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Further validation of the Birth Satisfaction Scale-Revised: factor structure, validity, and reliability

Abstract

The Birth Satisfaction Scale-Revised is a short but valid and reliable robust measure of different aspects of birth satisfaction. This study aimed to test factor structure, validity and reliability of the Croatian version of the Birth Satisfaction Scale-Revised. In the cross-sectional study, a convenient online sample of 552 women completed questionnaires in the first year postpartum. The Birth Satisfaction Scale-Revised, subscale Satisfaction with Delivery from the Childbirth Perception Questionnaire, and a set of questions on demographic and obstetric data were administered. The results showed the excellent fit of both the three-factor model (Stress experienced during labour, Women's personal attributes, Quality of care) and two-factor model (with Stress and Women's attributes combined into one factor), with no significant difference between the two models. Furthermore, bi-factor modeling revealed a general factor of childbirth experience, which explains the variance of items from Stress and Women's attributes subscales. The internal consistency was high for the total scale and Quality of care, while acceptable for the other two subscales. Convergent and divergent validity was high. Known-group discriminant validity showed that women who gave birth by unassisted vaginal birth and planned caesarean section reported higher levels of birth satisfaction. In conclusion, both empirical findings and theoretical background suggest a three-factor model as the better solution for the Birth Satisfaction Scale-Revised conceptualization. As the Croatian version of the Birth Satisfaction Scale-Revised was proved to be valid and reliable, it is recommended for use to measure birth satisfaction both for research and practical purposes.

Keywords: Birth Satisfaction Scale-Revised; birth; perinatal care; reliability and validity.

