

## Full Length Article

# Traumatic birth experience and posttraumatic stress disorder: The psychometric properties of the Icelandic version of the City Birth Trauma Scale (City BiTS)

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## ABSTRACT

**Objective:** The aim of this study was to investigate the psychometric properties of the Icelandic City Birth Trauma Scale (City BiTS) and assess the prevalence of childbirth related post-traumatic stress symptoms and post-traumatic stress disorder in the Icelandic population.

**Methods:** The City BiTS was translated to Icelandic and tested for face-validity ( $n = 6$ ). Data was collected in 2022 in an online cross-sectional survey among mothers 6–12 weeks postpartum ( $n = 616$ ). Exploratory Factor Analysis (EFA) was used to test the underlying factor structure. Internal consistency was assessed using Cronbach's alpha and McDonald's Omega. Convergent validity was evaluated with Spearman's rank correlation with Birth Satisfaction Scale Revised (BSS-R) and Edinburgh Postnatal Depression Scale. Discriminant validity was explored through correlations with BSS-R. Mann-Whitney  $U$  test and Kruskal-Wallis test was used for assessment of group differences. Dunn's paired tests were conducted for variables with more than two groups.

**Results:** Of 616 women, 15.6 % had traumatic birth experiences and 2.4 % fulfilled the criteria of childbirth-related post-traumatic stress. EFA showed that a two-factor model presented the best fit, comprising birth-related symptoms and general symptoms. Internal consistency of the Icelandic version of City BiTS was good; for birth-related symptoms subscale ( $\alpha = 0.88$ , McDonald's omega = 0.91); for general symptoms subscale ( $\alpha = 0.87$ , McDonald's omega = 0.89).

**Conclusions:** This version of the City BiTS is the first measurement in Icelandic, assessing childbirth-related PTSD according to DSM-5 criteria and provides a two-factor model for clinical and research purpose. Subsequent research should further validate the two-factor structure across diverse populations and settings.

## Background

Childbirth is a transformative and momentous event in every woman's life. While childbirth is often a positive experience, the experience can also bring about a range of psychological challenges. These challenges can affect women's psychological health and well-being both in short and long term [1]. Previous studies indicate that 5–40 % of women report childbirth as a traumatic or negative experience [2] and 3–4 % develop Post-Traumatic Stress Disorder (PTSD) after giving birth [3]. Postpartum PTSD is a distressing condition that can severely impact a woman's well-being, the mother-infant bond [4], and the overall family dynamic [5].

A reliable and valid tool for assessment of childbirth related PTSD symptoms is of great importance. Throughout the years, tools used to measure postpartum PTSD have been derived from the Diagnostic and Statistical Manual of Mental Disorders (DSM) [6]. Originally, the tools for evaluation of PTSD were developed for assessment of psychological distress following disasters such as war, natural disasters or accidents. However, in terms of the uniqueness of childbirth as a natural lifetime event, it is debatable whether tools developed for such purposes are appropriate for assessment of psychological symptoms following childbirth. Only three scales have been developed specifically to measure PTSD in relation to childbirth. The first one is the Traumatic Event Scale that follows the DSM-IV criteria and can be used during pregnancy and

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postpartum [7]. The second is the Perinatal Post Traumatic Stress Disorder Questionnaire (PPQ), developed for use in high-risk groups of mothers [8]. However, PPQ does not fulfil the DSM-5 criteria as a diagnostic measure. The third is the City Birth Trauma Scale (City BiTS), developed in English for the assessment of birth-related trauma. It is the only one of the three scales that fulfils the DSM-5 criteria for PTSD [9]. The categories of PTSD criteria according to DSM-5 included in the City BiTS are (A) stressor criteria, (B) intrusion symptoms, (C) avoidance, (D) negative alterations in cognitions and mood, and (E) alteration in arousal and reactivity, as well as (F) duration of symptoms, (G) significant distress or impairment in social, occupational or other important areas of functioning, and (H) exclusion criteria of physiological effects of a substance or other medical condition. Finally, DSM-5 includes two specifiers, depersonalization and derealization, which are also included in the City BiTS. The City BiTS has been validated and translated to several languages, showing good psychometric properties for assessment of Post Traumatic Stress Symptoms (PTSS) and PTSD following childbirth. Both exploratory and confirmatory factor analysis have suggested a best fit with a two-factor structure; general symptoms and birth-related symptoms [9–15].

Given the impact of maternal psychological health on women's and family's well-being, it is of importance to have an accurate measurement of childbirth related PTSS and PTSD. The purpose of this paper was to 1) describe the translation process of the City BiTS scale into Icelandic and investigate the psychometric properties of the translated instrument, and 2) assess the prevalence of childbirth related PTSS and PTSD in the Icelandic population.

## Methods

### Participants

In this population-based cross-sectional study which is a part of the *International survey of childbirth-related trauma (INTERSECT)* which was conducted 6 to 12 weeks postpartum in over 30 countries in all continents. Our data was collected with a survey via e-mail sent to women. A reminder was sent once, a week later. The sample consisted of all Icelandic and English-speaking women, 18 years or older who gave birth in Iceland between March 14th, to July 31st, 2022, and had their email address registered in the maternity records. This study reports on data collected from mothers who answered the Icelandic version of the questionnaire, as the purpose was to examine the psychometric properties of the Icelandic version of the scale. The final sample included 616 women (Fig. 1).

