Supplementary Information

# Sensitive power analysis

We used the powRICLPM R package (Mulder, 2023), which allows power analysis for RI-CLPM. Our primary objective was to determine the minimum cross-lagged coefficient at which the power exceeds 80%. We based our simulations on Model 2, which used MIBS and EPDS and imposed time-invariant constraints on both the cross-lagged and auto-regressive coefficients.

The power analysis takes into account several factors, such as the correlation between within-components, the correlation between random intercepts, intraclass correlations, and the auto-regressive coefficients. Following the approach of Gudmundsdottir, Pfund, Hill, & Olaru (2023), we set a range of parameters for the autoregressive effects (β= .07, .12, and .20), within-unit correlations (r = .10, .20, and .30), and intraclass correlations (ICC = .30, .40, .50, and .60), and examined the power for each combination. To refine and simplify our approach, we also conducted a meta-analysis based on previous studies that reported the simple correlation between mother-to-infant bonding and postpartum depressive symptoms (Davies, Silverio, Christiansen, & Fallon, 2021; Nolvi et al., 2016; Taylor, Atkins, Kumar, Adams, & Glover, 2005; Yücesoy & Erbi L, 2022) to estimate the meta-correlation between random intercepts. This allowed us to derive a meta-correlation coefficient of 0.36 between mother-to-infant bonding and postpartum depressive symptoms. The powRICLPM provides the simulated power for each parameter, not the minimum effect size. Following Orth et al. (2022), who outlines benchmarks for effect sizes in RI-CLPM, we ran simulations over a range from 0.03 (considered small) to 0.12 (considered large), looking for the cross-lagged coefficient where the estimated power exceeded 0.80.

