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Translation and validation of the Swedish version of the Birth Satisfaction Scale-Revised (BSS-R)

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ABSTRACT

Background: Optimizing women's childbirth experience is essential for development of quality mother infant relationships. The *Birth Satisfaction Scale-Revised* (*BSS-R*) can be used to measure birth satisfaction.
Aim: The current investigation sought to translate and validate a Swedish version of the BSS-R.
Method: Following translation, a comprehensive psychometric validation of the *Swedish-BSS-R* (*SW-BSS-R*) was carried out using a multi-model, cross-sectional, between- and within-subjects design.
Participants: A total of 619 Swedish-speaking women participated, from which 591 completed *SW-BSS-R and* were eligible for analysis.
Data analysis: Discriminant, convergent, divergent and predictive validity, internal consistency, test-retest reliability, and factor structure were evaluated.
Results: The *SW-BSS-R* was found to have excellent psychometric properties and hence is a valid translation of the original *UK(English)-BSS-R*. Important insights into relationships between mode of birth, post-traumatic stress disorder (PTSD), and postnatal depression (PND) were observed.
Conclusions and implications for practice: The *SW-BSS-R* is a psychometrically valid translation of the original *BSS-R* and is suitable for use in a Swedish-speaking population of women. The study has also highlighted important dynamics between birth satisfaction and areas of significant clinical concern (i.e., mode of birth, PTSD and PND) in Sweden.

Introduction

Childbirth is a complex and life changing experience, which has the power to determine future physical, psychological, and emotional health outcomes of women and their infants (Bell and Andersson, 2016). A positive birth experience is associated with improved self-esteem, easier transition to parenthood, and enhanced mother-infant bonding (Karlström et al., 2015). The World Health Organization (WHO) defines a positive birth experience as one that 'fulfils or exceeds a woman's prior personal and sociocultural beliefs and expectations, including giving birth to a healthy baby in a clinically and psychologically safe environment with continuity of practical and emotional support from a birth companion(s) and kind, technically competent clinical staff' (World Health Organisation, 2018, p. 1). In contrast, a negative birth experience is associated with higher risk of women developing postnatal depression (PND), postnatal stress, and impaired quality of life (Bell and Andersson, 2016), which in turn can affect the psychosocial and physical development of the newborn infant. A negative birth experience increases the risk of

Abbreviations: ANOVA, One-way analysis of variance; BSS-R, Birth satisfaction scale-revised; CB-PTSD, Citybits childbirth-related PTSD; CFA, Confirmatory factor analysis; CFI, Comparative fit index; CityBiTS, City birth trauma scale; CS, Caesarean section; EPDS, Edinburgh postnatal depression scale; G-PTSD, General ptsd; ICC, Intraclass correlation coefficient; ICHOM, International consortium for health outcome measurement; KGVD, Known-groups discriminant validity; PND, postnatal depression; PTSD, post-traumatic stress disorder; QC, Quality of Care; RMSEA, root mean squared error of approximation; SE, Stress Experienced during Childbearing; SRMR, square root mean residual; SW-BSS-R, Swedish-BSS-R; UVB, unassisted vaginal birth.

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developing posttraumatic stress disorder (PTSD) (Patterson et al., 2019) and fear of future childbirth, which together may influence women's future reproductive choices (Nilsson et al., 2012). Optimizing women's childbirth experiences is consequently an important mission for maternity care settings that deal with antenatal, intranatal, and postnatal women, partners and families.

Birth satisfaction encompasses multidimensional constructs, which are influenced by several factors. For example, complications or interventions (e.g., forceps, caesarian section, medical problems) that arise during labor may lead to decreased birth satisfaction, with the women's subjective perception and self-evaluation impacting most upon reported experiences (Carquillat et al., 2016). Other important influential factors include discrepancy between women's perceived expectations of childbirth and its actual reality (Hollins Martin and Fleming, 2011), practical and emotional support provided by partners and maternity care staff (Downe et al., 2018; Lundgren et al., 2009), and retaining control and having power to share active decision-making regarding suggested interventions (Downe et al., 2018).

During recent years, many papers have reported on use of instruments that measure women's birth satisfaction (Alfaro Blazquez, Corchon, and Ferrer Ferrandiz, 2017; Nilver et al., 2017; Sawyer et al., 2013), which represents the growing interest in improving quality of maternity care (Konerding, 2016). Nonetheless, some instruments designed to measure birth satisfaction have been criticized for their lack of population usability, ambiguous terminology, and measurement of loosely related concepts, such as fear of childbirth (Alfaro Blazquez et al., 2017; Nilver et al., 2017; Sawyer et al., 2013). Resolving accuracy of the conceptual underpinnings of birth satisfaction motivated development of the *Birth Satisfaction Scale-Revised* (*BSS-R*)(Hollins Martin and Martin, 2014). In essence, the validated *BSS-R* is bolstered by evidence-based factors that affect women's evaluation of their birth experience (Hollins Martin and Fleming, 2011). As such, the *BSS-R* is designed to assess three thematically derived dimensions of birth experience, which include (i) stress experienced during childbirth, (ii) women's attributes, and (iii) quality of care. Per se, the validated *BSS-R* is a short 10-item multi-dimensional tool, which has shown itself to have excellent psychometric properties in both English-language and translated versions (Hollins Martin and Martin, 2014; Jefford et al., 2018; Romero-Gonzalez et al., 2019; Skvirsky et al., 2020). In response to an assessment of its robustness and ease of use, the *BSS-R* was selected by The International Consortium for Health Outcome Measurement (2016). Since 2016, the *BSS-R* has been widely translated and validated for international use in many countries, which include Greece (Vardavaki et al., 2015), the US (Barbosa-Leiker et al., 2015), Australia (Jefford et al., 2018), Turkey (Goncu Serhatlioglu et al., 2018), Spain (Romero-Gonzalez et al., 2019), Slovakia (Skodova et al., 2019), Iran (Nasiri et al., 2020), Israel (Skvirsky et al., 2020), Brazil (Ferrari et al., 2021), Italy (Nespoli et al., 2021), the Netherlands (Emmens et al., 2021) and Czech Republic (Ratislavová et al., 2022). To add to this collection of validations, the aim of the current study was to develop and validate a Swedish-language version of the *BSS-R*, for purpose of facilitating accurate assessment of women's childbirth experiences in Sweden.

