

# Routinely Randomize Potential Sources of Measurement Reactivity to Estimate and Adjust for Biases in Subjective Reports

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# 1 Additional descriptive statistics

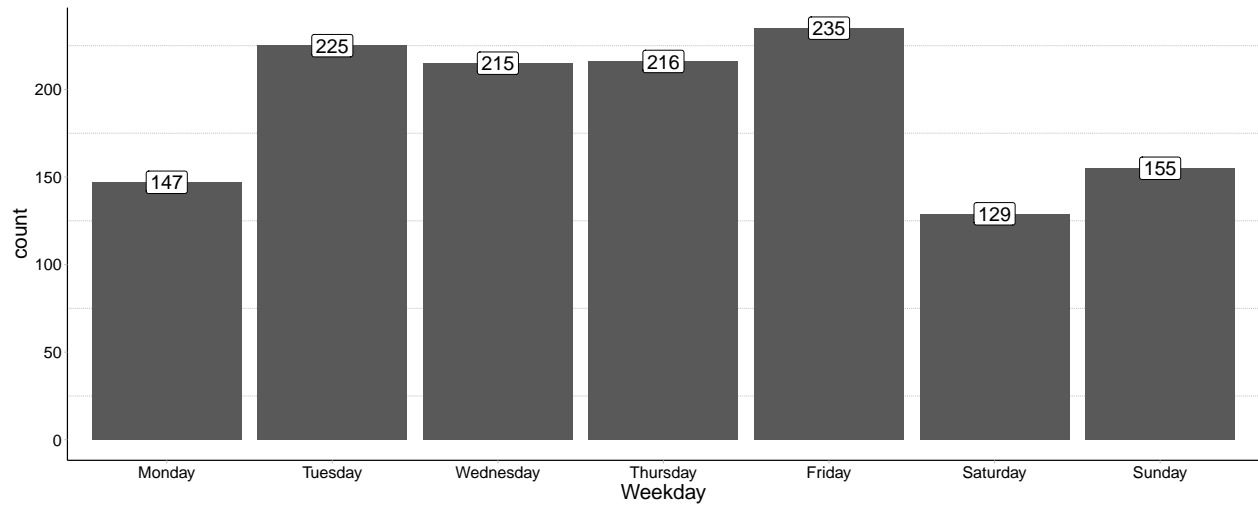


Figure 1: Weekday distribution on diary starting day. We see that women were more likely to start the diary on Tuesday-Friday.

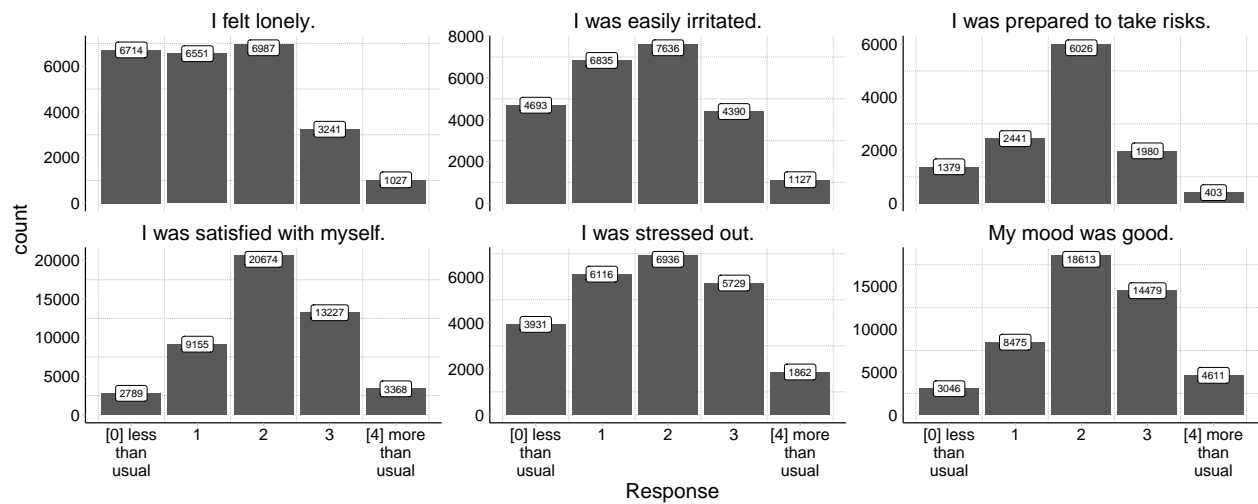


Figure 2: Distributions of items.

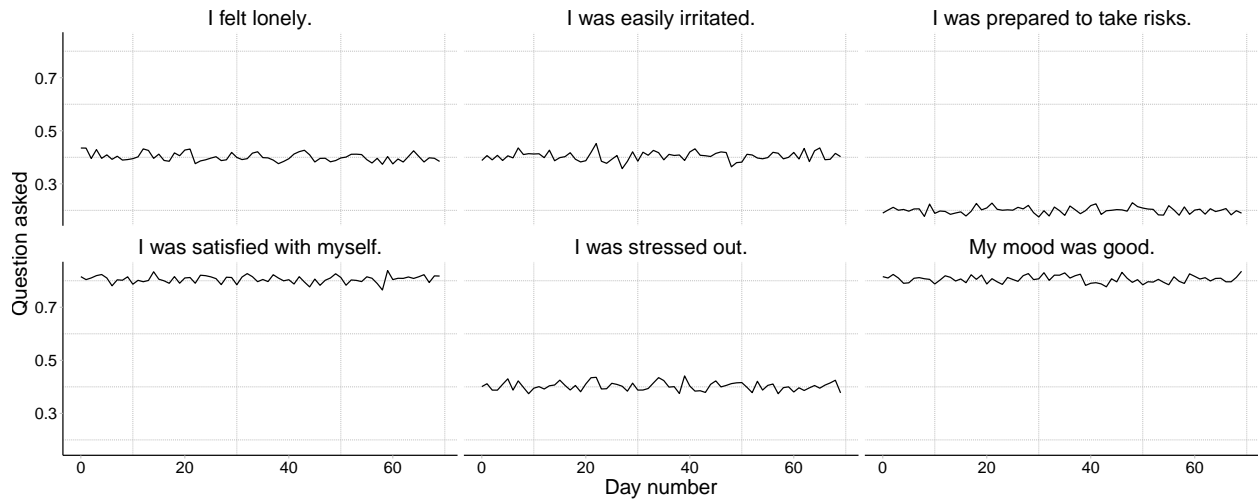


Figure 3: A quick verification that fluctuation in whether a question is asked is as random as intended over time.

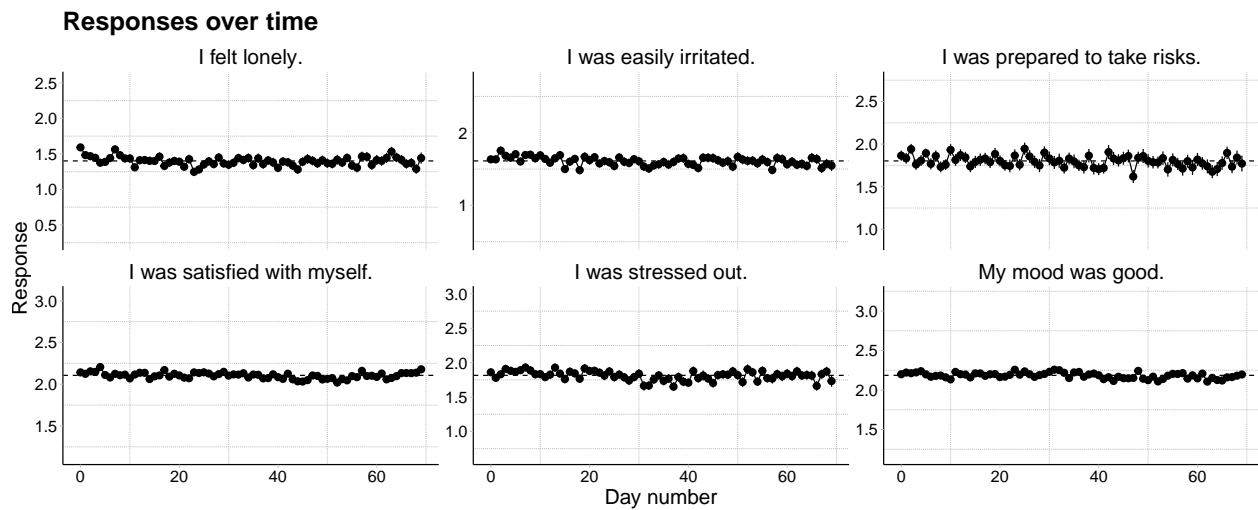


Figure 4: No strong time trends in the responses. The dashed line shows the overall mean. Y axis range is overall mean  $\pm 1$ SD.

## 2 Potential sources of measurement reactivity

### 2.1 Initial elevation bias

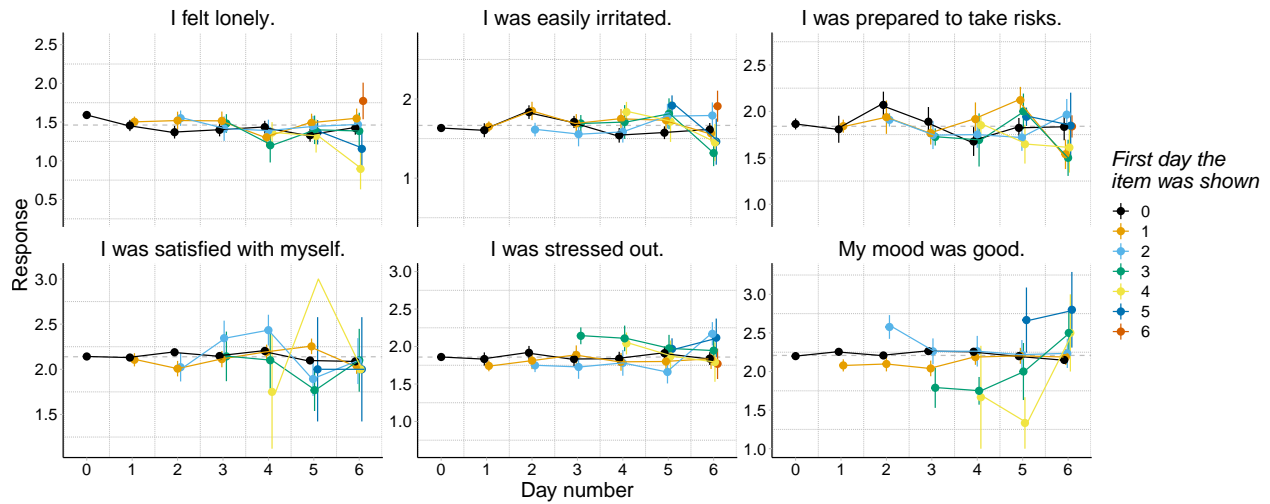


Figure 5: Figure 2, including combinations with fewer than 20 observations.

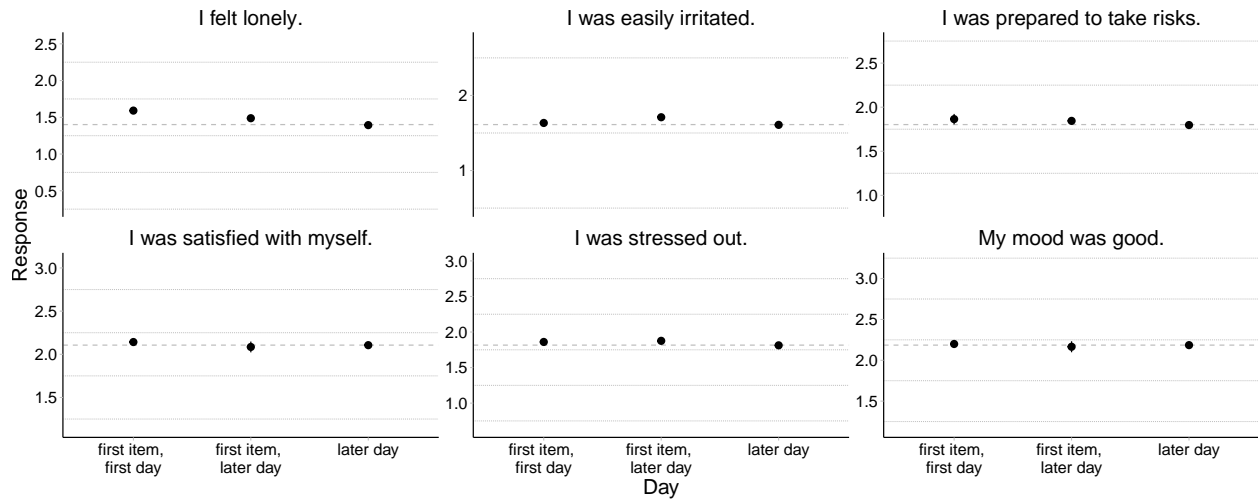


Figure 6: An alternative, more focused visualisation of initial elevation bias. Are responses elevated when shown for the first time, even if it is not the first day of the diary? The dashed line shows the overall mean for the item. Standard errors cannot be seen, because they are so narrow (and ignore the multilevel structure of the data)

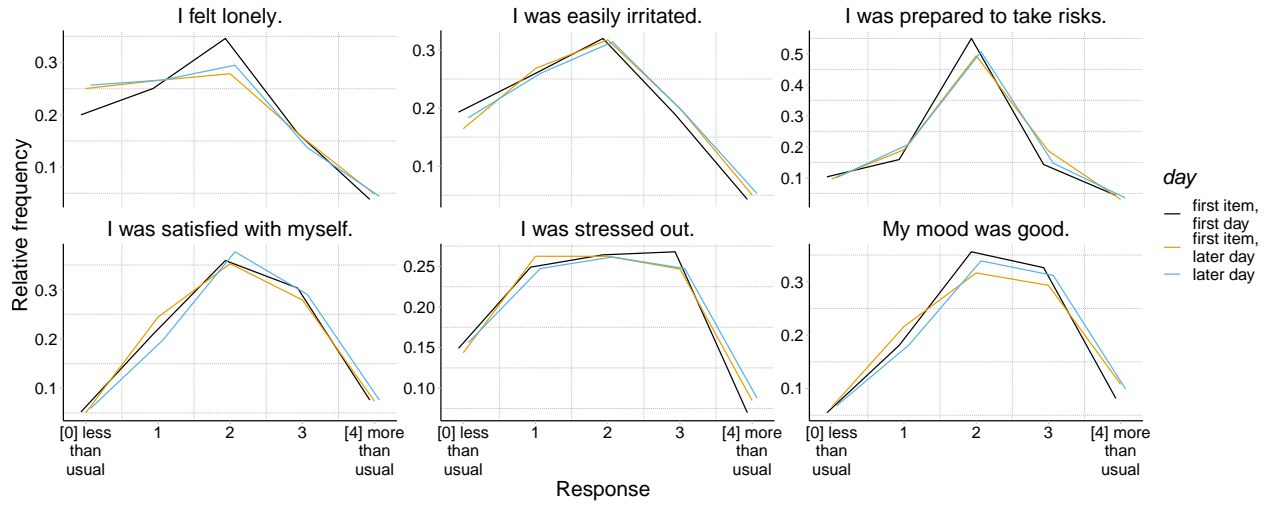


Figure 7: A response bias to a Likert scale may not only affect the mean response, but also the dispersion or the propensity to choose the middle or extreme categories. Such biases would balance out and not show up in the mean response. We therefore compute the relative frequency of certain responses for first days and later days. Days on which the item is first shown have very similar response distributions as later days.