***Table S1:*** *Estimated powers for each parameter combination*

|  | Intra-class correlation |
| --- | --- |
| Cross-lagged | Auto-regressive | Within-correlation | 0.3 | 0.4 | 0.5 | 0.6 |
| 0.03 | 0.07 | 0.1 | 0.18 | 0.16 | 0.13 | 0.16 |
| 0.2 | 0.16 | 0.17 | 0.14 | 0.14 |
| 0.3 | 0.16 | 0.16 | 0.14 | 0.14 |
| 0.12 | 0.1 | 0.17 | 0.16 | 0.16 | 0.14 |
| 0.2 | 0.16 | 0.15 | 0.15 | 0.13 |
| 0.3 | 0.17 | 0.15 | 0.14 | 0.13 |
| 0.2 | 0.1 | 0.16 | 0.15 | 0.15 | 0.14 |
| 0.2 | 0.15 | 0.15 | 0.12 | 0.12 |
| 0.3 | 0.16 | 0.14 | 0.13 | 0.12 |
| 0.04 | 0.07 | 0.1 | 0.26 | 0.25 | 0.22 | 0.22 |
| 0.2 | 0.26 | 0.24 | 0.22 | 0.21 |
| 0.3 | 0.23 | 0.21 | 0.22 | 0.23 |
| 0.12 | 0.1 | 0.25 | 0.24 | 0.23 | 0.23 |
| 0.2 | 0.26 | 0.24 | 0.22 | 0.20 |
| 0.3 | 0.24 | 0.23 | 0.23 | 0.20 |
| 0.2 | 0.1 | 0.24 | 0.24 | 0.24 | 0.22 |
| 0.2 | 0.21 | 0.23 | 0.19 | 0.19 |
| 0.3 | 0.24 | 0.22 | 0.20 | 0.20 |
| 0.05 | 0.07 | 0.1 | 0.32 | 0.36 | 0.32 | 0.31 |
| 0.2 | 0.36 | 0.34 | 0.31 | 0.32 |
| 0.3 | 0.35 | 0.32 | 0.32 | 0.30 |
| 0.12 | 0.1 | 0.34 | 0.34 | 0.34 | 0.32 |
| 0.2 | 0.35 | 0.34 | 0.33 | 0.30 |
| 0.3 | 0.33 | 0.33 | 0.31 | 0.29 |
| 0.2 | 0.1 | 0.34 | 0.34 | 0.32 | 0.29 |
| 0.2 | 0.33 | 0.32 | 0.27 | 0.27 |
| 0.3 | 0.33 | 0.31 | 0.27 | 0.27 |
| 0.06 | 0.07 | 0.1 | 0.49 | 0.46 | 0.46 | 0.45 |
| 0.2 | 0.47 | 0.45 | 0.44 | 0.43 |
| 0.3 | 0.44 | 0.44 | 0.41 | 0.40 |
| 0.12 | 0.1 | 0.45 | 0.43 | 0.41 | 0.40 |
| 0.2 | 0.46 | 0.44 | 0.42 | 0.41 |
| 0.3 | 0.45 | 0.43 | 0.41 | 0.38 |
| 0.2 | 0.1 | 0.46 | 0.44 | 0.40 | 0.42 |
| 0.2 | 0.44 | 0.43 | 0.39 | 0.36 |
| 0.3 | 0.44 | 0.42 | 0.38 | 0.37 |
| 0.07 | 0.07 | 0.1 | 0.58 | 0.56 | 0.56 | 0.58 |
| 0.2 | 0.58 | 0.59 | 0.55 | 0.53 |
| 0.3 | 0.57 | 0.55 | 0.54 | 0.52 |
| 0.12 | 0.1 | 0.57 | 0.54 | 0.56 | 0.53 |
| 0.2 | 0.57 | 0.57 | 0.54 | 0.54 |
| 0.3 | 0.55 | 0.54 | 0.52 | 0.51 |
| 0.2 | 0.1 | 0.53 | 0.56 | 0.52 | 0.53 |
| 0.2 | 0.56 | 0.54 | 0.49 | 0.49 |
| 0.3 | 0.55 | 0.53 | 0.49 | 0.48 |
| 0.08 | 0.07 | 0.1 | 0.68 | 0.70 | 0.70 | 0.71 |
| 0.2 | 0.68 | 0.67 | 0.66 | 0.66 |
| 0.3 | 0.66 | 0.66 | 0.64 | 0.64 |
| 0.12 | 0.1 | 0.68 | 0.67 | 0.69 | 0.64 |
| 0.2 | 0.68 | 0.66 | 0.63 | 0.65 |
| 0.3 | 0.65 | 0.67 | 0.62 | 0.64 |
| 0.2 | 0.1 | 0.66 | 0.65 | 0.64 | 0.62 |
| 0.2 | 0.66 | 0.65 | 0.63 | 0.60 |
| 0.3 | 0.63 | 0.61 | 0.59 | 0.60 |
| 0.09 | 0.07 | 0.1 | 0.76 | 0.80 | 0.79 | 0.78 |
| 0.2 | 0.78 | 0.79 | 0.75 | 0.77 |
| 0.3 | 0.75 | 0.77 | 0.73 | 0.75 |
| 0.12 | 0.1 | 0.79 | 0.76 | 0.76 | 0.77 |
| 0.2 | 0.78 | 0.77 | 0.74 | 0.75 |
| 0.3 | 0.74 | 0.75 | 0.74 | 0.74 |
| 0.2 | 0.1 | 0.77 | 0.74 | 0.74 | 0.73 |
| 0.2 | 0.77 | 0.75 | 0.73 | 0.73 |
| 0.3 | 0.76 | 0.71 | 0.71 | 0.69 |
| 0.1 | 0.07 | 0.1 | 0.87 | 0.86 | 0.85 | 0.85 |
| 0.2 | 0.86 | 0.86 | 0.85 | 0.83 |
| 0.3 | 0.86 | 0.84 | 0.83 | 0.82 |
| 0.12 | 0.1 | 0.86 | 0.86 | 0.83 | 0.85 |
| 0.2 | 0.84 | 0.87 | 0.82 | 0.82 |
| 0.3 | 0.85 | 0.84 | 0.82 | 0.82 |
| 0.2 | 0.1 | 0.83 | 0.83 | 0.82 | 0.82 |
| 0.2 | 0.85 | 0.83 | 0.83 | 0.81 |
| 0.3 | 0.81 | 0.81 | 0.78 | 0.77 |
| 0.11 | 0.07 | 0.1 | 0.92 | 0.92 | 0.91 | 0.92 |
| 0.2 | 0.91 | 0.92 | 0.90 | 0.90 |
| 0.3 | 0.90 | 0.90 | 0.88 | 0.87 |
| 0.12 | 0.1 | 0.92 | 0.90 | 0.90 | 0.90 |
| 0.2 | 0.91 | 0.91 | 0.89 | 0.88 |
| 0.3 | 0.89 | 0.89 | 0.89 | 0.87 |
| 0.2 | 0.1 | 0.91 | 0.90 | 0.89 | 0.88 |
| 0.2 | 0.90 | 0.89 | 0.87 | 0.88 |
| 0.3 | 0.88 | 0.87 | 0.87 | 0.85 |
| 0.12 | 0.07 | 0.1 | 0.95 | 0.94 | 0.96 | 0.95 |
| 0.2 | 0.97 | 0.96 | 0.95 | 0.96 |
| 0.3 | 0.95 | 0.94 | 0.93 | 0.93 |
| 0.12 | 0.1 | 0.96 | 0.95 | 0.94 | 0.95 |
| 0.2 | 0.96 | 0.95 | 0.94 | 0.93 |
| 0.3 | 0.94 | 0.93 | 0.93 | 0.93 |
| 0.2 | 0.1 | 0.93 | 0.94 | 0.93 | 0.94 |
| 0.2 | 0.94 | 0.93 | 0.92 | 0.92 |
| 0.3 | 0.94 | 0.94 | 0.91 | 0.91 |

