Supplement to: “Initial quantitative development of the Norse Feedback system: A novel adaptive multidimensional tool for use in routine mental healthcare.”

*Quality of Life Research*

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### Supplementary Table S1. DIF by sample (clinical v. nonclinical) in Study 2

| Scale          | Item | Brief content                        | Uniform DIF: $\chi^2$ Model 1 v. 2 | Non-Uniform DIF: $\chi^2$ Model 2 v. 3 | Total DIF: $\chi^2$ Model 1 v. 3 |
|----------------|------|--------------------------------------|-------------------------------------|--------------------------------------|----------------------------------|
|                |      |                                      | $p$ | $R^2$       | $p$ | $R^2$       | $p$ | $R^2$       |
| Attachment     | 41   | Form strong connections              | <.0001 | 0.0105 | 0.0117 | 0.0013 | <.0001 | 0.0118 |
| Attachment     | 1    | Care for others                      | 0.0179 | 0.0014 | 0.0241 | 0.0013 | 0.0048 | 0.0028 |
| Attachment     | 50   | Trusting                             | <.0001 | 0.0214 | 0.0633 | 0.0007 | <.0001 | 0.0221 |
| Attachment     | 89   | Comfortable w/ emotions               | <.0001 | 0.0049 | 0.0627 | 0.0007 | <.0001 | 0.0055 |
| Avoidance      | 78   | Avoid thoughts                       | <.0001 | 0.0436 | 0.0001 | 0.0034 | <.0001 | 0.0470 |
| Avoidance      | 8    | Avoid places                         | <.0001 | 0.0067 | 0.8427 | <.0001 | <.0001 | 0.0068 |
| Avoidance      | 10   | Emotions help me                     | <.0001 | 0.0140 | 0.8806 | <.0001 | <.0001 | 0.0140 |
| Avoidance      | 17   | Afraid of things                     | 0.0214 | 0.0017 | 0.0004 | 0.0041 | 0.0001 | 0.0058 |
| Avoidance      | 34   | Avoid emotions                       | <.0001 | 0.0104 | 0.0001 | 0.0031 | <.0001 | 0.0135 |
| Avoidance      | 64   | Avoid people                         | <.0001 | 0.0320 | 0.8568 | <.0001 | <.0001 | 0.0320 |
| Connectedness  | 43   | Comfortable w/ friends               | <.0001 | 0.0056 | 0.0006 | 0.0025 | <.0001 | 0.0081 |
| Connectedness  | 45   | Sat. w/ sex life                     | <.0001 | 0.0106 | 0.9808 | <.0001 | <.0001 | 0.0106 |
| Connectedness  | 50   | Trusting                             | <.0001 | 0.0414 | 0.0019 | 0.0021 | <.0001 | 0.0435 |
| Connectedness  | 54   | No control                           | <.0001 | 0.1151 | 0.0275 | 0.0013 | <.0001 | 0.1164 |
| Connectedness  | 62   | Have friends                         | <.0001 | 0.0186 | 0.0012 | 0.0025 | <.0001 | 0.0211 |
| Connectedness  | 69   | Feel alone                           | <.0001 | 0.0723 | 0.6404 | <.0001 | <.0001 | 0.0724 |
| Connectedness  | 80   | Have support                         | <.0001 | 0.0210 | <.0001 | 0.0073 | <.0001 | 0.0283 |
| Demoralization | 88   | Feel trapped                         | <.0001 | 0.1453 | <.0001 | 0.0044 | <.0001 | 0.1497 |
| Demoralization | 24   | Can't handle things                  | <.0001 | 0.0626 | 0.0996 | 0.0006 | <.0001 | 0.0632 |
| Demoralization | 36   | Others don't understand              | <.0001 | 0.0335 | <.0001 | 0.0076 | <.0001 | 0.0411 |
| Demoralization | 42   | Feel depressed                       | <.0001 | 0.0984 | 0.0001 | 0.0034 | <.0001 | 0.1018 |
| Demoralization | 61   | No hope                              | <.0001 | 0.0239 | 0.9601 | <.0001 | <.0001 | 0.0239 |
| Eating problems| 63   | Control food                         | <.0001 | 0.0187 | 0.0278 | 0.0012 | <.0001 | 0.0199 |
| Eating problems| 18   | Food planning                        | 0.7208 | 0.0001 | <.0001 | 0.0159 | <.0001 | 0.0160 |
| Eating problems| 46   | Afraid lose control of eating        | <.0001 | 0.0066 | 0.0189 | 0.0017 | <.0001 | 0.0083 |
| Eating problems| 47   | Digestive problems                   | <.0001 | 0.0099 | 0.0035 | 0.0019 | <.0001 | 0.0119 |
| Eating problems| 57   | Eating prevents socializing          | 0.0001 | 0.0086 | 0.7931 | <.0001 | 0.0003 | 0.0087 |
| Eating problems | Body image discomfort | .001 | .0179 | .0070 | .0014 | <.0001 | .0193 |
|-----------------|-----------------------|------|-------|-------|-------|---------|-------|
|                 | Spend energy ensuring safety | .0002 | .0027 | .3568 | .0002 | .0007 | .0029 |
| Hypervigilance | Prepared for worst | .0011 | .0021 | .2490 | .0003 | .0025 | .0023 |
| Hypervigilance | Feel safe at home | <.0001 | .0145 | .0001 | .0050 | <.0001 | .0195 |
| Hypervigilance | Trusting | <.0001 | .0051 | .4669 | .0001 | <.0001 | .0052 |
| Pressure from Negative Affect | Might cry uncontrollably | <.0001 | .0331 | .0141 | .0015 | <.0001 | .0346 |
| Pressure from Negative Affect | Anger | <.0001 | .0057 | .8857 | <.0001 | <.0001 | .0057 |
| Pressure from Negative Affect | Health worry | <.0001 | .0045 | .1536 | .0005 | <.0001 | .0050 |
| Pressure from Negative Affect | Self-harm | <.0001 | .0243 | .0949 | .0026 | <.0001 | .0269 |
| Pressure from Negative Affect | Sleep well | <.0001 | .0047 | .6517 | <.0001 | <.0001 | .0048 |
| Pressure from Negative Affect | Feel depressed | <.0001 | .1272 | .1544 | .0004 | <.0001 | .1277 |
| Pressure from Negative Affect | Restlessness | <.0001 | .1173 | .0503 | .0008 | <.0001 | .1181 |
| Pressure from Negative Affect | Feel down | <.0001 | .0715 | .0151 | .0012 | <.0001 | .0727 |
| Pressure from Negative Affect | Feel trapped | <.0001 | .1314 | .0069 | .0019 | <.0001 | .1333 |
| Perfectionism-Control | Worry about carelessness | .2801 | .002 | .0180 | .0012 | .0341 | .0014 |
| Perfectionism-Control | Doing things right interferes | .9059 | <.0001 | .8102 | <.0001 | .9648 | <.0001 |
| Perfectionism-Control | Might cry uncontrollably | <.0001 | .0193 | <.0001 | .0045 | <.0001 | .0238 |
| Perfectionism-Control | Self-berate | <.0001 | .0100 | <.0001 | .0058 | <.0001 | .0158 |
| Perfectionism-Control | Order compulsively | .0179 | .0022 | .9653 | <.0001 | .0606 | .0022 |
| Perfectionism-Control | Need control | .0406 | .0008 | .0954 | .0006 | .0306 | .0014 |
| Perfectionism-Control | Don't let others control relationships cause stress | .0436 | .0008 | .5156 | .0001 | .1056 | .0009 |
| Relational distress | Relationships affected by others' opinions | <.0001 | .1177 | .0014 | .0022 | <.0001 | .1199 |
| Relational distress | Others don't understand | <.0001 | .0643 | .3496 | .0003 | <.0001 | .0646 |
| Relational distress | Annoyed by others | <.0001 | .0089 | .0203 | .0011 | <.0001 | .0101 |
|                           | 65 | 66 | 69 | 27 | 6 | 15 | 22 | 33 | 40 | 55 | 56 | 67 | 70 | 84 | 89 | 39 | 3 | 38 | 76 | 85 | 87 | 5 | 22 | 27 | 3 | 30 |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Relational distress       | Many | Others | Have friends | Feel | Enjoy | Hope | Can relax | Sleep well | Assertive | Do things | Exercise | Like self | Not | Active | Comfortable | Uncontrollable | Self | Worthlessness | Need to | Important | Value in | Can relax | Feel | Physical | Health worry |
|                           | conflicts | conflicts | conflicts | productive | job/school | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
|                           | 0.0237 | 0.0209 | 0.0558 | 0.0074 | 0.0128 | 0.0124 | 0.0197 | 0.0012 | 0.198 | 0.0021 | 0.0015 | 0.0070 | 0.0140 | 0.0012 | 0.0198 | 0.0196 | 0.0714 | 0.0010 | 0.6777 | 0.0128 | 0.6677 | 0.0012 | 0.0083 | 0.0012 | 0.0689 | 0.0689 |
| Condition                  | Question                                      | p-values |
|---------------------------|-----------------------------------------------|----------|
| Somatic Anxiety           | Digestive problems                           | <.0001   |
|                           |                                               | 0.0103   |
|                           |                                               | 0.6598   |
|                           |                                               | <.0001   |
|                           |                                               | <.0001   |
|                           |                                               | 0.0103   |
| Somatic Anxiety           | Restlessness                                  | <.0001   |
|                           |                                               | 0.2311   |
|                           |                                               | 0.0021   |
|                           |                                               | 0.0019   |
|                           |                                               | <.0001   |
|                           |                                               | 0.2330   |
| Somatic Anxiety           | Physical arousal                              | <.0001   |
|                           |                                               | 0.1363   |
|                           |                                               | <.0001   |
|                           |                                               | 0.0047   |
|                           |                                               | <.0001   |
|                           |                                               | 0.1410   |
| Somatic Anxiety           | Fear without reason                           | <.0001   |
|                           |                                               | 0.2190   |
|                           |                                               | 0.6639   |
|                           |                                               | <.0001   |
|                           |                                               | <.0001   |
|                           |                                               | 0.2190   |
| Substance Use             | Concerned dependent                           | 0.0002   |
|                           |                                               | 0.0089   |
|                           |                                               | 0.0079   |
|                           |                                               | 0.0044   |
|                           |                                               | <.0001   |
|                           |                                               | 0.0133   |
| Substance Use             | Use interferes                                | 0.0024   |
|                           |                                               | 0.0066   |
|                           |                                               | 0.0106   |
|                           |                                               | 0.0047   |
|                           |                                               | 0.0004   |
|                           |                                               | 0.0113   |
| Substance Use             | Others mentioned use                          | 0.0043   |
|                           |                                               | 0.0062   |
|                           |                                               | 0.5304   |
|                           |                                               | 0.0003   |
|                           |                                               | 0.0140   |
|                           |                                               | 0.0065   |
| Substance Use             | Think should reduce use                       | 0.0045   |
|                           |                                               | 0.0041   |
|                           |                                               | 0.2518   |
|                           |                                               | 0.0007   |
|                           |                                               | 0.0092   |
|                           |                                               | 0.0047   |
| Suicide risk              | Thoughts of suicide                           | 0.1851   |
|                           |                                               | 0.0006   |
|                           |                                               | 0.1666   |
|                           |                                               | 0.0006   |
|                           |                                               | 0.1597   |
|                           |                                               | 0.0012   |
| Suicide risk              | Better if dead                                | 0.0384   |
|                           |                                               | 0.0016   |
|                           |                                               | 0.1734   |
|                           |                                               | 0.0007   |
|                           |                                               | 0.0464   |
|                           |                                               | 0.0023   |
| Suicide risk              | Scared of impulsive suicide                   | 0.4118   |
|                           |                                               | 0.0003   |
|                           |                                               | 0.6103   |
|                           |                                               | 0.0001   |
|                           |                                               | 0.6271   |
|                           |                                               | 0.0005   |
| Suicide risk              | Plans for suicide                             | 0.0529   |
|                           |                                               | 0.0025   |
|                           |                                               | 0.3444   |
|                           |                                               | 0.0006   |
|                           |                                               | 0.0982   |
|                           |                                               | 0.0030   |

Note. Rows where McFadden’s $R^2 < .02$ are presented in gray text for clarity.
## Supplementary Table S2. DIF by gender in Study 2

| Scale           | Item | Uniform DIF: $\chi^2$ Model 1 v. 2 | Total DIF: $\chi^2$ Model 1 v. 3 | Non-Uniform DIF: $\chi^2$ Model 2 v. 3 |
|-----------------|------|----------------------------------|----------------------------------|----------------------------------|
|                 |      | McFadden's $R^2$ | $p$  | McFadden's $R^2$ | $p$  | McFadden's $R^2$ | $p$  |
| Attachment      | 41   | 0.041              | 0.0008 | 0.114              | 0.0009 | 0.695              | <.0001 |
| Attachment      | 1    | <.001              | 0.0178 | <.001              | 0.0178 | 0.884              | <.0001 |
| Attachment      | 50   | 0.070              | 0.0006 | <.001              | 0.0081 | <.001              | 0.0075 |
| Attachment      | 89   | 0.590              | 0.0001 | 0.736              | 0.0001 | 0.569              | 0.0001 |
| Avoidance       | 78   | 0.535              | 0.0001 | 0.821              | 0.0001 | 0.920              | <.0001 |
| Avoidance       | 8    | 0.234              | 0.0003 | 0.439              | 0.0004 | 0.628              | 0.0001 |
| Avoidance       | 10   | 0.072              | 0.0007 | 0.132              | 0.0009 | 0.366              | 0.0002 |
| Avoidance       | 17   | 0.004              | 0.0027 | 0.016              | 0.0027 | 0.939              | <.0001 |
| Avoidance       | 34   | 0.031              | 0.0010 | <.001              | 0.0032 | 0.001              | 0.0022 |
| Avoidance       | 64   | 0.000              | 0.0034 | 0.000              | 0.0043 | 0.064              | 0.0008 |
| Connectedness   | 43   | 0.048              | 0.0008 | 0.064              | 0.0012 | 0.204              | 0.0003 |
| Connectedness   | 45   | 0.000              | 0.0030 | <.001              | 0.0053 | 0.001              | 0.0023 |
| Connectedness   | 50   | 0.085              | 0.0006 | 0.077              | 0.0011 | 0.143              | 0.0005 |
| Connectedness   | 54   | 0.240              | 0.0004 | 0.296              | 0.0007 | 0.304              | 0.0003 |
| Connectedness   | 62   | <.001              | 0.0072 | <.001              | 0.0082 | 0.045              | 0.0010 |
| Connectedness   | 69   | 0.621              | 0.0001 | 0.871              | 0.0001 | 0.858              | <.0001 |
| Connectedness   | 80   | <.001              | 0.0052 | <.001              | 0.0052 | 0.763              | <.0001 |
| Demoralization  | 88   | 0.857              | <.0001 | 0.963              | <.0001 | 0.834              | <.0001 |
| Demoralization  | 24   | <.001              | 0.0077 | <.001              | 0.0077 | 0.758              | <.0001 |
| Demoralization  | 36   | 0.888              | <.0001 | 0.792              | 0.0001 | 0.504              | 0.0001 |
| Demoralization  | 42   | 0.345              | 0.0002 | 0.585              | 0.0002 | 0.670              | <.0001 |
| Demoralization  | 61   | 0.056              | 0.0010 | 0.101              | 0.0013 | 0.332              | 0.0003 |
| Eating problems | 63   | 0.135              | 0.0005 | 0.265              | 0.0007 | 0.516              | 0.0001 |
| Eating problems | 18   | 0.018              | 0.0024 | 0.041              | 0.0027 | 0.370              | 0.0003 |
| Factor                      | N  | p-value | χ^2  | p-value | χ^2  | p-value | χ^2  | p-value |
|----------------------------|----|---------|------|---------|------|---------|------|---------|
| Eating problems            | 46 | 0.983   | <.0001 | 0.940   | <.0001 | 0.724   | <.0001 |         |
| Eating problems            | 47 | 0.733   | <.0001 | 0.757   | 0.0001 | 0.508   | 0.0001 |         |
| Eating problems            | 57 | 0.002   | 0.0054 | <.001   | 0.0094 | 0.009   | 0.0040 |         |
| Eating problems            | 86 | 0.001   | 0.0022 | <.001   | 0.0039 | 0.003   | 0.0017 |         |
| Hypervigilance             | 2  | 0.244   | 0.0003 | 0.085   | 0.0010 | 0.059   | 0.0007 |         |
| Hypervigilance             | 7  | 0.635   | <.0001 | 0.548   | 0.0002 | 0.322   | 0.0002 |         |
| Hypervigilance             | 9  | 0.018   | 0.0018 | 0.053   | 0.0019 | 0.573   | 0.0001 |         |
| Hypervigilance             | 50 | 0.613   | <.0001 | 0.038   | 0.0013 | 0.012   | 0.0012 |         |
| Pressure from Negative Affect | 28 | <.001  | 0.0151 | <.001  | 0.0152 | 0.493   | 0.0001 |         |
| Pressure from Negative Affect | 21 | 0.805  | <.0001 | 0.792   | 0.0001 | 0.524   | 0.0001 |         |
| Pressure from Negative Affect | 30 | 0.608  | 0.0001 | 0.845   | 0.0001 | 0.784   | <.0001 |         |
| Pressure from Negative Affect | 32 | 0.714  | 0.0001 | 0.610   | 0.0009 | 0.356   | 0.0008 |         |
| Pressure from Negative Affect | 33 | 0.163  | 0.0004 | 0.194   | 0.0006 | 0.248   | 0.0003 |         |
| Pressure from Negative Affect | 42 | 0.740  | <.0001 | 0.859   | 0.0001 | 0.659   | <.0001 |         |
| Pressure from Negative Affect | 51 | 0.682  | <.0001 | 0.148   | 0.0008 | 0.056   | 0.0008 |         |
| Pressure from Negative Affect | 60 | 0.771  | <.0001 | 0.414   | 0.0004 | 0.195   | 0.0003 |         |
| Pressure from Negative Affect | 88 | 0.280  | 0.0003 | 0.358   | 0.0005 | 0.347   | 0.0002 |         |
| Perfectionism-Control     | 20 | 0.177   | 0.0004 | 0.395   | 0.0004 | 0.849   | <.0001 |         |
| Perfectionism-Control     | 26 | <.001   | 0.0040 | <.001   | 0.0041 | 0.640   | <.0001 |         |
| Perfectionism-Control     | 28 | <.001   | 0.0094 | <.001   | 0.0098 | 0.208   | 0.0004 |         |
| Perfectionism-Control     | 38 | 0.588   | 0.0001 | 0.282   | 0.0006 | 0.134   | 0.0005 |         |
| Perfectionism-Control     | 48 | 0.032   | 0.0018 | 0.079   | 0.0020 | 0.479   | 0.0002 |         |
|                                    |      |        |        |        |        |        |
|------------------------------------|------|--------|--------|--------|--------|--------|
| **Perfectionism-Control**          | 52   | 0.150  | 0.0004 | 0.199  | 0.0006 | 0.281  |
| **Perfectionism-Control**          | 68   | 0.031  | 0.0009 | 0.097  | 0.0009 | 0.946  |
| **Relational distress**            | 81   | 0.371  | 0.0002 | 0.665  | 0.0002 | 0.898  |
| **Relational distress**            | 25   | <.001  | 0.0035 | <.001  | 0.0039 | 0.150  |
| **Relational distress**            | 36   | 0.950  | <.0001 | 0.997  | <.0001 | 0.962  |
| **Relational distress**            | 37   | 0.284  | 0.0002 | 0.558  | 0.0002 | 0.889  |
| **Relational distress**            | 65   | 0.257  | 0.0004 | 0.494  | 0.0004 | 0.727  |
| **Relational distress**            | 66   | <.001  | 0.0085 | <.001  | 0.0086 | 0.564  |
| **Relational distress**            | 69   | 0.805  | <.0001 | 0.086  | 0.0011 | 0.028  |
| **Resilience and personal coping** | 27   | 0.444  | 0.0001 | 0.675  | 0.0002 | 0.654  |
| **Resilience and personal coping** | 6    | <.001  | 0.0050 | <.001  | 0.0052 | 0.456  |
| **Resilience and personal coping** | 15   | 0.014  | 0.0015 | 0.036  | 0.0017 | 0.444  |
| **Resilience and personal coping** | 22   | 0.132  | 0.0006 | 0.113  | 0.0011 | 0.147  |
| **Resilience and personal coping** | 23   | 0.351  | 0.0002 | 0.455  | 0.0004 | 0.401  |
| **Resilience and personal coping** | 40   | 0.325  | 0.0002 | 0.575  | 0.0003 | 0.713  |
| **Resilience and personal coping** | 55   | 0.057  | 0.0009 | 0.001  | 0.0036 | 0.001  |
| **Resilience and personal coping** | 56   | 0.834  | <.0001 | 0.006  | 0.0027 | 0.001  |
| **Resilience and personal coping** | 67   | 0.570  | 0.0001 | 0.568  | 0.0003 | 0.369  |
| **Resilience and personal coping** | 70   | 0.071  | 0.0008 | 0.190  | 0.0008 | 0.809  |
| **Resilience and personal coping** | 84   | 0.026  | 0.0013 | 0.030  | 0.0018 | 0.153  |
|                          |     |         |         |         |         |         |
|--------------------------|-----|---------|---------|---------|---------|---------|
|                          |     |        |        |        |        |        |
| Resilience and personal  |     |        |        |        |        |        |
| coping                   | 89  | 0.944  | <.0001 | 0.988  | <.0001 | 0.887  | <.0001 |
| Hurtful Rumination       | 39  | 0.652  | <.0001 | 0.600  | 0.0002 | 0.366  | 0.0002 |
| Hurtful Rumination       | 3   | <.001  | 0.0050 | <.001  | 0.0050 | 0.739  | <.0001 |
| Hurtful Rumination       | 38  | 0.297  | 0.0002 | 0.195  | 0.0007 | 0.139  | 0.0005 |
| Hurtful Rumination       | 76  | 0.612  | 0.0001 | 0.447  | 0.0005 | 0.244  | 0.0004 |
| Hurtful Rumination       | 85  | 0.000  | 0.0025 | 0.001  | 0.0027 | 0.323  | 0.0002 |
| Social Role Functioning  | 87  | 0.176  | 0.0005 | 0.391  | 0.0005 | 0.841  | <.0001 |
| Social Role Functioning  | 5   | 0.993  | <.0001 | 0.912  | <.0001 | 0.668  | <.0001 |
| Social Role Functioning  | 22  | 0.023  | 0.0012 | 0.025  | 0.0017 | 0.136  | 0.0005 |
| Social Role Functioning  | 27  | 0.455  | 0.0001 | 0.708  | 0.0002 | 0.717  | <.0001 |
| Somatic Anxiety          | 3   | <.001  | 0.0057 | <.001  | 0.0059 | 0.285  | 0.0002 |
| Somatic Anxiety          | 30  | 0.292  | 0.0002 | 0.544  | 0.0003 | 0.740  | <.0001 |
| Somatic Anxiety          | 47  | 0.036  | 0.0010 | 0.054  | 0.0013 | 0.232  | 0.0003 |
| Somatic Anxiety          | 51  | <.001  | 0.0039 | <.001  | 0.0051 | 0.018  | 0.0011 |
| Somatic Anxiety          | 53  | 0.885  | <.0001 | 0.557  | 0.0003 | 0.284  | 0.0003 |
| Somatic Anxiety          | 75  | 0.685  | <.0001 | 0.713  | 0.0001 | 0.474  | 0.0001 |
| Substance Use            | 35  | 0.066  | 0.0018 | 0.184  | 0.0018 | 0.958  | <.0001 |
| Substance Use            | 4   | 0.481  | 0.0004 | 0.753  | 0.0004 | 0.790  | 0.0001 |
| Substance Use            | 16  | 0.044  | 0.0028 | 0.087  | 0.0034 | 0.363  | 0.0006 |
| Substance Use            | 59  | 0.474  | 0.0003 | 0.682  | 0.0004 | 0.616  | 0.0001 |
| Suicide risk             | 44  | 0.122  | 0.0008 | 0.079  | 0.0016 | 0.102  | 0.0009 |
| Suicide risk             | 19  | 0.042  | 0.0015 | 0.087  | 0.0017 | 0.389  | 0.0003 |
| Suicide risk             | 77  | 0.769  | <.0001 | 0.894  | 0.0001 | 0.711  | 0.0001 |
| Suicide risk             | 79  | 0.391  | 0.0004 | 0.689  | 0.0004 | 0.927  | <.0001 |

Note. Rows where McFadden’s $R^2 < .02$ are presented in gray text for clarity. That is all rows in this analysis.
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Supplemental Table S3. Standardized geomin rotated factor loadings from 12-factor EFA, Study 2.
Item Assigned Scale
1
2
3
4
5
6
7
8
9
Perfectionism20
0.77 0.13 -0.02 0.10 -0.03 0.05 -0.08 -0.04 0.09
Control
Emotional
23
0.77 0.11 0.04 0.00 0.11 -0.06 -0.16 -0.02 0.08
Distancing
39 Hurtful Rumination
0.74 -0.23 0.10 -0.05 0.02 -0.10 0.23 0.01 -0.05
3
Hurtful Rumination
0.69 0.11 -0.08 -0.06 -0.04 0.08 -0.03 -0.02 0.00
2
Hypervigilance
0.66 0.18 -0.05 0.00 -0.06 0.03 -0.01 0.21 0.27
Pressure from
51
0.65 -0.30 0.01 0.00 0.07 -0.03 0.27 0.00 -0.03
Negative Affect
78 Avoidance
0.61 -0.12 0.01 0.07 0.01 0.09 -0.02 -0.03 -0.01
Emotional
31
0.60 -0.09 0.06 0.04 0.04 -0.04 -0.31 0.21 -0.01
Distancing
7
Hypervigilance
0.56 0.09 -0.08 -0.02 0.01 0.21 -0.07 0.01 0.14
81 Relational distress
0.51 -0.06 -0.07 -0.10 0.02 -0.25 0.03 0.02 0.27
8
Avoidance
0.47 -0.03 0.02 -0.01 -0.04 -0.07 -0.02 0.15 0.25
34 Avoidance
0.45 -0.01 0.03 0.01 0.00 0.21 0.02 -0.04 0.31
58 Psychosis
0.44 0.24 0.09 0.15 0.05 0.01 -0.31 0.16 -0.10
75 Somatic Anxiety
0.42 -0.27 0.08 0.01 -0.06 0.10 0.17 0.21 0.14
85 Hurtful Rumination
0.40 0.04 -0.18 0.08 -0.06 -0.01 0.22 0.09 0.11
88 Demoralization
0.39 -0.18 -0.01 0.06 0.25 -0.15 0.25 0.05 0.02
64 Avoidance
0.37 -0.25 0.03 -0.07 0.07 -0.12 -0.02 0.05 0.31
25 Relational distress
0.37 -0.04 -0.01 0.21 0.03 0.22 0.12 0.05 -0.10
53 Somatic Anxiety
0.37 -0.01 0.03 -0.10 0.09 -0.05 0.05 0.32 0.35
38 Hurtful Rumination
0.35 -0.20 -0.03 0.25 0.07 0.05 -0.03 0.02 -0.03
54 Connectedness
0.31 -0.21 0.04 0.04 0.17 0.14 -0.03 0.26 0.19
Resilience and
6
-0.12 0.79 0.16 0.10 0.17 0.11 0.22 -0.04 -0.03
personal coping
Resilience and
27
0.01 0.70 0.13 -0.01 0.01 -0.06 0.30 -0.11 -0.07
personal coping
Resilience and
15
0.14 0.53 0.16 -0.09 -0.19 0.16 0.07 0.05 0.01
personal coping
42 Demoralization
0.36 -0.52 -0.02 -0.08 0.27 0.04 0.21 -0.01 -0.12
Pressure from
60
-0.25 0.49 -0.04 0.09 -0.20 -0.08 0.02 0.15 0.00
Negative Affect
69 Connectedness
0.33 -0.35 0.06 0.07 0.10 0.06 -0.01 -0.08 0.14
62 Connectedness
0.07 0.33 -0.01 -0.03 0.00 0.10 -0.02 0.03 -0.12
59 Substance Use
-0.03 0.00 0.96 0.01 -0.09 -0.03 -0.01 -0.07 0.23
35 Substance Use
0.16 0.04 0.95 -0.01 0.00 -0.08 0.01 0.06 -0.01
4
Substance Use
0.02 0.00 0.95 0.06 0.11 0.03 0.02 0.02 -0.05
16 Substance Use
0.02 -0.01 0.91 -0.03 0.02 0.02 -0.08 0.01 0.21
18 Eating problems
0.03 0.08 0.07 0.97 -0.02 -0.03 -0.07 -0.04 0.03
46 Eating problems
0.04 0.00 0.00 0.86 -0.10 0.15 -0.15 0.01 -0.03
57 Eating problems
-0.18 -0.06 0.05 0.85 0.22 -0.11 -0.02 0.09 0.03
63 Eating problems
0.00 0.04 -0.01 0.82 0.05 0.02 0.03 0.00 -0.01
86 Eating problems
0.04 0.04 -0.18 0.37 0.21 0.30 0.03 0.06 0.19
Perfectionism26
0.29 -0.22 -0.06 0.32 0.00 0.00 0.07 0.16 -0.04
Control
44 Suicide risk
0.01 0.02 0.07 -0.07 0.90 0.03 0.13 -0.05 0.07
79 Suicide risk
-0.01 0.03 -0.11 -0.10 0.84 -0.11 -0.32 0.10 -0.02