### 2.1.1 Response time

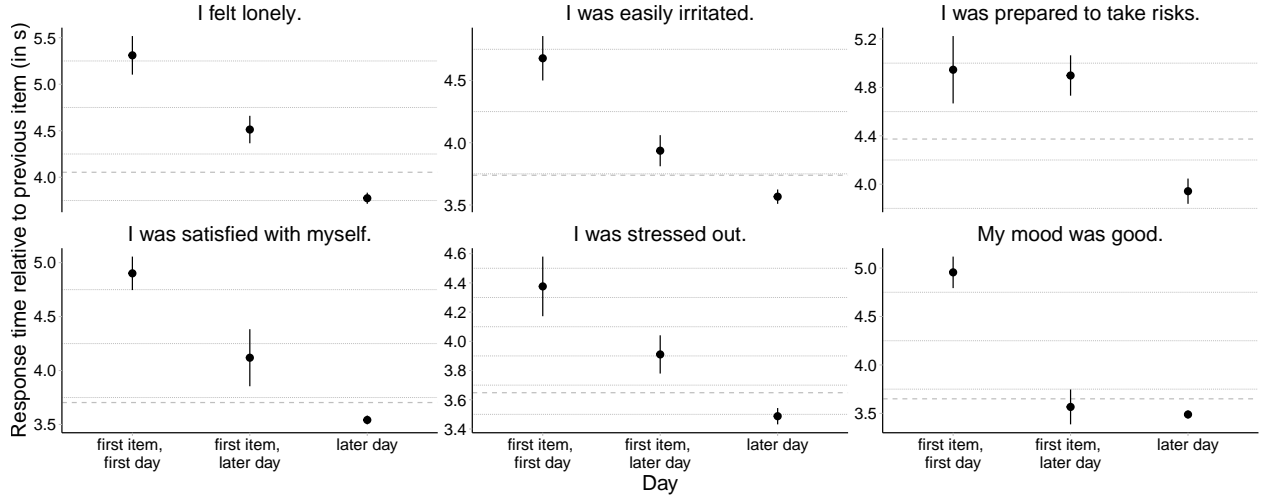


Figure 8: We can additionally examine whether responses slow down when items are first shown. We only examine the response time relative to the answer to the previous item here. This means the first item on each page is excluded from consideration. We do this, because responses relative to the time the page loaded are strongly biased upwards through participants who clicked the link and did something else until the page loaded, or participants who first familiarise themselves with all items. We also excluded responses that were made out of order (negative response times relative to the previous item), and responses that took longer than 30 seconds. Responses to the very first item take almost 8000ms, much longer than responses to later items. The dashed line shows the overall mean for the item. The points show means plus standard errors.

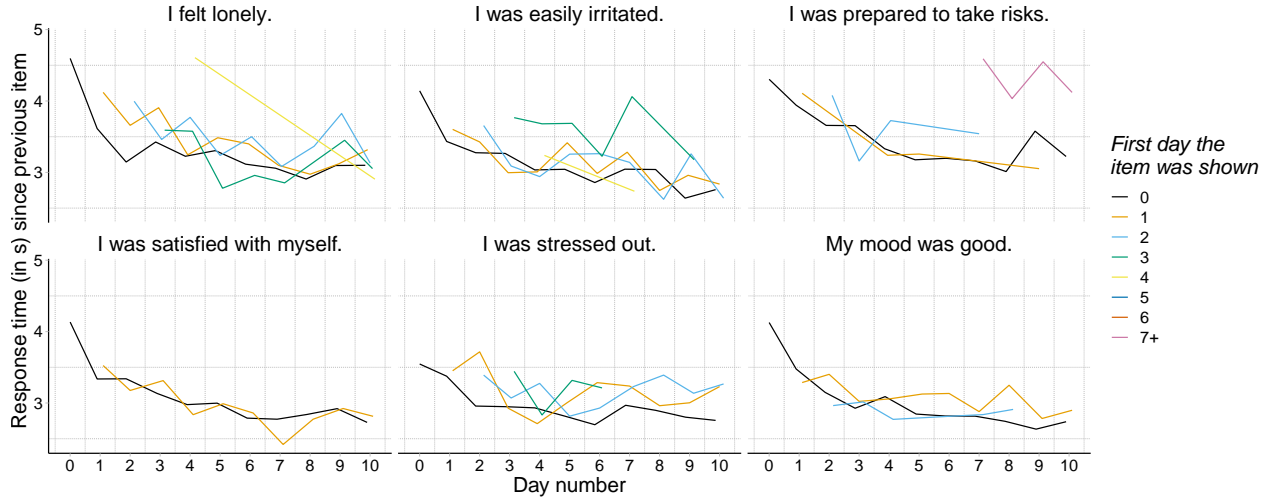


Figure 9: We can also examine response times as in Figure 2, but switching to the time series view somewhat clutters the display. Limited to combinations with at least 20 responses. Lines show 10% trimmed means.

### 2.1.2 Only participants who participated every day in the first week

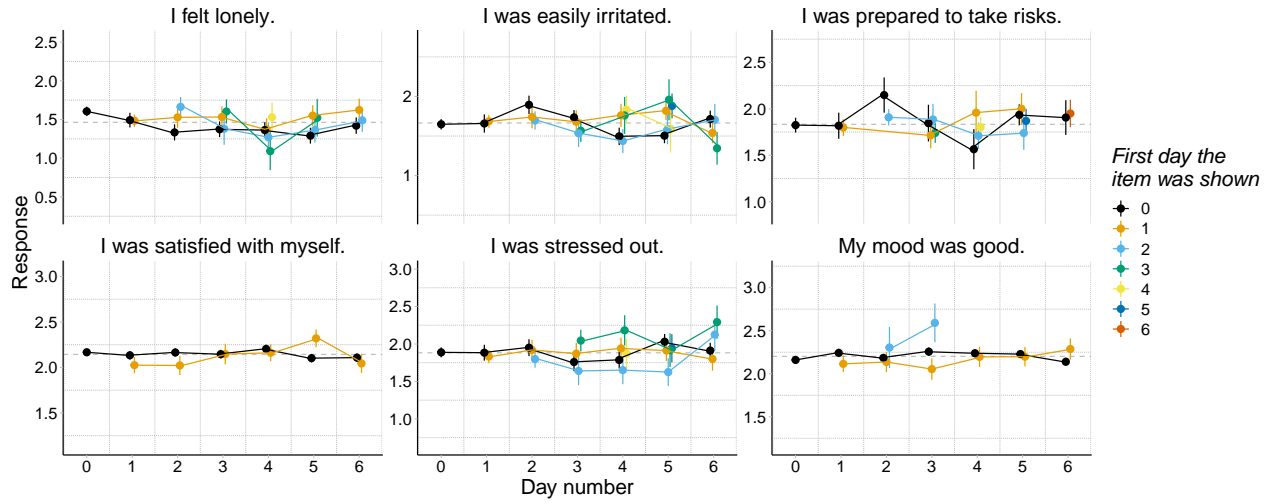


Figure 10: Figure 2, but only with those who didn't miss a day in the first week (ruling out selective dropout as an explanation). Patterns seem unchanged.

## 2.2 Item order

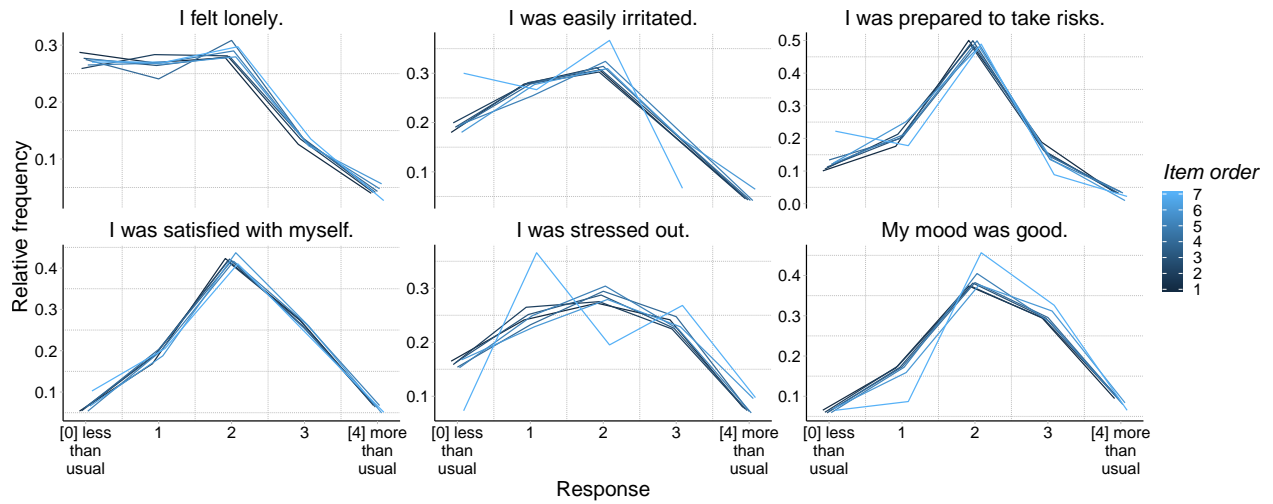


Figure 11: As above, we can not only examine the mean but also the response distribution according to item order.

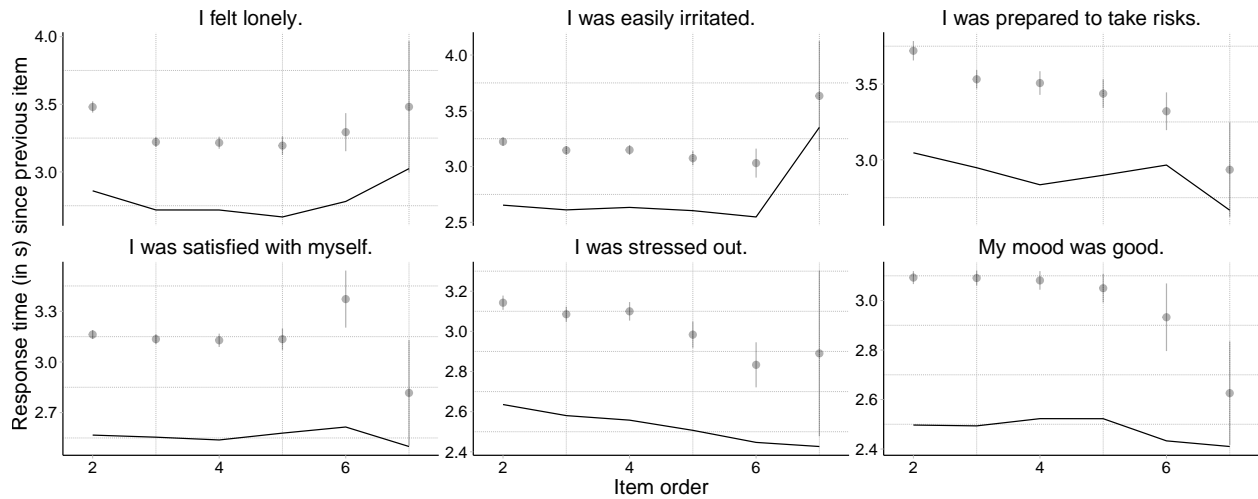


Figure 12: Again, we can also examine the response time to each item according to item order. The line shows the 10% trimmed means, the points show means plus standard errors. We excluded responses that were made out of order (negative response times relative to the previous item), and responses that took longer than 30 seconds.

## 2.3 Number of items shown

As mentioned above, the number of items shown is also a randomised variable. It is in turn confounded with item order, because items shown on a page with more items are likely to have a later item order. Most importantly, when only one item is shown, item order is necessarily 1.