### Measures

The City Birth Trauma Scale (City BiTS) is a 29-item self-report questionnaire, developed to assess post-traumatic stress symptoms following childbirth based on the DSM-5 criteria for PTSD. The scores are calculated from questions 3 to 22, where each question is answered on a four-point Likert scale from 0 (not at all) to 3 (five or more times last week). The total score range is 0 to 60 points, where higher scores indicate higher levels of childbirth related PTSS. The City BiTS can also be useful for diagnosing postpartum PTSD based on the following eight criteria: A) stressor criteria, (B) intrusive symptoms, (C) avoidance, (D) negative alteration in cognitions and mood, (E) alteration in arousal and reactivity, (F) duration, (G) distress and impairment, (H) exclusion of physiological effects of a substance or other medical condition (9). Psychometric evaluation of City BiTS in several languages has shown the best fit with two factor model indicating two subscales; birth related symptoms subscale and general symptoms subscale [9–15].

### Background variables and other measures

The following background variables were included in the survey: Age

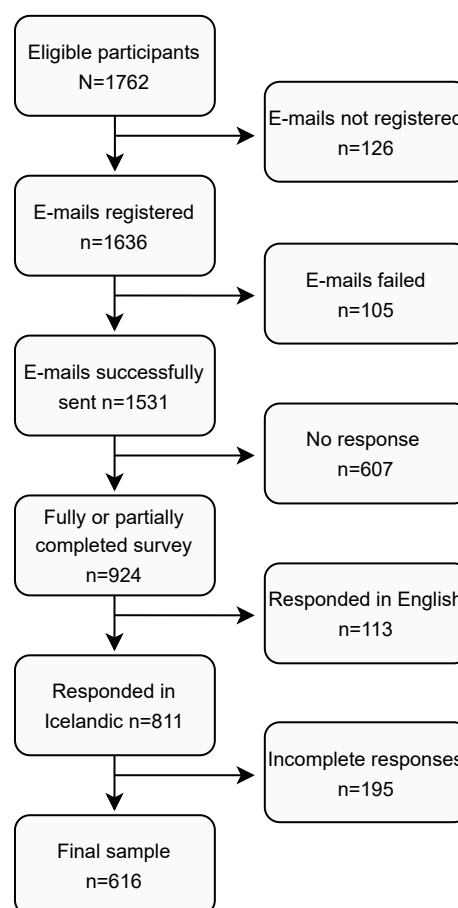


Fig. 1. Flowchart of the recruitment process for the study and the final study sample.

in years, country of origin (native-born, foreign-born); relationship status (single, married/living with partner); highest level of education completed (university education, other); residence (city, town, village, countryside) income compared to the population (lower than average, average, more than average); parity (primiparous, multiparous); place of birth (mixed-risk hospital setting, other); pregnancy complications and mode of birth (vaginal, instrumental, caesarean section). For place of birth, “other” settings included homebirth and midwifery-led birth centres.

To assess women's depressive symptoms postpartum, the Edinburgh Postnatal Depression Scale (EPDS) was used [16]. This 10-item self-assessment questionnaire utilizes a Likert scale ranging from 0 to 3 for each item, with higher values indicating more severe depressive symptoms. The EPDS is recognized as a reliable and valid measure for both antenatal and postnatal use [17]. The Icelandic version of the EPDS has also demonstrated strong reliability and excellent internal consistency ( $\alpha = 0.84$ – $0.85$ ) with recommendation of a cut-off score  $\geq 11$  [18]. In the original version of EPDS, a cutoff score ranging from 10 to 13 was considered as optimal [16].

The Generalized Anxiety Disorder Scale (GAD-7) was used in this study to assess symptoms of anxiety. It is a seven-item self-administered questionnaire in which each item is rated on a scale from 0 to 3, with higher total scores indicating more severe anxiety symptoms. The GAD-7 demonstrates excellent internal consistency ( $\alpha = 0.92$ ) [19]. The Icelandic adaptation of the GAD-7 also shows strong reliability and excellent internal consistency ( $\alpha = 0.87$ ) where a cutoff score of 10 is considered optimal, with a sensitivity of 86.2 % and a specificity of 95.5 % [20].

The Birth Satisfaction Scale Revised (BSS-R) was used to measure

satisfaction with labour and birth. It is a self-report questionnaire measuring the satisfaction in three categories: quality of care provision, personal attributes and stress experiences during labour [21]. BSS-R is a short form version of the original BSS scale with ten questions and was translated to Icelandic as part of the INTERSECT study. The psychometric properties of BSS-R in Icelandic have not been evaluated but it has shown good psychometric properties in other languages [21,22]. The BSS-R is based on statements about birth satisfaction and has response options on a 5-point Likert scale and a total score from 0 to 40. Lower score represents less birth satisfaction. There is no established cut-off score for BSS-R [21] but similar to previous studies, we report on the total score for the BSS-R [23].