The following predictions were empirically tested:

(1) The *SW-BSS-R* will demonstrate good known-groups discriminant validity using mode of birth as the between-groups criterion.
(2) The *SW-BSS-R* will demonstrate good known-groups discriminant validity using Edinburgh Postnatal Depression Scale (EPDS) case classification (negative/positive) as the between-groups criterion.
(3) The *SW-BSS-R* will demonstrate good convergent validity by correlating (total and sub-scales) significantly and negatively with sub-scales of a multidimensional measure self-report measure of PTSD.
(4) The *SW-BSS-R* will demonstrate acceptable divergent validity with non-significant correlation ($p>0.05$) with participant age.
(5) The *SW-BSS-R* will demonstrate good predictive validity by regressing sub-scale scores onto measures of childbirth-specific PTSD, general PTSD and self-report depression.
(6) *SW-BSS-R* sub-scales and total scale will demonstrate acceptable internal consistency.
(7) The *SW-BSS-R* (sub-scales and total scale) will demonstrate good test-retest reliability at one-month follow-up in a subgroup of the study cohort.
(8) The tri-dimensional measurement model of the *BSS-R* will offer acceptable data fit.
(9) The bifactor model of the *BSS-R* will offer acceptable data fit.

Method

A cross-sectional design was used to address prediction 1–9, which incorporated a between-groups approach to evaluate known-groups discriminant validity (prediction 1 and 2). Also, a within-subject design evaluated test-retest reliability on a subsample of participants (prediction 7).

Participants

Participants (n=619) were recruited from five birthing clinics in Sweden. Inclusion criteria included speaking Swedish, age ≥18 years, and having given birth within the past 2-months. Cases of stillbirth were excluded. Post-permission from each clinic unit manager, administrators generated lists with social security numbers of women aged 18-years or older who had given birth in the prior 4–8 weeks. Social security number lists were sent to the Swedish address register, from which potential participants' addresses were retrieved.

Data collection

Information about the study was sent to participants by mail, together with a personal code and link to the online survey. Informed consent was obtained through participants entering their personal code on the first page of the survey. After three weeks, the retest survey was sent to participants who had fully completed the first survey. Data was collected between September 2021 and January 2022.

Six-hundred and nineteen participants completed the *SW-BSS-R*, of which 22 (3.6%) had greater than >5% missing data. Post exclusion of incomplete scales, (n=597), the rest were further screened. In addition, multivariate outliers were identified (n=6) by calculation of Mahalanobis distances and removed from the dataset, which left 591 scales for psychometric appraisal. Participants mean age calculated at 32.79 (SD 4.49), with mean gestational age 39.48 (SD 1.85) weeks. The majority of participants (97%) were either married or in a civil partnership (n=242) or co-habiting with their partner (n=357). Most participants had an un-assisted vaginal birth (n=449; 76%), while a minority had assisted vaginal birth (forceps or ventouse) (n=48; 8%), emergency caesarean section (n=62; 11%), or elective caesarean section (n=32; 5%). Three-hundred and twenty-three (55%) of participants were nulliparous, and 268 (45%) were multiparous.

Instruments

The birth satisfaction scale-revised (BSS-R)

The *BSS-R* is a 10-item self-report measure of birth experience, which is comprised of three sub-scales: (1) Stress Experienced during labor (SE sub-scale, 4-items), (2) Women's personal Attributes (WA sub-scale, 2-items), and (3) Quality of Care (QC sub-scale, 4-items) (Hollins Martin and Martin, 2014). A number of items on the BSS-R are reverse scored, with both sub-scale and total higher scores indicating greater amounts of birth satisfaction. The English UK founder *BSS-R* has been validated by Hollins Martin and Martin (2014).

City birth trauma scale (CityBiTS)

The *CityBiTS* (Ayers et al., 2018) is comprised of 29 questions, which explore trauma symptoms that relate to childbirth. Questions are answered by participants responding with a YES or NO, and extent of experience marked on a 4-point Likert-scale. Higher scores indicate increased levels of posttraumatic stress. The CityBiTS consists of four sub-scales, which include (1) Re-experiencing symptoms, (2) Avoidance symptoms, (3) Negative cognitions and mood, and (4) Hyperarousal. Total scores range from 0 to 60, with 60 representing highest level of posttraumatic stress. The CityBiTS content relates to the DSM-V criteria and has been translated and validated in Swedish with good results (Stén et al., 2023).

Edinburgh postnatal depression scale (EPDS)

The *EPDS* (Cox et al., 1987) is a 10-item self-report screening measure for the detection of PND. Higher scores indicate more depressive symptoms. Various cut-off scores have been suggested (Levis et al., 2020). In the current study we use the 11/12 cut-point to differentiate screen case negative and screen case positive total scores (Wickberg and Hwang, 1996). The Swedish version of EPDS has been validated as is widely used in clincal practice and in research (Wickberg and Hwang, 1996).