Introduction

1 Childbirth is an important event, and for many women it is a life-changing experience.

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4 Childbirth experience is complex and multidimensional, including physiological and
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7 psychological aspects within the social, organizational and administrative context (Larkin et
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9 al., 2009). One aspect of childbirth experience is satisfaction with birth, often described in
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11 different ways, yet a complex and evaluative process shaped by individual perception and
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13 attitudes about care received (Sawyer et al., 2013). Birth satisfaction is essential, not only
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15 from the women's perspective, but also from the standpoint of delivering quality perinatal
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17 care. Childbearing women's satisfaction with health care is the most common measure from
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19 which health care providers and policymakers can improve services (Goodman et al., 2004),
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21 with it now crucial to consider using an additional valid and reliable instrument to measure
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23 women's satisfaction with their birth experience.
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29 Several instruments for measuring birth satisfaction have been developed (for a
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31 review, see Sawyer et al., 2013). However, some of these scales are very focused and specific,
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33 such as the questionnaires that measure satisfaction during very early preterm birth (Sawyer et
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35 al., 2014) and caesarean section (Morgan et al., 1999). There is also a review of different
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37 instruments of satisfaction, which reports that most lack theoretical background (Sawyer et
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39 al., 2013). A scale that has tried to overcome some of the shortcomings of prior measures
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41 built upon a comprehensive literature review, is the Birth Satisfaction Scale (BSS) (Hollins
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43 Martin & Fleming, 2011). Three themes emerged from the literature, upon which 30 items
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45 were constructed, which included quality of the provided service, personal attributes (e.g.,
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47 ability to cope and have control over the process), and stress experienced during birth.
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53 Validity tests **trimmed** the 30-item BSS down to a 10-item scale (Hollins Martin & Martin,
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55 2014). Since its validation, the BSS-R has gained international attention and has been
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57 validated in English speaking countries (US) (Fleming et al., 2016)) and non-English
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1 speaking countries, such as Greece (Vardavaki et al., 2015) and Turkey (Cosar Cetin et al.,
2 2015).
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4 To date, the BSS-R has been validated in English speaking countries, such as the
5 original study in the UK (Hollins Martin & Martin, 2014), the USA (Barbosa-Leiker et al.,
6 2015; Martin et al., 2017), and Australia (Jefford et al., 2018) where it was recently replicated
7 with high consistency (Martin et al., 2020). From all these versions, factor structure
8 invariance and validity were upheld. In response, the BSS-R was selected by the International
9 Consortium for Health Outcomes Measurement (USA) as the instrument of choice for
10 assessing birth satisfaction (International Consortium for Health Outcomes Measurement,
11 2021). There is also a BSS-R website (BSS-R, 2021). It is also the only patient-reported
12 measure to receive 100% endorsement (Nijagal et al., 2018) and it has been in use in 39
13 countries worldwide (Hollins Martin et al., 2020).
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29 The BSS-R has been translated and validated into some other non-English languages,
30 including Greek (Martin et al., 2016), Italian (Nespoli et al., 2020), Turkish (Göncü
31 Serhatlıoğlu et al., 2018), Hebrew (Skvirsky et al., 2019), Spanish (Romero-Gonzalez et al.,
32 2019), Iranian (Mortazavi et al., 2020; Omani-Samani et al., 2019), Portuguese (Ferrari et al.,
33 2021), and Urdu (Zafar et al., 2021). From the validation studies across both English and non-
34 English speaking countries, several conclusions emerged about the factor structure. (i) The
35 three-factor structure fit the data adequately and superiorly opposed to unidimensional
36 structure (Göncü Serhatlıoğlu et al., 2018; Hollins Martin & Martin, 2014; Jefford et al.,
37 2018; Romero-Gonzalez et al., 2019; Vardavaki et al., 2015). (ii) A hierarchical model based
38 on the three-factor model, but with a higher-order factor called the *experience of childbearing*
39 had been proposed, with some contrary findings. Namely, Hollins Martin and Martin (2014)
40 found the excellent fit of the model to the UK data, while Martin et al. (2017) found a
41 marginally better fit of the simpler three-factor model in the USA data than the hierarchical
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1 model. (iii) A bi-factor model with one general factor showed an excellent fit to the extensive
2 US sample data (Martin et al., 2018). However, this general factor explained somewhat better
3 Women's attributes (WA) and Stress experienced during labour (SE), than the Quality of care
4 factor (QC). (iv) Also, a two-factor model gained an excellent fit when WA and SE were
5 combined. However, it did not outperform the three-factor model (Martin et al., 2018). In
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7 summary, the final structure is still inconclusive, predominantly in non-English language
8 validation in which case the bi-factor model was not tested.
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17 Furthermore, although construct validity and reliability have been previously
18 examined, convergent and discriminant validity were not tested sufficiently. Namely, the
19 BSS-R has not been compared to some other measure of the birth experience so far, except
20 with the more extended 30-item version of the same scale (Fleming et al., 2016). Also, when
21 discriminant validity was tested by known-groups differences, just a few characteristics were
22 used, such as pregnancy plans (Fleming et al., 2016; Martin et al., 2017) and birth type, where
23 the only distinction was between unassisted vaginal birth versus intervention (Jefford et al.,
24 2018; Romero-Gonzalez et al., 2019; Vardavaki et al., 2015). However, these differences
25 might be extended to differences between alternative types of interventions used, given that
26 there is a bulk of studies which show that emergency caesarean section and instrumental
27 vaginal birth provoke more traumatic experience than planned caesarean section (Andersen et
28 al., 2012; Olde et al., 2006; Söderquist et al., 2009).
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46 Also, some cross-cultural differences were established. For example, the wording of
47 items 1 and 4 were changed from the UK version when applied in Australian validation, and it
48 was shown that these two items appeared as the only non-invariant items, both in the
49 Australian (Jefford et al., 2018) and Greek versions (Vardavaki et al., 2015). Therefore,
50 further examinations in other languages are needed.
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58 This study aimed to translate and validate the Croatian version of the BSS-R and:
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- (1) to test the adequacy of fit of the one-factor model (Hollins Martin & Martin, 2014), three-factor correlated model (Hollins Martin & Martin, 2014; Romero-Gonzalez et al., 2019; Vardavaki et al., 2015), and bi-factor model with three-factor (Martin et al., 2018);
 - (2) to examine the reliability of the BSS-R;
 - (3) to explore the convergent validity of the BSS-R against Satisfaction with delivery from the Childbirth Perception Questionnaire (Padawer et al., 1988);
 - (4) to examine divergent validity of the BSS-R via correlations with maternal age and time since birth;
 - (5) to test discriminant validity as possible differences in the BSS-R total and subscale scores between known-groups, concerning the type of birth, parity, traumatic birth experience, and pregnancy plans.

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Based on previous studies with different models substantiated, we could not hypothesize which model would fit better to the Croatian dataset. However, we expected the Croatian BSS-R to be reliable and to have high convergent and divergent validity. Namely, we expected the BSS-R to have moderate correlations with Childbirth Perception Questionnaire, while in non-significant correlations with maternal age and time since birth. Also, we anticipated that BSS-R would show high discriminant validity. Precisely, we expected that women who had planned their pregnancy, had an unassisted vaginal birth, and who did not perceive their birth as a traumatic experience, would have higher levels of birth satisfaction measured with the BSS-R.

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Methods

Participants

1 A convenience sample of 603 mothers with 1-12-month-old infants was recruited. We applied
2 exclusion and inclusion criteria from the study by Hollins Martin and Martin (2014), thus
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4 excluding women with prematurity (<37 weeks, $n = 36$) and postmaturity (>42 weeks, $n = 5$).
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6 The final sample included 562 women.
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9 The average maternal age was 30.59 years ($SD = 4.63$, range 20-47), and the mean
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11 time from birth was 6.12 months ($SD = 3.38$, range 1-12). Out of the sample, the majority of
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13 participants were married or cohabiting (99.3%), and had graduated from tertiary schooling
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15 (70.6%). One in two women reported being of average socioeconomic status (48.2%), with
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17 10.5% below average, and 41.3% above average.
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21 The majority of the sample were primiparas (60.9%), one in four gave birth to a
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23 second child (27.4%), and 11.7% were multiparas. In addition, the majority had an unassisted
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25 vaginal delivery (76.1%), 2.0% had instrumental vaginal childbirth, 7.7% had a planned
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27 caesarean section, and 14.2% had an emergency caesarean section (in total, 23.9% received an
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29 intervention), which is following the national statistics (Rodin et al., 2018).
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33 34 35 36 ***Instruments***