10

11

12

-0.08

0.04

-0.01

-0.04

-0.01

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0.02
-0.03
-0.03

-0.05
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-0.11
-0.39
0.07

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-0.06

-0.17

-0.01

-0.05

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-0.19

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-0.04

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-0.06
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-0.06
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0.03
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-0.07
0.00
-0.01
0.00

-0.01

0.06

0.08

-0.02
-0.02

0.04
0.01

0.01
-0.04


| 19 | Suicide risk | 0.08 | -0.05 | 0.00 | 0.02 | 0.84 | 0.02 | -0.05 | -0.17 | -0.05 | 0.12 | -0.01 | 0.01 |
| 77 | Suicide risk | -0.05 | -0.03 | 0.07 | -0.10 | 0.78 | 0.02 | -0.14 | 0.01 | 0.02 | 0.10 | -0.04 | 0.00 |
| 76 | Hurtful Ruminaton | 0.19 | -0.28 | -0.07 | 0.13 | 0.60 | 0.04 | -0.03 | -0.01 | 0.01 | -0.01 | -0.05 | 0.11 |
| 61 | Demoralization | 0.09 | -0.45 | 0.07 | 0.08 | 0.52 | -0.08 | -0.01 | 0.00 | 0.03 | -0.01 | 0.09 | -0.02 |
| 32 | Pressure from Negative Affect | -0.03 | -0.02 | -0.03 | 0.20 | 0.49 | 0.02 | -0.20 | 0.22 | 0.00 | 0.07 | -0.08 | -0.02 |
| 24 | Demoralization | 0.17 | -0.29 | 0.01 | -0.02 | 0.40 | 0.14 | 0.09 | 0.07 | -0.01 | 0.09 | -0.03 | -0.27 |
| 49 | Psychosis | 0.13 | 0.04 | 0.04 | 0.08 | 0.32 | -0.27 | -0.15 | -0.01 | 0.02 | 0.26 | 0.14 | 0.03 |
| 1 | Attachment | 0.02 | 0.02 | -0.04 | -0.08 | -0.02 | 0.57 | 0.31 | 0.01 | 0.09 | -0.14 | 0.21 | 0.06 |
| 28 | Perfectionism-Control | 0.37 | -0.01 | -0.06 | 0.11 | 0.10 | 0.37 | 0.02 | -0.21 | -0.05 | 0.19 | -0.12 | -0.03 |
| 87 | Social Role Functioning | -0.05 | 0.07 | 0.16 | -0.02 | -0.31 | 0.02 | 0.46 | 0.07 | -0.05 | 0.12 | 0.15 | -0.01 |
| 5 | Social Role Functioning | -0.06 | 0.10 | 0.25 | -0.11 | -0.33 | 0.07 | 0.46 | 0.07 | -0.02 | -0.25 | 0.12 | 0.01 |
| 56 | Resilience and personal coping | 0.03 | -0.05 | -0.02 | 0.38 | -0.05 | -0.34 | 0.42 | -0.05 | 0.04 | 0.02 | 0.40 | 0.01 |
| 10 | Avoidance | -0.02 | 0.16 | 0.01 | -0.15 | 0.05 | 0.02 | 0.38 | 0.07 | -0.06 | 0.12 | 0.26 | 0.12 |
| 9 | Hypervigilance | -0.01 | -0.07 | 0.00 | 0.05 | -0.16 | 0.14 | 0.28 | -0.15 | 0.03 | -0.23 | 0.26 | 0.07 |
| 17 | Avoidance | 0.10 | -0.18 | 0.07 | -0.06 | -0.04 | 0.17 | -0.03 | 0.59 | 0.07 | 0.08 | -0.12 | 0.14 |
| 29 | Psychosis | 0.03 | 0.08 | 0.14 | 0.01 | 0.23 | 0.00 | -0.48 | 0.50 | -0.06 | 0.07 | -0.01 | 0.04 |
| 30 | Pressure from Negative Affect | 0.09 | -0.13 | 0.00 | 0.10 | -0.09 | 0.38 | -0.02 | 0.44 | -0.07 | 0.03 | 0.02 | -0.20 |
| 48 | Perfectionism-Control | 0.31 | -0.01 | -0.05 | 0.17 | 0.08 | -0.12 | 0.02 | 0.41 | -0.10 | -0.01 | -0.02 | 0.01 |
| 52 | Perfectionism-Control | 0.12 | 0.13 | -0.17 | 0.22 | 0.19 | -0.03 | 0.27 | 0.38 | 0.21 | -0.05 | -0.01 | 0.04 |
| 83 | Independent | -0.01 | -0.08 | -0.01 | 0.01 | -0.15 | -0.14 | 0.29 | 0.32 | -0.07 | 0.23 | -0.05 | -0.03 |
| 43 | Connectedness | 0.02 | 0.16 | -0.01 | -0.13 | 0.03 | 0.02 | 0.15 | 0.05 | -0.54 | -0.06 | 0.28 | 0.00 |
| 50 | Attachment | 0.04 | 0.06 | 0.19 | 0.06 | -0.07 | -0.01 | 0.21 | 0.05 | -0.47 | -0.29 | 0.05 | 0.12 |
| 68 | Perfectionism-Control | 0.02 | 0.10 | -0.14 | 0.18 | -0.09 | 0.07 | 0.18 | 0.20 | 0.47 | 0.21 | -0.02 | -0.03 |
| 41 | Attachment | 0.00 | 0.03 | -0.01 | 0.01 | -0.02 | 0.41 | 0.33 | -0.09 | -0.46 | 0.06 | 0.05 | 0.04 |
| 70 | Resilience and personal coping | 0.14 | -0.19 | 0.00 | 0.08 | 0.03 | 0.18 | 0.13 | -0.10 | 0.42 | 0.27 | 0.02 | -0.01 |
| 65 | Relational distress | -0.06 | 0.00 | 0.01 | 0.07 | 0.00 | -0.05 | 0.01 | 0.11 | -0.03 | 0.75 | 0.14 | -0.08 |
| 37 | Relational distress | 0.07 | 0.00 | -0.02 | -0.02 | -0.06 | 0.00 | -0.05 | 0.15 | -0.06 | 0.63 | -0.18 | -0.03 |
| 36 | Demoralization | 0.27 | -0.04 | 0.16 | 0.16 | -0.03 | 0.12 | -0.27 | -0.01 | 0.06 | 0.51 | 0.04 | 0.01 |
| 66 | Relational distress | 0.07 | 0.17 | 0.02 | -0.20 | 0.11 | -0.24 | 0.03 | 0.01 | 0.02 | 0.49 | 0.03 | 0.09 |
| 21 | Pressure from Negative Affect | 0.01 | 0.08 | -0.15 | -0.01 | 0.09 | 0.07 | -0.01 | 0.32 | 0.04 | 0.48 | 0.02 | -0.14 |
| 80 | Connectedness | 0.21 | 0.23 | -0.03 | 0.00 | -0.12 | 0.01 | 0.05 | -0.03 | -0.01 | -0.29 | 0.29 | -0.08 |
| 45 | Connectedness | 0.00 | -0.03 | 0.06 | -0.08 | -0.13 | 0.02 | -0.19 | -0.04 | -0.01 | 0.01 | 0.57 | -0.11 |
| 40 | Resilience and personal coping | -0.04 | 0.14 | -0.09 | 0.04 | -0.01 | 0.02 | -0.04 | 0.24 | -0.26 | 0.10 | 0.53 | 0.18 |
| 89 | Attachment | -0.10 | -0.03 | -0.02 | -0.10 | -0.07 | 0.01 | 0.08 | 0.21 | -0.23 | -0.01 | 0.48 | -0.05 |
| 55 | Resilience and personal coping | -0.04 | -0.14 | 0.13 | 0.07 | 0.07 | -0.04 | -0.04 | 0.17 | 0.07 | 0.00 | 0.46 | 0.04 |
| 84 | Resilience and personal coping | 0.10 | 0.17 | -0.10 | 0.23 | -0.16 | -0.34 | 0.28 | -0.12 | -0.03 | 0.01 | 0.41 | 0.01 |
Resilience and personal coping  
|   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|   | -0.01 | 0.16 | 0.10 | -0.15 | -0.18 | -0.02 | **0.22** | 0.02 | -0.15 | 0.03 | **0.41** | -0.10 |
| 67 |   |   |   |   |   |   |   |   |   |   |   |   |
| Pressure from Negative Affect  
|   | 0.05 | **0.29** | -0.07 | -0.07 | -0.03 | -0.02 | 0.05 | 0.02 | -0.13 | 0.02 | 0.01 | **0.63** |
| 33 |   |   |   |   |   |   |   |   |   |   |   |   |
| Resilience and personal coping  
|   | -0.35 | 0.08 | 0.09 | -0.04 | 0.15 | 0.01 | 0.09 | 0.04 | 0.00 | -0.05 | **0.39** | **0.42** |
| 22 |   |   |   |   |   |   |   |   |   |   |   |   |
| Eating problems  
|   | -0.11 | -0.02 | 0.02 | **0.21** | 0.06 | 0.06 | 0.11 | 0.18 | 0.00 | 0.19 | 0.04 | -0.38 |
| 47 |   |   |   |   |   |   |   |   |   |   |   |   |
| Independent  
|   | -0.05 | 0.14 | 0.13 | 0.02 | 0.00 | 0.04 | **0.30** | 0.00 | 0.15 | -0.04 | 0.00 | **0.35** |
| 82 |   |   |   |   |   |   |   |   |   |   |   |   |

Loadings with absolute values between -0.2 and 0.2 are in gray text to increase interpretability. All loadings greater or equal to 0.4 in absolute value are bolded.
Supplementary Table S4. DIF by sites in Study 3.

| Scale           | Item | Brief description          | Uniform DIF: $\chi^2$ Model 1 v. 2 | Non-Uniform DIF: $\chi^2$ Model 2 v. 3 | Total DIF: $\chi^2$ Model 1 v. 3 |
|-----------------|------|----------------------------|-------------------------------------|----------------------------------------|----------------------------------|
| Cognitive       | 142  | Difficulty focusing        | $<.0001$                            | $0.0044$                               | $0.6215$                        |
| Problems        |      |                            |                                     |                                        | $<.0001$                        | $0.0045$                        |
| Cognitive       | 143  | Memory problems            | $0.3222$                            | $0.0002$                               | $0.6667$                        |
| Problems        |      |                            |                                     |                                        | $<.0001$                        | $0.5584$                        | $0.0003$                        |
| Cognitive       | 144  | Mentally slow              | $0.0723$                            | $0.0007$                               | $0.1343$                        |
| Problems        |      |                            |                                     |                                        | $0.0005$                        | $0.0648$                        | $0.0012$                        |
| Cognitive       | 145  | Forgetful                  | $0.3204$                            | $0.0002$                               | $0.0055$                        |
| Problems        |      |                            |                                     |                                        | $0.0017$                        | $0.0130$                        | $0.0020$                        |
| Cognitive       | 146  | Worried brain not working  | $<.0001$                            | $0.0043$                               | $0.7618$                        |
| Problems        |      |                            |                                     |                                        | $<.0001$                        | $0.0001$                        | $0.0043$                        |
| Cognitive       | 147  | Not thinking clearly       | $<.0001$                            | $0.0075$                               | $0.3953$                        |
| Problems        |      |                            |                                     |                                        | $0.0002$                        | $<.0001$                        | $0.0077$                        |
| Need for        | 26   | Doing things right interferes | $0.2984$                       | $0.0003$                               | $0.6219$                        |
| Control         |      |                            |                                     |                                        | $0.0001$                        | $0.5156$                        | $0.0003$                        |
| Need for        | 20   | Worry about carelessness   | $0.3509$                            | $0.0002$                               | $0.3580$                        |
| Control         |      |                            |                                     |                                        | $0.0002$                        | $0.4242$                        | $0.0004$                        |
| Need for        | 68   | Don't let others control   | $0.9284$                            | $<.0001$                               | $0.8092$                        |
| Control         |      |                            |                                     |                                        | $<.0001$                        | $0.9673$                        | $<.0001$                        |
| Need for        | 130  | Difficult to live with     | $0.7021$                            | $<.0001$                               | $0.0736$                        |
| Control         |      | Afraid lose control of eating | $<.0001$                      | $0.0109$                               | $0.0009$                        |
| Eating Problems |      |                            |                                     |                                        | $0.0031$                        | $<.0001$                        | $0.0141$                        |
| Eating Problems | 46   | Worry about weight         | $0.5078$                            | $0.0001$                               | $0.1627$                        |
| Eating Problems |      | Eating prevents socializing | $0.1095$                      | $0.0010$                               | $0.1937$                        |
| Eating Problems |      |                            |                                     |                                        | $0.0007$                        | $0.1194$                        | $0.0017$                        |
| Eating Problems | 18   | Food planning              | $0.0716$                            | $0.0013$                               | $0.5407$                        |
| Eating Problems |      |                            |                                     |                                        | $0.0001$                        | $0.1637$                        | $0.0014$                        |
| Eating Problems | 63   | Control food               | $0.7031$                            | $<.0001$                               | $0.6079$                        |
| Hopelessness     | 15   | Hope                       | $0.7698$                            | $<.0001$                               | $0.1946$                        |
| Hopelessness     | 61   | No hope                    | $0.2203$                            | $0.0004$                               | $0.1592$                        |
| Hopelessness     | 115  | Things don't get better    | $0.0004$                            | $0.0028$                               | $0.6868$                        |
|                 |      | Can't handle things        |                                     |                                        | $<.0001$                        | $0.0019$                        | $0.0028$                        |
| Hopelessness     | 24   | Hope                       | $0.8816$                            | $<.0001$                               | $0.3298$                        |
| Hopelessness     | 88   | Feel trapped               | $0.4459$                            | $0.0001$                               | $0.3642$                        |
| Internal         | 10   | Emotions help me           | $0.0213$                            | $0.0013$                               | $0.4836$                        |
| Avoidance        |      |                            |                                     |                                        | $0.0001$                        | $0.0552$                        | $0.0014$                        |
| Internal         | 34   | Avoid emotions             | $0.1876$                            | $0.0004$                               | $0.5363$                        |
| Avoidance        |      |                            |                                     |                                        | $0.0001$                        | $0.3466$                        | $0.0005$                        |
| Category             | Code | Description                                    | Value1  | Value2  | Value3  | Value4  | Value5  | Value6  |
|----------------------|------|-----------------------------------------------|---------|---------|---------|---------|---------|---------|
| Internal Avoidance   | 78   | Avoid thoughts                                | 0.6329  | 0.0001  | 0.3066  | 0.0003  | 0.5290  | 0.0003  |
| Internal Avoidance   | 122  | Shut down feelings                            | 0.0579  | 0.0009  | 0.6662  | <.0001  | 0.1508  | 0.0009  |
| Internal Avoidance   | 123  | If start, feelings would overwhelm            | 0.3790  | 0.0002  | 0.8502  | <.0001  | 0.6671  | 0.0002  |
| Recovery Environment | 80   | Have support                                  | 0.4151  | 0.0002  | 0.5842  | 0.0001  | 0.6177  | 0.0003  |
| Recovery Environment | 136  | Supportive environment                        | 0.0120  | 0.0016  | 0.2135  | 0.0004  | 0.0197  | 0.0020  |
| Recovery Environment | 138  | Satisfied with life                           | 0.6253  | 0.0001  | 0.5246  | 0.0001  | 0.7250  | 0.0002  |
| Recovery Environment | 139  | Have opportunity for pleasure                 | 0.2301  | 0.0004  | 0.9922  | <.0001  | 0.4866  | 0.0004  |
| Recovery Environment | 137  | Not enough money                               | 0.0329  | 0.0013  | 0.1253  | 0.0007  | 0.0318  | 0.0020  |
| Self-Criticism       | 67   | Like self                                     | 0.0002  | 0.0033  | 0.8643  | <.0001  | 0.0012  | 0.0033  |
| Self-Criticism       | 38   | Self-berate                                   | 0.1691  | 0.0004  | 0.4128  | 0.0002  | 0.2779  | 0.0006  |
| Self-Criticism       | 126  | Ashamed of self                               | 0.8852  | <.0001  | 0.6461  | 0.0001  | 0.8906  | 0.0001  |
| Self-Criticism       | 124  | Make stupid mistakes                          | 0.1335  | 0.0006  | 0.0721  | 0.0008  | 0.0644  | 0.0013  |
| Self-Criticism       | 129  | I am a bad person deep down                   | 0.6862  | <.0001  | 0.3880  | 0.0002  | 0.6350  | 0.0002  |
| Self-Criticism       | 127  | Unlovable                                     | 0.9407  | <.0001  | 0.5265  | 0.0001  | 0.8160  | 0.0001  |
| Self-Criticism       | 128  | Self-disgust                                  | 0.4151  | 0.0002  | 0.9541  | <.0001  | 0.7162  | 0.0002  |
| Social Safety         | 43   | Comfortable w/ friends                        | 0.1621  | 0.0005  | 0.6229  | 0.0001  | 0.3334  | 0.0005  |
| Social Safety         | 131  | Comfortable sharing emotions                   | 0.0769  | 0.0007  | 0.7187  | <.0001  | 0.1960  | 0.0008  |
| Social Safety         | 40   | Assertive                                     | 0.4163  | 0.0002  | 0.8944  | <.0001  | 0.7124  | 0.0002  |
| Social Safety         | 132  | Set limits                                    | 0.0383  | 0.0010  | 0.1844  | 0.0004  | 0.0484  | 0.0014  |
| Social Safety         | 62   | Have friends                                  | 0.1211  | 0.0006  | 0.3099  | 0.0002  | 0.1761  | 0.0008  |
| Social Safety         | 50   | Trusting                                      | 0.0302  | 0.0011  | 0.1698  | 0.0005  | 0.0372  | 0.0016  |
| Somatic Anxiety       | 51   | Restlessness                                  | 0.0005  | 0.0028  | 0.0444  | 0.0009  | 0.0003  | 0.0037  |
| Somatic Anxiety       | 103  | Tense all day                                 | 0.0082  | 0.0016  | 0.9689  | <.0001  | 0.0302  | 0.0016  |
| Somatic Anxiety       | 75   | Fear without reason                           | 0.0625  | 0.0007  | 0.7404  | <.0001  | 0.1671  | 0.0008  |
| Category          | Condition                                | Value 1 | Value 2 | Value 3 | Value 4 | Value 5 | Value 6 |
|-------------------|------------------------------------------|---------|---------|---------|---------|---------|---------|
| Somatic Anxiety   | Physical tension                        | 0.4325  | 0.0001  | 0.1429  | 0.0005  | 0.2513  | 0.0006  |
| Somatic Anxiety   | Physical arousal                         | 0.1934  | 0.0004  | 0.4131  | 0.0001  | 0.3071  | 0.0005  |
| Substance Recovery| Can handle problems w/o substance       | 0.0620  | 0.0055  | 0.8217  | 0.0001  | 0.1709  | 0.0056  |
| Substance Recovery| Can manage a day w/o substance           | 0.5039  | 0.0013  | 0.9732  | <.0001  | 0.7993  | 0.0013  |
| Substance Recovery| Urges manageable                        | 0.1890  | 0.0033  | 0.9633  | <.0001  | 0.4216  | 0.0033  |
| Substance Recovery| Substance problems are improving         | 0.6279  | 0.0004  | 0.3318  | 0.0016  | 0.5552  | 0.0020  |
| Substance Use     | Think should reduce use                  | 0.6697  | 0.0001  | 0.4792  | 0.0002  | 0.7109  | 0.0003  |
| Substance Use     | Use interferes                           | 0.7540  | 0.0001  | 0.6263  | 0.0002  | 0.8457  | 0.0002  |
| Substance Use     | Others worry about Use                   | 0.0006  | 0.0072  | 0.4790  | 0.0003  | 0.0023  | 0.0075  |
| Substance Use     | Concerned dependent                      | 0.6110  | 0.0002  | 0.8563  | <.0001  | 0.8643  | 0.0002  |
| Suicide           | Better if dead                           | 0.5702  | 0.0001  | 0.0188  | 0.0015  | 0.0538  | 0.0016  |
| Suicide           | Made suicide plans                       | 0.1000  | 0.0010  | 0.7703  | <.0001  | 0.2476  | 0.0010  |
| Suicide           | Scared of impulsive suicide              | 0.3612  | 0.0003  | 0.8768  | <.0001  | 0.6513  | 0.0003  |
| Suicide           | Decided to kill self                     | 0.6705  | 0.0001  | 0.2564  | 0.0008  | 0.4797  | 0.0009  |
| Trauma Reaction   | Overwhelming memories                    | 0.0792  | 0.0009  | 0.7529  | <.0001  | 0.2039  | 0.0009  |
| Trauma Reaction   | Nightmares                               | 0.5611  | 0.0001  | 0.5161  | 0.0001  | 0.6840  | 0.0002  |
| Trauma Reaction   | Alert to dangers                         | 0.0175  | 0.0015  | 0.2923  | 0.0003  | 0.0341  | 0.0018  |
| Trauma Reaction   | Try to control memories                  | 0.0194  | 0.0017  | 0.5577  | 0.0001  | 0.0547  | 0.0018  |

Note. Rows where McFadden's $R^2 < .02$ are presented in gray text for clarity. That is all rows in this analysis.
| Scale                  | Item | Uniform DIF: $\chi^2$ Model 1 v. 2 | Total DIF: $\chi^2$ Model 1 v. 3 | Non-Uniform DIF: $\chi^2$ Model 2 v. 3 |
|------------------------|------|-----------------------------------|---------------------------------|----------------------------------------|
|                        |      | McFadden's $p$ | McFadden's $R^2$ | McFadden's $p$ | McFadden's $R^2$ | McFadden's $p$ | McFadden's $R^2$ |
| Cognitive Problems     | 142  | <.001 | 0.006 | <.001 | 0.006 | 0.727 | <.001 |
| Cognitive Problems     | 143  | 0.001 | 0.003 | 0.002 | 0.003 | 0.183 | 0.000 |
| Cognitive Problems     | 144  | 0.272 | 0.000 | 0.328 | 0.001 | 0.312 | 0.000 |
| Cognitive Problems     | 145  | 0.001 | 0.002 | 0.005 | 0.002 | 0.748 | <.001 |
| Cognitive Problems     | 146  | 0.654 | <.001 | 0.128 | 0.001 | 0.048 | 0.001 |
| Cognitive Problems     | 147  | <.001 | 0.005 | <.001 | 0.006 | 0.162 | 0.000 |
| Need for Control       | 26   | 0.085 | 0.001 | 0.110 | 0.001 | 0.230 | 0.000 |
| Need for Control       | 20   | <.001 | 0.005 | <.001 | 0.007 | 0.012 | 0.002 |
| Need for Control       | 68   | 0.691 | <.001 | 0.806 | 0.000 | 0.600 | 0.000 |
| Need for Control       | 130  | 0.726 | <.001 | 0.940 | <.001 | 0.969 | <.001 |
| Eating Problems        | 46   | 0.028 | 0.001 | 0.072 | 0.002 | 0.500 | 0.000 |
| Eating Problems        | 104  | 0.848 | <.001 | 0.422 | 0.000 | 0.194 | 0.000 |
| Eating Problems        | 57   | 0.076 | 0.001 | 0.163 | 0.002 | 0.487 | 0.000 |
| Eating Problems        | 18   | 0.825 | <.001 | 0.937 | 0.000 | 0.776 | <.001 |
| Eating Problems        | 63   | 0.227 | 0.000 | 0.475 | 0.000 | 0.867 | <.001 |
| Hopelessness           | 15   | 0.628 | 0.000 | 0.857 | 0.000 | 0.785 | <.001 |
| Hopelessness           | 61   | 0.126 | 0.001 | 0.217 | 0.001 | 0.399 | 0.000 |
| Hopelessness           | 115  | 0.279 | 0.000 | 0.434 | 0.000 | 0.479 | 0.000 |
| Hopelessness           | 24   | 0.516 | 0.000 | 0.257 | 0.001 | 0.130 | 0.001 |
| Hopelessness           | 88   | 0.338 | 0.000 | 0.442 | 0.000 | 0.397 | 0.000 |
| Internal Avoidance     | 10   | 0.000 | 0.004 | 0.000 | 0.004 | 0.448 | 0.000 |
| Internal Avoidance     | 34   | 0.379 | 0.000 | 0.640 | 0.000 | 0.733 | <.001 |
| Internal Avoidance     | 78   | 0.347 | 0.000 | 0.605 | 0.000 | 0.731 | <.001 |
| Internal Avoidance     | 122  | 0.891 | <.001 | 0.887 | 0.000 | 0.638 | 0.000 |
| Internal Avoidance     | 123  | 0.077 | 0.001 | 0.198 | 0.001 | 0.738 | <.001 |
| Recovery Environment   | 80   | 0.004 | 0.002 | 0.010 | 0.003 | 0.437 | 0.000 |
| Recovery Environment   | 136  | 0.427 | 0.000 | 0.710 | 0.000 | 0.820 | <.001 |
| Recovery Environment   | 138  | 0.000 | 0.003 | <.001 | 0.006 | 0.002 | 0.003 |
| Recovery Environment   | 139  | 0.492 | 0.000 | 0.731 | 0.000 | 0.694 | <.001 |
| Recovery Environment   | 137  | 0.974 | <.001 | 0.421 | 0.001 | 0.189 | 0.001 |
| Self-Criticism         | 67   | 0.989 | <.001 | 0.272 | 0.001 | 0.106 | 0.001 |
| Self-Criticism         | 38   | 0.002 | 0.002 | 0.002 | 0.003 | 0.087 | 0.001 |
| Self-Criticism         | 126  | 0.206 | 0.000 | 0.449 | 0.000 | 0.981 | <.001 |
| Self-Criticism         | 124  | 0.300 | 0.000 | 0.001 | 0.003 | 0.001 | 0.003 |
| Variable                   | N  | McFadden's $R^2$ | Contribution 1 | Contribution 2 | Contribution 3 | Contribution 4 | p-value | Contribution 1 | Contribution 2 | Contribution 3 | Contribution 4 |
|----------------------------|----|-----------------|----------------|----------------|----------------|----------------|---------|----------------|----------------|----------------|----------------|
| Self-Criticism             | 129| 0.064           | 0.145          | 0.001          | 0.514          | 0.000          |         |                |                |                |                |
| Self-Criticism             | 127| 0.142           | 0.219          | 0.001          | 0.347          | 0.000          |         |                |                |                |                |
| Self-Criticism             | 128| 0.020           | 0.063          | 0.001          | 0.742          | <.001          |         |                |                |                |                |
| Self-Criticism             | 101| 0.001           | 0.004          | 0.003          | 0.641          | 0.000          |         |                |                |                |                |
| Social Safety              | 43 | 0.821           | <.001          | 0.871          | 0.636          | 0.000          |         |                |                |                |                |
| Social Safety              | 131| 0.011           | 0.032          | 0.002          | 0.501          | 0.000          |         |                |                |                |                |
| Social Safety              | 40 | 0.003           | 0.010          | 0.002          | 0.647          | 0.000          |         |                |                |                |                |
| Social Safety              | 132| 0.309           | 0.390          | 0.000          | 0.357          | 0.000          |         |                |                |                |                |
| Social Safety              | 62 | 0.187           | 0.310          | 0.001          | 0.437          | 0.000          |         |                |                |                |                |
| Social Safety              | 50 | 0.000           | 0.001          | 0.004          | 0.116          | 0.001          |         |                |                |                |                |
| Somatic Anxiety            | 51 | 0.007           | 0.000          | 0.005          | 0.001          | 0.003          |         |                |                |                |                |
| Somatic Anxiety            | 103| 0.552           | 0.790          | 0.000          | 0.732          | <.001          |         |                |                |                |                |
| Somatic Anxiety            | 75 | <.001           | <.001          | <.001          | 0.071          | 0.001          |         |                |                |                |                |
| Somatic Anxiety            | 3  | 0.000           | 0.000          | 0.004          | 0.030          | 0.001          |         |                |                |                |                |
| Somatic Anxiety            | 53 | 0.006           | 0.018          | 0.002          | 0.535          | 0.000          |         |                |                |                |                |
| Substance Recovery         | 109| 0.207           | 0.407          | 0.003          | 0.648          | 0.000          |         |                |                |                |                |
| Substance Recovery         | 154| 0.482           | 0.778          | 0.002          | 0.930          | <.001          |         |                |                |                |                |
| Substance Recovery         | 108| 0.219           | 0.454          | 0.003          | 0.795          | 0.000          |         |                |                |                |                |
| Substance Recovery         | 155| 0.986           | <.001          | 0.607          | 0.318          | 0.002          |         |                |                |                |                |
| Substance Use              | 59 | 0.445           | 0.712          | 0.000          | 0.757          | <.001          |         |                |                |                |                |
| Substance Use              | 4  | 0.504           | 0.278          | 0.002          | 0.146          | 0.001          |         |                |                |                |                |
| Substance Use              | 107| 0.567           | 0.483          | 0.001          | 0.289          | 0.001          |         |                |                |                |                |
| Substance Use              | 35 | 0.000           | 0.001          | 0.010          | 0.133          | 0.002          |         |                |                |                |                |
| Suicide                    | 19 | 0.774           | <.001          | 0.498          | 0.252          | 0.000          |         |                |                |                |                |
| Suicide                    | 105| 0.181           | 0.247          | 0.001          | 0.315          | 0.000          |         |                |                |                |                |
| Suicide                    | 77 | 0.742           | <.001          | 0.916          | 0.795          | <.001          |         |                |                |                |                |
| Suicide                    | 106| 0.000           | 0.000          | 0.012          | 0.071          | 0.002          |         |                |                |                |                |
| Trauma Reaction            | 111| 0.442           | 0.408          | 0.001          | 0.273          | 0.000          |         |                |                |                |                |
| Trauma Reaction            | 110| 0.059           | 0.168          | 0.001          | 0.912          | <.001          |         |                |                |                |                |
| Trauma Reaction            | 113| 0.289           | 0.522          | 0.000          | 0.674          | <.001          |         |                |                |                |                |
| Trauma Reaction            | 112| 0.108           | 0.262          | 0.001          | 0.762          | <.001          |         |                |                |                |                |