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**Table S2:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| RI\_MIBS <-> RI\_EPDS | 2.70 | 0.43 | 0.63 | < 0.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.60 | 0.25 | 0.25 | < 0.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.33 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.39 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.35 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.40 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.23 | 0.08 | 0.26 | < 0.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.23 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.20 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.23 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.21 | 0.06 | 0.23 | < 0.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.24 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.22 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.23 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.16 | 0.08 | 0.10 | 0.03 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.10 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.10 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.12 |
| W\_EPDS0mo -> W\_MIBS1mo | -0.01 | 0.03 | -0.02 | 0.76 |
| W\_EPDS1mo -> W\_MIBS4mo | -0.02 |
| W\_EPDS4mo -> W\_MIBS10mo | -0.01 |
| W\_EPDS10mo -> W\_MIBS18mo | -0.01 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, mo month, RI random intercept, W within-individual component |

**Table S3:** Correlation, auto-regressive and cross-lagged coefficients between LA, AR and EPDS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| Between-individual level |
| RI\_LA <-> RI\_EPDS | 0.97 | 0.20 | 0.46 | < 0.01 |
| RI\_LA <-> RI\_AR | 0.52 | 0.09 | 0.65 | < 0.01 |
| RI\_AR <-> RI\_EPDS | 1.32 | 0.22 | 0.64 | < 0.01 |
| Within-individual level |
| Correlation |
| W\_LA0mo <-> W\_EPDS0mo | 0.56 | 0.11 | 0.13 | < 0.01 |
| W\_LA1mo <-> W\_EPDS1mo | 0.23 |
| W\_LA4mo <-> W\_EPDS4mo | 0.30 |
| W\_LA10mo <-> W\_EPDS10mo | 0.28 |
| W\_LA18mo <-> W\_EPDS18mo | 0.37 |
| W\_LA0mo <-> W\_AR0mo | 0.32 | 0.05 | 0.24 | < 0.01 |
| W\_LA1mo <-> W\_AR1mo | 0.37 |
| W\_LA4mo <-> W\_AR4mo | 0.45 |
| W\_LA10mo <-> W\_AR10mo | 0.35 |
| W\_LA18mo <-> W\_AR18mo | 0.38 |
| W\_AR0mo <-> W\_EPDS0mo | 0.89 | 0.13 | 0.27 | < 0.01 |
| W\_AR1mo <-> W\_EPDS1mo | 0.29 |
| W\_AR4mo <-> W\_EPDS4mo | 0.34 |
| W\_AR10mo <-> W\_EPDS10mo | 0.31 |
| W\_AR18mo <-> W\_EPDS18mo | 0.32 |
| Auto-regressive effects |
| W\_LA0mo -> W\_LA1mo | 0.19 | 0.05 | 0.29 | < 0.01 |
| W\_LA1mo -> W\_LA4mo | 0.22 |
| W\_LA4mo -> W\_LA10mo | 0.17 |
| W\_LA10mo -> W\_LA18mo | 0.22 |
| W\_AR0mo -> W\_AR1mo | 0.20 | 0.06 | 0.22 | < 0.01 |
| W\_AR1mo -> W\_AR4mo | 0.22 |
| W\_AR4mo -> W\_AR10mo | 0.21 |
| W\_AR10mo -> W\_AR18mo | 0.22 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.17 | 0.07 | 0.16 | < 0.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.18 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.16 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.16 |
| Cross-lagged effects |
| W\_LA0mo -> W\_EPDS1mo | 0.01 | 0.13 | 0.00 | 0.93 |
| W\_LA1mo -> W\_EPDS4mo | 0.00 |
| W\_LA4mo -> W\_EPDS10mo | 0.00 |
| W\_LA10mo -> W\_EPDS18mo | 0.00 |
| W\_LA0mo -> W\_AR1mo | 0.09 | 0.05 | 0.12 | 0.07 |
| W\_LA1mo -> W\_AR4mo | 0.08 |
| W\_LA4mo -> W\_AR10mo | 0.06 |
| W\_LA10mo -> W\_AR18mo | 0.06 |
| W\_AR0mo -> W\_EPDS1mo | 0.42 | 0.12 | 0.14 | < 0.01 |
| W\_AR1mo -> W\_EPDS4mo | 0.16 |
| W\_AR4mo -> W\_EPDS10mo | 0.16 |
| W\_AR10mo -> W\_EPDS18mo | 0.20 |
| W\_AR0mo -> W\_LA1mo | 0.06 | 0.04 | 0.07 | 0.10 |
| W\_AR1mo -> W\_LA4mo | 0.09 |
| W\_AR4mo -> W\_LA10mo | 0.08 |
| W\_AR10mo -> W\_LA18mo | 0.10 |
| W\_EPDS0mo -> W\_LA1mo | -0.01 | 0.01 | -0.03 | 0.54 |
| W\_EPDS1mo -> W\_LA4mo | -0.03 |
| W\_EPDS4mo -> W\_LA10mo | -0.03 |
| W\_EPDS10mo -> W\_LA18mo | -0.03 |
| W\_EPDS0mo -> W\_AR1mo | -0.00 | 0.02 | -0.01 | 0.91 |
| W\_EPDS1mo -> W\_AR4mo | -0.01 |
| W\_EPDS4mo -> W\_AR10mo | -0.01 |
| W\_EPDS10mo -> W\_AR18mo | -0.00 |
| Note: EPDS the Edinburgh postnatal depression scale, LA Lack of affection, AR Anger and rejection, mo month, RI random intercept, W within-individual component |