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38 The *Birth Satisfaction Scale-Revised* (BSS-R)(Hollins Martin & Martin, 2014) is a 10-item
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40 scale that measures satisfaction in relation to three aspects of the birth experience: *stress*
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42 *experienced during labour* (SE, four items, $\alpha = .71$), *Women's personal attributes* (WA, two
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44 items, $\alpha = .64$), and *Quality of care provision* (QC, four items, $\alpha = .74$). Each item is scored
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46 on a 5-point scale (0 – *strongly disagree* to 4 – *strongly agree*). The total score ranges from 0
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48 to 40, where a higher score indicates greater satisfaction with birth. Cronbach's α for the
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50 whole scale was .79 (Hollins Martin and Martin, 2014). The back-translation method was
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52 used to translate the BSS-R to Croatian. One author translated it from English to Croatian
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(MB), and another translated it back from Croatian to English (SNR), with independent proofreading applied.

The *Childbirth Perception Questionnaire* (CPQ)(Padawer et al., 1988) is a 27-item questionnaire that measures different aspects of the childbirth experience, including Satisfaction with physical appearance/sexuality (5 items; $\alpha = .58$), Satisfaction with delivery and conduct during labour/delivery (13 items; $\alpha = .82$), and Satisfaction with interaction with spouse during childbirth (9 items; $\alpha = .75$). Each item is rated on a 6-point scale (1 – *agree completely* to 6 – *disagree completely*). A subscale of Satisfaction with delivery was used to examine the convergent validity against the BSS-R. The total score for this subscale can range from 13 to 78, where a higher number indicates a lower level of satisfaction. In this study, the one-factor structure was established, and the coefficient of internal consistency of both Cronbach's α and McDonald's ω was .88.

The General Data Sheet was comprised of questions that gathered maternal demographic data (i.e., age, education, marital status). Obstetric data included questions about *parity* (coded as primiparous vs multiparous), *pregnancy plans* (planned pregnancy, unplanned but wanted pregnancy, unplanned and unwanted pregnancy), *gestational age at birth* (coded as preterm vs term birth), *time since birth* (months), *type of birth* (i.e., vaginal, instrumental vaginal, planned caesarean section, emergency caesarean section, which was coded as vaginal unassisted vs intervention), and *traumatic birth experience* (yes vs no).

Procedure

A cross-sectional study was conducted online during November-December 2018. Participants were recruited via social networks. For example, Facebook and groups for parents in Croatia. Following informed consent, participants anonymously completed the questionnaires. The Ethical Committee of the [removed for blind review] approved the study.

Statistical analysis

Factor structure was examined by Confirmatory Factor Analysis (CFA). Interpretation of the fit indices of Confirmatory Fit Index (CFI) and Tucker-Lewis Index (TLI) values were above .95, Standardized Root Mean Square Residual (SRMR) below .08, and 90% confidence interval for the Root Mean Square Error Approximation (RMSEA) below .08 indicated a good fit (Browne & Cudeck, 1993; Hu & Bentler, 1999). We followed a general rule to have at least 200 participants to conduct the CFA, but this figure was substantially exceeded. Reliability of the BSS-R was examined using internal consistency Cronbach's α coefficient and McDonald's ω calculated with OMEGA macro for SPSS (Hayes & Coutts, 2020). Convergent validity was assessed using Pearson's correlation coefficients between the BSS-R total scale and subscale of the Childbirth Perception Questionnaire. Discriminant validity was examined by a series of one-way analysis of variance (ANOVA) of the BSS-R whole scale and subscales concerning different known groups. CFA analysis was performed using MPlus, version 8.1 and others using SPSS Statistics 21.0 for Windows.

Results

Data screening

There were no missing data in relation to BSS-R items. The dataset was screened for univariate and multivariate outliers and normality of distributions. No univariate outliers were found based on the z scores, which were all below $z < 3.29$ (Tabachnick & Fidell, 2007). However, by calculating Mahalanobis distances, 10 (1.8%) multivariate outliers were revealed and excluded from the following analysis. Inspecting the absolute values of skew (SI) and kurtosis (KI) indexes, all items were well below 3 and KI below 8. Thus we concluded that the normality of distributions were not violated (Kline, 2011).

Item analysis

Descriptive statistics for individual items of the BSS-R showed that all items had the full range of answers on the 5-point scale. For example, women were the most satisfied with the clean and hygienic delivery room, as the aspect of the Quality of care. On the other hand, they reported the lowest level of satisfaction for items 9 and 3, which refer to feelings of distress during labour and encouragement from the delivery room staff to make decisions about their birth progress.

Factor structure

We conducted CFA with one factor, which showed poor fit indices (Table 1). On the other hand, the fit indices for the three-factor model were excellent. However, there was an extremely high correlation between the subscales of SE and WA ($r = .995$). Therefore, we conducted CFA with a two-factor solution, where we combined factors of SE and WA. The fit indices were almost identical, as was the case for the three-factor model. The chi-square difference test for these two models was also insignificant.

