

Translation and validation of the Polish-language version of the Birth Satisfaction Scale-Revised (BSS-R) and its relationship to the type of delivery and the baby's Apgar score

BACKGROUND

Maternal birth experience is being increasingly recognised as a key clinical outcome parameter. The Birth Satisfaction Scale-Revised (BSS-R) is a short self-report measure designed to assess birth experience. The current investigation sought to translate the BSS-R into Polish and validate this version of the BSS-R (PL-BSS-R).

PARTICIPANTS AND PROCEDURE

The BSS-R was translated into Polish by an expert panel using forward and backward translation. A complex within-subjects design with an embedded between-subjects component was used to determine the key psychometric characteristics of the PL-BSS-R. Two hundred ninety-four Polish-speaking women in Poland completed the follow-up component of the study where the PL-BSS-R was administered. The PL-BSS-R measurement properties were examined using confirmatory factor analysis, divergent, convergent validity analysis, internal consistency appraisal and investigation of known-groups discriminant characteristics.

RESULTS

The PL-BSS-R was found to have generally very good measurement properties and to be equivalent to the original English-language version across key validity indices. The PL-BSS-R was found to be significantly correlated with neonatal physical health immediately postpartum and differed across delivery modes.

CONCLUSIONS

The PL-BSS-R is a psychometrically robust measure of birth experience appropriate for clinical and research use within Poland. Important associations were noted between subjective maternal birth experience and objective measures of neonatal physical health, indicating a critically important future research direction.

KEY WORDS

psychometrics; scales; birth experience; birth satisfaction

ORGANIZATION – 1: Institute of Psychology, University of Gdansk, Gdansk, Poland · 2: Department of Midwifery, Centre of Postgraduate Medical Education, Warsaw, Poland · 3: Department of Quality of Life Research, Medical University of Gdansk, Gdansk, Poland · 4: School of Nursing, Midwifery and Social Care, Edinburgh Napier University, Edinburgh, UK · 5: Institute for Health and Wellbeing, University of Suffolk, Ipswich, UK

AUTHORS' CONTRIBUTIONS – A: Study design · B: Data collection · C: Statistical analysis · D: Data interpretation · E: Manuscript preparation · F: Literature search · G: Funds collection

CORRESPONDING AUTHOR – Paulina Pawlicka, Ph.D., Institute of Psychology, University of Gdansk, 4 Bażyńskiego Str., 80-309 Gdansk, Poland, e-mail: paulina.pawlicka@ug.edu.pl

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BACKGROUND

The birth of a child represents a profound event during a woman's life course, with modern care systems facilitating, in most cases, a non-problematic and safe delivery of the baby (Knight & Tuffnell, 2018). More recently, the focus of both research enquiry and clinical care has also embraced the psychological and emotional aspects of the maternal birth journey, including the experience of the birth itself from the mother's perspective (Downe et al., 2020; Hollins Martin & Martin, 2014). This has also promoted interest in specific factors which may deleteriously affect the perception of this event (Chabbert et al., 2021b).

Childbirth is inevitably a complex experience, with many factors influencing both the subjective experience of birth and the pragmatic physiological aspects of delivery (Chabbert et al., 2021a; Prosser et al., 2018). In the context of dynamic physiological, psychological and social interplay (Larkin et al., 2009), understanding this complex picture with the goal to advance care and outcomes is a critical clinical research endeavour. An established contributor to this is the quality of the clinical care and support received from maternity services (Hodnett, 2002; Hollins Martin & Martin, 2014). A negative birth experience has been established to be associated with a broad range of sub-optimal outcomes for the woman (Bell et al., 2018; Garthus-Niegel et al., 2013; Vogel et al., 2024) as well as potentially deleterious neonatal outcomes (Seefeld et al., 2022). Thus, the experience of childbirth is of important relevance to the wellbeing of both mother and baby (Fenech & Thomson, 2014).

The 10-item Birth Satisfaction Scale-Revised (BSS-R) was originally developed in the UK to provide a valid and reliable self-report assessment of women's birth experience (Hollins Martin & Martin, 2014). The BSS-R is recommended as the self-report measure of birth experience for global use (Nijagal et al., 2018) and is one of the core outcome measures in the pregnancy and childbirth standard set (International Consortium for Health Outcome Measurement, 2017) which was developed to not only accurately assess and harmonise birth outcome assessment with 'gold standard' measures/indices, but also to allow for comparison of birth outcomes internationally. Following the development of the original UK-BSS-R (Hollins Martin & Martin, 2014), the instrument has been both translated and validated in many countries and review of the BSS-R dedicated website www.bss-r.co.uk at the time of writing indicates that the measure is being used in over 270 studies worldwide in 68 countries (Hollins Martin & Martin, 2022). Validation studies (Barbosa-Leiker et al., 2015; Jefford et al., 2018; Ratislavova et al., 2024; Romero-Gonzalez et al., 2019; Skodova