Translation of the Swedish-BSS-R (SW-BSS-R)

The *BSS-R* was translated into Swedish according to guidance recommended by (Wild et al., 2005). First, the original founder *UK-BSS-R* was translated separately by two researchers, familiar with the topic of childbirth, who are both fluent in Swedish and English. These two translated versions were discussed in depth by the research team, with any discrepancies resolved. Next, the agreed Swedish version was back translated by two other bilingual healthcare workers who are experienced in maternity care. The back-translations were examined for consistency against the original founder *UK-BSS-R*, and sent to the copywrite owners Hollins Martin and Martin (https://www.bss-r.co.uk) who commented on the translated version. Post comments and further discussion with the research team, a second Swedish version of the BSS-R was constructed with minor changes to wording. This draft version of the *SW-BSS-R* was piloted on a group of (n=6) women who had given birth 2–3 months earlier. This pilot group evaluated usability and understanding of the instrument in a Swedish cultural context. Post event, it was concluded that this final version of the *SW-BSS-R* was a comprehensive instrument for Swedish childbearing women to complete.

Data analysis

Known-groups discriminant validity

Translation and validation studies of the *BSS-R* have examined differences in sub-scale and total scores as a function of mode of birth to establish known-groups discriminant validity, usually comparing an unassisted vaginal birth (UVB) to an intervention birth, which invariably reports that a UVB is associated with significantly greater birth satisfaction (Fleming et al., 2016; Martin et al., 2016; Romero-Gonzalez et al., 2019; Škodová et al., 2019). These observations have been investigated further in contemporary studies that have examined *BSS-R* score differences as a function of caesarean section type (elective vs. emergency) (Emmens et al., 2021; Nakić Radoš et al., 2022; Ratislavová et al., 2022). Mode of birth was consequently categorized into four groups, which include: (1) vaginal birth, (2) assisted vaginal birth (instrument or ventouse), (3) elective caesarean section (CS), and (4) emergency CS. Comparison between groups on *BSS-R* sub-scale and total scores was undertaken using one-way analysis of variance (ANOVA). Post-hoc testing in the event of an overall statistically significant ANOVA result was undertaken using the Bonferroni correction to control for Type 1 error. Known-groups discriminant validity (KGDV) analysis was also undertaken, based upon EPDS case-classification to evaluate the hypothesis that 'those classified as case negative will have significantly higher total *BSS-R* score compared to those classified as case positive'.

Convergent validity

Convergent validity was determined by examinations of Pearson's r correlation coefficients between *SW-BSS-R* sub-scales and total score and the CityBiTS childbirth-related PTSD (CB-PTSD) sub-scale, and general PTSD (G-PTSD) sub-scale and the total score. It was predicted that *SW-BSS-R* sub-scale and total scores would be significantly and negatively correlated with CB-PTSD, G-PTSD and the CityBiTS total score. It was also predicted that correlations between *SW-BSS-R* sub-scale and total scores will be higher between CB-PTSD scores than G-PTSD scores.

Divergent validity

Adopting the approach of a number of previous *BSS-R* validation studies, for example Hollins Martin and Martin (2014), Romero-Gonzales et al. (2019), Ratislavová et al., 2022 and Skodova et al. (2019), divergent validity was determined by calculating correlation coefficients (Pearson's r) between *SW-BSS-R* total and sub-scale scores and participant age.

Predictive validity

Predictive validity was established by linear multiple regression using *BSS-R sub-scales* to predict CB-PTSD and G-PTSD sub-scale scores and EPDS total score. Based on these observations and in particular the observation of statistically predictive relationships, a path model was evaluated following and replicating the path modelling work of (Nakić Radoš et al., 2021).

Internal consistency

Internal consistency of the *SW-BSS-R* sub-scales and total score was determined using Cronbach's Alpha (Cronbach, 1951), using conventional values of 0.70 or greater to determine internal consistency acceptability (Kline, 2000). The inter-item correlation (Pearson's r) was used to evaluate the two-item WA sub-scale using the threshold range of 0.15–0.50 (Clark and Watson, 1995) to indicate acceptability. A recent study of the psychometric properties of the Czech-language version of the *BSS-R* also used McDonalds Omega (ω), Omega hierarchical (ωh), and Omega total (ωt) to evaluate internal consistency (Ratislavová et al., 2022), ω having been suggested as a superior determinant of total scale internal consistency (Hayes and Coutts, 2020). Consistent with (Ratislavová et al., 2022), it has also been suggested that ωh and ωt should be reported with total scale Cronbach's alpha (Revelle and Condon, 2019). Again, consistent with previous *BSS-R* validation studies, comparison to the original Hollins Martin and Martin (2014) validation were undertaken using the method of Diedenhofen and Musch (2016), which is an approach which utilizes the Cronbach alpha sampling error theory of Feldt et al. (1987).

Table 1
Mean, standard deviation and distributional characteristics of individual Swedish BSS-R items, sub-scale totals and the total *Swedish-BSS-R* score.