Also, we tried to replicate the bi-factor model, based upon the three-factor model (Martin et al., 2018). The bi-factor model was identified with excellent fit indices (Table 1), but was not significantly better than the three-factor model ($\Delta\chi^2 = 8.25$, $\Delta df = 7$, $p = .3110$). Factor loadings for this model are presented in Figure 1. Items of both SE and WA subscale were more saturated with the general factor than with the specific factor, while items of the QC had higher factor loadings on the specific factor. The proportion of variance contributed to each set of items by the corresponding latent factor were .33, .04, .01, and .42 for the general factor, SE, WA, and QC, respectively. Furthermore, the general factor explained 40%

of the variance for the SE subscale items, 56% of the variance for the WA subscale items, and only 15% of the QC subscale items.

Reliability

Reliability was analyzed as the internal consistency coefficient of .85 for both Cronbach's α and McDonald's ω . In addition, reliability of each subscale was above the standard threshold of .70 (Kline, 2000) and was $\alpha = .72$ and $\omega = .73$ for the SE; $\alpha = .72$ for WA; and $\alpha = .81$ and $\omega = .85$ for QC, respectively.

Convergent validity

The BSS-R total score and the subscale scores were in moderate and significant negative correlations with the Childbirth Perception Questionnaire, i.e. subscale Satisfaction with Delivery (Table 2). Namely, higher levels of birth satisfaction on the BSS-R were related to higher satisfaction levels on the Childbirth Perception Questionnaire. The same findings were found for the total score and the three subscales: SE, WA, and QC, compared with the Childbirth Perception Questionnaire. The correlations of the combined subscales of SE/WA and the Childbirth Perception Questionnaire are presented in the Online Resource 1.

Divergent validity

The BSS-R total score was not related to maternal age ($r = .01, p = .9040$). Moreover, none of the BSS-R subscales correlated with maternal age ($r_{SE} = .01, p = .7720$; $r_{WA} = -.06, p = .1810$; $r_{QC} = .03, p = .4300$), respectively. Furthermore, time since birth had a low, but significant negative correlation with the BSS-R total score ($r = -.09, p = .0350$) and non-significant correlations with the subscales ($r_{SE} = -.08, p = .0800$; $r_{WA} = -.07, p = .0860$; $r_{QC} = -.07, p = .0850$), respectively. We suspected that the significant correlation with the total BSS-R score

1 might be due to higher occurrence of traumatic birth in women who gave birth 8, 11, and 12
2 months ago (35.29%, 42.55%, and 38.24%, respectively, vs. 26.99% for the whole sample).

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4 When we controlled for the traumatic birth on the relationship between the total BSS-R score
5 and time since birth, we found a non-significant partial correlation ($r = -.03$, $p = .5040$).
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8 9 10 11 ***Discriminant validity***

12 Discriminant validity of the BSS-R full scale and subscale was examined via known-groups
13 differences (Table 3). Scores on the whole scale and subscales SE and WA were sensitive to
14 *type of birth*. More specifically, women with unassisted vaginal birth and planned caesarean
15 section had significantly higher levels of birth satisfaction than women with assisted vaginal
16 delivery and emergency caesarean section.
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19 Concerning *parity*, multiparous women reported greater total satisfaction, satisfaction
20 with SE and QC than primiparous women, but there was no difference in WA. Concerning
21 *birth trauma*, women who reported traumatic childbirth had significantly lower levels of birth
22 satisfaction on the total scale and all subscales. Finally, there was no difference in any aspect
23 of birth satisfaction in relation to *pregnancy plans*. Although there was a tendency of women
24 with an unwanted pregnancy to report lower levels of birth satisfaction, there was not enough
25 statistical power to detect the significance due to a small subsample ($n = 9$).
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28 Known-group differences for the combined subscales of SE/WA are presented in
29 Online Resource 2.
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32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 **Discussion**

