	3.2			
Grade 12	86	23.6	45	25.3	41	21.9			
Grade 11	5	1.4	3	1.7	2	1.1			
Grade 10	6	1.6	1	0.6	5	2.7			
Grade 9	2	0.5	1	0.6	1	0.5			
Grade 8	3	0.8	1	0.6	2	1.1			
Grade 7	1	0.3	0	0	1	0.5			
Employment status							3.62	3	0.305
Full-time	180	49.3	79	44.4	101	54.0			
Unemployed	99	27.1	54	30.3	45	24.1			
Self-employed	48	13.2	26	14.6	22	11.8			
Part-time	38	10.4	19	10.7	19	10.2			

Table 11 presents the number of weeks since birth, the infant's sex and gestational age at birth, and the infant feeding method the mother opted for. Most participants were between 5 and 7 weeks postpartum (32.1%) or 16 weeks postpartum (11.5%). The mean age postpartum was 5.3 weeks (standard deviation 3.768). The mean number of weeks since birth was 5.68 weeks (SD 4.043) for the English participants and 4.9 weeks (SD 3.421) for Afrikaans participants. A significant difference was noted between the English and Afrikaans participants in the number of weeks since birth ($x2 = 27.07$, $df = 12$, $p = 0.008$). More English mothers participated at 16 weeks postpartum than expected and substantially less Afrikaans mothers participated at 16 weeks than expected. Furthermore, more Afrikaans mothers participated at 5 weeks postpartum than expected and substantially less English mothers participated at 5 weeks than expected. There was no significant difference in the number of male and female babies born to the English and Afrikaans participants.

In both the Afrikaans and English samples, the majority of infants were born between 38 and 40 weeks postpartum (55.6% and 63.1% respectively). More mothers from the Afrikaans sample gave birth pre-term (25.9%) than mothers from the English sample (18.2%). These results were, however, not statistically significant.

The majority of mothers from both samples opted to breastfeed their babies from birth (Afrikaans: 46.1%; English: 48.7%), followed by mothers who breastfed initially but now bottle feed with formula only (Afrikaans: 21.9%; English: 20.9%). The feeding method of choice did not differ significantly between the English and Afrikaans mothers.

Table 11 Demographic Characteristics Stratified by Questionnaire Language: Number of Weeks Since Birth, Infant's Sex, Gestational Age at Birth, and Feeding Method

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
No. of weeks since birth							27.07	12	0.008**
4 weeks	25	6.8	8	4.5	17	9.1			
5 weeks	43	11.8	29	16.3	14	7.5			
6 weeks	36	9.9	12	6.7	24	12.8			
7 weeks	38	10.4	25	14.0	13	7.0			
8 weeks	35	9.6	17	9.6	18	9.6			
9 weeks	34	9.3	19	10.7	15	8.0			
10 weeks	30	8.2	16	9.0	14	7.5			
11 weeks	22	6.0	12	6.7	10	5.3			
12 weeks	22	6.0	11	6.2	11	5.9			
13 weeks	10	2.7	5	2.8	5	2.7			
14 weeks	15	4.1	6	3.4	9	4.8			
15 weeks	13	3.6	7	3.9	6	3.2			
16 weeks	42	11.5	11	6.2	31	16.6			
M	5.3 weeks		4.9 weeks		5.68 weeks				
SD	3.768		3.421		4.043				
Infant's sex							0.36	1	0.549
Male	174	47.7	82	46.1	92	49.2			
Female	191	52.3	96	53.9	95	50.8			
Gestational age of infant at birth							6.68	4	0.154
≤ 28 weeks	7	1.9	3	1.7	4	2.1			
29 - 33 weeks	11	3.0	9	5.1	2	1.1			
34 - 37 weeks	62	17.0	34	19.1	28	15.0			
38 - 40 weeks	217	59.5	99	55.6	118	63.1			
> 40 weeks	68	18.6	33	18.5	35	18.7			
Feeding method							2.49	3	0.476
Breast fed – from birth	173	47.4	82	46.1	91	48.7			
Initially breastfed but now bottle fed only	78	21.4	39	21.9	39	20.9			
Bottle fed - from birth [a]	58	15.9	33	18.5	25	13.4			

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Combination of breast and bottle	56	15.3	24	13.5	32	17.1			

* $p \leq 0.05$
** $p \leq 0.01$
*** $p \leq 0.001$
[a] bottle fed implies formula milk

Table 12 presents the perceived level of support obtained by the mothers in the postpartum period. More mothers from the English sample indicated that they received sufficient help and support from the baby's father (77%) than mothers from the Afrikaans sample (63.5%). Less mothers than expected from the English sample indicated that they received some help and support from the baby's father, while more Afrikaans mothers than expected indicated that they received some help and support (Table 68a and Table 68b in Appendix F). Overall the amount of help and support mothers received from the baby's father differed significantly between the two samples ($x2 = 10.09$, $df = 2$, $p = 0.006$). This is due to a larger percentage of English mothers indicating that they received sufficient help compared to Afrikaans mothers, while a smaller percentage indicated that they received some help and support. If the percentage of mothers who indicated that they received either sufficient help and support or some help and support from the baby's father were combined, then the distribution between the Afrikaans and English samples are strikingly similar at 92.7% for the Afrikaans sample and 92.5% for the English sample. The percentage of mothers who indicated that they received no help and support is similar in both samples (Afrikaans: 7.3%; English: 7.5%).

A similar pattern is seen for help and support obtained from family. The amount of help and support mothers received from extended family differed significantly between the two samples ($x2 = 10.05$, $df = 2$, $p = 0.007$). This may be attributed to the differences in expected rates of both sufficient help and support, and some help and support received from the two samples (Table 69a and Table 69b in Appendix F).

If the percentage of mothers who indicated that they received either sufficient help and support or some help and support from extended family were combined, then the distribution between the Afrikaans and English samples are strikingly similar with 87.2% of English mothers and 87.1% of Afrikaans mothers indicating that they received either sufficient or some help and support.

Slightly more English mothers received sufficient help or some help and support from friends (58.8%) compared to mother from the Afrikaans sample (52.8%). The majority of mothers from both samples do not receive additional support from other sources (Afrikaans: 78.7%; English 78.6%).

Table 12 Perceived Level of Support Obtained by Mothers, Stratified by Questionnaire Language

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*Df*	*P*
Support from father							10.09	2	0.006**
No	27	7.4	13	7.3	14	7.5			
Yes	257	70.4	113	63.5	144	77.0			
Some	81	22.2	52	29.2	29	15.5			
Support from family							10.05	2	0.007**
No	47	12.9	23	12.9	24	12.8			
Yes	231	63.3	100	56.2	131	70.1			
Some	87	23.8	55	30.9	32	17.1			
Support from friends							2.34	2	0.311
No	161	44.1	84	47.2	77	41.2			
Yes	129	35.3	56	31.5	73	39.0			
Some	75	20.5	38	21.3	37	19.8			
Support from others							4.24	2	0.120
No	287	78.6	140	78.7	147	78.6			
Yes	50	13.7	20	11.2	30	16.0			
Some	28	7.7	18	10.1	10	5.3			

* $p \leq 0.05$
** $p \leq 0.01$
*** $p \leq 0.001$

The obstetric profile of mothers is presented in Table 13. A total of 38.6% of mothers gave birth by elective caesarean. This was the most common method of delivery in both samples. This was followed by a normal vaginal delivery (27.1%), emergency caesarean (20.3%), and then traumatic vaginal delivery (13.7%). No significant differences were found in the method of delivery or in the rating of care during labour and delivery between the English and Afrikaans mothers. Most mothers rated their care during labour and delivery as being excellent (58.9%), with a further 29.3% rating it as good. Six percent of mothers perceived their care as being poor.

Most participants had only had 1 pregnancy (57.8%), followed by mothers who had two pregnancies (25.5%). Less mothers had 3 pregnancies (11%) and only 5.5% of mothers had a fourth, fifth or sixth pregnancy. Mean gravidity was 1.66 with a standard deviation of 0.939. No significant differences were found in gravidity between the two samples. The majority of mothers who participated in this study (60%) only had 1 child, 27.9% had two children, and 10.1% had three children. Few mothers had more than three children (1.7%). The mean number of children respondents had was 1.54 (*SD* 0.754). No significant differences were found between the English and Afrikaans mothers in the number of children they had.

Participants were asked to indicate whether a health practitioner had diagnosed them with either antenatal depression during, and/or PPD after their recent pregnancy at their postnatal follow-up appointment with their caregiver. If this was the case, they were asked to indicate whether they are currently receiving counselling or psychotherapy. This data is presented in Table 14. Close to a quarter of mothers (23.3%) had not yet had a postpartum follow-up appointment with their caregiver. Nearly half of the participants

(48.5%) indicated that their caregiver did not enquire about the presence of depressive symptoms at their postpartum follow-up, while 28.2% of mothers indicated that their caregivers did.

A small number of participants (5.5%) were diagnosed with PPD after their recent pregnancy and even less (3%) were diagnosed with antenatal depression. These figures were fairly similar across the samples and the differences were not statistically significant. Only 2.2% of these mothers were receiving counselling or psychotherapy for PPD at the time of assessment while 10.4% of mothers were using medication for depression or anxiety. No significant differences were found between the English and Afrikaans samples concerning counselling or psychotherapy and use of medication for depression or anxiety.

Table 13 Obstetric Profile of Mothers Stratified by Questionnaire Language

	Frequency Total (n=365) [b]	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Type of delivery [b]							4.66	3	0.198
Elective caesarean	141	38.6	67	37.6	39.6	74			
Normal vaginal	99	27.1	42	23.6	30.5	57			
Emergency caesarean	74	20.3	39	21.9	18.7	35			
Traumatic vaginal	50	13.7	30	16.9	10.7	20			
Perception of care during labour and delivery							5.25	3	0.154
Excellent	215	58.9	99	55.6	62.0	116			
Good	107	29.3	52	29.2	29.4	55			
Unremarkable	21	5.8	15	8.4	3.2	6			
Poor	22	6.0	12	6.7	5.3	10			
Gravidity [b]							3.00	5	0.700
1st pregnancy	211	57.8	100	56.2	59.4	111			
2nd pregnancy	93	25.5	45	25.3	25.7	48			
3rd pregnancy	40	11.0	20	11.2	10.7	20			
4th pregnancy	15	4.1	9	5.1	3.2	6			
5th pregnancy	4	1.1	3	1.7	0.5	1			
6th pregnancy	1	0.3			0.5	1			
M	1.66		1.7			1.61			
SD	0.939		0.974			0.905			
Number of biological children [b]							3.38	4	0.497
1 child	219	60.0	103	57.9	62.0	116			
2 children	102	27.9	48	27.0	28.9	54			
3 children	37	10.1	22	12.4	8.0	15			
4 children	5	1.4	3	1.7	1.1	2			
5 children	1	0.3	1	0.6					
M	1.54		1.59			1.48			
SD	0.754		0.814			0.691			

[b] Data is missing where totals do not add up to N = 365

Table 14 Current PPD and Antenatal Depression Assessment and/or Treatment of Mothers, Stratified by Questionnaire Language

	Frequency Total (N = 365) [b]	Total (%)	Frequency Afrikaans (n = 178)	Afrikaans (%)	Frequency English (N = 187)	English (%)	X^2	*df*	*P*
PPD diagnosis[a]	20	5.5	10	5.6	10	5.3	0.01	1	0.910
Antenatal depression diagnosis	11	3.0	5	2.8	6	3.2	0.05	1	0.823
Caregiver enquired about symptoms of depression at postnatal follow up							0.56	2	0.755
No	177	48.5	83	46.6	94	50.3			
Yes	103	28.2	53	29.8	50	26.7			
Not been for follow up	85	23.3	42	23.6	43	23.0			
Currently receiving counseling or psychotherapy for PPD [b]							1.30	2	0.523
No	18	4.9	7	3.9	11	5.9			
Yes	8	2.2	5	2.8	3	1.6			
N/A	337	92.3	164	92.1	173	92.5			
Currently using medication for depression or anxiety [b]							2.53	1	0.112
No	323	88.5	163	91.6	160	85.6			
Yes	38	10.4	14	7.9	24	12.8			

[a] Related to recent pregnancy
[b] Data is missing where totals do not add up to N = 365

The psychiatric history of the mothers is presented in Table 15. Most mothers (65.8%) had no history of the psychiatric illnesses listed in Table 15. Almost a quarter of mothers (23.8%) did, however, have a history of depression, while 8.2% had a history of an anxiety disorder, 6.6% had a history of PPD after a previous pregnancy, 3.3% of mothers had had an eating disorder, only 2 mothers (0.5%) had antenatal depression during a previous a pregnancy, and 1 mother (0.3%) indicated that she had a history of obsessive compulsive disorder.

Mothers were asked to indicate whether they think they had PPD (11.5%), some symptoms of PPD (22.2%), or no PPD (41.9%). Mothers could also opt to indicate that they were uncertain about whether or not they had PPD (20.5%), or that they did not really know what PPD was (3.8%). This data is presented in Table 16. A statistically significant difference was found to responses made by mothers from the two samples ($x2 = 10.90$, $df = 4$, $p = 0.028$). Significantly less English mothers than expected indicated that they thought they may have some symptoms of PPD, while significantly more Afrikaans mothers than expected thought they may have some symptoms of PPD. Furthermore, significantly more English mothers than expected thought they did not have PPD, and significantly less Afrikaans mothers than expected thought they did not have PPD.

Table 15 Psychiatric History of Mothers Stratified by Questionnaire Language

Psychiatric History	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)
Depression	87	23.8	46	25.8	41	21.9
Anxiety	30	8.2	8	4.5	22	11.8
PPD after a previous pregnancy	24	6.6	14	7.9	10	5.3
Anorexia	7	1.9	5	2.8	2	1.1
Bulimia	5	1.4	2	1.1	3	1.6
Antenatal depression during a previous pregnancy	2	0.5	1	0.6	1	0.5
Obsessive compulsive disorder	1	0.3	0	0	1	0.5

Table 16 Self Evaluation PPD Statements Chosen by Mothers, Stratified by Questionnaire Language

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Self evaluation							10.90	4	0.028*
I think I may have some symptoms of postpartum depression	81	22.2	52	29.2	29	15.5			
I think I may have postpartum depression	42	11.5	21	11.8	21	11.2			
I do not really know what postpartum depression is	14	3.8	5	2.8	9	4.8			
I know what postpartum depression is and I do not think I am suffering from it	153	41.9	67	37.6	86	46.0			
I feel uncertain about whether or not I may have postpartum depression	75	20.5	33	18.5	42	22.5			

* $p \leq 0.05$

Table 17 contains the peripartum and psychological profile of the mothers. Postpartum blues is fairly common after the birth of a baby, and this was evident in this study with 70.1% of mothers indicating that they had postpartum blues. For most mothers (72.3%) this pregnancy was planned. Some mothers (14.2%) indicated that they had difficulty conceiving, while 7.4% had had fertility treatment with their recent pregnancy. Close to a quarter of the mothers (24.1%) indicated that they had had complications in their pregnancy such as pre-eclampsia or a threatened miscarriage. More than a quarter of the mothers indicated that they were intensely anxious or fearful of childbirth, and 44.1% of mothers had a history of premenstrual dysphoric disorder (PMDD), or PMS. Furthermore, according to their own self-evaluation, nearly half of the mothers indicated that they thought they were perfectionistic. No significant differences were found between the English and Afrikaans mothers' peripartum and psychological profile.

The psychosocial characteristics are presented in Table 18. Women were asked about certain major distressing life events in the past two years which are known risk factors for PPD. Most common events included financial concerns (59.2%), moving house (46.6%), house alterations (36.7%), and changing jobs (31.8%). It should be noted, however, that the last mentioned factor also includes mothers who resigned and opted to be a stay-at-home mother. The researcher determined that in some instances this was chosen to ease the pressure of working full time while having young children and as such, for some participants, the change was not experienced as a major distressing life event, but quite the contrary.

Table 17 Peripartum and Psychological Profile of Mothers Stratified by Questionnaire Language

	Frequency Total (n=365) [b]	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Postpartum blues							1.79	1	0.181
No	109	29.9	59	33.1	50	26.7			
Yes	256	70.1	119	66.9	137	73.3			
Planned pregnancy							0.99	1	0.319
No	101	27.7	45	25.3	56	29.9			
Yes	264	72.3	133	74.7	131	70.1			
Difficulty conceiving[b]							0.18	1	0.669
No	312	85.5	154	86.5	158	84.5			
Yes	52	14.2	24	13.5	28	15.0			
Fertility treatment							2.35	1	0.125
No	338	92.6	161	90.4	177	94.7			
Yes	27	7.4	17	9.6	10	5.3			
Complicated pregnancy							1.55	1	0.213
No	277	75.9	130	73.0	147	78.6			
Yes	88	24.1	48	27.0	40	21.4			
Tokophobia or intensely fearful or anxious of childbirth [b]							0.28	1	0.600
No	269	73.7	133	74.7	136	72.7			
Yes	95	26.0	44	24.7	51	27.3			
History of PMS[a] **or PMDD**[c]							2.51	1	0.113
No	204	55.9	107	60.1	97	51.9			
Yes	161	44.1	71	39.9	90	48.1			
Consider self a perfectionist							2.75	1	0.097
No	195	53.4	103	57.9	92	49.2			
Yes	170	46.6	75	42.1	95	50.8			

[a] PMS = premenstrual syndrome
[b] Data is missing where totals do not add up to N = 365
[c] PMDD = premenstrual dysphoric disorder

Other common distressing life events that participants experienced are the loss of close friends or family, either through relocation or migration (29%), their spouse or partner changing jobs (28.8%), serious illness of a family member (26%), family problems (26%), being victimised by violence or crime (18.4%), marriage (17.8%), bereavement (17.3%), moving to a different town or city, or migration (16.4%), marital discord (14.8%), and another pregnancy and birth (14.2%). Less common stressful events were job loss or retrenchment (9.6%), serious injury, illness, or personal health problems (7.4%), and a spouse or partner's job loss or retrenchment (7.1%).

The responses to six different life stressors (moving house, moving city or migrating, job changes in mothers, job changes in partners, bereavement, and being victimised by violence or crime) varied significantly between the English and Afrikaans mothers.

A profile of how mothers felt about their pregnancies is presented in Table 19. The majority of mothers were positive about their pregnancies (73.7%), some were ambivalent (18.6%), and a small percentage were negative (5.2%) or predominantly anxious (2.5%). No significant differences were found between the two samples regarding how they felt about their pregnancies.

Table 18 Psychosocial Characteristics of Mothers Stratified by Questionnaire Language

Major Life Stresses in the past 2 years	Frequency Total (n=365) [b]	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
House alterations [b]							1.44	1	0.229
No	230	63.0	118	66.3	112	59.9			
Yes	134	36.7	60	33.7	74	39.6			
Moving house							8.52	1	0.004**
No	195	53.4	109	61.2	86	46.0			
Yes	170	46.6	69	38.8	101	54.0			
Moving city / immigrate [b]							5.34	1	0.021*
No	304	83.3	156	87.6	148	79.1			
Yes	60	16.4	21	11.8	39	20.9			
Job changes: self							6.77	1	0.009**
No	249	68.2	133	74.7	116	62.0			
Yes	116	31.8	45	25.3	71	38.0			
Job changes: partner							9.38	2	0.009**
No	252	69.0	136	76.4	116	62.0			
Yes	105	28.8	38	21.3	67	35.8			
N/A	8	2.2	4	2.2	4	2.1			
Job loss / retrenchment: self [b]							1.91	1	0.167
No	329	90.1	157	88.2	172	92.0			
Yes	35	9.6	21	11.8	14	7.5			
Job loss / retrenchment: partner							0.47	2	0.791
No	331	90.7	163	91.6	168	89.8			
Yes	26	7.1	11	6.2	15	8.0			
N/A	8	2.2	4	2.2	4	2.1			
Financial concerns							0.08	1	0.776
No	149	40.8	74	41.6	75	40.1			
Yes	216	59.2	104	58.4	112	59.9			
Bereavement [b]							5.73	1	0.017*

Major Life Stresses in the past 2 years	Frequency Total (n=365) [b]	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
No	301	82.5	155	87.1	146	78.1			
Yes	63	17.3	22	12.4	41	21.9			
Loss of close friends / family relocating, emigrating, etc. [b]							0.11	1	0.737
No	258	70.7	124	69.7	134	71.7			
Yes	106	29.0	53	29.8	53	28.3			
Serious illness of a family member							2.28	1	0.131
No	270	74.0	138	77.5	132	70.6			
Yes	95	26.0	40	22.5	55	29.4			
Another pregnancy and birth							1.93	1	0.164
No	313	85.8	148	83.1	165	88.2			
Yes	52	14.2	30	16.9	22	11.8			
Marriage [b]							0.51	1	0.475
No	299	81.9	148	83.1	151	80.7			
Yes	65	17.8	29	16.3	36	19.3			
Marital problems							0.16	1	0.694
No	311	85.2	153	86.0	158	84.5			
Yes	54	14.8	25	14.0	29	15.5			
Family problems [b]							0.02	1	0.897
No	269	73.7	131	73.6	138	73.8			
Yes	95	26.0	47	26.4	48	25.7			
Victimised by violence or crime							5.07	1	0.024*
No	298	81.6	137	77.0	161	86.1			
Yes	67	18.4	41	23.0	26	13.9			
Serious injury, illness, or personal health problems [b]							0.01	1	0.935
No	337	92.3	165	92.7	172	92.0			
Yes	27	7.4	13	7.3	14	7.5			

* $p \leq 0.05$
** $p \leq 0.01$
*** $p \leq 0.001$
[b] Data is missing where totals do not add up to N = 365

Table 19 Profile of How Mothers Felt About Their Pregnancies, Stratified by Questionnaire Language

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
How mother felt about expecting a baby							4.38	3	0.223
Positive	269	73.7	125	70.2	144	77.0			
Ambivalent	68	18.6	38	21.3	30	16.0			
Negative	19	5.2	12	6.7	7	3.7			
Other:	9	2.5	3	1.7	6	3.2	3.75	5	0.586
• Anxious	3	0.8	2	1.1	1	0.5			
• Anxious – overwhelmed	1	0.3			1	0.5			
• Anxious – losing baby	2	0.5	1	0.6	1	0.5			
• Anxious – pregnancy	1	0.3			1	0.5			
• Anxious – responsibility	1	0.3			1	0.5			
• Anxious – motherhood and weight gain	1	0.3			1	0.5			

Infant attributes as factors in maternal depression has been discussed in chapter 2. Infants who are temperamentally difficult or irritable are strongly predictive of maternal depression. Furthermore, a mother's psychological distress influences how she experiences her infant's behavioural characteristics. Table 20 outlines the mothers' perceptions of their infants' temperament and specific concerns they have had about their infants. Two thirds of the mothers in the study indicated that they experience their infants' temperament as being good. Infants described with demanding temperament accounted for 22.5% of mothers. Remaining mothers reported infant temperament as fussy (5.5%), difficult (4.1%), or a combination of all these characteristics (1.6%).

The majority of mothers from both samples reported no specific concerns regarding their infants. Of the concerns that were reported, infant colic (26.6%), infant sleeping (25.5%), and infant feeding (22.2%) issues were greater issues for the total sample. Significant differences were found between the English and Afrikaans mothers regarding infant feeding concerns ($x2 = 4.03$, $df = 1$, $p = 0.045$) and concerns regarding infant prematurity ($x2 = 13.21$, $df = 1$, $p < 0.001$). The amount of Afrikaans mothers who were concerned about their infants' prematurity was significantly higher than expected, whereas significantly fewer English mothers were concerned about their infants' prematurity than expected[1].

[1] Some mothers were referred from postpartum support groups. Although the researcher can only speculate, it is possible that a group of mothers were referred from a predominantly Afrikaans-speaking support group for mothers with premature babies.

Table 20 Infant Temperament and Concerns Regarding Infant, Stratified by Questionnaire Language

	Frequency Total (n=365)	Total (%)	Frequency Afrikaans (n=178)	Afrikaans (%)	Frequency English (n=187)	English (%)	X^2	*df*	*P*
Infant's temperament according to mother									
Good	242	66.3	116	65.2	126	67.4			
Demanding	82	22.5	42	23.6	40	21.4			
Fussy	20	5.5	6	3.4	14	7.5			
Difficult	15	4.1	10	5.6	5	2.7			
Combination of the Above	6	1.6	4	2.2	2	1.1			
Specific concerns regarding infant									
No problems	159	43.6	81	45.5	78	41.7			
Health concerns	16	4.4	8	4.5	8	4.3			
Colic	97	26.6	42	23.6	55	29.4			
Infant's sleep	93	25.5	44	24.7	49	26.2			
Feeding	81	22.2	48	27.0	33	17.6	4.03	1	0.045*
Allergies	15	4.1	4	2.2	11	5.9			
Premature	39	10.7	30	16.9	9	4.8	13.21	1	0.000***
Other:	22	6.0	11	6.2	11	5.9			
• Postnasal drip	1	0.3	0	0	1	0.5			
• Reflux	9	2.5	3	1.7	6	3.2			
• Difficulty winding	1	0.3	0	0	1	0.5			
• Occasional vomiting	1	0.3	0	0	1	0.5			
• Weight gain issues	2	0.5	0	0	2	1.1			
• Cramps and crying same time each day	1	0.3	1	0.6	0	0			
• Minor disability	1	0.3	1	0.6	0	0			
• Difficulty bonding	1	0.3	1	0.6	0	0			
• Infant dyschezia	1	0.3	1	0.6	0	0			
• Breastfeeding-related problems	4	1.1	4	2.2	0	0			

* $p \leq 0.05$
*** $p \leq 0.001$

8.3 Results of Rasch Analysis of the English PDSS

An IRT model, specifically the Rating Scale Model, a formulation of an extended Rasch model, was employed in this study as implemented by Winsteps (Linacre, 2009). Rasch analysis was performed on the 35-item PDSS and its Afrikaans translation to determine how well the items defined the underlying construct of postpartum depression in a South African sample. The PDSS was, however, developed as a multidimensional construct of postpartum depression, incorporating seven individual dimensions. Rasch analysis was also performed to determine how adequately the attitude continuum which underlies each PDSS dimension (or construct) was assessed by the five items which constitute the dimension. These additional analyses of the dimensions were considered essential due to the fact that PPD is a phenomenon that is composed of multiple components.

The Rasch model assumes that if people respond to a unidimensional construct they ought to respond as expected according to their ability levels and item difficulty levels (Harvey & Thomas as cited in Maree, personal communication, October 8, 2009). Therefore, the probability of a specific response by a specific person on a specific question is a function of the person's ability (level of depression), and the 'difficulty level' of the question (or the degree of depression that the question is meant to measure). Given that the Rasch model allows one to calculate the level of difficulty required to endorse items, it was possible to determine whether some individual items on the PDSS, or in turn, on each of the PDSS dimensions, were harder to endorse than others.

Unidimensionality was evaluated with fit statistics or indices: a mean-square infit and a mean-square outfit. The analysis of fit statistics is a quality control technique that is necessary to determine the validity of person responses and test items. It allows for the monitoring of the responses of persons and items to determine if and where misfit occurs, and how well the data cooperates with the construction of measurement. When fit statistics fall within an acceptable range for the study, confidence may be placed in item calibration and person measurement (Wright & Stone, 1999). Reasonable MNSQ fit values for a rating scale are recommended at 0.60 – 1.40 (Bond & Fox, 2007; Wright & Linacre, 1994).

Item person construct maps were constructed for the PDSS and the Afrikaans PDSS which show the positions of persons and items on a vertical ruler. This map gives an indication of difficulty indices (degree of depression) and how well the items span the attitude continuum, or, in other words, how well the construct has been differentiated.

The data was also examined to evaluate the effectiveness of the Likert response categories as this impacts on how well the response data defines the dimension. The PDSS and the Afrikaans PDSS were then compared to examine differential item functioning to determine if the items have significantly different meanings across the two samples.

8.3.1 Summary of English Rasch analysis: persons and items.

The summary statistics of the non-extreme persons and items[1] for the English PDSS are presented in Table 21a and Table 21b.The average person infit (1.10) and outfit (1.06) is almost 1 indicating that most persons responded according to expectation. The *SD* provides an indication of the variation of in/outfit values (in this case 0.56 and 0.65). One *SD* above and one *SD* below the mean, represents approximately 68 % of the distribution of values (if the distribution is normal), according to the ideal z- or normal distribution graph. The values are slightly higher than the Afrikaans sample, which are 1.07 and 1.03 respectively. The minimum and maximum values for infit (0.28 – 2.94) and outfit (0.16 – 4.38) are extreme (acceptable value 0.60 – 1.40; Bond & Fox, 2007; Wright & Linacre, 1994) indicating that there are some persons that had unexpected responses on the PDSS.

The min of -5.05 logits for the measure is extremely low indicating that one or some women in this sample were not really depressed. The maximum value of 4.19 on the contrary indicates that some were very depressed. The average logit for person ability was -0.80 with a *SD* of 1.63. This is rather wide and means that approximately 68 % of respondent scores fell within -2.43 and 0.83 logits. If this is the case then the minimum and maximum measure values of the PDSS are really extreme.

The PDSS items functioned well with average infit and outfit values (1.02 and 1.05) close to 1 which is the expected Chi-Square value for these indices. The *SD*s were 0.30 and 0.52 respectively. This indicates that there is neither too much nor too little variation and that most of the items fit the Rasch model. The minimum and maximum

[1] Summary statistics for extreme and non-extreme persons for the PDSS are presented in Table 70 in Appendix F.

values for infit (min 0.64; max 2.01) and outfit (min 0.44; max 2.63) indicate that there are some extreme values.

Reliability information for both items and persons on the PDSS is excellent. The person separation index is high at 4.52. The person reliability estimate is .95 with a Cronbach Alpha (KR-20) value of .98 indicating that the items in the PDSS as a whole were sufficiently able to separate the participants in the sample along the continuum. The person reliability estimate is conceptually equivalent to Cronbach's alpha. The formulation differs though and Cronbach's alpha includes extreme scores, whereas Rasch person reliability estimate is computed without extreme scores. The high person reliability (internal consistency) indicates that the items correlate highly with each other, or in other words, that the participants reacted to the various items in a similar manner.

The PDSS demonstrates an item separation index of 6.65. This indicates that the items are well dispersed on the scale and can distinguish between a number of levels of performance.

Table 21a Summary Statistics of 182 Non-Extreme Persons and Items for the English PDSS.

	Raw Score	Count	Measure	Model Error	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD
Mean	49.70	35.00	-0.80	0.26	1.10	0.00	1.06	0.00
S.D.	36.50	0.10	1.63	0.17	0.56	1.80	0.65	1.60
Max	138.00	35.00	4.19	1.03	2.94	5.50	4.38	6.40
Min	1.00	34.00	-5.05	0.16	0.28	-4.30	0.16	-3.90

Real RMSE	0.35	True S.D.	1.60	Separation	4.52	Particip Reliability .95
Model RMSE	0.31	True S.D.	1.60	Separation	5.16	Particip Reliability .96
S.E. of participant mean = 0.12						

Minimum Extreme Score: 5 Participants

Table 21b English PDSS: Summary of 35 Measured (Non-Extreme) PDSS

	Raw Score	Count	Measure	Model Error	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD
Mean	258.30	186.90	0.00	0.09	1.02	0.00	1.05	0.10
S.D.	84.70	0.20	0.63	0.01	0.30	2.40	0.52	2.50
Max	438.00	187.00	1.28	0.11	2.01	7.30	2.63	8.00
Min	105.00	186.00	-1.43	0.08	0.64	-3.60	0.44	-3.40

Real RMSE	0.09	True S.D.	0.62	Separation	6.65	Particip Reliability .98
Model RMSE	0.09	True S.D.	0.62	Separation	7.04	Particip Reliability .98
S.E. of PDSS mean = 0.11						

UMEAN = 0.0000 USCALE = 1.0000

PDSS items raw score-to-measure correlation = -1.00

Data points: 6368 Log-likelihood Chi-Square: 12552.26 with 6047 *d.f.* *p*= 0.0000

Global Root-Mean-Square Residual (exluding extreme scores): 0.8580

8.3.2 Rating scale requirements: English PDSS.

This section examines the quantitative functioning of the English PDSS rating scale. Table 22 contains summary statistics for the 5-point Likert response categories used for the PDSS. Summary statistics for the response categories for individual items are discussed later in this chapter.

a) Category observations

The frequency of responses to the categories of the 5-point Likert rating scale can be seen in Table 22. For response category 0 there were 2679 or 41 % of the total responses. The category that had the least responses were 4 (strongly agree) which had only 12 % or 769 responses. In this summary table no category had less than 10 responses.