Item	Item content	Domain	Mean	SD	Min	Max	Skew	Kurtosis	se
BSS-R 1	I came through childbirth virtually unscathed	SE	2.96	1.19	0	4	−1.01	−0.07	0.05
BSS-R 2	I thought my labour was excessively long	SE	3.02	1.28	0	4	−1.08	−0.08	0.05
BSS-R 3	The delivery room staff encouraged me to make decisions about how I wanted my birth to progress	QC	2.79	1.15	0	4	−0.72	−0.25	0.05
BSS-R 4	I felt very anxious during my labour and birth	WA	2.61	1.23	0	4	−0.58	−0.73	0.05
BSS-R 5	I felt well supported by staff during my labour and birth	QC	3.38	0.91	0	4	−1.70	2.78	0.04
BSS-R 6	The staff communicated well with me during labour	QC	3.32	0.92	0	4	−1.54	2.29	0.04
BSS-R 7	I found giving birth a distressing experience	SE	2.07	1.30	0	4	−0.07	−1.07	0.05
BSS-R 8	I felt out of control during my birth experience	WA	2.15	1.37	0	4	−0.15	−1.26	0.06
BSS-R 9	I was not distressed at all during labour	SE	1.59	1.22	0	4	0.35	−0.85	0.05
BSS-R 10	The delivery room was clean and hygienic	QC	3.60	0.67	1	4	−1.58	1.75	0.03
Stress	Sub-scale total		9.64	3.54	0	16	−0.44	−0.23	0.15
Attributes	Sub-scale total		4.77	2.27	0	8	−0.33	−0.81	0.09
Quality	Sub-scale total		13.09	2.87	2	16	−1.32	1.86	0.12
Total	Total score		27.50	7.01	3	40	−0.60	0.04	0.29

*Domain of the *Swedish-BSS-R*. SE=Stress experienced during childbearing, SE=standard error of kurtosis, WA=Women's attributes, QC=Quality of Care.

Test-retest reliability

Test-retest reliability was evaluated using the intraclass correlation coefficient (ICC), which compared results of the *SW-BSS-R* sub-scale and total scores at baseline, and follow-up within a convenience subset of the baseline sample.

Confirmatory factor analysis

The tri-dimensional measurement model of the *BSS-R* was investigated using *Confirmatory Factor Analysis* (CFA). CFA is a sophisticated statistical approach that assumes distributionally normal data (Brown, 2015). Data was therefore screened to determine excessive item skew and kurtosis that might violate psychometric assumptions, with multivariate outliers identified and removed (Kline, 2000). Three correlated factors and associated subscales of *Stress Experienced during labour* (SE sub-scale), *Women's personal Attributes* (WA sub-scale) and *Quality of Care* (QC subscale) represent the BSS-R measurement model (Hollins Martin and Martin, 2014). A bifactor model, offering additional evidence for the use of the *BSS-R* total score has been shown to offer a good fit to data (Martin et al., 2018; Nakić Radoš et al., 2022), and was thus also evaluated. The bifactor model evaluated a model circumscribed by a general factor (all items) and three uncorrelated specific factors of SE sub-scale items, WA sub-scale items and QC sub-scale items. Finally, a single-factor model was evaluated. Maximum-likelihood estimation was used for matrix calculations (Brown, 2015; Kline, 2011) and model fit evaluated by use of the comparative fit index (CFI) (Bentler, 1990), the root mean squared error of approximation (RMSEA) (Steiger and Lind, 1980), and the square root mean residual (SRMR) (Hu and Bentler, 1999). Conventional values of >0.90 (CFI) (Brown, 2015), <0.08 (RMSEA) (Browne and Cudeck, 1993) and <0.08 (SRMR) (Hu and Bentler, 1999) were used to determine model fit to data. We note that there has been some debate in the literature over an extensive period of time regarding the most appropriate cut-off values and these do indeed vary. Hu and Bentler (1999) for example, suggest alternative more stringent criteria of 0.95 (CFI) and 0.06 (RMSEA), while more recently there is the suggestion of adjusting model fit criteria based on the study sample size, though these again represent 'rules of thumb' rather than absolutes (Cho et al., 2020). Indeed, contemporary research specifically on model fit indices highlights the influence of sample size on model fit and has let to the suggestion that researchers may need to rely on a close-fit pragmatic approach to model-fit veracity, particularly within increasing sample sizes (Goretzko et al., 2023).

The study was approved by the Swedish Ethical Review Authority on August 20, 2021 (Dnr 2021–03,968). All data was pseudonymized and handled according to the General Data Protection Regulation.

Results

As presented in Table 1, no excessive skew or kurtosis was observed. Table 1 also provides an overview of descriptive and distributional characteristics and scores of *SW-BSS-R*.

SW-BSS-R sub-scale and total score correlations

SW-BSS-R sub-scales and the total score were all observed to be significant and positively correlated ($p<0.01$). Utilizing the approach of Diedenhofen and Musch (2015), no statistically significant differences were observed between correlation pairs of the current study and those of the original UK BSS-R validation, except the correlation between the QC sub-scale and total *SW-BSS-R* score which was significantly higher in the current study ($p<0.05$) (see supplementary file, Table S.1).

Known-groups discriminant validity

Main effects ($p<0.001$) were observed for all *SW-BSS-R* subscales and the total score between groups differentiated by mode of birth. Effect sizes for SE and WA sub-scales and the total score were medium, and for the QC sub-scale the effect size was small. Unpacking these by sub-scale, Bonferroni-corrected comparisons revealed that those who had an assisted vaginal birth or emergency CS had significantly lower QC sub-scale scores than those who had vaginal birth or elective CS. No significant statistical difference was observed between unassisted vaginal birth and elective CS. Women who had an unassisted vaginal birth had significantly higher WA sub-scale scores compared to all other groups on the WA sub-scale. Compared to the unassisted vaginal birth group, those who received an emergency CS scored significantly lower on the QC sub-scale. Finally, those who had an unassisted vaginal birth were observed to have a significantly higher total *SW-BSS-R* score, compared with the assisted vaginal birth group or emergency CS group. In contrast, the elective CS group were observed to have a significantly higher total *SW-BSS-R* score, compared against the emergency CS group (Table 2).

Highly statistically significant differences were observed for all sub-scales and the total *SW-BSS-R* score between groups differentiated by EPDS case classification status, with those in the case positive group reporting higher scores. Effect sizes were medium for sub-scales and large for the total *SW-BSS-R* score (Table 3).