#### Translation process

The City BiTS was translated into Icelandic language using a standard forward and backward translation process [20]. Two native Icelandic language speakers, familiar with childbirth care and perinatal mental health, translated the English version of the City BiTS [9] into Icelandic language. Then, a group of experts compared the two versions and combined them into one and a native English speaker translated the Icelandic version back to English. The translated English version was then compared to the original and any inconsistencies were discussed among the expert group until the final version was reached. The panel reported no significant discrepancies in the back-translation. This version was pre-tested on a group of six women who had recently given birth to evaluate the face validity of the instrument in the Icelandic context, resulting in minimal wording adjustments (Supplement 1).

#### Data analysis

First, a descriptive analysis was performed on the socio-demographic characteristics of the sample. Then, to evaluate the underlying structure of the City BiTS, an Exploratory Factor Analysis (EFA) was conducted, as the factor structure of the Icelandic translation had not been previously examined. The analysis used Weighted Least Squares with Mean and Variance adjustment (WLSMV) based on a polychoric correlations matrix, which is appropriate for ordinal data [24]. Items 3 to 22 were included.

To determine the suitability of the data for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were conducted. The KMO was 0.73, indicating that the data were suitable for factor analysis. Bartlett's test was significant ( $\chi^2 = 11900$ ,  $p < 0.001$ ), confirming that the correlation matrix was appropriate for factor extraction.

The Kaiser criterion (eigenvalue  $< 1$ ), Parallel Analysis, and inspection of the scree plot were used to determine the number of factors. An oblique rotation was applied to allow for correlated factors, and only factor loadings of 0.4 or higher were reported.

The internal consistency of the City BiTS was assessed using Cronbach's alpha and McDonald's Omega. Unlike Cronbach's alpha, Omega provides a more comprehensive estimate of internal consistency by accounting for the hierarchical factor structure [33].

To examine the normality of the data, a Shapiro-Wilk test was conducted for the City BiTS subscales. The results indicated a significant deviation from normality for both birth-related symptoms ( $W = 0.639$ ,  $p < 0.001$ ) and general symptoms ( $W = 0.852$ ,  $p < 0.001$ ), suggesting that the data were not normally distributed.

Construct validity of the City BiTS was examined by assessing both convergent and divergent validity. Convergent validity was evaluated by examining correlations with the Edinburgh Postnatal Depression Scale (EPDS) and the Generalized Anxiety Disorder Scale (GAD-7), which measure related constructs. Divergent validity was assessed by examining correlations with the Birth Satisfaction Scale – Revised (BSS-R), which measures a theoretically distinct construct. Spearman's rank correlation coefficients were used due to the non-normal distribution of

the data. The Mann-Whitney  $U$  test was used for comparisons between two independent groups and the Kruskal-Wallis test for comparisons involving more than two groups. When the Kruskal-Wallis test yielded a significant result, Dunn's post-hoc test with Bonferroni correction was used to identify group differences. The variables compared included mode of birth, parity, gestational age, mental illness, history of traumatic childbirth, and history of traumatic events. All statistical analyses were conducted using R studio (version 4.4.2).

#### Ethical Considerations

Approval for the study was received from the Icelandic National Bioethics Committee (VSNb2021120007/03.01) and all institutions providing childbirth care in Iceland. The study was reported to the Icelandic Data Protection Authority.

#### Results

##### Descriptive statistics

The mean age of the women participating in the study was 31.53 years ( $SD = 4.90$ ), with a range of 19 to 45 years. The average gestational period at birth was 39.30 weeks ( $SD = 1.74$ ) ranging from 26 weeks to full term. The majority of women were either married/in a civil partnership, or cohabiting (94.5 %), had attained secondary or higher education (92.5 %), and reported their income as average or above (85.6 %). Approximately half of the women had previous childbirth experience (55.1 %). Approximately one-fifth of women had a diagnosed mental disorder (21.4 %), and 37.7 % had been diagnosed with a mental disorder in their lifetime. About half of the sample reported a history of previous trauma (55.4 %) and 34.5 % of multiparous women reported that a previous birth had been traumatic. Additionally, 200 women (32.5 %) had experienced pregnancy loss, including miscarriage or stillbirth (Table 1).

The average score for the City BiTS was 8.47 ( $SD = 9.46$ ), with 79.4 % ( $n = 478$ ) of the participants indicating at least one symptom. Approximately 15.6 % of women described their current birth experience as traumatic (responded "yes" to one or both questions about believing her or baby would be seriously injured or die during labour, birth or immediately afterward). Additionally, 2.4 % met the diagnostic criteria for PTSD according to DSM-5 (Table 2). The average score on the EPDS was 6.45 ( $SD = 5.08$ ), on the GAD-7 4.39 ( $SD = 4.55$ ) and on the BSS 29.94 ( $SD = 7.05$ ).

##### Exploratory factor analysis

To determine the optimal number of factors, multiple criteria were evaluated. Kaiser's Criterion (eigenvalues  $> 1$ ) and the scree plot suggested a three-factor model, while Parallel Analysis (PA) indicated a four-factor model (Fig. 2).