No category across all items of the PDSS had less than ten observations, although there were individual items which had response categories with less than 10 observations. The overall response pattern indicates that all category frequency counts for the rating scale are sufficiently large. This indicates that locally stable estimates of the rating scale structure may be produced (Linacre, 2004).

Table 22 Summary Statistics for the 5-Point Likert Response Categories Used for the PDSS

Summary of Category Structure (N = 187)										
Category	Label	Score	Observed Count	%	Observed Averagea	Sample Expect.	MNSQ		Structure Calibration	Category Measure
							Infit	Outfit		
0	Strongly Disagree	0	2679	41	-2.17	-2.11	0.96	0.99	NONE	(-2.23)
1	Disagree	1	1311	20	-0.86	-1.01	0.98	0.71	-0.86	-0.88
2	Neither Disagree nor Agree	2	698	11	-0.15	-0.30	0.90	0.96	-0.01	-0.09
3	Agree	3	1086	17	0.23	0.37	1.31	1.61	-0.42	0.81
4	Strongly Agree	4	769	12	1.72	1.71	1.01	1.04	1.28	(2.51)

[a] Observed Average is mean of measures in category, not a parameter estimate.

b) Regular observation distribution

All categories were used fairly regularly, although category 0 (strongly disagree) was selected more frequently and has an observed count of 41%. Category 1 (disagree) follows at 20% (interestingly these values are the same in the same in the Afrikaans sample) and category 3 (agree) at 17%. Category 2 (neither disagree nor agree) and 4 (strongly agree) have the least observations (11% and 12% respectively). This indicates that mothers were less likely to choose the middle category (neither disagree nor agree) and the most extreme category (strongly agree) and that redundant categories may exist.

c) Average measures advance monotonically with category

The average measures (expressed as logits) increase from small to large in categories: -2.17, -0.86, -0.15, 0.23 and 1.72. The observed average measures demonstrate values that are fairly close to their expected values.

d) OUTFIT mean-squares less than 2

Outfit mean-squares indicate random noise and unexpected observations in a category. Most categories demonstrate values close to the expected 1.0. Category 3 (agree) had the largest value (1.61) indicating that the category has been used unexpectedly. A value of 1.6 is still considered acceptable for this sample.

e) Step calibrations advance orderly

The step calibrations should advance from easy to hard uniformly. In Table 22 the step calibrations are -0.86, -0.01, -0.42 and 1.28. The pattern is similar to the Afrikaans PDSS with disordered transition between categories 1 and 2 as well as between categories 2 and 3. Figure 3 shows that category 2 does not form a prominent hill on the graph as it should, indicating that it is relatively rarely observed (Linacre, 2004). If either categories 1 and 2 were combined, or categories 2 and 3, it would form a more prominent category and the transition between 1 and 3 will be as expected. Categories 0, 3 and 4 form distinct peaks, while category 1's peak is also somewhat submerged.

f) Step difficulties advance by at least 1 logit

The categories have step difficulties which advance as follows:

Categories 1-2: -.01 – (-0.86) = 0.85

Categories 2-3: -0.42 – (-.01) = -0.41

Categories 3-4: 1.28 – (-0.42) = 1.7

According to Linacre (2004), a five category rating scale should ideally advance by at least 1 logit Linacre (2004, p.274). The width of advances for categories 1 to 2 and categories 2 to 3 is somewhat narrow. This confirms the problematic nature of category 2. The step calibration of categories 2-3 are especially problematic and may indicate substantive problems with the rating scale category definitions when used with this sample. Categories 3-4 demonstrate an adequate step of 1.7 logits.

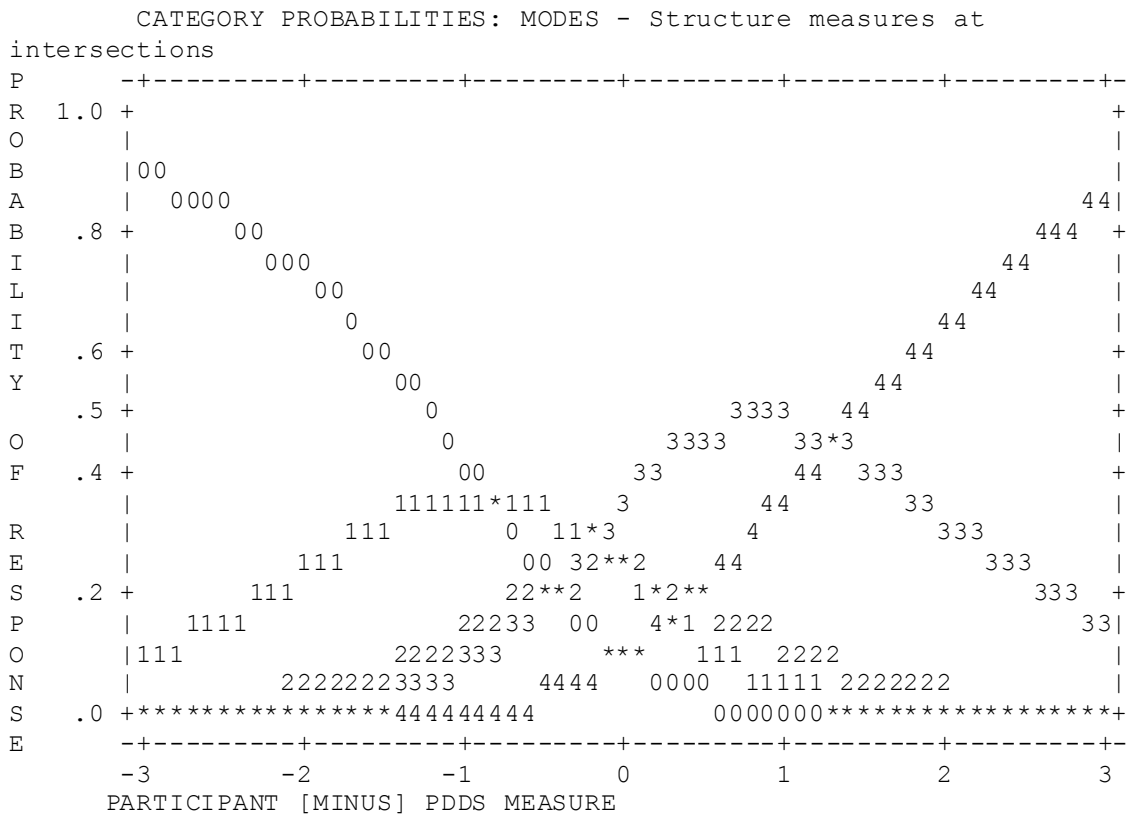

Figure 3 Probability curves of observations in each category of the PDSS.

8.3.3 Item person construct map: English PDSS.

Table 23 represents a geographical description of the two facets – participants and PDSS items. In this table the items are shown located at their calibrated measures. This allows for the comparison of both person ability (the presence of depression) and item difficulty (difficult items indicate more depression). A mapped hierarchy of the 35 items is provided along the vertical logit ruler. The items at the bottom of this figure are those that are easier for the participants to agree with. The items at the upper end are those that are more difficult to agree with. PDSS items are positioned according to its measure in logits. Ideally items should be spread out along the vertical logit ruler. This indicates good variable definition and is important for construct validity. From Table 23a it can be seen that in many instances more than two items are positioned on the same logit measure.

It seems as if insufficient items are present at either end of the difficulty level. This may indicate that low-ability (non-depressed) people did not understand the items, were unfamiliar with an expression used, or that the questionnaire is not appropriate for non-clinically depressed people. However, Table 23b shows that the categories in the rating scale cover the spread of person abilities well. The spread of ability (the absence or presence of depression) is much wider than the spread of item difficulty. There is an overrepresentation of items at the mean level and insufficient items at the upper and lower ends of the vertical logit ruler to allow for a proper description of the high and low scoring person and to determine depression accurately. A similar distribution is evident in

the Afrikaans sample, but in the English sample the distribution extends more toward the upper end of the vertical logit ruler indicating more English participants who scored higher than the items were able to measure.

From the distribution along the vertical logit ruler, it is evident that a significant proportion of the English sample screened positively for postpartum depression. Another significant proportion of the English sample screened negatively for postpartum depression.

Items 7 and 21 from the SUI dimension were the items that were most difficult to strongly agree with. These are closely followed by the remaining three items from the same dimension. Yet there were still participants who scored higher than the items could measure. This indicates that some measurement precision is lost at the most difficult level.

8.3.4 Item fit: English PDSS.

Item fit for the English PDSS is indicated in Table 24. A range of 0.60 to 1.40 for MNSQ infit and outfit are acceptable limits (Bond & Fox, 2007; Wright & Linacre, 1994). Items 1, 8, 15, 22, and 29 had infit mean-squares greater than 1.40 which indicates that they either do not fit the definition of the constructs they are measuring very well (thus forming another constructs). All these items are from the Sleeping/Eating Disturbances (SLP) dimension and their poorer fit values within the total PDSS may be a reflection that they form a separate dimension. No items were overfitted (i.e. < 0.60).

Table 23a Item-Person Distribution Map for the English PDSS (N = 187)

```
PARTICIPANT - MAP - PDDS
           <more>|<rare>
 5               +
                 |
                 |
                 |
                 |
                .|
 4               +
                 |
                .|
                 |
                .|
                 |
 3              #+
                .|
                 |
               .# T|
                .|
 2              .+
                 |
                 |
                #|
                #|T PDSS_21  PDSS_7
 1              .+  PDSS_14
               .# S|  PDSS_29  PDSS_35
              ###  |S PDSS_16  PDSS_28  PDSS_8
            .#####  |  PDSS_30
            .#####  |  PDSS_15  PDSS_18  PDSS_19  PDSS_20  PDSS_22  PDSS_27
                       PDSS_33
 0        #######  +M PDSS_10  PDSS_11  PDSS_12  PDSS_26  PDSS_32
            .####  |  PDSS_1   PDSS_31  PDSS_34  PDSS_4
           ######  |  PDSS_13  PDSS_17  PDSS_25
            #####  |S PDSS_23  PDSS_5   PDSS_6
           .##### M|  PDSS_2
-1          .####  +
           .#####  |T PDSS_3   PDSS_9
             .##   |  PDSS_24
            ####   |
             .##   |
-2           ###   +
               #   |
             ### S|
             .##   |
              ##   |
-3            .#   +
              .#   |
                   |
              ##   |
               .   |
-4               T+
                   |
              ##   |
                   |
                   |
-5            .#   +
                   |
                   |
                   |
                   |
-6           .##   +
           <less>|<frequ>
EACH "#" IS 2. EACH "." IS 1.
```

Table 23b Item Category-Person Distribution Map for the English PDSS (N = 187)

```
  PARTICIPANT - MAP - PDDS - Expected score zones (Rasch-half-point thresholds)
           <more>|  Disagree   Neither D  Agree      Strongly Agree
5                +
                 |
                 |
                 |
                 |
              .  |
4             .  +
              .  |
                 |
              .  |
                 |
3             #  +
              .  |                                    PDSS_2.35
                 |                                    PDSS_1.35
                                                      PDSS_7.35
             .# T|                                    PDSS_1.35
                                                      PDSS_1.35
                                                      PDSS_8.35
              .  |                                    PDSS_2.35
                                                      PDSS_3.35
2             .  +                                    PDSS_2.35
                                                      PDSS_3.35
                 |                                    PDSS_1.35
                                                      PDSS_1.35
                                                      PDSS_1.35
                                                      PDSS_2.35
                                                      PDSS_3.35
                 |                      PDSS_2.25     PDSS_1.35
                                                      PDSS_1.35
                                                      PDSS_1.35
                                                      PDSS_2.35
                                                      PDSS_2.35
                                                      PDSS_3.35
                                                      PDSS_4.35
              #  |                      PDSS_7.25     PDSS_1.35
                                                      PDSS_2.35
                                                      PDSS_2.35
                                                      PDSS_3.35
              #  |T                     PDSS_1.25     PDSS_1.35
                                                      PDSS_3.35
                                                      PDSS_6.35
1             .  +                      PDSS_2.25     PDSS_2.35
                                        PDSS_3.25     PDSS_5.35
                                                      PDSS_9.35
             .# S|             PDSS_2.15  PDSS_1.25   PDSS_2.35
                               PDSS_7.15  PDSS_2.25   PDSS_3.35
                                          PDSS_3.25
                                          PDSS_8.25
            ###  |S            PDSS_1.15  PDSS_2.25   PDSS_2.35
                                          PDSS_2.25
                                          PDSS_3.25
          .#####  |            PDSS_2.15  PDSS_1.25
                               PDSS_2.15  PDSS_1.25
                               PDSS_3.15  PDSS_1.25
                                          PDSS_1.25
                                          PDSS_1.25
                                          PDSS_1.25
                                          PDSS_2.25
                                          PDSS_3.25
          .#####  |                      PDSS_1.25
                                          PDSS_2.25
                                          PDSS_3.25
                                          PDSS_4.25
0        #######  +M PDSS_7.05  PDSS_1.15  PDSS_1.25
```

Table 23b (continued) Item Category-Person Distribution Map for the English PDSS (N = 187)

```
      PARTICIPANT - MAP - PDDS - Expected score zones (Rasch-half-point thresholds)
               <more>|  Disagree   Neither D  Agree      Strongly Agree

    0       #######  +M PDSS_7.05  PDSS_1.15  PDSS_1.25
                                   PDSS_2.15  PDSS_2.25
                                   PDSS_3.15  PDSS_3.25
                                   PDSS_8.15
              .####  |  PDSS_1.05  PDSS_1.15  PDSS_1.25
                        PDSS_2.05  PDSS_1.15  PDSS_2.25
                        PDSS_3.05  PDSS_2.15  PDSS_5.25
                                   PDSS_2.15  PDSS_6.25
                                   PDSS_3.15
              ######  |  PDSS_2.05  PDSS_1.15  PDSS_2.25
                                   PDSS_1.15
                                   PDSS_1.15
                                   PDSS_2.15
                                   PDSS_3.15
              #####  |S PDSS_2.05  PDSS_1.15  PDSS_3.25
                                   PDSS_3.15
                                   PDSS_3.15
                                   PDSS_4.15
              .##### M|             PDSS_1.15  PDSS_2.25
                                   PDSS_1.15  PDSS_9.25
   -1          .####  +  PDSS_2.05  PDSS_1.15
                        PDSS_2.05  PDSS_2.15
                        PDSS_8.05  PDSS_2.15
                                   PDSS_5.15
                                   PDSS_6.15
              .#####  |T PDSS_1.05  PDSS_2.15
                        PDSS_1.05
                        PDSS_1.05
                        PDSS_2.05
                        PDSS_3.05
                .##  |  PDSS_1.05
                        PDSS_3.05
                        PDSS_3.05
                        PDSS_3.05
               ####  |  PDSS_1.05  PDSS_3.15
                        PDSS_1.05
                        PDSS_2.05
                .##  |  PDSS_1.05  PDSS_2.15
                        PDSS_1.05  PDSS_9.15
                        PDSS_4.05
   -2           ###  +  PDSS_3.05
                  #  |  PDSS_1.05
                        PDSS_2.05
                        PDSS_5.05
                        PDSS_6.05
               ### S|  PDSS_1.05
                        PDSS_2.05
               .##  |
                ##  |
   -3            .#  +  PDSS_2.05
                        PDSS_3.05
                 .#  |
                     |  PDSS_9.05
                ##   |  PDSS_2.05
                 .   |
   -4              T+
                    |
                ##  |
                    |
                    |
   -5           .#  +
                    |
                    |
                    |
                    |
   -6            .##  +
               <less>|  Strongly   Disagree   Neither D  Agree
EACH "#" IS 2. EACH "." IS 1.
```

The difficulty level in logits (measure) and the measurement error (model SE) for each item are also indicated in Table 24. The Rasch error estimate, a standard error estimate (referred to as model error or model S.E.) indicates measurement precision (Wright, 1995). Smaller error estimates are better. However, if a respondent (or item) has haphazard responses it will reflect in a larger infit or outfit value. A large SEM means that less confidence can be placed in that respondent's (or item's) estimated score. All measurement error values for the English PDSS are small with values less than 0.12 and a mean of 0.09.

The Pearson item-total correlation (r_{it}) gives an indication of construct validity and whether there may be coding problems. The Pearson item-total correlation (r_{it}) has a range of -1 to +1. Negative or zero values suggest persons or items with response strings that contradict the variable, or no fit. A high negative correlation indicates a reverse coding problem. From Table 24 it can be seen that no negative correlations are evident. Furthermore, similar to the values for the Afrikaans PDSS, all the values are fairly high in spite of some fit problems. Pearson item-total correlation (r_{it}) values range from 0.55 to 0.79 with no negative correlations. Correlations are expected to higher within the PDSS dimensions than in the PDSS total, which, as a whole, may be considered multidimensional.

Table 24 Item Statistics for the English PDSS Total: Misfit Order (N = 187)

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	PDDS
1	281	187	-0.10	.09	2.01	7.3	2.63	8.0	A .55	.72	37.9	49.0	PDSS_1
8	200	187	0.52	.09	1.43	3.4	2.29	4.5	B .60	.68	48.4	52.3	PDSS_8
29	157	187	0.74	.10	1.46	3.1	1.95	3.0	C .58	.65	59.9	59.4	PDSS_29
22	223	187	0.30	.09	1.60	4.6	1.80	3.2	D .61	.69	45.1	51.2	PDSS_22
15	234	186	0.17	.08	1.60	4.6	1.72	3.0	E .62	.70	49.2	50.9	PDSS_15
2	367	187	-0.85	.09	1.36	3.1	1.67	4.6	F .68	.75	41.8	47.3	PDSS_2
31	284	187	-0.15	.08	1.20	1.7	1.61	2.3	G .69	.72	54.9	51.0	PDSS_31
30	212	187	0.39	.09	1.17	1.4	1.40	2.0	H .67	.69	54.9	51.4	PDSS_30
24	438	187	-1.43	.09	1.10	0.9	1.31	2.1	I .74	.77	44.5	46.8	PDSS_24
27	211	187	0.25	.08	0.92	-0.7	1.18	0.9	J .68	.68	58.2	53.4	PDSS_27
13	333	187	-0.48	.08	1.13	1.2	1.05	0.4	K .74	.74	41.8	49.0	PDSS_13
20	217	187	0.21	.08	1.10	0.9	0.93	-0.2	L .67	.67	53.3	53.3	PDSS_20
21	105	187	1.28	.11	1.07	0.5	0.78	-0.5	M .61	.61	68.1	68.5	PDSS_21
23	356	187	-0.68	.08	1.02	0.2	0.99	0.0	N .75	.75	52.2	47.6	PDSS_23
3	409	187	-1.10	.09	1.01	0.1	1.01	0.1	O .77	.77	41.8	47.2	PDSS_3
9	424	187	-1.26	.09	0.99	0.0	0.94	-0.5	P .79	.77	51.1	49.8	PDSS_9
25	314	187	-0.34	.09	0.98	-0.2	0.93	-0.5	Q .76	.74	47.8	48.0	PDSS_25
32	271	187	-0.01	.09	0.96	-0.4	0.87	-0.9	R .74	.72	54.9	48.3	PDSS_32
11	290	187	-0.09	.09	0.96	-0.4	0.96	-0.3	q .74	.73	49.5	47.5	PDSS_11
5	332	187	-0.56	.08	0.87	-1.3	0.94	-0.4	p .76	.74	51.1	47.2	PDSS_5
4	275	187	-0.13	.08	0.92	-0.8	0.94	-0.4	o .74	.72	50.0	48.5	PDSS_4
16	206	187	0.52	.09	0.92	-0.7	0.92	-0.4	n .71	.69	57.7	51.2	PDSS_16
7	106	187	1.16	.11	0.92	-0.4	0.65	-0.8	m .61	.60	70.3	69.7	PDSS_7
17	314	187	-0.40	.08	0.87	-1.2	0.91	-0.5	l .75	.73	52.2	48.5	PDSS_17
6	336	187	-0.55	.08	0.89	-1.0	0.86	-1.0	k .76	.74	46.2	47.8	PDSS_6
28	142	187	0.66	.09	0.88	-0.8	0.59	-1.2	j .65	.62	68.7	65.6	PDSS_28
14	119	187	1.01	.10	0.85	-1.0	0.66	-0.7	i .63	.61	65.9	67.4	PDSS_14
34	266	187	-0.13	.08	0.76	-2.3	0.58	-2.6	h .75	.70	60.4	49.9	PDSS_34
19	242	187	0.10	.08	0.75	-2.4	0.59	-2.4	g .74	.70	59.3	50.5	PDSS_19
35	133	186	0.75	.09	0.71	-2.1	0.44	-1.8	f .65	.61	70.7	66.4	PDSS_35
18	232	187	0.14	.08	0.71	-2.8	0.54	-2.5	e .74	.69	61.0	51.3	PDSS_18
12	255	187	0.03	.09	0.70	-3.0	0.61	-2.7	d .77	.71	53.8	49.4	PDSS_12
26	265	187	-0.10	.08	0.69	-3.1	0.56	-3.1	c .77	.71	61.5	49.2	PDSS_26
10	260	187	-0.02	.08	0.69	-3.1	0.60	-2.6	b .76	.71	56.6	49.1	PDSS_10
33	232	187	0.15	.09	0.64	-3.6	0.51	-3.4	a .76	.70	64.3	51.0	PDSS_33
MEAN	258.3	186.9	0.00	.09	1.02	0.0	1.05	0.1			54.4	52.4	
S.D.	84.7	0.2	0.63	.01	0.30	2.4	0.52	2.5			8.5	6.6	

PARTICIPANT: REAL SEP.: 3.86 REL.: .94
PDDS: REAL SEP.: 6.65 REL.: .98

8.3.5 Dimensionality: English PDSS.

A Rasch principle component analysis (PCA) of residuals was performed. Residuals are the differences between the scores that are predicted by the Rasch model and the actual scores that are observed (Chou & Wang, 2010; Hong & Wong, 2005). The PCA indicates the presence of secondary dimensions (Linacre, 2009) and was performed using calibrated data (logits) as opposed to raw data to avoid non-linearity in data accumulating in the PCA (Maree, personal communication, October 12, 2009). Table 25 indicates the variance explained by the measures and raw unexplained variance. The empirical values match the modelled values perfectly in most instances, which indicate that the measures explain the expected amount of variance in the data.

The variance explained by the measures is 64.60 eigenvalues or 64.9% which means that the measures explains most of the variance and that the English PDSS has a wide spread of items and persons with different abilities, i.e. different degrees of PPD. Raw unexplained variance is 35.1%. Eigenvalues greater than 1.40 are indicative of possible secondary dimensions. The unexplained variance in the first contrast is 3.60 eigenvalues (3.7%), in the second contrast, 3.20 eigenvalues (3.2%), in the third contrast, 3 eigenvalues (3%), in the fourth contrast 2.20 eigenvalues (2.2%), and in the fifth contrast 1.90 eigenvalues (2%). These values indicate that five additional dimensions exist, and that the PDSS is a multidimensional screening scale. The plot in Figure 4 below as well as the loadings of factors in Table 26 also suggest that dimensionality in the PDSS exists.

Table 25 Variance Decomposition of the Observations for the English PDSS Items (N = 187)

	Empirical			Modeled
	Eigenvalue units	%	%	%
Total raw variance in observations	99.60	100.00		100.00
Raw variance explained by measures	64.60	64.90		65.60
Raw variance explained by persons	33.80	33.90		34.30
Raw variance explained by items	30.90	31.00		31.30
Raw unexplained variance (total)	35.00	35.10	100.00	34.40
Unexplained variance in 1st contrast	3.60	3.70	10.40	
Unexplained variance in 2nd contrast	3.20	3.20	9.00	
Unexplained variance in 3rd contrast	3.00	3.00	8.60	
Unexplained variance in 4th contrast	2.20	2.20	6.20	
Unexplained variance in 5th contrast	2.00	2.00	5.60	

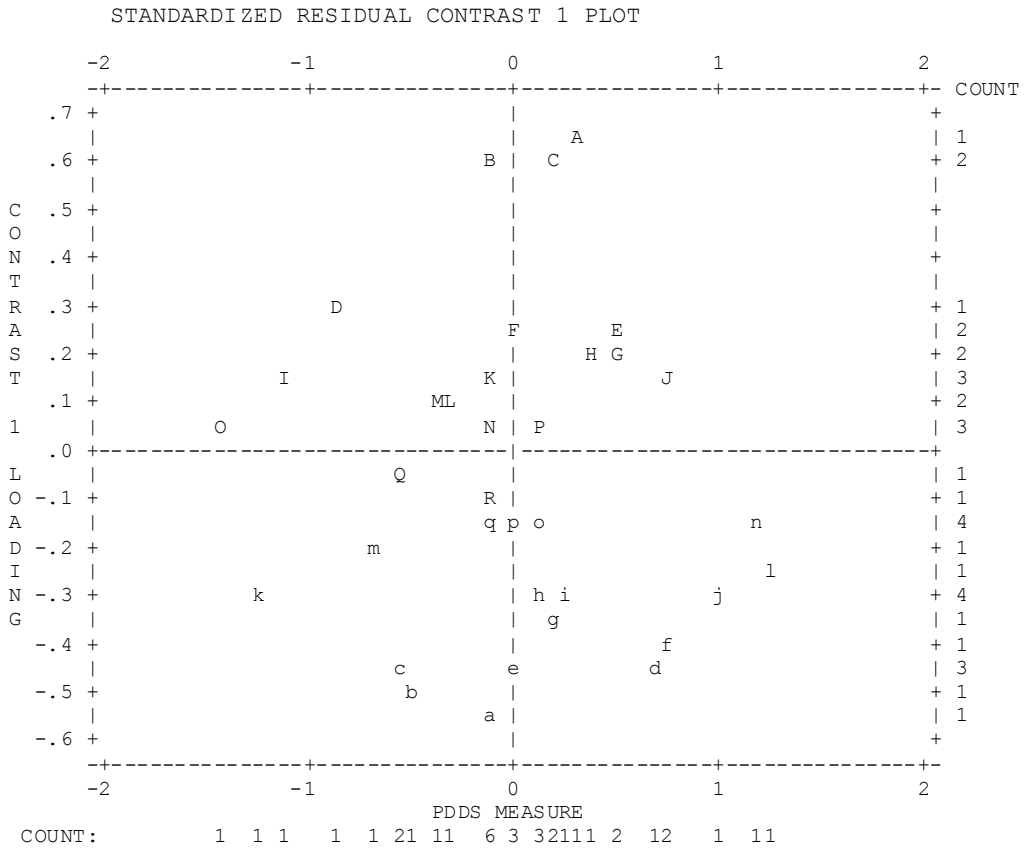

Figure 4 Standardized residual contrast of English PDSS items.

Table 26 Standardized Residual Loading for the English PDSS (Sorted by Loading)

PDSS Dimension	PDSS Item	Item Content	Loading	Measure	MNSQ		Entry Number
					Infit	Outfit	
SLP	1	I had trouble sleeping even when my baby was asleep.	.61	-0.21	1.96	2.74	A
SLP	22	I tossed and turned for a long time at night trying to fall asleep.	.59	0.21	1.65	1.77	B
SLP	15	I woke up on my own in the middle of the night and had trouble getting back to sleep.	.52	0.13	1.66	1.64	C
ANX	2	I got anxious over even the littlest things that concerned my baby.	.33	-0.80	1.28	1.78	D
MNT	32	I had difficulty focusing on a task.	.32	-0.13	0.88	0.82	E
MNT	11	I could not concentrate on anything.	.29	-0.26	0.83	0.95	F
ANX	16	I felt like I was jumping out of my skin.	.25	0.34	0.91	0.91	G
ANX	30	I felt like I had to keep moving or pacing.	.24	0.29	1.16	1.35	H
SLP	8	I lost my appetite.	.24	0.39	1.47	2.00	I
SLP	29	I knew I should eat but I could not.	.20	0.76	1.52	1.76	J
MNT	25	I had a difficult time making even a simple decision.	.19	-0.43	0.90	0.90	K
ELB	3	I felt like my emotions were on a roller coaster.	.19	-1.08	0.94	0.97	L
ELB	24	I have been very irritable.	.10	-1.29	1.03	1.45	M
MNT	4	I felt like I was losing my mind.	.05	-0.17	0.89	0.92	N
ELB	17	I cried a lot for no real reason.	.01	-0.44	0.90	0.88	O
GLT	34	I felt like a failure as a mother.	-.57	-0.10	0.86	0.67	a
SUI	35	I just wanted to leave this world.	-.57	1.01	1.02	0.64	b
SUI	28	I felt that my baby would be better off without me.	-.56	0.91	1.16	0.78	c
SUI	14	I started thinking that I would be better off dead.	-.48	1.18	1.15	0.83	d
ELB	10	I was scared that I would never be happy again.	-.42	-0.05	0.69	0.60	e
SUI	21	I wanted to hurt myself.	-.39	1.36	1.24	0.90	f
SUI	7	I have thought that death seemed like the only way out of this living nightmare.	-.39	1.35	1.21	0.77	g
GLT	6	I felt like I was not the mother I wanted to be.	-.38	-0.58	0.85	0.84	h
GLT	13	I felt like so many mothers were better than me.	-.38	-0.56	1.08	0.99	i
GLT	20	I felt guilty because I could not feel as much love for my baby as I should.	-.36	0.26	1.29	1.00	j
GLT	27	I felt like I had to hide what I was thinking or feeling towards the baby.	-.36	0.31	1.01	1.08	k
LOS	19	I did not know who I was anymore.	-.29	0.08	0.80	0.64	l
ANX	23	I felt all alone.	-.20	-0.71	1.03	0.95	m
LOS	33	I did not feel real.	-.16	0.15	0.63	0.50	n
ELB	31	I felt full of anger ready to explode.	-.16	-0.23	1.28	1.33	o
LOS	12	I felt as though I had become a stranger to myself.	-.12	-0.02	0.67	0.60	p
ANX	9	I felt really overwhelmed.	-.10	-1.19	0.85	0.88	q
LOS	26	I felt like I was not normal.	-.10	-0.09	0.70	0.58	R
LOS	5	I was afraid that I would never be my normal self again.	-.08	-0.54	0.82	0.88	Q
MNT	18	I thought I was going crazy.	-.06	0.14	0.79	0.62	P

8.3.6 Performance of English PDSS dimensions: Rasch analysis of persons and items.

This section presents the results of the Rasch analysis of persons and items for the seven dimensions of the English PDSS. Summary statistics for each dimension is presented in Table 27 and is discussed below. This will be followed by the item fit statistics for the five items that constitute each dimension.

8.3.6.1 Sleeping/Eating Disturbances (SLP) dimension.

Person and item information for the Sleep/Eating dimension is presented in Table 27. Winsteps (Linacre, 2009) eliminated 37 respondents in this dimension with extreme scores who scored all high (4's) or all low (0's) hence the observed count of 150 participants. The average raw score of persons in this dimension is the second lowest of the seven dimensions at 7.20.