52 Our findings contribute to existing literature about the BSS-R, confirming its validity and
53 reliability as a short measure of birth satisfaction, even when the scale is translated into a non-
54 English language. Factor structure analysis yielded a competing three-factor and two-factor
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1 model with excellent fit. Also, the bi-factor model was shown to be statistically equivalent to
2 the established tri-dimensional measurement model. Furthermore, internal consistency was
3 high for the total scale and acceptable for the subscales. Also, convergent, divergent validity,
4 and known-group discriminant validity were all high. These specific psychometric properties
5 are further discussed.
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11 First, concerning factor structure, the results showed the excellent fit of both the three-
12 factor model (SE, WA, QC) and two-factor model (with SE and WA combined into one
13 factor), with no significant difference between the two models. Similar findings were found in
14 a recent study by Martin et al. (2018), where also the two-factor model yielded excellent fit,
15 but it did not outperform the three-factor model. The high correlation between SE and WA
16 was also demonstrated in another CFA of the BSS-R (Hollins Martin & Martin, 2014). From
17 parsimony aspects (Brown, 2015), one could argue that the two-factor model should be
18 recommended. However, analysis other than CFA provided interesting findings, as well.
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31 Namely, analysis of the known-group discriminant validity revealed some differences
32 between the SE and WA. Although on the majority of inspected variables, the two subscales
33 were quite consistent. The SE was sensitive to parity, while the WA subscale was not. Despite
34 the small number of items, both subscales had reliability above the threshold for the
35 acceptable internal consistency (Kline, 2000), which was even higher than in other studies
36 (Hollins Martin and Martin, 2014; Romero-Gonzalez et al., 2019). Finally, given that the
37 three factors initially emerged from the literature (Hollins Martin & Fleming, 2011) and that
38 there are substantiated arguments from the analysis findings, the three-factor model is
39 recommended for use.
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53 We further examined the bi-factor model with three specific factors. Results were
54 similar to the findings from the US study by Martin et al. (2018) in several ways. First, as in
55 the US, the bi-factor model showed a similar fit to the three-factor model; also, all items had
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1 high loadings ($> .30$) on general factors except for item 10; and finally, the QC subscale was
2 more independent, while the variance of both SE and WA items were accounted by general
3 factor. This replication shows that the BSS-R scale can be used in Croatia in a similar way as
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5 in English speaking countries.
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9 Furthermore, the convergent and divergent validity was high. We found that the BSS-
10 R was moderately related to the older measure of satisfaction with birth, as measured by the
11 Childbirth Perception Questionnaire (Padawer et al., 1988). The Childbirth Perception
12 Questionnaire is a unidimensional measure that comprises different aspects of satisfaction,
13 including experiences of personal control during birth, personal dealing with pain, satisfaction
14 with the type of birth, and pain management. From this finding, it is clear that these specific
15 aspects tap all three subscales of the BSS-R. Therefore, we did not expect the correlations to
16 be too high. On the other hand, the BSS-R was not related to maternal age and time since
17 birth, thus demonstrating high divergent validity.
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31 Known-group discriminant validity showed that women who gave birth vaginally and
32 had a planned caesarean section reported higher levels of birth satisfaction than those who
33 gave birth by instrumental vaginal birth and emergency caesarean section. This is an
34 interesting finding, given that this is the first study to look at specific childbirth types. In
35 previous validations on the BSS-R, the only general distinction between unassisted vaginal
36 birth and intervention birth was analyzed showing that women with vaginal birth reported
37 higher birth satisfaction (Jefford et al., 2018; Romero-Gonzalez et al., 2019; Vardavaki et al.,
38 2015). Our findings are thus a meaningful extension to those of previous studies, as they show
39 that the BSS-R is also sensitive to different types of operative birth. Also, the findings are in
40 line with literature which shows that emergency caesarean section and instrumental vaginal
41 birth provokes a more traumatic birth experience (Andersen et al., 2012; Dahan, 2021; Olde et
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1 al., 2006; Söderquist et al., 2009). In line with that, our findings showed that women who
2 reported traumatic birth had significantly lower levels of birth satisfaction.
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4 Furthermore, the known-group analysis also revealed that primiparous women had
5 lower levels of birth satisfaction. This is consistent with the previous prospective study (Ayers
6 & Pickering, 2005) that found that primiparous women expected more negative emotions
7 before birth and reported more negative emotions after birth and more traumatic birth.
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10 Before drawing firm conclusions, several shortcomings of the study need to be
11 addressed. First, the convenience sample was recruited online. Although online recruitment
12 has advantages, especially in collecting larger samples within a short time, it is restricted to
13 those women who use technology. However, the sample was representative of Croatian
14 women, at least in regard to type of birth (Rodin et al., 2018), which was one of the main
15 variables for testing known-group validity. Furthermore, in most of the studies that validate
16 the BSS-R, women completed questionnaires within several weeks of birth. In contrast, in this
17 study, women in their first postnatal year participated. As such, one could argue that women
18 could forget or change recollections of their birth over time. However, there are studies that
19 show that some women have vivid memories of their childbirth, even after 20 years (Simkin,
20 1991). Also, we established a non-significant correlation between the time since birth and the
21 BSS-R, which is an important finding and suggests that the scale can be used in postnatal
22 women even after the puerperal period. However, this should be further tested with a
23 longitudinal design, especially to examine test-retest reliability as a measure of stability over
24 time. In this research, we did not establish discriminant validity based on pregnancy plans.
25 However, mothers may be reluctant to admit unwanted pregnancy, especially if their opinion
26 changes after the birth. Therefore, longitudinal studies would also be beneficial for
27 examination of possible effects of attitudes towards fertility and motherhood (Kossakowska &
28 Söderberg, 2020; Söderberg et al., 2015) and reported birth satisfaction. Also, we did not
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1 collect information on the received medications and analgesics during childbirth, which may
2 affect birth satisfaction (Dickinson et al., 2003; Nahaee et al., 2020). Finally, future studies
3 would benefit from investigating the prognostic validity of the BSS-R, especially in relation
4 to comparing birth satisfaction with different outcomes of postnatal mental health and
5 relationships with a baby.
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11 Nevertheless, this study adds to the current literature about BSS-R validation. Given
12 that this scale is the measure of choice for evaluating birth satisfaction (Nijagal et al., 2018), it
13 is imperative to confirm its validity in different settings and countries. Furthermore, this study
14 contributes to the bi-factor modeling literature in general, as an over 80-years old technique
15 that has received more attention only recently (Liao, 2018). Also, the findings of this study
16 contribute to the literature about negative birth experiences (Andersen et al., 2012; Dahan,
17 2021; Olde et al., 2006; Söderquist et al., 2009), showing that it is not the medical
18 intervention during childbirth that is associated with birth dissatisfaction. However,
19 *unplanned* interventions, such as instrumental vaginal birth and emergency caesarean section,
20 are associated with lower levels of birth satisfaction. Therefore, these women should receive
21 special care during and after delivery.
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39 In conclusion, both empirical findings and theoretical background suggest a three-
40 factor model is the best solution for conceptualizing the BSS-R. As the Croatian version of
41 the BSS-R was proved to be valid and reliable, it is recommended for use to measure birth
42 satisfaction both for research and practical purposes. Recently, the World Health Organization
43 indicated patient's satisfaction with the health service as an outcome measure of quality of
44 perinatal care (World Health Organization, 2016), and the International Consortium for
45 Health Outcomes Measurement chose the BSS-R as the recommended instrument of choice
46 to assess birth satisfaction (Nijagal et al., 2018). Therefore, the BSS-R should be used as a
47 standard procedure for evaluating perinatal healthcare. Women's experiences of childbirth are
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1 essential aspect of maternal care, with high scores of birth satisfaction setting a 'gold standard'
2 for service provision.
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7
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18 **Availability of data and material:** The datasets analyzed during the current study are available
19 from the corresponding author on reasonable request.
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22 **Code availability:** Not applicable.
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25 **Authors' contribution:**