Given these differing results, further examination of the factor structures and variance explained was necessary to determine the most parsimonious and interpretable model. An examination of the variance explained revealed that the third and fourth factors in the four-factor model contributed minimally to the overall structure (Table 3). Specifically, the model explained 60 % of the total variance, with factor 3 accounting for 8 % and factor 4 accounting for only 3 %, offering little additional explanatory power. As seen in Table 3, Factor 3 comprised items B1 (Recurrent unwanted memories of the birth (or parts of the birth) that you can't control), B2 (Bad dreams or nightmares about the birth (or related to the birth)), and b3 (Flashbacks to the birth and/or reliving the experience), while factor 4 contained only a single item E2 (Feeling self-destructive or acting recklessly), making it conceptually weak and difficult to interpret.

Given these limitations, a three-factor model was tested, which accounted for 61 % of the variance. However, when comparing the

**Table 1**  
Descriptive characteristics of participants (n = 616).

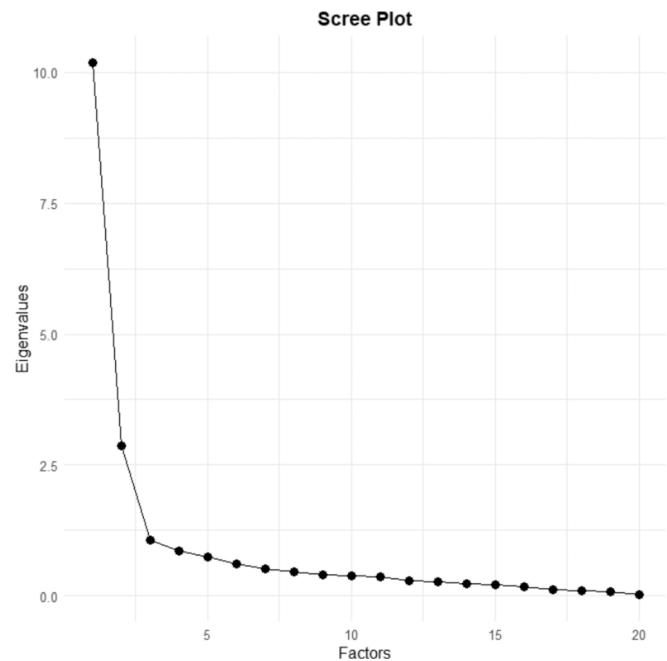
| Background                                                     | n (%)      |
|----------------------------------------------------------------|------------|
| <b>Parity (n = 563)</b>                                        |            |
| Multipara                                                      | 310 (55.1) |
| Primipara                                                      | 253 (44.9) |
| <b>Relationship status (n = 616)</b>                           |            |
| Married or civil partnership                                   | 476 (77.3) |
| Living with a partner                                          | 106 (17.2) |
| In relationship but not living together                        | 5 (0.8)    |
| Single                                                         | 28 (4.5)   |
| Other                                                          | 1 (0.2)    |
| <b>Educational status (n = 615)</b>                            |            |
| No formal education                                            | 3 (0.5)    |
| Elementary/primary education                                   | 42 (6.8)   |
| High/secondary school education                                | 125 (20.3) |
| Higher education                                               | 445 (72.4) |
| <b>Income (n = 615)</b>                                        |            |
| Below average                                                  | 88 (14.3)  |
| Average                                                        | 402 (65.4) |
| Above average                                                  | 125 (20.3) |
| <b>Previous diagnosis (n = 616)</b>                            |            |
| No                                                             | 370 (60.1) |
| Yes                                                            | 232 (37.7) |
| Don't know                                                     | 14 (2.3)   |
| <b>Current diagnosis (n = 616)</b>                             |            |
| No                                                             | 415 (67.4) |
| Yes                                                            | 132 (21.4) |
| Don't know                                                     | 69 (11.2)  |
| <b>Received treatment (n = 616)</b>                            |            |
| No                                                             | 524 (85.1) |
| Yes                                                            | 92 (14.9)  |
| <b>History of traumatic birth (n = 310)</b>                    |            |
| No                                                             | 203 (65.5) |
| Yes                                                            | 107 (34.5) |
| <b>History of pregnancy loss (n = 612)</b>                     |            |
| No                                                             | 412 (67.3) |
| Yes                                                            | 200 (32.7) |
| <b>History of previous trauma (n = 616)</b>                    |            |
| No                                                             | 275 (44.6) |
| Yes                                                            | 341 (55.4) |
| <b>Mode of birth (n = 610)</b>                                 |            |
| Vaginal                                                        | 476 (78)   |
| Instrumental vaginal birth                                     | 52 (8.5)   |
| Emergency caesarean                                            | 52 (8.5)   |
| Elective caesarean                                             | 30 (4.9)   |
| <b>Mother complication during pregnancy or birth (n = 616)</b> |            |
| No complication                                                | 269 (43.7) |
| Minor medical complication                                     | 290 (47.1) |
| Major medical complication                                     | 57 (9.3)   |
| <b>Infant complication during pregnancy or birth (n = 615)</b> |            |
| No complication                                                | 529 (86)   |
| Minor complication                                             | 66 (10.7)  |
| Major complication                                             | 20 (3.3)   |
| <b>Admission to neonatal intensive care unit (n = 615)</b>     |            |
| No                                                             | 557 (90.6) |
| Yes                                                            | 58 (9.4)   |