Table 2
Comparison of *Swedish-BSS-R* total and sub-scale scores differentiated by mode of birth. Standard deviations are in parentheses, degrees of freedom=3, 587.

BSS-R Scale	Vaginal Birth (n = 449) M (SD)	Assisted Vaginal Birth (n = 48) M (SD)	Emergency Section (n = 62) M (SD)	Elective Section (n = 32) M (SD)	F	p	ω^2	(95%CI)	Effect size
Stress	10.20 (3.27)[a,b]	6.71 (4.30)[a,b,c]	7.42 (3.44)[a,d]	10.59 (2.03)[c,d]	26.62	<0.001	0.12	0.07 – 0.16	Medium
Attributes	5.20 (2.08)[a,b,c]	3.54 (2.32)[a]	3.23 (2.42)[b]	3.56 (2.12)[c]	25.40	<0.001	0.11	0.06 – 0.16	Medium
Quality	13.42 (2.66)[a]	12.31 (3.30)	11.79 (3.29)[a]	12.13 (3.14)	8.97	<0.001	0.04	0.01 – 0.07	Small
Total score	28.82 (6.31)[a,b]	22.56 (8.49)[a]	22.44 (7.32)[b,c]	26.28 (5.44)[c]	27.60	<0.001	0.12	0.07 – 0.17	Medium

Note: [a,b,c,d] indicates statistically significant (p<0.05) Bonferroni-adjusted differences between group pairs.

Table 3
Comparison of Swedish BSS-R total and sub-scale scores differentiated by depression screening categorization using the EPDS. Standard deviations are in parentheses, degrees of freedom = 589.

BSS-R Scale	Case Negative (N = 493)	Case Positive (N = 98)	(95% CI)	t	p	Hedges g	Hedges g (95% CI)	Effect size
Stress	10.04 (3.29)	7.66 (4.07)	(1.63 – 3.12)	6.25	<0.001	0.69	0.47 – 0.91	Medium
Attributes	5.01 (2.14)	3.52 (2.48)	(1.02 – 1.97)	6.14	<0.001	0.68	0.46 – 0.90	Medium
Quality	13.35 (2.63)	11.79 (3.59)	(0.95 – 2.17)	5.03	<0.001	0.56	0.34 – 0.77	Medium
Total score	28.40 (6.26)	22.97 (8.67)	(3.97 – 6.89)	7.31	<0.001	0.81	0.59 – 1.03	Large

Table 4
Multiple linear regression analysis with Swedish BSS-R sub-scales predicting CityBiTS Childbirth-related PTSD (Regression Eq. 1.), CityBiTS General PTSD (Regression Eq. 2.) and EPDS total score (Regression Eq. 3.). PTSD) and CityBiTS total score (T-PTSD).

	R^2 (95%CI)	F(3579)	p	b (95%CI)	β	t	p	pr^2
Childbirth-related symptoms	0.38 (0.31, 0.44)	116.49	<0.001					
Stress				−0.38 (−0.50, −0.26)	−0.27	−6.29	<0.001	0.06
Attributes				−0.56 (−0.76, −0.37)	−0.26	−5.65	<0.001	0.05
Quality				−0.39 (−0.51, −0.26)	−0.22	−6.06	<0.001	0.06
General symptoms	0.08 (0.03, 0.12)	15.83	<0.001					
Stress				−0.20 (−0.36, −0.03)	−0.13	−2.37	0.02	0.01
Attributes				−0.20 (−0.46, −0.07)	−0.08	−1.44	0.15	0.004
Quality				−0.27 (−0.44, −0.10)	−0.14	−3.07	0.02	0.02
EPDS total score	0.13 (0.08, 0.19)	30.02	<0.001					
Stress				−0.16 (−0.31, −0.02)	−0.11	−2.17	0.30	0.08
Attributes				−0.37 (−0.61, −0.13)	−0.16	−3.01	0.003	0.02
Quality				−0.32 (−0.48, −0.17)	−0.18	−4.16	<0.001	0.03

Convergent validity

Pearson's r correlation coefficients between *SW-BSS-R* sub-scales and total score and CityBiTS sub-scales and total score are shown in supplementary file, Table S.2. *SW-BSS-R* sub-scales and total score were all significantly and negatively correlated with the CityBiTS sub-scales and total score. Correlations between *SW-BSS-R* total and sub-sale scores and the CB-PTSD sub-scale score were higher than the G-PTSD sub-scale score.

Divergent validity

SE, WA, and QC sub-scales, and the *SW-BSS-R* total score did not correlate significantly with participant age (SE r < 0.01, p=0.82, WA r < 0.01, p=0.95, QC r < 0.01, p=0.88, and total scale, r < 0.01, p=0.94).

Predictive validity

The findings from the multiple linear regression analysis are summarized in Table 4. All three multiple regressions undertaken were statistically significant. *SW-BSS-R* sub-scales were all significant predictors of CB-PTSD scores (Childbirth-related symptoms of PTSD) and EPDS scores. The SE and QC sub-scales were observed to be significant predictors of G-PTSD scores (General symptoms of PTSD).

Path model

The path developed from the regression equations above was evaluated and is summarized in Fig. 1. The model was found to offer an excellent fit to data, χ^2 (df) = 2.08 (1), p=0.15, CFI = 0.99, RMSEA = 0.04, SRMR = 0.01.

Internal consistency

Internal consistency was acceptable for *SW-BSS-R* total scale and QC sub-scales with Cronbach's alphas >0.70. Cronbach's alpha of SE and WA sub-scales were slightly below conventional threshold, although none of the internal consistencies were observed to be significantly different from those reported in the original UK study (see supplementary file, Table S.3). Total scale McDonalds Omega (ω), Omega hierarchical (ωh) and Omega total (ωt) findings were acceptable for ω and ωt, but below threshold for ωh based on Nájera Catalán (2019). Inter-item correlation of the *SW-BSS-R* sub-scale WA items was r=0.51, p <0.001, (95% CI 0.45 - 0.57) (Table S.3).