Person fit to the Rasch model is an index of whether individuals are responding to items in a consistent manner or whether the responses are erratic or idiosyncratic. The person infit mean-squares statistic = 0.96 with at t-statistic of -0.10, and the outfit mean-square statistic is 0.98 with a t-value of 0.00. These values are near to the Rasch-modeled expectations of 1.00. This indicates that there is neither too much nor too little variation with most participants responding as expected. The *SD* infit and outfit values for this dimension are 0.68 and 0.75 respectively. The minimum and maximum values for infit (0.07 and 3.72) and outfit (0.06 and 4.35) are extreme. This indicates that there are some persons that had unexpected responses to items on the SLP dimension.

Table 27 Summary Statistics for the PDSS Dimensions

Statistic		Sleeping / eating disturbances	Anxiety / insecurity	Emotional lability	Cognitive impairment	Loss of self	Guilt / shame	Contemplating harming oneself
Mean raw score	Items	219.00	313.00	341.00	276.40	265.20	272.60	121.00
	Persons	7.20	8.90	9.10	8.20	7.90	8.40	6.50
Measure (logits)	Items	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Persons	-0.66	-0.34	-0.33	-0.72	-0.89	-0.55	-1.15
Model error	Items	0.09	0.10	0.10	0.11	0.13	0.11	0.15
	Persons	0.57	0.63	0.66	0.69	0.74	0.71	0.67
SD (logits)	Items	0.32	0.90	0.76	0.28	0.60	0.68	0.58
	Persons	1.22	1.69	1.81	2.04	2.28	2.11	1.75
M Infit MNSQ	Items	1.01	1.01	1.02	0.98	1.00	1.02	0.99
	Persons	0.96	1.01	0.98	0.97	0.98	0.97	0.99
M Outfit MNSQ	Items	0.98	1.01	0.97	0.98	0.98	0.95	0.93
	Persons	0.98	1.01	0.97	0.98	0.98	0.95	0.93
Mean Infit (t)	Items	0.00	0.10	0.20	-0.10	0.00	0.00	-0.30
	Persons	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	0.00
Mean Outfit (t)	Items	-0.20	0.10	-0.30	-0.10	-0.20	-0.60	-0.50
	Persons	0.00	0.00	-0.10	-0.10	-0.10	0.00	0.00
Separation	Items	3.21	8.70	7.25	2.20	4.48	5.51	3.34
	Persons	1.56	2.02	2.10	2.30	2.41	2.38	2.06
Cronbach alpha		.85	.88	.91	.93	.95	.93	.95
Rasch reliability	Persons	.71	.80	.82	.84	.85	.85	.81

MNSQ = mean-square

Reasonable mean-square fit values for a rating scale are recommended at 0.60 – 1.40 (Wright & Linacre (1994). The minimum of -2.70 logits for the items in this dimension is very low indicating that one or some women in this sample did not have symptoms of sleeping/eating disturbances. The maximum value of 2.93, however, indicates that some participants had significant symptoms of sleeping/eating. The average logit for person ability or measure of sleeping/eating disturbances is -0.66 with a model standard error of 0.57 and a *SD* of 1.22. This means that almost 68 % of participants fell within a range of -1.88 and 0.56 logits (assuming that the distribution is approximately normal). Therefore the minimum measure value is (-2.70) is not extreme. The maximum measure value (2.93) is extreme. Extreme values are at least two standard deviations (i.e. 1.22 x 2 = 2.44) from the mean. This is approximately on a 5 % significance level.

The PDSS items on the SLP dimension functioned very well, but this will be confirmed later in the chapter when the items are examined individually in more detail. The average infit and outfit values of 1.01 (t = 0.00) and 0.98 (t = -0.20) respectively are ideal Chi-Square values for these indices. The infit and outfit *SD* values were 0.16 and 0.16. This indicates that there is very little variation and that most of the items in this dimension fit the Rasch model. The minimum and maximum MNSQ statistics for infit (min 0.80; max 1.18) as well as the minimum and maximum MNSQ statistics for outfit (min 0.77; max 1.16) in the SLP dimension are within an adequate range and indicate that the items function well together within this dimension.

Item reliability and item separation indices provide an indication of the measure's ability to define a distinction hierarchy of items along the measured variable. More confidence can be placed in an item's constant placement across different samples when

these values are higher (Bond & Fox, 2001). A large item separation index also demonstrates better confidence in the spread of items across the targeted continuum (Beck & Gable, 2001e).

Reliability information for both items and persons on the SLP dimension is also presented in Table 27. The person separation index is 1.56. This value is the lowest of the 7 dimensions and indicates that persons are not as well separated across the SLP dimension as they are on the other PDSS dimensions. The Rasch person reliability estimate is conceptually equivalent to Cronbach alpha (or KR-20 in the dichotomous case), but is computed using logits and does not include extreme scores making its value lower than that for Cronbach alpha (Linacre, 2009). Cronbach alpha is the conventional "test" reliability index which reports an estimated test reliability based on the sample's raw scores and is computed on the complete data set, including extreme scores. The Rasch model's reliability determination, based on logits and excluding extreme scores is the preferred reliability estimate. The Rasch person reliability estimate for the SLP dimension is also lower than other dimensions at .71 along with the Cronbach Alpha (KR-20) value at .85. The SLP dimension therefore demonstrates adequate internal consistency, but it is lower than that of the other PDSS dimensions. Participants are not responding as consistently across the 5 items of this dimension and the PDSS may not be screening the participants' level of sleep and eating disturbances as well as the other facets of PPD. The SLP dimension demonstrates a much lower item separation index of 3.21. The items on the SLP dimension are therefore not as well dispersed on the scale.

8.3.6.2 Anxiety/Insecurity (ANX) dimension.

The person and item information for the ANX dimension is also presented in Table 27. Data for this dimension is presented for 169 participants as Winsteps (Linacre, 2009) eliminated 18 respondents with extreme scores. The average raw score of persons in this dimension is the second highest of the 7 dimensions at 8.90.

The person infit mean-squares statistic is 1.01 with a t-statistic of -0.10, and the outfit mean-square statistic is 1.01 ($t = 0.00$). These values are near to the Rasch-modeled expectations of 1.00. The *SD* infit and outfit values for this dimension are fairly wide at 0.85 and 0.90 respectively. The minimum and maximum MNSQ statistics for infit (0.03 and 4.75) and outfit (0.03 and 4.83) indicate that there are some persons that had unexpected responses to items on this dimension.

The minimum of -3.81 logits for the items in this dimension is very low indicating that one or some women in this sample did not have symptoms of anxiety/insecurity. The maximum value of 3.79, however, indicates that some participants had significant symptoms of anxiety/insecurity. The average logit for person ability or measure of anxiety/insecurity levels, is -0.34 with a model standard error of 0.63 and a *SD* of 1.69. This means that almost 68 % of participants fell within a range of -2.03 and 1.35 logits (assuming that the distribution is approximately normal). Therefore the minimum and maximum measure values of 3.78 and -3.80 are extreme.

The PDSS items on the Anxiety/Insecurity dimension functioned very well, but this will be confirmed later in the chapter when the items are examined individually in more detail. The average MNSQ indices for both item infit and outfit are ideal at 1.01 ($t =$

0.10). The infit and outfit *SD* values were 0.11 and 0.21. This indicates that there is very little variation and that most of the items in this dimension fit the Rasch model. The minimum and maximum MNSQ statistics for infit (min 0.89; max 1.20) as well as the minimum and maximum MNSQ statistics for outfit (min 0.79; max 1.40) in the ANX dimension are adequate, although the maximum outfit value is slightly elevated. The values are, however, not as extreme as those for the PDSS as a whole (min infit 0.63; max infit 1.96; min outfit 0.50; max outfit 2.74). This indicates that the items function well together within this dimension.

Reliability information for both items and persons on the ANX dimension shows a person separation index of 2.02. This indicates that persons are sufficiently separated across the ANX dimension. The Rasch person reliability estimate for the Anx dimension is .80 and the Cronbach Alpha value is .88. This indicates that the PDSS items separated the participants well along the continuum. It further demonstrates good internal consistency of responses to items and that the items correlate highly with each other. Participants are therefore responding in a consistent fashion across the 5 items of this dimension.

The PDSS's ANX dimension therefore adequately screens for participants' levels of anxiety. The PDSS ANX dimension demonstrates an item separation index of 8.70. This indicates that the items on the ANX dimension are well dispersed on the scale and can distinguish between a number of levels of performance.

8.3.6.3 Emotional Lability (ELB) dimension.

The person and item information for the ELB dimension can also be found in Table 27. Winsteps (Linacre, 2009) eliminated 21 respondents in this dimension with extreme scores and the data is presented for the remaining 166 participants with non-extreme scores. The average raw score of persons in this dimension is 9.10. This is the highest raw score of the seven dimensions. The infit mean-squares statistic is 0.98 (t = -0.10) and the outfit mean-square statistic is 0.97 (t = -0.10). Both these values are close to the Rasch-modeled expectations of 1.00 with little variation and participants responding as expected with good fit to the Rasch model. The *SD* infit and outfit values for this dimension are rather wide at 0.95 and 1.10 respectively.

The minimum and maximum MNSQ statistics for person infit (0.11 and 5.59) and outfit (0.10 and 9.25) are extreme (acceptable value 0.60 – 1.40). The maximum MNSQ statistic is high for outfit (9.25) – the most extreme of all the dimensions. This indicates that there are persons that had unexpected responses to items on the ELB dimension.

The minimum and maximum values in logits (-3.67 and 3.62 respectively) for the items in this dimension are extreme indicating that one or some women in this sample did not have symptoms of emotional lability and that one or some participants had significant symptoms of emotional lability. The average logit for person ability is -0.33 with a model standard error of 0.66 and a *SD* of 1.81. Therefore, around 68% of participants fell within a range of -2.14 and 1.48 logits. The minimum measure value (-3.65) is not extreme. The maximum measure value (3.62) is extreme.

The items on the ELB dimension appear to have functioned very well. This will be confirmed later in the chapter when they are examined individually. The average infit and outfit values are 1.02 (t = 0.20) and 0.97 (t = -0.3) respectively. The infit and outfit *SD* values are 0.09 and 0.14 indicating that there is very little variation and that most of the items in the ELB dimension fit the Rasch model. The minimum and maximum MNSQ statistics for infit (min 0.89; max 1.15) as well as the minimum and maximum MNSQ statistics for outfit (min 0.73; max 1.16) in this dimension are adequate indicating that the items in the ELB dimension did not have extreme values and function well together.

Reliability information for items and persons on the ELB dimension shows a person separation index of 2.10. This indicates that persons are sufficiently separated across this dimension. The person reliability estimate for the ELB dimension is good at .82 and the Cronbach Alpha value of .91 also indicates good internal consistency of responses to items. This demonstrates consistent responding by participants across the 5 items of this dimension. The PDSS's ELB dimension therefore adequately screens for participants' levels of emotional lability. Items in this dimension are well dispersed on the scale with an item separation of 7.25.

8.3.6.4 Mental Confusion (MNT) dimension.

Person and item information for the MNT dimension is also presented in Table 27. Winsteps (Linacre, 2009) eliminated 36 respondents in this dimension with extreme scores and the data is presented for the remaining 151 participants with non-extreme scores. The average raw score of persons in this dimension is 8.20. The person infit

MNSQ statistic is 0.97 (t = -0.10) and the outfit mean-square statistic is 0.98 (t = -0.10). Both these values are close to the Rasch-modeled expectations of 1.00. Little variation is evident and participants responded as expected with good fit to the Rasch model. The *SD* infit and outfit values for this dimension are fairly wide at 0.81 and 0.86 respectively. The minimum and maximum MNSQ statistics for infit (0.02 and 4.98) and outfit (0.02 and 5.92) are also extreme (acceptable value 0.60 – 1.40) and indicative of some unexpected responses to items on the MNT dimension.

Furthermore, the extreme minimum and maximum values in logits (-4.25 and 4.60 respectively) for the items in this dimension indicate that one or some women in this sample did not have symptoms of mental confusion while one or some participants had significant symptoms. The average logit for person ability is -0.72 with a model standard error of 0.69 and a *SD* of 2.04. Close to 68% of participants fell within a range of -2.76 and 1.32 logits making the maximum measure value (4.59) extreme. The minimum measure value of -4.23 is not extreme.

Although it will be confirmed later in the chapter, the results here suggest that the items on the MNT dimension functioned very well. The average item infit and outfit MNSQ statistics are identical at 0.98 (t = -0.10). The infit and outfit *SD* values are 0.13 and 0.16 indicating that there is very little variation and that most of the items in the MNT dimension fit the Rasch model. The minimum and maximum MNSQ statistics for item infit (min 0.81; max 1.16) as well as the minimum and maximum MNSQ statistics for outfit (min 0.78; max 1.20) in this dimension are adequate. The items function well together within this dimension and did not have extreme values.

Reliability information for both items and persons on the MNT dimension reveals a person separation index of 2.30 indicating that persons are sufficiently separated across the MNT dimension. The person reliability estimate for this dimension is .84 with a Cronbach Alpha value of .93. This shows that responses to items on the MNT dimension demonstrate good internal consistency and that participants are responding in a consistent fashion across the 5 items of this dimension. The items on the MNT dimension therefore adequately screens for mental confusion among the participants. The item separation for this dimension is 2.20. This indicates that the items on the MNT dimension are not very well dispersed on the scale.

8.3.6.5 Loss of Self (LOS) dimension.

The person and item information for the LOS dimension can be found in Table 27. Winsteps (Linacre, 2009) eliminated 47 respondents in this dimension with extreme scores and the data is presented for the remaining 140 participants with non-extreme scores. The average raw score of persons in this dimension is 7.90. Both the person infit and outfit mean-squares statistics are 0.98 (t = -0.10). These values are very close to the Rasch-modeled expectations of 1.00. Little variation is evident with participants responding as expected and indicates good fit to the Rasch model. The *SD* infit and outfit values for this dimension are fairly wide at 0.81 and 0.85 respectively.

The minimum and maximum MNSQ statistics for person infit (0.04 and 4.68) and outfit (0.04 and 4.76) are extreme. This indicates that there are some persons that had unexpected responses to items on the LOS dimension.

The extreme minimum and maximum values in logits (-4.49 and 4.42 respectively) for the items in this dimension indicate that one or more women in this sample did not have symptoms while others had significant symptoms of loss of self. The average logit for person ability is -0.89 with a model standard error of 0.74 and a *SD* of 2.28. Approximately 68% of participants fell within a range of -3.17 and 1.39 logits. The minimum measure value (-4.49) is therefore not extreme. The maximum measure value (4.42) is extreme.

Functioning of the items on the LOS dimension appears to be very good with an average infit and outfit value of 1.00 (t = 0.00) and 0.98 (t = -0.20) respectively. The infit and outfit *SD* values for items are 0.17 and 0.16 respectively indicating little variation in responses and that items in the LOS dimension fit the Rasch model. The minimum and maximum MNSQ statistics for infit are 0.78 and 1.28, while the minimum and maximum MNSQ statistics for outfit are 0.76 and 1.26. While the minimum values are adequate, the maximum values are slightly high in this dimension indicating that some items had extreme values.

On the LOS dimension, the person separation index is 2.41. This indicates that persons are sufficiently separated across this dimension. The person reliability estimate for the LOS dimension is good at .85. The Cronbach Alpha value of .95 also indicates good internal consistency of responses to items. This demonstrates consistent responding by participants across the 5 items of this dimension. The PDSS's LOS dimension therefore adequately screens for participants' feelings of loss of self. Items in this dimension are fairly well dispersed on the scale with an item separation of 4.48.

8.3.6.6 Guilt/Shame (GLT) dimension.

Table 27 also presents the person and item information for the GLT dimension. Winsteps (Linacre, 2009) eliminated 43 respondents in the GLT dimension with extreme scores and the data is presented for the remaining 144 participants with non-extreme scores. The average raw score of persons in this dimension is 8.40. The infit and outfit mean-squares statistics are close to the Rasch-modeled expectation of 1.00 with MNSQ statistics of 0.97 (t = -0.10) for infit and 0.95 for outfit (t = 0.00). Items in this dimension fit the Rasch model with little variation evident and participants responding as expected.

The *SD* infit and outfit values for persons in this dimension are wide at 0.88 and 0.92 respectively. Relative to the other dimensions, the GLT dimension (– along with the ELB dimension) exhibit the most extreme maximum mean-square statistic values of infit and outfit. The maximum MNSQ for person infit is 5.79 (min 0.05) while the maximum for outfit is 6.09 (min 0.04). This indicates the presence of unexpected responses to items on this dimension.

The minimum and maximum values in logits (-4.09 and 3.91 respectively) for items in this dimension is extreme. This indicates that one or more women in this sample did not have symptoms while others had significant symptoms of guilt or shame. The average logit for person ability is -0.55 with a model standard error of 0.71 and a *SD* of 2.11. Almost 68% of participants fell within a range of -2.66 and 1.56 logits. The minimum measure value (-4.09) is therefore not extreme, whereas the maximum measure value (3.91) is extreme.

The performance of items on the GLT dimension is good. Individual item functioning will, however, be examined in more detail later in the chapter. The average infit and outfit values are 1.02 (t = 0.00) and 0.95 (t = -0.60) respectively. The infit and outfit *SD* values are both 0.25 indicating that there is slight variation and that most of the items in this dimension fit the Rasch model. The minimum and maximum MNSQ infit values (0.63 and 1.29 respectively) are adequate. The maximum MNSQ outfit value (1.29) is adequate but the minimum MNSQ outfit value (0.54) is a bit extreme.

Reliability information for the GLT dimension demonstrates a person separation index of 2.38 indicating that persons are sufficiently separated across this dimension. The person reliability estimate for this dimension is .85 with a Cronbach Alpha value of .93. This shows that responses to items on the GLT dimension demonstrate good internal consistency and that participants are responding in a consistent fashion across the items from this dimension. The items on the GLT dimension therefore adequately screens for feelings of guilt or shame among the participants. The item separation for the GLT dimension is very good at 5.51. This indicates that the items on the GLT dimension are well dispersed on the scale.

8.3.6.7 Suicidal Thoughts (SUI) dimension.

The person and item information for the SUI dimension can be found in Table 27. Winsteps (Linacre, 2009) eliminated 112 respondents with extreme scores in this dimension and the data is presented for the remaining 75 participants with non-extreme scores. The average raw score of persons in this dimension is the lowest of the 7

dimensions at 6.50. The person infit mean-squares statistic is 0.99 (t = 0.00) and the outfit mean-square statistic is 0.93 (t = 0.00). These values are near to the Rasch-modeled expectations of 1.00. The *SD* infit and outfit values for persons in this dimension are the narrowest of all 7 dimensions at 0.68 and 0.63 respectively.

The minimum and maximum MNSQ statistics for person infit (0.04 and 3.14) and outfit (0.05 and 3.03) indicate that there are some persons that had unexpected responses to items on the SUI dimension. The maximum infit and outfit values are, however, the lowest of the 7 dimensions.

The minimum and maximum measure values in logits for items in this dimension are extreme at -3.21 (minimum) and 4.38 (maximum) indicating that one or some women in this sample did not have symptoms of suicidal thoughts and that one or some participants had significant symptoms of suicidal thoughts. The average logit for person ability (suicidal thoughts) is -1.15 with a model standard error of 0.67 and a *SD* of 1.75. Therefore, around 68% of participants fell within a range of -2.90 and 0.60 logits.

Item performance on the SUI dimension is good with an average infit and outfit value of 0.99 (t = -0.30) and 0.93 (t = -0.5) respectively. The infit and outfit *SD* values are 0.44 and 0.38 indicating that there is some variation in participant responses. The minimum and maximum MNSQ statistics for item infit are 0.66 and 1.85 respectively, while the minimum and maximum MNSQ statistics for outfit are 0.61 and 1.66. The minimum values are adequate but the maximum values are extreme indicating that some items had extreme values in the SUI dimension.

The person separation index on the SUI dimension is 2.06. Participants are therefore adequately separated across this dimension. The person reliability estimate for the SUI dimension is good at .81. The Cronbach Alpha value of .95 also indicates good internal consistency of responses to items. Participants therefore responded consistently across the 5 items of this dimension indicating that it adequately screens for symptoms of suicidal ideation. Items in this dimension are, however, not as well dispersed on the scale with an item separation of 3.34.

8.3.7 Item Fit Statistics for the PDSS Dimensions.

Item-fit indices (MNSQ) indicate the degree to which individual items define a unidimensional construct (Hong & Wong, 2005). Therefore, to examine the unidimensionality – or in other terms, the construct validity – of a scale, item fit statistics must be computed (Schumacker, 2004). The analysis of fit is an essential part of using latent trait models, like the Rasch model, if the interpretation of the calibration of results is to be meaningful. The parameters of a Rasch model, once estimated, are used to compute the expected, or predicted, response pattern for every item. The comparison of the expected patterns and the observed patterns yields the fit statistics for persons and items. In Rasch measurement, fit statistics are used to assist in identifying and controlling the quality of item and person response patterns that do not meet the requirements of the model and therefore do not contribute to useful measurement. If the data (i.e. items or persons) do fit the model requirements, the estimated ability is believed to correctly represent the respondent's ability, and hence the difficulty parameters are believed to

correctly represent the item difficulty (Smith, R. M., 2000; Smith, E. V., 2004). Items or persons that do not fit the requirements of the model will be examined further to determine how they are interfering with the measurement process.

Unstandardised fit estimates (i.e. mean-squares, or MNSQ) are modelled by Rasch analysis to have a mean of 1. Ideally the actual unstandardised item fit statistic would be very close to the expected mean of 1 to indicate that there is little spread from the ideal and that there is a good fit between the item and the Rasch model (Bond & Fox, 2001). Reasonable MNSQ fit values for a self-report rating scale are recommended at 0.60 – 1.40 (Wright & Linacre, 1994).

The Rasch error estimate indicates how precisely the Rasch parameter was estimated. Large error estimates signify haphazard responses to an item.

The Pearson item-total correlation (r_{it}) is the correlation between the total item score and the item. "It is similar to the discrimination or item-total correlation in CTT, although it differs in that extreme values are omitted" (Maree, 2004, p. 7). A negative Pearson item-total correlation (r_{it}) indicates an inverse relationship between the dichotomous item responses and the total raw score, and may indicate the presence of a problem like reverse coding. A general rule is to drop any items with a zero or negative Pearson item-total correlations *(r_{it})* correlation (Schumacker, 2004). An item with a low Pearson item-total correlation (r_{it}) value indicates that the item does not fit the construct well and that it may be tapping another dimension. A high positive value suggests good correlation and that the item belongs to a unidimensional construct (Maree, 2004).

Furthermore, when there is a great discrepancy between the observed Pearson item-total correlation (r_{it}) and the expected (EXP) value, it may indicate that the item does not show a good fit with the dimension being measured. When the observed value is much higher than the expected value it may indicate dependency in the data. When the observed value is much lower than expected value, unmodeled noise is possible (Linacre, 2008).

The tables referred to in this section (Table 28 to Table 34) compare the items of the PDSS dimension in terms of their measure order. The items are listed in sequence from most difficult to agree with to easiest to agree with.

8.3.7.1 Sleeping/Eating Disturbances (SLP) dimension.

Table 28 presents the item fit statistics for the items from the SLP dimension. In this dimension the most difficult item to agree with is Item 29 (I knew I should eat but I could not) whereas the easiest to agree with is Item 1 (I had trouble sleeping even when my baby was asleep). Mean-squares for both infit and outfit for items in this dimension are good and all fall within the acceptable range of 0.60 and 1.40. This indicates that little distortion is evident in the measurement system, that the items were well understood by most participants, and that the items appear to fit the definition of the construct well. The SLP items have better fit statistics within the SLP dimension than within the total PDSS, which provides support for the construct validity of this dimension. The Rasch error estimates on this dimension were small and ranged from 0.09 – 0.10, with a mean of 0.09.

The Pearson item-total correlation (r_{it}) values for the SLP dimension support construct validity with values that range from .69 to .78. This also suggests that there are no coding errors in this dimension. The Pearson item-total correlation (r_{it}) values and the expected values of all items in this dimension indicate very little discrepancy. All items in this dimension correlate well and tap into a unidimensional construct of disturbances in sleeping or eating.

Table 28 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Sleeping/Eating Disturbances (SLP) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Sleeping/Eating Disturbances (SLP)						
1	I had trouble sleeping even when my baby was asleep.	-0.49	0.09	1.06	1.05	.78
8	I lost my appetite.	0.21	0.09	1.18	1.16	.71
15	I woke up on my own in the middle of the night and had trouble getting back to sleep.	-0.15	0.09	0.83	0.80	.78
22	I tossed and turned for a long time at night trying to fall asleep.	-0.02	0.09	0.80	0.77	.78
29	I knew I should eat but I could not.	0.45	0.10	1.14	1.09	.69
M		0.00	0.09	1.01	0.98	
SD		0.32	0.00	0.16	0.16	

MNSQ = mean-square

8.3.7.2 Anxiety/Insecurity (ANX) dimension.

The items from the ANX dimension are listed in Table 29 from most difficult to agree with (Item 16: I felt like I was jumping out of my skin) to easiest to agree with

(Item 9: I felt really overwhelmed). No items in this dimension were overfitted i.e. none for infit were smaller than 0.60. Item 2 (I got anxious over even the littlest things that concerned my baby), had an outfit MNSQ statistic that was borderline (1.40). Although infit MNSQ statistics are more likely to indicate problematic fit, this item was monitored for any further discrepancies. The Rasch error estimates on this dimension was small and ranged from 0.09 – 0.10, with a mean of 0.10.

The Pearson item-total correlation (r_{it}) values for the ANX dimension are high and indicate good construct validity and that there are no coding errors. There is not much discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of any items in this dimension. All items in this dimension correlate well and tap into a unidimensional construct of anxiety or insecurity.

Table 29 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Anxiety/Insecurity (ANX) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Anxiety/Insecurity (ANX)						
2	I got anxious over even the littlest things that concerned my baby.	-0.60	0.10	1.20	**1.40**	.78
9	I felt really overwhelmed.	-1.13	0.10	0.94	0.91	.84
16	I felt like I was jumping out of my skin.	1.14	0.10	0.89	0.79	.78
23	I felt all alone.	-0.40	0.09	0.93	0.91	.81
30	I felt like I had to keep moving or pacing.	0.98	0.10	1.07	1.05	.76
M		0.00	0.10	1.01	1.01	
SD		0.90	0.01	0.11	0.21	

Note. Boldface value indicates a high MNSQ statistic that is borderline for problematic fit.
MNSQ = mean-square

8.3.7.3 Emotional Lability (ELB) dimension.

Items from the ELB dimension are listed in Table 30. The most difficult item to agree with is Item 10 (I was scared that I would never be happy again). The easiest item to agree with is Item 24 (I have been very irritable).

All mean-squares for infit and outfit in the ELB dimension are near 1.00 indicating little distortion of the measurement system. Items in this dimension appear to have been well understood by the English participants and the items seem to fit the definition of the construct well. The Rasch error estimates on this dimension was small and ranged from 0.10 – 0.11, with a mean of 0.10.

The Pearson item-total correlation (r_{it}) values for the ELB dimension are all positive high values between .81 and .84, indicating good construct validity. These high

values also indicate that there are no coding errors. There is not much discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of any items in this dimension. All items in this dimension correlate well and tap into a unidimensional construct.

Table 30 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Emotional Lability (ELB) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Emotional Lability (ELB)						
3	I felt like my emotions were on a roller coaster.	-0.68	0.10	0.96	0.96	.84
10	I was scared that I would never be happy again.	0.88	0.10	0.89	0.73	.84
17	I cried a lot for no real reason.	0.29	0.10	1.10	1.06	.82
24	I have been very irritable.	-1.10	0.11	1.00	0.94	.84
31	I felt full of anger ready to explode.	0.62	0.10	1.15	1.16	.81
M		0.00	0.10	1.02	0.97	
SD		0.76	0.00	0.09	0.14	

MNSQ = mean-square

8.3.7.4 Mental Confusion (MNT) dimension.

Table 31 presents the item fit statistics for the items from the MNT dimension. In this dimension the most difficult item to agree with is Item 18 (I thought I was going crazy), and the easiest was Item 25 (I had a difficult time making even a simple decision). Infit and outfit mean-squares range between 0.78 and 1.20 – all within an acceptable range. Therefore little distortion is evident in the items of this dimension, they were well

understood by most participants, and the items appear to fit the definition of the construct well. The Rasch error estimates on this dimension was small and ranged from 0.11 – 0.12, with a mean of 0.11.

In the MNT dimension the high positive Pearson item-total correlation (r_{it}) values indicate good construct validity and no coding errors with values that range from .84 to .87. There is very little discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of the items in this dimension. All items in the MNT dimension correlate very well and tap into a unidimensional construct.

Table 31 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Mental Confusion (MNT) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Mental Confusion (MNT)						
4	I felt like I was losing my mind.	-0.07	0.11	1.09	1.11	.85
11	I could not concentrate on anything.	0.00	0.12	0.97	0.98	.87
18	I thought I was going crazy.	0.39	0.11	0.89	0.78	.84
25	I had a difficult time making even a simple decision.	-0.47	0.12	1.16	1.20	.85
32	I had difficulty focusing on a task.	0.15	0.12	0.81	0.81	.87
M		0.00	0.11	0.98	0.98	
SD		0.28	0.00	0.13	0.16	

MNSQ = mean-square

8.3.7.5 Loss of Self (LOS) dimension.

The items of the LOS dimension are listed in terms of their measure order in Table 32. The most difficult item to agree with is Item 33 (I did not feel real). The item that was

the easiest to agree with was Item 5 (I was afraid that I would never be my normal self again).

All infit and outfit MNSQ statistics for items in the LOS dimension are within an acceptable range. The items appear to have been well understood by the English participants and seem to fit the definition of the construct well. The Rasch error estimates on this dimension was small and ranged from 0.12 – 0.13, with a mean of 0.13.

The Pearson item-total correlation (r_{it}) values for the LOS dimension are all positive high values between .88 and .90 indicating good construct validity and no coding errors. The Pearson item-total correlation (r_{it}) values and the expected values of all items in this dimension indicate very little discrepancy. All items in this dimension correlate well and tap into a unidimensional construct.

Table 32 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Loss of Self (LOS) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Loss of Self (LOS)						
5	I was afraid that I would never be my normal self again.	-1.14	0.12	1.28	1.26	.88
12	I felt as though I had become a stranger to myself.	0.25	0.13	1.07	1.02	.89
19	I did not know who I was anymore.	0.39	0.12	0.78	0.93	.89
26	I felt like I was not normal.	-0.05	0.13	0.97	0.92	.89
33	I did not feel real.	0.54	0.13	0.89	0.76	.90
M		0.00	0.13	1.00	0.98	
SD		0.60	0.00	0.17	0.16	

MNSQ = mean-square

8.3.7.6 Guilt/Shame (GLT) dimension.

Item fit statistics from the GLT dimension are listed in Table 33. The most difficult item to agree with is Item 27 (I felt like I had to hide what I was thinking or feeling toward the baby). The easiest item to agree with was Item 6 (I felt like I was not the mother I wanted to be).

Item 34 overfit the model with an outfit MNSQ statistic of 0.54, which is below the acceptable range. The remaining items appear to have been well understood by the English participants and seem to fit the definition of the construct well. The Rasch error estimates on this dimension were small and ranged from 0.11– 0.12, with a mean of 0.11.

The Pearson item-total correlation (r_{it}) values for the GLT dimension indicate good construct validity with high positive values that range from .81 to .90. These high values also indicate that there are no coding errors. There is very little discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of the items in this dimension. All items in this dimension correlate well and tap into a unidimensional construct of feelings of guilt or shame.