26
27 All authors contributed to the conceptualization. The methodology was prepared by Sandra Nakić
28 Radoš, Marijana Matijaš and Maja Brekalo. Formal analysis was conducted by Sandra Nakić Radoš,
29 Marijana Matijaš and Colin R. Martin. The first draft of the manuscript was written by Sandra Nakić
30 Radoš, Marijana Matijaš and Maja Brekalo, and all authors commented on previous versions of the
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32 administration were cured by Sandra Nakić Radoš. Supervision was conducted by Sandra Nakić Radoš
33 and Colin R. Martin.
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38 **Ethics Approval:** This study was approved by the Ethical Committee of the Catholic University of
39 Croatia (Class: 602-04/18-04/12, No: 498-04-06-18-06-1), and it was conducted in accordance with
40 the ethical standards of the Declaration of Helsinki.
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47 **Consent to participate:** Informed consent was obtained from all individual participants included in
48 the study.
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55 **Consent for publication:** All participants gave their consent to publish the data analyzed on the
56 group level.
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Figure caption

Figure 1. Bi-factor model with standardized factor-loading of BSS-R. Arrows to the immediate right of items represent residual values.

**Title: Further validation of the Birth Satisfaction Scale-Revised: factor structure,
validity, and reliability**

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Abstract

The Birth Satisfaction Scale-Revised is a short but valid and reliable robust measure of different aspects of birth satisfaction. This study aimed to test factor structure, validity and reliability of the Croatian version of the Birth Satisfaction Scale-Revised. In the cross-sectional study, a convenient online sample of 552 women completed questionnaires in the first year postpartum. The Birth Satisfaction Scale-Revised, subscale Satisfaction with Delivery from the Childbirth Perception Questionnaire, and a set of questions on demographic and obstetric data were administered. The results showed the excellent fit of both the three-factor model (Stress experienced during labour, Women's personal attributes, Quality of care) and two-factor model (with Stress and Women's attributes combined into one factor), with no significant difference between the two models. Furthermore, bi-factor modeling revealed a general factor of childbirth experience, which explains the variance of items from Stress and Women's attributes subscales. The internal consistency was high for the total scale and Quality of care, while acceptable for the other two subscales. Convergent and divergent validity was high. Known-group discriminant validity showed that women who gave birth by unassisted vaginal birth and planned caesarean section reported higher levels of birth satisfaction. In conclusion, both empirical findings and theoretical background suggest a three-factor model as the better solution for the Birth Satisfaction Scale-Revised conceptualization. As the Croatian version of the Birth Satisfaction Scale-Revised was proved to be valid and reliable, it is recommended for use to measure birth satisfaction both for research and practical purposes.

Keywords: Birth Satisfaction Scale-Revised; birth; perinatal care; reliability and validity;

Dear Prof Ferraro,

We are delighted about the final decision on accepting our manuscript! Thank you and reviewers for your efforts and another round of thorough reading of the manuscript titled *Further validation of the Birth Satisfaction Scale-Revised: factor structure, validity, and reliability*. Responses to the comments are provided below and all changes (including proofreading) are marked in red in the manuscript.