Test-retest reliability

One hundred and three participants completed the retest *SW-BSS-R* and provided complete data for analysis. The mean period between first and second observations was 25 (SD 8.81) days

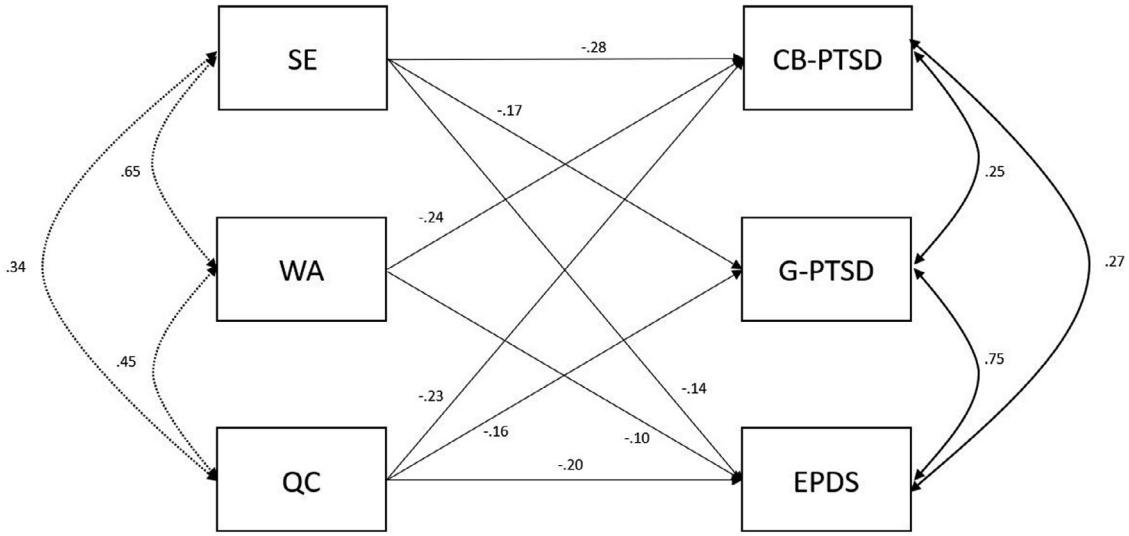

Fig. 1. Path model of BSS-R sub-scales predicting CityBiTS birth-related PTSD (CB-PTSD), general PTSD (G-PTSD) and the Edinburgh Postnatal Depression Scale (EPDS) total score.

Table 5
Confirmatory factor analysis and model fit of the *Swedish-BSS-R*.

Model	χ^2 (df)	*p*	RMSEA	SRMR	CFI
1. Single factor	730.65 (35)	<0.001	0.183	0.137	0.659
2. Three-factor	140.13 (32)	<0.001	0.076	0.056	0.947
3. Bifactor	88.70 (26)	<0.001	0.064	0.040	0.969

Note: In model 3 WA items were set to be equal in relation to contemporary practice for the run of bifactor models. Without this constraint, model fit of the bifactor model was similar χ^2 = 88.43, df=25, RMSEA=0.066, SRMR= 0.040, CFI=0.969.

(range = 14–55 days). The mean SE, WA, and QC sub-scale and total scores were for baseline 9.55 (SD 3.51), 4.59 (SD 2.35), 13.15 (SD 2.62) and 27.29 (SD 7.03), and for retest 9.79 (SD 3.29), 4.76 (SD 2.36), 12.83 (SD 2.70) and 27.37 (SD 6.81) respectively. No statistically significant differences were observed in test-retest scores for SE, $t(102) = 1.12$, $p = 0.27$, WA, $t(102) = 1.33$, $p = 0.19$, sub-scales, or the total *SW-BSS-R* score, $t(102) = 0.25$, $p = 0.80$. A statistically significant difference was observed between observations points for the QC sub-scale, $t(102) = 2.23$, p=0.03. The ICC was calculated using the two-way mixed-effects model with absolute agreement and single score for repeated measures designs (Koo and Li, 2016) for the SC, WA, and QC sub-scale and total scores were 0.81 (95% CI = 0.73 – 0.86), 0.86 (95% CI = 0.80 – 0.90), 0.85 (95% CI = 0.78 – 0.89) and 0.90 (95% CI = 0.85 – 0.93) respectively, which indicates a good level of test-retest reliability for *SW-BSS-R* sub-scales and excellent test-retest reliability for the total score.

Confirmatory factor analysis

The single-factor model was found to offer a poor-fit to data (Model 1). The tri-dimensional measurement model (Model 2) was observed to offer an excellent data fit, with the exception of the RMSEA which offered an acceptable fit. Model 3 (bifactor) offered an unambiguously excellent fit to data. The bifactor model comprised a general factor of SE and WA items and a separate QC factor (Table 5). Item-factor loadings of the tri-dimensional measurement model are shown in Fig. 2.

Discussion

The findings from the current investigation indicate that the *SW-BSS-R* is a valid translation of the original English-language *UK-BSS-R* (Hollins Martin and Martin, 2014), with generally excellent psychometric properties that are broadly equivalent to this original version.

SW-BSS-R sub-scale and total scores were all significantly and positively correlated, with comparisons reported in the original *UK-BSS-R* validation study (Hollins Martin and Martin, 2014), revealing no statistically significant differences between the degree of sub-scale/scale correlations except for the correlation between the QC sub-scale and the total score. This was higher in the current study, although the observation of no significant differences observed in any of the other sub-scale combinations would indicate ostensibly a similar relationship between these domains.