Table 33 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Guilt/Shame (GLT) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Guilt/Shame (GLT)						
6	I felt like I was not the mother I wanted to be.	-0.84	0.12	0.86	0.82	.90
13	I felt like so many mothers were better than me.	-0.69	0.12	1.05	1.04	.88
20	I felt guilty because I could not feel as much love for my baby as I should.	0.67	0.11	1.29	1.06	.81
27	I felt like I had to hide what I was thinking or feeling towards the baby.	0.83	0.12	1.27	1.28	.81
34	I felt like a failure as a mother.	0.03	0.11	0.63	**0.54**	.88
M		0.00	0.11	1.02	0.95	
SD		0.68	0.00	0.25	0.25	

Note. Boldface values have infit and outfit MNSQ statistics less than 0.60 or greater than 1.40
MNSQ = mean-square

8.3.7.7 Suicidal Thoughts (SUI) dimension.

Table 34 presents item fit statistics for the SUI dimension. The most difficult item in the SUI dimension to agree with was Item 21 (I wanted to hurt myself), and the easiest was Item 28 (I felt that my baby would be better off without me). Item 28 does, however have a high infit mean-square value (1.85) which indicates that responses to this item were unpredictable, possibly due to unmodeled noise or that their data underfit the model. The remaining items from this dimension had infit and outfit mean-squares within an acceptable range that reflect little distortion these items, that they were well understood by most participants, and appear to fit the definition of the construct well. The Rasch error estimates on this dimension were relatively higher than on the previous dimensions, but were still small and ranged from 0.14 – 0.17, with a mean of 0.15.

In the SUI dimension the high positive Pearson item-total correlation (r_{it}) values indicate good construct validity and no coding errors with values that range from .85 to .91. Item 28 shows slight discrepancy between the Pearson item-total correlation (r_{it}) value (.85) and the expected value (.89) and with a slightly elevated infit MNSQ statistic mentioned earlier, also suggests that item 28 may not fit the SUI dimension as well as the other items do.. There is very little discrepancy between these values on the remaining items of this dimension which suggests that they correlate very well and tap into a unidimensional construct.

Table 34 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the English PDSS Suicidal Thoughts (SUI) Dimension (n=187)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Suicidal Thoughts (SUI)						
7	I have thought that death seemed like the only way out of this living nightmare.	0.45	0.16	0.69	0.71	.90
14	I started thinking that I would be better off dead.	0.08	0.15	0.66	0.61	.91
21	I wanted to hurt myself.	0.77	0.17	1.01	0.93	.90
28	I felt that my baby would be better off without me.	-0.76	0.14	**1.85**	**1.66**	.85
35	I just wanted to leave this world.	-0.54	0.15	0.75	0.75	.90
M		0.00	0.15	0.99	0.93	
SD		0.58	0.01	0.44	0.38	

Note. Boldface values have infit and outfit MNSQ statistics less than 0.60 or greater than 1.40
MNSQ = mean-square

8.3.8 Response category statistics: Item option and distractor frequencies for the PDSS dimensions.

The frequency of responses to the 5-point Likert rating scale categories are outlined in the Table 72 to Table 78 in Appendix F and are briefly discussed below. In the English PDSS, the SLP, LOS, GLT and SUI dimensions, category "0" was selected most often in all items. This is particularly evident in the SUI dimension with percentage data counts ranging from 68% (Item 28) to 75% (Item 7). In the ANX, ELB and MNT dimensions, category "0" was selected more often for the majority of items.

Five categories from 4 items of the SUI dimension had less than 10 observations. The remaining dimensions had category observations that ranged from 10 to 140. In general though, the PDSS categories were used fairly regularly across all items.

All items, apart from Item 29, in the PDSS dimensions have average measure values (in logits) which increase gradually with each higher response category. This supports the validity of the 5-point Likert scale for the PDSS with each higher response category corresponding to "more" of the variable being measured. There are, however, a number of categories across all the PDSS dimensions that have outfit MNSQ statistics greater than 1.60 or lower than 0.60. The convergent and discriminant validity of the item categories for the PDSS dimensions is supported by the Pearson item-total correlation (r_{it}) values. In only three items from the PDSS the Pearson item-total correlation (r_{it}) values do not advance steadily. These are items 21, 29, and 35.

8.4 Results of Rasch Analysis of the Afrikaans PDSS

8.4.1 Summary of Afrikaans Rasch analysis: persons and items.

The summary statistics of the non-extreme persons and items[1] for the Afrikaans PDSS are presented in Table 35a and Table 35b. Most persons responded according to expectation with the average person infit (1.07) and outfit (1.03) at almost 1. The *SD* infit and outfit values are 0.52 and 0.61 respectively. According to the ideal z- or normal distribution graph, one *SD* above and below the mean represents approximately 68% of the distribution of values. The minimum and maximum values for person infit (min.0.20; max 3.48) and outfit (min. 0.25; max 4.00) are extreme signifying that some persons had unexpected responses to some items on the screening scale.

The min of -4.63 logits for the measure is extremely low indicating that one or some women in this sample did not have symptoms of PPD. The maximum value of 2.60 logits for the measure indicates that some participants were very depressed – although the maximum is somewhat lower than the maximum for the Eng PDSS (4.32 logits). The average logit for person ability was -0.99 (0.20 lower than the Eng PDSS) with a *SD* of 1.42. This range, although wide, is not as wide as the range for the Eng PDSS. It indicates that approximately 68% of respondent scores fell within -2.41 and 0.43 logits. Therefore the minimum and maximum measure values are extreme.

[1] Summary statistics for extreme and non-extreme persons for the Afrikaans PDSS are presented in Table 71 in Appendix F.

Based on these results, the Afrikaans PDSS items functioned well with average infit and outfit values (1.05 and 1.03) close to 1 – only marginally better than the Eng PDSS items. The *SD*s were 0.32 and 0.53, indicating neither too much nor too little variation and that most of the items fit the Rasch model. The minimum and maximum values for item infit (min 0.62; max 2.07) and outfit (min 0.54; max 3.10) indicate the presence of some extreme values.

Reliability information for items and persons on the Afrikaans PDSS is presented in Table 35a and Table 35b. The person separation index is high at 4.28. The person reliability estimate is excellent at .95 with a Cronbach Alpha of .98. This provides evidence of excellent internal consistency of responses to items on the Afrikaans PDSS and indicates that items were able to sufficiently separate the participants along the continuum. The 35 items in the Afrikaans PDSS correlate well with each other and participants are responding in a consistent fashion. The Afrikaans PDSS therefore adequately screens for measured symptoms of PPD.

Reliability is further confirmed with an item separation index of 7.00. This indicates that the Afrikaans PDSS items are well dispersed on the scale and can distinguish between a number of levels of performance.

Table 35a Summary Statistics of 170 Non-Extreme Persons and Items for the Afrikaans PDSS.

	Raw Score	Count	Measure	Model Error	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD
Mean	47.80	35.00	-0.99	0.25	1.07	0.00	1.03	0.00
S.D.	34.00	0.10	1.42	0.16	0.52	1.80	0.61	1.80
Max	129.00	35.00	2.60	1.01	3.48	5.20	4.00	5.90
Min	1.00	34.00	-4.63	0.16	0.20	-5.80	0.25	-4.40

Real RMSE	0.32	True S.D.	1.39	Separation	4.28	Particip Reliability .95
Model RMSE	0.30	True S.D.	1.39	Separation	4.66	Particip Reliability .96
S.E. of participant mean = 0.11						
Minimum Extreme Score:		8 Participants				

Table 35b Afrikaans PDSS: Summary of 35 Measured (Non-Extreme) PDSS

	Raw Score	Count	Measure	Model Error	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD
Mean	232.30	178.00	0.00	0.09	1.05	0.10	1.03	0.00
S.D.	85.70	0.20	0.69	0.01	0.32	2.50	0.53	2.40
Max	417.00	178.00	1.39	0.12	2.07	7.40	3.10	8.50
Min	80.00	177.00	-1.45	0.09	0.62	-3.90	0.54	-3.20

Real RMSE	0.10	True S.D.	0.68	Separation	7.00	Particip Reliability .98
Model RMSE	0.09	True S.D.	0.68	Separation	7.48	Particip Reliability .98
S.E. of PDSS mean = 0.12						

UMEAN = 0.0000 USCALE = 1.0000

PDSS items raw score-to-measure correlation = -1.00[a]

Data points: 5949 Log-likelihood Chi-Square: 11795.70 with 5743 *d.f.* *p*= 0.0000

[a] Approximate due to missing data

8.4.2 Rating scale requirements: Afrikaans PDSS

This section examines the quantitative functioning of the Afrikaans PDSS rating scale. Table 36 contains summary statistics for the 5-point Likert response categories used for the Afrikaans PDSS.

a) Category observations

All the responses for all the Afrikaans PDSS items are collated in Table 36. For response category 0 there were 2453 responses (41% of the total responses). Category 1 had 1174 responses (20% of the total responses). The same percentages were observed for responses to category 0 and category 1 on the English PDSS. The categories that had the least responses were categories 2 (neither agree nor disagree) and 4 (strongly agree) with 9% of the total responses each (observed count of 531 and 520 respectively). All category frequency counts are sufficiently large indicating that locally stable estimates of the rating scale structure may be produced (Linacre, 2004). The response pattern to individual items from the Afrikaans PDSS will be examined in more detail later to determine if there are items with category frequency counts less than 10.

Table 36 Summary Statistics for the 5-Point Likert Response Categories Used for the Afrikaans PDSS

Summary of Category Structure (N = 178)										
Category	Label	Score	Observed Count	%	Observed Average[a]	Sample Expect.	MNSQ		Structure Calibration	Category Measure
							Infit	Outfit		
0	Strongly Disagree	0	2453	41	-2.29	-2.24	0.96	1.10	NONE	(-2.21)
1	Disagree	1	1174	20	-0.89	-1.03	0.99	0.74	-0.84	-0.92
2	Neither Disagree nor Agree	2	531	9	-0.20	-0.31	0.92	0.86	0.14	-0.17
3	Agree	3	1271	21	0.24	0.31	1.14	1.34	-0.87	0.78
4	Strongly Agree	4	520	9	1.05	1.07	1.13	1.17	1.57	(2.74)
Missing			1	0	-0.87					

[a] Observed Average is mean of measures in category, not a parameter estimate.

b) Regular observation distribution

Category 0 (strongly disagree) was used most frequently (41%), followed by category 3 (agree; 21%) and category 1 (disagree; 20%). Categories 2 (neither disagree nor agree) and 4 (strongly agree) have 50 % less observations indicating that respondents did not endorse the middle category and the most extreme category as expected. These two categories were also used less frequently in the English PDSS which reflects that they may be redundant. Participants may also be more inclined to choose category 3 (agree) than category 4 (strongly agree).

c) Average measures advance monotonically with category

Average measures (expressed as logits) steadily increase from small to large with each category, i.e. -2.29, -0.89, -0.20, 0.24 and 1.05. The observed average measures demonstrate values that are close to their expected values.

d) OUTFIT mean-squares less than 2

Outfit mean-squares indicate random noise with values large than 1.4 indicating unexpected observations in that category (Smith, Wakely, De Kruif, & Swartz, 2003). Most categories demonstrate values close to the expected 1.0. No categories had values over 2. Similar to the English PDSS, category 3 (agree) also had the largest value (1.34) but his value is still acceptable for this sample.

e) Step calibrations advance orderly

Ideally step calibrations should increase uniformly from easy to hard. For the Afrikaans PDSS the step calibration values are: -.84, 0.14, -.87 and 1.57. The transitions between categories 1 and 2, and categories 2 and 3 are problematic. Linacre (2004) suggests that ideally curves should form a series of prominent hills. Figure 5 indicates, however, that the only prominent hills are for categories 0, 3 and 4. The negative value in the table for category 3 (-.87) may be due to the narrowness of categories 2 and 3.

Category 2 does not form a prominent hill meaning that this category is relatively rarely observed. A similar pattern is observed in the categories of the English PDSS.

f) Step difficulties advance by at least 1 logit

The Afrikaans PDSS categories have step difficulties which advance as follows:

Categories 1-2: 0.14 – (-.84) = 0.98

Categories 2-3: -0.87 – 0.14 = -1.01

Categories 3-4: 1.57 – (-0.87) = 2.44

Steps should ideally advance by at least 1 logit when five categories are employed (Linacre, 2004, p.274). The advance from categories 1 to 2 is the lowest (0.98), but is very near to the acceptable value of 1 logit. The advance from categories 2 to 3 is acceptable at 1.01 logits while the advance from category 3 to 4 is adequate at 2.44. The rating scale category definitions appear to function better with the Afrikaans sample than with the English sample.

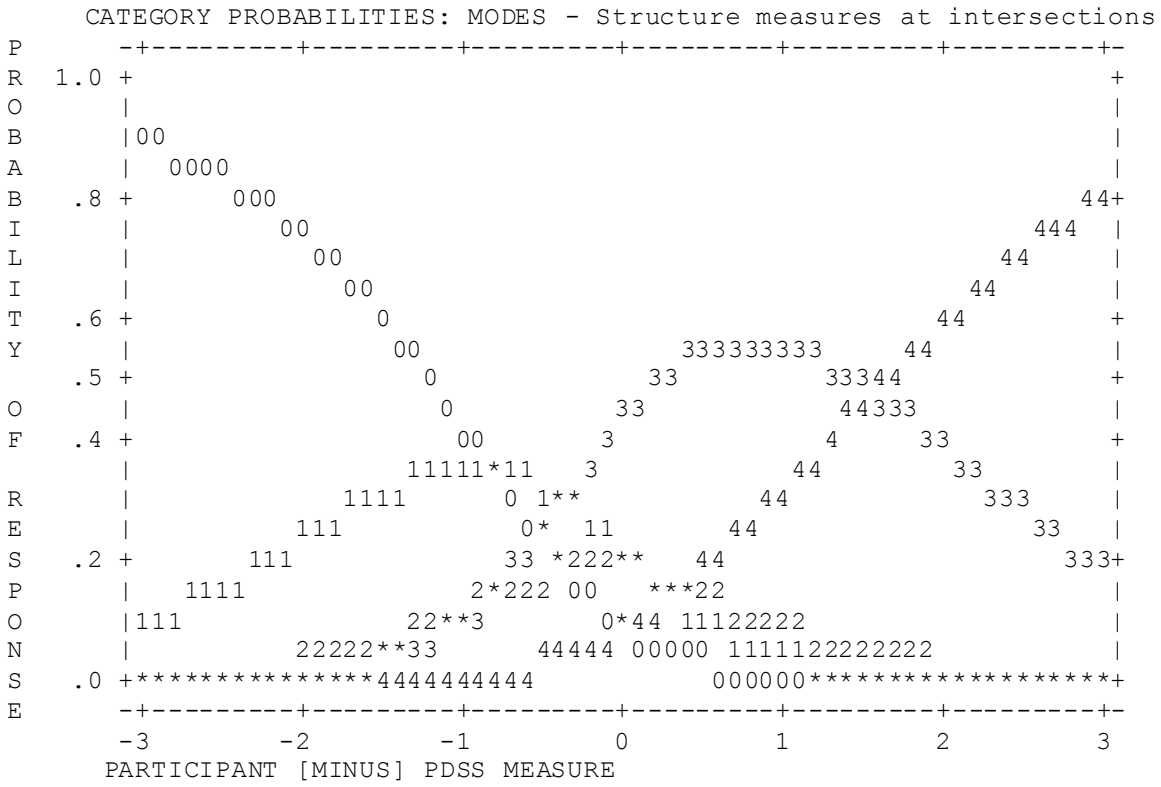

Figure 5 Probability curves of observations in each category.

8.4.3 Item person construct map: Afrikaans PDSS.

Table 37a represents a geographical description of the two facets – participants and PDSS items. More than two items are frequently positioned on the same logit measure. For good variable definition, and construct validity, items should be spread apart – the further, the better. As with the English PDSS, it seems as if there are insufficient items from the Afrikaans PDSS present at either end of the difficulty level. However, Table 37b shows that the rating scale categories cover the spread of person abilities well. Few Afrikaans respondents scored higher than the items were able to measure. The person and item distribution is indicative of some measurement precision lost at the most difficult level.

The distribution of participants indicates that significant proportions of the Afrikaans sample screened either negatively or positively for PPD. As with the English sample, items from the dimension that measures contemplating harming oneself were the items that were most difficult to agree strongly with (Item 7 and Item 21), and are also closely followed by the remaining items from this dimension (items 14, 35, and 28).

Table 37a Item Distribution Map for the Afrikaans PDSS (N=178)

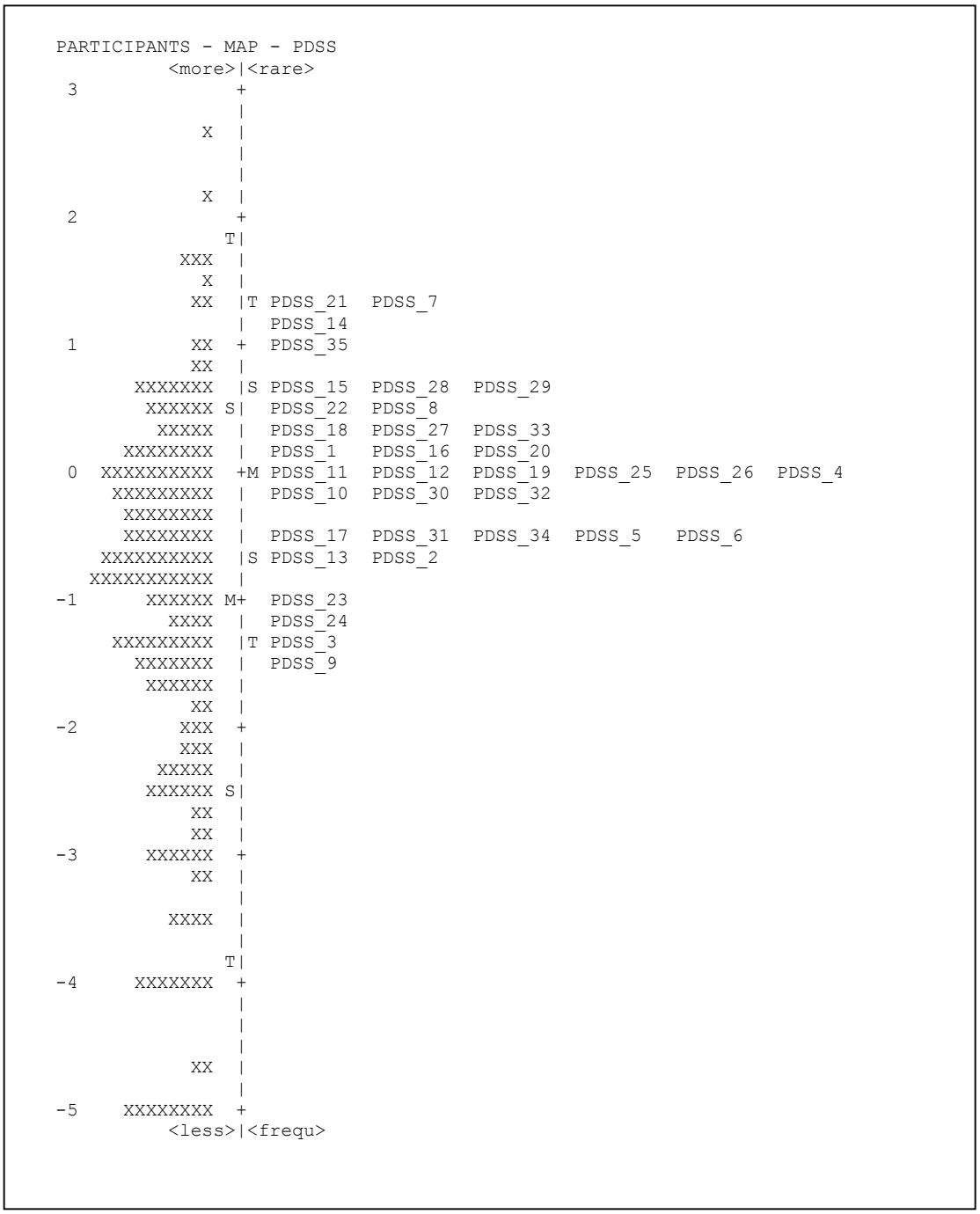

Table 37b Item Category-Person Distribution Map for Afrikaans PDSS (N = 178)

```
PARTICIPANT - MAP - PDDS - Expected score zones (Rasch-half-point thresholds)
            <more>|  Disagree   Neither D  Agree      Strongly Agree
    4             +
                  |
                  |
                  |
                  |
                  |                                    PDSS_2.35
                                                       PDSS_7.35
    3             +                                    PDSS_1.35
                  |                                    PDSS_3.35
              X   |
                  |                                    PDSS_1.35
                                                       PDSS_2.35
                                                       PDSS_2.35
                  |                                    PDSS_2.35
                                                       PDSS_8.35
              X   |                                    PDSS_1.35
                                                       PDSS_2.35
    2             +                                    PDSS_1.35
                                                       PDSS_1.35
                                                       PDSS_2.35
                                                       PDSS_3.35
                 T|                                    PDSS_1.35
                                                       PDSS_1.35
                                                       PDSS_2.35
            XXX   |                       PDSS_7.25    PDSS_1.35
                                                       PDSS_1.35
                                                       PDSS_2.35
                                                       PDSS_3.35
                                                       PDSS_4.35
              X   |                       PDSS_1.25    PDSS_3.35
                                          PDSS_2.25
             XX   |T                                   PDSS_1.35
                                                       PDSS_3.35
                                                       PDSS_3.35
                                                       PDSS_5.35
                                                       PDSS_6.35
                  |                       PDSS_3.25    PDSS_1.35
                                                       PDSS_2.35
    1         XX  +                       PDSS_2.25
              XX  |             PDSS_2.15  PDSS_1.25   PDSS_2.35
                                PDSS_7.15  PDSS_2.25
                                           PDSS_2.25
         XXXXXXX  |S            PDSS_1.15  PDSS_1.25   PDSS_2.35
                                           PDSS_8.25
          XXXXXX S|             PDSS_3.15  PDSS_2.25   PDSS_3.35
                                           PDSS_3.25
           XXXXX  |                        PDSS_1.25   PDSS_9.35
                                           PDSS_1.25
                                           PDSS_1.25
                                           PDSS_2.25
                                           PDSS_2.25
        XXXXXXXX  |             PDSS_1.15  PDSS_1.25
                                PDSS_2.15  PDSS_1.25
                                PDSS_2.15  PDSS_2.25
                                           PDSS_3.25
                                           PDSS_4.25
    0  XXXXXXXXXX  +M            PDSS_2.15  PDSS_1.25
```

Table 37b (continued) Item Category-Person Distribution Map for the Afrikaans PDSS (N = 178)

```
PARTICIPANT - MAP - PDDS - Expected score zones (Rasch-half-point thresholds)
            <more>|  Disagree   Neither D  Agree      Strongly Agree
    0  XXXXXXXXXX  +M            PDSS_2.15  PDSS_1.25
                                  PDSS_8.15  PDSS_3.25
        XXXXXXXXX  |  PDSS_2.05  PDSS_1.15  PDSS_3.25
                      PDSS_7.05  PDSS_2.15  PDSS_3.25
                                            PDSS_5.25
         XXXXXXXX  |  PDSS_1.05  PDSS_1.15  PDSS_1.25
                                  PDSS_1.15  PDSS_2.25
                                  PDSS_2.15  PDSS_6.25
                                  PDSS_3.15
         XXXXXXXX  |             PDSS_1.15  PDSS_1.25
                                  PDSS_1.15
                                  PDSS_2.15
       XXXXXXXXXX  |S PDSS_3.05  PDSS_1.15
                                  PDSS_1.15
                                  PDSS_2.15
                                  PDSS_3.15
                                  PDSS_4.15
      XXXXXXXXXXX  |  PDSS_2.05  PDSS_3.15  PDSS_2.25
                      PDSS_2.05
   -1      XXXXXX M+  PDSS_1.05  PDSS_1.15  PDSS_2.25
                      PDSS_2.05  PDSS_3.15  PDSS_3.25
                                  PDSS_3.15
                                  PDSS_5.15
                                  PDSS_6.15
            XXXX  |  PDSS_1.05  PDSS_1.15  PDSS_9.25
                      PDSS_8.05  PDSS_2.15
        XXXXXXXXX  |T PDSS_1.05
                      PDSS_2.05
                      PDSS_2.05
                      PDSS_3.05
          XXXXXXX  |  PDSS_1.05  PDSS_2.15
                      PDSS_1.05
                      PDSS_2.05
          XXXXXX  |  PDSS_1.05  PDSS_2.15
                      PDSS_1.05
                      PDSS_1.05
                      PDSS_2.05
                      PDSS_3.05
                      PDSS_4.05
              XX  |  PDSS_3.05  PDSS_3.15
   -2         XXX  +  PDSS_1.05  PDSS_9.15
                      PDSS_3.05
                      PDSS_3.05
                      PDSS_5.05
             XXX  |  PDSS_1.05
                      PDSS_2.05
                      PDSS_6.05
           XXXXX  |
          XXXXXX S|  PDSS_2.05
              XX  |
              XX  |  PDSS_2.05
                      PDSS_3.05
   -3      XXXXXX  +  PDSS_9.05
              XX  |
                  |
            XXXX  |
                  |
                 T|
   -4     XXXXXXX  +
                  |
                  |
              XX  |
                  |
   -5    XXXXXXXX  +
```

8.4.4 Item fit: Afrikaans PDSS.

Table 38 contains the item fit statistics for the Afrikaans PDSS. A range of 0.60 to 1.40 for infit and outfit MNSQ are acceptable limits. No items had an infit MNSQ less than 0.6. Infit MNSQ statistics were high for items 30, 1, 15, 2, 29, and 8. This means they do not fit the definition of the construct by either forming a secondary construct or dimension. Items 1, 8, 15 and 29 are, in fact, from a separate dimension – the SLP content scale. Misfit in the total Afrikaans PDSS for these items may therefore merely be a reflection that they form a clear construct on their own. A similar trend was seen with items from the SLP content scale in the English PDSS. It is therefore important to place more emphasis on the construct validity of the items within their content scales as opposed to within the total screening scale.

The measure statistic (difficulty level in logits), and Model SE (measurement error) for each item are also presented in Table 38. All measurement error values for the Afrikaans PDSS are small with values less than 0.12 and a mean of 0.9.

Pearson item-total correlation (r_{it}) represents item-total correlation which provides an indication of construct validity and the presence of coding problems. Table 38 shows that there are no zero or negative correlations suggesting that there are no reverse coding problems nor respondents or items with response strings that contradict the variable. All the Pearson item-total correlation (r_{it}) values range are quite high despite some fit problems, and range from .51 to .80.

Table 38 Item Statistics for the Afrikaans PDSS Total: Misfit Order (N = 178)

ENTRY NUMBER	RAW SCORE	COUNT	MODEL MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	r_{it}	EXACT MATCH OBS%	EXACT MATCH EXP%	PDSS
30	260	170	-0.23	.09	2.07	7.4	3.10	8.5	A .52	38.8	47.7	PDSS_30
1	212	170	0.12	.09	1.65	4.9	2.69	6.5	B .54	39.4	49.6	PDSS_1
15	152	170	0.60	.09	1.82	5.4	1.57	2.3	C .51	49.4	54.8	PDSS_15
2	313	170	-0.62	.09	1.24	2.0	1.78	4.3	D .68	35.3	48.8	PDSS_2
29	142	170	0.69	.10	1.50	3.5	1.12	0.6	E .55	54.1	56.5	PDSS_29
8	170	170	0.45	.09	1.31	2.4	1.02	0.2	F .60	55.3	52.7	PDSS_8
9	417	170	-1.45	.09	0.98	-.1	1.27	1.8	G .79	47.1	50.4	PDSS_9
20	203	170	0.19	.09	1.21	1.8	0.86	-0.7	H .66	50.6	51.1	PDSS_20
22	156	170	0.57	.09	1.19	1.5	0.99	0.0	I .60	54.1	54.1	PDSS_22
21	85	170	1.32	.12	1.17	1.0	0.72	-1.0	J .52	71.2	67.6	PDSS_21
7	80	170	1.39	.12	1.14	0.9	0.74	-0.8	K .51	76.5	69.1	PDSS_7
32	240	170	-0.09	.09	0.96	-0.3	1.14	0.9	L .69	51.8	48.2	PDSS_32
13	322	170	-0.69	.09	0.98	-0.1	1.13	0.9	M .76	52.9	48.7	PDSS_13
16	206	170	0.17	.09	1.02	0.2	1.13	0.7	N .66	53.5	50.6	PDSS_16
24	391	170	-1.23	.09	0.93	-0.5	1.12	0.8	O .80	55.9	50.1	PDSS_24
35	114	169	0.96	.10	1.11	0.8	0.76	-1.0	P .57	63.9	61.7	PDSS_35
23	366	170	-1.03	.09	1.10	0.9	1.03	0.2	Q .77	47.1	48.8	PDSS_23
14	93	170	1.22	.11	1.10	0.7	0.70	-1.1	R .54	69.4	66.1	PDSS_14
27	189	170	0.30	.09	1.07	0.6	0.80	-1.0	q .66	51.8	52.0	PDSS_27
17	296	170	-0.50	.09	1.03	0.3	1.06	0.4	p .73	48.2	48.4	PDSS_17
31	293	170	-0.47	.09	1.04	0.4	0.99	0.0	o .74	45.9	48.2	PDSS_31
3	394	170	-1.25	.09	0.93	-0.6	0.94	-0.3	n .80	52.9	50.3	PDSS_3
4	237	170	-0.07	.09	0.94	-0.5	0.87	-0.8	m .71	49.4	47.8	PDSS_4
5	291	170	-0.46	.09	0.93	-0.6	0.87	-0.8	l .75	51.2	48.4	PDSS_5
28	146	170	0.66	.10	0.91	-0.7	0.64	-1.7	k .64	58.2	55.8	PDSS_28
11	237	170	-0.07	.09	0.62	-3.9	0.88	-0.7	j .75	56.5	47.8	PDSS_11
33	194	170	0.26	.09	0.85	-1.3	0.84	-0.8	i .68	57.6	51.3	PDSS_33
19	222	170	0.05	.09	0.81	-1.8	0.65	-2.2	h .72	53.5	48.9	PDSS_19
10	254	170	-0.19	.09	0.80	-1.9	0.77	-1.5	g .74	53.5	47.6	PDSS_10
6	303	170	-0.55	.09	0.80	-1.8	0.73	-1.9	f .78	55.3	48.3	PDSS_6
25	238	170	-0.07	.09	0.75	-2.4	0.72	-1.8	e .74	57.6	47.8	PDSS_25
26	217	170	0.08	.09	0.70	-3.0	0.54	-3.1	d .73	57.6	49.6	PDSS_26
18	175	170	0.41	.09	0.68	-3.0	0.68	-1.7	c .69	65.9	52.2	PDSS_18
34	286	170	-0.42	.09	0.67	-3.3	0.59	-3.0	b .79	56.5	48.4	PDSS_34
12	235	170	-0.05	.09	0.65	-3.5	0.54	-3.2	a .75	60.6	47.9	PDSS_12
MEAN	232.3	170.0	.00	.09	1.05	.1	1.03	.0		54.2	51.9	
S.D.	85.7	.2	.69	.01	.32	2.5	.53	2.4		8.4	5.7	

PARTICIPANT: REAL SEP.: 4.28 REL.: .95
PDSS: REAL SEP.: 7.00 REL.: .98

8.4.5 Dimensionality: Afrikaans PDSS.

A Rasch principle component analysis (PCA) of residuals (the difference between observed and predicted scores) was performed. The PCA is indicative about the presence of secondary dimensions (Linacre, 2009) and was performed using calibrated data (logits) as opposed to raw data to avoid non-linearity in data accumulating in the PCA. Table 39 indicates the variance explained by the measures and raw unexplained variance. The empirical values match the modelled values reasonably well indicating that the measures explain the expected amount of variance in the data.

The variance explained by the measures is 58.60 eigenvalues or 62.6% which means that the measures explains most of the variance and that the Afrikaans PDSS has a wide spread of items and persons with different abilities, i.e. different degrees of PPD. Raw unexplained variance is 37.4%. Eigenvalues greater than 1.40 are indicative of possible secondary dimensions. The unexplained variance in the first contrast is 4.70 eigenvalues (5%), in the second contrast, 3.00 eigenvalues (3.2%), in the third contrast, 2.50 eigenvalues (2.7%), in the fourth contrast 2.30 eigenvalues (2.5%), and in the fifth contrast 1.80 eigenvalues (1.9%). These values indicate the presence of five additional dimensions, and that the Afrikaans PDSS is a multidimensional screening scale.