et al., 2019) specifically have found translated and validated versions to be generally equivalent to the original UK version (Hollins Martin & Martin, 2022). The sub-scales of the BSS-R: (i) stress experienced during labour (SE sub-scale), (ii) women's personal attributes (WA sub-scale) and (iii) quality of care (QC sub-scale) align to a tri-dimensional measurement model established by theory and confirmed by factor analysis (Hollins Martin & Martin, 2014). Numerous international studies have found the tri-dimensional measurement model a good fit to data (Barbosa-Leiker et al., 2015; Jefford et al., 2018; Ratislavova et al., 2024; Romero-Gonzalez et al., 2019; Skodova et al., 2019). It is noteworthy that contemporary studies have also found a good fit to data of a bifactor model comprising a general factor and three specific factors, essentially representing the SE, WA, QC sub-scales/factors and supporting the use of the BSS-R in both sub-scaled and total score formats (Emmens et al., 2023; Martin et al., 2018; Nakić Radoš et al., 2023; Ratislavova et al., 2024). To date, a Polish-language validated version of the BSS-R has not been available.

The Polish maternity care system is highly medically and obstetrically driven and hospital based (Węgrzynowska et al., 2020). Women give birth almost exclusively in hospitals (free of charge). Homebirths, although legal, are not publicly funded (Baranowska et al., 2019a, b). It is estimated that 0.2% of babies annually are born outside of hospital in Poland (Statistics Poland, 2021). There are currently 3 midwifery-led units in Poland (hospital-based), thus leaving the majority of the country with no alternatives to hospital birth. The level of medicalization of childbirth is also high. The average percentages of Caesarean sections are growing worldwide, but Poland is among the countries with the steepest growth in Caesarean sections – from 19.2% in 2006 to 39.3% in 2017 (Organisation for Economic Co-operation and Development, 2023) and 44.4% in 2019 (Euro-Peristat, 2022). In a large cross-sectional, Polish study the percentage of women giving birth vaginally was found to be 57% (61.3% in 2018), the percentage of assisted deliveries (suction cup or forceps) was 3% in 2021 (2.5% in 2018) and the percentage of Caesarean sections was 40% in 2021 (36.2% in 2018) (Adamska et al., 2022). Official Polish statistics report the total Caesarean section rate for Poland at 45.1% in 2020 (Central Statistical Office, 2021). Additionally, various medical interventions are frequently performed during vaginal labour in Polish hospitals. Pitocin was administered to 64% of women in 2021 (61% in 2018) and 50.6% of women in 2021 (54.5% in 2018) had episiotomy during childbirth. The Polish Ministry of Health is aware of the increasing medicalisation of labour and birth and thus in need to lower it. *The organizational standard of perinatal care* – the ordinance constituting binding law – was introduced in 2012 to protect wom-

en's rights, to grant them protection in accordance with evidence-based medicine, to stimulate natural mechanisms of physiological labour and to reduce the percentage of operational labours (Minister of Health, 2018). The provisions of the standard are being implemented slowly, as reflected in the above indicators of medicalization.

The study had the following aims within the total study goal of developing and validating a Polish-language version of the BSS-R (PL-BSS-R) for use in Poland.

The study objectives were to:

1. Determine model fit of the three-dimensional measurement model of the BSS-R in the PL-BSS-R.
2. Evaluate internal consistency characteristics of the PL-BSS-R quality of care (QC), women's attributes (WA), and stress experienced during childbearing (SE) sub-scales and the total PL-BSS-R scale.
3. Determine the known-groups discriminant validity of the PL-BSS-R.
4. Evaluate the convergent validity of the PL-BSS-R.
5. Evaluate the divergent validity of the PL-BSS-R.
6. Investigate the potential relationship between maternal birth satisfaction assessed using the PL-BSS-R and clinical indicators of immediate postpartum neonatal physical health.

It was predicted that (i) the established tri-dimensional measurement model of the BSS-R would offer a good fit to data, (ii) a bifactor model based on the tri-dimensional measurement model would offer good data fit, (iii) the PL-BSS-R sub-scales and total score would have acceptable internal consistency, (iv) the PL-BSS-R would exhibit good known-groups discriminant validity as a function of delivery type classification, (v) the PL-BSS-R would also exhibit good known-groups discriminant validity as a function of self-report depression screen classification, (vi) there would be good convergent validity with a single-item self-report measure of birth satisfaction, (vii) the PL-BSS-R would exhibit acceptable divergent validity with no statistically significant correlation being found with participant age, and (viii) the PL-BSS-R would demonstrate statistically significant correlations with neonatal Apgar scores at 1 minute postpartum.

PARTICIPANTS AND PROCEDURE

This was a longitudinal study with two assessments. The first time point was in the third trimester of pregnancy (mean gestational age 33.50 weeks [$SD = 3.90$]) and the second time-point was between 12 and 16 weeks postpartum. A repeated-measures design was used with an integrated retrospective cross-sectional component to address the study objectives. Inclusion criteria included speaking Polish, age >18 years, third trimester of pregnancy, and planning birth in Poland.

TRANSLATION OF THE ENGLISH-LANGUAGE VERSION TO POLISH

The original UK version of the BSS-R (Hollins Martin & Martin, 2014) was translated into Polish by three independent psychologists fluent in English and Polish and then back translated by three other persons (Brislin, 1970; Tyupa, 2011). Any discrepancies between the original and translated versions were discussed in the team comprising a language professional, a midwife working in practice and in academia, and academic psychologists.