KGDV evaluation confirmed the findings of both Nakić Radoš et al. (2022) and Ratislavová et al. (2022) with regard to mode of birth and desirability to differentiate between Caesarean section type. It was observed that there was little difference between *SW-BSS-R* sub-scale and total scale scores between unassisted vaginal birth and elective Caesarean section. Looking at the data, an assisted vaginal birth is associated with significantly lower birth satisfaction compared with unassisted vaginal birth across all scales, except for the QC sub-scale score. Interestingly, compared to unassisted vaginal birth, an emergency Caesarean section is associated with significantly lower perceptions of quality of care as determined by QC sub-scale differences.

Women screening positive on the EPDS were observed to have significantly lower *SW-BSS-R* scores (all sub-scales and total score), compared to those screening negative with medium to large effect sizes observed. This finding is unsurprising, given the evidence supporting the notion of a negative birth experience being implicated in the development of PND (Bell and Andersson, 2016). Also, consistent with the recommendations of Bell and Andersson (2016), our findings can be interpreted as supportive of the need to optimize birth experience for women in order to reduce risk of developing PND.

Excellent convergent validity was observed between all *SW-BSS-R* sub-scales and the CityBiTS CB-PTSD and G-PTSD sub-scales. The prediction that correlations between *SW-BSS-R* sub-scales and CB-PTSD sub-scale scores would be higher than those between G-PTSD sub-scale scores was also supported, which emphasizes the relationship between trauma associated with birth experience itself, compared with generic cause or pre-existing PTSD that may be detected by opportunistic screening postpartum. Thus our findings

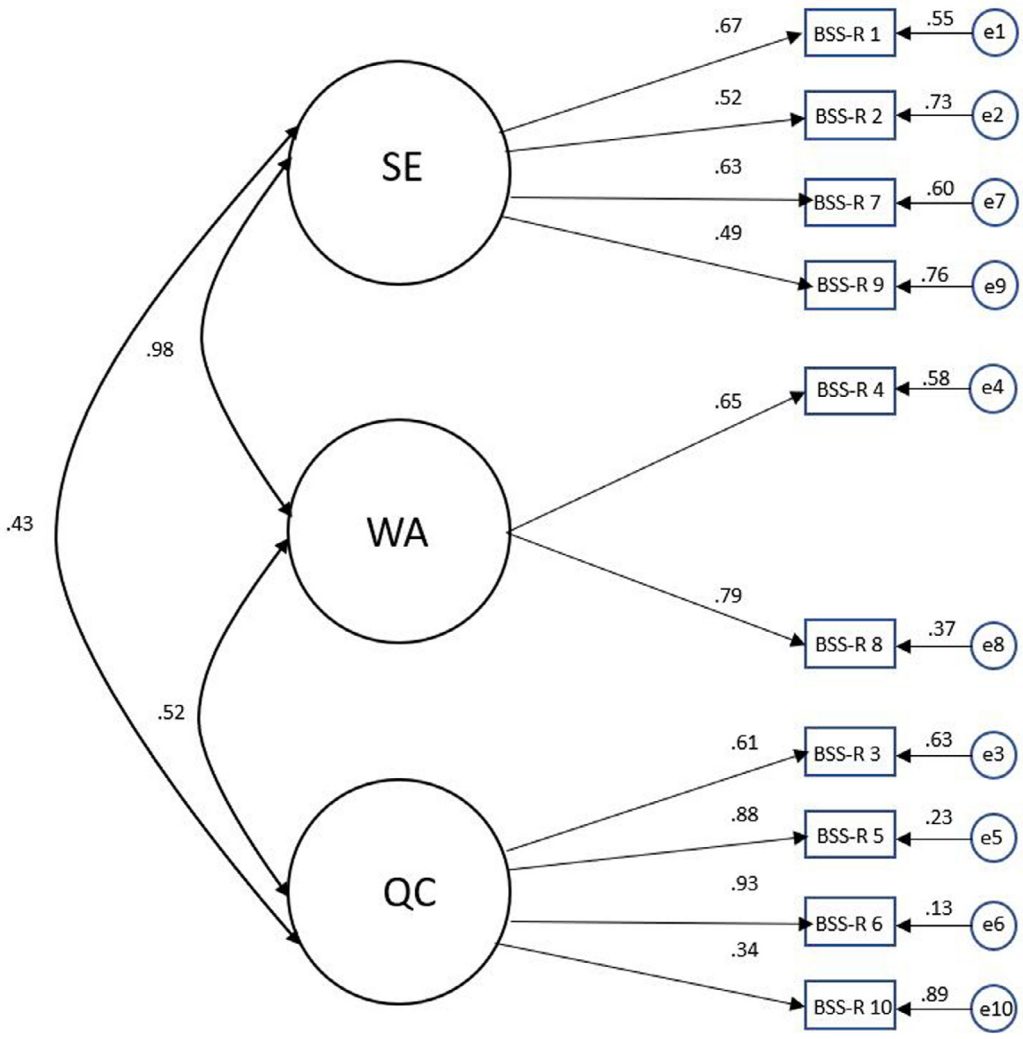

Fig. 2. Standardised factor loadings of the tri-dimensional measurement model of the BSS-R. Correlations between factors and error term values are also indicated.