**Table S4:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS with prenatal CES-D

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| RI\_MIBS <-> RI\_EPDS | 1.60 | 0.33 | 0.53 | < 0.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.57 | 0.25 | 0.25 | < 0.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.33 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.38 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.35 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.39 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.23 | 0.08 | 0.25 | < 0.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.23 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.20 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.23 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.17 | 0.06 | 0.18 | < 0.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.19 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.18 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.18 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.15 | 0.08 | 0.09 | 0.05 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.09 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.09 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.10 |
| W\_EPDS0mo -> W\_MIBS1mo | -0.02 | 0.03 | -0.04 | 0.47 |
| W\_EPDS1mo -> W\_MIBS4mo | -0.04 |
| W\_EPDS4mo -> W\_MIBS10mo | -0.03 |
| W\_EPDS10mo -> W\_MIBS18mo | -0.03 |
| Regression |
| CES-Dpreg -> W\_MIBS0mo | 0.10 | 0.02 | 0.32 | < 0.01 |
| CES-Dpreg -> W\_MIBS1mo | 0.35 |
| CES-Dpreg -> W\_MIBS4mo | 0.36 |
| CES-Dpreg -> W\_MIBS10mo | 0.32 |
| CES-Dpreg -> W\_MIBS18mo | 0.33 |
| CES-Dpreg -> W\_EPDS0mo | 0.20 | 0.02 | 0.38 | < 0.01 |
| CES-Dpreg -> W\_EPDS1mo | 0.38 |
| CES-Dpreg -> W\_EPDS4mo | 0.42 |
| CES-Dpreg -> W\_EPDS10mo | 0.43 |
| CES-Dpreg -> W\_EPDS18mo | 0.45 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, CES-D the Center for epidemiologic studies depression scale, mo month, preg pregnancy, RI random intercept, W within-individual component |

**Table S5:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS with infant temperament

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| RI\_MIBS <-> RI\_EPDS | 2.45 | 0.42 | 0.60 | < 0.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.58 | 0.25 | 0.24 | < 0.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.33 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.39 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.35 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.39 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.22 | 0.08 | 0.26 | < 0.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.23 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.20 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.23 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.20 | 0.06 | 0.22 | < 0.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.23 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.21 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.22 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.16 | 0.07 | 0.10 | 0.03 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.10 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.10 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.12 |
| W\_EPDS0mo -> W\_MIBS1mo | -0.01 | 0.03 | -0.02 | 0.69 |
| W\_EPDS1mo -> W\_MIBS4mo | -0.02 |
| W\_EPDS4mo -> W\_MIBS10mo | -0.02 |
| W\_EPDS10mo -> W\_MIBS18mo | -0.02 |
| Regression |
| Temperament -> W\_MIBS1mo | 0.24 | 0.08 | 0.18 | < 0.01 |
| Temperament -> W\_MIBS4mo | 0.32 | 0.14 | 0.13 | 0.03 |
| Temperament -> W\_EPDS1mo | 0.23 | 0.11 | 0.17 | 0.02 |
| Temperament -> W\_EPDS4mo | 0.37 | 0.18 | 0.16 | 0.04 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, mo month, preg pregnancy, RI random intercept, W within-individual component |

**Table S6:** Model fit indices for models with control variables

| Model.description | CFI | RMSEA |
| --- | --- | --- |
| MIBS and EPDS | 0.96 | 0.04 |
| LA, AR and EPDS | 0.95 | 0.04 |
| MIBS and EPDS with Prenatatal CES-D | 0.95 | 0.04 |
| MIBS and EPDS with Infant Temperament | 0.94 | 0.05 |
| MIBS and EPDS without single participants | 0.96 | 0.04 |

Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, LA Lack of affection, AR Anger and rejection, CFI comparative fit index, RMSEA root mean squared error of approximation, AIC Akaike information criterion, BIC Bayesian information criterion