Note. Rows where McFadden's $R^2 < .02$ are presented in gray text for clarity. That is all rows in this analysis.
Supplementary Table S6. DIF by gender in Study 3.

| Scale                | Item | Uniform DIF: χ² Model 1 v. 2 | Total DIF: χ² Model 1 v. 3 | Non-Uniform DIF: χ² Model 2 v. 3 |
|----------------------|------|-----------------------------|-----------------------------|----------------------------------|
|                      |      | McFadden's R² | p | McFadden's R² | p | McFadden's R² | p |
| Cognitive Problems   | 142  | 0.375         | 0.000 | 0.150 | 0.001 | 0.083 | 0.001 |
| Cognitive Problems   | 143  | 0.205         | 0.000 | 0.212 | 0.001 | 0.222 | 0.000 |
| Cognitive Problems   | 144  | 0.234         | 0.000 | 0.315 | 0.001 | 0.346 | 0.000 |
| Cognitive Problems   | 145  | 0.202         | 0.000 | 0.207 | 0.001 | 0.217 | 0.000 |
| Cognitive Problems   | 146  | 0.010         | 0.002 | 0.034 | 0.002 | 0.752 | <0.001 |
| Cognitive Problems   | 147  | 0.005         | 0.002 | 0.016 | 0.002 | 0.466 | 0.000 |
| Need for Control     | 26   | 0.527         | 0.000 | 0.591 | 0.000 | 0.419 | 0.000 |
| Need for Control     | 20   | 0.342         | 0.000 | 0.231 | 0.001 | 0.154 | 0.001 |
| Need for Control     | 68   | <.001         | 0.009 | <.001 | 0.010 | 0.070 | 0.001 |
| Need for Control     | 130  | 0.000         | 0.004 | 0.001 | 0.004 | 0.920 | <0.001 |
| Eating Problems      | 46   | <.001         | 0.014 | <.001 | 0.015 | 0.122 | 0.001 |
| Eating Problems      | 104  | <.001         | 0.021 | <.001 | 0.021 | 0.371 | 0.000 |
| Eating Problems      | 57   | 0.338         | 0.000 | 0.319 | 0.001 | 0.242 | 0.001 |
| Eating Problems      | 18   | <.001         | 0.013 | <.001 | 0.013 | 0.285 | 0.001 |
| Eating Problems      | 63   | 0.210         | 0.000 | 0.449 | 0.000 | 0.865 | <0.001 |
| Hopelessness         | 15   | 0.109         | 0.001 | 0.179 | 0.001 | 0.350 | 0.000 |
| Hopelessness         | 61   | <.001         | 0.005 | <.001 | 0.005 | 0.470 | 0.000 |
| Hopelessness         | 115  | 0.428         | 0.000 | 0.373 | 0.000 | 0.246 | 0.000 |
| Hopelessness         | 24   | 0.104         | 0.001 | 0.263 | 0.001 | 0.887 | <0.001 |
| Hopelessness         | 88   | 0.615         | 0.000 | 0.833 | 0.000 | 0.738 | <0.001 |
| Internal Avoidance   | 10   | 0.733         | <.001 | 0.854 | 0.000 | 0.656 | <0.001 |
| Internal Avoidance   | 34   | 0.940         | <.001 | 0.990 | <.001 | 0.904 | <0.001 |
| Internal Avoidance   | 78   | 0.427         | 0.000 | 0.652 | 0.000 | 0.636 | 0.000 |
| Internal Avoidance   | 122  | <.001         | 0.007 | <.001 | 0.007 | 0.968 | <0.001 |
| Internal Avoidance   | 123  | 0.000         | 0.003 | 0.001 | 0.003 | 0.961 | <0.001 |
| Recovery Environment | 80   | 0.735         | <.001 | 0.720 | 0.000 | 0.461 | 0.000 |
| Recovery Environment | 136  | 0.771         | <.001 | 0.253 | 0.001 | 0.103 | 0.001 |
| Recovery Environment | 138  | <.001         | 0.005 | <.001 | 0.008 | 0.002 | 0.002 |
| Recovery Environment | 139  | 0.000         | 0.004 | 0.001 | 0.004 | 0.777 | <0.001 |
| Recovery Environment | 137  | 0.703         | <.001 | 0.927 | <.001 | 0.945 | <0.001 |
| Self-Criticism       | 67   | 0.296         | 0.000 | 0.287 | 0.001 | 0.236 | 0.000 |
| Self-Criticism       | 38   | 0.290         | 0.000 | 0.572 | 0.000 | 0.977 | <0.001 |
| Self-Criticism       | 126  | 0.013         | 0.002 | 0.044 | 0.002 | 0.830 | <0.001 |
| Self-Criticism       | 124  | 0.449         | 0.000 | 0.650 | 0.000 | 0.591 | 0.000 |
| Self-Criticism       | 129  | 0.723         | <.001 | 0.346 | 0.001 | 0.158 | 0.001 |
|                                | 127 |   0.241 |   0.000 |   0.445 |   0.000 |   0.622 |   0.000 |
|--------------------------------|-----|---------|---------|---------|---------|---------|---------|
| Self-Criticism                | 128 |   0.010 |   0.002 |   0.037 |   0.002 |   0.842 | <.001  |
| Social Safety                 | 101 |   0.015 |   0.002 |   0.017 |   0.002 |   0.126 | 0.001  |
| Social Safety                 |  43 |   0.659 | <.001   |   0.841 |   0.000 |   0.699 | <.001  |
| Social Safety                 | 131 |   <.001 |   0.005 | <.001   |   0.005 |   0.918 | <.001  |
| Social Safety                 |  40 |   0.120 |   0.001 |   0.279 |   0.001 |   0.719 | <.001  |
| Social Safety                 | 132 |   0.004 |   0.002 |   0.014 |   0.002 |   0.741 | <.001  |
| Social Safety                 |  62 |   0.001 |   0.003 | <.001   |   0.005 |   0.003 | 0.002  |
| Social Safety                 |  50 |   <.001 |   0.008 | <.001   |   0.008 |   0.981 | <.001  |
| Somatic Anxiety               |  51 |   0.873 | <.001   |   0.980 | <.001   |   0.899 | <.001  |
| Somatic Anxiety               | 103 |   <.001 |   0.008 | <.001   |   0.009 |   0.045 | 0.001  |
| Somatic Anxiety               |  75 |   0.112 |   0.001 |   0.041 |   0.001 |   0.050 | 0.001  |
| Somatic Anxiety               |   3 |   <.001 |   0.010 | <.001   |   0.014 | <.001   | 0.004  |
| Somatic Anxiety               |  53 |   0.006 |   0.002 | <.001   |   0.006 | <.001   | 0.004  |
| Substance Recovery            | 109 |   0.760 |   0.000 |   0.949 |   0.000 |   0.912 | <.001  |
| Substance Recovery            | 154 |   0.429 |   0.002 |   0.602 |   0.003 |   0.532 | 0.001  |
| Substance Recovery            | 108 |   0.912 | <.001   |   0.732 |   0.001 |   0.434 | 0.001  |
| Substance Recovery            | 155 |   0.610 |   0.000 |   0.872 |   0.000 |   0.911 | <.001  |
| Substance Use                 |   5 |   0.026 |   0.002 |   0.082 |   0.002 |   0.926 | <.001  |
| Substance Use                 |   4 |   0.984 | <.001   |   0.692 |   0.001 |   0.391 | 0.001  |
| Substance Use                 | 107 |   0.167 |   0.001 |   0.135 |   0.003 |   0.148 | 0.001  |
| Substance Use                 |  35 |   0.839 | <.001   |   0.979 | <.001   |   0.986 | <.001  |
| Suicide                       |   9 |   0.586 |   0.000 |   0.437 |   0.000 |   0.244 | 0.000  |
| Suicide                       | 105 |   0.005 |   0.003 | <.001   |   0.009 |   0.000 | 0.006  |
| Suicide                       |  77 |   0.874 | <.001   |   0.552 |   0.000 |   0.281 | 0.000  |
| Suicide                       | 106 |   0.450 |   0.000 |   0.150 |   0.002 |   0.072 | 0.002  |
| Trauma Reaction               | 111 |   0.340 |   0.000 |   0.617 |   0.000 |   0.816 | <.001  |
| Trauma Reaction               | 110 |   0.199 |   0.001 |   0.294 |   0.001 |   0.371 | 0.000  |
| Trauma Reaction               | 113 |   0.156 |   0.001 |   0.366 |   0.001 |   0.984 | <.001  |
| Trauma Reaction               | 112 |   0.001 |   0.004 |   0.001 |   0.004 |   0.207 | 0.001  |

Note. Rows where McFadden's $R^2 < .02$ are presented in gray text for clarity.
Analysis results supplement to ‘Initial quantitative development of the Norse Feedback system A novel clinical feedback system for routine mental healthcare’

Andrew A. McAleavey, Samuel S. Nordberg, & Christian Moltu

November 19, 2020

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| Category                        | Site 1 | Site 2 | Site DIF |
|--------------------------------|--------|--------|----------|
| Self-Criticism                 |        |        |          |
| Irritability                   |        |        |          |
| Internal Avoidance             |        |        |          |
| Hopelessness                   |        |        |          |
| Need for Control               |        |        |          |
| Social Safety                  |        |        |          |
| Recovery Environment           |        |        |          |
| Readiness for Recovery         |        |        |          |
| Trauma Reaction                |        |        |          |
| Suicide                        |        |        |          |
| Gender-based DIF: Suicide      |        |        |          |
| Age-based DIF: Suicide         |        |        |          |
| Gender-based DIF: Trauma Reaction |      |        |          |
| Age-based DIF: Trauma Reaction |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Need for Control               |        |        |          |
| Gender-based DIF: Need for Control |      |        |          |
| Age-based DIF: Need for Control |        |        |          |
| Gender-based DIF: Hopelessness |        |        |          |
| Age-based DIF: Hopelessness    |        |        |          |
| Internal Avoidance             |        |        |          |
| Gender-based DIF: Internal Avoidance |    |        |          |
| Age-based DIF: Internal Avoidance |      |        |          |
| Irritability                   |        |        |          |
| Gender-based DIF: Irritability |        |        |          |
| Age-based DIF: Irritability    |        |        |          |
| Self-Criticism                 |        |        |          |
| Site 1                          |        |        |          |
| Site 2                          |        |        |          |
| Site DIF                        |        |        |          |
| Gender-based DIF: Suicide      |        |        |          |
| Age-based DIF: Suicide         |        |        |          |
| Gender-based DIF: Trauma Reaction |      |        |          |
| Age-based DIF: Trauma Reaction |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Need for Control               |        |        |          |
| Gender-based DIF: Need for Control |      |        |          |
| Age-based DIF: Need for Control |        |        |          |
| Gender-based DIF: Hopelessness |        |        |          |
| Age-based DIF: Hopelessness    |        |        |          |
| Internal Avoidance             |        |        |          |
| Gender-based DIF: Internal Avoidance |    |        |          |
| Age-based DIF: Internal Avoidance |      |        |          |
| Irritability                   |        |        |          |
| Gender-based DIF: Irritability |        |        |          |
| Age-based DIF: Irritability    |        |        |          |
| Self-Criticism                 |        |        |          |
| Site 1                          |        |        |          |
| Site 2                          |        |        |          |
| Site DIF                        |        |        |          |
| Gender-based DIF: Suicide      |        |        |          |
| Age-based DIF: Suicide         |        |        |          |
| Gender-based DIF: Trauma Reaction |      |        |          |
| Age-based DIF: Trauma Reaction |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Need for Control               |        |        |          |
| Gender-based DIF: Need for Control |      |        |          |
| Age-based DIF: Need for Control |        |        |          |
| Gender-based DIF: Hopelessness |        |        |          |
| Age-based DIF: Hopelessness    |        |        |          |
| Internal Avoidance             |        |        |          |
| Gender-based DIF: Internal Avoidance |    |        |          |
| Age-based DIF: Internal Avoidance |      |        |          |
| Irritability                   |        |        |          |
| Gender-based DIF: Irritability |        |        |          |
| Age-based DIF: Irritability    |        |        |          |
| Self-Criticism                 |        |        |          |
| Site 1                          |        |        |          |
| Site 2                          |        |        |          |
| Site DIF                        |        |        |          |
| Gender-based DIF: Suicide      |        |        |          |
| Age-based DIF: Suicide         |        |        |          |
| Gender-based DIF: Trauma Reaction |      |        |          |
| Age-based DIF: Trauma Reaction |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Need for Control               |        |        |          |
| Gender-based DIF: Need for Control |      |        |          |
| Age-based DIF: Need for Control |        |        |          |
| Gender-based DIF: Hopelessness |        |        |          |
| Age-based DIF: Hopelessness    |        |        |          |
| Internal Avoidance             |        |        |          |
| Gender-based DIF: Internal Avoidance |    |        |          |
| Age-based DIF: Internal Avoidance |      |        |          |
| Irritability                   |        |        |          |
| Gender-based DIF: Irritability |        |        |          |
| Age-based DIF: Irritability    |        |        |          |
| Self-Criticism                 |        |        |          |
| Site 1                          |        |        |          |
| Site 2                          |        |        |          |
| Site DIF                        |        |        |          |
| Gender-based DIF: Suicide      |        |        |          |
| Age-based DIF: Suicide         |        |        |          |
| Gender-based DIF: Trauma Reaction |      |        |          |
| Age-based DIF: Trauma Reaction |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Need for Control               |        |        |          |
| Gender-based DIF: Need for Control |      |        |          |
| Age-based DIF: Need for Control |        |        |          |
| Gender-based DIF: Hopelessness |        |        |          |
| Age-based DIF: Hopelessness    |        |        |          |
| Internal Avoidance             |        |        |          |
| Gender-based DIF: Internal Avoidance |    |        |          |
| Age-based DIF: Internal Avoidance |      |        |          |
| Irritability                   |        |        |          |
| Gender-based DIF: Irritability |        |        |          |
| Age-based DIF: Irritability    |        |        |          |
| Self-Criticism                 |        |        |          |
| Site 1                          |        |        |          |
| Site 2                          |        |        |          |
| Site DIF                        |        |        |          |
| Gender-based DIF: Suicide      |        |        |          |
| Age-based DIF: Suicide         |        |        |          |
| Gender-based DIF: Trauma Reaction |      |        |          |
| Age-based DIF: Trauma Reaction |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Readiness for Recovery         |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |
| Readiness for Recovery         |        |        |          |
| Gender-based DIF: Readiness for Recovery |        |        |          |
| Age-based DIF: Readiness for Recovery |    |        |          |
| Gender-based DIF: Social Safety |        |        |          |
| Age-based DIF: Social Safety   |        |        |          |

4
Summary

This supplement is ordered roughly by the order of the manuscript.

The Preliminary section covers some essential but not substantively important work. Specifically it includes the R language code for the custom functions used in these analyses, to ease replication.

This is the analysis output companion supplement to “Initial quantitative development of the Norse Feedback system: A novel adaptive multidimensional tool for use in routine mental healthcare.” If you are NOT reading this in the HTML version, we strongly advise that you do so, as this document is too long to navigate as a PDF. Proceed to this webpage (https://osf.io/6xvmf/?view_only=fcbfbb26e65c4c7bb6e8ceed3e975bc), download the HTML version, and open that file using your web browser. The contents are identical to this document.
In Study 2: Scale performance, we present information on each scale’s reliability (Cronbach’s alpha, mean item-total correlation, and alpha if removed statistics), unidimensionality (scree plot, eigenvalue ratio, actual eigenvalues, and factor analysis output including goodness of fit), a graded response model for that scale, along with DIF analyses for gender and sample (clinical vs. nonclinical). The outputs are a combination of standard software-generated outputs and synthesized results.

These analytic outputs are already described in the text, but as we could not feasibly include all meaningful information for each scale in a single table, interested readers are directed to these individual scale analyses. Relevant DIF output includes the number of items flagged for DIF, along with the magnitude of effect size.

In Study 2: ROC curves, we present visual representations of the scales’ discrimination abilities between the clinical and nonclinical samples in this study.

In Study 3: Scale performance, we present very similar analyses to those presented in Study 2: Scale performance. The primary differences are in the group comparisons for DIF analysis. Outputs are similar or exactly the same.

The Session Information section contains the custom functions and loaded packages required to run these analyses.

### Preliminary

Loaded libraries are found at the end of this document, along with version numbers of packages and R. We omit the call here for legibility.

### Functions

Several convenience and analysis functions are defined at this point in the report with suppressed output, and are repeated in the Session Information section at the end of the document.

These functions rely on objects of type `grm` from the package `{ltm}` and type `roc` from the package `{pROC}`, among others. Again, they are actually defined at this point in the analysis code, but are not presented until the final section of this document for reference.

All installed packages are included in the Session Information section below. The subsequent code loops through different repeatable reports, each with several functions for each scale, and knits a single report from them.

### Reading data

This section imports data from external repositories, the location of which is obscured for security reasons. Some (but not all) analysis objects are read into the global environment from previously-saved locations. This reduces compilation time of this supplement. Reproduction of analyses is still demonstrated within the code below. Interested readers may examine all code upon request (to AAM), though most analysis code is not included for here for clarity.
Study 2: Scale performance

Attachment

Reliability: Attachment

```r
## Cronbach's alpha is 0.607.
## Mean item-total correlation is 0.278.
## If each item were dropped:
## raw_alpha std.alpha 06(smc) average_r S/N alpha se var.r med.r
## Q41 0.49 0.49 0.40 0.24 0.96 0.035 0.00670 0.21
## Q1 0.57 0.57 0.47 0.30 1.31 0.030 0.00089 0.30
## Q50- 0.54 0.54 0.45 0.29 1.20 0.032 0.00584 0.28
## Q89 0.54 0.54 0.45 0.28 1.17 0.032 0.00885 0.30
```

Unidimensionality: Attachment

Scree Plot

```r
## [1] "Ratio of first to second eigenvalues: 2.09"
## [1] 1.8408832 0.8807387 0.6744616 0.6039165
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q41 0.63 0.40 0.60 1
## Q1 0.47 0.22 0.78 1
## Q50 -0.50 0.25 0.75 1
## Q89 0.51 0.26 0.74 1
```
## MR1
## SS loadings  1.14
## Proportion Var 0.28
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 6 and the objective function was 0.41 with Chi Square of 255.51
## The degrees of freedom for the model are 2 and the objective function was 0.03
##
## The root mean square of the residuals (RMSR) is 0.05
## The df corrected root mean square of the residuals is 0.09
##
## The harmonic number of observations is 600 with the empirical chi square 19.9 with prob < 4.8e-05
## The total number of observations was 619 with Likelihood Chi Square = 18.96 with prob < 7.6e-05
##
## Tucker Lewis Index of factoring reliability = 0.796
## RMSEA index = 0.117 and the 90 % confidence intervals are 0.073 0.168
## BIC = 6.1
## Fit based upon off diagonal values = 0.97
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.79
## Multiple R square of scores with factors 0.62
## Minimum correlation of possible factor scores 0.24

Graded-Response Model: Attachment

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q41     | -2.521  | -1.489  | -0.855  | -0.270  | 0.270   | 0.920  | 1.659  |
| Q1      | -3.596  | -2.512  | -1.895  | -1.186  | -0.477  | 0.547  | 1.128  |
| Q50     | 3.150   | 1.824   | 0.999   | 0.230   | -0.497  | -1.300 | -1.030 |
| Q89     | -2.350  | -1.344  | -0.483  | 0.459   | 1.214   | 2.079  | 1.106  |
Gender-based DIF: Attachment

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```
Number of DIF groups: 2

Number of items flagged for DIF: 2 of 4

Items flagged: 2, 3

Number of iterations for purification: 3 of 10

Detection criterion: Chisqr

Threshold: alpha = 0.01

| item | ncat | chi2 | chi12 | chi13 | chi23 |
|------|------|------|-------|-------|-------|
| 1    | 1    | 7    | 0.0406| 0.1139| 0.6945|
| 2    | 2    | 7    | 0.0000| 0.0000| 0.8835|
| 3    | 3    | 7    | 0.0697| 0.0000| 0.0000|
| 4    | 4    | 7    | 0.5904| 0.7356| 0.5690|

Trait Distributions

- Female
- Male
Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)

Item True Score Functions – Item 3

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Sample-based DIF: Attachment

## Call:
# lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 4 of 4

## Items flagged: 1, 2, 3, 4

## Number of iterations for purification: 2 of 10

## Detection criterion: Chisqr

## Threshold: alpha = 0.01

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 7     | 0.0000| 0.0117|
| 2    | 2    | 6     | 0.0179| 0.0241|
| 3    | 3    | 7     | 0.0000| 0.0633|
| 4    | 4    | 7     | 0.0000| 0.0627|

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### Avoidance

**Reliability: Avoidance**

## Cronbach's alpha is 0.663.

## Mean item-total correlation is 0.242.

## If each item were dropped:

| item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q78  | 0.61      | 0.60      | 0.59    | 0.23      | 1.5 | 0.024 | 0.015 | 0.026 | 0.21  |
| Q8   | 0.58      | 0.58      | 0.54    | 0.21      | 1.4 | 0.026 | 0.015 | 0.015 | 0.19  |
| Q10  | 0.69      | 0.69      | 0.66    | 0.31      | 2.2 | 0.019 | 0.012 | 0.021 | 0.31  |
| Q17  | 0.67      | 0.66      | 0.64    | 0.28      | 1.9 | 0.021 | 0.012 | 0.021 | 0.30  |
| Q34  | 0.58      | 0.57      | 0.55    | 0.21      | 1.3 | 0.027 | 0.021 | 0.018 | 0.19  |
| Q64  | 0.58      | 0.57      | 0.55    | 0.21      | 1.3 | 0.026 | 0.018 | 0.20  |
Unidimensionality: Avoidance

Scree Plot

## [1] "Ratio of first to second eigenvalues: 2.152"
## [1] 2.3191260 1.0777077 0.8164151 0.7313954 0.5587366 0.4966192

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##     MR1  h2  u2  com
## Q78 0.51 0.265 0.74  1
## Q8  0.65 0.422 0.58  1
## Q10 0.20 0.041 0.96  1
## Q17 0.33 0.108 0.89  1
## Q34 0.64 0.404 0.60  1
## Q64 0.66 0.438 0.56  1
##
## MR1
## SS loadings 1.68
## Proportion Var 0.28
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 15 and the objective function was 0.88 with Chi Square of 542.34
## The degrees of freedom for the model are 9 and the objective function was 0.09
##
## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.07
##

## The harmonic number of observations is 588 with the empirical chi square 56.01 with prob < 7.8e-09
## The total number of observations was 619 with Likelihood Chi Square = 52.48 with prob < 3.7e-08
## Tucker Lewis Index of factoring reliability = 0.862
## RMSEA index = 0.088 and the 90 % confidence intervals are 0.066 0.112
## BIC = -5.37
## Fit based upon off diagonal values = 0.96
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.85
## Multiple R square of scores with factors 0.73
## Minimum correlation of possible factor scores 0.46

Graded-Response Model: Avoidance

Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
Q78  -1.691  -1.103  -0.620  0.011   0.690   1.603   1.204
Q8   -0.959  -0.378   0.007   0.503   1.016   1.702   1.758
Q10  -4.307  -2.102  -0.561   1.571   3.157   5.490   0.426
Q17   0.239   1.113   1.539   2.111   2.758   3.607   0.793
Q34  -1.558  -0.925  -0.518  -0.044   0.536   1.156   1.684
Q64  -1.162  -0.468   0.014   0.598   1.076   1.768   1.722

![Test Information Function](image-url)
Gender-based DIF: Avoidance

## Call:
```r
lordin::lordin(resp.data = as.data.frame(sex.data), group = sex)
```

## Number of DIF groups: 2

## Number of items flagged for DIF: 3 of 6

## Items flagged: 4, 5, 6

## Number of iterations for purification: 2 of 10

## Detection criterion: Chisqr

## Threshold: alpha = 0.01

## item ncat chi12 chi13 chi23
## 1 1 7 0.5349 0.8207 0.9195
## 2 2 7 0.2344 0.4385 0.6278
## 3 3 7 0.0718 0.1315 0.3664
## 4 4 7 0.0039 0.0157 0.9387
## 5 5 7 0.0306 0.0005 0.0012
## 6 6 7 0.0002 0.0001 0.0636
Trait Distributions

Item True Score Functions – Item 4

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Item True Score Functions – Item 5

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Sample-based DIF: Avoidance

```
## Call:
## lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
##
## Number of DIF groups: 2
```
## Connectedness

### Reliability: Connectedness

## Cronbach's alpha is 0.71.
## Mean item-total correlation is 0.263.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|-------|----|-------|-------|
| Q43  | 0.66      | 0.67       | 0.65    | 0.25      | 2.0 | 0.021 | 0.0095 | 0.23 |
| Q45  | 0.72      | 0.72       | 0.71    | 0.30      | 2.6 | 0.017 | 0.0104 | 0.29 |
| Q50  | 0.68      | 0.68       | 0.67    | 0.26      | 2.1 | 0.020 | 0.0135 | 0.23 |
| Q54  | 0.70      | 0.70       | 0.68    | 0.28      | 2.4 | 0.019 | 0.0112 | 0.28 |
| Q62  | 0.65      | 0.66       | 0.64    | 0.24      | 1.9 | 0.022 | 0.0097 | 0.23 |
| Q69  | 0.66      | 0.67       | 0.65    | 0.25      | 2.0 | 0.021 | 0.0140 | 0.21 |
| Q80  | 0.67      | 0.68       | 0.66    | 0.26      | 2.1 | 0.020 | 0.0138 | 0.21 |
Unidimensionality: Connectedness

Scree Plot

```
## [1] "Ratio of first to second eigenvalues: 2.506"
## [1] 2.6359076 1.0516989 0.9643826 0.7120680 0.6526773 0.5133448 0.4699208

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q43 -0.62 0.385 0.61 1
## Q45  0.30 0.092 0.91 1
## Q50 -0.53 0.284 0.72 1
## Q54  0.39 0.151 0.85 1
## Q62  0.66 0.437 0.56 1
## Q69  0.56 0.314 0.69 1
## Q80  0.54 0.292 0.71 1
##
## MR1
## SS loadings 1.96
## Proportion Var 0.28
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 21 and the objective function was 1.2 with Chi Square of 740.8
## The degrees of freedom for the model are 14 and the objective function was 0.2
##
## The root mean square of the residuals (RMSR) is 0.07
## The df corrected root mean square of the residuals is 0.09
```
The harmonic number of observations is 570 with the empirical chi square 122.58 with prob < 2e-19
The total number of observations was 619 with Likelihood Chi Square = 121.65 with prob < 3e-19

Tucker Lewis Index of factoring reliability = 0.775
RMSEA index = 0.111 and the 90% confidence intervals are 0.094 0.13
BIC = 31.66
Fit based upon off diagonal values = 0.94
Measures of factor score adequacy

Correlation of (regression) scores with factors 0.86
Multiple R square of scores with factors 0.75
Minimum correlation of possible factor scores 0.49

Graded-Response Model: Connectedness

|     | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-----|---------|---------|---------|---------|---------|---------|--------|
| Q43 | -1.674  | -1.011  | -0.456  | 0.110   | 0.606   | 1.500   | 1.618  |
| Q45 | 2.043   | 0.908   | 0.269   | -0.914  | -1.641  | -2.948  | -0.593 |
| Q50 | -2.858  | -1.662  | -0.909  | -0.208  | 0.457   | 1.184   | 1.189  |
| Q54 | 3.218   | 1.807   | 0.873   | -0.063  | -0.955  | -1.899  | -0.750 |
| Q62 | 1.825   | 1.107   | 0.628   | 0.222   | -0.209  | -0.857  | -1.851 |
| Q69 | 1.771   | 1.017   | 0.422   | -0.344  | -0.850  | -1.550  | -1.191 |
| Q80 | 3.328   | 2.116   | 1.632   | 0.945   | 0.281   | -0.498  | -1.309 |

Test Information Function
Gender-based DIF: Connectedness

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 3 of 7
##
## Items flagged: 2, 5, 7
##
## Number of iterations for purification: 4 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1  7  0.0484  0.0636  0.2042
## 2 2  7  0.0002  0.0000  0.0012
## 3 3  7  0.0845  0.0774  0.1434
## 4 4  7  0.2402  0.2957  0.3039
## 5 5  7  0.0000  0.0000  0.0449
## 6 6  7  0.6212  0.8710  0.8580
## 7 7  7  0.0000  0.0001  0.7625
```
Trait Distributions

Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Item True Score Functions – Item 5

- $P(x_{12}, 1) = 0.042$, $P(x_{12}, 1) = 0.0072$

- $R_{12} = 0.0072$

- $\Delta(\beta_1) = 0.0022$

Item Response Functions

- Probability

- $1.87, -3.04, -2.32, -1.84, -1.4, -0.75, -0.0$

- $1.65, -2.8, -1.88, -1.65, -1.14, -0.6, 0.26$

Differences in Item True Score Functions

- $P(x_{12}, 1) = 0.042$, $P(x_{12}, 1) = 0.0072$

- $R_{12} = 0.0072$

- $\Delta(\beta_1) = 0.0022$

Impact (Weighted by Density)

- Size

- $-4, -2, 0, 2, 4$

Item True Score Functions – Item 7

- $P(x_{13}, 2) = 1e^{-0.04}$

- $R_{13} = 0.0052$

- $P(x_{23}, 1) = 0.7625$

- $R_{23} = 0.001$

Item Response Functions

- Probability

- $1.87, -3.04, -2.32, -1.84, -1.4, -0.75, -0.0$

- $1.65, -2.8, -1.88, -1.65, -1.14, -0.6, 0.26$

Differences in Item True Score Function

- $P(x_{13}, 2) = 1e^{-0.04}$

- $R_{13} = 0.0052$

- $P(x_{23}, 1) = 0.7625$

- $R_{23} = 0.001$
Sample-based DIF: Connectedness