DATA COLLECTION

A total number of 530 participants were recruited to the study during pregnancy, of whom 294 (55%) completed the questionnaires included in the follow-up for evaluation of the study objectives. Participants were recruited in pregnancy during antenatal classes, obstetricians' routine visits and via an announcement published on the Facebook profile of the widely recognized and highly respected Polish foundation 'Birth with Dignity Foundation'. One hundred ninety-three expectant mothers were approached in person to complete a paper-pencil version of the questionnaires (recruited during antenatal classes), 256 women were asked to provide an e-mail address and the following e-mail with the link to the online survey (including the same set of questionnaires in the same order) was sent to them (antenatal classes and obstetricians' visits), while 81 women used the link to the online survey provided in the announcement (recruited via the Facebook profile). The pregnancy questionnaire included a question about the e-mail address for the follow-up contact and about the prospecting date of delivery. This information was used to estimate the time when the second e-mail including the link to the second stage of the study (online data capture only) was sent (two additional reminders about the study were sent if a participant did not respond and or did not complete the questionnaire). Thus the survey at the second time-point was carried out solely through the online survey with the link sent via personalized e-mails sent to the e-mail addresses provided by the first time-point survey participants. As mentioned above, 294 women participated in surveys at both time-points (a dropout rate of 44.5%, $N = 236$).

PARTICIPANTS

Two-hundred and ninety-four participants completed the BSS-R at follow-up. Multivariate outliers ($n = 5$) were identified by calculation of Mahalano-

Paulina Pawlicka,
Wiktor Wróbel,
Barbara
Baranowska,
Daria Macewicz,
Michał Olech,
Caroline J. Hollins
Martin,
Colin R. Martin

bis distances and distance from the centroid and removed. Consequently, the dataset for psychometric analysis comprised $N = 289$ participants (mean age 29.63 ($SD = 4.09$), range 19-43 years). The mean duration of pregnancy was 39.85 ($SD = 1.69$) weeks. Eight women had complex deliveries which could not be unambiguously classified and accurate data on birth type were unavailable for a further eight women, so these cases were excluded from birth type analysis. Sixty-seven (25%) women had an unassisted vaginal delivery, while 109 (40%) women had an assisted vaginal delivery. Thirty-six women (13%) had a planned Caesarean section and 61 (22%) women had an emergency Caesarean section. Two-hundred and three (71%) women were having their first baby while 84 (29%) had given birth previously (parity data were unavailable for two participants).

MEASURES

The Birth Satisfaction Scale-Revised (BSS-R). The BSS-R assesses birth experience using a self-report format and three sub-scales: stress experienced during labour (SE sub-scale, 4-items), women's personal attributes (WA sub-scale, 2-items) and quality of care (QC sub-scale, 4-items) (Hollins Martin & Martin, 2014). A total score is also calculated (range 0-40) and this has been advocated as a 'gold standard' measure of birth experience (International Consortium for Health Outcome Measurement, 2017). The BSS-R can thus be used as a sub-scaled or total scored instrument, or indeed in both guises, depending on the research purpose or clinical application (Martin et al., 2018).

General birth satisfaction. Participants filled in an additional question about the general birth satisfaction. The single-item measure required the participant to report her satisfaction with birth experience on a 1-9 scale from *very unsatisfied – it couldn't be worse* to *very satisfied – it couldn't be better*.

Apgar score. The Apgar score (Apgar, 1953) is a measure of baby health taken at 1 minute and 5 minutes postpartum and assessing five domains of baby wellbeing (heart rate, respiration, skin colour, muscle tone and reflex irritability). A total score is calculated with scores of 7-10 indicating 'reassuring', 4-6 'moderately abnormal' and 0-3 'low' (American College of Obstetricians and Gynecologists, 2015).

Type of delivery. The participants could choose among the following options: unassisted vaginal delivery, assisted vaginal delivery, elective Caesarean section, emergency Caesarean section – both with or without systolic activity. Assisted vaginal delivery was described as a delivery with one or more of the following medical interventions: suction cap/forceps, curettage, episiotomy, membrane sweep, amniotomy.