**Table S7:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS with control variables

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| Correlation |
| RI\_MIBS <-> RI\_EPDS | 2.47 | 0.41 | 0.64 | <.01 |
| Regression |
| Age -> RI\_MIBS | -0.02 | 0.03 | -0.04 | 0.51 |
| Income -> RI\_MIBS | -0.17 | 0.07 | -0.13 | 0.03 |
| Parity -> RI\_MIBS | -0.20 | 0.25 | -0.05 | 0.41 |
| Infant’s sex -> RI\_MIBS | -0.08 | 0.23 | -0.02 | 0.73 |
| Education -> RI\_MIBS | 0.29 | 0.15 | 0.13 | 0.05 |
| Birth weight -> RI\_MIBS | -0.00 | 0.00 | -0.00 | 0.98 |
| Gestational age -> RI\_MIBS | 0.14 | 0.11 | 0.09 | 0.20 |
| Depression history -> RI\_MIBS | 1.11 | 0.86 | 0.12 | 0.20 |
| Age -> RI\_EPDS | -0.11 | 0.04 | -0.21 | <.01 |
| Income -> RI\_EPDS | -0.08 | 0.11 | -0.05 | 0.45 |
| Parity -> RI\_EPDS | -0.60 | 0.33 | -0.13 | 0.07 |
| Infant’s sex -> RI\_EPDS | -0.46 | 0.30 | -0.10 | 0.13 |
| Education -> RI\_EPDS | -0.24 | 0.22 | -0.08 | 0.26 |
| Birth weight -> RI\_EPDS | 0.00 | 0.00 | 0.08 | 0.25 |
| Gestational age -> RI\_EPDS | -0.14 | 0.16 | -0.07 | 0.37 |
| Depression history -> RI\_MIBS | 2.78 | 0.86 | 0.24 | <.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.64 | 0.26 | 0.26 | <.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.34 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.40 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.36 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.40 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.22 | 0.07 | 0.25 | <.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.23 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.19 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.22 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.22 | 0.06 | 0.23 | <.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.24 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.23 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.23 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.16 | 0.08 | 0.10 | 0.03 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.10 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.10 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.12 |
| W\_EPDS0mo -> W\_MIBS1mo | 0.00 | 0.03 | 0.00 | 0.99 |
| W\_EPDS1mo -> W\_MIBS4mo | 0.00 |
| W\_EPDS4mo -> W\_MIBS10mo | 0.00 |
| W\_EPDS10mo -> W\_MIBS18mo | 0.00 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, mo month, RI random intercept, W within-individual component |