```r
# Call:
# lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
#
# Number of DIF groups: 2
#```
## Number of items flagged for DIF: 7 of 7
## Items flagged: 1, 2, 3, 4, 5, 6, 7
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01
## item ncat chi12 chi13 chi23
## 1 1 7 0 0 0.0006
## 2 2 7 0 0 0.9808
## 3 3 7 0 0 0.0019
## 4 4 7 0 0 0.0275
## 5 5 7 0 0 0.0012
## 6 6 7 0 0 0.6404
## 7 7 7 0 0 0.0000

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Demoralization

Reliability: Demoralization

## Cronbach's alpha is 0.799.
## Mean item-total correlation is 0.441.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q88 0.75 0.75 0.70 0.42 2.9 0.016 0.0108 0.41
## Q24 0.73 0.73 0.68 0.41 2.7 0.017 0.0071 0.39
## Q36 0.80 0.81 0.76 0.51 4.1 0.013 0.0026 0.51
## Q42 0.75 0.74 0.70 0.42 2.9 0.016 0.0081 0.39
## Q61 0.76 0.76 0.72 0.44 3.2 0.015 0.0137 0.44
Unidimensionality: Demoralization

Scree Plot

## [1] "Ratio of first to second eigenvalues: 3.739"
## [1] 2.7934518 0.7472057 0.5770869 0.4626998 0.4195558

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##   MR1 h2  u2  com
## Q88 0.71 0.51 0.49  1
## Q24 0.78 0.60 0.40  1
## Q36 0.48 0.23 0.77  1
## Q42 0.72 0.52 0.48  1
## Q61 0.65 0.42 0.58  1
##
##   MR1
## SS loadings 2.28
## Proportion Var 0.46
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 10 and the objective function was 1.45 with Chi Square of 894.4
## The degrees of freedom for the model are 5 and the objective function was 0.01
##
## The root mean square of the residuals (RMSR) is 0.02
## The df corrected root mean square of the residuals is 0.03
##
## The harmonic number of observations is 598 with the empirical chi square 4.45 with prob < 0.49
# The total number of observations was 619 with Likelihood Chi Square = 6.66 with prob < 0.25
# Tucker Lewis Index of factoring reliability = 0.996
# RMSEA index = 0.023 and the 90 % confidence intervals are 0 0.064
# BIC = -25.48
# Fit based upon off diagonal values = 1
# Measures of factor score adequacy

## MR1
# Correlation of (regression) scores with factors 0.91
# Multiple R square of scores with factors 0.82
# Minimum correlation of possible factor scores 0.65

Graded-Response Model: Demoralization

|     | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-----|---------|---------|---------|---------|---------|---------|---------|
| Q88 | -1.045  | -0.594  | -0.253  | 0.150   | 0.592   | 1.028   | 1.991   |
| Q24 | -1.091  | -0.472  | -0.030  | 0.406   | 0.874   | 1.476   | 2.439   |
| Q36 | -0.399  | 0.406   | 0.937   | 1.660   | 2.416   | 3.251   | 1.116   |
| Q42 | -1.555  | -0.860  | -0.439  | -0.039  | 0.495   | 1.099   | 2.046   |
| Q61 | -0.376  | 0.164   | 0.640   | 1.168   | 1.754   | 2.268   | 1.890   |

Test Information Function

![Test Information Function Graph](image-url)
Gender-based DIF: Demoralization

## Call:
`lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)`

## Number of DIF groups: 2

## Number of items flagged for DIF: 1 of 5

## Items flagged: 2

## Number of iterations for purification: 3 of 10

## Detection criterion: Chisqr

## Threshold: alpha = 0.01

| item ncat | chi12  | chi13  | chi23  |
|-----------|--------|--------|--------|
| 1         | 1      | 7      | 0.8571 | 0.9625 | 0.8336 |
| 2         | 2      | 7      | 0.0000 | 0.0000 | 0.7581 |
| 3         | 3      | 7      | 0.8880 | 0.7918 | 0.5038 |
| 4         | 4      | 7      | 0.3452 | 0.5849 | 0.6699 |
| 5         | 5      | 7      | 0.0560 | 0.1005 | 0.3319 |
Trait Distributions

Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Sample-based DIF: Demoralization

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
##
## Number of DIF groups: 2
```

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## Number of items flagged for DIF: 5 of 5
## Items flagged: 1, 2, 3, 4, 5
## Number of iterations for purification: 4 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01
##
### item ncat chi12 chi13 chi23
### 1 1 7 0 0 0.0000
### 2 2 7 0 0 0.0996
### 3 3 6 0 0 0.0000
### 4 4 7 0 0 0.0001
### 5 5 7 0 0 0.9601

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### Eating Problems

Reliability: Eating Problems

## Cronbach's alpha is 0.751.
## Mean item-total correlation is 0.365.
## If each item were dropped:
##
### raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
### Q63 0.69 0.72 0.71 0.34 2.6 0.020 0.037 0.27
### Q18 0.68 0.70 0.68 0.32 2.3 0.020 0.027 0.26
### Q46 0.66 0.69 0.68 0.31 2.2 0.022 0.030 0.26
### Q47 0.80 0.81 0.79 0.46 4.3 0.013 0.024 0.49
### Q57 0.71 0.73 0.72 0.35 2.7 0.019 0.040 0.28
### Q86 0.75 0.78 0.77 0.41 3.5 0.016 0.044 0.49

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Unidimensionality: Eating Problems

Scree Plot

## 

## [1] "Ratio of first to second eigenvalues: 3.187"

## [1] 2.9776746 0.9342068 0.8223128 0.5632239 0.3682961 0.3342858

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q63 0.71 0.51 0.49 1
## Q18 0.82 0.67 0.33 1
## Q46 0.83 0.69 0.31 1
## Q47 0.24 0.06 0.94 1
## Q57 0.66 0.44 0.56 1
## Q86 0.39 0.16 0.84 1

##
## SS loadings 2.52
## Proportion Var 0.42

##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 15 and the objective function was 1.84 with Chi Square of 1132.68
## The degrees of freedom for the model are 9 and the objective function was 0.04
## The root mean square of the residuals (RMSR) is 0.03
## The df corrected root mean square of the residuals is 0.04
##
## The harmonic number of observations is 595 with the empirical chi square 13.27 with prob < 0.15
## The total number of observations was 619 with Likelihood Chi Square = 25.12 with prob < 0.0028
## Tucker Lewis Index of factoring reliability = 0.976
## RMSEA index = 0.054 and the 90 % confidence intervals are 0.029 0.079
## BIC = -32.73
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.93
## Multiple R square of scores with factors 0.86
## Minimum correlation of possible factor scores 0.73

Graded-Response Model: Eating Problems

| Exrmt1 | Exrmt2 | Exrmt3 | Exrmt4 | Exrmt5 | Exrmt6 | Dscrmn |
|--------|--------|--------|--------|--------|--------|--------|
| Q63    | -0.323 | 0.167  | 0.556  | 0.954  | 1.261  | 1.655  | 2.565  |
| Q18    | 0.666  | 1.116  | 1.380  | 1.634  | 1.782  | 2.056  | 3.708  |
| Q46    | 0.216  | 0.682  | 0.874  | 1.091  | 1.303  | 1.532  | 3.543  |
| Q47    | -1.224 | 0.057  | 0.737  | 1.700  | 2.578  | 3.842  | 0.531  |
| Q57    | 0.860  | 1.254  | 1.486  | 1.685  | 1.869  | 2.169  | 2.710  |
| Q86    | -2.243 | -1.367 | -0.724 | -0.006 | 0.728  | 1.573  | 1.003  |

Test Information Function
Gender-based DIF: Eating Problems

## Call:
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 6
##
## Items flagged: 5, 6
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 7 0.1350 0.2649 0.5156
## 2 2 5 0.0183 0.0413 0.3703
## 3 3 7 0.9834 0.9395 0.7244
## 4 4 7 0.7325 0.7573 0.5076
## 5 5 5 0.0022 0.0003 0.0085
## 6 6 7 0.0008 0.0000 0.0029
Item True Score Functions – Item 6

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items
Sample-based DIF: Eating Problems

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
```
##
##   Number of DIF groups: 2
##   Number of items flagged for DIF: 6 of 6
##   Items flagged: 1, 2, 3, 4, 5, 6
##   Number of iterations for purification: 2 of 10
##   Detection criterion: Chisqr
##   Threshold: alpha = 0.01
##
```r
# item ncat chi12 chi13 chi23
## 1  1  7 0.0000 0e+00 0.0278
## 2  2  6 0.7208 0e+00 0.0000
## 3  3  7 0.0000 0e+00 0.0189
## 4  4  7 0.0000 0e+00 0.0035
## 5  5  6 0.0001 3e-04 0.7931
## 6  6  7 0.0000 0e+00 0.0070
```

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Hypervigilance

Reliability: Hypervigilance

## Cronbach's alpha is 0.502.
## Mean item-total correlation is 0.199.
## If each item were dropped:
## |   | raw_alpha | std.alpha | G6(smc) | average_r | S/N alpha | se | var.r | med.r |
## |---|-----------|-----------|---------|-----------|-----------|----|-------|-------|
## | Q2| 0.40      | 0.40      | 0.32    | 0.18      | 0.68      | 0.036| 0.0024| 0.17  |
## | Q7| 0.30      | 0.30      | 0.23    | 0.13      | 0.43      | 0.043| 0.0015| 0.12  |
## | Q9-| 0.51     | 0.51      | 0.44    | 0.25      | 1.03      | 0.029| 0.0290| 0.24  |
## | Q50-| 0.48     | 0.48      | 0.41    | 0.23      | 0.91      | 0.032| 0.0302| 0.15  |

Unidimensionality: Hypervigilance

Scree Plot

Dimension

## [1] "Ratio of first to second eigenvalues: 1.64"
## [1] 1.6106444 0.9821730 0.8529011 0.5542815

Factor Analysis using method = minres
Call: fa(r = grm_obj$X)
Standardized loadings (pattern matrix) based upon correlation matrix
MR1  h2  u2  com
| Q2 | 0.50 | 0.254 | 0.75 | 1 |
| Q7 | 0.81 | 0.661 | 0.34 | 1 |
| Q9-| -0.22| 0.050 | 0.95 | 1 |
| Q50-| -0.27| 0.074 | 0.93 | 1 |

MR1
SS loadings  1.04
## Proportion Var 0.26
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 6 and the objective function was 0.29 with Chi Square of 235.59
## The degrees of freedom for the model are 2 and the objective function was 0.02
## The root mean square of the residuals (RMSR) is 0.04
## The df corrected root mean square of the residuals is 0.08
## The harmonic number of observations is 526 with the empirical chi square 12.71 with prob < 0.0017
## The total number of observations was 814 with Likelihood Chi Square = 13.6 with prob < 0.0011
## Tucker Lewis Index of factoring reliability = 0.848
## RMSEA index = 0.084 and the 90 % confidence intervals are 0.046 0.129
## BIC = 0.19
## Fit based upon off diagonal values = 0.96
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.84
## Multiple R square of scores with factors 0.71
## Minimum correlation of possible factor scores 0.42

Graded-Response Model: Hypervigilance

## Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q2 -1.170 -0.297 0.325 1.596 2.307 1.271
## Q7 -1.662 -0.946 -0.551 -0.045 0.600 1.299 2.311
## Q9 7.802 5.107 3.237 2.268 0.712 -1.297 -0.443
## Q50 2.410 0.586 -0.980 -2.933 -4.620 -7.070 -0.542
Gender-based DIF: Hypervigilance

## Call:
```
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```
Number of DIF groups: 2
Number of items flagged for DIF: 0 of 4
Items flagged:
Number of iterations for purification: 1 of 10
Detection criterion: Chisqr
Threshold: alpha = 0.01

Sample-based DIF: Hypervigilance

Call:
lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
Number of DIF groups: 2
Number of items flagged for DIF: 4 of 4
Items flagged: 1, 2, 3, 4
Number of iterations for purification: 1 of 10
Detection criterion: Chisqr
Threshold: alpha = 0.01

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 0.0002| 0.0007| 0.3568|
| 2    | 2    | 0.0011| 0.0025| 0.2490|
| 3    | 3    | 0.0000| 0.0000| 0.0001|
| 4    | 4    | 0.0000| 0.0000| 0.4669|

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Pressure from Negative Affect

Reliability: Pressure from Negative Affect

Cronbach's alpha is 0.762.
Mean item-total correlation is 0.266.
If each item were dropped:

| raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q28       | 0.74      | 0.75    | 0.75      | 0.27| 2.9   | 0.015| 0.024 | 0.21  |
| Q21       | 0.76      | 0.76    | 0.76      | 0.29| 3.2   | 0.014| 0.023 | 0.23  |
| Q30       | 0.76      | 0.77    | 0.77      | 0.29| 3.3   | 0.014| 0.022 | 0.24  |
| Q32       | 0.76      | 0.77    | 0.77      | 0.29| 3.3   | 0.014| 0.022 | 0.24  |
| Q33       | 0.76      | 0.76    | 0.76      | 0.29| 3.2   | 0.014| 0.022 | 0.22  |
| Q42       | 0.71      | 0.71    | 0.71      | 0.24| 2.5   | 0.017| 0.013 | 0.21  |
| Q51       | 0.72      | 0.72    | 0.72      | 0.24| 2.6   | 0.017| 0.017 | 0.21  |
Unidimensionality: Pressure from Negative Affect

Scree Plot

```r
## Q60 0.72 0.72 0.71 0.24 2.6 0.016 0.014 0.21
## Q88 0.71 0.72 0.72 0.24 2.5 0.017 0.018 0.21

## [1] "Ratio of first to second eigenvalues: 3.081"
## [1] 3.3149321 1.0759714 0.9575043 0.8739044 0.7461750 0.7054858 0.5463449
## [8] 0.4489102 0.3307720

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##   MR1   h2   u2  com
## Q28 0.47 0.217 0.78 1
## Q21 0.33 0.107 0.89 1
## Q30 0.30 0.091 0.91 1
## Q32 0.30 0.091 0.91 1
## Q33 0.36 0.127 0.87 1
## Q42 0.78 0.612 0.39 1
## Q51 0.70 0.488 0.51 1
## Q60 0.72 0.515 0.49 1
## Q88 0.71 0.498 0.50 1

## MR1
## SS loadings 2.75
## Proportion Var 0.31
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
```
## The degrees of freedom for the null model are 36 and the objective function was 2.06 with Chi Square of 1265.17
## The degrees of freedom for the model are 27 and the objective function was 0.18
## The root mean square of the residuals (RMSR) is 0.05
## The df corrected root mean square of the residuals is 0.06
## The harmonic number of observations is 596 with the empirical chi square 100.86 with prob < 1.9e-10
## The total number of observations was 619 with Likelihood Chi Square = 107.41 with prob < 1.5e-11
## Tucker Lewis Index of factoring reliability = 0.913
## RMSEA index = 0.069 and the 90 % confidence intervals are 0.056 0.083
## BIC = -66.15
## Fit based upon off diagonal values = 0.97
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.92
## Multiple R square of scores with factors 0.84
## Minimum correlation of possible factor scores 0.68

**Graded-Response Model: Pressure from Negative Affect**

|       | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-------|---------|---------|---------|---------|---------|---------|--------|
| Q28   | -0.888  | -0.079  | 0.405   | 0.964   | 1.460   | 2.286   | 1.012  |
| Q21   | -0.821  | 0.517   | 1.144   | 1.904   | 2.699   | 3.756   | 0.597  |
| Q30   | -1.704  | -0.432  | 0.642   | 1.685   | 2.946   | 4.047   | 0.565  |
| Q32   | 1.857   | 2.400   | 2.642   | 2.878   | 3.022   | 3.325   | 0.861  |
| Q33   | -3.680  | -2.399  | -1.641  | -0.695  | 0.496   | 1.656   | 0.728  |
| Q42   | -1.452  | -0.815  | -0.423  | -0.043  | 0.460   | 1.014   | 2.611  |
| Q51   | -1.853  | -1.332  | -0.854  | -0.345  | 0.261   | 0.865   | 1.934  |
| Q60   | -2.524  | -1.833  | -1.017  | -0.143  | 0.675   | 1.441   | 2.178  |
| Q88   | -1.098  | -0.625  | -0.268  | 0.156   | 0.618   | 1.080   | 1.788  |
Gender-based DIF: Pressure from Negative Affect

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```

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## Number of DIF groups: 2
## Number of items flagged for DIF: 1 of 9
## Items flagged: 1
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

| item | ncat | chi2 | chi13 | chi23 |
|------|------|------|-------|-------|
| 1    | 1    | 7    | 0.0000| 0.0000| 0.4929|
| 2    | 2    | 7    | 0.8050| 0.7915| 0.5236|
| 3    | 3    | 7    | 0.6081| 0.8446| 0.7844|
| 4    | 4    | 3    | 0.7143| 0.6104| 0.3556|
| 5    | 5    | 7    | 0.1627| 0.1935| 0.2478|
| 6    | 6    | 7    | 0.7395| 0.8586| 0.6593|
| 7    | 7    | 7    | 0.6815| 0.1484| 0.0562|
| 8    | 8    | 7    | 0.7710| 0.4137| 0.1949|
| 9    | 9    | 7    | 0.2798| 0.3582| 0.3467|

![Trait Distributions](image-url)

- **Female**
- **Male**

---

Density

theta
Item True Score Functions – Item 1

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items

TCC
Sample-based DIF: Pressure from Negative Affect

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
```
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 9 of 9
##
## Items flagged: 1, 2, 3, 4, 5, 6, 7, 8, 9
##
## Number of iterations for purification: 4 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 1 7 0 0 0.0141
## 2 2 2 7 0 0 0.8857
## 3 3 3 7 0 0 0.1536
## 4 4 4 3 0 0 0.0949
## 5 5 5 7 0 0 0.0517
## 6 6 6 7 0 0 0.1544
## 7 7 7 7 0 0 0.1544
## 8 8 8 7 0 0 0.0503
## 9 9 9 7 0 0 0.0069
```

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Perfectionism

Reliability: Perfectionism

## Cronbach's alpha is 0.732.
## Mean item-total correlation is 0.282.
## If each item were dropped:
## 
|   | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|---|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q20 | 0.70      | 0.70      | 0.68    | 0.28      | 2.3 | 0.016 | 0.0063 | 0.26  |
| Q26 | 0.68      | 0.69      | 0.66    | 0.27      | 2.2 | 0.017 | 0.0055 | 0.26  |
| Q28 | 0.71      | 0.71      | 0.68    | 0.29      | 2.5 | 0.016 | 0.0056 | 0.27  |
| Q38 | 0.69      | 0.69      | 0.67    | 0.28      | 2.3 | 0.017 | 0.0065 | 0.26  |
| Q48 | 0.71      | 0.72      | 0.70    | 0.30      | 2.5 | 0.016 | 0.0061 | 0.29  |
| Q52 | 0.70      | 0.69      | 0.66    | 0.27      | 2.3 | 0.016 | 0.0033 | 0.26  |
| Q68 | 0.71      | 0.71      | 0.68    | 0.29      | 2.4 | 0.016 | 0.0038 | 0.29  |

Unidimensionality: Perfectionism

Scree Plot

## Ratio of first to second eigenvalues: 2.704

## Factor Analysis using method = minres

Factor Analysis using method = minres
## Standardized loadings (pattern matrix) based upon correlation matrix

|   | MR1 | h2  | u2  | com |
|---|-----|-----|-----|-----|
| Q20 | 0.53 | 0.28 | 0.72 | 1   |
| Q26 | 0.62 | 0.39 | 0.61 | 1   |
| Q28 | 0.46 | 0.21 | 0.79 | 1   |
| Q38 | 0.57 | 0.32 | 0.68 | 1   |
Graded-Response Model: Perfectionism

## Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q20 -1.465 -0.536 0.132 0.828 1.586 2.587 1.254
## Q26 -1.282 -0.488 -0.036 0.519 1.228 2.075 1.514
## Q28 -0.760 -0.097 0.467 0.981 1.560 2.469 1.122
## Q38 -1.649 -0.849 -0.264 0.274 0.919 1.781 1.263
## Q48  0.546  1.285  1.688  2.150  2.744  3.236  1.037
## Q52 -2.610 -1.935 -1.416 -0.584  0.209  1.215  1.460
## Q68 -2.779 -1.732 -1.067 -0.487  0.331  1.174  1.184
Gender-based DIF: Perfectionism

## Call:
```
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```
Number of DIF groups: 2

Number of items flagged for DIF: 2 of 7

Items flagged: 2, 3

Number of iterations for purification: 2 of 10

Detection criterion: Chisqr

Threshold: alpha = 0.01

| item | ncat | chi2 | chi3 | chi23 |
|------|------|------|------|-------|
| 1    | 1    | 7    | 0.1771 | 0.3950 | 0.8489 |
| 2    | 2    | 7    | 0.0000 | 0.0001 | 0.6397 |
| 3    | 3    | 7    | 0.0000 | 0.0000 | 0.2082 |
| 4    | 4    | 7    | 0.5884 | 0.2817 | 0.1344 |
| 5    | 5    | 7    | 0.0324 | 0.0789 | 0.4790 |
| 6    | 6    | 7    | 0.1503 | 0.1989 | 0.2813 |
| 7    | 7    | 7    | 0.0309 | 0.0972 | 0.9456 |

Trait Distributions

Female
Male
Item True Score Functions

- Item 2

Item Response Functions

- Item 3

Differences in Item True Score Functions

Impact (Weighted by Density)
Sample-based DIF: Perfectionism

```
## Call:
## lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
##
## Number of DIF groups: 2
```

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## Number of items flagged for DIF: 2 of 7
## Items flagged: 3, 4
## Number of iterations for purification: 3 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

```
# item ncat chi12 chi13 chi23
# 1 1 7 0.2801 0.0341 0.0180
# 2 2 7 0.9059 0.9648 0.8102
# 3 3 7 0.0000 0.0000 0.0000
# 4 4 7 0.0000 0.0000 0.0000
# 5 5 7 0.0179 0.0606 0.9653
# 6 6 7 0.0406 0.0306 0.0954
# 7 7 7 0.0436 0.1056 0.5156
```

### Trait Distributions

![Trait Distributions](image)
Item True Score Functions – Item 3

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

Item True Score Functions – Item 4

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)
Psychosis

Reliability: Psychosis

## Cronbach's alpha is 0.416.
## Mean item-total correlation is 0.202.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N alpha | se | var.r | med.r |
|------|-----------|------------|---------|------------|-----------|----|-------|-------|
| Q58  | 0.27      | 0.28       | 0.16    | 0.16       | 0.38      | 0.057 | NA    | 0.16  |
| Q29  | 0.28      | 0.29       | 0.17    | 0.17       | 0.40      | 0.057 | NA    | 0.17  |
| Q49  | 0.40      | 0.43       | 0.28    | 0.28       | 0.76      | 0.044 | NA    | 0.28  |

Unidimensionality: Psychosis

### Scree Plot

![Scree Plot](image)

### Factor Analysis using method = minres

**Call:** `fa(r = grm_obj$X)`

**Standardized loadings (pattern matrix) based upon correlation matrix**

| Item | MR1 | h2   | u2   | com |
|------|-----|------|------|-----|
| Q58  | 0.54| 0.29 | 0.71 | 1   |
| Q29  | 0.51| 0.26 | 0.74 | 1   |
| Q49  | 0.32| 0.10 | 0.90 | 1   |

**SS loadings 0.65**

**Proportion Var 0.22**

**Mean item complexity = 1**

**Test of the hypothesis that 1 factor is sufficient.**

**The degrees of freedom for the null model are 3 and the objective function was 0.12 with Chi Square of 74.93**

**The degrees of freedom for the model are 0 and the objective function was 0**
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
##
## The harmonic number of observations is 595 with the empirical chi square 0 with prob < NA
## The total number of observations was 619 with Likelihood Chi Square = 0 with prob < NA
##
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.68
## Multiple R square of scores with factors 0.46
## Minimum correlation of possible factor scores -0.07

Graded-Response Model: Psychosis

## Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q58 -0.406 -0.982 -1.329 -1.636 -2.119 -2.544 -1.464
## Q29 -1.460 -1.887 -2.119 -2.495 -2.699 -2.981 -1.767
## Q49 -1.286 -2.119 -2.741 -3.447 -4.359 -5.238 -0.729

Test Information Function
Gender-based DIF: Psychosis

## No Gender-based DIF detected

Sample-based DIF: Psychosis

## No Sample-based DIF detected

Relational Distress

Reliability: Relational Distress

## Cronbach's alpha is 0.746.
## Mean item-total correlation is 0.296.
## If each item were dropped:

| Item  | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se  | var.r | med.r |
|-------|-----------|------------|---------|-----------|-----|-------|-----|-------|-------|
| Q81   | 0.69      | 0.69       | 0.67    | 0.27      | 2.3 | 0.019 | 0.0086 | 0.26 |
| Q25   | 0.73      | 0.73       | 0.71    | 0.31      | 2.7 | 0.017 | 0.0062 | 0.31 |
| Q36   | 0.70      | 0.70       | 0.68    | 0.28      | 2.4 | 0.018 | 0.0092 | 0.29 |
| Q37   | 0.71      | 0.70       | 0.68    | 0.28      | 2.4 | 0.018 | 0.0087 | 0.29 |
| Q65   | 0.72      | 0.72       | 0.70    | 0.30      | 2.6 | 0.017 | 0.0078 | 0.31 |
| Q66   | 0.74      | 0.74       | 0.72    | 0.33      | 2.9 | 0.016 | 0.0063 | 0.35 |
| Q69-  | 0.71      | 0.71       | 0.69    | 0.29      | 2.4 | 0.018 | 0.0078 | 0.31 |
Unidimensionality: Relational Distress

### Scree Plot

#### Eigenvalues

| Dimension | Eigenvalue |
|-----------|------------|
| 1         | 2.8086127  |
| 2         | 1.0013286  |
| 3         | 0.8522043  |
| 4         | 0.6906615  |
| 5         | 0.6028426  |
| 6         | 0.5479389  |
| 7         | 0.4964113  |

#### Factor Analysis

```r
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1   h2  u2  com
## Q81 0.65 0.43 0.57 1
## Q25 0.46 0.21 0.79 1
## Q36 0.62 0.38 0.62 1
## Q37 0.60 0.36 0.64 1
## Q65 0.51 0.26 0.74 1
## Q66 0.40 0.16 0.84 1
## Q69 -0.58 0.34 0.66 1
##
## SS loadings  2.14
## Proportion Var 0.31
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 21 and the objective function was 1.3 with Chi Square of 801.78
## The degrees of freedom for the model are 14 and the objective function was 0.14
## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.07
```
The harmonic number of observations is 594 with the empirical chi square 86.05 with prob < 2.1e-12.
The total number of observations was 619 with Likelihood Chi Square = 87.49 with prob < 1.1e-12.