The items loading in Table 40 and the plot in Figure 6 below suggests that dimensionality in the Afrikaans PDSS exists.

Table 39 Variance Decomposition of the Observations for the Afrikaans PDSS Items (n = 178)

	Empirical			Modeled
	Eigenvalue units	%	%	%
Total raw variance in observations	93.60	100.00		100.00
Raw variance explained by measures	58.60	62.60		63.90
Raw variance explained by persons	39.40	42.10		43.00
Raw variance explained by items	19.20	20.50		20.90
Raw unexplained variance (total)	35.00	37.40	100.00	36.10
Unexplained variance in 1st contrast	4.70	5.00	13.30	
Unexplained variance in 2nd contrast	3.00	3.20	8.60	
Unexplained variance in 3rd contrast	2.50	2.70	7.20	
Unexplained variance in 4th contrast	2.30	2.50	6.60	
Unexplained variance in 5th contrast	1.80	1.90	5.10	

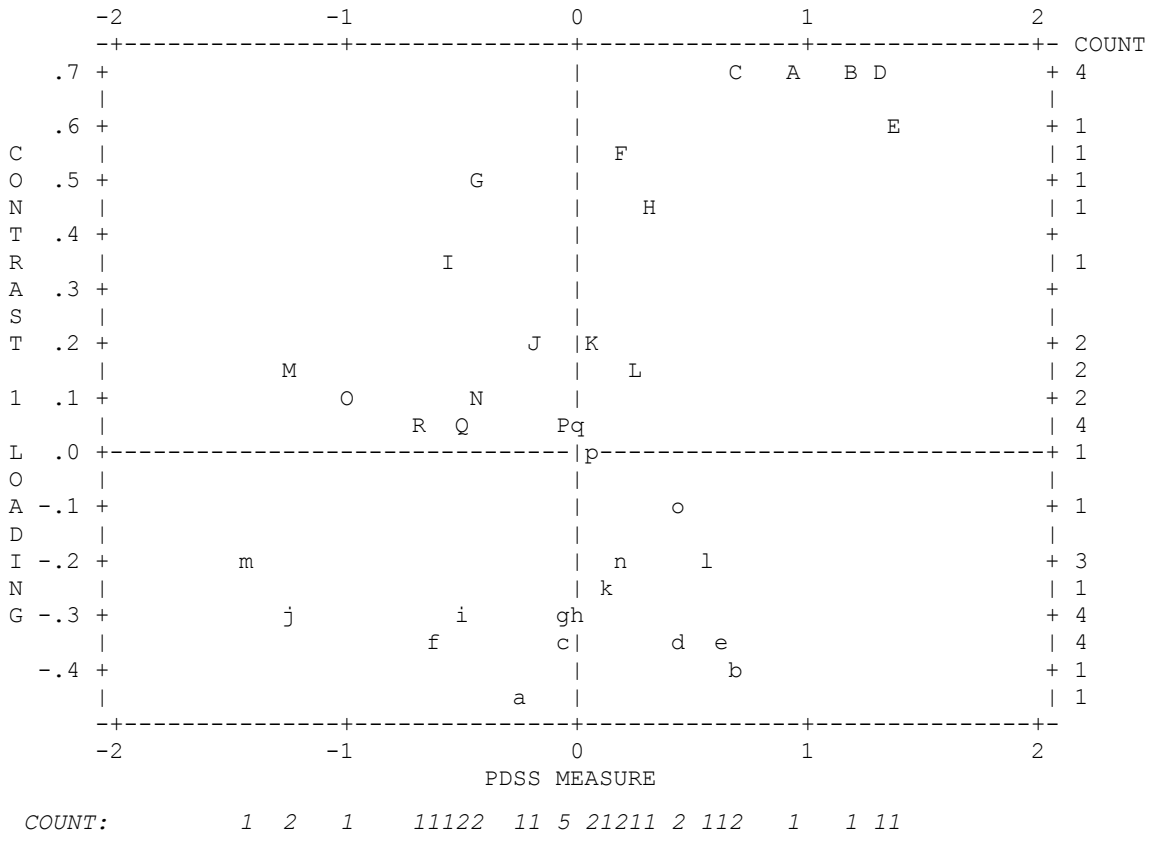

Figure 6 Standardized residual contrast of Afrikaans PDSS items.

Table 40 Standardized Residual Loading for the Afrikaans PDSS (Sorted by Loading)

PDSS Dimension	PDSS Item	Item Content	Loading	Measure	MNSQ		Entry Number
					Infit	Outfit	
SUI	35	Ek wou eenvoudig hierdie wêreld agterlaat.	.70	0.96	1.11	0.76	A
SUI	14	Ek het begin dink dat dit beter sou wees as ek dood was.	.69	1.22	1.10	0.70	B
SUI	28	Ek het gevoel dat dit vir my baba beter sou wees sonder my.	.69	0.66	0.91	0.64	C
SUI	21	Ek wou myself seermaak.	.68	1.32	1.17	0.72	D
SUI	7	Ek het gedink die dood sou die enigste uitweg uit hierdie nagmerrie wees.	.60	1.39	1.14	0.74	E
GLT	20	Ek het skuldig gevoel omdat dit vir my gevoel het asof ek nie my baba lief genoeg het nie.	.54	0.19	1.21	0.86	F
GLT	34	Ek het gevoel asof ek as ma misluk.	.48	-0.42	0.67	0.59	G
GLT	27	Dit het gevoel asof ek my ware gevoelens en gedagtes oor my baba moes wegsteek.	.44	0.30	1.07	0.80	H
GLT	6	Ek het gevoel asof ek nie die ma is wat ek wou wees nie.	.35	-0.55	0.80	0.73	I
ELB	10	Ek was bang dat ek nooit weer gelukkig sou wees nie.	.22	-0.19	0.80	0.77	J
LOS	26	Ek het gevoel asof ek nie normaal was nie.	.19	0.08	0.70	0.54	K
LOS	33	Ek het nie eg gevoel nie.	.14	0.26	0.85	0.84	L
ELB	24	Ek was baie geïrriteerd.	.14	-1.23	0.93	1.12	M
LOS	5	Ek was bang dat ek nooit weer my normale self sou wees nie.	.10	-0.46	0.93	0.87	N
ANX	23	Ek het alleen gevoel.	.08	-1.03	1.10	1.03	O
MNT	4	Ek het gevoel of ek van my verstand af raak.	.07	-0.07	0.94	0.87	P
ELB	31	Ek het baie kwaad gevoel en was gereed om te ontplof.	.06	-0.47	1.04	0.99	Q
GLT	13	Ek het gevoel asof baie ander ma's beter as ek was.	.06	-0.69	0.98	1.13	R
LOS	12	Ek het soos 'n vreemde vir myself gevoel.	.03	-0.05	0.65	0.54	q
ANX	30	Ek het gevoel asof ek heeltyd aan die gang moes bly.	-.43	-0.23	2.07	3.10	a
SLP	29	Ek het geweet ek moes eet, maar kon nie.	-.39	0.69	1.50	1.12	b
SLP	8	Ek het my eetlus verloor.	-.37	0.45	1.31	1.02	c
MNT	32	Ek het gesukkel om op 'n taak te konsentreer.	-.37	-0.09	0.96	1.14	d
SLP	15	Ek het in die middel van die nag vanself wakker geskrik en gesukkel om weer aan die slaap te raak.	-.34	0.60	1.82	1.57	e
ANX	2	Die geringste dingetjie wat met my baba te doen het, het my angstig gemaak.	-.34	-0.62	1.24	1.78	f
MNT	11	Ek kon op niks konsentreer nie.	-.32	-0.07	0.62	0.88	g
MNT	25	Ek het dit moeilik gevind om die eenvoudigste besluite te neem.	-.32	-0.07	0.75	0.72	h
ELB	17	Ek het sonder enige rede baie gehuil.	-.30	-0.50	1.03	1.06	i
ELB	3	Ek het gevoel asof my emosies wipplank ry.	-.28	-1.25	0.93	0.94	j
SLP	1	Al het my baba geslaap, het ek gesukkel om te slaap.	-.23	0.12	1.65	2.69	k
SLP	22	Ek het snags lank rondgerol en gesukkel om aan die slaap te raak.	-.22	0.57	1.19	0.99	l
ANX	9	Ek het heeltemal oorweldig gevoel.	-.21	-1.45	0.98	1.27	m
ANX	16	Ek was so angstig ek het gevoel asof ek uit my vel wou spring.	-.21	0.17	1.02	1.13	n
MNT	18	Ek het gedink ek raak gek.	-.09	0.41	0.68	0.68	o
LOS	19	Ek het myself nie meer geken nie.	-.02	0.05	0.81	0.65	p

8.4.6 Performance of Afrikaans PDSS dimensions: Rasch analysis of persons and items.

The results of the Rasch analysis of persons and items for the seven dimensions of the Afrikaans PDSS are presented in this section. The summary statistics for each Afrikaans PDSS dimension as a whole is presented in Table 41 and is discussed below. A discussion of the dimensions' individual item fit statistics will be presented in the section that follows.

8.4.6.1 Afrikaans Sleeping/Eating Disturbances (SLP) dimension.

Table 41 summarizes the person and item information for the Afrikaans SLP dimension. Data for 58 participants with extreme minimum scores were excluded. Data for the remaining 120 participants demonstrate an average raw score of 6.90. The person mean-squares statistics are near to the Rasch-modeled expectations of 1.00. The infit MNSQ is 0.96 (t = 0.00) and the outfit MNSQ is 0.93 (t = 0.00). The *SD* infit and outfit values for this dimension are both 0.65. The minimum and maximum MNSQ statistics for infit (0.02 and 3.48) and outfit (0.02 and 3.32) indicate that there are some persons that had unexpected responses to items on this dimension.

Table 41 Summary Statistics for the Afrikaans PDSS Dimensions

Statistic		Sleeping / eating disturbances	Anxiety / insecurity	Emotional lability	Cognitive impairment	Loss of self	Guilt / shame	Contemplating harming oneself
Mean raw score	Items	166.40	312.40	325.60	225.40	231.80	260.60	103.60
	Persons	6.90	9.40	10.10	7.40	8.30	9.30	6.50
Measure (logits)	Items	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Persons	-0.81	-0.27	-0.06	-1.18	-0.66	-0.28	-1.33
Model error	Items	0.10	0.09	0.10	0.12	0.12	0.12	0.17
	Persons	0.58	0.58	0.63	0.70	0.69	0.65	0.73
SD (logits)	Items	0.25	0.67	0.62	0.29	0.49	0.72	0.67
	Persons	1.14	1.36	1.67	1.87	2.00	1.77	1.99
M Infit MNSQ	Items	1.01	1.02	1.00	0.99	0.98	0.98	0.98
	Persons	0.96	1.00	0.99	0.99	0.94	0.96	0.95
M Outfit MNSQ	Items	0.93	0.98	0.99	0.97	0.96	1.00	0.99
	Persons	0.93	0.98	0.99	0.97	0.96	1.00	0.99
Mean Infit (t)	Items	0.10	0.00	0.00	-0.10	-0.20	-0.20	-0.10
	Persons	0.00	0.00	-0.10	-0.10	-0.10	-0.20	-0.10
Mean Outfit (t)	Items	-0.30	-0.30	-0.10	-0.20	-0.30	0.00	0.00
	Persons	0.00	0.00	-0.10	-0.10	-0.10	-0.10	0.00
Separation	Items	2.16	6.98	5.78	2.11	3.90	5.85	3.52
	Persons	1.34	1.69	2.04	2.04	2.31	2.11	2.12
Cronbach alpha		.87	.84	.90	.91	.93	.93	.94
Rasch reliability	Persons	.64	.74	.81	.81	.84	.82	.82

MNSQ = mean-square

As with the English SLP dimension, the Afrikaans SLP dimension demonstrates minimum and maximum values in logits (-2.69 and 2.23 respectively) that are least extreme of the seven dimensions. Afrikaans participants were therefore also more likely to report the presence of some slight or moderate disturbance in sleeping or eating. The average logit for person ability is -0.81 with a model standard error of 0.58 and a *SD* of 1.14. Approximately 68% of participants therefore fell within a range of -1.95 and 0.33 logits.

On average, the items on the SLP dimension functioned very well. Individual item performance will, however, be discussed later in the chapter. The average item infit and outfit values are 1.01 (t = 0.10) and 0.93 (t = -0.3) respectively. The infit and outfit *SD* values are 0.22 and 0.23 respectively, indicating that there is little variation and that most of the items in the SLP dimension fit the Rasch model. The minimum and maximum MNSQ statistics for item infit (min 0.64; max 1.27) as well as the minimum and maximum MNSQ statistics for item outfit (min 0.65; max 1.25) in this dimension are within an acceptable range. The items in the Afrikaans SLP dimension do not have extreme values and function well together in this dimension.

On the SLP dimension, the person separation index is 1.34. As with the English SLP dimension, the person separation index for the Afrikaans SLP dimension is the lowest of the 7 dimensions and indicates that persons are not as well separated across this dimension as they are on the other dimensions. The person reliability estimate is also lower than other dimensions at .64. The Cronbach Alpha is higher at .87. Internal consistency for the SLP dimension is adequate, although it is lower than that of the other PDSS dimensions. As with the English sample, the participants in the Afrikaans sample

are not responding as consistently across the 5 items of this dimension. The PDSS may not be screening the participants' level of sleep and eating disturbances as well as the other facets of PPD. An item separation index of 2.16 for this dimension indicates that the items on the SLP dimension are not as well dispersed on the scale.

8.4.6.2 Afrikaans Anxiety/Insecurity (ANX) dimension.

Person and item information for the Afrikaans PDSS Anxiety/Insecurity dimension is also summarized in Table 41. Winsteps (Linacre, 2009) eliminated 11 participants in this dimension who had extreme scores, hence the observed count of 167 participants. The average raw score of persons in the Afrikaans ANX dimension is 9.4 – the second highest raw score of the seven dimensions. The person infit mean-squares statistic = 1 with a t-statistic of 0.00, and the outfit mean-square statistic = 0.98, also with a t-statistic of 0.00. This demonstrates good fit the Rasch model in this dimension with neither too much nor too little variation and most participants responding as expected. The *SD* infit and outfit values for this dimension are 0.74 and 0.71 respectively.

The minimum and maximum values for person infit (0.03 and 3.68) and outfit (0.03 and 3.28) are fairly extreme. This indicates that there are some persons that had unexpected responses to items on the Afrikaans Anxiety/Insecurity dimension.

The minimum of -3.09 logits for items in the ANX dimension is low. This suggests that one or more women in this sample did not have symptoms of anxiety/insecurity. The maximum of 3.49 logits does, however, indicate that some participants had significant symptoms of anxiety/insecurity. The average logit for person ability or measure of

anxiety/insecurity levels, is -0.27 with a model standard error of 0.58 and a *SD* of 1.36. If the distribution were approximately normal, almost 68 % of participants fell within a range of -1.63 and 1.09 logits. The minimum and maximum measure values of 3.49 and -3.09 are therefore extreme.

The PDSS items on the Anxiety/Insecurity dimension functioned very well. Individual item functioning will, however, be examined in more detail later. The average item infit and outfit values of 1.00 (t = 0.00) and 1.01 (t = 0.10) respectively are ideal Chi-Square values for these indices. Infit and outfit *SD* values were both 0.29. This indicates little variation and that most of the items in this dimension fit the Rasch model. The minimum MNSQ infit value for items is adequate at 0.81 while the maximum MNSQ infit value is elevated at 1.59. Outfit MNSQ shows an acceptable minimum of 0.74 but an elevated maximum of 1.54. Although the maximum MNSQ statistics are elevated, they remain lower than those for the Afrikaans PDSS as a whole (max infit 2.07; max outfit 3.10). This indicates that the items function well together within this dimension.

Reliability information for both items and persons on the ANX dimension is also shown in Table 41. The person separation index is moderate at 1.69. The person reliability estimate for this dimension is .74 with a Cronbach Alpha of .84 indicating that the items in this dimension were able to sufficiently separate the participants along the continuum. It further demonstrates good internal consistency of responses to items and that the items in the ANX dimension correlate well with each other. Participants are responding in a consistent fashion across the 5 items of this dimension. The Afrikaans PDSS's ANX dimension therefore adequately screens for participants' levels of anxiety.

The Afrikaans ANX dimension demonstrates an item separation index of 6.98. This indicates that the items on the ANX dimension are well dispersed on the scale and can distinguish between a number of levels of performance.

8.4.6.3 Afrikaans Emotional Lability (ELB) dimension.

The person and item information for the ELB dimension can also be found in Table 41. Winsteps (Linacre, 2009) eliminated 25 respondents in this dimension with extreme scores and the data is presented for the remaining 153 participants with non-extreme scores. As with the English PDSS ELB dimension, the Afrikaans PDSS ELB dimension also demonstrates the highest average raw score (10.10) of persons across the seven dimensions. Both the infit and outfit mean-squares statistics for persons are 0.99 (t = -0.10). These values are close to the Rasch-modeled expectations of 1.00. Little variation is present with participants responding as expected in this dimensions showing good fit to the Rasch model. The *SD* infit and outfit values for this dimension are wide at 0.79 and 0.97 respectively.

The minimum and maximum MNSQ statistics for person infit (0.02 and 4.76) and outfit (0.02 and 6.75) are extreme and are an indication that there are persons that had unexpected responses to items on the ELB dimension.

The minimum and maximum values in logits (-3.53 and 3.72 respectively) for the items in this dimension suggest that one or some women in this sample did not have symptoms of emotional lability while one or more participants had significant symptoms of emotional lability. The average logit for person ability is -0.06 with a model standard

error of 0.63 and a *SD* of 1.67. Approximately 68% of participants therefore fell within a range of -1.73 and 1.61 logits. The minimum and maximum measure values of -3.53 and 3.72 are therefore extreme.

On average, the items on the ELB dimension functioned very well within this dimension. The average item infit and outfit values are 1.00 (t = 0.00) and 0.99 (t = -0.10) respectively. The infit and outfit *SD* values are 0.09 and 0.14 suggest that very little variation is present and that most of the items in the ELB dimension fit the Rasch model. The minimum and maximum MNSQ statistics for infit (min 0.89; max 1.12) as well as the minimum and maximum MNSQ statistics for outfit (min 0.82; max 1.15) in this dimension are adequate indicating that the items in the ELB dimension did not have extreme values and function well together.

Reliability information for items and persons on the Afrikaans ELB dimension shows a person separation index of 2.04 which indicates that persons are sufficiently separated across this dimension. The person reliability estimate for the ELB dimension is good at .81 and the Cronbach Alpha of .90 also indicates good internal consistency of responses to items. This demonstrates consistent responding by participants across the 5 items of this dimension. The Afrikaans PDSS's ELB dimension therefore adequately screens for participants' levels of emotional lability. Items in this dimension are well dispersed on the scale with an item separation of 5.78.

8.4.6.4 Afrikaans Mental Confusion (MNT) dimension.

The person and item information for the Afrikaans PDSS MNT dimension is presented in Table 41. Winsteps (Linacre, 2009) eliminated 34 respondents with extreme scores and the data is presented for the remaining 144 participants with non-extreme scores. The average raw score of persons in this dimension is 7.40. The infit mean-squares statistic is 0.99 (t = -0.10) and the outfit mean-square statistic is 0.97 (t = -0.10). Both these values are close to the Rasch-modeled expectations of 1.00. Little variation is evident and participants responded as expected. This indicates that the items in the Afrikaans MNT dimension fit the Rasch model. The *SD* infit and outfit values for this dimension are fairly wide at 0.92 and 0.90 respectively. The minimum and maximum MNSQ statistics for person infit (0.04 and 6.65) and outfit (0.04 and 5.71) are also extreme and are indicative of some unexpected responses to items on the Afrikaans MNT dimension.

The extreme minimum and maximum values in logits (-4.48 and 4.23 respectively) for the Afrikaans MNT items suggest that one or more women in this sample did not have symptoms of mental confusion while one or more had significant symptoms. The average logit for person ability is -1.18 with a model standard error of 0.70 and a *SD* of 1.87. Close to 68% of participants fell within a range of -3.05 and 0.69 logits. The maximum score of 4.23 logits is therefore very high.

Overall, the Afrikaans MNT items functioned very well within this dimension. Individual item performance is, however, examined in more detail in the next section. The average item infit and outfit values are 0.99 (t = -0.10) and 0.97 (t = -0.20)

respectively. The infit and outfit *SD* values are 0.21 and 0.24 indicating that there is only some variation and that most of the items in the MNT dimension fit the Rasch model. The minimum and maximum MNSQ statistics for infit (min 0.75; max 1.32) as well as the minimum and maximum MNSQ statistics for outfit (min 0.76; max 1.37) in this dimension are adequate. The Afrikaans MNT items therefore function well together within this dimension and did not have extreme values.

Reliability information for both items and persons on the MNT dimension, as shown on Table 41, indicates a person separation index of 2.04 indicating that persons are sufficiently separated across the MNT dimension. The person reliability estimate for this dimension is .81 with a Cronbach Alpha of .91. The items on the Afrikaans MNT dimension demonstrate good internal consistency and participants responded in a consistent fashion across the 5 items of this dimension. The items on the Afrikaans MNT dimension therefore adequately screen for mental confusion among the participants. An item separation index of 2.17 suggests that the items on the MNT dimension not very well dispersed on the scale.

8.4.6.5 Afrikaans Loss of Self (LOS) dimension.

Table 41 also presents the person and item information for the Afrikaans PDSS LOS dimension. Winsteps (Linacre, 2009) eliminated 46 respondents with extreme scores in this dimension and the data is presented for the remaining 132 participants with non-extreme scores. The average raw score of persons in this dimension is 8.30. The person infit mean-squares statistic is 0.94 (t = -0.10) and the outfit mean-square statistic is 0.96 (t

= -0.10). These values are close to the Rasch-modeled expectations of 1.00. Little variation is therefore evident with participants responding as expected in this dimension and demonstrating good fit to the Rasch model. The *SD* infit and outfit values for this dimension are rather wide at 0.78 and 0.86 respectively.

The minimum and maximum MNSQ statistics for person infit (0.04 and 4.68) and outfit (0.04 and 5.71) are extreme. This suggests that there are some persons that had unexpected responses to items on the Afrikaans PDSS LOS dimension.

The extreme minimum and maximum values in logits (-3.95 and 4.59 respectively) for the items in this dimension indicate that one or more women in this sample did not have symptoms while others had significant symptoms of loss of self. The average logit for person ability is -0.66 with a model standard error of 0.69 and a *SD* of 2.00. Therefore, approximately 68% of participants fell within a range of -2.66 and 1.34 logits. The minimum and maximum measure values of -3.95 and 4.59 are therefore extreme.

The items on the Afrikaans LOS dimension appear to function well, on average, with an average infit and outfit value of 0.98 (t = -0.20) and 0.96 (t = -0.30) respectively. The infit and outfit *SD* values are 0.11 and 0.15 respectively indicating little variation in responses and that these items fit the Rasch model. Both the minimum and maximum MNSQ statistics for item infit (min 0.80; max 1.13) and outfit (min 0.75; max 1.18) are adequate.

On the LOS dimension, the person separation index is 2.31. This indicates that persons are sufficiently separated across this dimension. The person reliability estimate for the LOS dimension is good at .84. The Cronbach Alpha of .93 also indicates good

internal consistency of responses to items. This demonstrates consistent responding by participants across the 5 items of this dimension. The Afrikaans PDSS's LOS dimension therefore adequately screen for participants' feelings of loss of self. Items in this dimension are moderately well dispersed on the scale with an item separation of 3.90.

8.4.6.6 Afrikaans Guilt/Shame (GLT) dimension.

The person and item information for the GLT dimension can be found in Table 41. Winsteps (Linacre, 2009) eliminated 53 respondents with extreme scores in this dimension and the data is presented for the remaining 125 participants with non-extreme scores. The average raw score of persons in this dimension is 9.30. The person infit and outfit mean-squares statistics are close to the Rasch-modeled expectation of 1.00 with MNSQ statistics of 0.96 (t = -0.20) for infit and 1.00 for outfit (t = -0.10). Items in this dimension fit the Rasch model with little variation evident and participants responding as expected.

The *SD* infit and outfit values for this dimension are wide at 1.01 and 1.23 respectively. The Afrikaans GLT dimension exhibits the most extreme maximum mean-square statistic infit and outfit values. The maximum MNSQ for person infit is 8.04 (min 0.07) while the maximum for outfit is 9.01 (min 0.06). This indicates the presence of unexpected responses to items on this dimension.

The minimum and maximum values in logits (-3.83 and 4.11 respectively) for items in this dimension is extreme. This indicates that one or more women in this sample did not have symptoms while others had significant symptoms of guilt or shame. The average

logit for person ability is -0.28 with a model standard error of 0.65 and a *SD* of 1.77. Approximately 68% of participants therefore fell within a range of -2.05 and 1.49 logits. The minimum and maximum measure values of -4.08 and 3.90 are therefore extreme.

In general, the items in the Afrikaans GLT dimension performed well, although this will be confirmed later when the items of the GLT dimension are examined individually. The average item infit and outfit MNSQ statistics are 0.98 (t = -0.20) and 1.00 (t = 0.00) respectively. The infit and outfit *SD* values are 0.14 and 0.18 indicating that there is slight variation and that most of the items in this dimension fit the Rasch model. The minimum and maximum MNSQ infit values are adequate (min 0.83; max 1.17). The maximum MNSQ outfit value (1.24) is slightly high while the minimum is adequate at 0.83. Some items in this dimension therefore had slightly extreme values.

Reliability information for this dimension demonstrates a person separation index of 2.11 indicating that persons are sufficiently separated across this dimension. The person reliability estimate for this dimension is good at .82 with a Cronbach Alpha of .93. This shows that responses to items on the Afrikaans GLT dimension demonstrate good internal consistency and that participants are responding in a consistent fashion across the items from this dimension. The items on the GLT dimension therefore adequately screens for feelings of guilt or shame among the participants. Items on the Afrikaans GLT dimension are well dispersed on the scale with an item separation index of 5.85.

8.4.6.7 Afrikaans Suicidal Thoughts (SUI) dimension.

The person and item information for the SUI dimension is presented in Table 41. Winsteps (Linacre, 2009) eliminated 105 respondents in this dimension with extreme scores and the data is presented for the remaining 73 participants with non-extreme scores. Similar to the English PDSS SUI dimension, the average raw score of persons in the Afrikaans SUI dimension is the lowest of the 7 dimensions at 6.50. The person infit mean-squares statistic is 0.95 (t = -0.10) and the outfit mean-square statistic is 0.99 (t = 0.00). These values are near to the Rasch-modeled expectations of 1.00. The *SD* infit and outfit values for this dimension are 0.77 and 0.94 respectively.

The minimum and maximum MNSQ statistics for person infit (0.07 and 3.86) and outfit (0.07 and 5.06) indicate that there are persons that had unexpected responses to items on the SUI dimension.

The minimum and maximum measure values, in logits, for items in this dimension are extreme at -4.06 (minimum) and 3.49 (maximum). This suggests that one or more women in this sample did not have symptoms of suicidal thoughts and that one or more participants had significant symptoms of suicidal thoughts. The average logit for person ability (suicidal thoughts) is -1.33 with a model standard error of 0.73 and a *SD* of 1.99. Therefore, around 68% of participants fell within a range of -3.32 and 0.66 logits.

Item performance on the SUI dimension is, in general, good with an average infit and outfit value of 0.98 (t = -0.10) and 0.99 (t = 0.00) respectively. The infit and outfit *SD* values are 0.28 and 0.26 indicating that there is slight variation in participant responses. The minimum and maximum MNSQ statistics for item infit are 0.68 and 1.48

respectively, while the minimum and maximum MNSQ statistics for item outfit are 0.68 and 1.45. The minimum values are adequate but the maximum values are extreme indicating that some items had extreme values in the SUI dimension.

The person separation index on the SUI dimension is 2.12. Participants are therefore adequately separated across this dimension. The person reliability estimate for the SUI dimension is good at .82. The Cronbach Alpha of .94 also indicates very good internal consistency of responses to items. Participants therefore responded consistently across the 5 items of this dimension indicating that it adequately screens for symptoms of suicidal ideation. Items in this dimension are, however, only moderately well dispersed on the scale, with an item separation index of 3.34.

8.4.7 Item fit statistics for the Afrikaans PDSS dimensions.

Tables 42 to 48 compare the items of the Afrikaans PDSS dimensions in terms of their measure order. The items are listed in sequence from most difficult to agree with to easiest to agree with.

8.4.7.1 Afrikaans Sleeping/Eating Disturbances (SLP) dimension.

The items from the Afrikaans SLP dimension are listed in Table 42. The most difficult item to agree with is Item 29 (Ek het geweet ek moes eet, maar kon nie) and the easiest to agree with is Item 1 (Al het my baba geslaap, het ek gesukkel om te slaap) – similar to the English SLP dimension. The infit MNSQ statistics for items from this content scale indicate that the items perform better within the Afrikaans SLP content scale than within the total Afrikaans PDSS. This indicates good construct validity for items from this content scale. The Rasch error estimates for items on this dimension were small at 0.10 for all items.

The Pearson item-total correlation (r_{it}) values for the Afrikaans SLP dimension indicate good construct validity with positive values that range from .71 to .78. These high values also indicate that there are no coding errors. Item 1 has a slight discrepancy between the Pearson item-total correlation (r_{it}) value (.78) and the expected value (.82) and with a slightly elevated infit MNSQ statistic mentioned earlier, also suggests that item 1 may not fit the SLP dimension as well as the other items do. There is not much discrepancy between the Pearson item-total correlation (r_{it}) values and the expected

values (EXP) of the other items in this dimension which correlate well and tap into a unidimensional construct of disturbances in sleeping or eating.

Table 42 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Sleeping/Eating Disturbances (SLP) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Sleeping/Eating Disturbances (SLP)						
1	Al het my baba geslaap, het ek gesukkel om te slaap.	-0.46	0.10	1.27	1.25	.78
8	Ek het my eetlus verloor.	0.02	0.10	1.10	1.06	.76
15	Ek het in die middel van die nag vanself wakker geskrik en gesukkel om weer aan die slaap te raak.	0.06	0.10	0.92	0.71	.74
22	Ek het snags lank rondgerol en gesukkel om aan die slaap te raak.	0.08	0.10	0.64	0.65	.77
29	Ek het geweet ek moes eet, maar kon nie.	0.30	0.10	1.14	0.96	.71
M		0.00	0.10	1.01	0.93	
SD		0.25	0.00	0.22	0.23	

MNSQ = mean-square

8.4.7.2 Afrikaans Anxiety/Insecurity (ANX) dimension.

Table 43 lists the items from the Afrikaans PDSS ANX dimension. The most difficult item to agree with is Item 16 (Ek was so angstig ek het gevoel asof ek uit my vel wou spring) and the item that was the easiest to agree with is Item 9 (Ek het heeltemal oorweldig gevoel). These items were also indicated as the most difficult and the easiest to agree with in the English ANX dimension. Item 30 ('Ek het gevoel asof ek heeltyd aan die gang moes bly.') does not fit well with an infit MNSQ statistic of 1.59. This item may be poorly constructed, ambiguous, or does not relate closely to the overall construct. The remaining items demonstrate good fit with values that range from 0.81 to 1.01. (acceptable = 0.60 – 1.40; Wright & Linacre, 1994). The Rasch error estimates on this dimension was small and ranged from 0.08 – 0.10, with a mean of 0.09.