**Table S8:** Correlation, auto-regressive and cross-lagged coefficients between LA, AR and EPDS with control variables

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| Correlation |
| RI\_LA <-> RI\_EPDS | 0.94 | 0.20 | 0.49 | < 0.01 |
| RI\_LA <-> RI\_AR | 0.50 | 0.09 | 0.65 | < 0.01 |
| RI\_AR <-> RI\_EPDS | 1.17 | 0.21 | 0.64 | < 0.01 |
| Regression |
| Age -> RI\_LA | 0.00 | 0.01 | 0.02 | 0.82 |
| Income -> RI\_LA | -0.07 | 0.04 | -0.11 | 0.06 |
| Parity -> RI\_LA | -0.16 | 0.12 | -0.08 | 0.20 |
| Infant’s sex -> RI\_LA | 0.11 | 0.11 | 0.06 | 0.36 |
| Education -> RI\_LA | 0.14 | 0.07 | 0.13 | 0.05 |
| Birth weight -> RI\_LA | 0.00 | 0.00 | 0.00 | 0.97 |
| Gestational age -> RI\_LA | 0.05 | 0.05 | 0.07 | 0.23 |
| Depression history -> RI\_LA | 0.26 | 0.34 | 0.06 | 0.44 |
| Age -> RI\_EPDS | -0.11 | 0.04 | -0.22 | < 0.01 |
| Income -> RI\_EPDS | -0.08 | 0.11 | -0.05 | 0.46 |
| Parity -> RI\_EPDS | -0.63 | 0.32 | -0.13 | 0.05 |
| Infant’s sex -> RI\_EPDS | -0.47 | 0.30 | -0.10 | 0.12 |
| Education -> RI\_EPDS | -0.24 | 0.21 | -0.09 | 0.26 |
| Birth weight -> RI\_EPDS | 0.00 | 0.00 | 0.07 | 0.26 |
| Gestational age -> RI\_EPDS | -0.13 | 0.05 | -0.07 | < 0.01 |
| Depression history -> RI\_EPDS | 2.64 | 0.84 | 0.23 | < 0.01 |
| Age -> RI\_AR | -0.02 | 0.01 | -0.10 | 0.11 |
| Income -> RI\_AR | -0.07 | 0.04 | -0.11 | 0.11 |
| Parity -> RI\_AR | -0.13 | 0.13 | -0.07 | 0.31 |
| Infant’s sex -> RI\_AR | -0.21 | 0.12 | -0.12 | 0.06 |
| Education -> RI\_AR | 0.10 | 0.08 | 0.09 | 0.19 |
| Birth weight -> RI\_AR | -0.00 | 0.00 | -0.03 | 0.73 |
| Gestational age -> RI\_AR | 0.05 | 0.04 | 0.07 | 0.23 |
| Depression history -> RI\_AR | 0.31 | 0.41 | 0.07 | 0.45 |
| Within-individual level |
| Correlation |
| W\_LA0mo <-> W\_EPDS0mo | 0.57 | 0.12 | 0.13 | < 0.01 |
| W\_LA1mo <-> W\_EPDS1mo | 0.24 |
| W\_LA4mo <-> W\_EPDS4mo | 0.31 |
| W\_LA10mo <-> W\_EPDS10mo | 0.28 |
| W\_LA18mo <-> W\_EPDS18mo | 0.36 |
| W\_LA0mo <-> W\_AR0mo | 0.32 | 0.05 | 0.24 | < 0.01 |
| W\_LA1mo <-> W\_AR1mo | 0.38 |
| W\_LA4mo <-> W\_AR4mo | 0.46 |
| W\_LA10mo <-> W\_AR10mo | 0.35 |
| W\_LA18mo <-> W\_AR18mo | 0.37 |
| W\_AR0mo <-> W\_EPDS0mo | 0.91 | 0.13 | 0.27 | < 0.01 |
| W\_AR1mo <-> W\_EPDS1mo | 0.30 |
| W\_AR4mo <-> W\_EPDS4mo | 0.34 |
| W\_AR10mo <-> W\_EPDS10mo | 0.32 |
| W\_AR18mo <-> W\_EPDS18mo | 0.32 |
| Auto-regressive effects |
| W\_LA0mo -> W\_LA1mo | 0.18 | 0.05 | 0.28 | < 0.01 |
| W\_LA1mo -> W\_LA4mo | 0.21 |
| W\_LA4mo -> W\_LA10mo | 0.16 |
| W\_LA10mo -> W\_LA18mo | 0.20 |
| W\_AR0mo -> W\_AR1mo | 0.20 | 0.06 | 0.22 | < 0.01 |
| W\_AR1mo -> W\_AR4mo | 0.22 |
| W\_AR4mo -> W\_AR10mo | 0.21 |
| W\_AR10mo -> W\_AR18mo | 0.22 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.18 | 0.07 | 0.16 | 0.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.18 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.16 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.16 |
| Cross-lagged effects |
| W\_LA0mo -> W\_EPDS1mo | 0.01 | 0.13 | 0.00 | 0.94 |
| W\_LA1mo -> W\_EPDS4mo | 0.00 |
| W\_LA4mo -> W\_EPDS10mo | 0.00 |
| W\_LA10mo -> W\_EPDS18mo | 0.00 |
| W\_LA0mo -> W\_AR1mo | 0.09 | 0.05 | 0.12 | 0.08 |
| W\_LA1mo -> W\_AR4mo | 0.08 |
| W\_LA4mo -> W\_AR10mo | 0.06 |
| W\_LA10mo -> W\_AR18mo | 0.06 |
| W\_AR0mo -> W\_EPDS1mo | 0.42 | 0.13 | 0.14 | < 0.01 |
| W\_AR1mo -> W\_EPDS4mo | 0.16 |
| W\_AR4mo -> W\_EPDS10mo | 0.16 |
| W\_AR10mo -> W\_EPDS18mo | 0.20 |
| W\_AR0mo -> W\_LA1mo | 0.06 | 0.04 | 0.08 | 0.09 |
| W\_AR1mo -> W\_LA4mo | 0.10 |
| W\_AR4mo -> W\_LA10mo | 0.08 |
| W\_AR10mo -> W\_LA18mo | 0.10 |
| W\_EPDS0mo -> W\_LA1mo | -0.00 | 0.01 | -0.02 | 0.71 |
| W\_EPDS1mo -> W\_LA4mo | -0.02 |
| W\_EPDS4mo -> W\_LA10mo | -0.02 |
| W\_EPDS10mo -> W\_LA18mo | -0.02 |
| W\_EPDS0mo -> W\_AR1mo | 0.00 | 0.02 | 0.00 | 0.98 |
| W\_EPDS1mo -> W\_AR4mo | 0.00 |
| W\_EPDS4mo -> W\_AR10mo | 0.00 |
| W\_EPDS10mo -> W\_AR18mo | 0.00 |
| Note: EPDS the Edinburgh postnatal depression scale, LA Lack of affection, AR Anger and rejection, mo month, RI random intercept, W within-individual component |