Tucker Lewis Index of factoring reliability = 0.859
RMSEA index = 0.092 and the 90% confidence intervals are 0.074 0.111
BIC = -2.51
Fit based upon off diagonal values = 0.96
Measures of factor score adequacy
Correlation of (regression) scores with factors 0.87
Multiple R square of scores with factors 0.77
Minimum correlation of possible factor scores 0.53

Graded-Response Model: Relational Distress

Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrnn
Q81 -1.595 -0.899 -0.348 0.204 0.742 1.405 1.690
Q25 -2.363 -1.454 -0.766 -0.212 0.453 1.275 1.051
Q36 -0.286 0.325 0.725 1.267 1.832 2.431 1.751
Q37 -1.469 -0.390 0.249 0.870 1.409 2.158 1.439
Q65 -0.140 0.967 1.539 2.143 2.848 3.685 1.237
Q66 -0.140 0.740 1.328 2.107 2.956 3.634 0.980
Q69 1.602 0.937 0.404 -0.283 -0.741 -1.381 -1.416

Test Information Function

Information

Ability

63
Gender-based DIF: Relational Distress

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 7
##
## Items flagged: 2, 6
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01

## item ncat  chi12  chi13  chi23
## 1  1   7  0.3710  0.6647  0.8975
## 2  2   7  0.0000  0.0000  0.1495
## 3  3   6  0.9503  0.9970  0.9624
## 4  4   7  0.2840  0.5578  0.8886
## 5  5   7  0.2566  0.4943  0.7266
## 6  6   7  0.0000  0.0000  0.5641
## 7  7   7  0.8048  0.0858  0.0277
```
Trait Distributions

Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
**Item True Score Functions**

- Item 6: 
  - $P(r_{12}: \theta) = 0.0085$, $R_{12} = 0.0085$, $\Delta(\theta) = 0.0082$
  - $P(r_{13}: \theta) = 0.0086$, $R_{13} = 0.0086$

**Differences in Item True Score Functions**

- $Pr(\chi^2_{12}, 1) = 0$, $R_{12} = 1e^{-04}$

**Item Response Functions**

- Probability: $1.66, 0.61, 1.26, 1.62, 2.14, 2.65, 3.05$
  - $1.55, 0.16, 0.88, 1.29, 1.9, 2.48, 3.04$

**Impact (Weighted by Density)**

- Size: $10, 20, 30, 40$

**All Items**

- TCC
  - Female
  - Male

**DIF Items**

- TCC
  - Female
  - Male
Sample-based DIF: Relational Distress

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
```
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 7 of 7
##
## Items flagged: 1, 2, 3, 4, 5, 6, 7
##
## Number of iterations for purification: 4 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
```
## item ncat chi12 chi13 chi23
## 1 1 7 0 0 0.0014
## 2 2 7 0 0 0.0714
## 3 3 6 0 0 0.3496
## 4 4 7 0 0 0.0203
## 5 5 5 0 0 0.0070
## 6 6 7 0 0 0.0000
## 7 7 7 0 0 0.6452
```
Resilience

Reliability: Resilience

```r
## Cronbach's alpha is 0.768.
## Mean item-total correlation is 0.218.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q27- 0.75 0.75 0.76 0.22 3.0 0.015 0.011 0.21
## Q6  0.75 0.75 0.76 0.21 3.0 0.015 0.011 0.21
## Q15 0.74 0.75 0.77 0.21 3.0 0.015 0.014 0.20
## Q22 0.74 0.74 0.76 0.21 2.9 0.015 0.014 0.20
## Q33- 0.76 0.76 0.78 0.22 3.2 0.014 0.014 0.21
## Q40 0.75 0.75 0.77 0.21 3.0 0.015 0.014 0.21
## Q55 0.78 0.78 0.80 0.24 3.5 0.013 0.011 0.23
## Q56 0.76 0.76 0.77 0.23 3.2 0.014 0.012 0.22
## Q67 0.74 0.74 0.77 0.21 2.9 0.015 0.014 0.20
## Q70 0.76 0.76 0.78 0.22 3.2 0.014 0.014 0.21
## Q84 0.75 0.75 0.76 0.22 3.0 0.015 0.013 0.21
## Q89 0.75 0.75 0.77 0.21 2.9 0.015 0.013 0.21
```

Unidimensionality: Resilience

![Scree Plot](image)

```r
## [1] "Ratio of first to second eigenvalues: 2.507"
## [1] 3.5189340 1.4035499 1.2032386 0.9944428 0.9475198 0.8002591 0.6395633
## [8] 0.6366297 0.5910327 0.4915612 0.4061040 0.3671649
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
```

68
## Standardized loadings (pattern matrix) based upon correlation matrix

|   | MR1  | h2   | u2   | com |
|---|------|------|------|-----|
| Q27 | -0.52 | 0.275 | 0.73 | 1   |
| Q6  | 0.54  | 0.290 | 0.71 | 1   |
| Q15 | 0.55  | 0.305 | 0.69 | 1   |
| Q22 | 0.56  | 0.312 | 0.69 | 1   |
| Q33 | -0.41 | 0.166 | 0.83 | 1   |
| Q40 | 0.52  | 0.267 | 0.73 | 1   |
| Q55 | 0.18  | 0.033 | 0.97 | 1   |
| Q56 | 0.36  | 0.127 | 0.87 | 1   |
| Q67 | 0.57  | 0.325 | 0.67 | 1   |
| Q70 | 0.42  | 0.173 | 0.83 | 1   |
| Q84 | 0.46  | 0.210 | 0.79 | 1   |
| Q89 | 0.55  | 0.299 | 0.70 | 1   |

## MR1

|   | SS loadings 2.78 |
|---|-----------------|
|   | Proportion Var 0.23 |

## Mean item complexity = 1

Test of the hypothesis that 1 factor is sufficient.

The degrees of freedom for the null model are 66 and the objective function was 2.54 with Chi Square 1556.09
The degrees of freedom for the model are 54 and the objective function was 0.87

The root mean square of the residuals (RMSR) is 0.09
The df corrected root mean square of the residuals is 0.1

The harmonic number of observations is 553 with the empirical chi square 559.56 with prob < 3.5e-85
The total number of observations was 619 with Likelihood Chi Square = 533.07 with prob < 5.7e-80

Tucker Lewis Index of factoring reliability = 0.607
RMSEA index = 0.12 and the 90% confidence intervals are 0.111 0.129
BIC = 185.96
Fit based upon off diagonal values = 0.87

Measures of factor score adequacy

|   | MR1 |
|---|-----|
| Correlation of (regression) scores with factors | 0.89 |
| Multiple R square of scores with factors | 0.79 |
| Minimum correlation of possible factor scores | 0.58 |

Graded-Response Model: Resilience

|   | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrnn |
|---|---------|---------|---------|---------|---------|---------|--------|
| Q27 | 2.149   | 1.182   | 0.488   | -0.160  | -0.697  | -1.553  | -1.111 |
| Q6  | -1.952  | -1.231  | -0.707  | -0.117  | 0.466   | 1.401   | 1.168  |
| Q15 | -2.479  | -1.537  | -0.933  | -0.283  | 0.564   | 1.490   | 1.264  |
| Q22 | -1.038  | -0.183  | 0.532   | 1.178   | 1.647   | 2.257   | 1.341  |
| Q33 | 3.300   | 2.142   | 1.455   | 0.596   | -0.479  | -1.517  | -0.823 |
| Q40 | -1.664  | -0.385  | 0.500   | 1.217   | 2.092   | 3.015   | 1.153  |
| Q55 | -3.975  | -1.878  | -0.214  | 2.049   | 3.716   | 5.843   | 0.405  |
| Q56 | -2.755  | -1.713  | -0.925  | 0.032   | 0.782   | 1.855   | 0.723  |
| Q67 | -1.938  | -1.317  | -0.624  | 0.157   | 0.968   | 1.914   | 1.445  |
## Q70 -1.174 -0.105 0.675 1.497 2.148 3.132 0.886
## Q84 -2.372 -1.388 -0.711 0.165 1.028 1.821 0.939
## Q89 -2.135 -1.216 -0.431 0.431 1.122 1.914 1.262

### Test Information Function

### Item Information Curves
Gender-based DIF: Resilience

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 3 of 12
##
## Items flagged: 2, 7, 8
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 7 0.4444 0.6752 0.6543
## 2 2 7 0.0000 0.0001 0.4558
## 3 3 7 0.0136 0.0355 0.4438
## 4 4 7 0.1324 0.1125 0.1468
## 5 5 7 0.3505 0.4547 0.4013
## 6 6 7 0.3245 0.5750 0.7125
## 7 7 7 0.0573 0.0007 0.0009
## 8 8 7 0.8336 0.0059 0.0014
## 9 9 7 0.5698 0.5684 0.3691
## 10 10 7 0.0709 0.1900 0.8094
## 11 11 7 0.0257 0.0299 0.1528
## 12 12 7 0.9439 0.9876 0.8874
```

Trait Distributions

![Trait Distributions Graph](image-url)
Item True Score Functions – Item 8

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items
Sample-based DIF: Resilience

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
```

## Number of DIF groups: 2

## Number of items flagged for DIF: 7 of 12

## Items flagged: 1, 2, 3, 4, 7, 9, 10

## Number of iterations for purification: 5 of 10

## Detection criterion: Chisqr

## Threshold: alpha = 0.01

```
# item ncat chi12 chi13 chi23
# 1  1  7  0.0000  0.0000  0.7361
# 2  2  6  0.0000  0.0000  0.1685
# 3  3  7  0.0000  0.0000  0.0000
# 4  4  7  0.0000  0.0000  0.6677
# 5  5  7  0.0274  0.0838  0.7617
# 6  6  7  0.9819  0.0661  0.0198
# 7  7  7  0.0031  0.0000  0.0000
# 8  8  7  0.0179  0.0607  0.9940
# 9  9  7  0.0000  0.0000  0.5486
#10 10  7  0.0000  0.0000  0.0735
#11 11  7  0.0310  0.0835  0.5760
#12 12  7  0.0652  0.1601  0.6070
```
Trait Distributions

Item True Score Functions – Item 1

Item Response Functions

Impact (Weighted by Density)
Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)

Item True Score Functions – Item 3

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Item True Score Functions – Item 4

\[ \Pr(\chi_{12}^{1}, \chi_{1}^{2}) = 0.0031, R_{12}^{1} = 0.0021, \Delta(\beta_{1}) = 0.0777 \]

\[ \Pr(\chi_{13}^{1}, \chi_{2}^{2}) = 0 \]

\[ \Pr(\chi_{23}^{2}, \chi_{1}^{1}) = 0.6677, R_{23}^{2} = 0 \]

Differences in Item True Score Function

\[ \theta \]

Item Response Functions

\[ 0.78, -3.03, -1.99, -1.04, 0.16, 1.28, 2.58 \]

\[ 0.39, -5.68, -2.73, -0.79, 2.07, 4.18, 6.46 \]

Impact (Weighted by Density)

\[ \text{Size} \]
Item True Score Functions – Item 9

\[ \Pr(\chi_{12}, 1) = 0, R_{12} = 0.007, \Delta(\beta_1) = 0.0467 \]

\[ \Pr(\chi_{13}, 2) = 0, R_{13} = 0.0071, \Delta(\beta_1) = 0.0467 \]

\[ \Pr(\chi_{23}, 2) = 0.5486, R_{23} = 1 \times 10^{-4} \]

Differences in Item True Score Functions

Item Response Functions

\[ 1.35, -3.2, -2.46, -1.75, -1.01, -0.05, 1.48 \]

\[ 1.35, -2.54, -1.83, -1.15, -0.25, 0.6, 1.64 \]

Impact (Weighted by Density)

Item True Score Functions – Item 10

\[ \Pr(\chi_{14}, 1) = 0, R_{14} = 0.014, \Delta(\beta_1) = 0.1063 \]

\[ \Pr(\chi_{15}, 2) = 0, R_{15} = 0.0147, \Delta(\beta_1) = 0.1063 \]

\[ \Pr(\chi_{25}, 2) = 0.0735, R_{25} = 8 \times 10^{-4} \]

Differences in Item True Score Function

Item Response Functions

\[ 0.96, -2.81, -1.45, -0.69, -0.06, 0.66, 1.77 \]

\[ 0.79, -1.72, -0.53, 0.37, 1.34, 2.14, 3.25 \]

Impact (Weighted by Density)
Hurtful Rumination

Reliability: Hurtful Rumination

## Cronbach’s alpha is 0.757.
Mean item-total correlation is 0.385.

If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|------|----|-------|-------|
| Q39  | 0.68      | 0.68      | 0.64    | 0.35      | 2.1 | 0.021| 0.0095 | 0.33 |
| Q3   | 0.74      | 0.74      | 0.69    | 0.41      | 2.8 | 0.017| 0.0081 | 0.43 |
| Q38  | 0.70      | 0.70      | 0.64    | 0.37      | 2.3 | 0.020| 0.0064 | 0.38 |
| Q76  | 0.72      | 0.72      | 0.67    | 0.40      | 2.6 | 0.018| 0.0042 | 0.40 |
| Q85  | 0.73      | 0.73      | 0.68    | 0.40      | 2.7 | 0.018| 0.0096 | 0.42 |

Unidimensionality: Hurtful Rumination

Scree Plot

Eigenvalue  Dimension

| Dimension | Eigenvalue |
|-----------|------------|
| 1         | 2.5504445  |
| 2         | 0.8552244  |
| 3         | 0.6480348  |
| 4         | 0.4924785  |
| 5         | 0.4538178  |

Ratio of first to second eigenvalues: 2.982

Factor Analysis using method = minres
Call: fa(r = grm_obj$X)
Standardized loadings (pattern matrix) based upon correlation matrix

| Item | MR1  | h2    | u2    | com  |
|------|------|-------|-------|------|
| Q39  | 0.73 | 0.54  | 0.46  | 1    |
| Q3   | 0.53 | 0.28  | 0.72  | 1    |
| Q38  | 0.68 | 0.46  | 0.54  | 1    |
| Q76  | 0.59 | 0.35  | 0.65  | 1    |
| Q85  | 0.57 | 0.33  | 0.67  | 1    |

Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.

## The degrees of freedom for the null model are 10 and the objective function was 1.15 with Chi Square of 709.24
## The degrees of freedom for the model are 5 and the objective function was 0.09

## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.09

## The harmonic number of observations is 598 with the empirical chi square 43.99 with prob < 2.3e-08
## The total number of observations was 619 with Likelihood Chi Square = 57.54 with prob < 3.9e-11

## Tucker Lewis Index of factoring reliability = 0.85
## RMSEA index = 0.13 and the 90 % confidence intervals are 0.101 0.162
## BIC = 25.4
## Fit based upon off diagonal values = 0.98
## Measures of factor score adequacy

## Measures of factor score adequacy

Graded-Response Model: Hurtful Rumination

## Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q39 -1.885 -1.123 -0.740 -0.302 0.158 0.686 2.004
## Q3 -1.547 -0.766 -0.218 0.303 1.015 1.745 1.149
## Q38 -0.918 -0.286 0.106 0.481 0.947 1.562 1.921
## Q76 -0.445 0.029 0.446 0.994 1.543 2.160 1.661
## Q85 -2.602 -2.139 -1.578 -1.182 -0.670 0.050 1.474

### Test Information Function

![Test Information Function Graph](image-url)
Gender-based DIF: Hurtful Rumination

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 5
##
## Items flagged: 2, 5
##
## Number of iterations for purification: 3 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 7 0.6519 0.6004 0.3662
## 2 2 7 0.0000 0.0000 0.7387
## 3 3 7 0.2967 0.1945 0.1393
## 4 4 7 0.6118 0.4465 0.2444
## 5 5 7 0.0003 0.0010 0.3226
```
Trait Distributions

Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
**Item True Score Functions – Item 5**

![Item True Score Functions](image)

**Item Score Functions**

- Item 5
- \( \theta \)
- \( \chi^2 \)
- \( R^2 \)
- \( \Delta \)
- \( \beta \)
- \( \text{TCC} \)
- \( \text{Female} \)
- \( \text{Male} \)

**Differences in Item True Score Function**

![Differences in Item True Score Function](image)

**Item Response Functions**

- Probability
- \( \theta \)
- Probability
- \( \theta \)
- \( \text{TCC} \)
- \( \text{Female} \)
- \( \text{Male} \)

**Impact (Weighted by Density)**

- Size
- \( \theta \)
- Size
- \( \theta \)
- \( \text{TCC} \)
- \( \text{Female} \)
- \( \text{Male} \)
Sample-based DIF: Hurtful Rumination

```
## Call:
## lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 5
##
## Items flagged: 3
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## | item | ncat | chi2 | chi3 | chi23 |
##|------|------|------|------|-------|
##| 1    | 1    | 7    | 0.4392| 0.6920 | 0.7104 |
##| 2    | 2    | 7    | 0.4665| 0.1786 | 0.0877 |
##| 3    | 3    | 7    | 0.0000| 0.0000 | 0.6195 |
##| 4    | 4    | 7    | 0.3878| 0.6171 | 0.6394 |
##| 5    | 5    | 7    | 0.3260| 0.1098 | 0.0631 |
```
Trait Distributions

Item True Score Functions – Item 3

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Social Role Functioning

Reliability: Social Role Functioning

## Cronbach's alpha is 0.676.
## Mean item-total correlation is 0.346.
## If each item were dropped:

|     | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se     | var.r | med.r |
|-----|-----------|-----------|---------|-----------|-----|-------|--------|-------|-------|
| Q87-| 0.55      | 0.55      | 0.45    | 0.29      | 1.2 | 0.032 | 0.00078| 0.27  |
| Q5  | 0.51      | 0.51      | 0.41    | 0.26      | 1.0 | 0.034 | 0.00066| 0.27  |
| Q22 | 0.66      | 0.67      | 0.65    | 0.40      | 2.0 | 0.024 | 0.07214| 0.27  |
| Q27-| 0.70      | 0.70      | 0.67    | 0.43      | 2.3 | 0.021 | 0.05867| 0.32  |

### Unidimensionality: Social Role Functioning

#### Scree Plot

![Scree Plot](image)

```
[1] "Ratio of first to second eigenvalues: 2.303"
[1] 2.0896950 0.9074757 0.7249887 0.2778405

Factor Analysis using method = minres
Call: fa(r = grm_obj$X)
Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q87 -0.77 0.59 0.41 1
## Q5  0.90 0.81 0.19 1
## Q22 0.39 0.15 0.85 1
## Q27 -0.34 0.12 0.88 1

SS loadings  1.67
Proportion Var 0.42

Mean item complexity = 1
Test of the hypothesis that 1 factor is sufficient.

The degrees of freedom for the null model are 6 and the objective function was 0.96 with Chi Squa
## The degrees of freedom for the model are 2 and the objective function was 0.04
## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.11
## The harmonic number of observations is 540 with the empirical chi square 23.88 with prob < 6.5e-06
## The total number of observations was 619 with Likelihood Chi Square = 23.98 with prob < 6.2e-06
## Tucker Lewis Index of factoring reliability = 0.887
## RMSEA index = 0.133 and the 90 % confidence intervals are 0.089 0.184
## BIC = 11.12
## Fit based upon off diagonal values = 0.98
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.92
## Multiple R square of scores with factors 0.85
## Minimum correlation of possible factor scores 0.71

Graded-Response Model: Social Role Functioning

|        | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|--------|---------|---------|---------|---------|---------|---------|---------|
| Q87    | 1.033   | 0.562   | 0.147   | -0.403  | -0.823  | -1.403  | -2.866  |
| Q5     | -1.565  | -1.001  | -0.605  | -0.038  | 0.382   | 0.821   | 4.237   |
| Q22    | -1.504  | -0.242  | 0.788   | 1.745   | 2.438   | 3.341   | 0.787   |
| Q27    | 3.330   | 1.845   | 0.790   | -0.212  | -1.047  | -2.401  | -0.629  |

Test Information Function
Gender-based DIF: Social Role Functioning

```
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 4
##
## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
```
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 7 0 0e+00 0.5205
## 2 2 7 0 1e-04 0.3929
## 3 3 7 0 0e+00 0.2994
## 4 4 7 0 2e-04 0.7270

Somatic Anxiety

Reliability: Somatic Anxiety

## Cronbach's alpha is 0.76.
## Mean item-total correlation is 0.348.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q3 0.72 0.72 0.70 0.34 2.6 0.018 0.0186 0.30
## Q30 0.75 0.75 0.73 0.37 3.0 0.016 0.0179 0.40
## Q47 0.77 0.77 0.74 0.40 3.3 0.015 0.0121 0.40
## Q51 0.71 0.72 0.68 0.33 2.5 0.018 0.0080 0.30
## Q53 0.70 0.70 0.68 0.32 2.4 0.019 0.0146 0.29
## Q75 0.70 0.70 0.66 0.32 2.3 0.019 0.0076 0.29
Unidimensionality: Somatic Anxiety

Scree Plot

---

## 

### Ratio of first to second eigenvalues: 2.918

### Factor Analysis using method = minres

### Proportion Var 0.37

### Mean item complexity = 1

### Test of the hypothesis that 1 factor is sufficient.

### The degrees of freedom for the null model are 15 and the objective function was 1.42 with Chi Square = 10.56

### The degrees of freedom for the model are 9 and the objective function was 0.11

### The root mean square of the residuals (RMSR) is 0.06

### The df corrected root mean square of the residuals is 0.07

---
The harmonic number of observations is 602 with the empirical chi square 55.62 with prob < 9.3e-09.
The total number of observations was 619 with Likelihood Chi Square = 67.87 with prob < 4e-11.

Tucker Lewis Index of factoring reliability = 0.885
RMSEA index = 0.103 and the 90 % confidence intervals are 0.081 0.126
BIC = 10.01
Fit based upon off diagonal values = 0.98
Measures of factor score adequacy
Correlation of (regression) scores with factors 0.89
Multiple R square of scores with factors 0.80
Minimum correlation of possible factor scores 0.60

Graded-Response Model: Somatic Anxiety

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q3      | -1.333  | -0.639  | -0.158  | 0.296   | 0.909   | 1.541  | 1.406  |
| Q30     | -1.129  | -0.305  | 0.396   | 1.088   | 1.923   | 2.635  | 0.944  |
| Q47     | -0.803  | 0.125   | 0.582   | 1.286   | 1.921   | 2.831  | 0.708  |
| Q51     | -1.813  | -1.288  | -0.816  | -0.330  | 0.250   | 0.852  | 1.950  |
| Q53     | -0.769  | -0.260  | 0.125   | 0.487   | 0.916   | 1.489  | 1.912  |
| Q75     | -1.144  | -0.680  | -0.313  | 0.089   | 0.576   | 1.035  | 2.380  |

Test Information Function
Gender-based DIF: Somatic Anxiety

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 6
##
## Items flagged: 1, 4
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 1 7 0.0000 0.0000 0.2851
## 2 2 2 7 0.2923 0.5435 0.7397
## 3 3 7 0.0357 0.0539 0.2319
## 4 4 7 0.0000 0.0000 0.0183
## 5 5 7 0.8853 0.5568 0.2835
## 6 6 7 0.6848 0.7125 0.4738
```
Trait Distributions

Item True Score Functions – Item 1

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Item True Score Functions

- Female
- Male

Item Score

Pr($\chi^2_{12}$) = 0.0009, $R_{12} = 0.0039, \Delta(\beta) = 0.0083$

Pr($\chi^2_{13}$) = 0.0051

Pr($\chi^2_{23}$) = 0.0183, $R_{23} = 0.0011$

Differences in Item True Score Functions

Item Score

Impact (Weighted by Density)

Size

Impact

All Items

DIF Items

TCC

- Female
- Male

Theta

96
Sample-based DIF: Somatic Anxiety

## Call:
```r
lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
```
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 6 of 6
##
## Items flagged: 1, 2, 3, 4, 5, 6
##
## Number of iterations for purification: 4 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1  1  1  7   0   0  0.5280
## 2  2  2  7   0   0  0.4738
## 3  3  3  7   0   0  0.6598
## 4  4  4  7   0   0  0.0021
## 5  5  5  7   0   0  0.0000
## 6  6  6  7   0   0  0.6639

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Substance Use

Reliability: Substance Use

## Cronbach's alpha is 0.918.
## Mean item-total correlation is 0.742.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q35 0.89 0.89 0.85 0.74 8.4 0.0073 2.7e-03 0.76
## Q4 0.90 0.90 0.86 0.75 9.1 0.0069 6.7e-04 0.76
## Q16 0.90 0.91 0.86 0.76 9.5 0.0067 2.8e-06 0.76
## Q59 0.88 0.89 0.84 0.72 7.7 0.0081 1.8e-03 0.72

Unidimensionality: Substance Use

Scree Plot

## [1] "Ratio of first to second eigenvalues: 9.675"
## [1] 3.2363277 0.3345069 0.2296355 0.1995300

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q35 0.88 0.77 0.23 1
## Q4  0.85 0.72 0.28 1
## Q16 0.83 0.69 0.31 1
## Q59 0.90 0.80 0.20 1

##
## SS loadings  2.98
## Proportion Var 0.75
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 6 and the objective function was 3 with Chi Square of 1849.79
## The degrees of freedom for the model are 2 and the objective function was 0.05
## The root mean square of the residuals (RMSR) is 0.02
## The df corrected root mean square of the residuals is 0.04
## The harmonic number of observations is 561 with the empirical chi square 3.54 with prob < 0.17
## The total number of observations was 619 with Likelihood Chi Square = 30.49 with prob < 2.4e-07
## Tucker Lewis Index of factoring reliability = 0.954
## RMSEA index = 0.152 and the 90 % confidence intervals are 0.107 0.202
## BIC = 17.63
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.96
## Multiple R square of scores with factors 0.92
## Minimum correlation of possible factor scores 0.85

Graded-Response Model: Substance Use

## Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q35 -0.614 -0.949 -1.146 -1.468 -1.650 -1.915 -3.567
## Q4 -0.968 -1.313 -1.521 -1.707 -1.919 -2.193 -3.321
## Q16 -0.795 -1.092 -1.254 -1.434 -1.590 -1.793 -2.971
## Q59 -0.612 -0.878 -1.022 -1.146 -1.423 -1.605 -3.849
Gender-based DIF: Substance Use

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```
Sample-based DIF: Substance Use

```r
Call:
lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
```

## Data

```r
# Number of DIF groups: 2
# Number of items flagged for DIF: 4 of 4
# Items flagged: 1, 2, 3, 4
# Number of iterations for purification: 1 of 10
# Detection criterion: Chisqr
# Threshold: alpha = 0.01
```

### Item NCTA $\chi^2_{12}$ $\chi^2_{13}$ $\chi^2_{23}$

|   | 1  | 1  | 4  | 0.0002 | 0.0000 | 0.0079 |
|---|----|----|----|--------|--------|--------|
| 2 | 2  | 5  | 0.0024 | 0.0004 | 0.0106 |
| 3 | 3  | 4  | 0.0043 | 0.0140 | 0.5304 |
| 4 | 4  | 7  | 0.0045 | 0.0092 | 0.2518 |

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## Suicide Risk

### Reliability: Suicide Risk

```r
# Cronbach's alpha is 0.678.
# Mean item-total correlation is 0.343.
# If each item were dropped:
```

| item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|----------|-------|-------|
| Q44  | 0.68      | 0.68      | 0.59    | 0.42      | 2.1 | 0.034    | 0.0058| 0.42  |
| Q19  | 0.63      | 0.63      | 0.54    | 0.36      | 1.7 | 0.040    | 0.00507| 0.35  |
| Q77  | 0.58      | 0.57      | 0.50    | 0.31      | 1.3 | 0.046    | 0.01859| 0.35  |
| Q79  | 0.54      | 0.54      | 0.46    | 0.28      | 1.2 | 0.049    | 0.01391| 0.30  |
### Unidimensionality: Suicide Risk

#### Scree Plot

```
## [1] "Ratio of first to second eigenvalues: 2.405"
## [1] 2.0452860 0.8503631 0.5821785 0.5221724
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q44 0.43 0.18 0.82 1
## Q19 0.55 0.30 0.70 1
## Q77 0.65 0.42 0.58 1
## Q79 0.74 0.54 0.46 1
##
## MR1
## SS loadings  1.45
## Proportion Var 0.36
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  6  and the objective function was  0.64  with Chi Square = 161.77
## The degrees of freedom for the model are  2  and the objective function was  0.03
##
## The root mean square of the residuals (RMSR) is  0.04
## The df corrected root mean square of the residuals is  0.07
##
## The harmonic number of observations is  257  with the empirical chi square  5.64  with prob < 0.06
## The total number of observations was  257  with Likelihood Chi Square =  6.47  with prob < 0.039
```
Tucker Lewis Index of factoring reliability = 0.914
RMSEA index = 0.093 and the 90 % confidence intervals are 0.018 0.178
BIC = -4.63
Fit based upon off diagonal values = 0.99
Measures of factor score adequacy
Correlation of (regression) scores with factors = 0.85
Multiple R square of scores with factors = 0.72
Minimum correlation of possible factor scores = 0.44

Graded-Response Model: Suicide Risk

|          | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|----------|---------|---------|---------|---------|---------|---------|--------|
| Q44      | -4.210  | -2.338  | -1.451  | -0.879  | -0.197  | 0.899   | 0.819  |
| Q19      | -1.722  | -0.994  | -0.298  | 0.401   | 1.216   | 1.914   | 1.399  |
| Q77      | -0.943  | -0.080  | 0.352   | 0.828   | 1.304   | 1.857   | 1.729  |
| Q79      | -0.313  | 0.264   | 0.720   | 1.025   | 1.459   | 1.933   | 1.798  |

Test Information Function
Gender-based DIF: Suicide Risk

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
## ## Number of DIF groups: 2
## ## Number of items flagged for DIF: 0 of 4
## ## Items flagged:
## ## Number of iterations for purification: 1 of 10
## ## Detection criterion: Chisqr
## ## Threshold: alpha = 0.01
```

Sample-based DIF: Suicide Risk

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sample.data), group = clinYN)
## ## Number of DIF groups: 2
## ## Number of items flagged for DIF: 0 of 4
## ## Items flagged:
## ```
## Study 2: ROC curves

For each scale, unadjusted scale scores are compared between the clinical and nonclinical samples in Study 2. For those scales that demonstrated substantial sample-based DIF (Connectedness, Demoralization, Pressure from Negative Affect, Relational Distress, and Somatic Anxiety), these comparisons should not be interpreted. In all cases, the ROC curve and the area under the curve are presented below. The AUC appears in the manuscript as well.