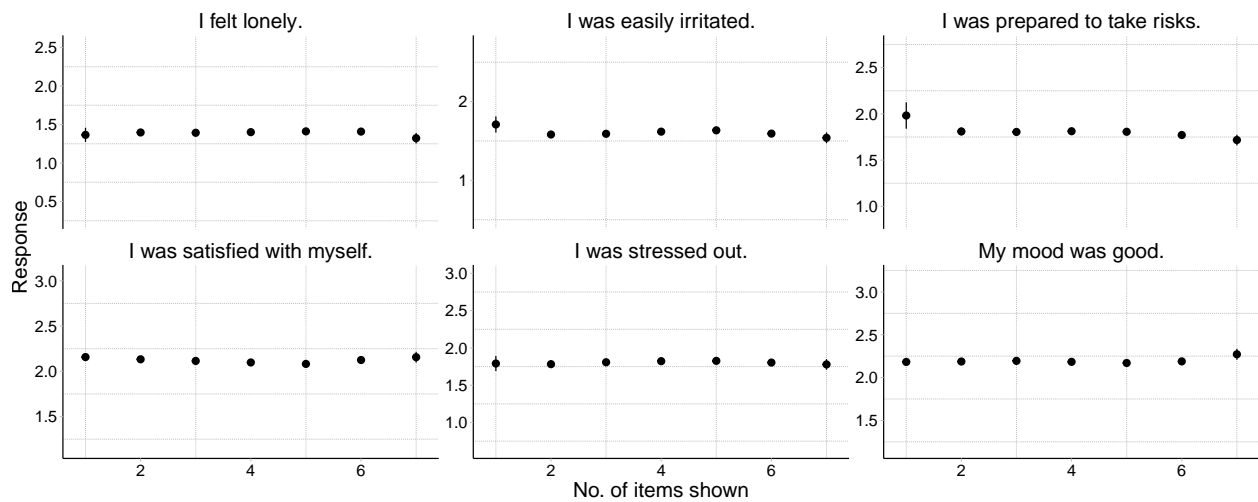


Figure 13: Response means according to the number of items shown. The Y axis scale is displayed from each item's mean  $\pm 1$  SD; values ranged from 0 to 4. The standard errors for the means do not account for the person-level structure of the data.



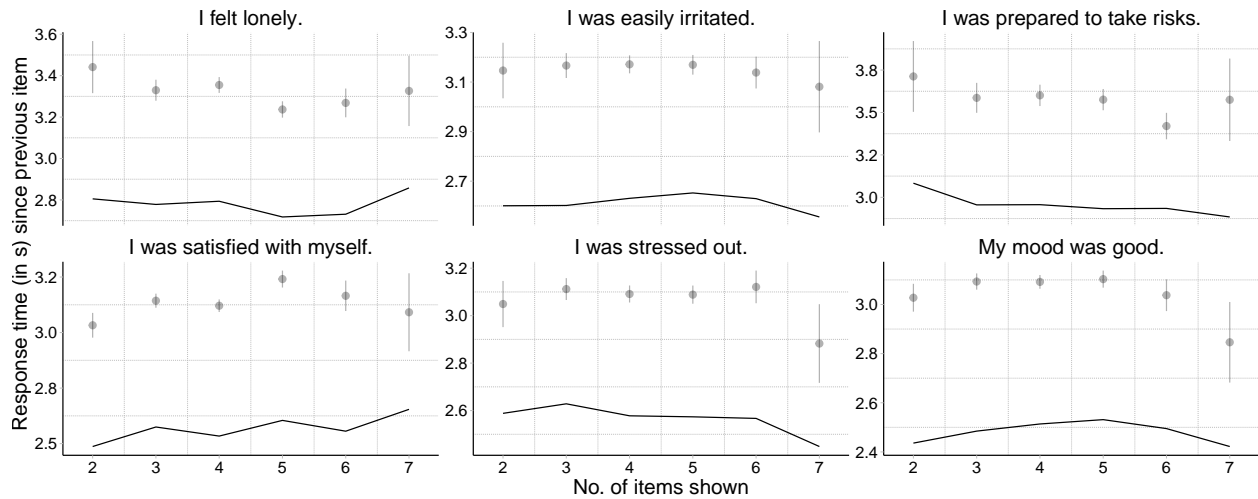


Figure 14: Again, we can also examine the response time to each item according to number of items shown. The line shows the 10% trimmed means, the points show means plus standard errors. We excluded responses that were made out of order (negative response times relative to the previous item), and responses that took longer than 30 seconds.

## 2.4 Last item

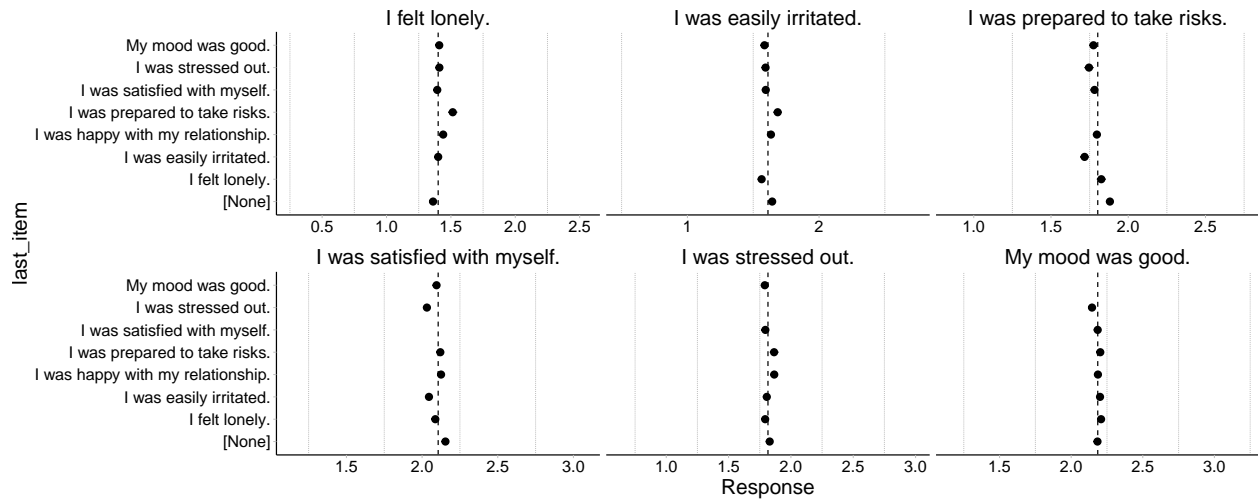


Figure 15: A different way to think about item order is to consider the identity of the immediately preceding item. The Y axis here shows which item (if any) preceded the given item. The X axes include the global mean  $\pm 1$  global standard deviation for each item. Standard errors (not visible) do not account for the multilevel structure of the data.

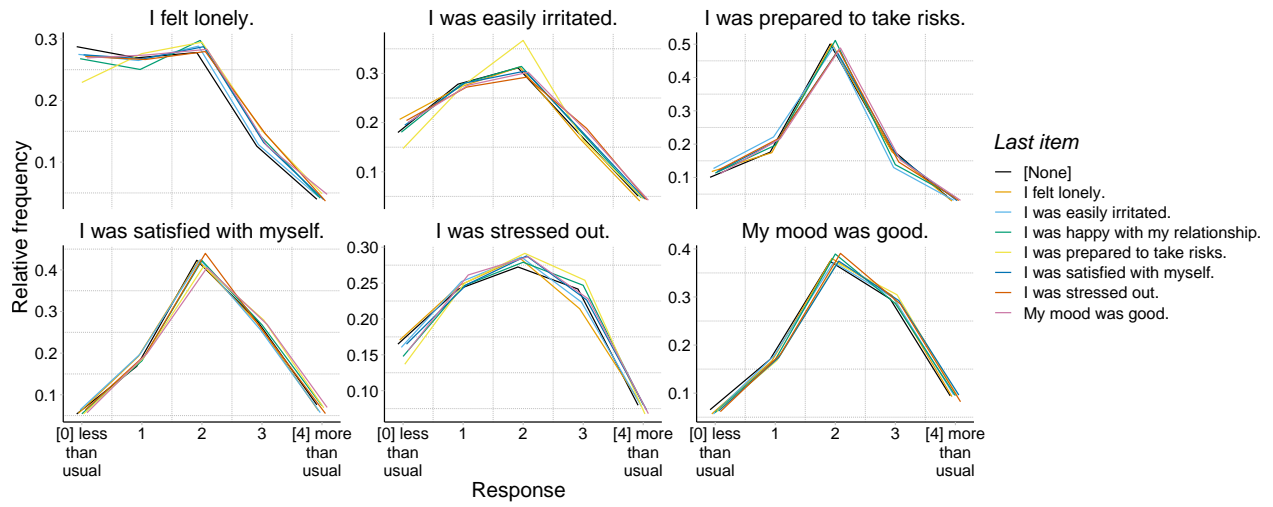


Figure 16: As above, we can not only examine the mean but also the distribution of each response.

### 3 Multilevel analysis

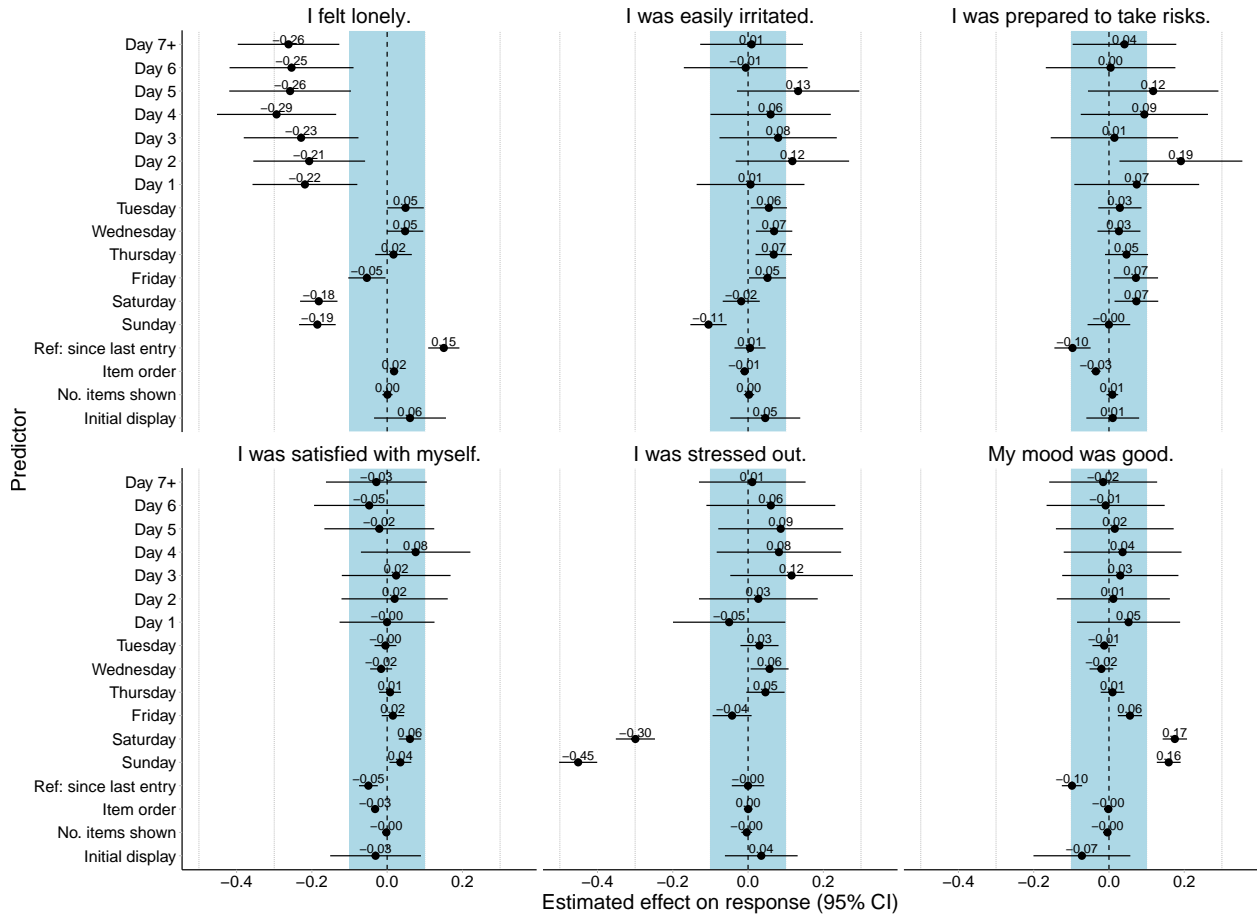


Figure 17: Figure 6 only showed the randomised variables. Here, we additionally show the estimates for the covariates.

Table 1: Residual correlation

| Response variable             | Correlation |
|-------------------------------|-------------|
| I was prepared to take risks. | 0.997       |
| I was satisfied with myself.  | 0.998       |
| I felt lonely.                | 0.999       |
| I was easily irritated.       | 1.000       |
| I was stressed out.           | 1.000       |
| My mood was good.             | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.