DATA ANALYSIS

Consistent with previous translation and validation studies of the BSS-R (e.g. Emmens et al., 2023; Romero-Gonzalez et al., 2019; Skvirsky et al., 2020) confirmatory factor analysis (CFA) was undertaken to evaluate the underlying measurement model. An initial screen of data was undertaken prior to CFA to evaluate individual item skew and kurtosis and to remove multivariate outliers (Kline, 2000) in order to be confident that the data profile is distributionally normal and thus satisfies the parametric assumptions of this statistical approach (Brown, 2015). The three sub-scales of the BSS-R (i) stress experienced during labour (SE sub-scale), (ii) women's personal attributes (WA sub-scale) and (iii) quality of care (QC sub-scale) represent the underlying measurement model of the scale with the relationship between factors being specified as correlated (Hollins Martin & Martin, 2014). The maximum-likelihood approach was used for model estimation (Brown, 2015; Kline, 2015). Conventional model fit indices, including the comparative fit index (CFI; Bentler, 1990), the root mean squared error of approximation (RMSEA; Steiger & Lind, 1980), and the square root mean residual (SRMR; Hu & Bentler, 1999) were used to evaluate each model. Threshold values of > 0.90 (CFI), < 0.08 (RMSEA) and < 0.06 (SRMR) were set as cut-points to establish model adequacy. Recent studies (Martin et al., 2018; Moreira et al., 2023; Ratislavova et al., 2024) have evaluated a bifactor model of the BSS-R where the variance from a general factor of birth experience is evaluated in terms of its substantive contribution to the model compared to the variance from the hypothesized sub-scales. Previous papers investigating the bifactor model have supported the notion of a substantive general factor of birth experience and definable sub-scales and thus have supported the use of the BSS-R as both a sub-scaled and total scored instrument. A single-factor model was also evaluated. A recent study (Moreira et al., 2023) highlighted the high correlation between SE and WA factors in the Portuguese version of the BSS-R and evaluated a two-factor version with SE and WA factors combined and found a good fit to data with a two-factor model and a bifactor model (with combined SE and WA items as a single factor and the QC factor). Thus, these two models were also evaluated in the event of a high correlation being observed between SE and WA factors. Consistent with the recent study of Moreira et al. (2023), we also computed bifactor-specific indices, these being the explained common variance (ECV; (Sijtsma, 2009), percentage of uncontaminated correlations (PUC; (Bonifay et al., 2015), and the omega (ω) reliability coefficients (McDonald, 1999; Zinbarg et al., 2005). These measures can be used in combination to gain insights into the degree of unidimensionality vs. multidimensionality within the measure. High ECV values are an indica-

Paulina Pawlicka,
Wiktor Wróbel,
Barbara
Baranowska,
Daria Macewicz,
Michał Olech,
Caroline J. Hollins
Martin,
Colin R. Martin

tor of the degree of unidimensionality and indicate a dominant overall factor indicating unidimensionality (Rodriguez et al., 2016). Comparatively higher PUC values may indicate unidimensionality. ECV and PUC values can be used in combination, for example ECV > .70 and PUC > .70 as indicating unidimensionality (Rodriguez et al., 2016). Further, for PUC values < .80 in combination with general ECV values > .60 and with the total score omega hierarchical (ω_h) > .70, the measure may be considered unidimensional, even within the context of a modest degree of multidimensionality (Reise et al., 2013a). Finally, ω estimates common factor score variance while in contrast, ω_h and omega hierarchical sub-scale (ω_{hs}) differentiate score variance estimation accountable to the single common factor, thus the general factor (ω_h), or the specific factor (ω_{hs}). Omega hierarchical (ω_h) > .50 indicates a strong general factor (Reise et al., 2013b with values > .80 indicating that total scores can be treated as a single (unidimensional) scale (Rodriguez et al., 2016).

INTERNAL CONSISTENCY

Cronbach's α (Cronbach, 1951) threshold values of .70 or greater were adopted to indicate satisfactory internal consistency for the four-item BSS-R sub-scales (SE and QC) and the total scale (Kline, 2000). Internal consistency of the two-item WA sub-scale was determined using the inter-item correlation (Pearson's r) with the acceptable threshold range of .15-.50 (Clark & Watson, 1995). Cronbach's α was also calculated for the WA sub-scale to facilitate comparison with values reported in the original BSS-R development and validation study (Hollins Martin & Martin, 2014). Consistent with contemporary BSS-R translation and validation studies (Ratislavova et al., 2024) the total scale internal consistency of the PL-BSS-R was also evaluated using McDonald's omega (ω), omega hierarchical (ω_h) and omega total (ω_t) (Hayes & Coutts, 2020; Revelle & Condon, 2019). Finally, the statistical approach of Diedenhofen and Musch (2016) was used to facilitate inferential comparison with the internal consistency observations reported by Hollins Martin and Martin (2014).

KNOWN-GROUPS DISCRIMINANT VALIDITY

Consistent with contemporary approaches to known-groups discriminant validity (KGDV) analysis in translation and validation studies of the BSS-R equivocal findings (Emmens et al., 2023; Nakić Radoš et al., 2023; Ratislavova et al., 2024) the KGDV of the measure was determined by evaluation of PL-BSS-R sub-scale and total scores as a function of delivery type. Delivery was categorised into vaginal delivery, assist-

ed vaginal delivery, elective Caesarean section (CS) and emergency CS. Sub-scale/total score comparison between groups was undertaken using one-way analysis of variance (ANOVA) with post-hoc testing using the Bonferroni correction in the event of a statistically significant main effect being observed.

CONVERGENT VALIDITY

Convergent validity was determined by calculation of Pearson's r correlation coefficients between PL-BSS-R subscale/total scores and a single-item self-report measure of satisfaction with the birth experience.