The Pearson item-total correlation (r_{it}) values for the Afrikaans ANX dimension are generally good (.64 to .80) suggesting that coding errors were unlikely. Item 30 (Ek het gevoel asof ek heeltyd aan die gang moes bly) does, however, have the lowest Pearson item-total correlation (r_{it}) value of all items in the Afrikaans PDSS. Furthermore, relative to other items in the Afrikaans PDSS, it differs more significantly from the expected value (.73) for this item which suggests the presence of unmodeled noise. Coupled with a high infit MNSQ statistic (1.59), Item 30 does not fit the ANX dimension as well as the other items do. The items in this dimension correlate well and tap into a unidimensional construct of anxiety or insecurity suggesting good construct validity.

Table 43 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Anxiety/Insecurity (ANX) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Anxiety/Insecurity (ANX)						
2	Die geringste dingetjie wat met my baba te doen het, het my angstig gemaak.	-0.05	0.09	0.83	0.82	.79
9	Ek het heeltemal oorweldig gevoel.	-1.01	0.10	1.01	0.94	.80
16	Ek was so angstig ek het gevoel asof ek uit my vel wou spring.	0.95	0.09	0.81	0.74	.73
23	Ek het alleen gevoel.	-0.36	0.08	0.86	0.87	.79
30	Ek het gevoel asof ek heeltyd aan die gang moes bly.	0.47	0.09	**1.59**	**1.54**	.64
M		0.00	0.09	1.02	0.98	
SD		0.67	0.00	0.29	0.29	

Note. Boldface values have infit and outfit MNSQ statistics less than 0.60 or greater than 1.40
MNSQ = mean-square

8.4.7.3 Afrikaans Emotional Lability (ELB) dimension.

Table 44 lists the items from the Afrikaans ELB dimension The most difficult item to agree with was Item 10 (Ek was bang dat ek nooit weer gelukkig sou wees nie). The easiest item to agree with is Item 24 (Ek was baie geïrriteerd). The same items were noted as the most difficult and easiest to agree to in the English ELB dimension. All mean-squares for infit and outfit in the ELB dimension are near 1.00 and fall within an acceptable range. This suggests little distortion of the measurement system for this dimension. Items in this dimension appear to have been well understood by the Afrikaans participants and seem to fit the definition of the construct – emotional lability – well. The Rasch error estimates on this dimension was small and ranged from 0.10 – 0.11, with a mean of 0.10.

The Pearson item-total correlation (r_{it}) values for the ELB dimension are all high positive values between .77 and .87 which indicate that there are no coding errors. There is very little discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of the items in this dimension. This indicates good construct validity and that all the items in this dimension correlate well and tap into a unidimensional construct.

Table 44 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Emotional Lability (ELB) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Emotional Lability (ELB)						
3	Ek het gevoel asof my emosies wipplank ry.	-0.72	0.11	1.12	1.15	.85
10	Ek was bang dat ek nooit weer gelukkig sou wees nie.	0.78	0.10	1.07	1.01	.77
17	Ek het sonder enige rede baie gehuil.	0.35	0.10	1.04	1.12	.80
24	Ek was baie geïrriteerd.	-0.76	0.11	0.89	0.85	.87
31	Ek het baie kwaad gevoel en was gereed om te ontplof.	0.35	0.10	0.90	0.82	.83
M		0.00	0.10	1.00	0.99	
SD		0.62	0.01	0.09	0.14	

MNSQ = mean-square

8.4.7.4 Afrikaans Mental Confusion (MNT) dimension.

Table 45 presents the item fit statistics for the items for the Afrikaans MNT dimension. The most difficult item to agree with is Item 18 (Ek het gedink ek raak gek). This item was also the most difficult to agree with in the English MNT dimension. The

easiest was Item 4 (Ek het gevoel of ek van my verstand af raak). Items in this content scale had infit MNSQ statistics within an acceptable range. Item 4 demonstrates the poorest fit (infit MNSQ = 1.32; outfit MNSQ = 1.37), but its fit statistic still falls within an acceptable range. The items in this dimension were well understood by most participants and appear to fit the definition of the construct well. The Rasch error estimates on this dimension was small and ranged from 0.11 – 0.13, with a mean of 0.12.

High positive Pearson item-total correlation (r_{it}) values in the Afrikaans MNT dimension indicate that there are no coding errors and support good construct validity. The values range from .79 to .86. There is not much discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of any items in this dimension indicating that they correlate very well and tap into a unidimensional construct.

Table 45 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Mental Confusion (MNT) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Mental Confusion (MNT)						
4	Ek het gevoel of ek van my verstand af raak.	-0.34	0.11	1.32	1.37	.79
11	Ek kon op niks konsentreer nie.	0.24	0.13	0.84	0.80	.86
18	Ek het gedink ek raak gek.	0.43	0.12	0.75	0.76	.82
25	Ek het dit moeilik gevind om die eenvoudigste besluite te neem.	-0.13	0.12	0.92	0.80	.85
32	Ek het gesukkel om op 'n taak te konsentreer.	-0.20	0.12	1.14	1.14	.82
M		0.00	0.12	0.99	0.97	
SD		0.29	0.00	0.21	0.24	

MNSQ = mean-square

8.4.7.5 Afrikaans Loss of Self (LOS) dimension.

The items of the Afrikaans LOS dimension are listed in terms of their measure order in Table 46. The most difficult item to agree with is Item 33 (Ek het nie eg gevoel nie). The item that was the easiest to agree with was Item 5 (Ek was bang dat ek nooit weer my normale self sou wees nie). Both these items also ranked as the most difficult and the easiest to agree with in the English LOS dimension. The infit MNSQ statistics for items in the Afrikaans LOS dimension are all within an acceptable range. The items suggest undimensionality and appear to have been well understood by the Afrikaans participants. The Rasch error estimates for items on this dimension were small at 0.12 for all items.

Pearson item-total correlation (r_{it}) values for the Afrikaans LOS dimension are all positive high values between .83 and .87 indicating good construct validity and that there are no coding errors. The Pearson item-total correlation (r_{it}) values and the expected values of all items in this dimension indicate very little discrepancy. All items in the Afrikaans LOS dimension correlate well and tap into a unidimensional construct.

Table 46 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Loss of Self (LOS) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Loss of Self (LOS)						
5	Ek was bang dat ek nooit weer my normale self sou wees nie.	-0.94	0.12	1.13	1.06	.87
12	Ek het soos 'n vreemde vir myself gevoel.	0.08	0.12	0.80	0.75	.88
19	Ek het myself nie meer geken nie.	0.10	0.12	0.98	0.92	.86
26	Ek het gevoel asof ek nie normaal was nie.	0.27	0.12	0.94	0.85	.86
33	Ek het nie eg gevoel nie.	0.48	0.12	1.04	1.18	.83
M		0.00	0.12	0.98	0.96	
SD		0.49	0.00	0.11	0.15	

MNSQ = mean-square

8.4.7.6 Afrikaans Guilt/Shame (GLT) dimension.

Table 47 lists the item fit statistics for the Afrikaans GLT dimension. Similar to the English GLT dimension, the most difficult item to agree with here is also Item 27 (Dit het gevoel asof ek my ware gevoelens en gedagtes oor my baba moes wegsteek). The easiest item to agree with was, however, Item 13 (Ek het gevoel asof baie ander ma's beter as ek was).

All items in this dimension had infit MNSQ statistics within an acceptable range. They appear to have been well understood by the English participants and seem to fit the definition of the construct well. The Rasch error estimates on this dimension was small and ranged from 0.11 – 0.12, with a mean of 0.12.

The Pearson item-total correlation (r_{it}) values for the Afrikaans GLT dimension indicate good construct validity with high positive values that range from .80 to .90.

These high values also indicate that there are no coding errors. There is very little discrepancy between the Pearson item-total correlation (r_{it}) values and the expected values (EXP) of the items in this dimension suggesting that they correlate well and tap into a unidimensional construct of feelings of guilt or shame.

Table 47 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Guilt/Shame (GLT) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Guilt/Shame (GLT)						
6	Ek het gevoel asof ek nie die ma is wat ek wou wees nie.	-0.52	0.12	0.85	0.83	.90
13	Ek het gevoel asof baie ander ma's beter as ek was.	-0.85	0.12	1.17	1.24	.89
20	Ek het skuldig gevoel omdat dit vir my gevoel het asof ek nie my baba lief genoeg het nie.	0.79	0.11	0.90	0.87	.82
27	Dit het gevoel asof ek my ware gevoelens en gedagtes oor my baba moes wegsteek.	0.94	0.12	1.12	1.21	.80
34	Ek het gevoel asof ek as ma misluk.	-0.36	0.12	0.83	0.86	.89
M		0.00	0.12	0.98	1.00	
SD		0.72	0.00	0.14	0.18	

MNSQ = mean-square

8.4.7.7 Afrikaans Suicidal Thoughts (SUI) dimension.

Table 48 shows that the most difficult item in the Afrikaans SUI dimension to agree with was Item 7 (Ek het gedink die dood sou die enigste uitweg uit hierdie nagmerrie wees), and, like in the English SUI dimension, the easiest was Item 28 (Ek het gevoel dat dit vir my baba beter sou wees sonder my). The Afrikaans version of Item 28 does, however, also has a high infit mean-square value (1.48) which indicates that this item did not fit the model well or that responses to this item were unpredictable, possibly due to unmodeled noise. The remaining items from this dimension had infit and outfit mean-squares within an acceptable range that reflect little distortion in these items, that they were well understood by most participants, and appear to fit the definition of the construct well. The Rasch error estimates on this dimension was slightly higher than on other dimensions in the Afrikaans PDSS and ranged from 0.16 – 0.19, with a mean of 0.17.

The high positive Pearson item-total correlation (r_{it}) values that range from .85 to .90 support good construct validity for items in this dimension and that there are no coding errors. The Pearson item-total correlation (r_{it}) values and the expected values of all items in this dimension indicate very little discrepancy. All items in the Afrikaans SUI dimension correlate well and tap into a unidimensional construct.

Table 48 Item Difficulty, Fit Statistics, and Pearson Item-Total Correlations (r_{it}) for the Afrikaans PDSS Suicidal Thoughts (SUI) Dimension (n=178)

	Dimension / Item	Item difficulty (logits)	*SE*	Infit MNSQ	Outfit MNSQ	r_{it}
Suicidal Thoughts (SUI)						
7	Ek het gedink die dood sou die enigste uitweg uit hierdie nagmerrie wees.	0.74	0.19	1.06	1.06	.85
14	Ek het begin dink dat dit beter sou wees as ek dood was.	0.33	0.18	0.68	0.68	.89
21	Ek wou myself seermaak.	0.43	0.18	0.87	0.90	.85
28	Ek het gevoel dat dit vir my baba beter sou wees sonder my.	-1.09	0.16	**1.48**	**1.45**	.90
35	Ek wou eenvoudig hierdie wêreld agterlaat.	-0.41	0.17	0.80	0.86	.90
M		0.00	0.17	0.98	0.99	
SD		0.67	0.01	0.28	0.26	

Note. Boldface values have infit and outfit MNSQ statistics less than 0.60 or greater than 1.40
MNSQ = mean-square

8.4.8 Response category statistics: Item option and distractor frequencies for the Afrikaans PDSS dimensions.

The frequency of responses to the 5-point Likert rating scale categories of the Afrikaans PDSS are briefly discussed below and are outlined in Table 79 to Table 85 in Appendix F. In the Afrikaans PDSS the SLP, LOS, GLT and SUI dimensions, category "0" was selected most often in all items. This trend was also noted in the same dimensions of the English PDSS. This was particularly evident in the SLP dimension and even more so in the SUI dimension with frequency counts ranging from 63% (item 28) to 78% (item 21). Similar to the English PDSS, category "0" was selected more often for the majority of items in the Afrikaans ANX, ELB and MNT dimensions.

The Afrikaans PDSS items had more categories with less than 10 observations than the English PDSS items had. This was particularly noticeable in the Afrikaans SLP dimension (7 categories) and the Afrikaans SUI dimension (9 categories), but also in the Afrikaans MNT dimension (4 categories) and the Afrikaans ANX dimension (1 category). The remaining dimensions had category observations that ranged from 10 to 138. The remaining categories for the Afrikaans PDSS were used fairly regularly.

All items in the Afrikaans PDSS dimensions have average measure values (in logits) which increase gradually with each higher response category. This supports the validity of the 5-point Likert scale for the Afrikaans PDSS with each higher response category corresponding to "more" of the variable being measured. Similar to the English PDSS, however, there are a number of categories across all the Afrikaans PDSS dimensions that have outfit MNSQ statistics greater than 1.40 or lower than 0.60. The Pearson item-total correlation (r_{it}) values provide support for the convergent and discriminant validity of the item categories for the Afrikaans PDSS dimensions. Some items, however, have values that do not advance steadily. These are items 8, 11, 12, 14, 15, 16, 21, 22, 26, 29, 30 and 35.

When there is a great discrepancy between the observed Pearson item-total correlation (r_{it}) and the expected (EXP) value, it may indicate that the item does not show a good fit with the dimension being measure. When the observed value is much higher than the expected value it may indicate dependency in the data. When the observed value is much lower than expected value, unmodeled noise is possible (Linacre, 2008).

8.5 Items Marked as Difficult to Understand

After completing the PDSS, or its Afrikaans translation, the participants were asked to indicate if there were any items that they found difficult to fully understand. It is important that respondents understand the language of the assessment measure used. Respondents who are not proficient in the language of the measure may introduce construct irrelevant components to the assessment process (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999). To effectively identify women with PPD from different cultures and language groups, there should be no language barrier in the screening process.

Cultural groups may differ in their language spoken. They may also differ in terms of the way in which verbal expressions are formally structured, even if they speak the same language. Furthermore, different cultural groups may assign different meanings to commonly used expressions. Respondents from one cultural or ethnic group will therefore differ to other cultural or ethnic groups in their performance to the extent that they are familiar with the questionnaire's language as well as expressions associated with that language. For this reason participants were asked to mark items they did not fully understand. These items are presented in Table 49 below.

Twelve English participants and eight Afrikaans participants marked items as difficult to understand. Several participants had difficulty understanding a number of items. Item 16 (I felt like I was jumping out of my skin; Ek was so angstig ek het gevoel asof ek uit my vel wou spring) was marked most frequently as difficult to understand, and

was also the most frequently marked Afrikaans item (three participants). Item 16 was marked by five English participants and, together with Item 2 (I got anxious over even the littlest things that concerned my baby) were the most frequently marked English items. Other frequently marked items were Item 3 (I felt like my emotions were on a roller coaster; Ek het gevoel asof my emosies wipplank ry), Item 9 (I felt really overwhelmed; Ek het heeltemal oorweldig gevoel), Item 30 (I felt like I had to keep moving or pacing; Ek het gevoel asof ek heeltyd aan die gang moes bly), and Item 33 (I did not feel real; Ek het nie eg gevoel nie).

Table 49 Items Marked by Participants as Difficult to Understand after Completing English PDSS or Afrikaans PDSS

Participants	No. of items marked	Items marked as difficult to understand															
		Item[a]	Item[b]	Item	Item	Item[d]	Item[d]	Item[a]	Item[d]	Item	Item[a]	Item[d]	Item[bd]	Item[ad]	Item	Item[abc]	Item
English																	
E 17	5		2	3				9					24			30	
E 39[e]	1									16							
E 52	6			3	4					16	18					30	33
E 110	3		2	3						16							
E 113	1																33
E 114	1									16							
E 130	1					5											
E 136[e]	5		2				8	9		16						30	
E 152	1							9									
E 154	1																33
E 178	1		2														
E 183	1		2														
Afrikaans																	
A 4	1													26			
A 33	1									16							
A 72	1	1															
A 85[e]	5		2	3				9					24			30	
A 88	7		2						12	16		19			27	30	33
A 116[e]	1			3													
A 149	1																33
A 178	2									16							
Total times item was marked		1	7	5	1	1	1	4	1	8	1	1	2	1	1	5	5

a items with DIF in total PDSS or total Afrikaans PDSS
b items with DIF in content scale
c item had fit problems in Rasch analysis of Afrikaans PDSS Anxiety/Insecurity content scale
d item contributes to INC index
e participant has an INC score of 4 or more.

8.6 Invariance and Differential Item Functioning

Demonstrating reliability and validity are important steps in the cross-cultural adaptation and validation of instruments. Although necessary, these are, however, not sufficient conditions for evaluating cross-cultural validity when the aim is to compare persons across diverse cultures or countries by means of adapted versions of the same instrument. An increasing awareness of the cultural, gender, developmental, and socio-economic influences on psychological constructs has resulted in greater recognition of the need to demonstrate measurement invariance before assuming that measures are equivalent across groups (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999).

Invariance is therefore also a requirement of cross-cultural validation. In simple terms, invariance means that if two respondents from different racial, ethnic, gender (or other) subgroups are at the same level of the trait or construct being measure, then the probability of a respondent from one subgroup affirming an item (in the dichotomous case) will be the same as the probability of a respondent from another subgroup affirming the item (Küçükdeveci et al., 2004 Get another ref here). Bond and Fox (2007) define invariance as a variable which maintains its identity from one occasion to the next. Invariance may encompass stability over time or stability over samples in the order of item logit positions as well as stability of item positions on the logit scale across time or across samples.

Construct-irrelevant variance and construct under-representation are two major threats to validity (Downing & Haladyna, 2004). The construct-irrelevant components of a measure refer to those “variables that systematically (rather than randomly)

interfere with the ability to meaningfully interpret scores or ratings …" (Downing & Haladyna, 2004, p.327). These variables do not form part of the construct that is being measured and may include, for example, items that have not been statistically proven to be valid and reliable, items written at an inappropriate reading level, or the use of inappropriate jargon (Downing & Haladyna, 2004). If the responses to a questionnaire (and hence the outcome or results to that questionnaire) are dependent on language proficiency, that dependency may be responsible for construct-irrelevant variance.

Measurement invariance must be established before instruments may be deemed to be equivalent in a measurement sense (Küçükdeveci et al., 2004). If measurement invariance is established, then the differences on the screening scales' scores accurately reflect the differences on the latent characteristics assessed by the construct.

Invariance is determined through analysis of item bias or differential item functioning (DIF). When an item's difficulty estimate location is not consistent across samples, but varies by more than the modelled error, it provides clear evidence that DIF exists. The presence of DIF between groups indicates that they cannot be compared meaningfully on the item. DIF is based on whether items have shifted in meaning for differing time points or groups (Bond, 2003; Bond & Fox, 2007).

Item response theory (IRT) is a parametric method for identifying DIF. Analysis of DIF is a powerful means of testing items for bias in IRT relative to CTT-based methods (Harvey & Hammer, 1999). Edelen, Thissen, Teresi, Kleinman, and Ocepek-Welikson (2006) agree that IRT and the likelihood-based model comparison approach are robust in their ability detect DIF in order to develop, refine and evaluate measures for use in ethnically diverse populations.

Rasch modelling, however, has advantages which make it more suitable for identifying DIF than IRT or CTT (Andrich, 2004a; Royal, 2010). Chiang et al (2009) assert that invariance analyses, although they can be conducted using CTT by examining differences in item means by group or time, are greatly simplified via use of Rasch modelling software. The separability of the item difficulty and person ability parameters is one advantage. This characteristic parameter separation is unique to the Rasch model (Andrich, 2004a). The parameters are derived independently and the item analysis is therefore not dependent on the sample from which it was taken. This provides fundamental person-free measurement and item-free calibration when the data adequately fits the Rasch model and persons and item can be mapped on a common invariant scale (Bond & Fox, 2001).

Two and three parameter IRT models control for factors like difficulty, discrimination and guessing. This means that the item response curves of different items can cross (Andrich 2004b). As a result the relative difficulty levels of items are not invariant across persons in the sample. This violates the assumptions of invariant measurement. Sample independent measurement is only feasible in a one-parameter model, like the Rasch model. The Rasch measurement model aims to deliver invariance in scientific measurement with estimates of item difficulty and estimates of person ability where the probability of a correct response is a function of the difference between item difficulty and person ability, and nothing else (Bond & Fox, 2007). Furthermore, Rasch analyses instantiates interval level measurement as opposed to ratio level measurement. The invariance of item and person estimate values therefore always remains relative (Bond & Fox, 2007).

In measurement, it is important that the values attributed to variables by a measurement system be independent of the particular measuring instrument that was used. The calibrations of the measuring instrument should also remain invariant when using an appropriate measuring instrument for the purpose intended (Bond & Fox, 2007). The Rasch model is based on a mathematical formulation of invariance, which is an operational criterion for fundamental measurement (Andrich, 2004a). The Rasch model therefore has significant advantages as a measurement model for the validation of tests and measuring instruments.

Proponents of Rasch modelling maintain that data is never pure or accurate and the data must therefore conform to the measurement model rather than the measurement model chosen to fit the data (as in two-parameter and three-parameter logistic IRT approaches). As a result, only data which adequately fit the Rasch model can satisfy the requirements of fundamental measurement.

Figure 7 plots the English and Afrikaans PDSS item location values (d) against each other. The diagonal dotted line is drawn through the points that represent the calibration mean of D.x and D.y (zero logit). It represents the precise modelled relation between the English and Afrikaans PDSS's sets of item estimates if they did not shift location, staying completely invariant in precise and error-free measurement conditions – a situation that is unachievable in practice (Bond & Fox, 2007, p. 73). Measurement error estimates are provided by Rasch modeling for all difficulty estimates which are used to construct 'quality control lines' on either side. These lines on the outside represent the 95% confidence band. This enables determining how close the distribution of the plotted ability points is to the modelled diagonal line for the measures to be considered sufficiently invariant. It also allows for distinguishing

those items on the outside of the confidence 95% band which show significant shift. Measurement error estimates are always provided by Rasch modelling and therefore some shift in location is not unexpected.

Nearly one third of the items in the complete PDSS and Afrikaans PDSS exhibit differential item functioning indicating that those items functioned differently across the two language groups. Table 50 lists items that showed significant shift in the PDSS total item Rasch analysis.

Invariance (within measurement error) across the two language versions of the PDSS dimensions was supported for most items. This helps to affirm the integrity of the PDSS dimensions under Rasch analysis procedures. It further demonstrates that the PDSS dimensions maintain its measurement properties across both English and Afrikaans South African samples. The six items that showed significant shift in the PDSS dimensions are listed in Table 51.

Figure 8 to 14 plots the English and Afrikaans PDSS dimensions' item location values (d) against each other. Measurement error estimates, provided by Rasch modeling, are used to construct 'quality control lines' on either side and are represent by the 95 % confidence band on the outside. These figures provide a visual aid for distinguishing those items on the outside of the confidence 95% band which show significant shift.

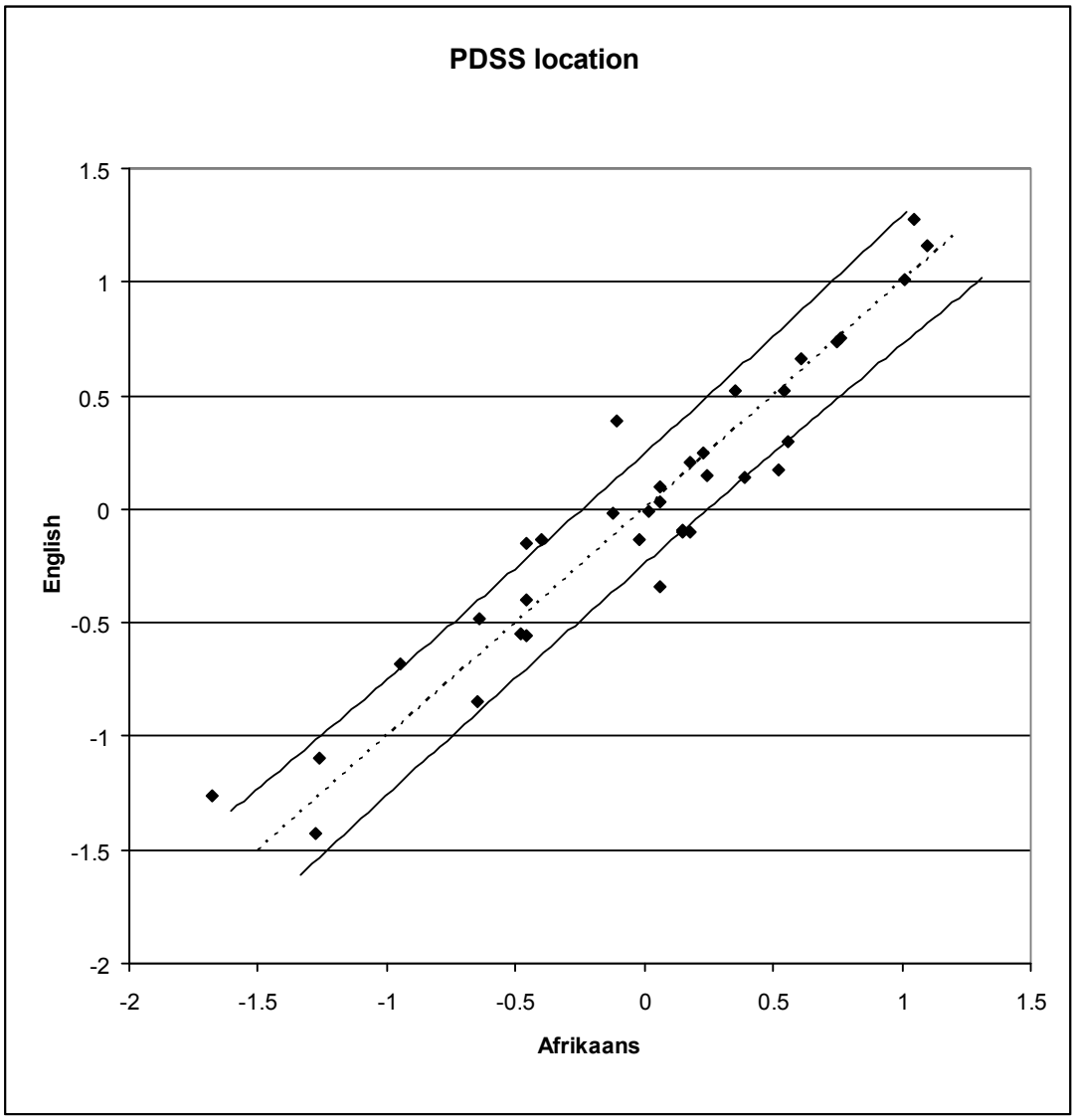

Figure 7 Differential Item Functioning of English and Afrikaans PDSS items.

Table 50 Items that Exhibit Differential Item Functioning in the PDSS Total Item Rasch Analysis

Item	Dim	Item content	Afrikaans PDSS	English PDSS	Afrikaans Model SE	English Model SE	z-value
1[a b]	SLP	I had trouble sleeping even when my baby was asleep. Al het my baba geslaap, het ek gesukkel om te slaap.	0.18	-0.10	0.09	0.09	2.20
9	ANX/INS	I felt really overwhelmed. Ek het heeltemal oorweldig gevoel.	-1.68	-1.26	0.10	0.09	-3.12
15[ab]	SLP	I woke up on my own in the middle of the night and had trouble getting back to sleep. Ek het in die middel van die nag vanself wakker geskrik en gesukkel om weer aan die slaap te raak.	0.52	0.17	0.09	0.08	2.91
18	MNT	I thought I was going crazy. Ek het gedink ek raak gek.	0.39	0.14	0.09	0.08	2.08
22[a]	SLP	I tossed and turned for a long time at night trying to fall asleep. Ek het snags lank rondgerol en gesukkel om aan die slaap te raak.	0.56	0.30	0.09	0.09	2.04
23	ANX/INS	I felt all alone. Ek het alleen gevoel.	-0.95	-0.68	0.09	0.08	-2.24
25	MNT	I had a difficult time making even a simple decision. Ek het dit moeilik gevind om die eenvoudigste besluite te neem.	0.06	-0.34	0.09	0.09	3.14
26	LOS	I felt like I was not normal. Ek het gevoel asof ek nie normaal was nie.	0.15	-0.10	0.09	0.08	2.08
30[b]	ANX	I felt like I had to keep moving or pacing. Ek het gevoel asof ek heeltyd aan die gang moes bly.	-0.11	0.39	0.09	0.09	-3.93
31	ELB	I felt full of anger ready to explode. Ek het baie kwaad gevoel en was gereed om te ontplof.	-0.46	-0.15	0.09	0.08	-2.57
34	GLT	I felt like a failure as a mother. Ek het gevoel asof ek as ma misluk.	-0.4	-0.13	0.09	0.08	-2.24

a Item also had problems in English PDSS total fit analysis

b Item also had problems in Afrikaans PDSS total fit analyis

Table 51 Items that Exhibit Differential Item Functioning in the PDSS Dimensions

Item	Dim	Item content	Afrikaans PDSS	English PDSS	Afrikaans Model SE	English Model SE	z-value
2	ANX/INS	I got anxious over even the littlest things that concerned my baby. Die geringste dingetjie wat met my baba te doen het, het my angstig gemaak.	-0.05	-0.60	0.09	0.10	4.09
24	ELB	I have been very irritable. Ek was baie geïrriteerd.	-0.76	-1.10	0.11	0.11	2.19
25[a]	MNT	I had a difficult time making even a simple decision. Ek het dit moeilik gevind om die eenvoudigste besluit te neem.	-0.13	-0.47	0.12	0.12	2.00
30[ab]	ANX/INS	I felt like I had to keep moving or pacing. Ek het gevoel asof ek heeltyd aan die gang moes bly.	0.47	0.98	0.09	0.10	-3.79
32	MNT	I had difficulty focusing on a task. Ek het gesukkel om op 'n taak te konsentreer.	-0.20	0.15	0.12	0.12	-2.06
34[ab]	GLT	I felt like a failure as a mother. Ek het gevoel asof ek as ma misluk.	-0.36	0.03	0.12	0.11	-2.40

a Items showed significant shift in Rasch analysis of PDSS as a whole as well as in analysis of dimensions.

b Items also had misfit in PDSS dimensions

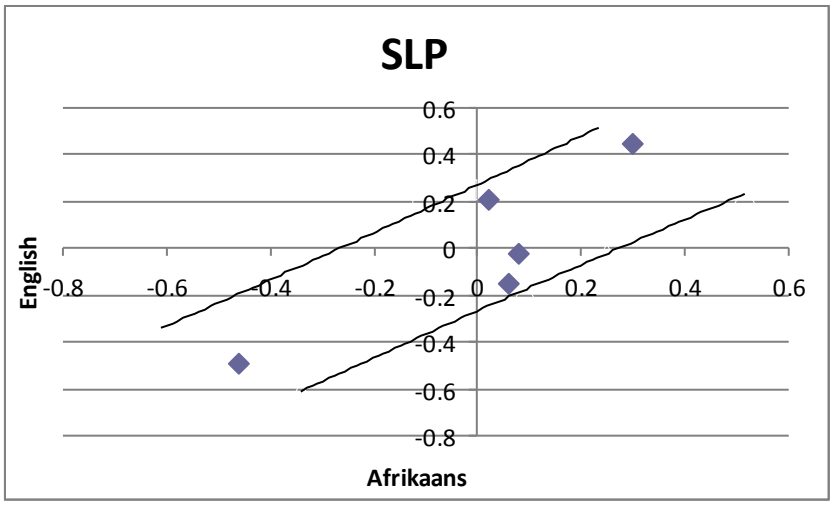

Figure 8 Differential item functioning of items in the Sleeping/Eating Disturbances (SLP) dimension.