Table 2: Multilevel regression coefficients

| term                  | good_mood               | irritable               | loneliness              | risk_taking             | self_esteem             | stressed                |
|-----------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Intercept             | 2.25<br>[2.10;2.39]     | 1.59<br>[1.44;1.74]     | 1.52<br>[1.37;1.67]     | 1.86<br>[1.71;2.02]     | 2.24<br>[2.10;2.38]     | 1.91<br>[1.76;2.07]     |
| Initial display       | -0.07<br>[-0.20;0.06]   | 0.05<br>[-0.05;0.14]    | 0.06<br>[-0.03;0.16]    | 0.01<br>[-0.06;0.08]    | -0.03<br>[-0.15;0.09]   | 0.04<br>[-0.06;0.13]    |
| No. items shown       | -0.00<br>[-0.01;0.00]   | 0.00<br>[-0.01;0.02]    | 0.00<br>[-0.01;0.01]    | 0.01<br>[-0.01;0.02]    | -0.00<br>[-0.01;0.01]   | -0.00<br>[-0.02;0.01]   |
| Item order            | -0.00<br>[-0.01;0.01]   | -0.01<br>[-0.02;0.00]   | 0.02<br>[0.01;0.03]     | -0.03 [-<br>0.05;-0.02] | -0.03 [-<br>0.04;-0.02] | 0.00<br>[-0.01;0.01]    |
| Ref: since last entry | -0.10 [-<br>0.13;-0.07] | 0.01<br>[-0.04;0.05]    | 0.15<br>[0.11;0.19]     | -0.10 [-<br>0.15;-0.05] | -0.05 [-<br>0.07;-0.02] | -0.00<br>[-0.04;0.04]   |
| Sunday                | 0.16<br>[0.13;0.19]     | -0.11 [-<br>0.15;-0.06] | -0.19 [-<br>0.23;-0.14] | -0.00<br>[-0.06;0.06]   | 0.04<br>[0.01;0.06]     | -0.45 [-<br>0.50;-0.40] |
| Saturday              | 0.17<br>[0.14;0.21]     | -0.02<br>[-0.07;0.03]   | -0.18 [-<br>0.23;-0.13] | 0.07<br>[0.01;0.13]     | 0.06<br>[0.03;0.09]     | -0.30 [-<br>0.35;-0.25] |
| Friday                | 0.06<br>[0.02;0.09]     | 0.05<br>[0.00;0.10]     | -0.05 [-<br>0.10;-0.00] | 0.07<br>[0.01;0.13]     | 0.02<br>[-0.01;0.04]    | -0.04<br>[-0.09;0.01]   |
| Thursday              | 0.01<br>[-0.02;0.04]    | 0.07<br>[0.02;0.12]     | 0.02<br>[-0.03;0.07]    | 0.05<br>[-0.01;0.10]    | 0.01<br>[-0.02;0.04]    | 0.05<br>[-0.00;0.10]    |
| Wednesday             | -0.02<br>[-0.05;0.01]   | 0.07<br>[0.02;0.12]     | 0.05<br>[-0.00;0.10]    | 0.03<br>[-0.03;0.08]    | -0.02<br>[-0.05;0.01]   | 0.06<br>[0.01;0.11]     |
| Tuesday               | -0.01<br>[-0.04;0.02]   | 0.06<br>[0.01;0.10]     | 0.05<br>[0.00;0.10]     | 0.03<br>[-0.03;0.09]    | -0.00<br>[-0.03;0.02]   | 0.03<br>[-0.02;0.08]    |
| Day 1                 | 0.05<br>[-0.08;0.19]    | 0.01<br>[-0.14;0.15]    | -0.22 [-<br>0.36;-0.08] | 0.07<br>[-0.09;0.24]    | -0.00<br>[-0.13;0.13]   | -0.05<br>[-0.20;0.10]   |
| Day 2                 | 0.01<br>[-0.14;0.16]    | 0.12<br>[-0.03;0.27]    | -0.21 [-<br>0.36;-0.06] | 0.19<br>[0.03;0.35]     | 0.02<br>[-0.12;0.16]    | 0.03<br>[-0.13;0.19]    |
| Day 3                 | 0.03<br>[-0.12;0.18]    | 0.08<br>[-0.08;0.24]    | -0.23 [-<br>0.38;-0.08] | 0.01<br>[-0.15;0.18]    | 0.02<br>[-0.12;0.17]    | 0.12<br>[-0.05;0.28]    |
| Day 4                 | 0.04<br>[-0.12;0.19]    | 0.06<br>[-0.10;0.22]    | -0.29 [-<br>0.45;-0.14] | 0.09<br>[-0.07;0.26]    | 0.08<br>[-0.07;0.22]    | 0.08<br>[-0.08;0.25]    |
| Day 5                 | 0.02<br>[-0.14;0.17]    | 0.13<br>[-0.03;0.30]    | -0.26 [-<br>0.42;-0.10] | 0.12<br>[-0.06;0.29]    | -0.02<br>[-0.17;0.13]   | 0.09<br>[-0.08;0.25]    |
| Day 6                 | -0.01<br>[-0.17;0.15]   | -0.01<br>[-0.17;0.16]   | -0.25 [-<br>0.42;-0.09] | 0.00<br>[-0.17;0.18]    | -0.05<br>[-0.19;0.10]   | 0.06<br>[-0.11;0.23]    |
| Day 7+                | -0.02<br>[-0.16;0.13]   | 0.01<br>[-0.13;0.15]    | -0.26 [-<br>0.40;-0.13] | 0.04<br>[-0.10;0.18]    | -0.03<br>[-0.16;0.11]   | 0.01<br>[-0.13;0.15]    |
| sd (Intercept)        | 0.35                    | 0.41                    | 0.47                    | 0.42                    | 0.39                    | 0.42                    |
| sd Observation        | 0.96                    | 1.04                    | 1.03                    | 0.85                    | 0.89                    | 1.09                    |

*Note:*

Estimates from the multilevel regression model displayed in Figure 6, with 95% confidence intervals.

### 3.1 Robustness checks

Here, we examine several alternative model specifications to see whether the results are robust to additional constraints or relaxed assumptions.

#### 3.1.1 Complete first week

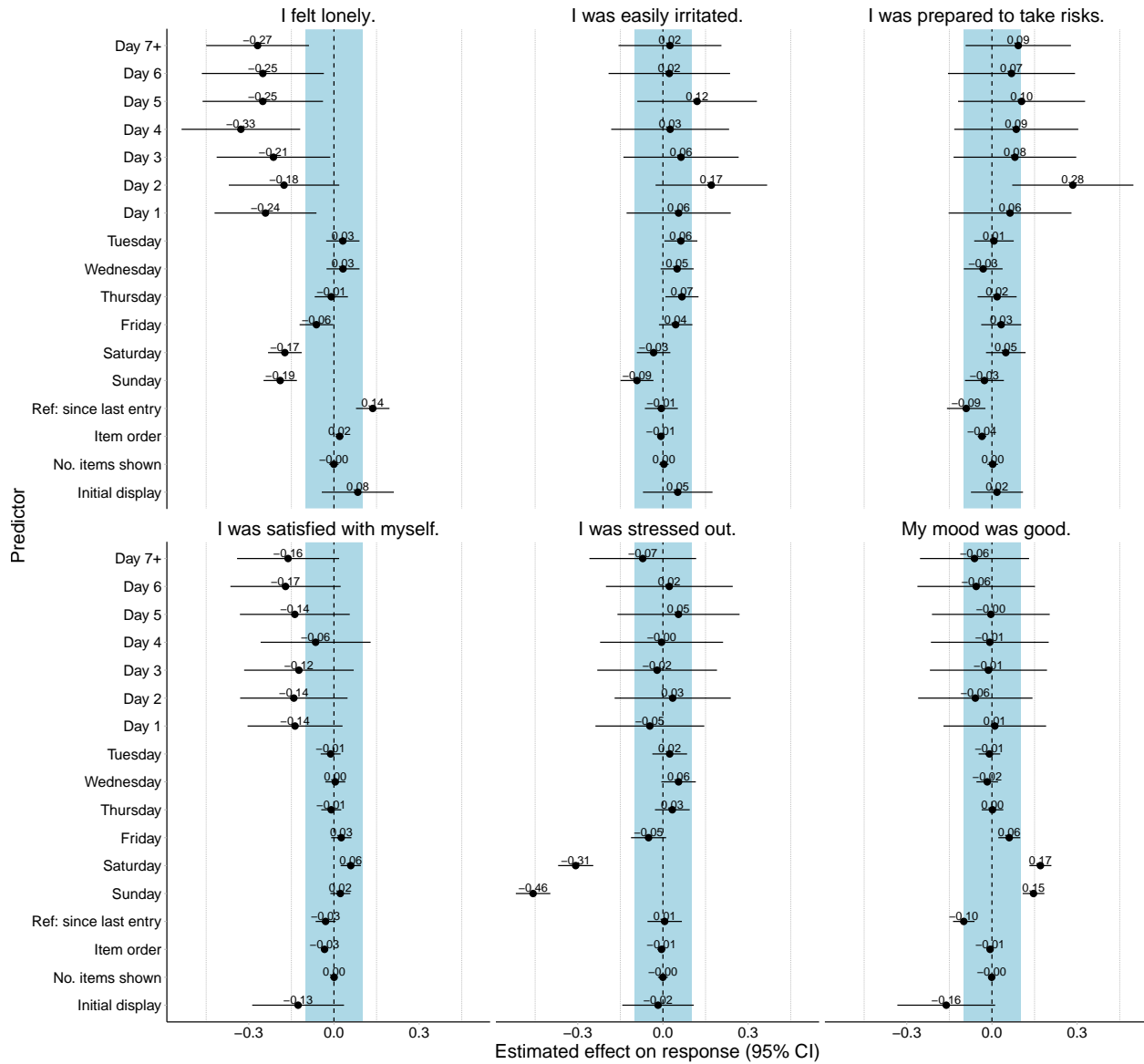


Figure 18: Here, we fit the same model as before, but include only participants who participated the entire first week.

Table 3: Residual correlation

| Response variable             | Correlation |
|-------------------------------|-------------|
| I was prepared to take risks. | 0.997       |
| I was satisfied with myself.  | 0.998       |
| I felt lonely.                | 0.999       |
| I was easily irritated.       | 1.000       |
| I was stressed out.           | 1.000       |
| My mood was good.             | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.

### 3.1.2 Last item identity

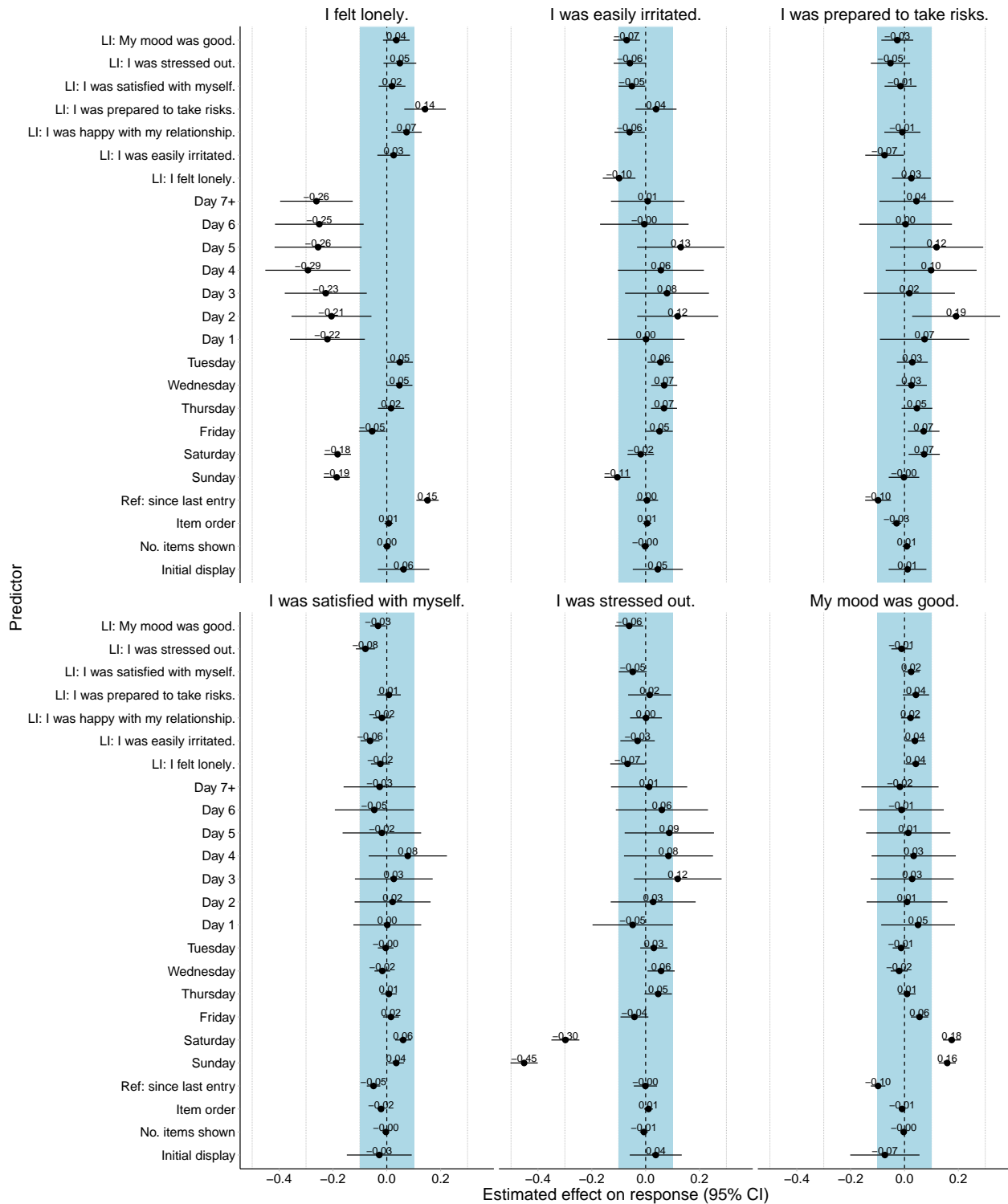


Figure 19: Here, we additionally test for an effect of last item identity (which is heavily collinear with item order).

Table 4: Residual correlation

| Response variable             | Correlation |
|-------------------------------|-------------|
| I was prepared to take risks. | 0.996       |
| I was satisfied with myself.  | 0.997       |
| I felt lonely.                | 0.999       |
| I was easily irritated.       | 0.999       |
| I was stressed out.           | 0.999       |
| My mood was good.             | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables (including last item identity).



Table 5: Model comparison

| response                      | df | AIC    | logLik | statistic | Chi.Df | p.value |
|-------------------------------|----|--------|--------|-----------|--------|---------|
| I felt lonely.                | 8  | 73401  | -36692 | NA        | NA     | NA      |
| I felt lonely.                | 14 | 73395  | -36684 | 17        | 6      | 0.01    |
| I was easily irritated.       | 8  | 73574  | -36779 | NA        | NA     | NA      |
| I was easily irritated.       | 14 | 73566  | -36769 | 20        | 6      | 0.00    |
| I was prepared to take risks. | 8  | 32215  | -16100 | NA        | NA     | NA      |
| I was prepared to take risks. | 14 | 32218  | -16095 | 9         | 6      | 0.17    |
| I was satisfied with myself.  | 8  | 130788 | -65386 | NA        | NA     | NA      |
| I was satisfied with myself.  | 14 | 130769 | -65370 | 32        | 6      | 0.00    |
| I was stressed out.           | 8  | 76136  | -38060 | NA        | NA     | NA      |
| I was stressed out.           | 14 | 76135  | -38053 | 13        | 6      | 0.04    |
| My mood was good.             | 8  | 138564 | -69274 | NA        | NA     | NA      |
| My mood was good.             | 14 | 138564 | -69268 | 12        | 6      | 0.06    |

*Note:*

Do models additionally accounting for last item identity fit better? We test this separately because item order 1 and last item "[None]" are identical, and estimates become less precise because of similar, less severe multicollinearity.