**Table 2**

Post-traumatic stress disorder (PTSD) symptoms using the DSM 5 diagnostic criteria (n = 616) 6–12 weeks postpartum.

| Criterion | n(%)                                                         |
|-----------|--------------------------------------------------------------|
| A         | Stressor criterion<br>96 (15.6)                              |
| B         | Intrusion symptoms ( $\geq 1$ items)<br>232 (37.7)           |
| C         | Avoidance symptoms ( $\geq 1$ items)<br>80 (13)              |
| D         | Negative cognitions and mood ( $\geq 2$ items)<br>301 (48.9) |
| E         | Hyperarousal ( $\geq 2$ items)<br>306 (49.7)                 |
| F         | Duration ( $>1$ month)<br>244 (39.6)                         |
| G         | Distress and impairment ( $\geq 1$ items)<br>244 (39.6)      |
| H         | Exclusion criteria ( $\geq 1$ items)<br>28 (4.5)             |
|           | Diagnostic criteria met for PTSD<br>15 (2.4)                 |

n = number.

**Fig. 2.** Scree plot showing the eigenvalues for the Exploratory Factor Analysis.

three-factor model to the four-factor model, it became evident that factor 3 from the four-factor model merged with factor 1 rather than remaining a distinct construct. Additionally, the third factor in the three-factor model was the same as factor 4 in the four-factor model and accounted for 4 % of the variance, further demonstrating its weak explanatory power. A closer examination of the factor loadings seen in Table 4 revealed that item E2 (“feeling self-destructive or acting recklessly”) loaded onto Factor 3 (0.48) but also onto Factor 2 (0.50), indicating a lack of theoretical distinctiveness. These findings suggested that Factor 3 was not theoretically meaningful and did not contribute substantively to the model.

A two-factor model was therefore tested. It accounted for 62 % of the total variance and had strong factor loadings ( $> 0.50$ ), as seen in Table 4, with no significant cross-loadings, supporting a clear structure. Factor 1 (birth-related symptoms) accounted for 34 % of the variance, while Factor 2 (general symptoms) explained 28 %. The correlation between the two factors was  $r = 0.55$ , indicating a moderately strong relationship while preserving conceptual distinctiveness.

#### Reliability analysis

To assess the internal consistency of the subscales identified in the factor analysis, Cronbach's Alpha ( $\alpha$ ) and McDonald's omega were calculated. The birth-related symptoms subscale showed good internal consistency ( $\alpha = 0.88$ , McDonald's omega = 0.91), with an average inter-item correlation of 0.45, within the recommended range (0.30–0.50). Similarly, the general symptoms subscale exhibited high reliability ( $\alpha = 0.87$ , McDonald's omega = 0.89), with an average inter-item correlation of 0.40, aligning with recommended values. All items contributed strongly to the overall scales except item E2, which had the lowest corrected item-total correlation ( $r = 0.25$ ), suggesting it may be a weaker indicator of the construct.

#### Validity

To assess validity, Spearman's rank-order correlations were computed between the City BiTS subscales (birth-related symptoms and general symptoms), birth experience, perceived birth trauma, the EPDS, GAD-7, and the BSS-R. Women's experiences of birth and perceived

**Table 3**  
Factor Analysis Summary.

|                 | 4 factor model |          |         |         | 3 factor model |          |          | 2 factor model |         |
|-----------------|----------------|----------|---------|---------|----------------|----------|----------|----------------|---------|
|                 | Factor 1       | Factor 2 | Factor3 | Factor4 | Factor1        | Factor 2 | Factor 3 | Factor 1       | Factor2 |
| SS load.        | 5.092          | 4.825    | 1.530   | 0.599   | 5.303          | 5.092    | 0.845    | 6.807          | 5.542   |
| Prop. Var.      | 0.255          | 0.241    | 0.077   | 0.030   | 0.265          | 0.255    | 0.042    | 0.34           | 0.277   |
| Cumulative Var. | 0.255          | 0.496    | 0.572   | 0.602   | 0.265          | 0.529    | 0.607    | 0.34           | 0.617   |

SS load.: Sum of Squared Loadings; Proportion Var.: Proportion of Variance Explained; Cumulative Var.: Cumulative Explained Variance.