DIVERGENT VALIDITY

Consistent with recent translation and validation studies of the BSS-R (Ratislavova et al., 2024), divergent validity of the PL-BSS-R total and sub-scale scores was determined by calculation of Pearson's r correlation coefficients with participant age.

RESULTS

PL-BSS-R items and scale scores are summarised in Table 1. No excessive skew or kurtosis was observed in items, sub-scale and total score.

CONFIRMATORY FACTOR ANALYSIS

The single-factor model offered a poor fit to data. The three-factor measurement model offered a good fit to data in terms of CFA but poor fit with regard to SRMR and RMSEA. The bifactor model offered an excellent fit to data with regard to the CFI and RMSEA indices but a marginal fit with regard to RMSEA (Fabrigar et al., 1999). A general factor combining SE and WA items dominated the explained variance in the model; however, SE sub-scale items remained independently differentiated and a strong separate QC factor was also observed. SE and WA factors were observed to be highly correlated and thus the two-factor model (combined SE and WA items) was run and found to offer a similar fit to data as the three-factor measurement model in terms of specific model fit indices, though in terms of χ^2 , the three-factor model was a better fit to data ($\Delta\chi^2 = 6.62$, $\Delta df = 2$, $p = .042$). This model (combined SE/WA) was then run as a bifactor model and was found to offer an excellent fit to the data. Scrutiny of this bifactor model also revealed a strong general factor and a clearly differentiated and strong QC and combined (SE/WA) factors. ECV, PUC and ω_h values of 0.56, 0.53 and 0.76 respectively were in combination not sufficient within the second

Table 1*Descriptive and distributional characteristics of the PL-BSS-R*

Item	Item content	Domain*	M	SD	Min	Max	Skew	Kurtosis	SE
BSS-R 1	I came through childbirth virtually unscathed	SE	2.21	1.38	0	4	-0.22	-1.27	0.08
BSS-R 2	I thought my labour was excessively long	SE	2.84	1.23	0	4	-0.95	-0.07	0.07
BSS-R 3	The delivery room staff encouraged me to make decisions about how I wanted my birth to progress	QC	2.18	1.14	0	4	-0.41	-0.56	0.07
BSS-R 4	I felt very anxious during my labour and birth	WA	2.25	1.29	0	4	-0.30	-1.04	0.08
BSS-R 5	I felt well supported by staff during my labour and birth	QC	3.07	1.03	0	4	-1.23	1.18	0.06
BSS-R 6	The staff communicated well with me during labour	QC	3.14	0.93	0	4	-1.17	1.21	0.05
BSS-R 7	I found giving birth a distressing experience	SE	2.00	1.35	0	4	-0.02	-1.24	0.08
BSS-R 8	I felt out of control during my birth experience	WA	2.06	1.32	0	4	-0.11	-1.16	0.08
BSS-R 9	I was not distressed at all during labour	SE	1.49	1.27	0	4	0.46	-0.91	0.07
BSS-R 10	The delivery room was clean and hygienic	QC	3.53	0.60	1	4	-0.97	0.42	0.04
Stress	Sub-scale total		8.55	3.99	0	16	-0.12	-0.75	0.23
Attributes	Sub-scale total		4.30	2.38	0	8	-0.22	-0.96	0.14
Quality	Sub-scale total		11.91	2.88	2	16	-0.87	0.62	0.17
Total	Total score		24.76	7.99	2	40	-0.36	-0.22	0.47

Polish validation of Birth Satisfaction Scale

Note. *Domain of the Polish BSS-R: SE – stress experienced during childbearing, WA – women’s attributes, QC – quality of care.

bifactor (two specific factors) model tested to draw conclusions regarding unidimensionality; however, the first bifactor (three specific factors) model evaluated (ECV = 0.69, PUC = 0.71, $\omega_h = 0.76$) revealed that within the context of a multi-dimensionality interpretation of the PL-BSS-R, there was sufficient unidimensionality to satisfy the measure being used at a total scored instrument (see Table 2).

PL-BSS-R SUB-SCALE AND TOTAL SCORE CORRELATIONS

Correlations between sub-scales and between sub-scales and the total PL-BSS-R score were all statistically significant ($p < .01$). The degree of correlation was significantly higher across all PL-BSS-R scales

($p < .05$) compared to the UK instrument development study when using the correlation comparison method of Diedenhofen and Musch (2015) (see Table 3).

INTERNAL CONSISTENCY

PL-BSS-R total scale and all sub-scale Cronbach’s α values were $> .70$. The WA sub-scale and the total scale alpha were significantly ($p < .01$) higher than the original UK instrument development study (Table 4). The correlation between the two WA sub-scale items was $r = .67$ ($p < .001$), explaining 45% of common shared variance. Adopting the thresholds of Nájera Catalán (2019), McDonald’s omega (ω), omega hierarchical (ω_h) and omega total (ω_t), .88, .67 and .91, respectively, were all acceptable.