### 3.1.3 Varying effects

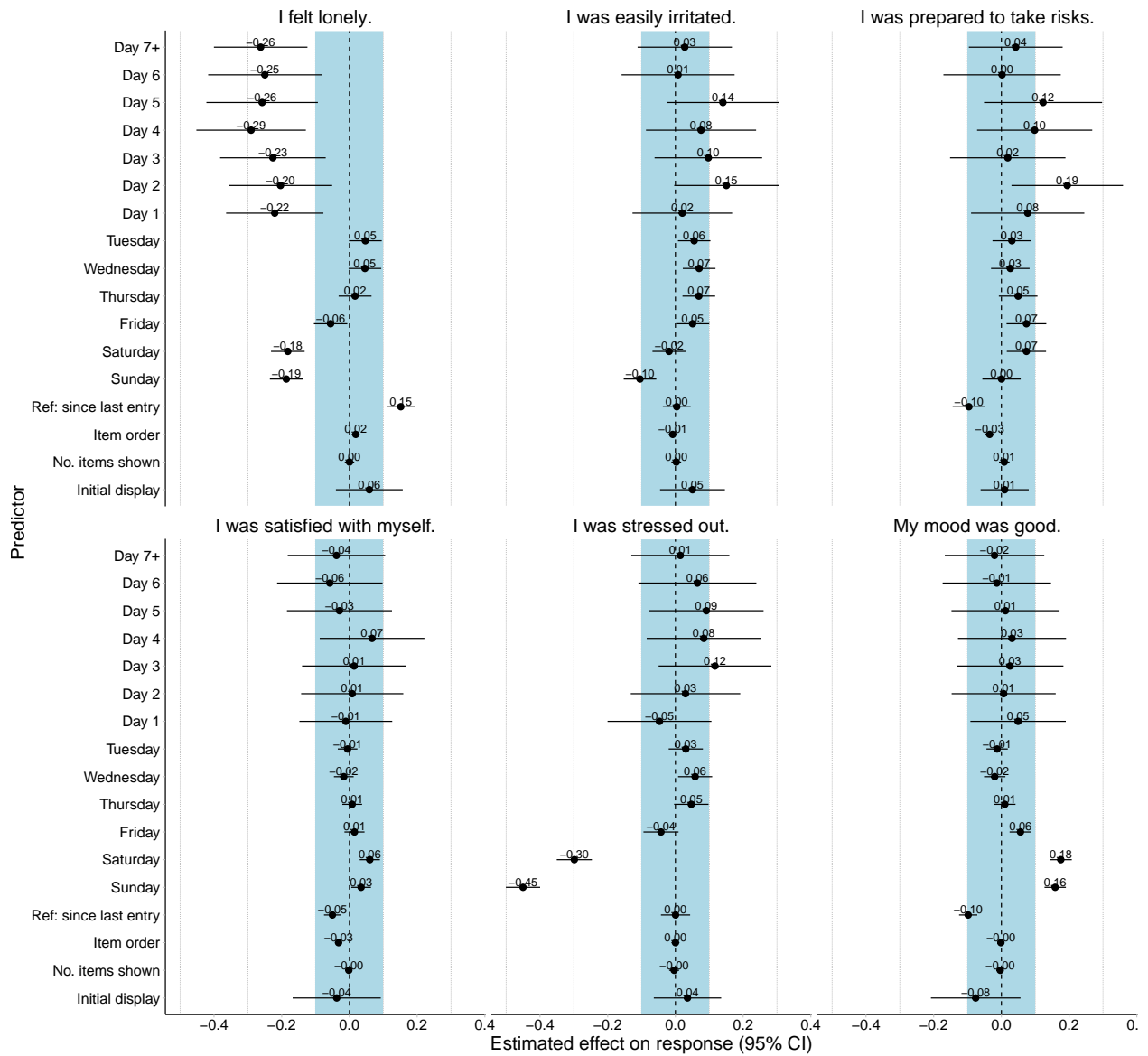


Figure 20: Here, we allow the effect of the randomised variables to vary by woman.

Table 6: Residual correlation

| Response variable             | Correlation |
|-------------------------------|-------------|
| I was prepared to take risks. | 0.995       |
| I was satisfied with myself.  | 0.996       |
| I felt lonely.                | 0.997       |
| I was easily irritated.       | 0.997       |
| I was stressed out.           | 0.998       |
| My mood was good.             | 0.999       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.

Table 7: Multilevel regression coefficients

| term                                  | good_mood               | irritable               | loneliness              | risk_taking             | self_esteem             | stressed                |
|---------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Intercept                             | 2.25<br>[2.10;2.40]     | 1.57<br>[1.42;1.72]     | 1.52<br>[1.37;1.67]     | 1.86<br>[1.71;2.02]     | 2.25<br>[2.10;2.40]     | 1.91<br>[1.75;2.07]     |
| Initial display                       | -0.08<br>[-0.21;0.06]   | 0.05<br>[-0.05;0.15]    | 0.06<br>[-0.04;0.16]    | 0.01<br>[-0.06;0.08]    | -0.04<br>[-0.17;0.09]   | 0.04<br>[-0.06;0.14]    |
| No. items<br>shown                    | -0.00<br>[-0.01;0.01]   | 0.00<br>[-0.01;0.02]    | 0.00<br>[-0.01;0.01]    | 0.01<br>[-0.01;0.02]    | -0.00<br>[-0.01;0.01]   | -0.00<br>[-0.02;0.01]   |
| Item order                            | -0.00<br>[-0.01;0.01]   | -0.01<br>[-0.02;0.00]   | 0.02<br>[0.01;0.03]     | -0.03 [-<br>0.05;-0.02] | -0.03 [-<br>0.04;-0.02] | 0.00<br>[-0.01;0.01]    |
| Ref: since last<br>entry              | -0.10 [-<br>0.13;-0.07] | 0.00<br>[-0.04;0.05]    | 0.15<br>[0.11;0.19]     | -0.10 [-<br>0.14;-0.05] | -0.05 [-<br>0.08;-0.03] | 0.00<br>[-0.04;0.04]    |
| Sunday                                | 0.16<br>[0.13;0.19]     | -0.10 [-<br>0.15;-0.06] | -0.19 [-<br>0.24;-0.14] | 0.00<br>[-0.06;0.06]    | 0.03<br>[0.01;0.06]     | -0.45 [-<br>0.50;-0.40] |
| Saturday                              | 0.18<br>[0.14;0.21]     | -0.02<br>[-0.07;0.03]   | -0.18 [-<br>0.23;-0.13] | 0.07<br>[0.02;0.13]     | 0.06<br>[0.03;0.09]     | -0.30 [-<br>0.35;-0.25] |
| Friday                                | 0.06<br>[0.02;0.09]     | 0.05<br>[0.00;0.10]     | -0.06 [-<br>0.11;-0.01] | 0.07<br>[0.02;0.13]     | 0.01<br>[-0.01;0.04]    | -0.04<br>[-0.09;0.01]   |
| Thursday                              | 0.01<br>[-0.02;0.04]    | 0.07<br>[0.02;0.12]     | 0.02<br>[-0.03;0.07]    | 0.05<br>[-0.01;0.11]    | 0.01<br>[-0.02;0.04]    | 0.05<br>[-0.00;0.10]    |
| Wednesday                             | -0.02<br>[-0.05;0.01]   | 0.07<br>[0.02;0.12]     | 0.05<br>[-0.00;0.09]    | 0.03<br>[-0.03;0.08]    | -0.02<br>[-0.05;0.01]   | 0.06<br>[0.01;0.11]     |
| Tuesday                               | -0.01<br>[-0.04;0.02]   | 0.06<br>[0.01;0.10]     | 0.05<br>[-0.00;0.10]    | 0.03<br>[-0.03;0.09]    | -0.01<br>[-0.03;0.02]   | 0.03<br>[-0.02;0.08]    |
| cor (Intercept)<br>Initial display    | -0.46                   | -0.31                   | -0.46                   | -0.13                   | -0.44                   | -0.58                   |
| cor (Intercept)<br>Item order         | 0.06                    | -0.41                   | 0.13                    | -0.18                   | -0.20                   | 0.20                    |
| cor (Intercept)<br>No. items<br>shown | -0.51                   | -0.65                   | -0.25                   | -1.00                   | -0.62                   | -0.50                   |
| cor Item order<br>Initial display     | -0.20                   | -0.59                   | -0.09                   | -0.64                   | 0.08                    | 0.45                    |

|   |                       |                      |                         |                      |                       |                       |
|---|-----------------------|----------------------|-------------------------|----------------------|-----------------------|-----------------------|
| cor No. items<br>shown Initial<br>display | 0.38                  | 0.13                 | 0.14                    | 0.13                 | 0.36                  | 0.31                  |
| cor No. items<br>shown Item<br>order      | -0.89                 | 0.42                 | -0.99                   | 0.18                 | 0.88                  | -0.47                 |
| Day 1                                     | 0.05<br>[-0.09;0.19]  | 0.02<br>[-0.13;0.17] | -0.22 [-<br>0.36;-0.08] | 0.08<br>[-0.09;0.24] | -0.01<br>[-0.15;0.13] | -0.05<br>[-0.20;0.11] |
| Day 2                                     | 0.01<br>[-0.15;0.16]  | 0.15<br>[-0.00;0.30] | -0.20 [-<br>0.36;-0.05] | 0.19<br>[0.03;0.36]  | 0.01<br>[-0.14;0.16]  | 0.03<br>[-0.13;0.19]  |
| Day 3                                     | 0.03<br>[-0.13;0.18]  | 0.10<br>[-0.06;0.26] | -0.23 [-<br>0.38;-0.07] | 0.02<br>[-0.15;0.19] | 0.01<br>[-0.14;0.17]  | 0.12<br>[-0.05;0.28]  |
| Day 4                                     | 0.03<br>[-0.13;0.19]  | 0.08<br>[-0.09;0.24] | -0.29 [-<br>0.45;-0.13] | 0.10<br>[-0.07;0.27] | 0.07<br>[-0.09;0.22]  | 0.08<br>[-0.08;0.25]  |
| Day 5                                     | 0.01<br>[-0.15;0.17]  | 0.14<br>[-0.02;0.31] | -0.26 [-<br>0.42;-0.09] | 0.12<br>[-0.05;0.30] | -0.03<br>[-0.18;0.13] | 0.09<br>[-0.08;0.26]  |
| Day 6                                     | -0.01<br>[-0.17;0.15] | 0.01<br>[-0.16;0.17] | -0.25 [-<br>0.42;-0.08] | 0.00<br>[-0.17;0.18] | -0.06<br>[-0.21;0.10] | 0.06<br>[-0.11;0.24]  |
| Day 7+                                    | -0.02<br>[-0.17;0.13] | 0.03<br>[-0.11;0.17] | -0.26 [-<br>0.40;-0.12] | 0.04<br>[-0.10;0.18] | -0.04<br>[-0.18;0.11] | 0.01<br>[-0.13;0.16]  |
| sd (Intercept)                            | 0.38                  | 0.57                 | 0.51                    | 0.50                 | 0.43                  | 0.48                  |
| sd Initial<br>display                     | 0.33                  | 0.39                 | 0.41                    | 0.23                 | 0.47                  | 0.40                  |
| sd Item order                             | 0.04                  | 0.04                 | 0.07                    | 0.06                 | 0.03                  | 0.03                  |
| sd No. items<br>shown                     | 0.02                  | 0.07                 | 0.05                    | 0.02                 | 0.02                  | 0.05                  |
| sd Observation                            | 0.96                  | 1.03                 | 1.03                    | 0.84                 | 0.89                  | 1.08                  |

*Note:*

Estimates from the multilevel regression model with varying slopes. With 95% confidence intervals.