**Table 4**  
Exploratory Factor Analysis.

| Item                             |                                                                                         | Factor 1 | Factor 2 |
|----------------------------------|-----------------------------------------------------------------------------------------|----------|----------|
| Factor 1: Birth-Related Symptoms |                                                                                         |          |          |
| q3                               | Recurrent unwanted memories of the birth (or parts of the birth) that you can't control | 0.899    |          |
| q4                               | Bad dreams or nightmares about the birth (or related to the birth)                      | 0.706    |          |
| q5                               | Flashbacks to the birth and/or reliving the experience                                  | 0.672    |          |
| q6                               | Getting upset when reminded of the birth                                                | 0.885    |          |
| q7                               | Feeling tense or anxious when reminded of the birth                                     | 0.923    |          |
| q8                               | Trying to avoid thinking about the birth                                                | 0.903    |          |
| q9                               | Trying to avoid things that remind me of the birth (e. g. people, places, TV programs   | 0.867    |          |
| q10                              | Not able to remember details of the birth                                               | 0.526    |          |
| q11                              | Blaming myself or others for what happened during the birth                             | 0.759    |          |
| q12                              | Feeling strong negative emotions about the birth (e.g. fear, anger, shame)              | 0.853    |          |
| Factor 2: General Symptoms       |                                                                                         |          |          |
| q13                              | Feeling negative about myself or thinking something awful wil happen                    |          | 0.640    |
| q14                              | Lost interest in activities that were important to me                                   |          | 0.740    |
| q15                              | Feeling detached from other people                                                      |          | 0.758    |
| q16                              | Not able to feel positive emotions (e.g. happy, excited)                                |          | 0.809    |
| q17                              | Feeling irritable or aggressive                                                         |          | 0.745    |
| q18                              | Feeling self destructive or acting recklessly                                           |          | 0.511    |
| q19                              | Feeling tense and on edge                                                               |          | 0.942    |
| q20                              | Feeling mumpy or easily startled                                                        |          | 0.638    |
| q21                              | Problems concentrating                                                                  |          | 0.761    |
| q22                              | Not sleeping well because of things that are not due to the bab's sleep pattern         |          | 0.651    |

birth trauma correlated strongly with the birth-related symptoms ( $\rho = 0.53$ ,  $p < 0.001$ , 95 % CI [0.46, 0.58]; and  $\rho = 0.60$ ,  $p < 0.001$ , 95 % CI [0.54, 0.65], respectively), and moderately with the general symptoms ( $\rho = 0.32$ ,  $p < 0.001$ , 95 % CI [0.25, 0.40]; and  $\rho = 0.34$ ,  $p < 0.001$ , 95 % CI [0.26, 0.41], respectively). The EPDS and GAD-7 on the other hand correlated strongly with the general symptoms subscale ( $\rho = 0.75$ ,  $p < 0.001$ , 95 % CI [0.71, 0.78]; and  $\rho = 0.76$ ,  $p < 0.001$ , 95 % CI [0.72, 0.80], respectively), and moderately with the birth-related symptoms subscale ( $\rho = 0.38$ ,  $p < 0.001$ , 95 % CI [0.31, 0.45]; and  $\rho = 0.39$ ,  $p < 0.001$ , 95 % CI [0.31, 0.45], respectively). These results provide strong support for convergent validity, for both the birth-related symptoms and the general symptoms.

The BSS-R demonstrated a moderate negative correlation with general symptoms ( $\rho = -0.36$ ,  $p < 0.001$ , 95 % CI [-0.43, -0.28]) and a strong negative correlation with birth-related symptoms ( $\rho = -0.55$ ,  $p < 0.001$ , 95 % CI [-0.61, -0.49]). These findings about general symptoms suggest adequate discriminant validity for both subscales, with birth-related symptoms demonstrating stronger differentiation.

*Group differences in City BiTS*

A Mann-Whitney *U* test indicated significantly different birth-related symptoms and general symptoms scores between multiparous and primiparous women, though effect sizes were small ( $r = 0.225$  and  $0.110$ ,

**Table 5**  
Differences in the City-Bits subscales between known groups.

| Groups                                    |                                   | Birth-related symptoms M (SD, Mdn)  | General symptoms M (SD, Mdn)      |
|-------------------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
| Parity                                    | Primiparous ( $n = 307$ )         | 2.07 (4.09, 0)                      | 4.97 (5.56, 3)                    |
|                                           | Multiparous ( $n = 249$ )         | 3.83 (5.46, 2)                      | 6.49 (6.78, 4)                    |
| Mann-Whitney, <i>p</i>                    |                                   | $W = 28793$ , $p < 0.001$           | $W = 33399$ , $p < 0.01$          |
| Mode of birth                             | Vaginal ( $n = 474$ )             | 2.23 (3.91, 0)                      | 5.36 (5.93, 3)                    |
|                                           | Instrumental vaginal ( $n = 52$ ) | 5.85 (7.16, 3)                      | 5.52 (6.36, 3.5)                  |
|                                           | Emergency c section (52)          | 6 (7.4, 2.5)                        | 7.83 (7.48, 5)                    |
|                                           | Elective c section ( $n = 30$ )   | 1.57 (3.75, 0)                      | 7.10 (6.44, 6)                    |
| Kruskal-Wallis, <i>p</i>                  |                                   | $\chi^2(3) = 36.09$ , $p < 0.001$   | $\chi^2(3) = 5.789$ , ns          |
| Mother complication                       | No complication ( $n = 266$ )     | 2.24 (4.13, 0)                      | 4.76 (5.49, 3)                    |
|                                           | Minor complication ( $n = 285$ )  | 2.98 (5.10, 1)                      | 6.08 (6.29, 4)                    |
|                                           | Major complication ( $n = 57$ )   | 4.78 (6.04, 3)                      | 7.86 (7.69, 6)                    |
| Kruskal-Wallis, <i>p</i>                  |                                   | $\chi^2(2) = 11.6420$ , $p > 0.005$ | $\chi^2(2) = 9.5585$ , $p > 0.01$ |
| Infant complication                       | No complication ( $n = 524$ )     | 2.61 (4.68, 1)                      | 5.53 (6.06, 3)                    |
|                                           | Minor complication ( $n = 64$ )   | 3.86 (5.17, 1.5)                    | 5.63 (5.97, 4)                    |
|                                           | Major complication ( $n = 20$ )   | 5.10 (7.06, 2)                      | 9.50 (8.39, 7)                    |
| Kruskal-Wallis, <i>p</i>                  |                                   | $\chi^2(2) = 7.6141$ , $p < 0.05$   | $\chi^2(2) = 4.1804$ , ns         |
| Admission to neonatal intensive care unit | No ( $n = 557$ )                  | 5.64 (6.11, 4)                      | 2.68 (4.64, 1)                    |
|                                           | Yes ( $n = 58$ )                  | 6.03 (6.60, 4)                      | 4.24 (6.23, 1.5)                  |
| Mann-Whitney, <i>p</i>                    |                                   | $W = 15993$ , ns                    | $W = 13794$ , ns                  |