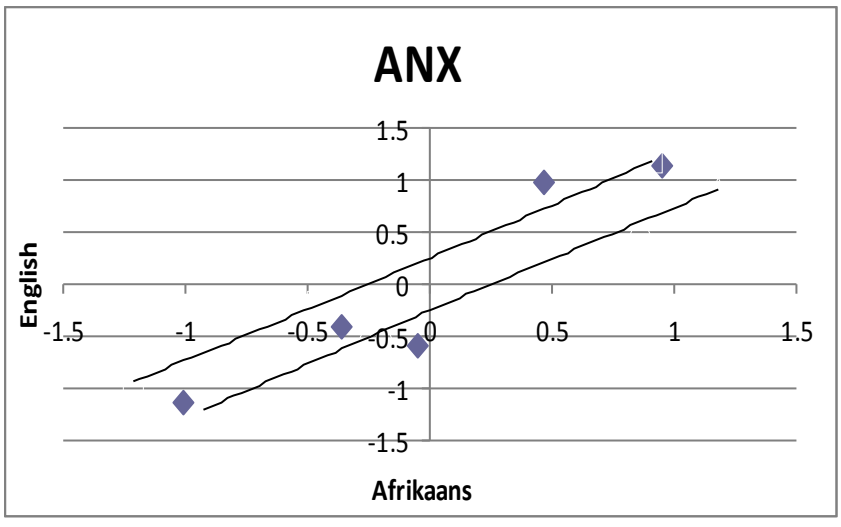

Figure 9. Differential item functioning of items in the Anxiety/Insecurity (ANX) dimension.

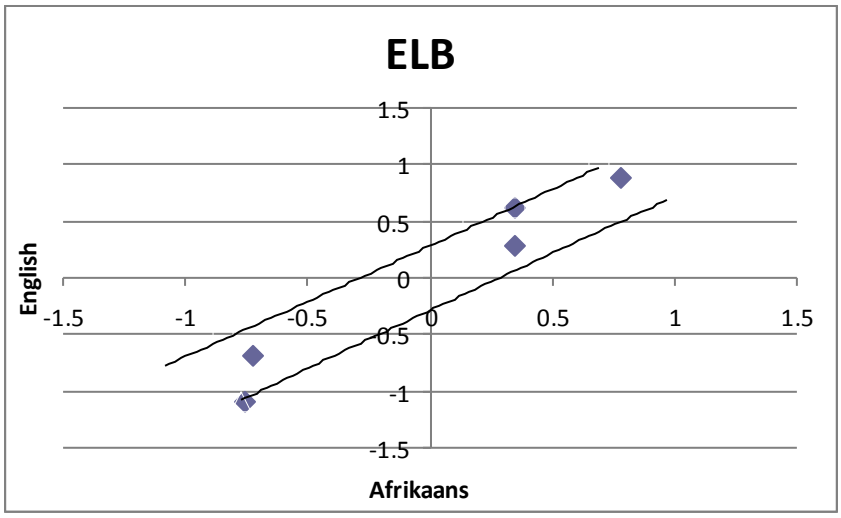

Figure 10. Differential item functioning of items in the Emotional Lability (ELB) dimension.

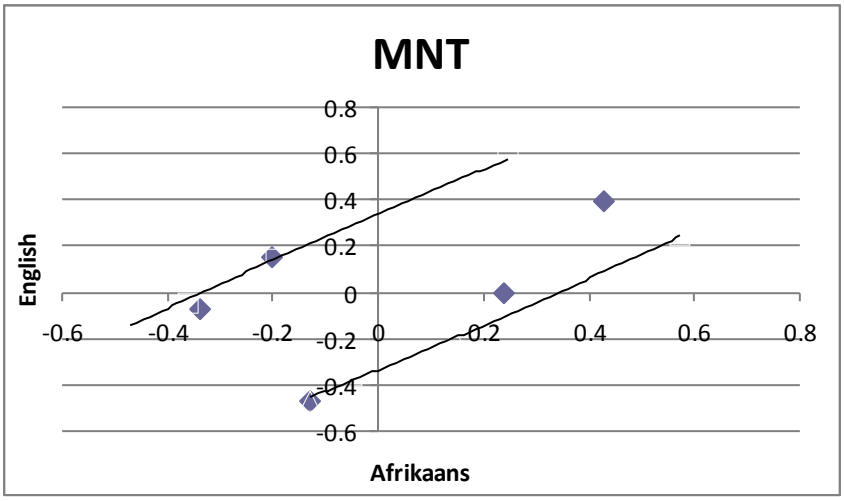

Figure 11. Differential item functioning of items in the Mental Confusion (MNT) dimension.

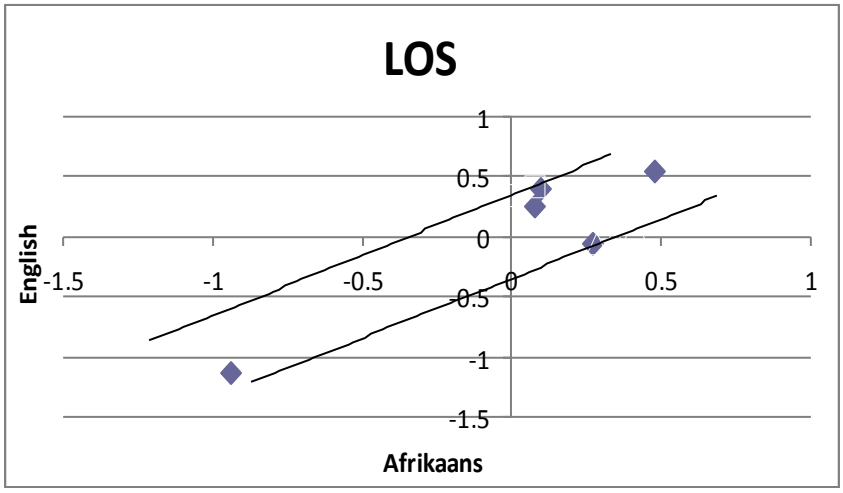

Figure 12. Differential item functioning of items in the Loss of Self (LOS) dimension.

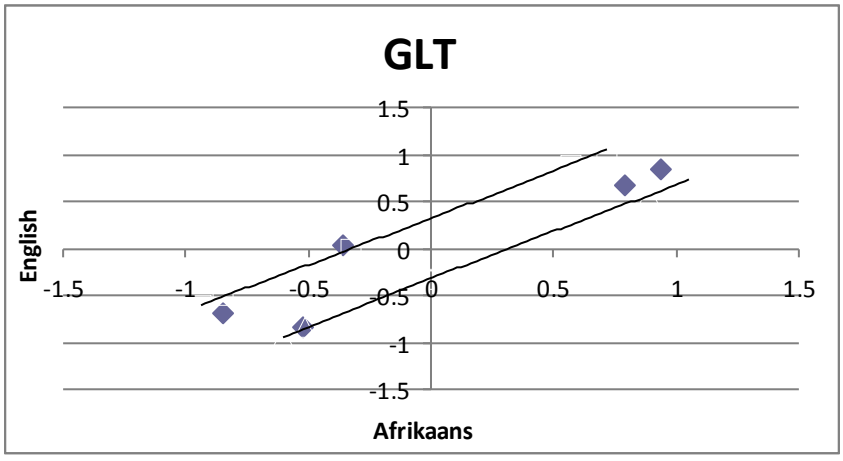

Figure 13. Differential item functioning of items in the Guilt/Shame (GLT) dimension.

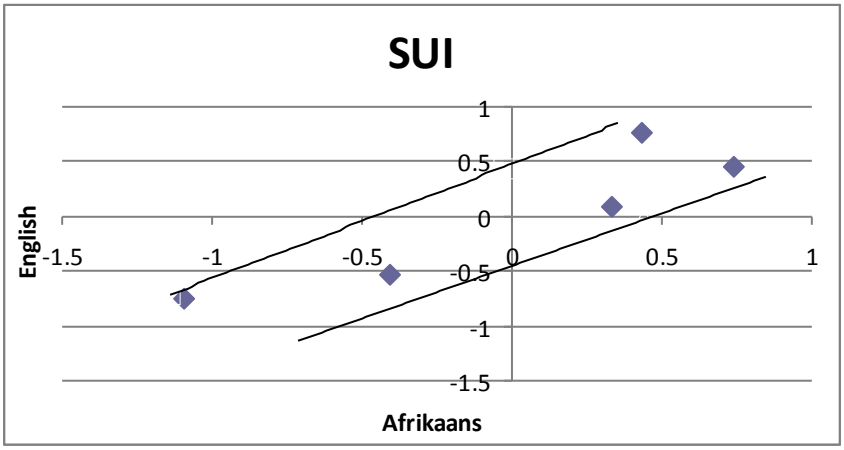

Figure 14. Differential item functioning of items in the Suicidal Thoughts (SUI) dimension.

8.7 Results of the Analysis of Risk Factors for PPD

The demographic and obstetric characteristics of the participants and their PDSS screening results across three screening outcome categories are presented in Table 52. The screening outcome categories, recommended by Beck and Gable (2002), are as follows: i) normal adjustment (total score of ≤59); ii) significant symptoms of PPD (total score of 60 to 79); and iii) positive screening for PPD (total score of ≥80). The prevalence of a positive screen for major PPD using the PDSS in this study was 47.9% (n = 175). Furthermore, screening identified an additional 17.3% (n = 63) of mothers with potential symptoms of PPD.

Table 52 Demographic and Obstetric Variables by PDSS Screening Result (N = 365)

Variable		Normal Adjustment (≤59)		Symptoms of PPD Present (60-79)		Major PPD (≥80)	
	Total	n	%	n	%	n	%
	N = 365	127	34.8	63	17.3	175	47.9%
Marital status							
Married	324	120	37.0	57	17.6	147	45.4
Unmarried	24	2	8.3	4	16.7	18	75.0
Divorced	2	1	50.0	0	0.0	1	50.0
De facto relationship	15	4	26.7	2	13.3	9	60.0
Gestational age of baby at birth							
Before 28 weeks	7	4	57.1	0	0.0	3	42.9
29 - 33 weeks	11	2	18.2	3	27.3	6	54.5
34 - 37 weeks	62	14	22.6	12	19.4	36	58.1
38 - 40 weeks	217	83	38.2	37	17.1	97	44.7
Beyond 40 weeks	68	24	35.3	11	16.2	33	48.5
Type of delivery							
Normal vaginal	99	46	46.5	15	15.2	38	38.4
Traumatic vaginal	50	15	30.0	4	8.0	31	62.0
Elective caesarean	141	45	31.9	20	14.2	76	53.9
Emergency caesarean	74	21	28.4	24	32.4	29	39.2
Perception of care received during labour and delivery							
Excellent	215	94	43.7	38	17.7	83	38.6
Good	107	28	26.2	21	19.6	58	54.2
Unremarkable	21	4	19.1	2	9.5	15	71.4
Poor	22	1	4.5	2	9.1	19	86.4
Help and support received from baby's father							
Yes, most of the time	257	112	43.6	42	16.3	103	40.1
Not as often as needed	81	13	16.0	16	19.8	52	64.2
Hardly any	27	2	7.4	5	18.5	20	74.1
Help and support received from family							
Yes, most of the time	231	108	46.8	37	16.0	86	37.2
Not as often as needed	87	15	17.2	18	20.7	54	62.1
Hardly any	47	4	8.5	8	17.0	35	74.5
Help and support received from friends							
Yes, most of the time	129	73	56.6	20	15.5	36	27.9
Not as often as needed	75	19	25.3	18	24.0	38	50.7
Hardly any	161	35	21.7	25	15.5	101	62.7

Variable		Normal Adjustment (≤59)		Symptoms of PPD Present (60-79)		Major PPD (≥80)	
	Total	n	%	n	%	n	%
Diagnosed with antenatal depression during recent pregnancy							
Yes	11	0	0.0	0	0.0	11	100.0
No	354	127	35.9	63	17.8	164	46.3
Postpartum blues after recent pregnancy							
Yes	256	51	19.9	49	19.1	156	60.9
No	109	76	69.7	14	12.8	19	17.4
Psychiatric history							
No history of depression	278	114	41.0	48	17.3	116	41.7
History of depression	87	13	14.9	15	17.2	59	67.8
History of PPD after previous pregnancy	24	3	12.5	3	12.5	18	75.0
History of antenatal depression during previous pregnancy	2	0	0.0	0	0.0	2	100.0
History of anxiety	30	6	20.0	5	16.7	19	63.3
History of obsessive compulsive disorder	1	0	0.0	0	0.0	1	100.0
History of eating disorders	12	1	8.3	1	8.3	10	83.3
Complicated pregnancy							
Yes	88	20	22.7	12	13.6	56	63.6
Fear of childbirth							
Yes	95	11	11.6	8	8.4	76	80.0
Difficulty conceiving							
Yes	52	16	30.8	8	15.4	28	53.8
No	312	111	35.6	54	17.3	147	47.1
Unplanned pregnancy	101	21	20.8	19	18.8	61	60.4
Planned pregnancy	264	106	40.2	44	16.7	114	43.2
Mother's feelings about expecting a baby							
Positive	269	117	43.5	48	17.8	104	38.7
Ambivalent, negative or anxious	96	10	10.4	15	15.6	71	74.0
Mother's perception of baby's temperament							
Good	242	119	49.2	42	17.4	81	33.5
Fussy, demanding, and/or difficult	123	8	6.5	21	17.1	94	76.4
Experience of specific concerns regarding baby:							
No concerns	159	87	54.7	25	15.7	47	29.6
Health problems	16	3	18.8	0	0.0	13	81.3
Colic	97	21	21.6	17	17.5	59	60.8
Sleeping concerns	93	6	6.5	14	15.1	73	78.5
Feeding concerns	81	5	6.2	11	13.6	65	80.2

Variable		Normal Adjustment (≤59)		Symptoms of PPD Present (60-79)		Major PPD (≥80)	
	Total	n	%	n	%	n	%
Allergies	15	3	20.0	6	40.0	6	40.0
Prematurity	39	8	20.5	8	20.5	23	59.0
Financial concerns							
Yes	216	56	25.9	40	18.5	120	55.6
No	149	71	47.7	23	15.4	55	36.9
Marital problems							
Yes	54	9	16.7	9	16.7	36	66.7
No	311	118	37.9	54	17.4	139	44.7

Multiple regression analysis with a stepwise selection method was employed to determine the variables that were statistically significant predictors of a positive screen for major PPD across the total sample. According to the multiple regression model assumptions, the minimum sample size should be at least 50 + 8k or 104 + k (k = number of predictors). Applied to this study with 11 predictor variables, the minimum sample size should be either 50 + 88 = 138, or 104 + 11 = 115. The larger of the two is selected, that is 138 (Field, 2005, p. 173). This number is smaller than the sample size in this study (N = 365). The sample size is therefore adequate.

The Durbin-Watson (1.947) is very close to two. This indicates that the assumption of independent residuals or errors is met (Field, 2005, p. 189). Values lower than one or larger than three are problematical (Field, 2005, pp. 170, 190).

The multiple correlation coefficient, *R* expresses the relationship between the total PDSS score and the set of predictor variables, which were selected based on the literature

of risk factors for PPD. R^2 shows the proportion of variance in the positive screen for PPD which is accounted for, or explained by, the set of predictor variables (history of depression, etc). In other words, R^2 is an indication of how well the extent of PPD can be predicted when the predictor variables are known. According to Foster et al. (2006), R^2 is the most powerful indicator of how effective the prediction is. The Adjusted R^2 is calculated because R^2 is inclined to over-estimate the success of the prediction. Ideally the Adjusted R^2 should be the same or very close to the value of R^2 (Brace, Kemp, & Snelgar, 2009; Field, 2005). The Adjusted R^2 takes the number of predictor variables as well as the number of participants into account and is therefore a more accurate measure of the effectiveness of the prediction (Brace et al., 2009).

Table 53 presents the model summary. Stepwise regression analysis provided a model which indicates a very strong relationship between the predictor variables and a PDSS score (R = 72, R^2 = 0.52, Adjusted R^2 = 0.51). The model accounts for 50.8% of the overlap in variance between the variables. (Field, 2005, pp. 188-189) Table 54 presents the analysis of variance (ANOVA). The model is highly significant at $p \leq 0.001$ ($F_{(11,346)} = 35.53$; Field, 2005, p. 189).

Table 53 Model Summary of the Dependent Variable (PDSS score)

Model	*R*	R^2	Adjusted R^2	Std. Error of the Estimate
11	.07*	0.52	0.51	25.24

* Predictors: (Constant), Presence of postpartum blues, Felt negative or ambivalent about expecting this baby, Infant temperament, Psychiatric history, Fearful of birth, No father support, Infant's health problems Antenatal depression, No friend support, Difficulty falling pregnant, Life stress

Table 54 Analysis of Variance of the Dependent Variable (PDSS score)

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
11	Regression	242047.85	11	22004.35	34.53	.000*
	Residual	220497.15	346	637.28		
	Total	462545.01	357			

* Predictors: (Constant), Presence of postpartum blues, Felt negative or ambivalent about expecting this baby, Infant temperament, Psychiatric history, Fearful of birth, No father support, Infant's health problems Antenatal depression, No friend support, Difficulty falling pregnant, Life stress

The following variables were entered in the stepwise multiple regression: (a) baby's health problems; (b) infant temperament; (c) felt negative or ambivalent about expecting this baby; (d) rating of care received during labour and delivery; (e) traumatic birth experience; (f) fearful of birth; (g) premature baby; (h) complicated pregnancy; (i) difficulty conceiving; (j) unplanned pregnancy; (k) postpartum blues; (l) psychiatric history; (m) antenatal depression in recent pregnancy; (n) single marital status; (o) lack of support from baby's father; (p) lack of support from friends; (q) lack of support from family; and (r) life stress. Using the stepwise method, 11 significant predictor variables emerged:

$$\text{PDSS score } = c + m_1(x_1) + m_2(x_2) + m_3(x_3)...m_{11}(x_{11})$$

Table 55 presents the raw score (B) values of the predictor variables along with values for Beta (β), t, and the significance (p) for each of the predictors as provided by SPSS. β is the standardized regression coefficient. Its value is an indication of how

strongly each predictor variable influences the criterion variable – in this case, the PDSS score. Larger β values have a greater influence on the PDSS score. The β value allows the predictor variables to be directly compared so that it can be seen which variables carry more weight in establishing the dependent variable, the PDSS score. Results indicate that postpartum blues (β = .24) and feeling ambivalent or negative towards the baby (β = .21) have the greatest influence on the PDSS score. Difficulty conceiving (β = .08), life stress (β = .09), and lack of support from friends (β = .09), although significant, have less impact.

Examination of the raw scores indicates that a diagnosis of antenatal depression during a recent pregnancy increases the predicted raw score by 24.67. Having postpartum blues increases the predicted raw score by 18.84. Both antenatal depression as well as postpartum blues increases the predicted score considerably by 43.51. Life stress is a significant predictor variable that has the smallest impact on the predicted score (it adds only 1.26 points). The significance of the contribution of each predictor variable to the model is also shown in the Table 55.

Table 55 Multiple Regression Analysis of the Association between Demographic and Obstetric Variables and Scores on the PDSS (N = 365)

Variable	Coefficients[a]						
	Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.	Collinearity Statistics	
	B	*SE B*	*B*			Tolerance	VIF
(Constant)	34.85	3.47		10.05	0.000		
Presence of postpartum blues	18.84	3.20	.24	5.90	0.000	0.83	1.20
Felt negative or ambivalent about expecting this baby	16.84	3.45	.21	4.88	0.000	0.77	1.30
Infant temperament	10.61	3.48	.14	3.08	0.002	0.67	1.49
Psychiatric history	12.23	3.03	.16	4.04	0.000	0.87	1.15
Fearful of birth	12.49	3.28	.15	3.80	0.000	0.85	1.17
No father support	8.56	3.17	.11	2.71	0.007	0.84	1.19
Infant's health problems	8.36	3.14	.12	2.67	0.008	0.73	1.37
Antenatal depression	24.67	8.22	.11	3.00	0.003	0.97	1.03
No friend support	6.90	3.02	.09	2.29	0.023	0.86	1.17
Difficulty conceiving	8.33	3.92	.08	2.13	0.034	0.95	1.06
Life stress	1.26	0.61	.09	2.07	0.039	0.80	1.24

a. Dependent Variable: PDSS score

The following predictor variables were dropped from the model in the stepwise analysis as they did not significantly strengthen the model: single marital status, traumatic birth experience, rating of care received during labour and delivery, lack of support from family, unplanned pregnancy, complicated pregnancy, and having a baby born prematurely.

An assumption of regression analysis is that no multicollinearity is present in the data (Field, 2005, p. 196). SPSS 19 provides an indication of the presence of collinearity in the data by means of the variance inflation factor (VIF) and tolerance statistics.

The largest VIF should be less than 10 and the average VIF for all predictor variables should not be considerably greater than one as this may indicate that the regression is biased (Myers, and Bowerman & O'Connell as cited in Field, 2005, p. 196). The collinearity statistics in Table 55 shows the data meets this requirement. The largest VIF is well below ten (1.494). Furthermore, the average VIF is close to one (1.216) which means that the regression is not biased. Tolerance statistics below 0.1 are problematic, while those below 0.2 are potentially problematic (Menard as cited in Field, 2005, p. 196). The tolerance statistics (Table 55) for all the predictor variables in this study are well above 0.2. The VIF and tolerance statistics therefore indicate that no multicollinearity exists in the dataset.

Examination of the variance proportions may also be used to detect collinearity. Variance proportions should be spread equally across the dimensions. Furthermore, each dimension should have a unique high variance proportion (Field, 2005, pp. 196-197). Variance proportions are presented in the collinearity diagnostics table (Table 56) below. Dimension 3 shows a high variance proportion (72%) with antenatal depression and not with any other predictor variables. This suggests that antenatal depression does not correlate or overlap in variance with other predictor variables. "Infant's health problems" has most of its variance loading onto dimension 9 (62%) and does not overlap in variance with other predictor variables. A number of the other predictor variables have the majority of their variance distributed fairly equally onto two dimensions (e.g. "Life

stress", "Felt negative or ambivalent about expecting this baby", "infant temperament", "psychiatric history", and "fearful of birth"). The majority of predictor variables, however, have unique and relatively high variance on unique dimensions. Given that the sample size is not very big and that the statistics above indicate no-multicollinearity, these overlapping variances are not overly problematic.

Table 56 Collinearity Diagnostics of the PDSS Scores

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions											
				(Constant)	Postpartum blues	Negative or Ambivalent About expecting baby	Infant Temp*	Psychiatric History	Fearful of birth	Lack of support from father	Infant's health problems	Antenatal depression	Lack of support from friends	Difficulty Conceiving	Life stress
11	1	6.33	1.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00
	2	1.03	2.48	0.00	0.01	0.06	0.01	0.00	0.00	0.05	0.00	0.19	0.00	0.42	0.00
	3	0.95	2.58	0.00	0.00	0.05	0.00	0.02	0.00	0.02	0.00	0.72	0.00	0.08	0.00
	4	0.71	2.99	0.00	0.00	0.16	0.11	0.06	0.03	0.16	0.04	0.04	0.00	0.20	0.01
	5	0.66	3.09	0.01	0.00	0.07	0.04	0.19	0.40	0.06	0.00	0.01	0.01	0.08	0.01
	6	0.59	3.29	0.00	0.00	0.00	0.11	0.31	0.39	0.02	0.05	0.01	0.03	0.00	0.00
	7	0.47	3.67	0.01	0.01	0.26	0.09	0.01	0.01	0.64	0.01	0.00	0.00	0.06	0.02
	8	0.43	3.82	0.03	0.03	0.26	0.15	0.31	0.12	0.00	0.01	0.02	0.07	0.12	0.01
	9	0.28	4.77	0.00	0.01	0.00	0.19	0.03	0.00	0.01	0.62	0.00	0.31	0.02	0.03
	10	0.24	5.09	0.01	0.26	0.01	0.19	0.05	0.02	0.00	0.19	0.00	0.47	0.01	0.06
	11	0.21	5.55	0.02	0.52	0.10	0.09	0.00	0.01	0.03	0.06	0.00	0.00	0.00	0.41
	12	0.11	7.74	0.92	0.15	0.03	0.02	0.01	0.00	0.00	0.02	0.00	0.10	0.00	0.45

* Infant temperament

The residual statistics for extreme cases should be examined. For a fairly accurate model 95% of cases should have standardized residuals within ±2, and 99% of all cases should have standardized residuals within ±2.5. Only 1% of cases should like outside of these limits (Field, 2005, p. 199). Results from this dataset, reported in Table 57 below, indicate that only three observations were indicated as outliers with the casewise diagnostics. Three outliers in a sample of 358 (7 cases were excluded due to missing values) is merely 0.8 %, which is excellent. The sample therefore conforms to what is expected for a fairly accurate model. The three outliers (case 100, 142, and 179) have standardized residuals greater than three and should be investigated further.

The influence statistics for all the selected cases is shown in Table 58. None of the outliers have Cook's distance larger than one. This means that they do not influence or bias the regression model (Field, 2005, p. 200). The average leverage may be calculated as (k+1)/n or (12/358) = 0.03 and the recommended threshold should ideally be no bigger than three times this value (i.e. 0.09). All three outliers are well within this limit. The Mahalanobis distance is lower than the recommended threshold of 23 (in small sample sizes of 200 cases with five predictors, and a threshold of 25 in samples of 500 cases with five predictors; Field, 2005, p. 202; Stevens, 1984) for all three outliers. None of the cases exceeded this criterion. Case 179 has the largest Mahalanobis distance (10.99). These results indicate that it is unlikely that there were influential cases in the data.

Table 57 Casewise Diagnostics of the PDSS Score

Case Number	Standardized Residual	PDSS Score	Predicted Value	Residual
100	4.10	149	45.53	103.47
142	3.38	124	38.64	85.36
179	3.03	171	94.64	76.36

Table 58 Case Summaries

		Unstandardized Predicted Value	Mahalanobis Distance	Cook's Distance	Centered Leverage Value
100		45.53	5.27	0.03	0.02
142		38.64	4.19	0.01	0.01
179		94.64	10.99	0.03	0.03
Total	N	3	3	3	3

The histogram in Figure 15 (Appendix F) shows that the residuals are reasonably normally distributed as they should be (Field, 2005, p. 204). The normal distribution of residuals is confirmed by the straight line in the plot in Figure 16 (Appendix F). No deviation from normality is evident.

Some heteroscedacity is evident in the scatterplot of the residuals of the outcome variable and each PPD predictor variable when both variables are regressed separately on the remaining predictors (Figure 17 in Appendix F). The points should be random but a slight pattern that funnels out is apparent which indicates increasing variance across the residuals (Field, 2005, p. 203). Outliers on this plot represent cases that may have impacted excessively on a predictor's regression coefficient.

Two of the predictor variables in the multiple regression analysis were subjected to further analysis. These were life stressors and psychiatric history. Each of these predictor variables were composed of multiple characteristics items. Point biserial correlations (r_{pb}) were used to determine if certain life stressors and a history of specific psychiatric illnesses were more significantly associated with a high score on the PDSS. The point biserial correlation coefficient provides a measure of the association between a dichotomous variable and a continuous variable, such as the scores on a test (Ferguson, 1981). It is mathematically equivalent to the Pearson product-moment correlation (r), although the Pearson product-moment correlation can only be used when both variables are non-dichotomous. A p-value of ≤ 0.05 was used to indicate statistically significant results even though a less conservative alpha of $p < 0.15$ is commonly recommended in the literature for predictive models (as opposed to explanatory models; Bloch & Klein, 2005). The life stress variables and psychiatric history variables that were correlated with the total PDSS score are presented in Table 59. Point biserial correlations revealed that eight life stress variables were significantly associated with high PDSS scores, namely moving house, job loss of the mother's partner, change of jobs of the mother's partner, financial concerns, another pregnancy or birth, marriage, marital problems, and family problems. A history of depression was the only psychiatric history variable that was significantly associated with a high PDSS score indicative of major PPD in this study.

Table 59 Point Biserial Correlations of Psychiatric History and Life Stress Variables with Total PDSS Scores (N = 365)

Variables	r_{pb}		Sig	n
Psychiatric history				
Postpartum depression after a previous pregnancy	.100		0.057	365
Antenatal depression during a previous pregnancy	.015		0.769	365
Depression	.300	**	0.000	365
Anxiety	.087		0.096	365
Obsessive compulsive disorder	.036		0.487	365
Anorexia	.068		0.192	365
Bulimia	.078		0.136	365
No psychiatric history	-.338	**	0.000	365
Life stressors in past two years				
House alterations	.046		0.384	364
Moving house	.163	**	0.002	365
Moving city / migration	.071		0.179	364
Job changes: self	.079		0.134	365
Job changes: partner	.159	**	0.002	365
Job loss / retrenchment: self	.101		0.055	364
Job loss / retrenchment: partner	.178	**	0.001	365
Financial concerns	.170	**	0.001	365
Bereavement	.051		0.328	364
Loss of close friends / family relocating, emigrating, etc.	.051		0.334	364
Serious illness of a family member	-.031		0.554	365
Another pregnancy and birth	.124	*	0.018	365
Marriage	.112	*	0.033	364
Marital problems	.216	**	0.000	365
Family problems	.262	**	0.000	364
Been victimised by violence or crime	.102		0.052	365
Serious injury, illness, or personal health problems	.049		0.346	364

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

8.8 Results of the Comparison of the PDSS, the EPDS, and the QIDS-SR16

Descriptive statistics for the PDSS, the EPDS and the QIDS-SR16 were calculated and frequencies determined according to the participants' screening results at each of screening scales' recommended cut-off thresholds. Chi-square analysis was used to compare participants who scored positive for symptoms of PPD on the three measures. Pearson correlations were used to determine the relationship among the continuous scores on the screening scales.

The PDSS is intended to provide an overall score for PPD, but also considers the multidimensionality of postpartum depression and gives seven subscale scores. The summative scoring results in a total score range from 35 to 175. Participants in this study obtained scores that ranged from 35 to 173, with a mean of 82.04 (SD = 35.92). Descriptive statistics for the PDSS, the EPDS, and the QIDS-SR16 are presented in Table 60. The PDSS total score may be sorted into one of three categories: i) normal adjustment (total score of ≤59); ii) significant symptoms of PPD (total score of 60 to 79); and iii) positive screening for PPD (total score of ≥80; Beck & Gable, 2002). Beck and Gable (2001a) recommend a cut-off score of 80 for major PPD (sensitivity = 94%, specificity = 98%), and a cut-off score of 60 (sensitivity = 91%, specificity = 72%) for minor or major depression. Just over one third (n = 127; 34.8%) scored in the range classified as representing normal adjustment (score ≤59). There were 17.3% (n = 63) who obtained a score in the range classified as representing significant symptoms of PPD (score 60-79), while close to half of the participants in this study (n = 175; 47.9%) screened positive for major PPD with scores of 80 or more.

The EPDS is a 10-item self report measure with a 4-point Likert scale. Each of the 10 questions has 4 answer choices that are scored between 0 and 3. The EPDS total score, obtained by adding the scores for each item, may range from 0 to 30. Participants in this study obtained EPDS scores that ranged from 0 to 30, with a mean of 11.10 (SD = 7.20). The cut-off point of the EPDS is recommended at 12 or 13 for probable depression, and at 9 or 10 for possible depression (Cox et al 1987). Boyd et al (2005) have suggested, however, that different cut-off scores may be warranted for different cultural groups. In Beck and Gable's (2001a) comparative study of the PDSS, EPDS and BDI-II, the EPDS yielded a sensitivity of 78%, a specificity of 99% and a positive predictive value of 93% when using a cut-off score of ≥ 12. In this study 38.6% (n = 141) of the participants had scores ranging from 0 – 8 on the EPDS. A further 15.3% (n = 56) had scores ranging from 9 to 11, indicating possible depression, and 46% (n = 168) of the participants had scores ≥12, indicating probable depression.