**Table S9:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS with prenatal CES-D and control variables

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| Correlation |
| RI\_MIBS <-> RI\_EPDS | 1.50 | 0.33 | 0.53 | <.01 |
| Regression |
| Age -> RI\_MIBS | 0.02 | 0.03 | 0.05 | 0.45 |
| Income -> RI\_MIBS | -0.14 | 0.07 | -0.11 | 0.05 |
| Parity -> RI\_MIBS | -0.14 | 0.23 | -0.04 | 0.54 |
| Infant’s sex -> RI\_MIBS | -0.13 | 0.21 | -0.04 | 0.53 |
| Education -> RI\_MIBS | 0.42 | 0.14 | 0.20 | <.01 |
| Birth weight -> RI\_MIBS | -0.00 | 0.00 | -0.06 | 0.43 |
| Gestational age -> RI\_MIBS | 0.18 | 0.10 | 0.12 | 0.09 |
| Depression history -> RI\_MIBS | 0.72 | 0.87 | 0.09 | 0.41 |
| Age -> RI\_EPDS | -0.04 | 0.03 | -0.10 | 0.24 |
| Income -> RI\_EPDS | -0.02 | 0.10 | -0.02 | 0.80 |
| Parity -> RI\_EPDS | -0.47 | 0.28 | -0.13 | 0.10 |
| Infant’s sex -> RI\_EPDS | -0.56 | 0.26 | -0.15 | 0.03 |
| Education -> RI\_EPDS | 0.03 | 0.18 | 0.01 | 0.88 |
| Birth weight -> RI\_EPDS | -0.00 | 0.00 | -0.00 | 0.99 |
| Gestational age -> RI\_EPDS | -0.08 | 0.13 | -0.05 | 0.56 |
| Depression history -> RI\_EPDS | 2.02 | 0.82 | 0.22 | 0.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.59 | 0.25 | 0.25 | <.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.33 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.39 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.36 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.39 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.22 | 0.08 | 0.24 | <.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.22 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.19 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.22 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.18 | 0.06 | 0.18 | <.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.19 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.19 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.18 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.15 | 0.08 | 0.09 | 0.06 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.09 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.09 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.10 |
| W\_EPDS0mo -> W\_MIBS1mo | -0.01 | 0.03 | -0.03 | 0.61 |
| W\_EPDS1mo -> W\_MIBS4mo | -0.03 |
| W\_EPDS4mo -> W\_MIBS10mo | -0.02 |
| W\_EPDS10mo -> W\_MIBS18mo | -0.02 |
| Regression |
| CES-Dpreg -> W\_MIBS0mo | 0.10 | 0.02 | 0.33 | <.01 |
| CES-Dpreg -> W\_MIBS1mo | 0.37 |
| CES-Dpreg -> W\_MIBS4mo | 0.38 |
| CES-Dpreg -> W\_MIBS10mo | 0.34 |
| CES-Dpreg -> W\_MIBS18mo | 0.35 |
| CES-Dpreg -> W\_EPDS0mo | 0.19 | 0.02 | 0.36 | <.01 |
| CES-Dpreg -> W\_EPDS1mo | 0.37 |
| CES-Dpreg -> W\_EPDS4mo | 0.40 |
| CES-Dpreg -> W\_EPDS10mo | 0.42 |
| CES-Dpreg -> W\_EPDS18mo | 0.42 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, CES-D the Center for epidemiologic studies depression scale, mo month, preg pregnancy, RI random intercept, W within-individual component |

**Table S10:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS with infant negative temperament and control variables

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| Correlation |
| RI\_MIBS <-> RI\_EPDS | 2.25 | 0.39 | 0.61 | <.01 |
| Regression |
| Age -> RI\_MIBS | -0.02 | 0.03 | -0.05 | 0.48 |
| Income -> RI\_MIBS | -0.17 | 0.07 | -0.14 | 0.02 |
| Parity -> RI\_MIBS | -0.12 | 0.25 | -0.03 | 0.62 |
| Infant’s sex -> RI\_MIBS | -0.06 | 0.23 | -0.02 | 0.79 |
| Education -> RI\_MIBS | 0.28 | 0.14 | 0.13 | 0.06 |
| Birth weight -> RI\_MIBS | -0.00 | 0.00 | -0.00 | 0.99 |
| Gestational age -> RI\_MIBS | 0.14 | 0.11 | 0.10 | 0.18 |
| Depression history -> RI\_MIBS | 1.09 | 0.85 | 0.12 | 0.20 |
| Age -> RI\_EPDS | -0.11 | 0.04 | -0.22 | <.01 |
| Income -> RI\_EPDS | -0.09 | 0.11 | -0.06 | 0.40 |
| Parity -> RI\_EPDS | -0.48 | 0.32 | -0.10 | 0.14 |
| Infant’s sex -> RI\_EPDS | -0.43 | 0.30 | -0.09 | 0.15 |
| Education -> RI\_EPDS | -0.26 | 0.21 | -0.09 | 0.22 |
| Birth weight -> RI\_EPDS | 0.00 | 0.00 | 0.08 | 0.24 |
| Gestational age -> RI\_EPDS | -0.14 | 0.15 | -0.07 | 0.35 |
| Depression history -> RI\_EPDS | 2.72 | 0.83 | 0.24 | <.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.61 | 0.26 | 0.25 | <.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.34 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.40 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.36 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.39 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.22 | 0.08 | 0.25 | <.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.22 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.19 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.22 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.21 | 0.06 | 0.22 | <.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.23 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.22 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.22 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.16 | 0.07 | 0.10 | 0.03 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.10 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.10 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.12 |
| W\_EPDS0mo -> W\_MIBS1mo | -0.00 | 0.03 | -0.00 | 0.93 |
| W\_EPDS1mo -> W\_MIBS4mo | -0.00 |
| W\_EPDS4mo -> W\_MIBS10mo | -0.00 |
| W\_EPDS10mo -> W\_MIBS18mo | -0.00 |
| Regression |
| Temperament -> W\_MIBS1mo | 0.24 | 0.08 | 0.18 | <.01 |
| Temperament -> W\_MIBS4mo | 0.33 | 0.14 | 0.13 | 0.04 |
| Temperament -> W\_EPDS1mo | 0.23 | 0.11 | 0.17 | 0.02 |
| Temperament -> W\_EPDS4mo | 0.37 | 0.18 | 0.16 | 0.03 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, mo month, preg pregnancy, RI random intercept, W within-individual component |