### Attachment

![ROC Curve](attachment.png)

## Area under the curve: 0.6532
Avoidance

Area under the curve: 0.8564
Connectedness

Area under the curve: 0.7321
Demoralization

## Area under the curve: 0.8483
Eating problems

Area under the curve: 0.6715
Hurtful rumination

## Area under the curve: 0.8572
Hypervigilance

## Area under the curve: 0.78
Perfectionism

## Area under the curve: 0.7799
Pressure from Negative Affect

## Area under the curve: 0.8626
Psychosis

## Area under the curve: 0.6961
Relational distress

Area under the curve: 0.7612
## Area under the curve: 0.7562
Social Role Functioning

## Area under the curve: 0.5482
Somatic Anxiety

Area under the curve: 0.8426
Substance Use

## Area under the curve: 0.5948
Suicide Risk

## Area under the curve: 0.7457

**Study 3: Scale performance**

**Eating Problems**

**Site 1**

**Reliability: Eating Problems**

## Cronbach's alpha is 0.86.

## Mean item-total correlation is 0.561.

## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha_se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|---------|-------|-------|
| Q46  | 0.82      | 0.83      | 0.79    | 0.55      | 4.9 | 0.012   | 0.0044| 0.56  |
| Q104 | 0.84      | 0.85      | 0.81    | 0.58      | 5.5 | 0.010   | 0.0013| 0.57  |
| Q57  | 0.84      | 0.85      | 0.81    | 0.58      | 5.5 | 0.010   | 0.0022| 0.57  |
| Q18  | 0.83      | 0.83      | 0.79    | 0.55      | 4.9 | 0.011   | 0.0027| 0.56  |
| Q63  | 0.82      | 0.83      | 0.79    | 0.55      | 4.8 | 0.011   | 0.0031| 0.57  |
Unidimensionality: Eating Problems

```r
## [1] "Ratio of first to second eigenvalues: 5.76"
## [1] 3.2438805 0.5631446 0.4885950 0.3666453 0.3377346
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q46 0.78 0.60 0.40  1
## Q1040.70 0.49 0.51  1
## Q57 0.71 0.50 0.50  1
## Q18 0.77 0.59 0.41  1
## Q63 0.79 0.62 0.38  1
##
## MR1
## SS loadings 2.81
## Proportion Var 0.56
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 10 and the objective function was 2.2 with Chi Square 1351.25
## The degrees of freedom for the model are 5 and the objective function was 0.07
##
## The root mean square of the residuals (RMSR) is 0.03
## The df corrected root mean square of the residuals is 0.05
##
## The harmonic number of observations is 592 with the empirical chi square 14.43 with prob < 0.013
## The total number of observations was 617 with Likelihood Chi Square = 40.05 with prob < 1.5e-07
##
## Tucker Lewis Index of factoring reliability = 0.948
```
## RMSEA index = 0.107 and the 90 % confidence intervals are 0.077 0.138
## BIC = 7.92
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy

### Graded-Response Model: Eating Problems

|      | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrnn |
|------|---------|---------|---------|---------|---------|---------|--------|
| Q46  | -0.219  | 0.219   | 0.513   | 0.797   | 1.144   | 1.446   | 2.405  |
| Q104 | -0.722  | -0.216  | 0.084   | 0.367   | 0.753   | 1.108   | 2.363  |
| Q57  | 0.595   | 0.964   | 1.246   | 1.464   | 1.697   | 1.960   | 2.657  |
| Q18  | 0.415   | 0.889   | 1.108   | 1.334   | 1.613   | 1.917   | 3.116  |
| Q63  | -0.216  | 0.242   | 0.565   | 0.832   | 1.254   | 1.581   | 2.544  |

Test Information Function
Site 2

Reliability: Eating Problems

## Cronbach's alpha is 0.836.
## Mean item-total correlation is 0.525.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|----------|-------|-------|
| Q46  | 0.78      | 0.80       | 0.76    | 0.50      | 4.0 | 0.014    | 0.0034| 0.50 |
| Q104 | 0.81      | 0.82       | 0.78    | 0.53      | 4.6 | 0.012    | 0.0036| 0.54 |
| Q57  | 0.82      | 0.83       | 0.79    | 0.55      | 5.0 | 0.012    | 0.0022| 0.55 |
| Q18  | 0.80      | 0.80       | 0.76    | 0.50      | 4.1 | 0.013    | 0.0041| 0.51 |
| Q63  | 0.81      | 0.82       | 0.78    | 0.53      | 4.6 | 0.012    | 0.0042| 0.53 |
Unidimensionality: Eating Problems

```r
## [1] "Ratio of first to second eigenvalues: 5.188"
## [1] 3.1099043 0.5994110 0.5250118 0.4206820 0.3449910
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q46 0.79 0.63 0.37 1
## Q104 0.70 0.49 0.51 1
## Q57 0.65 0.42 0.58 1
## Q18 0.78 0.61 0.39 1
## Q63 0.70 0.50 0.50 1
##
## MR1
## SS loadings 2.65
## Proportion Var 0.53
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 10 and the objective function was 1.95 with Chi Square = 1156.36
## The degrees of freedom for the model are 5 and the objective function was 0.05
##
## The root mean square of the residuals (RMSR) is 0.03
## The df corrected root mean square of the residuals is 0.04
##
## The harmonic number of observations is 572 with the empirical chi square 11.25 with prob < 0.047
## The total number of observations was 596 with Likelihood Chi Square = 28.49 with prob < 2.9e-05
##
## Tucker Lewis Index of factoring reliability = 0.959
```
## RMSEA index = 0.089 and the 90 % confidence intervals are 0.059 0.122
## BIC = -3.46
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors  0.93
## Multiple R square of scores with factors  0.86
## Minimum correlation of possible factor scores  0.71

Graded-Response Model: Eating Problems

|     | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-----|---------|---------|---------|---------|---------|---------|--------|
| Q46 | -1.087  | -1.272  | -1.337  | -1.577  | -1.692  | -1.817  | -3.757 |
| Q104| 0.022   | -0.590  | -0.940  | -1.299  | -1.680  | -1.780  | -1.931 |
| Q57 | -1.098  | -1.372  | -1.452  | -1.707  | -1.906  | -2.019  | -3.293 |
| Q18 | -1.207  | -1.595  | -1.757  | -2.001  | -2.165  | -2.255  | -3.501 |
| Q63 | -0.745  | -1.171  | -1.416  | -1.915  | -2.193  | -2.336  | -2.628 |

Test Information Function

![Test Information Function Graph](image)
## Site DIF

```
# Call:
# lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
#
# Number of DIF groups: 2
# Number of items flagged for DIF: 1 of 5
# Items flagged: 1
# Number of iterations for purification: 3 of 10
# Detection criterion: Chisqr
# Threshold: alpha = 0.01
#
# item ncat chi12 chi13 chi23
# 1 1 7 0.0000 0.0000 0.0003
# 2 2 7 0.2634 0.1704 0.1303
# 3 3 7 0.2341 0.2054 0.1859
# 4 4 7 0.0414 0.1130 0.6533
# 5 5 7 0.7899 0.9417 0.8246
```
Trait Distributions

Item True Score Functions – Item 1

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Gender-based DIF: Eating Problems

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## ```
## Number of DIF groups: 2
## Number of items flagged for DIF: 3 of 5
## Items flagged: 1, 2, 4
## Number of iterations for purification: 5 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 7     | 0.0000| 0.0000| 0.1223|
| 2    | 2    | 7     | 0.0000| 0.0000| 0.3713|
| 3    | 3    | 6     | 0.3378| 0.3189| 0.2423|
| 4    | 4    | 4     | 0.0000| 0.0000| 0.2853|
| 5    | 5    | 7     | 0.2097| 0.4488| 0.8653|

### Trait Distributions

![Trait Distributions Graph](image.png)

- Female
- Male
Item True Score Functions

$$\text{Item True Score Functions – Item 1}$$

**Item Score**

- Female
- Male

Probability

- $$2.63, -0.06, 0.3, 0.58, 0.9, 1.18, 1.46$$
- $$2.16, 0.32, 0.87, 1.12, 1.43, 1.9, 2.23$$

Impact (Weighted by Density)

Size

**Item True Score Functions – Item 2**

**Differences in Item True Score Function**

**Item Response Functions**

**Differences in Item True Score Function**

**Item Response Functions**

**Impact (Weighted by Density)**
Item True Score Functions – Item 4

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items

TCC

-4 -2 0 2 4

-4 -2 0 2 4

-4 -2 0 2 4

-4 -2 0 2 4

θ

θ

θ

θ

Female

Male

Probability

Probability

Probability

Probability

0.0 0.6

0.0 0.6

0.0 0.6

0.0 0.6

3.34, 0.44, 0.91, 1.15

2.65, 0.86, 1.34, 1.62

TCC

TCC

TCC

TCC

−4 −2 0 2 4

−4 −2 0 2 4

−4 −2 0 2 4

−4 −2 0 2 4

θ

θ

θ

θ

Female

Male

Female

Male

131
## Call:
## `lordif::lordif(resp.data = as.data.frame(age.data), group = age)`
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 5
##
## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr

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### Sad Affect

Site 1

Reliability: Sad Affect

## Back to top

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q42  | 0.75      | 0.76      | 0.61    | 0.61      | 3.1 | 0.020 | NA | 0.61  |       |
| Q102 | 0.87      | 0.87      | 0.76    | 0.76      | 6.4 | 0.011 | NA | 0.76  |       |
Unidimensionality: Sad Affect

```r
## [1] "Ratio of first to second eigenvalues: 4.67"
## [1] 2.2798353 0.4881968 0.2319679

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q42 0.83 0.68 0.32 1
## Q102 0.66 0.43 0.57 1
## Q100 0.92 0.85 0.15 1

## MR1
## SS loadings 1.97
## Proportion Var 0.66

## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 3 and the objective function was 1.35 with Chi Square 831.64
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 598 with the empirical chi square 0 with prob < NA
## The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
```

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## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.95
## Multiple R square of scores with factors 0.90
## Minimum correlation of possible factor scores 0.79

Graded-Response Model: Sad Affect

|      | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|------|---------|---------|---------|---------|---------|---------|--------|
| Q42  | -1.823  | -1.087  | -0.646  | -0.112  | 0.390   | 0.896   | 3.013  |
| Q102 | -1.007  | -0.388  | -0.009  | 0.465   | 1.077   | 1.782   | 1.722  |
| Q100 | -1.707  | -1.041  | -0.557  | -0.013  | 0.462   | 1.011   | 4.146  |

Test Information Function
Item Information Curves

Site 2

Reliability: Sad Affect

## Cronbach's alpha is 0.838.
## Mean item-total correlation is 0.638.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
![](image)

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|-------|----|-------|-------|
| Q42  | 0.74      | 0.75       | 0.59    | 0.59      | 2.9 | 0.021 | NA | 0.59  |       |
| Q102 | 0.86      | 0.86       | 0.76    | 0.76      | 6.3 | 0.011 | NA | 0.76  |       |
| Q100 | 0.72      | 0.72       | 0.56    | 0.56      | 2.5 | 0.023 | NA | 0.56  |       |

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Unidimensionality: Sad Affect

```r
## [1] "Ratio of first to second eigenvalues: 4.801"
## [1] 2.2857213 0.4760639 0.2382148
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q42  0.85 0.72 0.28  1
## Q102 0.67 0.44 0.56  1
## Q100 0.90 0.80 0.20  1
##
## MR1
## SS loadings 1.97
## Proportion Var 0.66
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  3  and the objective function was  1.35  with Chi Square 800.84
## The degrees of freedom for the model are 0  and the objective function was 0
##
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
##
## The harmonic number of observations is 575 with the empirical chi square 0 with prob < NA
## The total number of observations was 596 with Likelihood Chi Square = 0 with prob < NA
##
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```
Graded-Response Model: Sad Affect

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q42     | -1.344  | -0.626  | -0.233  | 0.234   | 0.665   | 1.073  | 3.479  |
| Q102    | -0.447  | 0.055   | 0.492   | 0.914   | 1.416   | 1.951  | 1.923  |
| Q100    | -1.301  | -0.657  | -0.104  | 0.390   | 0.885   | 1.447  | 3.952  |

Test Information Function
Gender-based DIF: Sad Affect

## No Gender-based DIF detected

Age-based DIF: Sad Affect

## No age-based DIF detected

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Somatic Anxiety

Site 1

Reliability: Somatic Anxiety

## Cronbach’s alpha is 0.803.
## Mean item-total correlation is 0.456.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|-------|----|-------|-------|
| Q51  | 0.76      | 0.76       | 0.71    | 0.44      | 3.2 | 0.016 | 0.0045 | 0.45  |
| Q103 | 0.78      | 0.78       | 0.73    | 0.47      | 3.6 | 0.015 | 0.0026 | 0.47  |
| Q75  | 0.76      | 0.76       | 0.71    | 0.44      | 3.2 | 0.016 | 0.0036 | 0.44  |
| Q3   | 0.78      | 0.78       | 0.73    | 0.47      | 3.6 | 0.015 | 0.0017 | 0.48  |
| Q53  | 0.76      | 0.76       | 0.71    | 0.45      | 3.2 | 0.016 | 0.0041 | 0.46  |
Unidimensionality: Somatic Anxiety

```r
# [1] "Ratio of first to second eigenvalues: 3.953"
# [1] 2.8291224 0.7157431 0.5210768 0.5123736 0.4216841
# Factor Analysis using method = minres
# Call: fa(r = grm_obj$X)
# Standardized loadings (pattern matrix) based upon correlation matrix
#   MR1  h2  u2  com
# Q51  0.71 0.50 0.50  1
# Q103 0.64 0.40 0.60  1
# Q75  0.72 0.51 0.49  1
# Q3   0.63 0.39 0.61  1
# Q53  0.69 0.48 0.52  1
#
# SS loadings  2.29
# Proportion Var 0.46
#
# Mean item complexity = 1
# Test of the hypothesis that 1 factor is sufficient.
#
# The degrees of freedom for the null model are  10  and the objective function was  1.48  with Chi Square  1.48
# The degrees of freedom for the model are  5  and the objective function was  0.06
#
# The root mean square of the residuals (RMSR) is  0.04
# The df corrected root mean square of the residuals is  0.06
#
# The harmonic number of observations is  595  with the empirical chi square  22.37  with prob <  0.00044
# The total number of observations was  617  with Likelihood Chi Square =  37.38  with prob <  5e-07
#
# Tucker Lewis Index of factoring reliability =  0.928
```
RMSEA index = 0.102 and the 90 % confidence intervals are 0.073 0.134
BIC = 5.25
Fit based upon off diagonal values = 0.99

Measures of factor score adequacy

---

Correlation of (regression) scores with factors 0.90
Multiple R square of scores with factors 0.81
Minimum correlation of possible factor scores 0.62

Graded-Response Model: Somatic Anxiety

|       | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-------|---------|---------|---------|---------|---------|---------|--------|
| Q51   | -2.462  | -1.833  | -1.241  | -0.739  | -0.029  | 0.714   | 2.072  |
| Q103  | -0.751  | -0.048  | 0.507   | 1.045   | 1.609   | 2.268   | 1.753  |
| Q75   | -1.581  | -1.031  | -0.618  | -0.198  | 0.385   | 1.008   | 2.069  |
| Q3    | -1.160  | -0.682  | -0.248  | 0.226   | 0.774   | 1.345   | 1.495  |
| Q53   | -1.063  | -0.470  | -0.104  | 0.316   | 0.828   | 1.448   | 1.785  |

Test Information Function
Site 2

Reliability: Somatic Anxiety

## Cronbach's alpha is 0.808.
## Mean item-total correlation is 0.459.
## If each item were dropped:

| Item  | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha_se | var.r | med.r |
|-------|-----------|------------|---------|-----------|-----|----------|-------|-------|
| Q51   | 0.77      | 0.77       | 0.73    | 0.45      | 3.3 | 0.015    | 0.0068| 0.47  |
| Q103  | 0.79      | 0.79       | 0.75    | 0.48      | 3.7 | 0.014    | 0.0060| 0.49  |
| Q75   | 0.75      | 0.76       | 0.71    | 0.44      | 3.1 | 0.016    | 0.0055| 0.45  |
| Q3    | 0.79      | 0.79       | 0.75    | 0.49      | 3.9 | 0.014    | 0.0023| 0.48  |
| Q53   | 0.75      | 0.75       | 0.71    | 0.44      | 3.1 | 0.017    | 0.0078| 0.42  |
Unidimensionality: Somatic Anxiety

```r
## [1] "Ratio of first to second eigenvalues: 3.855"
## [1] 2.8439146 0.7377162 0.5750519 0.4418454 0.4014719
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2   u2  com
## Q51  0.69 0.48 0.52 1
## Q103 0.62 0.38 0.62 1
## Q75  0.75 0.56 0.44 1
## Q3   0.59 0.35 0.65 1
## Q53  0.74 0.55 0.45 1
##
## SS loadings 2.32
## Proportion Var 0.46
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 10 and the objective function was 1.54 with Chi Square of 913.47
## The degrees of freedom for the model are 5 and the objective function was 0.08
## The root mean square of the residuals (RMSR) is 0.05
## The df corrected root mean square of the residuals is 0.07
## The harmonic number of observations is 578 with the empirical chi square 26.46 with prob < 7.3e-05
## The total number of observations was 596 with Likelihood Chi Square = 46.14 with prob < 8.5e-09
## Tucker Lewis Index of factoring reliability = 0.909
```

Scree Plot

---

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### Graded-Response Model: Somatic Anxiety

|   | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---|---------|---------|---------|---------|---------|---------|--------|
| Q51 | -2.291  | -1.404  | -0.796  | -0.187  | 0.415   | 0.961   | 1.924  |
| Q103| -0.551  | 0.138   | 0.644   | 1.191   | 1.592   | 2.323   | 1.696  |
| Q75 | -1.313  | -0.704  | -0.307  | 0.164   | 0.642   | 1.157   | 2.341  |
| Q3  | -1.028  | -0.394  | 0.199   | 0.615   | 1.274   | 1.862   | 1.364  |
| Q53 | -0.869  | -0.338  | 0.119   | 0.506   | 0.922   | 1.453   | 1.998  |
Site DIF

```r
## Call:
## lorf::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 5
##
## Items flagged: 1
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1  1  7  0.0001  0.0002  0.2917
## 2  2  7  0.1997  0.3781  0.5837
## 3  3  7  0.1224  0.2884  0.7514
## 4  4  7  0.0725  0.0523  0.1019
## 5  5  7  0.1865  0.3079  0.4345
```
Trait Distributions

Item True Score Functions – Item 1

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Gender-based DIF: Somatic Anxiety

## Call:
```r
lordinf::lordinf(resp.data = as.data.frame(sex.data), group = sex)
```

## Number of DIF groups: 2
Number of items flagged for DIF: 3 of 5

Items flagged: 2, 4, 5

Number of iterations for purification: 3 of 10

Detection criterion: Chisqr

Threshold: alpha = 0.01

# item ncat chi12 chi13 chi23
# 1 1 7 0.8733 0.9795 0.8991
# 2 2 7 0.0000 0.0000 0.0454
# 3 3 7 0.1115 0.0413 0.0500
# 4 4 7 0.0000 0.0000 0.0000
# 5 5 7 0.0058 0.0000 0.0000

Trait Distributions
Item True Score Functions

\[ \text{Item Score} \]

| theta | Female | Male  |
|-------|--------|-------|
| -4    |        |       |
| -2    |        |       |
| 0     |        |       |
| 2     |        |       |
| 4     |        |       |

\[ \Pr(\chi^2_{12}, 1) = 0, R_{12}^2 = 0.0079, \Delta(\beta_1) = 0.0813 \]

\[ \Pr(\chi^2_{13}, 2) = 0, R_{13}^2 = 0.0088 \]

\[ \Pr(\chi^2_{23}, 1) = 0.0454, R_{23}^2 = 9 \times 10^{-4} \]

Differences in Item True Score Functions

\[ \text{Item Score} \]

| theta | Female | Male  |
|-------|--------|-------|
| -4    |        |       |
| -2    |        |       |
| 0     |        |       |
| 2     |        |       |
| 4     |        |       |

\[ \Delta(\beta_1) = 0.0313 \]

Item Response Functions

\[ \text{Probability} \]

| theta | 1.91, -0.58, 0.12, 0.63, 1.16, 1.6, 2.31 |
|-------|------------------------------------------|
|       | 1.56, -0.89, -0.23, 0.32, 0.87, 1.17, 2.11 |

Impact (Weighted by Density)

\[ \text{Size} \]

Differences in Item True Score Function

\[ \text{Item Score} \]

| theta | Female | Male  |
|-------|--------|-------|
| -4    |        |       |
| -2    |        |       |
| 0     |        |       |
| 2     |        |       |
| 4     |        |       |

\[ \Delta(\beta_1) = 0.0093 \]

Item True Score Functions – Item 4

\[ \text{Item Score} \]

| theta | Female | Male  |
|-------|--------|-------|
| -4    |        |       |
| -2    |        |       |
| 0     |        |       |
| 2     |        |       |
| 4     |        |       |

\[ \Pr(\chi^2_{24}, 1) = 0.01, R_{24}^2 = 0.0143, \Delta(\beta_1) = 0.0044 \]

Item Response Functions

\[ \text{Probability} \]

| theta | 1.24, -1.44, -0.86, -0.3, 0.24, 0.89, 1.53 |
|-------|------------------------------------------|
|       | 2.08, -0.69, -0.19, 0.24, 0.57, 1.07, 1.59 |

Impact (Weighted by Density)
Item True Score Functions – Item 5

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items

TCC

Female

Male
Age-based DIF: Somatic Anxiety

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(age.data), group = age)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 4 of 5
##
## Items flagged: 1, 3, 4, 5
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat  chi2  chi3  chi23
## 1   1   7 0.0066 0.0001 0.0005
## 2   2   7 0.5523 0.7902 0.7315
## 3   3   7 0.0000 0.0000 0.0711
## 4   4   7 0.0001 0.0001 0.0296
## 5   5   7 0.0057 0.0181 0.5346
```
Trait Distributions

Item True Score Functions – Item 1

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Item True Score Functions – Item 3

Item True Score Functions – Item 4

Differences in Item True Score Function

Differences in Item True Score Function

Item Response Functions

Item Response Functions

Impact (Weighted by Density)

Impact (Weighted by Density)
Item True Score Functions – Item 5

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items
Substance Use

Site 1

Reliability: Substance Use

## Cronbach's alpha is 0.845.
## Mean item-total correlation is 0.598.
## If each item were dropped:

|    | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|----|-----------|-----------|---------|-----------|-----|----------|-------|-------|
| Q59 | 0.81      | 0.81      | 0.74    | 0.58      | 4.2 | 0.013    | 0.00049 | 0.57  |
| Q4  | 0.79      | 0.81      | 0.74    | 0.59      | 4.3 | 0.013    | 0.00034 | 0.59  |
| Q107| 0.80      | 0.82      | 0.75    | 0.60      | 4.6 | 0.013    | 0.00113 | 0.59  |
| Q35 | 0.81      | 0.83      | 0.76    | 0.62      | 4.8 | 0.012    | 0.00043 | 0.61  |
Unidimensionality: Substance Use

```r
## [1] "Ratio of first to second eigenvalues: 6.057"
## [1] 2.7783561 0.4586974 0.4083178 0.3546287

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1   h2  u2  com
## Q59  0.78 0.61 0.39  1
## Q4   0.80 0.65 0.35  1
## Q107 0.77 0.59 0.41  1
## Q35  0.72 0.52 0.48  1
##
## MR1
## SS loadings 2.37
## Proportion Var 0.59
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 6 and the objective function was 1.69 with Chi Square of 1037.32
## The degrees of freedom for the model are 2 and the objective function was 0
##
## The root mean square of the residuals (RMSR) is 0.01
## The df corrected root mean square of the residuals is 0.02
##
## The harmonic number of observations is 546 with the empirical chi square 0.62 with prob < 0.73
## The total number of observations was 617 with Likelihood Chi Square = 2.17 with prob < 0.34
##
## Tucker Lewis Index of factoring reliability = 1
## RMSEA index = 0.012 and the 90 % confidence intervals are 0 0.082
```
### BIC = -10.68
### Fit based upon off diagonal values = 1
### Measures of factor score adequacy

## Correlation of (regression) scores with factors 0.93
## Multiple R square of scores with factors 0.86
## Minimum correlation of possible factor scores 0.71

#### Graded-Response Model: Substance Use

|   | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---|---------|---------|---------|---------|---------|---------|--------|
| Q59 | -0.737  | -1.144  | -1.440  | -1.781  | -2.187  | -2.403  | -3.399 |
| Q4  | -1.129  | -1.802  | -2.154  | -2.321  | -2.595  | -2.741  | -3.435 |
| Q107 | -1.326  | -1.790  | -2.011  | -2.285  | -2.532  | -2.711  | -3.324 |
| Q35 | -1.414  | -1.848  | -2.114  | -2.354  | -2.649  | -3.064  | -3.149 |

#### Test Information Function

![Test Information Function Graph](image-url)
Site 2

Reliability: Substance Use

## Cronbach’s alpha is 0.917.
## Mean item-total correlation is 0.755.
## If each item were dropped:

|   | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se   | var_r | med_r |
|---|-----------|------------|---------|------------|-----|-------|------|-------|-------|
| Q59 | 0.92      | 0.92       | 0.88    | 0.79       | 11.1| 0.0059| 0.00079| 0.80  |
| Q4  | 0.88      | 0.89       | 0.84    | 0.72       | 7.9 | 0.0084 | 0.00192| 0.74  |
| Q107| 0.88      | 0.90       | 0.86    | 0.74       | 8.7 | 0.0082 | 0.00429| 0.75  |
| Q35 | 0.90      | 0.91       | 0.87    | 0.77       | 9.8 | 0.0070 | 0.00100| 0.75  |
Unidimensionality: Substance Use

## [1] "Ratio of first to second eigenvalues: 9.448"

## [1] 3.2729631 0.3464255 0.2256145 0.1549969

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q59 0.81 0.65 0.35 1
## Q4  0.93 0.87 0.13 1
## Q107 0.89 0.79 0.21 1
## Q35  0.85 0.73 0.27 1
##
## MR1
## SS loadings 3.04
## Proportion Var 0.76
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  6  and the objective function was  3.23 with Chi Square 1913.47
## The degrees of freedom for the model are  2  and the objective function was  0.05
##
## The root mean square of the residuals (RMSR) is  0.02
## The df corrected root mean square of the residuals is  0.04
##
## The harmonic number of observations is  520 with the empirical chi square  2.82 with prob <  0.24
## The total number of observations was  596 with Likelihood Chi Square =  28.56 with prob <  6.3e-07
##
## Tucker Lewis Index of factoring reliability =  0.958
## RMSEA index =  0.149 and the 90 % confidence intervals are  0.104 0.2
### BIC = 15.78
### Fit based upon off diagonal values = 1
### Measures of factor score adequacy
###
### Correlation of (regression) scores with factors 0.97
### Multiple R square of scores with factors 0.94
### Minimum correlation of possible factor scores 0.88

Graded-Response Model: Substance Use

|       | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrnn |
|-------|---------|---------|---------|---------|---------|---------|--------|
| Q59   | -0.737  | -1.057  | -1.291  | -1.581  | -1.845  | -2.047  | -2.745 |
| Q4    | -1.153  | -1.454  | -1.638  | -1.969  | -2.178  | -2.579  | -3.523 |
| Q107  | -1.000  | -1.370  | -1.620  | -1.870  | -2.091  | -2.313  | -3.112 |
| Q35   | -1.157  | -1.545  | -1.766  | -2.062  | -2.223  | -2.387  | -3.478 |

**Test Information Function**

![Test Information Function Graph]

159
Site DIF

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 4
##
## Items flagged: 3

## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr

## Threshold: alpha = 0.01

## item ncat chi12 chi13 chi23
## 1 1 7 0.8874 0.7627 0.4701
## 2 2 6 0.4715 0.5554 0.4174
## 3 3 6 0.0004 0.0018 0.5952
## 4 4 6 0.4924 0.7698 0.8195
```
Trait Distributions

Item True Score Functions

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Gender-based DIF: Substance Use

```r
# Call:
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
#
# Number of DIF groups: 2
```
Age-based DIF: Substance Use

## Call:
`lordif::lordif(resp.data = as.data.frame(age.data), group = age)`

## Number of DIF groups: 2
## Number of items flagged for DIF: 1 of 4
## Items flagged: 4
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

| item ncat | ncat | chi12 | chi13 | chi23 |
|-----------|------|-------|-------|-------|
| 1         | 1    | 7     | 0.4450| 0.7122| 0.7571|
Suicide

Site 1

Did not converge.
Reliability: Suicide

```r
## Cronbach's alpha is 0.823.
## Mean item-total correlation is 0.575.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q19 0.76 0.80 0.72 0.57 3.9 0.015 4.3e-04 0.56
## Q105 0.76 0.80 0.73 0.57 4.0 0.015 2.5e-04 0.57
## Q77 0.77 0.81 0.74 0.59 4.3 0.014 2.7e-05 0.59
## Q106 0.80 0.80 0.73 0.57 4.1 0.014 3.5e-04 0.57
```

Unidimensionality: Suicide

```
## [1] "Ratio of first to second eigenvalues: 6.173"
## [1] 2.7591314 0.4469352 0.4098761 0.3840574
## Factor Analysis using method = minres
## Standardized loadings (pattern matrix) based upon correlation matrix
##     MR1   h2    u2   com
## Q19  0.79 0.62 0.38  1
## Q105 0.77 0.60 0.40  1
## Q77  0.74 0.55 0.45  1
## Q106 0.76 0.58 0.42  1
```

Scree Plot

```
## SS loadings  2.35
## Proportion Var 0.59
##
##
```
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.

## The degrees of freedom for the null model are 6 and the objective function was 1.64 with Chi Square of 971.83
## The degrees of freedom for the model are 2 and the objective function was 0

## The root mean square of the residuals (RMSR) is 0.01
## The df corrected root mean square of the residuals is 0.01

## The harmonic number of observations is 567 with the empirical chi square 0.36 with prob < 0.84
## The total number of observations was 596 with Likelihood Chi Square = 1.11 with prob < 0.57

## Tucker Lewis Index of factoring reliability = 1.003
## RMSEA index = 0 and the 90% confidence intervals are 0 0.068
## BIC = -11.67
## Fit based upon off diagonal values = 1

## Measures of factor score adequacy

## Correlation of (regression) scores with factors 0.92
## Multiple R square of scores with factors 0.85
## Minimum correlation of possible factor scores 0.70

Graded-Response Model: Suicide

## Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q19 -0.801 -1.335 -1.747 -2.089 -2.401 -2.620 -2.500
## Q105 -1.602 -1.753 -1.805 -2.049 -2.169 -2.266 -3.606
## Q77 -1.442 -1.859 -1.907 -2.049 -2.169 -2.266 -3.606
## Q106 -2.015 -2.317 -2.601 -2.983 -3.275 -3.581 -2.090

Test Information Function
Gender-based DIF: Suicide