### 3.1.4 Nonlinear effects

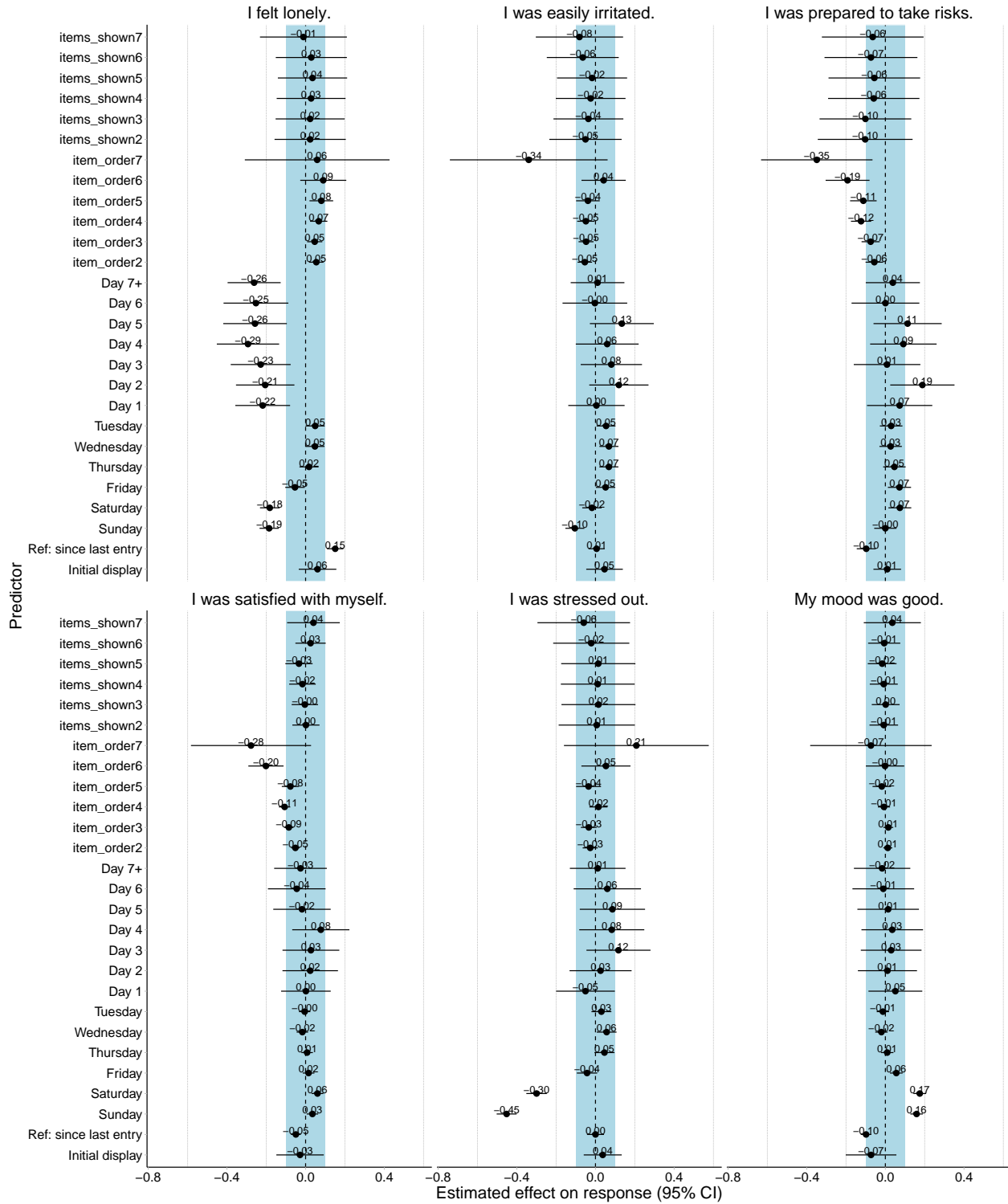


Figure 21: Here, we allow the effects of the randomised variables to be nonlinear.

Table 8: Residual correlation

| Response variable             | Correlation |
|-------------------------------|-------------|
| I was prepared to take risks. | 0.997       |
| I was satisfied with myself.  | 0.997       |
| I felt lonely.                | 0.999       |
| I was easily irritated.       | 0.999       |
| I was stressed out.           | 1.000       |
| My mood was good.             | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.

## 4 Other items

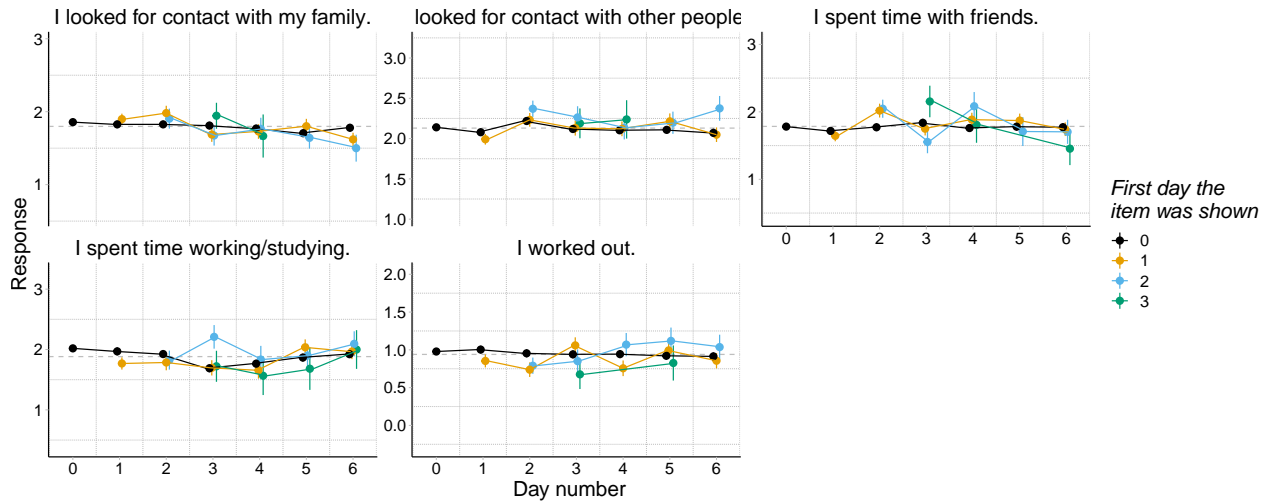
We focused on the most general items on the first page of our study. However, the diary also contained randomised (in order and odds of appearing) items about sexual desire, time use, and partner jealousy, among others. We show that the overall results (that residualising for estimated biases has negligible effects) holds here too, even though the partner jealousy items were asked on a response scale from “not at all” to “very much”, the desire items on a scale of “very inaccurate” to “very accurate”, and the time use items on the same “less than usual” to “more than usual” scale as the items on the first page.

### 4.1 Time items

On a “less than usual” to “more than usual” response scale.

Table 9: How often did how many women see each item?

| item_name     | label_english                           | women | days  |
|---------------|---|-------|-------|
| time_family   | I looked for contact with my family.    | 1330  | 42952 |
| time_friends  | I spent time with friends.              | 1335  | 43119 |
| time_people   | I looked for contact with other people. | 1333  | 43042 |
| time_sports   | I worked out.                           | 1339  | 42850 |
| time_work_uni | I spent time working/studying.          | 1332  | 42785 |



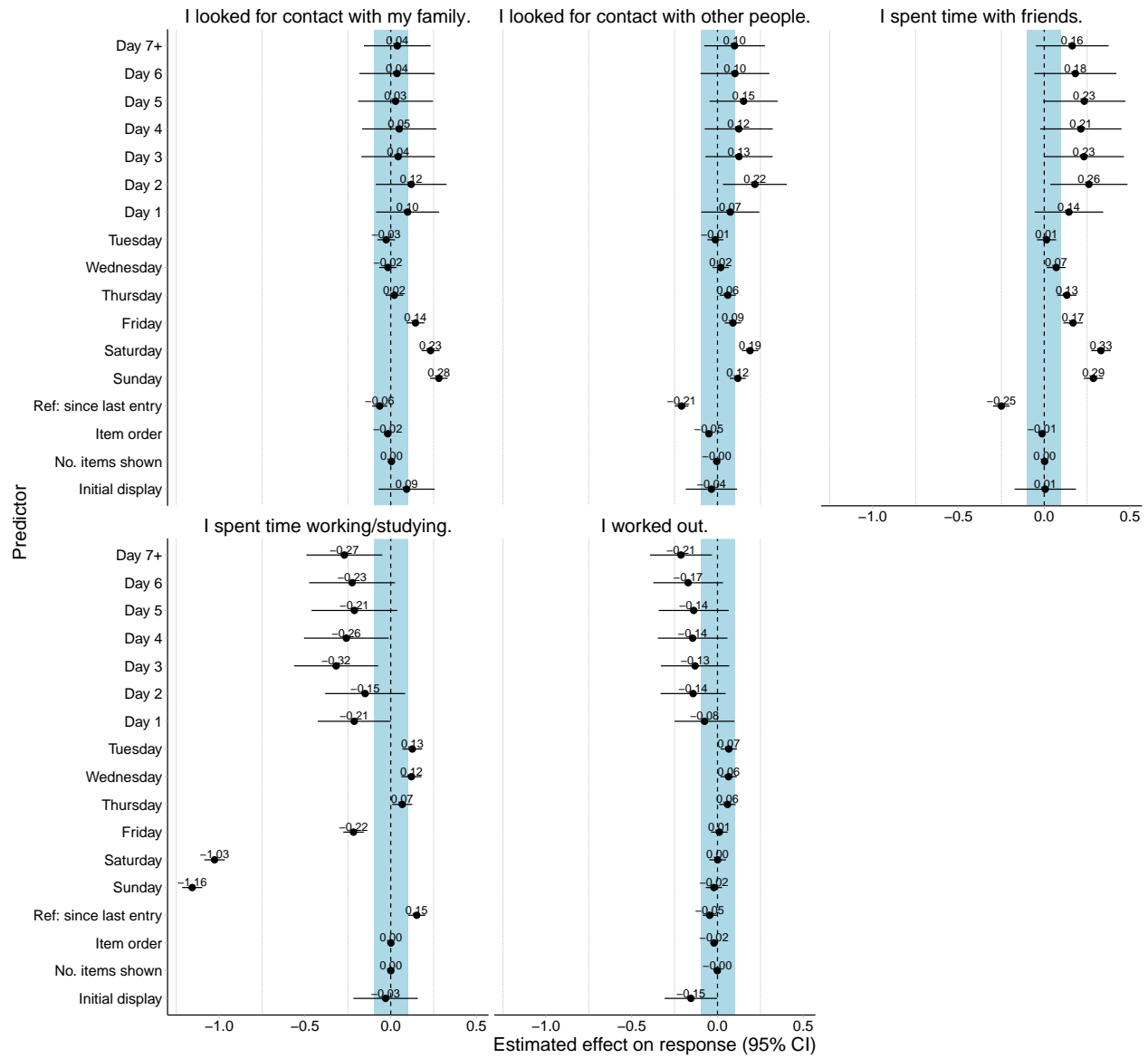


Figure 22: Estimates for biases and covariates for the time items.



Table 10: Residual correlation

| Response variable                       | Correlation |
|---|-------------|
| I looked for contact with other people. | 0.996       |
| I worked out.                           | 0.999       |
| I looked for contact with my family.    | 1.000       |
| I spent time with friends.              | 1.000       |
| I spent time working/studying.          | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.

Table 11: Multilevel regression coefficients

| term                  | time_family            | time_friends           | time_people            | time_sports            | time_work_uni          |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Intercept             | 1.71<br>[1.51;1.92]    | 1.67<br>[1.45;1.90]    | 2.26<br>[2.07;2.44]    | 1.15<br>[0.95;1.34]    | 2.25<br>[2.02;2.49]    |
| Initial display       | 0.09<br>[-0.07;0.26]   | 0.01<br>[-0.17;0.18]   | -0.04<br>[-0.18;0.11]  | -0.15<br>[-0.31;-0.00] | -0.03<br>[-0.22;0.16]  |
| No. items shown       | 0.00<br>[-0.01;0.02]   | 0.00<br>[-0.02;0.02]   | -0.00<br>[-0.02;0.01]  | -0.00<br>[-0.02;0.01]  | 0.00<br>[-0.02;0.02]   |
| Item order            | -0.02<br>[-0.03;-0.00] | -0.01<br>[-0.03;0.00]  | -0.05<br>[-0.06;-0.04] | -0.02<br>[-0.03;-0.01] | 0.00<br>[-0.01;0.02]   |
| Ref: since last entry | -0.06<br>[-0.11;-0.02] | -0.25<br>[-0.30;-0.20] | -0.21<br>[-0.25;-0.17] | -0.05<br>[-0.09;-0.00] | 0.15<br>[0.10;0.20]    |
| Sunday                | 0.28<br>[0.23;0.33]    | 0.29<br>[0.23;0.34]    | 0.12<br>[0.07;0.17]    | -0.02<br>[-0.07;0.03]  | -1.16<br>[-1.22;-1.10] |
| Saturday              | 0.23<br>[0.18;0.28]    | 0.33<br>[0.27;0.39]    | 0.19<br>[0.14;0.24]    | 0.00<br>[-0.05;0.05]   | -1.03<br>[-1.09;-0.97] |
| Friday                | 0.14<br>[0.09;0.20]    | 0.17<br>[0.11;0.22]    | 0.09<br>[0.04;0.14]    | 0.01<br>[-0.04;0.06]   | -0.22<br>[-0.28;-0.16] |
| Thursday              | 0.02<br>[-0.03;0.07]   | 0.13<br>[0.08;0.19]    | 0.06<br>[0.01;0.11]    | 0.06<br>[0.01;0.11]    | 0.07<br>[0.01;0.13]    |
| Wednesday             | -0.02<br>[-0.07;0.04]  | 0.07<br>[0.01;0.13]    | 0.02<br>[-0.03;0.07]   | 0.06<br>[0.02;0.11]    | 0.12<br>[0.06;0.18]    |
| Tuesday               | -0.03<br>[-0.08;0.02]  | 0.01<br>[-0.04;0.07]   | -0.01<br>[-0.06;0.03]  | 0.07<br>[0.02;0.11]    | 0.13<br>[0.07;0.18]    |
| Day 1                 | 0.10<br>[-0.09;0.28]   | 0.14<br>[-0.06;0.34]   | 0.07<br>[-0.09;0.24]   | -0.08<br>[-0.25;0.10]  | -0.21<br>[-0.43;0.00]  |
| Day 2                 | 0.12<br>[-0.09;0.33]   | 0.26<br>[0.04;0.49]    | 0.22<br>[0.03;0.40]    | -0.14<br>[-0.33;0.05]  | -0.15<br>[-0.38;0.08]  |
| Day 3                 | 0.04<br>[-0.17;0.26]   | 0.23<br>[-0.00;0.46]   | 0.13<br>[-0.07;0.32]   | -0.13<br>[-0.33;0.07]  | -0.32<br>[-0.56;-0.07] |
| Day 4                 | 0.05<br>[-0.17;0.27]   | 0.21<br>[-0.02;0.45]   | 0.12<br>[-0.07;0.32]   | -0.14<br>[-0.35;0.06]  | -0.26<br>[-0.51;-0.01] |
| Day 5                 | 0.03<br>[-0.19;0.25]   | 0.23<br>[-0.01;0.47]   | 0.15<br>[-0.05;0.35]   | -0.14<br>[-0.34;0.07]  | -0.21<br>[-0.46;0.04]  |

|                |                      |                      |                      |                        |                        |
|----------------|----------------------|----------------------|----------------------|------------------------|------------------------|
| Day 6          | 0.04<br>[-0.18;0.26] | 0.18<br>[-0.06;0.42] | 0.10<br>[-0.10;0.30] | -0.17<br>[-0.37;0.03]  | -0.23<br>[-0.48;0.03]  |
| Day 7+         | 0.04<br>[-0.16;0.23] | 0.16<br>[-0.05;0.38] | 0.10<br>[-0.08;0.28] | -0.21<br>[-0.39;-0.03] | -0.27<br>[-0.49;-0.05] |
| sd (Intercept) | 0.45                 | 0.47                 | 0.40                 | 0.57                   | 0.54                   |
| sd Observation | 1.11                 | 1.21                 | 1.02                 | 1.03                   | 1.26                   |