The QIDS-C16 and the QIDS-SR16 total scores are obtained by adding scores for the nine criterion symptom domains: (1) sad mood; (2) concentration/decision-making; (3) self-outlook; (4) suicidal ideation; (5) involvement; (6) energy/fatigability ; (7) sleep (based on the highest score on any one of the four relevant items – sleep onset insomnia, mid-nocturnal insomnia, early morning insomnia, hypersomnia); (8) weight/appetite change (based on the highest score on any one of the four relevant items – weight increase, weight decrease, appetite increase, appetite decrease) ; and (9) psychomotor changes (based on the highest score on any one of the two relevant items – psychomotor slowing or psychomotor agitation). The total score ranges from 0 to 27. Participants in this study obtained QIDS-SR16 scores that ranged from 0 to 24, with a mean of 9.16 (SD = 5.34). The thresholds

recommended when screening with the QIDS-SR16 are ≤5 for no depression, a score of 6 to 10 for mild depression, a score of 11 to 15 for moderate depression, a score of 16 to 20 for severe depression, and a score of ≥21 for very severe depression (Rush et al., 2003). There were 30.4% (n = 111) of participants in this sample had no depressive symptoms on the QIDS-SR16 with scores ≤5, 31.5% (n = 115) obtained scores ranging from 6 to 10, indicating mild depression, 25.5% (n = 93) obtained scores of 11 to 15 indicating moderate depression, 10.1% (n = 37) of participants were classified with severe depression with scores of 16 to 20, and a further 2.5% (n = 9) had scores indicative of very severe depression (≥21).

Table 60 Descriptive Statistics for the PDSS, EPDS, and QIDS-SR16

	N	Minimum	Maximum	Mean	Std. Deviation
QIDS-SR16	365	0	24	9.16	5.34
EPDS	365	0	30	11.10	7.20
PDSS	365	35	173	82.04	35.92

The published recommended cut-off scores for major depression for the three instruments are presented in Table 61. Based on these cut-off points, the PDSS identified 175 (47.9%) of the participants with major depression, while the EPDS identified 168 (46%), and the QIDS-SR16 identified 46 (12.6%).

Table 61 Cut-off Scores for Screening for the Diagnosis of Major Postpartum Depression for the PDSS, EPDS, and QIDS-SR16

Instrument	Cut-off score for major postpartum depression	n	Frequency
PDSS	≥ 80	175	47.9%
EPDS	≥ 12	168	46.0%
QIDS-SR16	≥ 16	46	12.6%

Cross-tabulation of the PDSS and the EPDS (Table 62) indicates that five mothers (1.4%) that were identified with major PPD by the PDSS were classified with no depression by the EPDS. Furthermore, the EPDS identified three mothers (0.8%) with probable depression that were classified as normal adjustment by the PDSS. Chi-square tests for categorical data indicate a significant correlation between these two measures at the $p < 0.05$ level (chi-square ($df = 4$) = 296.94, $p < 0.001$).

Table 62 Cross Tabulation of the Participants According to Cut-off Scores for the PDSS and EPDS

	PDSS			Total
	≤ 59	60 - 79	≥ 80	
EPDS				
No depression ≤ 8	112	24	5	141
Possible depression 9–11	12	26	18	56
Probable depression ≥ 12	3	13	152	168
Total	127	63	175	365

The cross-tabulation of the PDSS and the QIDS-SR16 (Table 63) shows that only 46 participants (12.6%) were classified by the QIDS-SR16 as presenting with severe or very severe depression, in comparison to the PDSS, which identified 47.9% (n = 175). One mother (0.3%) with a score ranging from 16 to 20 on the QIDS-SR16, indicative of severe depression, was classified by the PDSS as having minor depression. Furthermore, the PDSS identified two participants (0.6%) with major PPD and 16 participants (4.4%) with minor depression who all obtained low scores on the QIDS-SR16 suggesting that no depression was present. Chi-square analysis detected a significant correlation between the categorical data of these two measures (chi-square ($df = 8$) = 261.70, $p < 0.001$).

Table 63 Cross Tabulation of the Participants According to Cut-off Scores for the PDSS and QIDS-SR16

	PDSS			Total
	≤ 59	60 - 79	≥ 80	
QIDS-SR16				
No depression < 5	93	16	2	111
Mild 6 – 10	33	38	44	115
Moderate 11 – 15	1	8	84	93
Severe 16 – 20	0	1	36	37
Very Severe ≥ 21	0	0	9	9
Total	127	63	175	365

The EPDS identified 46% whereas the QIDS-SR16 only identified 12.6% of mothers with major depression. Cross tabulation of the EPDS and the QIDS-SR16 (Table 64) shows that the EPDS identified one participant (0.3%) at risk of probable depression and 13 participants (3.6%) at risk of possible depression who all were identified by the QIDS-

SR16 as having no depression. Comparisons of the categorical depression status of these two measures using chi-square tests indicate a significant correlation (chi-square (df = 8) = 251.92, p < 0.001).

Table 64 Cross Tabulation of the Participants According to Cut-off Scores for the EPDS and QIDS-SR16

	EPDS_Tot (Binned)			Total
	No depression ≤ 8	Possible depression 9 – 11	Probable depression ≥ 12	
QIDS-SR16				
No depression < 5	97	13	1	111
Mild 6 – 10	42	32	41	115
Moderate 11 – 15	2	11	80	93
Severe 16 – 20	0	0	37	37
Very Severe ≥ 21	0	0	9	9
Total	141	56	168	365

The Pearson product-moment correlation was used to determine how well the three instruments, the PDSS, the EPDS and the QIDS-SR16, correlate with each other. These results are reported in Table 65. The total scores obtained on the PDSS and the total scores obtained on the EPDS showed a statistically significant correlation (r = 0.918, N = 365, p < 0.001). The PDSS explains 84% of the variance in the EPDS (r^2 = 0.84). The correlation between the PDSS and the EPDS was slightly higher than the correlation between the PDSS and the QIDS-SR16, although both were strong. The QIDS-SR16 correlated equally well with both the EPDS and PDSS yielding a statistical significant results in both

instances (r = 0.879, N = 365, p < 0.001). The QIDS-SR16 explains 77% of the variance in both the PDSS and the EPDS (r^2 = 0.77).

Table 65 Pearson Correlations between the Total Scores of the PDSS, EPDS, and QIDS-SR16 (N=365)

Scale	PDSS			EPDS		
	r	r^2	p	*r*	r^2	Sig
EPDS	0.918**	0.84	0.000	-	-	-
QIDS-SR16	0.879**	0.77	0.000	0.879**	0.77	0.000

** Correlation is significant at the 0.01 level (2-tailed).

In previous studies, Beck and Gable (2001a) examined the convergent validity of the PDSS. Correlations were calculated among the totals scores of the PDSS, the EPDS, the BDI-II, and diagnostic status as determined by the Structured Clinical Interview for DSM-IV Axis 1 Disorders (SCID). Their results indicated that the PDSS correlated strongly with these self-report depression measures as well as with the clinical interview. The PDSS' correlation with the EPDS was 0.79 (N = 150; p < 0.001). The correlation between these two screening measures in this study were very strong (r = 0.918; p < 0.001; N = 365).

8.9 Discussion

8.9.1 Discussion of Rasch analysis.

Results reveal excellent reliability for both the PDSS (person reliability estimate = .95, Cronbach α = .98) and the Afrikaans PDSS (person reliability estimate = .95, Cronbach α = .98). Person reliability estimates for the PDSS dimensions were very good and ranged from .71 to .85. The SLP dimension had the lowest person reliability estimate (.71) and person separation index (1.56) – the only dimension in the PDSS with a person separation index below 2.00. Person reliability estimates for the Afrikaans PDSS dimensions were generally good, ranging from .64 to .84. The Afrikaans SLP and Afrikaans ANX dimensions yielded the lowest person reliability estimates (.64 and .74 respectively). These two dimensions were also the only two dimensions in the Afrikaans PDSS with a person separation index below 2.00. (Afr SLP 1.34; Afr ANX 1.69).

Rasch analysis was performed with the PDSS and Afrikaans PDSS to evaluate how well the items contributed to underlying construct of PPD. The same analysis was also performed with the scales' dimensions. Average fit statistics for the PDSS and the Afrikaans PDSS as a whole were good with infit and outfit MNSQ statistics near 1.00.

Items 1, 8, 15, 22, and 29 in the English PDSS, and items 1, 15, 29, and 30 in the Afrikaans PDSS had infit MNSQ statistics greater than 1.40. This may indicate that these items did not fit the definition of the constructs they are measuring very well (thus forming another construct(s)). All the misfit items from the English PDSS total and three of the four misfit items from the Afrikaans PDSS total are from the Sleeping/Eating dimension. This

may be a reflection that they form a separate dimension. No items were overfitted (i.e. < 0.60).

The majority of items in the PDSS dimensions as well as in the Afrikaans PDSS dimensions demonstrated fit statistics that supported the underlying constructs of each dimension. An analysis of the PDSS dimensions revealed that one of the 35 items (Item 28) had an infit and outfit MNSQ statistic beyond the acceptable range of 0.60 to 1.40 (Bond & Fox, 2007; Wright & Linacre, 1994), Item 34 had an outfit MNSQ statistic beyond the acceptable range, and Item 2 had a borderline outfit MNSQ statistic of 1.40. Two items from the Afrikaans PDSS demonstrated misfit for both infit and outfit MNSQ statistics. A summary of the misfit items are presented in Table 66 below.

Table 66 Infit and Outfit MNSQ Statistic for Misfit Items in the PDSS and Afrikaans PDSS Dimensions

Scale	Dimension	Item	Content	Infit MNSQ	Outfit MNSQ
English PDSS					
	ANX[c]	2	I got anxious over even the littlest things that concerned my baby		1.40
	SUI[a]	28	I felt that my baby would be better off without me.	1.85	1.66
	GLT[b]	34	I felt like a failure as a mother.		0.54
Afrikaans PDSS					
	SUI[a]	28	Ek het gevoel dat dit vir my baba beter sou wees sonder my.	1.48	1.45
	ANX[c]	30	Ek het gevoel asof ek heeltyd aan die gang moes bly.	1.59	1.54

[a] Suicidal Thoughts Dimension
[b] Guilt/Shame Dimension
[c] Anxiety/Insecurity Dimension

These items demonstrate poor fit to the Rasch model with their observed responses departing considerably from their expected responses. Item misfit occurs for any number of reasons, such as unclear or ambiguous items, items that are not closely related to the overall construct, items that load on another construct, or it may indicate item redundancy. Item 28 and Item 30, in particular, appear to be problematic items. They will be discussed in more detail in the next section.

Item person construct maps showing the positions of persons and items on the PDSS and Afrikaans PDSS were computed. The spread of the items on both questionnaires was fairly good, but there were still persons that scored higher than the items could measure and an overrepresentation of items at the mean level.

Item difficulty estimates indicated that suicidal thought symptoms were more difficult to endorse in both the English and Afrikaans samples. Item 3 (I felt like my emotions were on a roller coaster), Item 9 (I felt really overwhelmed), and Item 24 (I have been very irritable) were the more easily endorsed items from both samples.

The Rasch error estimates for the items in the PDSS as a whole were small with values less than 0.12 and a mean of 0.90. The Rasch error estimates on the PDSS dimensions were also small with the SUI dimension demonstrating the highest estimates and a mean of 0.15. The remaining PDSS dimensions had mean error estimates that ranged from 0.09 to 0.13 All Rasch error estimates for the Afrikaans PDSS items, as a whole, were also small with values less than 0.12 and a mean of 0.90. The Afrikaans PDSS dimensions revealed small error estimates, also with the higher estimates in the SUI dimension with a

mean of 0.17. This suggests that the SUI dimensions in both samples had more haphazard responses than other dimensions.

The data was also examined to evaluate the effectiveness of the Likert response categories as this impacts on how well the response data defines the dimension. Except for item 29 on the PDSS, the average measure (in logits) for each item's response option in both the PDSS and the Afrikaans PDSS does increase with each higher response option, starting with a high negative, and increasing to a positive value. On the 5-point Likert scale, a higher response options therefore does correspond to a higher level of agreement with the item and "more" of the construct measured by the dimension.

The PDSS and the Afrikaans PDSS were compared to examine differential item functioning – i.e. if the items have significantly different meanings across the two samples.

8.9.2 Discussion of problematic items and items with differential item functioning.

Bond and Fox (2007) recommended that items which show DIF ought to be investigated thoroughly to determine what can be inferred about the underlying construct. Although statistical analyses are helpful to detect problematic items with DIF, they do not reveal the causes of item bias. The specific causes of cross-language DIF items that were identified statistically cannot be determined in this study. However, some potential sources of DIF are discussed below.

The more homogeneous the groups are the more accurate DIF detection is (Allalouf & Sireci, 1998). Pearson Chi-square statistics were used to determine if significant differences were present between the characteristics of the English and Afrikaans samples. The two samples were similar across most characteristics, but significant differences were noted for the following: number of weeks since birth ($p = 0.008$), support from father ($p = 0.006$), support from family ($p = 0.007$), gave birth prematurely ($p \leq 0.001$), and infant feeding method ($p = 0.045$), as well as for the following life stressors: moving house ($p = 0.004$), moving city or migrating ($p = 0.021$), mother changed jobs ($p = 0.009$), partner changed jobs ($p = 0.009$), bereavement ($p = 0.017$), and been victimised by violence or crime ($p = 0.024$). These significant differences make it difficult to determine whether DIF was due to differences in these sample characteristics, or whether bias could be attributed to translation or language issues. The presence of DIF in items that did not have misfit in the Rasch analysis may be a reflection of differences in the English and Afrikaans samples.

In Chapter 7 it was pointed out that DIF may have many explanations and be due to several factors, including differences in the item's meaning or item content due to an inaccurate translation or a word having more than one meaning in the target language, differences in the language, wording or format of items, differences in words or expressions which create problems in the interpretation of constructs due to cultural relevance, and so forth. According to Teresi (2006), there are a number of other factors that have received less attention in the literature that also influence the detection of DIF. These include model assumptions, model fit, the distribution of latent variables, sample size, and the length of the test or measuring instrument.

The Rasch measurement model, like most IRT models, assumes that the underlying trait being measured is unidimensional. A contentious issue is whether DIF is merely a reflection of multidimensionality or not. Roussos and Stout (as cited in Teresi, 2006, p. S154) suggest that the presence of multidimensionality is the general cause of DIF – that DIF items measure one or more dimensions apart from the primary dimension. It is important to examine the unidimensionality assumption of the model because multidimensionality can be mistaken for DIF (Teresi, 2006). A requirement of DIF analyses is that the two language versions demonstrate equivalence in their dimensionality structure. The results of this study indicate that the original PDSS and the Afrikaans translation of the PDSS demonstrated adequate equivalence in their dimensional structure through Rasch analysis. This indicates that the same psychological construct was measured for the seven PDSS content scales across both language groups.

The translation of an instrument is one of the critical factors that may contribute to measurement bias (Ramirez et al., 2006). Brislin's back-translation method together with the committee approach was selected for use in this study in an effort to improve the linguistic equivalence of translation of she PDSS. Despite efforts to arrive at a translation as close as possible to the original PDSS, a number of items were identified as showing DIF. The content of these items need to be examined to determine possible reasons for DIF across the two language groups.

Items with large DIF values, with a z-value beyond 1.96, indicate more problematic DIF. Items with borderline DIF values could be due to measurement error or sample idiosyncrasies. Items that did not present with significantly large DIF values in the analysis of the total PDSS and total Afrikaans PDSS could be as a result of multidimensionality.

Items that presented with fit problems and with large DIF in the total PDSS and the total Afrikaans PDSS were Item 30 (z = -3.93), Item 25 (z = 3.14), and Item 9 (z = -3.12). The performance of these items in the content scales was examined.

Item 30 (Ek het gevoel asof ek heeltyd aan die gang moes bly) presented with DIF (z = -3.79) as well as fit problems in the Afrikaans PDSS ANX content scale (infit MNSQ = 1.59; outfit MNSQ = 1.54). Furthermore, two participants who completed the Afrikaans PDSS marked item 30 as difficult to understand while three English participants marked this item as difficult to understand on the English PDSS. However, Item 30 only presented with fit problems in the Afrikaans PDSS ANX content scale, not in the English language version. This may indicate that the Afrikaans translation was not adequate, that Afrikaans respondents were not familiar with the item content, or that the item's content is not appropriate for this Afrikaans sample.

The researcher noticed when assessing some women in person that some English participants had read the word 'pacing' in item 30 as 'packing', and then interpreted 'moving' as relocating. This is likely due to poor reading skills in women who do not have English as a home language. It is uncertain how many women who participated online also misread this item. The terminology in this item may be more familiar to some participants than to others. Both the English and Afrikaans versions of this item should be revised so that an alternative may be found that demonstrates better fit to the Rasch model and with no DIF.

Item 25 (I had a difficult time making even a simple decision; Ek het dit moeilik gevind om die eenvoudigste besluit te neem) did not present with fit problems in either the

Afrikaans or the English PDSS content scales. It did, however, present with DIF in the PDSS MNT content scale (z = 2.00), although the DIF value was relatively small and could be due to measurement error or sample idiosyncrasies. Item 25 was not marked as an item that was difficult to fully understand. The performance of this item may need to be monitored in future studies.

Item 9 (I felt really overwhelmed; Ek het heeltemal oorweldig gevoel), which presented with DIF in the analysis of the total scale (z = -3.12) did not present with DIF or with fit problems in the ANX content scale (z = 0.85). This suggests that no translation problems are evident in this item and it fits the construct of the ANX content scale well. It was, however, marked as difficult to understand by three English participants and one Afrikaans participant. This item may be misunderstood by participants who are not proficient in either English or Afrikaans of these languages. Closer inspection of the item's Afrikaans translation (Ek het heeltemal oorweldig gevoel) reveals that the translated version indicates greater severity with the word "heeltemal". The use of this word implies "I felt completely overwhelmed" rather than "really overwhelmed". This changes the meaning of the item slightly and it may need to be revised.

Item 34 (I felt like a failure as a mother; Ek het gevoel asof ek as ma misluk) presented with borderline DIF in the total screening scale (z = -2.24) as well as borderline DIF in the GLT content scale (z = -2.40). Item 34 also had a low outfit MNSQ statistic in the English PDSS (0.54). Aberrant infit scores are generally a greater cause of concern than aberrant outfit scores (Bond & Fox, 2001). Outfit statistics are not weighted and are more sensitive to the influence of outlying scores. Nevertheless, some DIF together with some fit problems means that the Afrikaans version of this item may need to be monitored.

Relative bias may potentially be a cause for DIF in Item 34 (I felt like a failure as a mother). Relative bias has been identified as a possible source of DIF which occurs when a participant rates herself relative to others in the setting. An item may, for instance, require the respondent to rate herself in comparison to an imagined peer group. This type of item is therefore dependent on the respondent's frame of reference (Teresi, 2006). Item 34 may, to a certain extent, cause the mother to rate herself according to what she regards as failure.

Some items, which did not present with DIF in the analysis of the total scale, did present with DIF in the analysis of the content scales. These were Item 2 (z = 4.09; I got anxious over even the littlest things that concerned my baby; Die geringste dingetjie wat met my baba te doen het, het my angstig gemaak), Item 24 (z = 2.19; I have been very irritable; Ek was baie geïrriteerd), and Item 32 (z = -2.06; I had difficulty focusing on a task; Ek het gesukkel om op 'n taak te konsentreer).

Of the items with DIF in the content scales, Item 24, Item 25, Item 32 and Item 34 presented with borderline DIF that did not seem highly significant, but should nevertheless be monitored in future studies. Only Item 2 and Item 30 had large DIF values in the content scales. Item 30 was discussed above. Item 2 (I got anxious over even the littlest things that concerned my baby; Die geringste dingetjie wat met my baba te doen het, het my angstig gemaak) had a large DIF value (z = 4.09). Item 2 also presented with borderline fit problems in the English PDSS ANX content scale (outfit MNSQ = 1.40). Furthermore, seven participants (five English participants and two Afrikaans participants) indicated that they had difficulty fully understanding this item. DIF, fit results, and taking into account that this item was flagged as difficult to understand by some participants, particularly

English participants, indicates that the English version of this item was not well understood by the English participants of this sample.

No DIF was present for items from the SLP and LOS content scales. The SLP content scale is composed of three items which measure disruptions in normal sleeping habits (items 1, 15, and 22) and two items that measure disruptions in normal eating habits (items 8 and 29). All three items which measure sleep disruptions showed borderline DIF in the total PDSS. However, in the dimension analysis, not one of these three items showed DIF. Furthermore, all the items from the Sleeping/Eating content scale presented with good fit statistics within the content scale, supporting construct validity for the Sleeping/Eating content scale. Poor fit of items from this content scale in the analysis of the total PDSS and total Afrikaans PDSS may simply suggest that these items form a different construct.

Item 23 had borderline DIF in the analysis of the total scale ($z = -2.24$), which does not seem significant, especially considering that no DIF was evident for this item in the ANX content scale. Nevertheless, it may be argued that item 23 (I felt all alone) is slightly stronger in meaning than its Afrikaans translation (Ek het alleen gevoel) due to the word "all" in the original. This item did not present with fit problems and was not flagged as difficult to understand.

When Rasch analysis was performed with each respective content scale, item fit MNSQ statistics supported the measurement of a unidimensional construct in each content scale with the exception of two items, which had high MNSQ fit statistics, suggesting a lack of construct homogeneity. One item was Item 28 (I felt that my baby would be better off without me; Ek het gevoel dat dit vir my baba beter sou wees sonder my) in both the

English PDSS and the Afrikaans PDSS, and the other was Item 30, which was discussed earlier. Unlike Item 30, Item 28 did not present with DIF and was not indicated as an item that was difficult to understand. Poor fit of Item 28 may be an indication that it was consistently misunderstood by both English and Afrikaans respondents, but considering that the item demonstrated poor fit in both languages, it is more likely that it did not fit the construct of the SUI content scale very well. Pearson's correlation of the items with the PDSS content scales (Table 86 in Appendix F) shows that item 28 does not correlate better with another dimension in the PDSS. Item 28 correlates best with the dimension it purports to measure – the SUI content scale (r = .850; p < 001; N = 365). The language of this item may therefore need to be revised even though the language and sentence construction in both English and Afrikaans do not seem to indicate ambiguity. Alternatively, an additional equivalent item can be added to the screening scale and its performance, along with the original Item 28, can be determined in future studies with a wider sample. The additional item can be calibrated along with the other items and, if the additional item demonstrates better psychometric properties in a South African population, it may be considered a suitable alternative to replace the original Item 28.

The Afrikaans version of Item 31 (Ek het baie kwaad gevoel en was gereed om te ontplof) is only slightly different to the original (I felt full of anger ready to explode) due to the words "baie kwaad". This is likely to be translated back into English as "very angry" rather than "full of anger". In the translation process, two alternatives for this item were arrived at. The other alternative was "Ek was woedend en gereed om te ontplof". Future studies may consider substituting the items to see which performs better.

Angoff and Cook (as cited in Allalouf, 2003, p. 56) state that an item with less text (i.e. a shorter item) is more likely to have translation DIF. Furthermore, items with more text tended to retain their meaning and their psychometric characteristics. Allalouf (2003, p. 56) states that subsequent researchers have come to the same conclusion. All the PDSS items consist of relatively short statements, some slightly shorter than others. The length of the statements did not appear to impact on DIF.

8.9.3 Discussion of the risk factors for major PPD in this study.

A high score on the PDSS does not in itself confirm a depressive illness as it is screening instrument and not a diagnostic instrument. The PDSS has, however proved to be a reliable and valid screening instrument for the detection of PPD (Beck & Gable, 2002). It is therefore reasonable to assume that the risk factors (predictor variables) identified as significant in this study are important in the development of PPD.

The PDSS scores of almost two thirds (65%) of mothers in this study exceeded 59, indicating the presence of significant symptoms of PPD or a positive screen for major PPD. The prevalence of mothers who screened positively for major PPD between 4 and 16 weeks postpartum was 48%. A further 17% of mothers presented with symptoms that indicate a potential risk for PPD. This rate is not unexpected given that many mothers were recruited from antenatal and postnatal support groups, from magazine articles about postpartum depression, and from health practitioners who suspected that the mother may have PPD.

Statistically significant variables associated with major PPD in this study were a history of psychiatric illness – depression in particular, antenatal depression in recent

pregnancy, postpartum blues, lack of support from the baby's father, lack of support from friends, life stress, infant temperament, difficulty conceiving, feeling negative or ambivalent about expecting this baby, fearful of childbirth, and concern about health related issues regarding the infant, like colic, sleeping and feeding problems, and allergies. Although multiple regression analysis did not reveal a statistically significant relationship between a previous diagnosis of PPD, mothers were slightly more likely to have a positive score of major PPD if they had previously been diagnosed with PPD. Furthermore, the incidence of major PPD was greater in mothers who reported greater dissatisfaction with the care they received during labour and delivery. This variable was, however, not statistically significant when multiple regression analysis was employed. Mothers presenting with these variables should be closely monitored by their health practitioners as they have an increased risk of developing PPD.

The following factors were not found to be associated with major PPD: marital status, gestational age of infant at birth, method of delivery, support from family, unplanned pregnancy, and complicated pregnancy.

Women with a previous history of depression were more likely to screen positive for major PPD. The incidence rate for major PPD in mothers who reported a past history of depression was 67.8% compared to 41.7% in mothers with no history of depression. This result replicates findings from numerous studies which indicated that a history of depression is a strong and significant risk factor for PPD. An antenatal history of anxiety disorders also slightly increased the likelihood that mothers may develop PPD, although no statistically significant relationship was noted. A history of psychiatric illness prior to

becoming pregnant has also been associated with PPD, significantly increasing a woman's risk twofold (Forman et al., 2000).

Eleven mothers in this study (3%) indicated that they had been diagnosed with antenatal depression during their recent pregnancy. All these mothers screened positive for major PPD. The finding that antenatal depression is a risk factor for PPD is consistent with findings from other studies (e.g. Forman et al., 2000).

The significant relationship found between postpartum blues and PPD is consistent with findings from other studies. Postpartum blues is more prevalent than PPD. Results from this study are consistent with the literature that postpartum blues affects up to 70% percent of postpartum women. All mothers who experience postpartum blues will not necessarily develop PPD. The incidence of major PPD in this study was 60.9% in mothers who had postpartum blues PPD compared to 17.4% in mothers who reported not having had postpartum blues in their recent pregnancy.

Mothers who reported feeling ambivalent, negative or anxious about expecting a baby were significantly more likely to present with major PPD (74%) than those mothers who felt positive about expecting a baby (38.7%). Mothers whose recent pregnancy was unplanned were slightly more likely to present with major PPD (60.4%) than mothers whose pregnancy was planned.

Mothers who described their infants as demanding, fussy or difficult accounted for 32.1% of the sample. Infants with a difficult or irritable temperament have been implicated as a factor that contributes to maternal depression. Results from this study also indicate a significant relationship between these infant temperament characteristics and major PPD.

The incidence of major PPD in mothers who described their infants as demanding, fussy or difficulty was 76.4% compared to a 33.5% incidence of major PPD in mothers who did not report these infant characteristics.

Results indicate a significant relationship between major PPD and mothers' reports of infant health concerns, such as concerns with feeding and sleeping, colic, reflux and infant illness. Maternal reports of depression have been associated with infant sleep problems. A quarter (25.5%) of the mothers in this study indicated that their infants were sleeping poorly. More than three quarters (78.5%) of the mothers who screened positive for major PPD reported that their infants were sleeping poorly. Maternal sleep quality may act as an important mediator in the relationship between depression and infant sleep problems. It is therefore important to ensure that mothers who present with PPD and who report to be sleeping poorly themselves, receive assistance in teaching their infants to settle independently.

Infantile colic is a common problem of early infancy and has been reported to be associated with early postpartum depressive symptoms (Akman et al., 2006; Howell et al., 2006). More than a quarter of the mothers in this study (26.6%) reported that their infants suffered from colic. The incidence of major PPD in these mothers was 60.8%.

Surprisingly, the incidence of major PPD in mothers who reported concern about their infants' health and feeding problems was even higher at 81.3% and 80.2% respectively. A participation requirement was that mothers gave birth to a healthy baby without a disability. It may therefore be reasonable to assume that the health concerns the mothers had about their infants were not major health issues. This was, however, not

determined. Anxiety (Beck, 1992, 1993) and a negative cognitive attributional style, when assessed through self-report, is strongly related to high levels of PPD symptoms (O'Hara & Swain, 1996). These variables were not explored in this study but have led the researcher to wonder whether they have an impact on mothers who present with major PPD and express concern regarding their infants' feeding, appropriate weight gain, and health. This may be explored in future studies.

Fear of childbirth is not uncommon in pregnant women. In this study 26% of mothers reported feeling intensely anxious or fearful prior to delivering their baby. It has been found that fear of childbirth is a risk factor for both PPD and postpartum post-traumatic stress (Soderquist et al, 2009). Eighty percent of mothers who screened positive for major PPD in this study reported fear of childbirth in their pregnancy.

Low levels of social support and lack of support from the mother's partner are among the strongest predictors of PPD (e.g. Forman et al., 2000). Findings from this study indicate that lack of support from the mother's partner and from friends are significant variables associated with a high PDSS score. The incidence of major PPD in this study was 74.1% in mothers who reported that they did not receive any support from their partners and 62.7% in mothers who reported not receiving support from friends.

Life stress has been shown to be a significant predictor of PPD. Mothers who had a high PDSS score were significantly more likely to have moved house, had a partner who changed jobs or lost his job, had financial concerns, and experienced marital and family problems. Having another baby and getting married in the last two years were also associated with high scores on the PDSS, although somewhat less highly significant.

More than half of mothers in this study indicated that they were concerned about their finances in the previous two years. The prevalence of PPD has been reported to be significantly higher in women who experience financial stress or who are financially poor (e.g. Segre et al., 2007). The percentage of women who screened positive for major PPD who indicated that they were experiencing financial stress was 55.6%. In comparison, 36.9% of mothers screened positive for major PPD who did not report experiencing financial stress. This result replicates findings in other studies which indicated that financial stress is a strong and significant risk factor for PPD.

The results of this study confirm findings from other studies that marital conflict is a strong and significant predictor of PPD. The prevalence of major PPD in women who reported to be experiencing marital problems was 66.7% Results from this study also indicate that family problems is associated with major PPD. A limitation of this study is that it was not determined what family the mother was referring to, and whether family problems were experienced within the nuclear family, with extended family, or problems in the daughter-in-law-mother-in-law relationship.

Difficulty conceiving was found to be significantly associated with major PPD in this study. This variable is not generally regarded as a risk factor for PPD. The amount of mothers who indicated that they had difficulty conceiving was 14.2%. While 7.4% of the mothers in this study sought assistance with conception, seeking treatment for infertility was not significantly associated with major PPD. Yet, research has shown that assisted conception is a risk factor for postpartum mood disturbance (Fisher, Hammarberg, & Baker, 2005). A potential reason that Fisher et al (2005) cites is that women who struggled to conceive may feel they have a lowered sense of entitlement to seek help or to complain

because the infant was so highly desired. This reason potentially also applies to women who struggled to conceive who did not opt for – or who could not afford – assisted reproductive technologies. Furthermore, other factors that were not explored in this study, but that may have been related to both difficulty in conception as well as predictive of postpartum mood disturbance, may be an area for future research.

8.9.4 Discussion of the correlation of the PDSS, the EPDS, and the QIDS-SR16.

Using multiple screening scales to determine convergent validity is, according to Campbell and Fiske (as cited in Beck & Gable, 2002, p. 39) a preferred approach to demonstrate that a measure has construct validity. Convergent validity indicates whether a test correlates positively with other tests that claim to measure the same construct. It is therefore an important part of construct validity.

Comparisons of the categorical depression status of the PDSS, EPDS, and the QIDS-SR16 with each other using chi-square tests indicate significant correlation between all three measures (all $p \leq 0.001$). Parametric correlation of the continuous scores on the PDSS, the EPDS, and the QIDS-SR16 also indicate that the three measures were highly correlated (all $p \leq 0.001$). In this case the correlation was slightly stronger between the PDSS and the EPDS than between the PDSS and the QIDS-SR16. The QIDS-SR16 correlated equally well with both the PDSS and the EPDS. All three instruments therefore identified the same women as likely to have post-partum depression. The finding that the

PDSS was correlated strongly with both the EPDS and the QIDS-SR16 provides evidence of its convergent validity, and hence its construct validity.