SD. Standard deviations; Mdn: Median.

respectively) (Table 5). A Kruskal-Wallis test revealed a significant difference in birth-related symptoms scores across birth mode, though the effect size was small ( $\eta^2 = 0.0548$ ). Dunn's post-hoc tests showed significantly lower birth-related symptoms scores among those who had a vaginal birth compared to those with an instrumental vaginal birth or emergency caesarean section ( $p < 0.001$ ,  $p < 0.005$ ). No differences were found between instrumental vaginal and emergency caesarean section births ( $p = 1.00$ ) or between vaginal and elective caesarean section births ( $p = 0.726$ ). No significant differences were found for general symptoms scores across mode of birth. Birth-related symptoms and general symptoms scores varied significantly by maternal complications during labour, birth or immediately postpartum but with small effect sizes ( $\eta^2 = 0.0159$  and  $0.0125$ , respectively). Post-hoc tests

showed a significant difference between mothers with no complications and major complications for birth related symptoms ( $p = 0.00267$ ) and general symptoms ( $p = 0.023$ ), but no differences between no complications and minor complications ( $p = 0.2448$ ,  $p = 0.066$ ) or minor and major complications ( $p = 0.0611$ ,  $p = 0.540$ , respectively). A significant difference in birth related symptoms scores was found across levels of infant complications during labour, birth or immediately postpartum, though post-hoc tests revealed no significant pairwise differences ( $p > 0.05$ ), and the effect size was small ( $\eta^2 = 0.00928$ ). No significant difference was found for general symptoms scores. Neonatal intensive care unit (NICU) admission was also examined, but no significant differences in birth related symptoms and general symptoms scores were found between those who were admitted to NICU and those who did not.

## Discussion

This study aimed to evaluate the psychometric properties of the City BiTS in Iceland and explore the prevalence of traumatic birth and postpartum PTSD among Icelandic women 6–12 weeks postpartum. It is the first scale that has been translated and adapted in Icelandic language, specifically aimed for evaluation of PTSD following childbirth. The results provided support for a two-factor structure of the City BiTS, comprising birth-related symptoms and general symptoms subscales. Both subscales demonstrated acceptable validity and reliability. This finding contributes to the growing body of research on perinatal PTSD assessment tools internationally and supports the applicability of the City BiTS in perinatal mental health research across diverse populations. Our findings further suggest that the prevalence of PTSD in the Icelandic sample may be lower than worldwide averages.

The participants in the study reflected the childbearing population in Iceland regarding the mean age of mothers and relationship status [25] as well as parity and birth mode [26]. However, participants had a higher level of education (72.2 %) compared to the general population of women aged 25–34 years (54.7 %). This is a known phenomenon as individuals with higher education are often more likely to participate in scientific research [27].

The prevalence of traumatic birth experiences among our participants (15.6 %) is in the lower range worldwide according to a recent multi country analysis using the City BiTS for evaluation and the same applies to childbirth related PTSD (2.4%) [28]. This may be partly explained by maternity and postpartum care system in Iceland, which is freely available to all women. In Iceland, almost all women and newborns receive daily home visits from a midwife during the first ten days after birth, followed by approximately two visits from a nurse at the local primary health care centre during the first six weeks postpartum. Moreover, postpartum mothers with identified psychological concerns are given priority access to low-cost psychological care.

## Factor structure

Our findings align with previous research on the City BiTS, demonstrating a distinction between birth-related PTSD symptoms and more general PTSD symptoms [9–15]. Initial exploratory factor analysis criteria suggested conflicting models, however, closer examination revealed that a two-factor model retained as the most valid and interpretable structure for representation of PTSD symptoms postpartum. The two-factor model demonstrated a strong and conceptually meaningful structure, with no substantial cross-loadings and a moderately strong correlation between the birth-related symptoms and general symptoms, suggesting related but distinct constructs. The birth-related symptoms subscale captured intrusive thoughts, avoidance behaviours, and birth-related distress, while the general symptoms subscale reflected more generalized PTSD symptoms, including emotional numbing and hyperarousal. This distinction aligns with Ayers et al. study of psychometric evaluation of City BiTS [9].