Table 2*Confirmatory factor analysis and model fit of the PL-BSS-R*

Model	χ^2 (df)	<i>p</i>	RMSEA	SRMR	CFI
1. Single factor	473.35 (35)	< .001	.208	.105	.714
2. Three-factor	131.10 (32)	< .001	.104	.076	.935
3. Bifactor	87.02 (26)	< .001	.090	.050	.960
4. Two-factor	137.73 (34)	< .001	.103	.076	.932
5. Modified bifactor	70.23 (25)	< .001	.079	.045	.970

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 $\chi^2 = 80.55$, *df* = 25, RMSEA = .088, SRMR = .058, CFI = .964.

Table 3*Correlations of PL-BSS-R sub-scales and total score and comparison with original UK BSS-R validation study*

Scale combination	Current study <i>r</i>	UK study <i>r</i>	<i>Z</i>	95% CI	<i>p</i>
Stress-Attributes	.77	.57	4.18	[0.10; 0.30]	< .001
Stress-Quality	.50	.26	3.18	[0.09; 0.39]	.002
Attributes-Quality	.56	.35	3.01	[0.07; 0.35]	.003
Total score-Stress	.91	.86	2.63	[0.01; 0.09]	.009
Total score-Attributes	.88	.80	3.11	[0.03; 0.14]	.002
Totals score-Quality	.78	.63	3.41	[0.06; 0.25]	< .001

Table 4*Cronbach's α of PL-BSS-R sub-scales and total score*

Sub-scale	Polish study	UK study	χ^2	<i>p</i>
Stress	.76	.74	1.37	.243
Attributes	.80	.66	7.31	.007
Quality	.76	.81	0.24	.622
Total score	.87	.78	12.03	< .001

Note. Degrees of freedom = 1.

KNOWN-GROUPS DISCRIMINANT VALIDITY

Main effects were observed as a function of delivery type category for all PL-BSS-R sub-scales/total score ($p < .001$). Vaginal delivery was associated with significantly higher BSS-R sub-scale and total scores in all groups with the sole exception of assisted vaginal delivery specific to the QC sub-scale. Assisted vaginal delivery was observed to be associated with significantly higher BSS-R sub-scale and total scores compared to emergency CS. WA sub-scale scores were significantly higher in the assisted vaginal delivery group compared to the elective CS group. Scrutiny of effect sizes revealed these to be large for the WA sub-scale and the PL-BSS-R total score and medium for the SE and QC sub-scales (Table 5).

CONVERGENT VALIDITY

Correlations between PL-BSS-R total and sub-scale scores were all observed to be highly statistically significant ($p < .001$) and positively correlated with the general birth satisfaction single-item ($M = 6.05$, $SD = 2.25$, range 1-9), SE $r = .76$, WA $r = .69$, QC $r = .58$, PL-BSS-R total $r = .79$).

DIVERGENT VALIDITY

No significant correlation between SE, WA, and QC sub-scales, and the PL-BSS-R total score and participant age (SE $r = .01$, $p = .843$, WA $r = .04$, $p = .537$, QC $r = .04$, $p = .468$, and total scale, $r = .02$, $p = .732$) was observed.

Paulina Pawlicka,
Wiktor Wróbel,
Barbara
Baranowska,
Daria Macewicz,
Michał Olech,
Caroline J. Hollins
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APGAR SCORES

Correlations between Apgar scores and PL-BSS-R scores are shown in Table 6. Highly statistically significant correlations were observed between PL-BSS-R SE and QC sub-scales and the total score, and Apgar score at 1 minute postpartum.

DISCUSSION

The findings from the current study support the successful translation of the BSS-R into Polish and the development of a robust version of the tool, equivalent in all major respects to the original UK English-language version (Hollins Martin & Martin, 2014). The findings from the CFA provide a more complex interpretation than previous BSS-R validation studies. We found the three-factor measurement model of the BSS-R to offer an acceptable fit to data. However, a two-factor model with SE and WA items combined into a single factor and correlated with the QC sub-scale suggested by Moreira and colleagues (2023) was found to offer a similar fit to data, though a comparison with the traditional three-factor model indicated a significantly worse fit using the chi-square differences test. This is of profound interest since a bifactor version of this model offered the best fit to data. Thus, a somewhat contradictory position arises where a bifactor derivative model of a comparatively poorer fitting model (two-factor compared to three-factor) offers a better fit compared to the bifactor derivation of the three-factor measurement model. However, such a position can be reconciled in that bifactor models are fundamentally different to correlated models and thus a direct comparison between models (correlated vs. bifactor) still represents a difficult undertaking in terms of interpretation of comparative best model fit. Nevertheless, examination of the bifactor-specific indices suggest that the bifactor model with three specific factors (i.e. bifactor derivation of the traditional three-factor measurement model) was found to be multidimensional and yet have sufficient unidimensionality to justify the use of the tool as a single score measure. This finding is consistent with the conclusions drawn by others (Martin et al., 2018; Moreira et al., 2023; Ratislavova et al., 2024) regarding the use of the BSS-R in both sub-scaled and total score modalities dependent on purpose. The high correlation between SE and WA factors has been reported in a number of BSS-R studies (Jefford et al., 2018; Nakić Radoš et al., 2023; Romero-Gonzalez et al., 2019); thus the issue of best-fit models may vary between studies as an artefact of this high level of correlation between factors and the interplay between the degree of statistical association and the underlying characteristics of the population which will inevitably have an impact on fit variability between models. There-