*Note:*

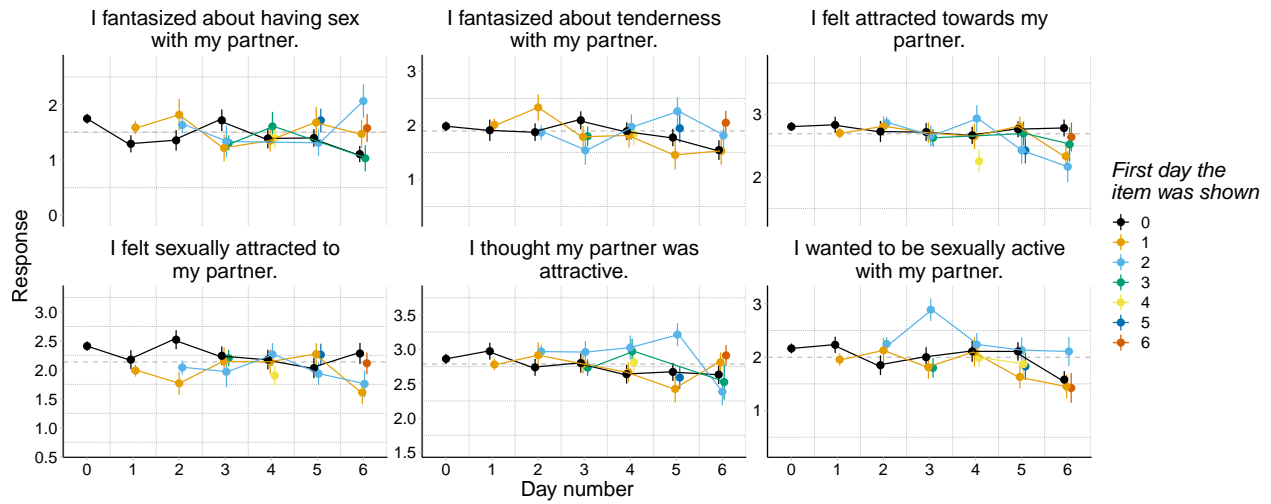
Estimates from the multilevel regression model, with 95% confidence intervals.

## 4.2 Desire items

On a “very inaccurate” to “very accurate” response scale.

Table 12: How often did how many women see each item?

| label_english                                   | women | days  |
|---|-------|-------|
| I fantasized about having sex with my partner.  | 864   | 12076 |
| I fantasized about tenderness with my partner.  | 862   | 12134 |
| I felt attracted towards my partner.            | 862   | 12174 |
| I felt sexually attracted to my partner.        | 861   | 12205 |
| I thought my partner was attractive.            | 868   | 12297 |
| I wanted to be sexually active with my partner. | 861   | 12119 |



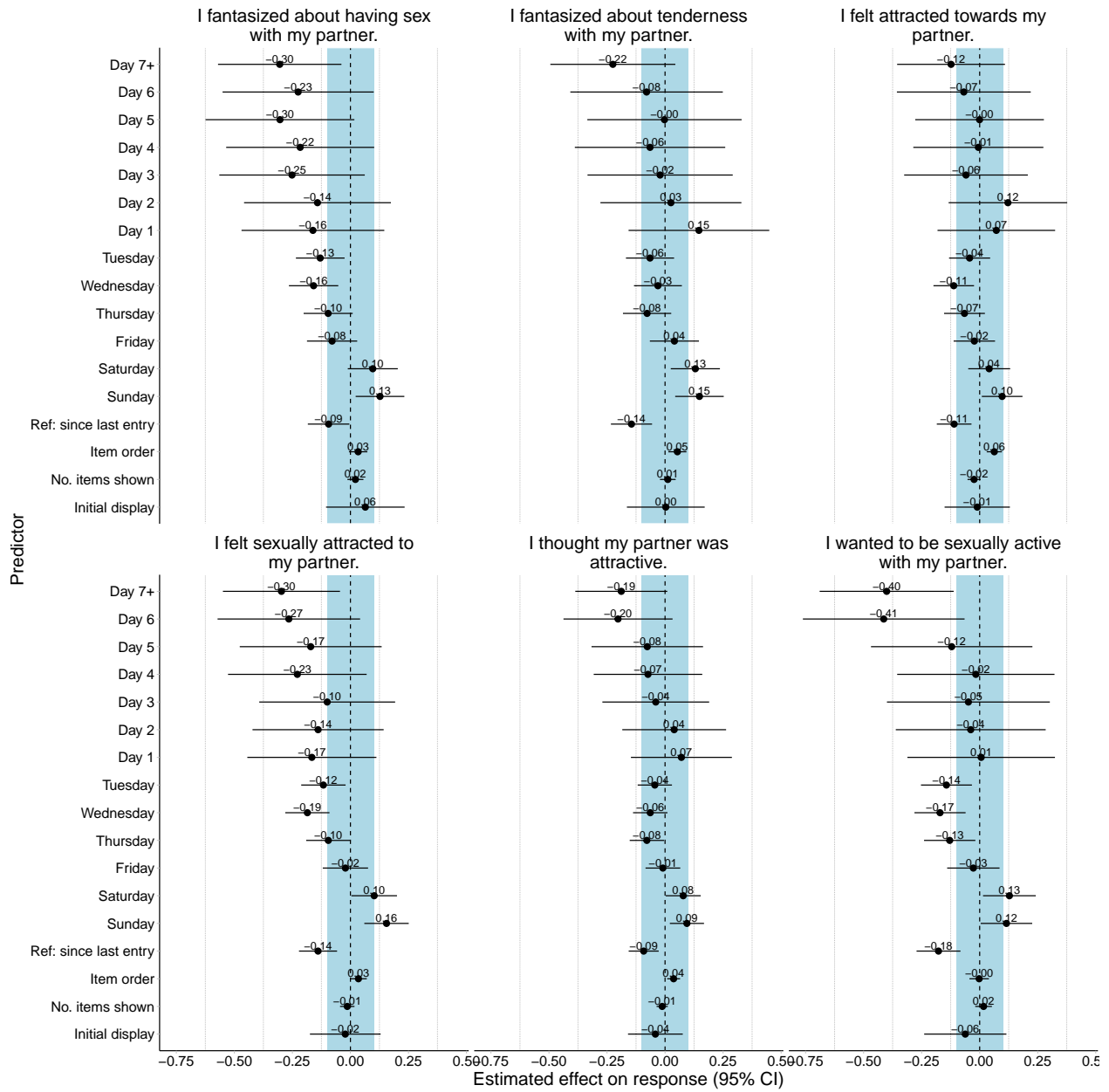


Figure 23: Estimates for biases and covariates for the desire items.

Table 13: Residual correlation

| Response variable                               | Correlation |
|---|-------------|
| I fantasized about having sex with my partner.  | 0.998       |
| I fantasized about tenderness with my partner.  | 0.998       |
| I felt attracted towards my partner.            | 0.998       |
| I felt sexually attracted to my partner.        | 0.999       |
| I thought my partner was attractive.            | 0.999       |
| I wanted to be sexually active with my partner. | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.

Table 14: Multilevel regression coefficients

| term                     | desire_10              | desire_11              | desire_13              | desire_14              | desire_7               | desire_8               |
|--------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Intercept                | 2.37<br>[2.10;2.64]    | 2.25<br>[1.94;2.55]    | 1.88<br>[1.60;2.17]    | 1.64<br>[1.36;1.93]    | 2.75<br>[2.50;2.99]    | 2.91<br>[2.70;3.13]    |
| Initial display          | -0.02<br>[-0.17;0.13]  | -0.06<br>[-0.24;0.12]  | 0.00<br>[-0.16;0.17]   | 0.06<br>[-0.11;0.23]   | -0.01<br>[-0.15;0.13]  | -0.04<br>[-0.16;0.08]  |
| No. items<br>shown       | -0.01<br>[-0.04;0.02]  | 0.02<br>[-0.02;0.05]   | 0.01<br>[-0.02;0.05]   | 0.02<br>[-0.01;0.06]   | -0.02<br>[-0.05;0.00]  | -0.01<br>[-0.04;0.01]  |
| Item order               | 0.03<br>[-0.00;0.07]   | -0.00<br>[-0.04;0.04]  | 0.05<br>[0.01;0.09]    | 0.03<br>[-0.01;0.07]   | 0.06<br>[0.03;0.10]    | 0.04<br>[0.01;0.06]    |
| Ref: since last<br>entry | -0.14<br>[-0.22;-0.06] | -0.18<br>[-0.27;-0.08] | -0.14<br>[-0.23;-0.06] | -0.09<br>[-0.18;-0.00] | -0.11<br>[-0.18;-0.04] | -0.09<br>[-0.16;-0.03] |
| Sunday                   | 0.16<br>[0.06;0.25]    | 0.12<br>[0.00;0.23]    | 0.15<br>[0.04;0.25]    | 0.13<br>[0.02;0.23]    | 0.10<br>[0.01;0.18]    | 0.09<br>[0.02;0.17]    |
| Saturday                 | 0.10<br>[0.00;0.20]    | 0.13<br>[0.01;0.24]    | 0.13<br>[0.02;0.24]    | 0.10<br>[-0.01;0.20]   | 0.04<br>[-0.05;0.13]   | 0.08<br>[0.00;0.15]    |
| Friday                   | -0.02<br>[-0.12;0.08]  | -0.03<br>[-0.14;0.09]  | 0.04<br>[-0.07;0.15]   | -0.08<br>[-0.19;0.03]  | -0.02<br>[-0.11;0.07]  | -0.01<br>[-0.08;0.07]  |
| Thursday                 | -0.10<br>[-0.19;0.00]  | -0.13<br>[-0.24;-0.02] | -0.08<br>[-0.18;0.03]  | -0.10<br>[-0.20;0.01]  | -0.07<br>[-0.15;0.02]  | -0.08<br>[-0.15;-0.00] |
| Wednesday                | -0.19<br>[-0.28;-0.09] | -0.17<br>[-0.28;-0.06] | -0.03<br>[-0.13;0.07]  | -0.16<br>[-0.26;-0.05] | -0.11<br>[-0.20;-0.02] | -0.06<br>[-0.14;0.01]  |
| Tuesday                  | -0.12<br>[-0.21;-0.02] | -0.14<br>[-0.25;-0.03] | -0.06<br>[-0.17;0.04]  | -0.13<br>[-0.23;-0.03] | -0.04<br>[-0.13;0.05]  | -0.04<br>[-0.12;0.03]  |
| Day 1                    | -0.17<br>[-0.44;0.11]  | 0.01<br>[-0.31;0.32]   | 0.15<br>[-0.16;0.45]   | -0.16<br>[-0.47;0.15]  | 0.07<br>[-0.18;0.33]   | 0.07<br>[-0.15;0.29]   |
| Day 2                    | -0.14<br>[-0.42;0.14]  | -0.04<br>[-0.36;0.28]  | 0.03<br>[-0.28;0.33]   | -0.14<br>[-0.46;0.17]  | 0.12<br>[-0.13;0.38]   | 0.04<br>[-0.18;0.26]   |
| Day 3                    | -0.10<br>[-0.39;0.19]  | -0.05<br>[-0.40;0.30]  | -0.02<br>[-0.33;0.29]  | -0.25<br>[-0.56;0.06]  | -0.06<br>[-0.33;0.21]  | -0.04<br>[-0.27;0.19]  |
| Day 4                    | -0.23<br>[-0.53;0.07]  | -0.02<br>[-0.36;0.32]  | -0.06<br>[-0.39;0.26]  | -0.22<br>[-0.54;0.10]  | -0.01<br>[-0.29;0.27]  | -0.07<br>[-0.31;0.16]  |
| Day 5                    | -0.17<br>[-0.48;0.13]  | -0.12<br>[-0.47;0.23]  | -0.00<br>[-0.33;0.33]  | -0.30<br>[-0.62;0.02]  | -0.00<br>[-0.28;0.28]  | -0.08<br>[-0.32;0.16]  |
| Day 6                    | -0.27<br>[-0.57;0.04]  | -0.41<br>[-0.76;-0.07] | -0.08<br>[-0.41;0.25]  | -0.23<br>[-0.55;0.10]  | -0.07<br>[-0.36;0.22]  | -0.20<br>[-0.44;0.03]  |
| Day 7+                   | -0.30<br>[-0.55;-0.04] | -0.40<br>[-0.69;-0.11] | -0.22<br>[-0.49;0.04]  | -0.30<br>[-0.57;-0.04] | -0.12<br>[-0.36;0.11]  | -0.19<br>[-0.39;0.01]  |
| sd (Intercept)           | 0.79                   | 0.74                   | 0.83                   | 0.74                   | 0.74                   | 0.74                   |
| sd Observation           | 1.08                   | 1.25                   | 1.18                   | 1.20                   | 0.99                   | 0.84                   |

*Note:*

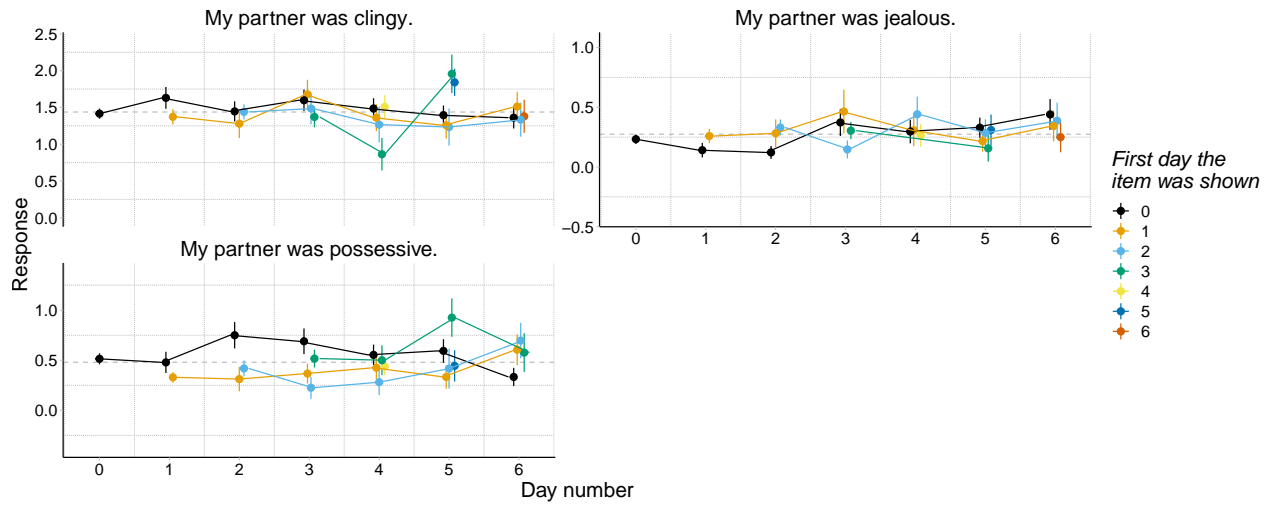
Estimates from the multilevel regression model, with 95% confidence intervals.