Comments from the Editor:

CUPS-D-21-00354R2

"Further validation of the Birth Satisfaction Scale-Revised: factor structure, validity, and reliability"

The recommendation is for acceptance with a need for editing. Please, see the Reviewer remarks and address all of them in your revision and cover letter.

In addition, & should never be used within a sentence. It can only be used within parentheses when one is citing sources.

Please, correct this.

Response: *We apologise for this mistake. It was corrected on Page 3, and all manuscript was checked thoroughly.*

The ethics statement and informed consent statement required by this journal are missing. please, visit the author submission guidelines and add them.

Response: *We provided the Declarations; however, we misplaced them on the Title page. We apologise for this, and we inserted it now in the manuscript, before References.*

With best regards.

Stay well.

Reviewer #2: Thank you for your revision. You have made the recommended changes and the manuscript is well done. Two small issues - there is a space missing on line 27 page 14 and on page 2 line 53 the word "strimmed" looks like it should be 'trimmed' as strimmed requires the use of a trimmer to cut grass?

Congratulations on a very nice manuscript.

Response: *We added the missing line and changed "strimmed" to "trimmed". Thank you for spotting this, and thank you for your nice comment and efforts in reviewing our manuscript.*

Table 1. Model comparison of the BSS-R ($N=552$)

Model	χ^2 (<i>df</i>)	$\Delta\chi^2$	Δdf	<i>p</i>	RMSEA	SRMR	CFI
One-factor model	816.84 (35)	-	-	-	.201	.145	.687
Two-factor model	113.09 (34)	703.75	1	< .001	.065	.047	.968
Three-factor model	112.99 (32)	0.10	2	.476	.068	.047	.968
Bi-factor model	104.74 (25)	8.25	7	.311	.076	.047	.968

Note: BSS-R: Birth Satisfaction Scale – Revised; RMSEA - Root Mean Square Error Approximation
 SRMR - Standardized Root Mean Square Residual; CFI - Confirmatory Fit Index.

Table 2. Intercorrelations of the BSS-R total scale and subscales, and correlations with Satisfaction with delivery measured by CPQ ($N = 552$)

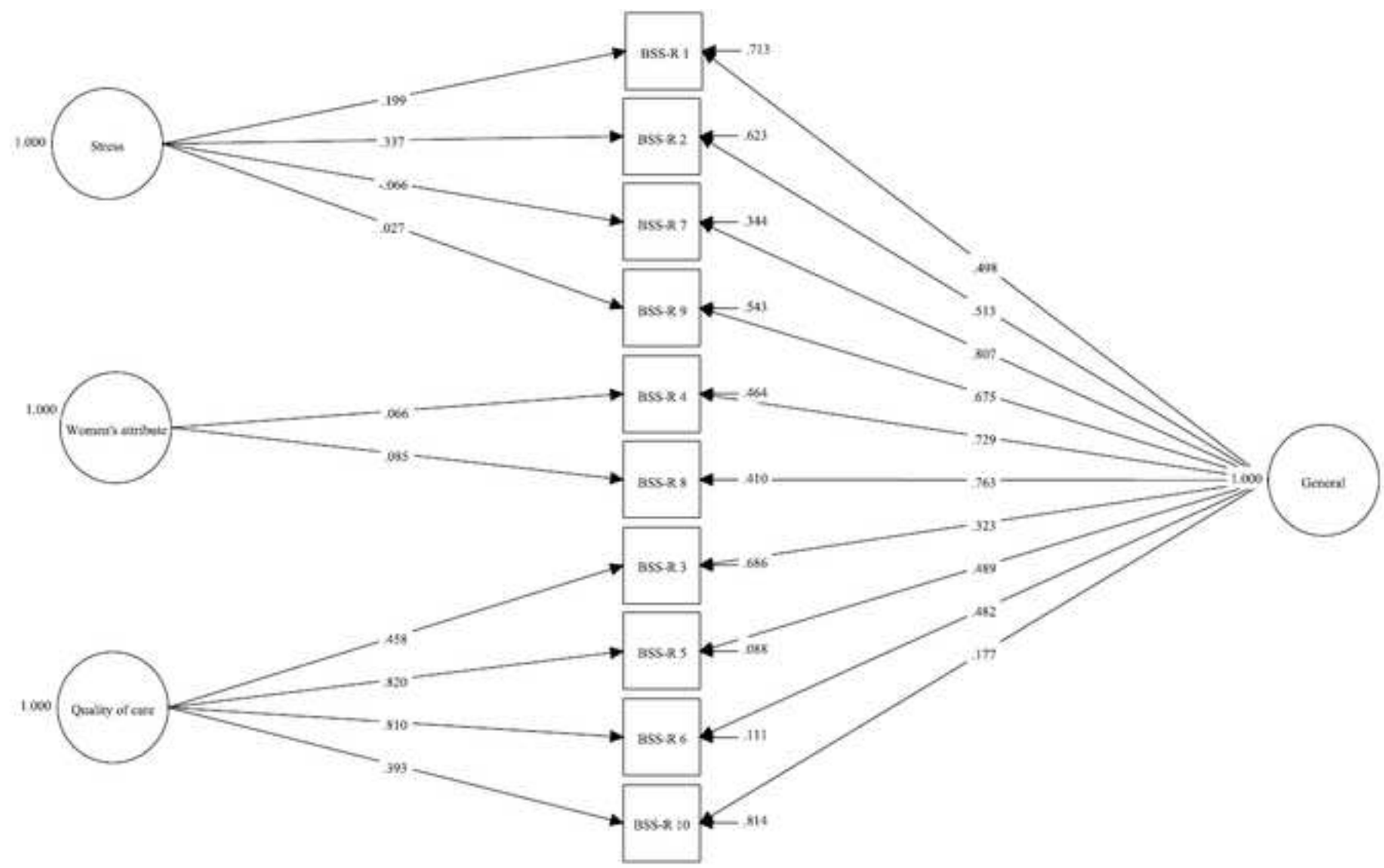
	<i>M (SD)</i>	1.	2.	3.	4.	5.
1. BSS-R Total score	22.96 (8.63)	-	.88**	.80**	.78**	-.72**
2. Stress during labour	8.33 (4.11)		-	.71**	.44**	-.67**
3. Women's attributes	4.43 (2.43)			-	.40**	-.64**
4. Quality of care	10.20 (3.94)				-	-.48**
5. Satisfaction with delivery (CPQ)	30.85 (13.42)					-