Table 5

Comparison of PL-BSS-R total and sub-scale scores differentiated by delivery type

BSS-R Scale	Vaginal delivery (n = 67) M (SD)	Assisted delivery (n = 109) M (SD)	Elective section (n = 36) M (SD)	Emergency section (n = 61) M (SD)	F	p	ω^2	[95% CI]	Effect size
Stress	10.63 (3.84) ^{b,c,d}	8.89 (3.71) ^{a,b}	8.06 (3.50) ^d	6.26 (3.90) ^{a,c}	14.83	< .001	.13	[.06; .21]	Medium
Attributes	5.61 (2.24) ^{c,d,e}	4.71 (2.04) ^{a,b,c}	2.75 (2.13) ^{b,e}	2.97 (2.24) ^{a,d}	23.74	< .001	.20	[.11; .28]	Large
Quality	13.06 (2.35) ^{b,c}	12.02 (2.64) ^a	11.08 (2.98) ^c	10.84 (3.37) ^{a,b}	7.84	< .001	.07	[.02; .12]	Medium
Total score	29.30 (7.14) ^{b,c,d}	25.62 (7.07) ^{a,b}	21.89 (7.01) ^d	20.07 (8.37) ^{a,c}	18.93	< .001	.16	[.08; .24]	Large
GSISQ	7.19 (1.75) ^b	6.29 (2.14) ^{a,b}	5.97 (2.20) ^c	4.52 (2.20) ^{a,c}	18.33	< .001	.16	[.08; .24]	Large

Note. ^{a,b,c,d} indicate statistically significant ($p < .05$) Bonferroni-adjusted differences between group pairs. Total N = 273 (see Participants section); GSISQ – general single-item satisfaction question; degrees of freedom = 3, 269.

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Table 6*Correlation of PL-BSS-R total and sub-scale scores with Apgar scores*

Variable	Stress	Attributes	Quality	Total score	Apgar 1	Apgar 2	Apgar 3
Stress	1	.77	.50	.91	.21***	.27***	.18*
Attributes		1	.56	.88	.11	.18*	.17*
Quality			1	.78	.17**	.18*	.14
Total score				1	.20***	.25***	.19*
Apgar 1					1	.73	.56
Apgar 2						1	.79
Apgar 3							1

Note. Sample size for correlations with BSS-R scores: Apgar 1 (1 minute postpartum, $n = 285$), Apgar 2 (5 minutes postpartum, $n = 172$), Apgar 3 (10 minutes postpartum, $n = 132$). Four Apgar 1 scores had missing data. Though clinical practice in Poland is to collect Apgar scores at 1 minute and 5 minutes postpartum, it is not uncommon in the event of a high (8-10) Apgar 1 score and no other clinical reason to the contrary to not collect the Apgar 2 score. The Apgar 3 score (10 minutes postpartum) may be collected if the preceding Apgar observations were unsatisfactory. * $p < .05$, ** $p < .01$, *** $p < .001$.

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Wiktor Wróbel,
Barbara
Baranowska,
Daria Macewicz,
Michał Olech,
Caroline J. Hollins
Martin,
Colin R. Martin

fore statistically this may be of interest and useful in evaluating competing models, but in terms of relevance and interpretation, any difference, particularly where the magnitude is small, between two- and three-factor models is theoretically and operationally trivial. Finally, in terms of the CFA findings, a salient caveat is that the bifactor models may intrinsically, as an artefact of statistical bias (Burke & Johnston, 2020; Greene et al., 2019), offer a better fit to data than correlated factor models; therefore it cannot be concluded unambiguously that the bifactor models are comparatively 'better' models (Ratislavova et al., 2024).

Internal consistency estimates of the PL-BSS-R were acceptable and good for all sub-scales and the total score. It was noted that the correlation coefficient combinations between sub-scales/total scale were all highly statistically significant and, interestingly, the degree of correlation was significantly higher than those reported in the original UK study (Hollins Martin & Martin, 2014), again, across all combinations. A similar observation was noted in the recent Czech-language translation and validation of the BSS-R (Ratislavova et al., 2024), and it may be that the same factors reported by those researchers, namely social, cultural and service delivery aspects, impact characteristically on the Polish birth experience to influence the correlational relationship between PL-BSS-R sub-scales.

Highly statistically significant differences were observed across all PL-BSS-R sub-scales/total scale scores as a function of delivery type, with the highest scores being in the unassisted vaginal delivery group. These participants felt the least stressed during childbirth, significantly more in control over the process and were least anxious, compared to medicated types of delivery (both vaginal and CS). It may be partially due to the characteristics of a woman that help her