```
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 4
##
## Items flagged: 2
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1  1  7  0.5858  0.4369  0.2437
## 2  2  7  0.0052  0.0000  0.0001
## 3  3  7  0.8737  0.5515  0.2805
## 4  4  5  0.4501  0.1497  0.0724
```
Age-based DIF: Suicide

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(age.data), group = age)
##
## Number of DIF groups: 2
```
Number of items flagged for DIF: 1 of 4

Items flagged: 4

Number of iterations for purification: 2 of 10

Detection criterion: Chisqr

Threshold: alpha = 0.01

### item ncat chi12 chi13 chi23
### 1 1 7 0.7743 0.4980 0.2520
### 2 2 7 0.1809 0.2467 0.3153
### 3 3 7 0.7417 0.9157 0.7952
### 4 4 4 0.0001 0.0001 0.0712

Trait Distributions

![Trait Distributions](image-url)
Item True Score Functions – Item 4

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items
Reliability: Trauma Reaction

## Cronbach's alpha is 0.744.
## Mean item-total correlation is 0.425.
## If each item were dropped:

|   | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha   | S/N | se   | var.r | med.r |
|---|-----------|------------|---------|-----------|-----|---------|-----|------|-------|-------|
| Q111 | 0.59      | 0.59       | 0.50    | 0.33      | 1.5 | 0.029   | 0.0042 | 0.32 |
| Q110 | 0.71      | 0.72       | 0.68    | 0.46      | 2.6 | 0.021   | 0.0417 | 0.37 |
| Q113 | 0.77      | 0.77       | 0.72    | 0.53      | 3.4 | 0.016   | 0.0227 | 0.50 |
| Q112 | 0.65      | 0.65       | 0.57    | 0.38      | 1.8 | 0.025   | 0.0139 | 0.37 |
Unidimensionality: Trauma Reaction

```
## [1] "Ratio of first to second eigenvalues: 3.004"
## [1] 2.3081635 0.7682523 0.6327374 0.2908468
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q111 0.91 0.83 0.17 1
## Q110 0.55 0.31 0.69 1
## Q113 0.42 0.18 0.82 1
## Q112 0.75 0.56 0.44 1
##
## MR1
## SS loadings 1.88
## Proportion Var 0.47
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  6  and the objective function was  1.12 with Chi Square of 687.4
## The degrees of freedom for the model are  2  and the objective function was  0.01
##
## The root mean square of the residuals (RMSR) is  0.02
## The df corrected root mean square of the residuals is  0.03
##
## The harmonic number of observations is  547  with the empirical chi square  1.96  with prob <  0.38
## The total number of observations was  617  with Likelihood Chi Square =  3.16  with prob <  0.21
##
## Tucker Lewis Index of factoring reliability =  0.995
## RMSEA index =  0.031  and the 90 % confidence intervals are  0 0.091
```
## BIC = -9.69
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.93
## Multiple R square of scores with factors 0.87
## Minimum correlation of possible factor scores 0.75

Graded-Response Model: Trauma Reaction

|       | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-------|---------|---------|---------|---------|---------|---------|--------|
| Q111  | -0.415  | 0.060   | 0.401   | 0.680   | 0.992   | 1.163   | 2.688  |
| Q110  | 0.284   | 0.541   | 0.712   | 0.968   | 1.209   | 1.462   | 2.038  |
| Q113  | -1.105  | -0.600  | -0.256  | 0.169   | 1.007   | 1.512   | 0.982  |
| Q112  | 0.066   | 0.271   | 0.425   | 0.685   | 0.936   | 1.097   | 4.074  |

Test Information Function
Site 2

Reliability: Trauma Reaction

## Cronbach's alpha is 0.765.
## Mean item-total correlation is 0.454.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var_r med_r
## Q111 0.65 0.65 0.56 0.38 1.9 0.025 0.0025 0.37
## Q110 0.72 0.73 0.67 0.47 2.7 0.020 0.0228 0.40
## Q113 0.78 0.78 0.71 0.54 3.5 0.016 0.0104 0.53
## Q112 0.68 0.69 0.61 0.42 2.2 0.023 0.0096 0.40
Unidimensionality: Trauma Reaction

## [1] "Ratio of first to second eigenvalues: 3.389"

## [1] 2.3764852 0.7011546 0.5770705 0.3452897

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q111 0.85 0.72 0.28 1
## Q110 0.63 0.39 0.61 1
## Q113 0.50 0.25 0.75 1
## Q112 0.73 0.54 0.46 1

## MR1
## SS loadings 1.90
## Proportion Var 0.48

## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  6  and the objective function was  1.1 with Chi Square of 653.64
## The degrees of freedom for the model are  2  and the objective function was  0.01
##
## The root mean square of the residuals (RMSR) is  0.02
## The df corrected root mean square of the residuals is  0.03
##
## The harmonic number of observations is  523  with the empirical chi square  2.36  with prob <  0.31
## The total number of observations was  596  with Likelihood Chi Square =  4.66  with prob <  0.097
##
## Tucker Lewis Index of factoring reliability =  0.988
## RMSEA index =  0.047  and the 90 % confidence intervals are  0 0.105
BIC = -8.12

Fit based upon off diagonal values = 1

Measures of factor score adequacy

Correlation of (regression) scores with factors 0.91
Multiple R square of scores with factors 0.82
Minimum correlation of possible factor scores 0.65

Graded-Response Model: Trauma Reaction

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q111    | -0.398  | 0.096   | 0.479   | 0.822   | 1.209   | 1.571  | 3.163  |
| Q110    | -0.053  | 0.464   | 0.895   | 1.200   | 1.629   | 2.074  | 1.660  |
| Q113    | -1.071  | -0.434  | 0.089   | 0.527   | 1.173   | 1.971  | 1.053  |
| Q112    | -0.185  | 0.252   | 0.617   | 0.999   | 1.277   | 1.668  | 2.444  |

Test Information Function
Site DIF

## Call:
## `lordif::lordif(resp.data = as.data.frame(merged_data), group = site)`
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 4
##
## Items flagged: 4
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## | item | ncat | chi2 | chi13 | chi23 |
##|------|------|------|-------|-------|
##| 1    | 1    | 7    | 0.7018| 0.9287| 0.9720|
##| 2    | 2    | 7    | 0.2885| 0.5013| 0.6140|
##| 3    | 3    | 7    | 0.0312| 0.0718| 0.4292|
##| 4    | 4    | 7    | 0.0007| 0.0022| 0.3627|
Trait Distributions

Item True Score Functions – Item 4

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Gender-based DIF: Trauma Reaction

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
```
Number of items flagged for DIF: 1 of 4

Items flagged: 4

Number of iterations for purification: 2 of 10

Detection criterion: Chisqr

Threshold: alpha = 0.01

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 7     | 0.3398| 0.6171| 0.8158|
| 2    | 2    | 7     | 0.1989| 0.2936| 0.3708|
| 3    | 3    | 7     | 0.1562| 0.3659| 0.9837|
| 4    | 4    | 7     | 0.0005| 0.0011| 0.2069|

Trait Distributions

Density

-4  -2  0  2  4
theta
Item True Score Functions – Item 4

- \( P_r(\chi^{2}_{12}) = 0.04, R^{2} = 0.0038, A(\hat{\beta}) = 0.0172 \)
- \( P_r(\chi^{2}_{13}) = 0.0011, R^{2} = 0.0041 \)
- \( P_r(\chi^{2}_{23}) = 0.2069, R^{2} = 5 \times 10^{-4} \)

Differences in Item True Score Function

- \( \Delta(\hat{\beta}_1) = 0.0172 \)

Item Response Functions

- Probability
  - All Items: 2.66, -0.11, 0.33, 0.68, 1.02, 1.39, 1.79
  - DIF Items: 2.07, -0.26, 0.21, 0.59, 1.03, 1.34, 1.71

Impact (Weighted by Density)

- Size

All Items

- TCC
  - Female
  - Male

DIF Items

- TCC
  - Female
  - Male
Age-based DIF: Trauma Reaction

```r
# Call:
# lordif::lordif(resp.data = as.data.frame(age.data), group = age)
#
# Number of DIF groups: 2
# Number of items flagged for DIF: 0 of 4
# Items flagged:
# Number of iterations for purification: 1 of 10
# Detection criterion: Chisqr
# Threshold: alpha = 0.01
```

Back to top

Readiness for Recovery

Site 1

Reliability: Readiness for Recovery

```r
# Cronbach's alpha is 0.407.
# Mean item-total correlation is 0.184.
# If each item were dropped:
# raw_alpha  std.alpha  G6(smc)  average_r  S/N alpha  se  var.r  med.r
# Q133  0.26  0.26  0.15  0.15  0.35  0.059  NA  0.15
```
## Scree Plot

Unidimensionality: Readiness for Recovery

```r
## [1] "Ratio of first to second eigenvalues: 1.545"
## [1] 1.3761048 0.8904652 0.7334300

# Factor Analysis using method = minres
# Call: fa(r = grm_obj$X)
# Standardized loadings (pattern matrix) based upon correlation matrix
##  
## MR1  h2  u2  com
## Q133 0.49 0.240 0.76 1
## Q134 0.54 0.295 0.70 1
## Q135 0.28 0.078 0.92 1
##
##  
## MR1
## SS loadings 0.61
## Proportion Var 0.20
##
## # Mean item complexity = 1
## # Test of the hypothesis that 1 factor is sufficient.
## # The degrees of freedom for the null model are 3 and the objective function was 0.11 with Chi Square of 65.58
## The degrees of freedom for the model are 0 and the objective function was 0
##
## # The root mean square of the residuals (RMSR) is 0
## # The df corrected root mean square of the residuals is NA
##
## # The harmonic number of observations is 580 with the empirical chi square 0 with prob < NA
## # The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
```
# Tucker Lewis Index of factoring reliability = -Inf
# Fit based upon off diagonal values = 1
# Measures of factor score adequacy

# Correlation of (regression) scores with factors 0.67
# Multiple R square of scores with factors 0.45
# Minimum correlation of possible factor scores -0.10

Graded-Response Model: Readiness for Recovery

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q133    | -2.029  | -1.128  | -0.294  | 0.608   | 1.356   | 2.535  | 1.149  |
| Q134    | -3.394  | -2.757  | -1.904  | -1.095  | -0.297  | 0.674  | 1.158  |
| Q135    | -0.409  | 1.377   | 2.911   | 5.159   | 7.875   | 11.332 | 0.475  |

Test Information Function

[Graph showing the test information function with ability on the x-axis and information on the y-axis.]
Site 2

Reliability: Readiness for Recovery

## Cronbach's alpha is 0.441.
## Mean item-total correlation is 0.205.
## If each item were dropped:

| Item  | raw_alpha | std.alpha | G6(smc) | average_r | S/N alpha | se | var.r | med.r |
|-------|-----------|-----------|---------|-----------|-----------|----|-------|-------|
| Q133  | 0.20      | 0.20      | 0.11    | 0.11      | 0.25      | 0.065 | NA    | 0.11  |
| Q134  | 0.31      | 0.31      | 0.19    | 0.19      | 0.45      | 0.056 | NA    | 0.19  |
| Q135  | 0.48      | 0.48      | 0.32    | 0.32      | 0.94      | 0.042 | NA    | 0.32  |
Unidimensionality: Readiness for Recovery

```r
## [1] "Ratio of first to second eigenvalues: 1.569"
## [1] 1.4226754 0.9069711 0.6703535
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q133 0.73 0.537 0.46  1
## Q134 0.44 0.189 0.81  1
## Q135 0.25 0.064 0.94  1
##
## MR1
## SS loadings 0.79
## Proportion Var 0.26
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are  3  and the objective function was  0.15 with Chi Square of 86.04
## The degrees of freedom for the model are  0  and the objective function was  0
##
## The root mean square of the residuals (RMSR) is  0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 565 with the empirical chi square  0  with prob < NA
## The total number of observations was 596 with Likelihood Chi Square =  0  with prob < NA
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```
## MR1

- Correlation of (regression) scores with factors: 0.77
- Multiple R square of scores with factors: 0.59
- Minimum correlation of possible factor scores: 0.19

Graded-Response Model: Readiness for Recovery

|        | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|--------|---------|---------|---------|---------|---------|---------|--------|
| Q133   | -1.403  | -0.678  | -0.008  | 0.751   | 1.598   | 2.670   | 1.594  |
| Q134   | -3.089  | -2.412  | -1.619  | -0.687  | 0.049   | 1.237   | 1.008  |
| Q135   | 0.079   | 1.181   | 2.381   | 4.147   | 5.219   | 7.678   | 0.573  |

Test Information Function

![Test Information Function Graph]
Gender-based DIF: Readiness for Recovery

## No Gender-based DIF detected

Age-based DIF: Readiness for Recovery

## No age-based DIF detected

Recovery Environment

Site 1

Reliability: Recovery Environment

## Cronbach's alpha is 0.643.
## Mean item-total correlation is 0.266.
## If each item were dropped:

|   | raw_alpha | std.alpha | 6(sm) | average_r | S/N | alpha se | var.r | med.r |
|---|-----------|-----------|-------|-----------|-----|----------|-------|-------|
| Q80 | 0.60      | 0.60      | 0.53  | 0.27      | 1.5 | 0.026    | 0.00146 | 0.29  |
| Q136 | 0.58      | 0.58      | 0.51  | 0.26      | 1.4 | 0.027    | 0.00150 | 0.25  |
| Q138 | 0.60      | 0.60      | 0.53  | 0.27      | 1.5 | 0.026    | 0.00104 | 0.28  |
| Q139 | 0.60      | 0.60      | 0.53  | 0.27      | 1.5 | 0.026    | 0.00114 | 0.29  |
| Q137 | 0.58      | 0.58      | 0.51  | 0.26      | 1.4 | 0.028    | 0.00091 | 0.25  |
Unidimensionality: Recovery Environment

```r
## [1] "Ratio of first to second eigenvalues: 2.577"
## [1] 2.0756735 0.8055102 0.7783887 0.7037467 0.6366809
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##    MR1   h2   u2  com
## Q80  0.50 0.25 0.75 1
## Q136 0.55 0.30 0.70 1
## Q138 0.50 0.25 0.75 1
## Q139 0.49 0.24 0.76 1
## Q137 0.56 0.31 0.69 1
##
##    MR1
## SS loadings 1.35
## Proportion Var 0.27
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 10 and the objective function was 0.54 with Chi Square of 330.89
## The degrees of freedom for the model are 5 and the objective function was 0.01
##
## The root mean square of the residuals (RMSR) is 0.03
## The df corrected root mean square of the residuals is 0.04
##
## The harmonic number of observations is 563 with the empirical chi square 8.11 with prob < 0.15
## The total number of observations was 617 with Likelihood Chi Square = 8.49 with prob < 0.13
## Tucker Lewis Index of factoring reliability = 0.978
```
## RMSEA index = 0.034 and the 90% confidence intervals are 0 0.071
## BIC = -23.63
## Fit based upon off diagonal values = 0.99
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.81
## Multiple R square of scores with factors 0.65
## Minimum correlation of possible factor scores 0.30

Graded-Response Model: Recovery Environment

|       | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-------|---------|---------|---------|---------|---------|---------|--------|
| Q80   | -0.614  | 0.120   | 0.776   | 1.468   | 2.287   | 3.476   | 1.159  |
| Q136  | -1.205  | -0.343  | 0.400   | 1.261   | 1.952   | 2.840   | 1.253  |
| Q138  | -1.023  | -0.359  | 0.218   | 0.902   | 1.580   | 2.352   | 1.134  |
| Q139  | -1.797  | -0.837  | 0.121   | 1.015   | 1.883   | 2.990   | 1.085  |
| Q137  | -0.230  | 0.285   | 0.683   | 1.085   | 1.551   | 2.060   | 1.419  |

![Test Information Function](image-url)
Reliability: Recovery Environment

## Cronbach’s alpha is 0.633.
## Mean item-total correlation is 0.261.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|----------|-------|-------|
| Q80  | 0.58      | 0.58      | 0.52    | 0.26      | 1.4 | 0.028    | 0.0051| 0.24  |
| Q136 | 0.56      | 0.56      | 0.50    | 0.24      | 1.3 | 0.029    | 0.0028| 0.23  |
| Q138 | 0.58      | 0.59      | 0.53    | 0.26      | 1.4 | 0.028    | 0.0074| 0.26  |
| Q139 | 0.56      | 0.57      | 0.50    | 0.25      | 1.3 | 0.029    | 0.0040| 0.25  |
| Q137 | 0.61      | 0.62      | 0.55    | 0.29      | 1.6 | 0.026    | 0.0036| 0.28  |
Unidimensionality: Recovery Environment

```
## [1] "Ratio of first to second eigenvalues: 2.199"
## [1] 2.0630248 0.9381012 0.7182923 0.6806631 0.5999186

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##     MR1 h2 u2 com
## Q80 0.52 0.28 0.72 1
## Q136 0.60 0.36 0.64 1
## Q138 0.47 0.22 0.78 1
## Q139 0.59 0.34 0.66 1
## Q137 0.39 0.15 0.85 1

## SS loadings 1.35
## Proportion Var 0.27

## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 10 and the objective function was 0.57 with Chi Square of 335.5
## The degrees of freedom for the model are 5 and the objective function was 0.04
## The root mean square of the residuals (RMSR) is 0.05
## The df corrected root mean square of the residuals is 0.07
## The harmonic number of observations is 553 with the empirical chi square 24.85 with prob < 0.00015
## The total number of observations was 596 with Likelihood Chi Square = 21.92 with prob < 0.00054
## Tucker Lewis Index of factoring reliability = 0.896
```
RMSEA index = 0.075 and the 90\% confidence intervals are 0.045 0.109
BIC = -10.03
Fit based upon off diagonal values = 0.97
Measures of factor score adequacy

Correlation of (regression) scores with factors 0.81
Multiple R square of scores with factors 0.66
Minimum correlation of possible factor scores 0.32

Graded-Response Model: Recovery Environment

|        | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|--------|---------|---------|---------|---------|---------|---------|--------|
| Q80    | -0.381  | 0.306   | 0.868   | 1.594   | 2.202   | 3.160   | 1.317  |
| Q136   | -1.065  | -0.232  | 0.315   | 1.010   | 1.645   | 2.396   | 1.538  |
| Q138   | -0.739  | -0.077  | 0.524   | 1.088   | 1.624   | 2.394   | 1.032  |
| Q139   | -1.204  | -0.420  | 0.321   | 1.114   | 1.757   | 3.051   | 1.466  |
| Q137   | 0.189   | 0.778   | 1.179   | 1.752   | 2.435   | 3.055   | 0.892  |

Test Information Function
Site DIF

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 5
##
## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
```

Gender-based DIF: Recovery Environment

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 5
```
## Items flagged: 3, 4
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

| Item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 0.7349| 0.7197| 0.4611|
| 2    | 2    | 0.7714| 0.2528| 0.1025|
| 3    | 3    | 0.0000| 0.0000| 0.0021|
| 4    | 4    | 0.0001| 0.0006| 0.7773|
| 5    | 5    | 0.7025| 0.9274| 0.9449|

### Trait Distributions

![Trait Distributions](image)

Density

- Female
- Male
**Item True Score Functions** – Item 3

| Item Score | Probability |
|------------|-------------|
| Female     | Male        |
| 0.0051     | 0.0024      |
| 0.0119     | 0.0051      |
| 0.0051     | 0.0024      |
| 0.0119     | 0.0051      |
| 0.0051     | 0.0024      |
| 0.0119     | 0.0051      |

**Differences in Item True Score Function**

| Item Score | Probability |
|------------|-------------|
| Female     | Male        |
| 0.0037     | 0.0038      |
| 0.0088     | 0.0088      |
| 0.0037     | 0.0038      |
| 0.0088     | 0.0088      |
| 0.0037     | 0.0038      |
| 0.0088     | 0.0088      |

**Item Response Functions**

| Probability |
|-------------|
| 0.98, -0.79, -0.02, 0.64, 1.32, 1.99, 2.81 |
| 1.39, -0.88, -0.38, 0.05, 0.62, 1.18, 1.75 |

**Impact (Weighted by Density)**

| Size |
|------|
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |

**Item True Score Functions** – Item 4

| Item Score | Probability |
|------------|-------------|
| Female     | Male        |
| 1e-04     | 0.0037      |
| 0.0037     | 1e-04      |
| 0.0088     | 0.0088      |
| 0.0037     | 1e-04      |
| 0.0088     | 0.0088      |
| 0.0037     | 1e-04      |
| 0.0088     | 0.0088      |

**Differences in Item True Score Function**

| Item Score | Probability |
|------------|-------------|
| Female     | Male        |
| 0.0037     | 0.0038      |
| 0.0088     | 0.0088      |
| 0.0037     | 0.0038      |
| 0.0088     | 0.0088      |
| 0.0037     | 0.0038      |
| 0.0088     | 0.0088      |

**Item Response Functions**

| Probability |
|-------------|
| 1.32, -1.45, -0.69, 0.13, 1, 1.71, 2.93 |
| 1.45, -1.27, -0.3, 0.5, 1.17, 1.89, 3.04 |

**Impact (Weighted by Density)**

| Size |
|------|
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |
| 0.0  |

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Age-based DIF: Recovery Environment

## Call:
# lordif::lordif(resp.data = as.data.frame(age.data), group = age)
##
## Number of DIF groups: 2
## Number of items flagged for DIF: 2 of 5
## Items flagged: 1, 3
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01
##
## item ncat chi12 chi13 chi23
## 1 1 7 0.0035 0.0103 0.4367
## 2 2 7 0.4265 0.7102 0.8199
## 3 3 7 0.0004 0.0000 0.0018
## 4 4 7 0.4924 0.7312 0.6940
## 5 5 7 0.9740 0.4214 0.1888

### Trait Distributions

**Density**

- **Female**
- **Male**

- **theta**

| Density | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 |
|---------|-----|-----|-----|-----|-----|
| Theta   | -4  | -2  | 0   | 2   | 4   |
Item True Score Functions

- Item 1

| Item Score | Female | Male |
|------------|--------|------|
| Pr(χ12)   | 0.0035 | 0.0024 |
| R12       | 0.0024 |
| Δ(β1)     | 4e-004 |

- Item 2

| Item Score | Female | Male |
|------------|--------|------|
| Pr(χ13)   | 0.0103 | 0.0025 |
| R13       | 0.0025 |
| Δ(β1)     | 0.0011 |

- Item 3

| Item Score | Female | Male |
|------------|--------|------|
| Pr(χ23)   | 0.4367 | 2e-004 |
| R23       | 2e-004 |
| Δ(β1)     | 0.011  |

Differences in Item True Score Functions

- Item 1

| Item Score | Female | Male |
|------------|--------|------|
| Pr(χ12)   | 0.0035 | 0.0024 |
| R12       | 0.0024 |
| Δ(β1)     | 4e-004 |

- Item 2

| Item Score | Female | Male |
|------------|--------|------|
| Pr(χ13)   | 0.0103 | 0.0025 |
| R13       | 0.0025 |
| Δ(β1)     | 0.0011 |

- Item 3

| Item Score | Female | Male |
|------------|--------|------|
| Pr(χ23)   | 0.4367 | 2e-004 |
| R23       | 2e-004 |
| Δ(β1)     | 0.011  |

Item Response Functions

- Item 1

| Probability | 1.2, -0.34, 0.35, 1.03, 1.77, 2.52, 4.11 |
|-------------|------------------------------------------|
|             | 1.19, -0.61, 0.11, 0.71, 1.51, 2.22, 3.29 |

- Item 2

| Probability | 0.96, -1.16, -0.46, 0.28, 1.04, 1.89, 2.66 |
|-------------|---------------------------------------------|
|             | 1.27, -0.55, 0.11, 0.54, 1.04, 1.47, 2.14 |

Impact (Weighted by Density)
All Items

DIF Items

Social Safety

Site 1

Reliability: Social Safety
# Cronbach's alpha is 0.749.
# Mean item-total correlation is 0.335.
# If each item were dropped:

| raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se   | var.r | med.r |
|-----------|-----------|---------|-----------|-----|-------|------|-------|-------|
| Q43       | 0.69      | 0.69    | 0.66      | 0.31| 2.2   | 0.020| 0.0106| 0.31  |
| Q131      | 0.71      | 0.71    | 0.68      | 0.33| 2.4   | 0.019| 0.0138| 0.36  |
| Q40       | 0.69      | 0.69    | 0.66      | 0.31| 2.2   | 0.020| 0.0111| 0.31  |
| Q132      | 0.75      | 0.75    | 0.72      | 0.38| 3.1   | 0.016| 0.0067| 0.38  |
| Q62       | 0.70      | 0.71    | 0.68      | 0.33| 2.4   | 0.019| 0.0121| 0.32  |
| Q50       | 0.73      | 0.74    | 0.71      | 0.36| 2.8   | 0.017| 0.0106| 0.38  |

## Unidimensionality: Social Safety

[Scree Plot]

Eigenvalue

| Dimension | 1   | 2   | 3   | 4   | 5   |
|-----------|-----|-----|-----|-----|-----|
| 0.5       | 1.0 | 1.5 | 2.0 |

Eigenvalue

| Dimension |
|-----------|
| 0.5       |
| 1.0       |
| 1.5       |
| 2.0       |

## Scree Plot

[Scree Plot Image]

Unidimensionality: Social Safety

[1] "Ratio of first to second eigenvalues: 2.786"

[1] 2.7184604 0.9758992 0.707665 0.6426698 0.4942761 0.4610280

# Factor Analysis using method = minres
# Call: fa(r = grm_obj$X)
# Standardized loadings (pattern matrix) based upon correlation matrix
# MR1  h2  u2  com
# Q43  0.71 0.50 0.50 1
# Q131 0.61 0.37 0.63 1
# Q40  0.68 0.46 0.54 1
# Q132 0.41 0.17 0.83 1
# Q62  0.62 0.38 0.62 1
# Q50  0.48 0.23 0.77 1
#
# SS loadings  2.10
# Proportion Var 0.35
#
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 15 and the objective function was 1.29 with Chi Square of 791.72
## The degrees of freedom for the model are 9 and the objective function was 0.12
##
## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.08
##
## The harmonic number of observations is 586 with the empirical chi square 63.24 with prob < 3.2e-10
## The total number of observations was 617 with Likelihood Chi Square = 71.46 with prob < 7.9e-12
##
## Tucker Lewis Index of factoring reliability = 0.866
## RMSEA index = 0.106 and the 90 % confidence intervals are 0.084 0.13
## BIC = 13.64
## Fit based upon off diagonal values = 0.97
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.88
## Multiple R square of scores with factors 0.78
## Minimum correlation of possible factor scores 0.56

### Graded-Response Model: Social Safety

|          | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|----------|---------|---------|---------|---------|---------|---------|--------|
| Q43      | -2.075  | -1.407  | -0.880  | -0.295  | 0.201   | 0.926   | 1.997  |
| Q131     | -1.805  | -1.100  | -0.522  | 0.303   | 0.922   | 1.968   | 1.483  |
| Q40      | -2.454  | -1.722  | -1.060  | -0.311  | 0.380   | 1.449   | 1.685  |
| Q132     | -2.662  | -1.523  | -0.844  | 0.193   | 1.193   | 2.820   | 0.797  |
| Q62      | -1.001  | -0.360  | 0.175   | 0.684   | 1.239   | 1.964   | 1.603  |
| Q50      | -2.966  | -2.017  | -1.434  | -0.694  | 0.060   | 1.072   | 1.062  |
Test Information Function

![Test Information Function Graph]

Item Information Curves

![Item Information Curves Graph]

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Site 2

Reliability: Social Safety
Cronbach's alpha is 0.742.
Mean item-total correlation is 0.325.
If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N alpha | se | var.r | med.r |
|------|-----------|------------|---------|------------|------------|----|-------|-------|
| Q43  | 0.69      | 0.69       | 0.66    | 0.31       | 2.3        | 0.020 | 0.0120 | 0.34  |
| Q131 | 0.69      | 0.69       | 0.67    | 0.31       | 2.3        | 0.020 | 0.0145 | 0.34  |
| Q40  | 0.69      | 0.69       | 0.66    | 0.31       | 2.2        | 0.020 | 0.0167 | 0.33  |
| Q132 | 0.76      | 0.76       | 0.72    | 0.39       | 3.2        | 0.016 | 0.0026 | 0.38  |
| Q62  | 0.69      | 0.69       | 0.66    | 0.31       | 2.2        | 0.020 | 0.0116 | 0.35  |
| Q50  | 0.70      | 0.70       | 0.67    | 0.32       | 2.4        | 0.019 | 0.0111 | 0.34  |

Unidimensionality: Social Safety

Ratio of first to second eigenvalues: 2.745

Factor Analysis using method = minres
Standardized loadings (pattern matrix) based upon correlation matrix

| Item | MR1  | h2   | u2   | com |
|------|------|------|------|-----|
| Q43  | 0.63 | 0.40 | 0.60 | 1   |
| Q131 | 0.62 | 0.39 | 0.61 | 1   |
| Q40  | 0.63 | 0.39 | 0.61 | 1   |
| Q132 | 0.32 | 0.10 | 0.90 | 1   |
| Q62  | 0.64 | 0.40 | 0.60 | 1   |
| Q50  | 0.60 | 0.36 | 0.64 | 1   |
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 15 and the objective function was 1.22 with Chi Square of 720.81
## The degrees of freedom for the model are 9 and the objective function was 0.11
##
## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.07
##
## The harmonic number of observations is 565 with the empirical chi square 54.3 with prob < 1.7e-08
## The total number of observations was 596 with Likelihood Chi Square = 64.1 with prob < 2.2e-10
##
## Tucker Lewis Index of factoring reliability = 0.87
## RMSEA index = 0.101 and the 90 % confidence intervals are 0.079 0.126
## BIC = 6.59
## Fit based upon off diagonal values = 0.97
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.88
## Multiple R square of scores with factors 0.77
## Minimum correlation of possible factor scores 0.53