## Internal consistency

Both subscales demonstrated strong internal consistency, supporting their reliability. The birth-related symptoms subscale exhibited higher inter-item correlations than the general symptoms subscale, yet both with an acceptable internal consistency. Notably, item E2 (“feeling self-destructive or acting recklessly”) showed the weakest item-total correlation, indicating it may be a less reliable indicator of its respective construct. However, it might still capture clinically relevant but less frequently reported postpartum behaviours, such as risk-taking or self-destructive tendencies, warranting further investigation in diverse postpartum populations. Future research should evaluate whether its inclusion in the scale remains important or whether modifications can improve the measure’s psychometric robustness.

## Construct validity

Convergent validity was supported by the strong association between general symptoms and EPDS, and a moderate correlation between birth-related symptoms and EPDS, confirming that the City BiTS effectively captures postpartum psychological distress. Discriminant validity analyses revealed that lower birth satisfaction was moderately associated with higher general symptoms scores and more strongly associated with higher birth-related symptoms scores. These findings suggest that while both subscales are linked to negative birth experiences, birth-related symptoms are more specifically aligned with birth-related PTSD. These findings suggest an adequate discriminant validity for both subscales, with birth-related symptoms demonstrating stronger differentiation. Small but significant differences in PTSD symptoms were found based on parity, birth method, and maternal complications. Similar to previous research, primiparous women reported higher PTSD symptoms [12] and women who had instrumental vaginal births or emergency caesarean sections had significantly higher birth-related symptoms scores than those with unassisted vaginal births [12].

The strong correlation between EPDS and GAD-7 with the general symptoms suggests that the general symptoms subscale effectively captures broader symptoms of depression and anxiety and might be utilised for identifying broader postpartum distress. These findings are in line with previous research regarding depression [13,29] and anxiety [13]. Its strong association with these scales reinforces its validity as a measure of general emotional distress following childbirth. Further studies should explore if the general symptoms part of City BiTS might have any incremental clinical value beyond general screening tools like the EPDS, by specifically capturing trauma-related symptoms associated with childbirth.

While maternal and infant complications during pregnancy or birth influenced birth-related PTSD symptoms scores, only major maternal complications were associated with significantly higher symptoms. Interestingly, NICU admission did not predict PTSD severity in our study although such associations have been detected in previous studies [30]. We can only speculate about this difference. Recent systematic reviews have suggested that skin-to-skin care and spontaneous touch seemed to have positive effects on parenting behaviours [31] and perceived stress related to the sick newborn, previous obstetric complications, pre-existing mental health issues, lack of psychological support in the NICU and social factors were also predictive factors for birth related PTSD symptoms [32]. These factors may have been protective factors in our study, although we did not examine this further.

## Strengths and limitations

One of the strengths of our study was a large population-based sample size representative of the childbearing population, except for the level of education which was higher in the study sample than the population of women of childbearing age. As previously stated, this is a known phenomenon in studies using a questionnaire to collect data as

more educated participants might be more motivated to participate. The study also followed a rigorous translation process, using a forward-to-back translation process. Limitations of the study include recall bias as all data was self-reported. However, the data collected was mostly about participants' current situation and recent experience. Our sample included only women who could read our national language, Icelandic; therefore, we are not able to conclude about all women who gave birth in Iceland at that time. As this study does not involve immigrant or linguistically diverse participants, future studies might explore the City BiTS performance in such subgroups within Iceland. Finally, we did not have any background information on non-respondents to compare with the final sample.

## Conclusion

The prevalence of perceived traumatic birth and postpartum PTSD among Icelandic women is low in worldwide comparisons. Exploratory factor analysis indicates that the City BiTS is optimally represented by a two-factor structure, delineating birth-related symptoms and general symptoms as distinct yet moderately correlated dimensions. This investigation underscores the multidimensionality of PTSD symptoms, emphasizing the necessity of scoring and interpreting the two factors independently. This distinction might be of clinical value, allowing for more targeted screening and treatment, where trauma-focused interventions may be prioritized for individuals with elevated birth-related symptoms, and broader mental health support for those with high general symptoms scores.

Clinicians may utilize the two-factor model to enhance their understanding of an individual's symptom profile, thereby facilitating a more precise and comprehensive PTSD diagnosis and treatment planning.

Subsequent research should include confirmatory factor analysis of the two-factor structure to assess its generalizability across diverse populations and settings. While several comparisons were statistically significant, effect sizes remained small, suggesting that birth method, maternal complications, infant complications, NICU admission and parity have limited practical influence on PTSD symptoms. The translation and psychometric evaluation of City BiTS to multiple languages contributes to the international effort to improve the identification and support of women experiencing postpartum trauma, across cultures.

## CRedit authorship contribution statement

**Valgerður Lísá Sigurðardóttir:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Linda Bára Lýðsdóttir:** Writing – review & editing, Writing – original draft, Validation, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Emma Marie Swift:** Writing – review & editing, Writing – original draft, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

## 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.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.srhc.2025.101124>.

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