### 4.3 Retention items

On a “not at all” to “very much” response scale.

Table 15: How often did how many women see each item?

| item_name       | label_english              | women | days  |
|-----------------|----------------------------|-------|-------|
| mate_retention1 | My partner was clingy.     | 866   | 12376 |
| mate_retention2 | My partner was jealous.    | 863   | 12200 |
| mate_retention3 | My partner was possessive. | 860   | 12174 |



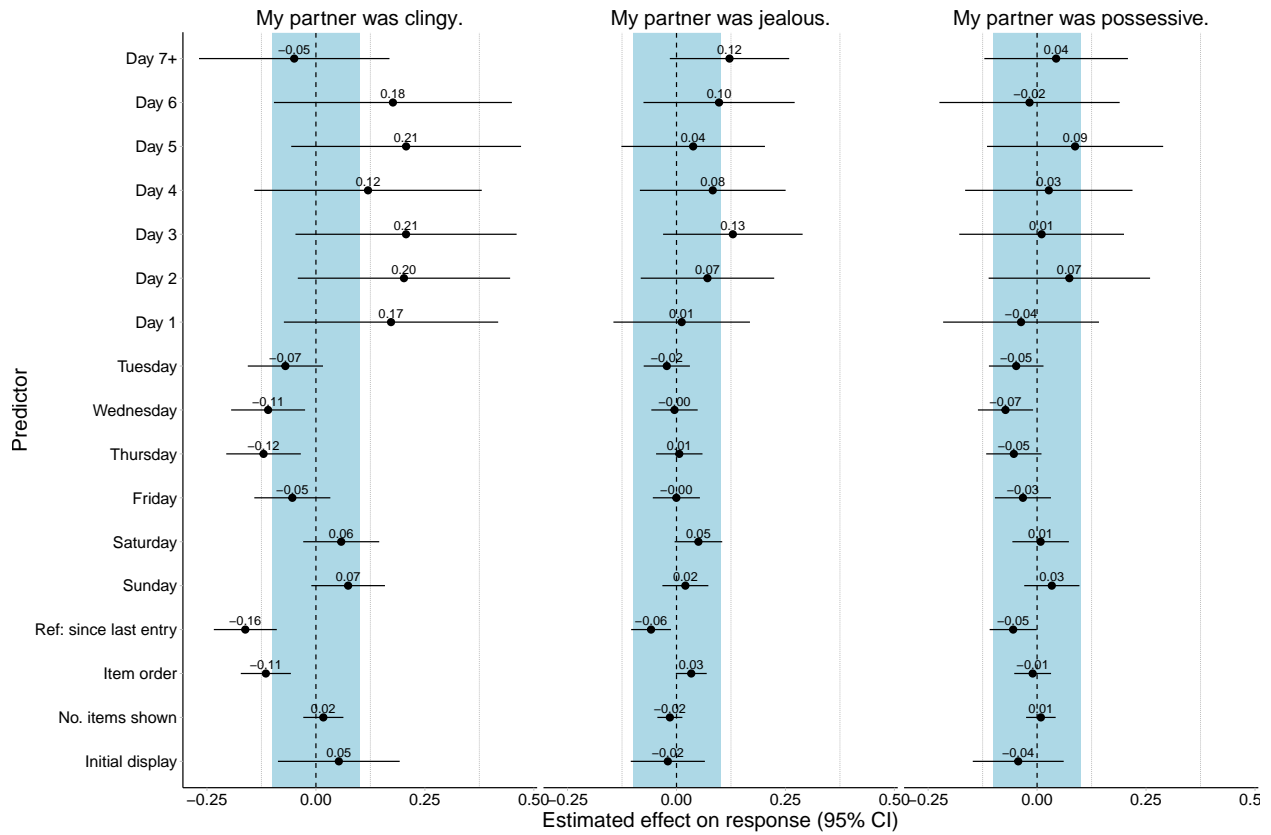


Figure 24: Estimates for biases and covariates for the mate retention items.

Table 16: Residual correlation

| Response variable          | Correlation |
|----------------------------|-------------|
| My partner was clingy.     | 0.997       |
| My partner was jealous.    | 0.999       |
| My partner was possessive. | 1.000       |

*Note:*

Correlation between the residuals of a covariate-only model and a model additionally including the randomised variables.



Table 17: Multilevel regression coefficients

| term                     | mate_retention1        | mate_retention2        | mate_retention3        |
|--------------------------|------------------------|------------------------|------------------------|
| Intercept                | 1.51 [1.28;1.75]       | 0.24 [0.09;0.38]       | 0.55 [0.37;0.73]       |
| Initial display          | 0.05 [-0.09;0.19]      | -0.02<br>[-0.10;0.07]  | -0.04<br>[-0.15;0.06]  |
| No. items<br>shown       | 0.02 [-0.03;0.06]      | -0.02<br>[-0.04;0.01]  | 0.01 [-0.03;0.04]      |
| Item order               | -0.11<br>[-0.17;-0.06] | 0.03 [-0.00;0.07]      | -0.01<br>[-0.05;0.03]  |
| Ref: since last<br>entry | -0.16<br>[-0.23;-0.09] | -0.06<br>[-0.10;-0.01] | -0.05<br>[-0.11;-0.00] |
| Sunday                   | 0.07 [-0.01;0.16]      | 0.02 [-0.03;0.07]      | 0.03 [-0.03;0.10]      |
| Saturday                 | 0.06 [-0.03;0.15]      | 0.05 [-0.00;0.10]      | 0.01 [-0.06;0.07]      |
| Friday                   | -0.05<br>[-0.14;0.03]  | -0.00<br>[-0.05;0.05]  | -0.03<br>[-0.10;0.03]  |
| Thursday                 | -0.12<br>[-0.21;-0.03] | 0.01 [-0.05;0.06]      | -0.05<br>[-0.12;0.01]  |
| Wednesday                | -0.11<br>[-0.19;-0.02] | -0.00<br>[-0.06;0.05]  | -0.07<br>[-0.14;-0.01] |
| Tuesday                  | -0.07<br>[-0.16;0.02]  | -0.02<br>[-0.08;0.03]  | -0.05<br>[-0.11;0.01]  |
| Day 1                    | 0.17 [-0.07;0.42]      | 0.01 [-0.14;0.17]      | -0.04<br>[-0.22;0.14]  |
| Day 2                    | 0.20 [-0.04;0.45]      | 0.07 [-0.08;0.22]      | 0.07 [-0.11;0.26]      |
| Day 3                    | 0.21 [-0.05;0.46]      | 0.13 [-0.03;0.29]      | 0.01 [-0.18;0.20]      |
| Day 4                    | 0.12 [-0.14;0.38]      | 0.08 [-0.08;0.25]      | 0.03 [-0.17;0.22]      |
| Day 5                    | 0.21 [-0.06;0.47]      | 0.04 [-0.13;0.20]      | 0.09 [-0.11;0.29]      |
| Day 6                    | 0.18 [-0.10;0.45]      | 0.10 [-0.08;0.27]      | -0.02<br>[-0.22;0.19]  |
| Day 7+                   | -0.05<br>[-0.27;0.17]  | 0.12 [-0.02;0.26]      | 0.04 [-0.12;0.21]      |
| sd (Intercept)           | 0.70                   | 0.43                   | 0.52                   |
| sd Observation           | 0.97                   | 0.60                   | 0.71                   |

*Note:*

Estimates from the multilevel regression model, with 95% confidence intervals.

## 5 Dropout

The additional workload on each day (total number of randomised items that were shown) is a random variable, conditional on relationship status (women in relationships had to answer slightly more questions, some of which were also randomised in appearance). We can use this variable to predict whether a woman who had to answer more questions is less likely to answer the diary on the next day.

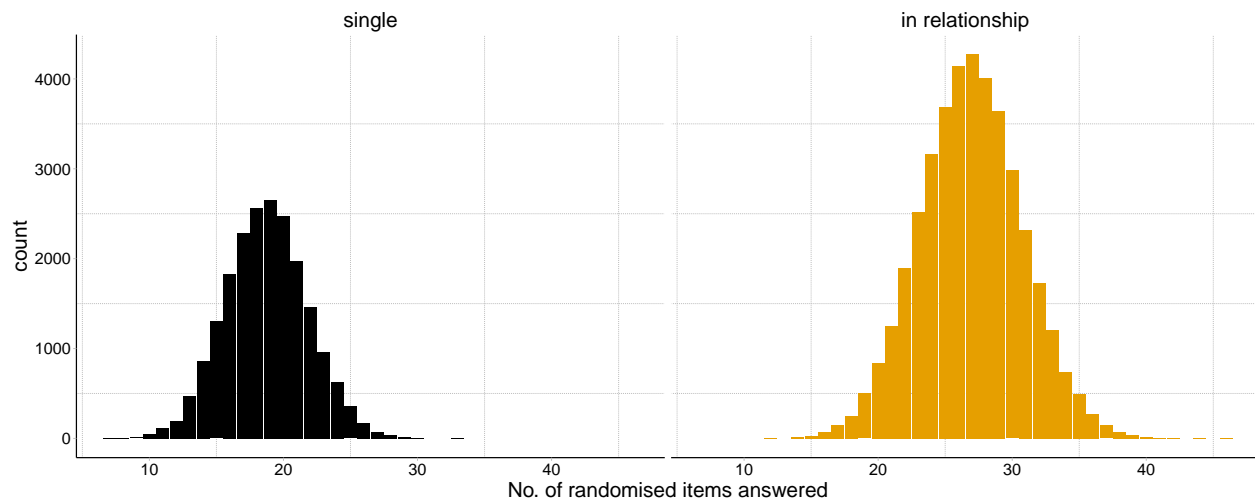


Figure 25: Distribution of the number of randomised items assigned on each day, split by relationship status.

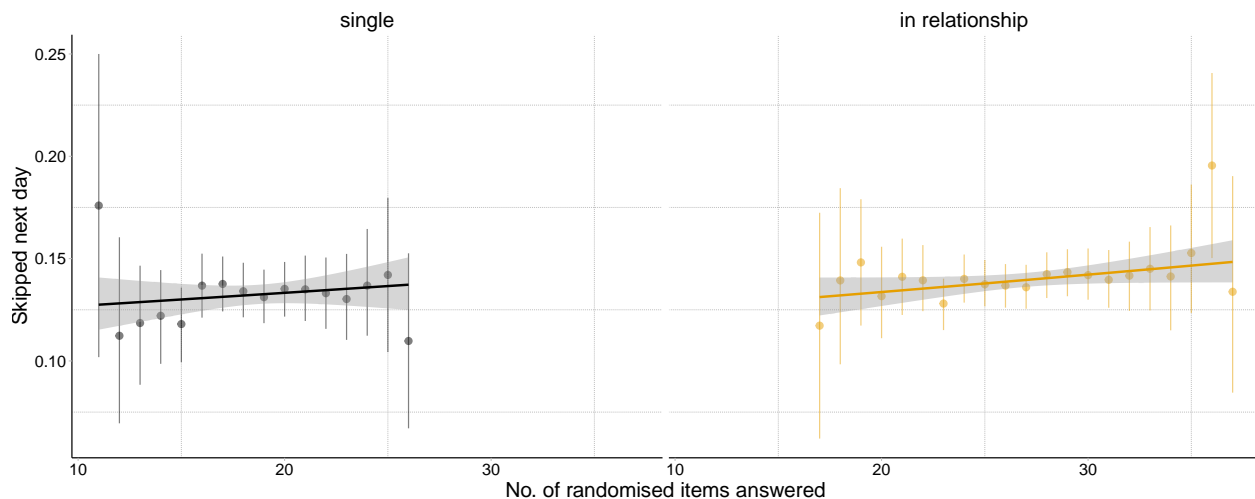


Figure 26: Is there any relationship between the number of items today and whether the participant takes part again on the next day? Only randomised variable counts with at least 100 instances are shown. The line and shading reflects a fit from a logistic regression that does not account for the multilevel structure of the data.

Table 18: Model comparison

| term | df | AIC   | logLik | statistic | Chi.Df | p.value |
|------|----|-------|--------|-----------|--------|---------|
| m0   | 3  | 43288 | -21641 | NA        | NA     | NA      |
| m1   | 7  | 43290 | -21638 | 5.4       | 4      | 0.25    |

*Note:*

Can we predict whether participants will skip the next day any better through the randomised number of items they answered today? Compares a multilevel model adjusted only for being in a relationship with one that allows for an effect of the no. of randomised items, which is allowed to vary between women and moderated by relationship status.