both confirm and extend the findings from the large UK study by Harrison et al. (2020), which reports that *BSS-R* total scores are predictive of birth-specific and general PTSD postpartum. In addition, this also extrapolates to the sub-scale scores and strength of the relationship between different aspects of postpartum PTSD. Our findings from the multiple regression analysis and path modelling also provide further supportive evidence of this position, given that regression equations were significant. For example, the *SW-BSS-R* sub-scale score prediction of *CB-PTSD* scores explained more variance than *SW-BSS-R* sub-scale scores predicted *G-PTSD* scores. Our findings from this path analysis, though broadly confirming the observations of Nakic Rados et al. (2021), also highlight relationships between depression and general PTSD (as assessed by the EPDS and the *G-PTSD)*. This may be quintessentially different to that of the relationship between depression and childbirth-related noted by *CB-PTSD* scores, which is evidenced by the difference in magnitude of correlation between these PTSD domains and the EPDS score, and the fundamentally stronger relationship between *SW-BSS-R* scores and *CB-PTSD* scores. Further work in this area is essential, particularly to identify if *G-PTSD* scores are *opportunistically* detecting pre-existing PTSD postpartum, precisely because there are major implications in terms of antenatal screening for PTSD. Excellent divergent validity was observed with significant correlations observed between *SW-BSS-R* sub-scales and total score and participants' age.

Internal consistency was generally good for the *SW-BSS-R*, although it was observed that the SE sub-scale was slightly below established criterion. Nonetheless, there was no statistically significant differences observed between internal consistencies (alpha) in the current study and those of the original *UK-BSS-R* development study. Omega ω and ωt were also found to be acceptable and consistent with the observations of acceptable total Cronbach's alpha score.

The three-factor measurement model of the *SW-BSS-R* was found to offer a good fit to data, as did the bifactor model, which confirms the suitability of the measure for use in either sub-scaled or total score guises dependant upon use and purpose (Martin et al., 2018). We note the observations of Ratislavová et al. (2022) Czech validation study of the *BSS-R*, in which the bifactor model was observed to offer a superior fit to data than the three-factor measurement model. Nonetheless, we emphasize the Ratislavová et al. (2022) remarks that statistical bias within bifactor models may report better fit for these models, which makes conclusions of absolute superior fit challenging.

This is the first *BSS-R* translation and full validation study, as far as we are aware, that has examined test-retest reliability of the measure. Ferrari et al. (2021) undertook test-retest reliability evaluation of the Brazilian version of the *BSS-R*, but it was not a comprehensive psychometric validation. We have observed good test-retest reliability for all *SW-BSS-R* sub-scales, and excellent test-

retest reliability for the *SW-BSS-R* total score. It was observed that the QC sub-scale score was significantly lower at follow-up compared to the first observation, and that this finding serves to emphasis that perspectives on birth experience may change over time. Nonetheless, these may be domain specific in the current context, and specific to quality of care received. This is an important observation within the context of standardization of administration data collection timelines in maternity care studies that rely on retrospective *BSS-R* reporting. Indeed, this facet is highlighted within the The International Consortium for Health Outcome Measurement (2016) guideline, so that studies may be comparable between countries and populations.

The clinical relevance of validating a *SW-BSS-R*, is that midwives, obstetricians, and allied health care professionals can use it to improve, monitor, and evaluate women's experiences of childbirth. The *SW-BSS-R* can be used to help organize care that promotes dignity, privacy, confidentiality, informed choice, and continuous support during labour (WHO, 2018). Beyond maintaining the already highly developed maternity care system in Sweden, is the need to deliver respectful care in both high and low resource settings. This in part, is also dependant upon the kindness, professionalism, and commitment of care providers (Stanton and Gogoi, 2022). Quality assessment must be incorporated into local and regional policies, with measurement of progress including respect, protection, and fulfilment of human rights. As part of process, it is essential to involve stakeholders, midwives, obstetricians, allied health care professionals, management, policy makers, and parents themselves in evaluation, with zero tolerance for neglect. Robust answerability and redressal processes are required to evaluate women's experiences of childbirth, with the *SW-BSS-R* being a useful tool to incorporate into any package at both a local and national level.

Finally, we acknowledge that the study had some limitations. Participants were recruited exclusively from five specific birthing clinics and therefore there may be implicit differences in the representiveness of this sample compared to the general population. However, on key parameters, for example Caesarean section rate, we note that the overall section rate observed in our study is similar to that of the general population based on OECD country norms (17% Sweden). We note however, that though our sample of women having an unassisted vaginal delivery was relatively high compared to other European studies, for example, Ratislavová et al. (2022), the psychometric performance of the *SW-BSS-R* was similar. We are however minded to consider and incorporate into our future research, those participants who may not be representative, for example those with a high risk pregnancy, significant mental health concerns or those with issues of profound social deprivation.

Conclusion

The *SW-BSS-R* has generally excellent psychometric properties, which are generally equivalent to those of the original *UK-BSS-R* (Hollins Martin and Martin, 2014). As such, the *SW-BSS-R* has now been validated as suitable for use in Sweden as a robust and reliable measure of women's birth experience.

Availability of the BSS-R

The *BSS-R* is free to use for clinical and research purposes, but requires permission. If you would like to request a copy, please contact Professor Caroline J. Hollins Martin at c.hollinsmartin@napier.ac.uk. Also, for more information about the *BSS-R*, see the dedicated *BSS-R* website at: www.bss-r.co.uk.

Ethical approval

The Swedish Ethical Review Authority provided approval for the study on August 20, 2021 (Dnr 2021–03,968).

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Hanna Grundström: Conceptualization, Data curation, Investigation, Project administration, Writing – original draft, Writing – review & editing. **Caroline J. Hollins Martin:** Methodology, Supervision, Writing – review & editing. **Anna Malmquist:** Conceptualization, Writing – review & editing. **Katri Nieminen:** Conceptualization, Writing – review & editing. **Colin R. Martin:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.midw.2023.103745.

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