Note: * $p < .05$, ** $p < .01$. BSS-R - the Birth Satisfaction Scale-Revised, CPQ - Childbirth Perception Questionnaire. The absolute value of the correlation is its effect size (Cohen, 1992).

Table 3. Differences in the BSS-R total score and subscales between known-groups ($N = 552$)

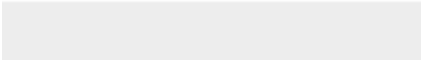

		Total score	Stress during labour	Women's attributes	Quality of care
Groups		$M (SD)$	$M (SD)$	$M (SD)$	$M (SD)$
Type of birth	Unassisted vaginal ($n = 421$)	23.54 (8.67)	8.62 (4.15)	4.60 (2.40)	10.32 (3.99)
	Instrumental vaginal ($n = 11$)	18.00 (9.82)	6.09 (4.57)	2.72 (2.10)	9.18 (4.92)
	Emergency c.s. ($n = 78$)	19.31 (7.72)	6.42 (3.70)	3.47 (2.36)	9.41 (3.59)
	Planned c.s. ($n = 42$)	25.24 (7.37)	9.50 (3.14)	4.98 (2.49)	10.76 (3.78)
		$F(3, 548) = 7.75$ $p < .0001^a$	$F(3, 548) = 8.88$ $p < .0001^a$	$F(3, 548) = 7.43$ $p < .0001^a$	$F(3, 548) = 1.70$ $p = .1650$
Parity	Primiparous ($n = 335$)	21.85 (8.68)	7.74 (4.06)	4.33 (2.49)	9.78 (4.03)
	Multiparous ($n = 217$)	24.67 (8.28)	9.23 (4.03)	4.59 (2.35)	10.85 (3.72)
		$F(1, 550) = 14.43$ $p < .0001$	$F(1, 550) = 17.74$ $p < .0001$	$F(1, 550) = 1.52$ $p = .2180$	$F(1, 550) = 9.91$ $p = .0020$
Birth trauma	Non-traumatic ($n = 403$)	25.96 (7.22)	9.72 (3.48)	5.15 (2.11)	11.09 (3.57)
	Traumatic ($n = 149$)	14.85 (6.69)	4.56 (3.25)	2.49 (2.19)	7.80 (3.92)
		$F(1, 550) = 267.30$ $p < .0001$	$F(1, 550) = 247.27$ $p < .0001$	$F(1, 550) = 169.45$ $p < .0001$	$F(1, 550) = 87.61$ $p < .0001$
Pregnancy plans ^b	Planned pregnancy ($n = 267$)	23.11 (8.60)	8.18 (4.22)	4.57 (2.43)	10.36 (3.87)
	Unplanned but wanted ($n = 132$)	22.90 (9.58)	8.36 (4.21)	4.45 (2.56)	10.10 (4.35)
	Unplanned and unwanted ($n = 9$)	18.78 (8.90)	6.44 (3.50)	3.22 (2.68)	9.11 (4.28)
		$F(2, 405) = 1.03$ $p = .3590$	$F(2, 405) = 0.88$ $p = .4170$	$F(2, 405) = 1.32$ $p = .2680$	$F(2, 405) = 0.56$ $p = .5750$


Note: ^a *post hoc*: vaginal = planned c.s. > instrumental vaginal = emergency c.s.; ^b pregnancy plans: the only analysis with the subsample of 408 women due to missing data on this variable.





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Supplementary Material
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