**Table S11:** Correlation, auto-regressive and cross-lagged coefficients between MIBS and EPDS without unmarried participants

| Parameter | Unstandardized coefficients | Standard error | Standardized coefficients | p value |
| --- | --- | --- | --- | --- |
| Between-individual level |
| Correlation |
| RI\_MIBS <-> RI\_EPDS | 2.48 | 0.41 | 0.64 | <.01 |
| Regression |
| Age -> RI\_MIBS | -0.02 | 0.03 | -0.04 | 0.55 |
| Income -> RI\_MIBS | -0.17 | 0.07 | -0.13 | 0.02 |
| Parity -> RI\_MIBS | -0.19 | 0.25 | -0.05 | 0.43 |
| Infant’s sex -> RI\_MIBS | -0.08 | 0.23 | -0.02 | 0.73 |
| Education -> RI\_MIBS | 0.30 | 0.15 | 0.13 | 0.05 |
| Birth weight -> RI\_MIBS | -0.00 | 0.00 | -0.00 | 0.95 |
| Gestational age -> RI\_MIBS | 0.15 | 0.11 | 0.09 | 0.19 |
| Depression history -> RI\_MIBS | 1.11 | 0.86 | 0.12 | 0.20 |
| Age -> RI\_EPDS | -0.11 | 0.04 | -0.21 | <.01 |
| Income -> RI\_EPDS | -0.09 | 0.11 | -0.06 | 0.40 |
| Parity -> RI\_EPDS | -0.59 | 0.33 | -0.12 | 0.07 |
| Infant’s sex -> RI\_EPDS | -0.45 | 0.30 | -0.10 | 0.14 |
| Education -> RI\_EPDS | -0.23 | 0.22 | -0.08 | 0.29 |
| Birth weight -> RI\_EPDS | 0.00 | 0.00 | 0.08 | 0.27 |
| Gestational age -> RI\_EPDS | -0.13 | 0.16 | -0.07 | 0.40 |
| Depression history -> RI\_MIBS | 2.78 | 0.86 | 0.24 | <.01 |
| Within-individual level |
| Correlation |
| W\_MIBS0mo <-> W\_EPDS0mo | 1.64 | 0.26 | 0.26 | <.01 |
| W\_MIBS1mo <-> W\_EPDS1mo | 0.34 |
| W\_MIBS4mo <-> W\_EPDS4mo | 0.40 |
| W\_MIBS10mo <-> W\_EPDS10mo | 0.36 |
| W\_MIBS18mo <-> W\_EPDS18mo | 0.40 |
| Auto-regressive effects |
| W\_MIBS0mo -> W\_MIBS1mo | 0.22 | 0.08 | 0.26 | <.01 |
| W\_MIBS1mo -> W\_MIBS4mo | 0.23 |
| W\_MIBS4mo -> W\_MIBS10mo | 0.19 |
| W\_MIBS10mo -> W\_MIBS18mo | 0.22 |
| W\_EPDS0mo -> W\_EPDS1mo | 0.22 | 0.06 | 0.23 | <.01 |
| W\_EPDS1mo -> W\_EPDS4mo | 0.24 |
| W\_EPDS4mo -> W\_EPDS10mo | 0.23 |
| W\_EPDS10mo -> W\_EPDS18mo | 0.23 |
| Cross-lagged effects |
| W\_MIBS0mo -> W\_EPDS1mo | 0.16 | 0.08 | 0.10 | 0.03 |
| W\_MIBS1mo -> W\_EPDS4mo | 0.10 |
| W\_MIBS4mo -> W\_EPDS10mo | 0.10 |
| W\_MIBS10mo -> W\_EPDS18mo | 0.12 |
| W\_EPDS0mo -> W\_MIBS1mo | 0.00 | 0.03 | 0.00 | 0.97 |
| W\_EPDS1mo -> W\_MIBS4mo | 0.00 |
| W\_EPDS4mo -> W\_MIBS10mo | 0.00 |
| W\_EPDS10mo -> W\_MIBS18mo | 0.00 |
| Note: MIBS the Mother-to-infant bonding scale, EPDS the Edinburgh postnatal depression scale, mo month, RI random intercept, W within-individual component |