birth with no medical interventions (Domańska et al., 2014; Hoffmann et al., 2023). However, other behavioural and contextual factors (such as the quality of care provided, non-medical support, parity, age, history of previous childbirths or physiology of childbirth itself (Prosser et al., 2018) help a woman give birth with no need for interventions. Quality of care was assessed comparably high in both types of vaginal delivery (medicated and unmedicated) and higher than in CS (significant difference between unmedicated birth and emergency CS). Assisted vaginal delivery was associated with a lower amount of stress compared to emergency, but not elective, CS. And finally, total birth satisfaction score was comparable in both types of CS (10 points difference between CS and unassisted vaginal delivery). These observations are consistent with earlier BSS-R validation studies which dichotomously compared unassisted vaginal delivery to an intervention delivery (Jefford et al., 2018; Martin et al., 2020; Romero-Gonzalez et al., 2019) and more recent studies indicating high levels of birth satisfaction being associated with unassisted vaginal delivery (Emmens et al., 2023; Nakić Radoš et al., 2023). However, it is notable that though some previous studies have indicated similar sub-scale scores between those having an unassisted vaginal delivery and those have an elective Caesarean section (Nakić Radoš et al., 2023), it is clear from the current study that an unassisted vaginal delivery is unambiguously associated with higher BSS-R sub-scale and total scale scores, including in a very medicalized maternity care system, as the Polish one is. Such a result is striking taking into account the very high CS rate in Poland (43%) and low rate of unassisted vaginal births (Adamska et al., 2022). The lowest birth satisfaction was reported by the women who had the emergency CS, and this group included almost one fourth of the participants (22%). The differences be-

tween studies may be influenced by a range of factors including service delivery structure, service delivery philosophy and cultural norms. Comparing results of a Polish study with the results of three other countries from Central Europe belonging to the EU and having medicalized maternity care systems (Czechia, Slovakia and Croatia) it can be concluded that in Poland, where the CS rate is the highest of all these countries (23.8% in Czechia and 29.4% in Slovakia in 2020, OECD, 2023; 23% in Croatia in 2016, WHO, 2018) unassisted vaginal delivery outperforms other types of delivery in satisfaction reported by women and consistently CS delivery is associated with lower birth satisfaction compared to vaginal delivery (see Nakić Radoš et al., 2023; Ratislavova et al., 2024; Skodova et al., 2019).

The quality of care sub-scale may reflect the service delivery differences between the countries. In Czechia women after emergency CS assessed the aspect of quality of provided care significantly lower than women after other types of deliveries. The Slovak version vividly shows that non-physiological childbirth is associated with a higher level of stress experienced by women, although the difference in the quality of care, although significant, was rather small. The Polish study showed that quality of care is rated higher by women after vaginal delivery than CS. It means that women after CS felt less supported, less involved in decision process and less satisfied with communication with medical staff than women after vaginal deliveries. It can result from the medical nature of the CS delivery where personnel are focused on performing the surgery with no complications, leaving the conscious but distressed mother on her own. Given the large number of CS deliveries in Poland, the issue of taking care of the communication during this type of delivery is very much needed as it impacts the woman's experience.

A remarkable finding from the current study was the observation of statistically significant correlations between PL-BSS-R sub-scale/total scores and newborn Apgar scores. It was notable that these observations for the 1 minute Apgar score were significant for SE (maternal stress experienced during childbirth) and QC (quality of care) sub-scales and the PL-BSS-R total score. These findings not only confirm the interesting observations of others regarding the relationship between psychological constructs and underlying physiological substrates within the woman (Miller et al., 2019; Zelkowitz et al., 2014) but also extend these to one of the main clinical indices of newborn health immediately postpartum. The mechanisms involved in such a relationship are clearly complex and beyond the scope of this study to unravel with any degree of certainty or veracity, as it is possible that the physiological state of the baby made the woman and the medical staff more stressed and it was reflected in the birth satisfaction score. However

an important 'take home' and immediate message of relevance within the clinical context is that improving the birth experience of women may very well be associated with enhanced immediate postpartum neonatal wellbeing. Since many factors within the clinical environment and indeed within antenatal service provision may be optimised to promote and enhance the birth experience, these findings are of immediate clinical relevance and currency.

The PL-BSS-R was also noted to demonstrate excellent convergent and divergent validity.

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CONCLUSIONS

The PL-BSS-R was established to have generally very good psychometric properties and may be considered equivalent conceptually to the original UK version (Hollins Martin & Martin, 2014). The current investigation confirms the findings of others regarding an unassisted vaginal delivery generally being associated with comparatively greater birth satisfaction, as compared with vaginal delivery with medical interventions and Caesarean section. Though differences from previous studies in this regard were noted, we did not find elective Caesarean section broadly equivalent to an unassisted vaginal delivery as has been reported in some studies. This result is important, as young women may prefer the CS over the vaginal delivery in a healthy pregnancy mainly due to the fear of uncontrollable labour pain and fear of physical damage during vaginal delivery (which is striking considering that CS is a surgical procedure) (Koelewijn et al., 2017). The finding that BSS-R sub-scale scores are significantly associated with neonatal physical health (measured with the Apgar score) immediately postpartum is a unique contribution to the literature and a fundamentally crucial area for future research.

AVAILABILITY OF THE BSS-R

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

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DISCLOSURES

Paulina Pawlicka,
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Barbara
Baranowska,
Daria Macewicz,
Michał Olech,
Caroline J. Hollins
Martin,
Colin R. Martin

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Barbara
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