### Graded-Response Model: Social Safety

|        | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|--------|---------|---------|---------|---------|---------|---------|--------|
| Q43    | -1.810  | -1.321  | -0.755  | -0.245  | 0.331   | 1.174   | 1.696  |
| Q131   | -1.750  | -1.083  | -0.506  | 0.137   | 0.933   | 2.160   | 1.487  |
| Q40    | -2.348  | -1.725  | -1.027  | -0.229  | 0.552   | 1.596   | 1.531  |
| Q132   | -2.887  | -1.746  | -0.742  | 0.723   | 2.193   | 3.834   | 0.635  |
| Q62    | -0.877  | -0.261  | 0.177   | 0.537   | 1.053   | 1.717   | 1.701  |
| Q50    | -2.199  | -1.418  | -0.927  | -0.264  | 0.319   | 1.155   | 1.508  |
Test Information Function

Item Information Curves

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Site DIF

```r
## Call:
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```
## lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 6
##
## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01

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Gender-based DIF: Social Safety

## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 4 of 6
##
## Items flagged: 2, 4, 5, 6
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01

##
## item ncat chi12 chi13 chi23
## 1 1 7 0.6586 0.8414 0.6985
## 2 2 7 0.0000 0.0000 0.9181
## 3 3 7 0.1196 0.2791 0.7193
## 4 4 7 0.0036 0.0138 0.7406
## 5 5 7 0.0006 0.0000 0.0034
## 6 6 7 0.0000 0.0000 0.9805
Trait Distributions

**Item True Score Functions – Item 2**

**Differences in Item True Score Function**

**Item Response Functions**

**Impact (Weighted by Density)**
Item True Score Functions

- 
- Item Score
- Female
- Male

Pr($\chi_{12}^2, 1) = 0$
$R_{12}^2 = 0.0077$
$\Delta(\beta_1) = 0.0193$

Pr($\chi_{13}^2, 2) = 0$
$R_{13}^2 = 0.0077$

Pr($\chi_{23}^2, 1) = 0.9805$
$R_{23}^2 = 0$

Differences in Item True Score Functions

- 
- Item Score

Item Response Functions

- Probability

Impact (Weighted by Density)

- Size

All Items

- TCC

DIF Items

- TCC
Age-based DIF: Social Safety

## Call:
```
# lordif::lordif(resp.data = as.data.frame(age.data), group = age)
```
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 6
##
## Items flagged: 3, 6
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
### item ncat chi12 chi13 chi23
### 1 1 7 0.8205 0.8712 0.6358
### 2 2 7 0.0112 0.0320 0.5006
### 3 3 7 0.0026 0.0097 0.6470
### 4 4 7 0.3093 0.3900 0.3567
### 5 5 7 0.1872 0.3098 0.4369
### 6 6 7 0.0004 0.0005 0.1158
Item True Score Functions

- Item 6

\[ \Pr(\chi_{12}^2, 1) = 4e^{-0.04}, R_{12}^2 = 0.003, \Delta(\beta_1) = 0.0025 \]

\[ \Pr(\chi_{13}^2, 2) = 5e^{-0.04}, R_{13}^2 = 0.0036 \]

\[ \Pr(\chi_{23}^2, 1) = 0.1158, R_{23}^2 = 6e^{-0.04} \]

Differences in Item True Score Functions

- Item Score

| Item Score | Theta |
|------------|-------|
| Female     |       |
| Male       |       |

Impact (Weighted by Density)

- Size

TCC

- Female

TCC

- Female

DIF Items

- Theta

All Items

- Theta
Need for Control

Site 1

Reliability: Need for Control

```r
## Cronbach's alpha is 0.624.
## Mean item-total correlation is 0.293.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q26  0.50  0.51  0.42  0.26  1.0 0.035 0.0075 0.22
## Q20  0.54  0.54  0.45  0.28  1.2 0.032 0.0040 0.26
## Q68  0.58  0.57  0.50  0.31  1.3 0.029 0.0249 0.24
## Q130 0.59  0.59  0.51  0.32  1.4 0.029 0.0210 0.26
```
Unidimensionality: Need for Control

```r
## [1] "Ratio of first to second eigenvalues: 1.952"
## [1] 1.8814133 0.9637693 0.6436392 0.5111782
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##     MR1 h2 u2 com
## Q26  0.68 0.46 0.54  1
## Q20  0.61 0.37 0.63  1
## Q68  0.46 0.21 0.79  1
## Q130 0.43 0.18 0.82  1
##
## MR1
## SS loadings 1.22
## Proportion Var 0.30
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  6  and the objective function was  0.52 with Chi Square of 317.07
## The degrees of freedom for the model are  2  and the objective function was  0.08
##
## The root mean square of the residuals (RMSR) is  0.09
## The df corrected root mean square of the residuals is  0.15
##
## The harmonic number of observations is  573  with the empirical chi square  49.77  with prob <  1.6e-11
## The total number of observations was  617  with Likelihood Chi Square =  46.68  with prob <  7.3e-11
##
## Tucker Lewis Index of factoring reliability =  0.569
## RMSEA index =  0.19  and the 90 % confidence intervals are  0.145 0.24
```
## BIC = 33.83
## Fit based upon off diagonal values = 0.92
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.81
## Multiple R square of scores with factors 0.66
## Minimum correlation of possible factor scores 0.31

Graded-Response Model: Need for Control

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q26     | -1.335  | -0.663  | -0.269  | 0.327   | 0.877   | 1.529  | 1.901  |
| Q20     | -1.302  | -0.606  | -0.175  | 0.234   | 0.771   | 1.376  | 1.596  |
| Q68     | -2.806  | -1.824  | -1.226  | -0.396  | 0.399   | 1.313  | 0.933  |
| Q130    | -1.633  | -0.217  | 0.611   | 1.633   | 2.691   | 3.668  | 0.796  |

**Test Information Function**

| Information | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 |
|-------------|-----|-----|-----|-----|-----|
| Ability     | -4  | -2  | 0   | 2   | 4   |

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Site 2

Reliability: Need for Control

## Cronbach’s alpha is 0.674.
## Mean item-total correlation is 0.341.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|----------|-------|-------|
| Q26  | 0.59      | 0.59       | 0.50    | 0.33      | 1.5 | 0.029    | 0.00087| 0.34  |
| Q20  | 0.57      | 0.57       | 0.47    | 0.31      | 1.3 | 0.031    | 0.00164| 0.31  |
| Q68  | 0.65      | 0.65       | 0.56    | 0.38      | 1.9 | 0.024    | 0.00855| 0.35  |
| Q130 | 0.62      | 0.62       | 0.53    | 0.35      | 1.6 | 0.027    | 0.01469| 0.29  |
### Unidimensionality: Need for Control

```r
## [1] "Ratio of first to second eigenvalues: 2.51"
## [1] 2.0323792 0.8097225 0.6475203 0.5103781
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q26  0.63 0.40 0.60 1
## Q20  0.69 0.48 0.52 1
## Q68  0.47 0.22 0.78 1
## Q130 0.55 0.30 0.70 1
##
## MR1
## SS loadings 1.40
## Proportion Var 0.35
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  6 and the objective function was  0.61 with Chi Square of 361.07
## The degrees of freedom for the model are  2 and the objective function was  0.03
##
## The root mean square of the residuals (RMSR) is  0.05
## The df corrected root mean square of the residuals is  0.08
##
## The harmonic number of observations is  554 with the empirical chi square 14.81 with prob <  0.00061
## The total number of observations was  596 with Likelihood Chi Square = 16.92 with prob <  0.00021
##
## Tucker Lewis Index of factoring reliability = 0.874
## RMSEA index = 0.112 and the 90 % confidence intervals are  0.067 0.164
```
## BIC = 4.14
## Fit based upon off diagonal values = 0.98
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.83
## Multiple R square of scores with factors 0.70
## Minimum correlation of possible factor scores 0.39

Graded-Response Model: Need for Control

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrnn |
|---------|---------|---------|---------|---------|---------|--------|
| Q26     | -0.901  | -0.194  | 0.277   | 0.758   | 1.262   | 1.803  | 1.732  |
| Q20     | -0.983  | -0.325  | 0.094   | 0.504   | 1.004   | 1.632  | 1.936  |
| Q68     | -2.187  | -1.267  | -0.637  | -0.026  | 0.742   | 1.421  | 1.060  |
| Q130    | -0.798  | 0.190   | 0.716   | 1.367   | 2.045   | 2.695  | 1.240  |

Test Information Function
Site DIF

## Call:
```r
lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
```
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 4
##
## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisq
##
## Threshold: alpha = 0.01

Gender-based DIF: Need for Control

## Call:
```r
lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 4
## Items flagged: 3, 4
## Number of iterations for purification: 5 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

| item | ncat | chi² | chi²12 | chi²13 | chi²23 |
|------|------|------|--------|--------|--------|
| 1    | 1    | 7    | 0.5272 | 0.5910 | 0.4194 |
| 2    | 2    | 7    | 0.3421 | 0.2306 | 0.1541 |
| 3    | 3    | 7    | 0.0000 | 0.0000 | 0.0700 |
| 4    | 4    | 7    | 0.0001 | 0.0006 | 0.9197 |

### Trait Distributions

![Trait Distributions](image)
Item True Score Functions – Item 3

\[
\Pr(\chi_{12}^2, 1) = 0, \quad R_{12} = 0.009, \quad \Delta(\beta_1) = 0.0165
\]

\[
\Pr(\chi_{13}^2, 2) = 0, \quad R_{13} = 0.0098
\]

\[
\Pr(\chi_{23}^2, 1) = 0.07, \quad R_{23} = 8e^{-0.04}
\]

Differences in Item True Score Functions

\[
\text{item score}
\]

Item Response Functions

\[
1.04, -2.47, -1.61, -1.06, -0.36, 0.34, 1.12
\]

\[
0.95, 1.29, -1.19, 0.54, 0.00, 1.22, 2.21
\]

Impact (Weighted by Density)

Item True Score Functions – Item 4

\[
\Pr(\chi_{13}^2, 1) = 1e^{-0.04}, \quad R_{12} = 0.0037, \quad \Delta(\beta_1) = 0.0062
\]

\[
\Pr(\chi_{13}^2, 2) = 6e^{-0.04}, \quad R_{13} = 0.0037
\]

\[
\Pr(\chi_{23}^2, 1) = 0.9197, \quad R_{23} = 0
\]

Differences in Item True Score Functions

\[
\text{item score}
\]

Item Response Functions

\[
1.01, -1.18, -0.13, 0.46, 1.25, 2.06, 2.86
\]

\[
1.17, -0.92, 0.19, 0.9, 1.71, 2.67, 3.3
\]

Impact (Weighted by Density)
Age-based DIF: Need for Control

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(age.data), group = age)
##
## Number of DIF groups: 2
##
```
## Number of items flagged for DIF: 1 of 4
## Items flagged: 2
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

```
# item ncat chi2 chi3 chi23
# 1 1 7 0.0846 0.1100 0.2301
# 2 2 7 0.0000 0.0000 0.0122
# 3 3 7 0.6912 0.8055 0.6001
# 4 4 7 0.7262 0.9398 0.9686
```

### Trait Distributions

![Diagram showing trait distributions for Female and Male with a peak density at approximately 0.0 and 0.5 respectively.](image)

- **Female**
- **Male**
### Item True Score Functions – Item 2

**Item Score**

- **Probability Function**:
  - \( P(\theta | 1) \)
  - \( P(\theta | 2) \)

**Differences in Item True Score Function**

**Item Score**

- **Probability Function**:
  - \( P(\theta | 1) = 0.0052 \)
  - \( P(\theta | 2) = 0.0015 \)

### Differences in Item True Score Functions

**Item Score**

- **Probability Function**:
  - \( P(\theta | 1) = 0.0052 \)
  - \( P(\theta | 2) = 0.0015 \)

### Item Response Functions

**Probability**

- **Parameters**:
  - \( 1.41, -1.46, -0.69, -0.23, 0.25, 0.84, 1.46 \)
  - \( 1.95, -0.96, -0.33, 0.1, 0.49, 1, 1.63 \)

### Impact (Weighted by Density)

**Size**

- **Density**
  - \( All\ Items \)
  - \( DIF\ Items \)

**TCC**

- **Female**
  - \( \text{Female} \)
- **Male**
  - \( \text{Male} \)
Hopelessness

Site 1

Reliability: Hopelessness

## Cronbach’s alpha is 0.807.
## Mean item-total correlation is 0.448.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|----------|-------|-------|
| Q15  | 0.84      | 0.84       | 0.80    | 0.56      | 5.2 | 0.011    | 0.0019| 0.58  |
| Q61  | 0.74      | 0.73       | 0.71    | 0.40      | 2.7 | 0.017    | 0.0430| 0.42  |
| Q115 | 0.74      | 0.73       | 0.71    | 0.40      | 2.7 | 0.017    | 0.0299| 0.46  |
| Q24  | 0.75      | 0.75       | 0.73    | 0.42      | 2.9 | 0.016    | 0.0321| 0.46  |
| Q88  | 0.77      | 0.76       | 0.74    | 0.45      | 3.2 | 0.015    | 0.0256| 0.49  |
Unidimensionality: Hopelessness

```r
## [1] "Ratio of first to second eigenvalues: 3.036"
## [1] 2.8569948 0.9409413 0.4273236 0.4119507 0.3627897
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##     MR1 h2 u2 com
## Q15 0.37 0.14 0.86 1
## Q61 0.76 0.57 0.43 1
## Q115 0.81 0.65 0.35 1
## Q24 0.75 0.56 0.44 1
## Q88 0.69 0.48 0.52 1
##
##     MR1
## SS loadings 2.40
## Proportion Var 0.48
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 10 and the objective function was 1.76 with Chi Square of 1081.05
## The degrees of freedom for the model are 5 and the objective function was 0.13
##
## The root mean square of the residuals (RMSR) is 0.07
## The df corrected root mean square of the residuals is 0.1
##
## The harmonic number of observations is 589 with the empirical chi square 55.26 with prob < 1.2e-10
## The total number of observations was 617 with Likelihood Chi Square = 76.62 with prob < 4.3e-15
## Tucker Lewis Index of factoring reliability = 0.866
```
RMSEA index = 0.152 and the 90 % confidence intervals are 0.123 0.184
BIC = 44.49
Fit based upon off diagonal values = 0.98
Measures of factor score adequacy

|     | MR1         |
|-----|-------------|
| Correlation of (regression) scores with factors | 0.92 |
| Multiple R square of scores with factors       | 0.85 |
| Minimum correlation of possible factor scores   | 0.70 |

Graded-Response Model: Hopelessness

Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
Q15  -1.537  -0.372   0.800  2.030  3.133  4.623  0.783
Q61  -0.866  -0.287   0.213  0.776  1.257  1.829  2.336
Q115 -1.480  -0.881  -0.387  0.139  0.689  1.276  2.604
Q24  -1.544  -0.793  -0.394  0.130  0.641  1.333  2.080
Q88  -2.100  -1.563  -1.117  -0.638  -0.110  0.542  1.935

Test Information Function

![Test Information Function Graph]
## Cronbach's alpha is 0.812.
## Mean item-total correlation is 0.46.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|----------|-------|-------|
| Q15  | 0.83      | 0.83       | 0.79    | 0.55      | 4.9 | 0.011    | 0.0035| 0.56  |
| Q61  | 0.76      | 0.76       | 0.73    | 0.44      | 3.1 | 0.015    | 0.0308| 0.44  |
| Q115 | 0.74      | 0.74       | 0.71    | 0.42      | 2.9 | 0.017    | 0.0178| 0.46  |
| Q24  | 0.76      | 0.75       | 0.73    | 0.43      | 3.1 | 0.016    | 0.0208| 0.46  |
| Q88  | 0.78      | 0.77       | 0.74    | 0.46      | 3.4 | 0.015    | 0.0155| 0.49  |
Unidimensionality: Hopelessness

```r
## [1] "Ratio of first to second eigenvalues: 3.256"

## [1] 2.8795248 0.8845061 0.4445027 0.4283331 0.3631333

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##   MR1 h2 u2 com
## Q15 0.44 0.19 0.81 1
## Q61 0.71 0.51 0.49 1
## Q115 0.81 0.66 0.34 1
## Q24 0.76 0.57 0.43 1
## Q88 0.69 0.47 0.53 1
##
##   MR1
## SS loadings 2.40
## Proportion Var 0.48
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 10 and the objective function was 1.74 with Chi Square of 1029.02
## The degrees of freedom for the model are 5 and the objective function was 0.11
##
## The root mean square of the residuals (RMSR) is 0.06
## The df corrected root mean square of the residuals is 0.09
##
## The harmonic number of observations is 566 with the empirical chi square 47.63 with prob < 4.2e-09
## The total number of observations was 596 with Likelihood Chi Square = 65.01 with prob < 1.1e-12
##
## Tucker Lewis Index of factoring reliability = 0.882
```
RMSEA index = 0.142 and the 90% confidence intervals are 0.112 0.174
BIC = 33.06
Fit based upon off diagonal values = 0.98
Measures of factor score adequacy

## MR1 ##
Correlation of (regression) scores with factors 0.92
Multiple R square of scores with factors 0.84
Minimum correlation of possible factor scores 0.69

Graded-Response Model: Hopelessness

|            | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|------------|---------|---------|---------|---------|---------|---------|--------|
| Q15        | -0.801  | 0.062   | 0.933   | 2.042   | 2.959   | 4.350   | 0.926  |
| Q61        | -0.387  | 0.251   | 0.693   | 1.207   | 1.732   | 2.267   | 2.014  |
| Q115       | -1.168  | -0.560  | -0.037  | 0.488   | 0.876   | 1.374   | 2.850  |
| Q24        | -1.012  | -0.349  | 0.117   | 0.521   | 0.965   | 1.481   | 2.321  |
| Q88        | -1.584  | -1.019  | -0.653  | -0.115  | 0.288   | 0.814   | 2.121  |

Test Information Function
Site DIF

## Call:
## lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 5
##
## Items flagged: 3
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## | item | ncat | chi12 | chi13 | chi23 |
##|------|------|------|------|------|
##| 1    | 1    | 0.7690 | 0.2831 | 0.1184 |
##| 2    | 2    | 0.0695 | 0.1213 | 0.3364 |
##| 3    | 3    | 0.0020 | 0.0084 | 0.9961 |
##| 4    | 4    | 0.6814 | 0.5746 | 0.3324 |
##| 5    | 5    | 0.9635 | 0.4093 | 0.1816 |
Trait Distributions

Item True Score Functions – Item 3

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Gender-based DIF: Hopelessness

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```

## Number of DIF groups: 2
Number of items flagged for DIF: 1 of 5

Items flagged: 2

Number of iterations for purification: 2 of 10

Detection criterion: Chisqr

Threshold: alpha = 0.01

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 0.1092| 0.1791| 0.3499|
| 2    | 2    | 0.0000| 0.0000| 0.4704|
| 3    | 3    | 0.4284| 0.3726| 0.2457|
| 4    | 4    | 0.1036| 0.2632| 0.8874|
| 5    | 5    | 0.6145| 0.8328| 0.7375|

Trait Distributions
Item True Score Functions

Item True Score Functions – Item 2

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items

TCC

TCC
Age-based DIF: Hopelessness

## Call:
## lordif::lordif(resp.data = as.data.frame(age.data), group = age)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 5
##
## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01

Internal Avoidance

Site 1

Reliability: Internal Avoidance

## Cronbach's alpha is 0.733.
## Mean item-total correlation is 0.348.
## If each item were dropped:
##
## | raw_alpha | std.alpha | G6(smc) | average_r | S/N   | alpha | se   | var.r | med.r |
##|-----------|------------|---------|-----------|-------|-------|------|-------|-------|
##| Q10       | 0.78       | 0.78    | 0.73      | 0.47  | 3.5   | 0.015| 0.0081| 0.45  |
##| Q34       | 0.62       | 0.62    | 0.57      | 0.29  | 1.6   | 0.024| 0.0181| 0.28  |
## Q78 0.70 0.69 0.67 0.36 2.2 0.020 0.0373 0.33
## Q122 0.66 0.65 0.62 0.32 1.9 0.022 0.0348 0.30
## Q123 0.65 0.64 0.61 0.31 1.8 0.023 0.0303 0.28

![Scree Plot](image)

### Unidimensionality: Internal Avoidance

```r
## [1] "Ratio of first to second eigenvalues: 2.676"
## [1] 2.4939949 0.9320973 0.6619944 0.5341351 0.3777783

# Factor Analysis using method = minres
# Call: fa(r = grm_obj$X)
# Standardized loadings (pattern matrix) based upon correlation matrix
# MR1 h2  u2 com
# Q10  0.25  0.061  0.94  1
# Q34  0.82  0.678  0.32  1
# Q78  0.55  0.303  0.70  1
# Q122 0.67  0.446  0.55  1
# Q123 0.71  0.497  0.50  1
#
## SS loadings 1.99
## Proportion Var 0.40
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 10 and the objective function was 1.17 with Chi Square of 717.48
## The degrees of freedom for the model are 5 and the objective function was 0.02
## The root mean square of the residuals (RMSR) is 0.03
## The df corrected root mean square of the residuals is 0.04
```

240
## The harmonic number of observations is 567 with the empirical chi square 7.15 with prob < 0.21
## The total number of observations was 617 with Likelihood Chi Square = 10.76 with prob < 0.056
## Tucker Lewis Index of factoring reliability = 0.984
## RMSEA index = 0.043 and the 90 % confidence intervals are 0 0.079
## BIC = -21.36
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.90
## Multiple R square of scores with factors 0.81
## Minimum correlation of possible factor scores 0.63

### Graded-Response Model: Internal Avoidance

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q10     | -5.076  | -3.744  | -1.704  | -0.062  | 1.351   | 3.583  | 0.477  |
| Q34     | -1.548  | -0.913  | -0.526  | -0.140  | 0.369   | 0.881  | 2.888  |
| Q78     | -2.058  | -1.288  | -0.752  | -0.076  | 0.548   | 1.326  | 1.316  |
| Q122    | -1.403  | -0.883  | -0.361  | 0.180   | 0.715   | 1.301  | 1.800  |
| Q123    | -1.641  | -0.975  | -0.648  | -0.143  | 0.427   | 1.030  | 1.866  |

### Test Information Function

![Test Information Function Graph](attachment:image)
Site 2

Reliability: Internal Avoidance

## Cronbach's alpha is 0.761.
## Mean item-total correlation is 0.381.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q10 0.79 0.79 0.76 0.49 3.9 0.014 0.013 0.50
## Q34 0.66 0.65 0.61 0.32 1.9 0.023 0.021 0.31
## Q78 0.75 0.74 0.71 0.42 2.9 0.017 0.036 0.41
## Q122 0.68 0.67 0.64 0.34 2.0 0.021 0.028 0.31
## Q123 0.68 0.68 0.65 0.35 2.1 0.021 0.029 0.31
Unidimensionality: Internal Avoidance

```r
## [1] "Ratio of first to second eigenvalues: 2.925"
## [1] 2.6116558 0.8929579 0.6857242 0.4501308 0.3595313
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q10 0.31 0.097 0.90 1
## Q34 0.83 0.694 0.31 1
## Q78 0.51 0.257 0.74 1
## Q122 0.75 0.561 0.44 1
## Q123 0.73 0.527 0.47 1
##
## MR1
## SS loadings 2.14
## Proportion Var 0.43
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 10 and the objective function was 1.35 with Chi Square of 800.87
## The degrees of freedom for the model are 5 and the objective function was 0.01
## The root mean square of the residuals (RMSR) is 0.02
## The df corrected root mean square of the residuals is 0.02
## The harmonic number of observations is 542 with the empirical chi square 3.12 with prob < 0.68
## The total number of observations was 596 with Likelihood Chi Square = 5.24 with prob < 0.39
## Tucker Lewis Index of factoring reliability = 0.999
```
RMSEA index = 0.009 and the 90% confidence intervals are 0 0.058
BIC = -26.71
Fit based upon off diagonal values = 1

Measures of factor score adequacy

Correlation of (regression) scores with factors 0.91
Multiple R square of scores with factors 0.84
Minimum correlation of possible factor scores 0.67

Graded-Response Model: Internal Avoidance

|      | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|------|---------|---------|---------|---------|---------|---------|--------|
| Q10  | 2.978   | 1.889   | 0.736   | -0.634  | -2.056  | -3.669  | -0.666 |
| Q34  | 1.203   | 0.682   | 0.252   | -0.178  | -0.645  | -1.112  | -3.012 |
| Q78  | 2.165   | 1.275   | 0.521   | -0.180  | -0.957  | -1.771  | -1.118 |
| Q122 | 1.198   | 0.618   | 0.144   | -0.336  | -0.792  | -1.412  | -2.279 |
| Q123 | 1.397   | 0.771   | 0.362   | -0.093  | -0.587  | -1.066  | -2.129 |

Test Information Function
Site DIF

## Call:
## lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 5
##
## Items flagged: 1
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01

##
## | item | ncat | chi12 | chi13 | chi23 |
## |------|------|------|------|------|
## | 1    | 1    | 7    | 0.0080 | 0.0182 | 0.3231 |
## | 2    | 2    | 7    | 0.1544 | 0.2378 | 0.3581 |
## | 3    | 3    | 7    | 0.5892 | 0.2471 | 0.1135 |
## | 4    | 4    | 7    | 0.2460 | 0.4601 | 0.6494 |
## | 5    | 5    | 7    | 0.3006 | 0.5603 | 0.7682 |
Trait Distributions

Item True Score Functions – Item 1

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
Gender-based DIF: Internal Avoidance

## Call:
```
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
```
## Number of DIF groups: 2
Number of items flagged for DIF: 2 of 5
Items flagged: 4, 5
Number of iterations for purification: 2 of 10
Detection criterion: Chisqr
Threshold: alpha = 0.01

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 7     | 0.7329| 0.8544| 0.6562|
| 2    | 2    | 7     | 0.9395| 0.9899| 0.9043|
| 3    | 3    | 7     | 0.4268| 0.6522| 0.6364|
| 4    | 4    | 7     | 0.0000| 0.0000| 0.9679|
| 5    | 5    | 7     | 0.0003| 0.0014| 0.9609|

Trait Distributions

![Trait Distributions Graph](image)
Item True Score Functions – Item 4

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)

Item True Score Functions – Item 5

Differences in Item True Score Functions

Item Response Functions

Impact (Weighted by Density)
Age-based DIF: Internal Avoidance

## Call:
## lordif::lordif(resp.data = as.data.frame(age.data), group = age)
##
## Number of DIF groups: 2
## Number of items flagged for DIF: 1 of 5
## Items flagged: 1
## Number of iterations for purification: 2 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

| item | ncat | chi2  | chi13 | chi23 |
|------|------|------|------|------|
| 1    | 1    | 7    | 0.0001 | 0.0003 | 0.4479 |
| 2    | 2    | 7    | 0.3786 | 0.6404 | 0.7333 |
| 3    | 3    | 7    | 0.3468 | 0.6054 | 0.7305 |
| 4    | 4    | 7    | 0.8914 | 0.8869 | 0.6379 |
| 5    | 5    | 7    | 0.0768 | 0.1975 | 0.7376 |

### Trait Distributions

Density

- **Female**
- **Male**

theta

0.0

0.1

0.2

0.3

0.4

-4

-2

0

2

4
**Item True Score Functions**

- **Item 1**
  - \( \Pr(\chi_{12}^2, 1) = 10^{-0.4} \), \( R_{12} = 0.0039 \), \( \Delta(\beta_1) = 0.0272 \)

**Differences in Item True Score Function**

**Item Response Functions**

**Impact (Weighted by Density)**

**All Items**

- **TCC**
  - \( \Pr(\chi_{23}^2, 1) = 0.4479 \), \( R_{23} = 10^{-0.04} \)

**DIF Items**

- **TCC**
  - \( \Pr(\chi_{13}^2, 2) = 30^{-0.4} \), \( R_{13} = 0.004 \)

**Theta**

- **Probability**
  - \( 0.49, -4.98, -3.55, -1.91, -0.03, 1.55, 3.73 \)
  - \( 0.58, -3.61, -2.37, -0.72, 0.69, 2.12, 3.9 \)

**Size**

- **Density**
  - Female: \( 0.6 \)
  - Male: \( 0.4 \)
Irritability

Site 1

Reliability: Irritability

## Cronbach's alpha is 0.45.
## Mean item-total correlation is 0.22.
## If each item were dropped:

| item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|------------|---------|-----------|-----|-------|----|-------|-------|
| Q37  | 0.38      | 0.38       | 0.23    | 0.23      | 0.61| 0.050 | NA | 0.23  |       |
| Q114 | 0.46      | 0.46       | 0.30    | 0.30      | 0.87| 0.043 | NA | 0.30  |       |
| Q65  | 0.22      | 0.22       | 0.12    | 0.12      | 0.28| 0.063 | NA | 0.12  |       |
Unidimensionality: Irritability

```r
## [1] "Ratio of first to second eigenvalues: 1.642"
## [1] 1.4467859 0.8813400 0.6718741
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q37 0.40 0.158 0.84 1
## Q114 0.31 0.096 0.90 1
## Q65 0.76 0.573 0.43 1
##
## MR1
## SS loadings 0.83
## Proportion Var 0.28
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 3 and the objective function was 0.15 with Chi Square of 94.98
## The degrees of freedom for the model are 0 and the objective function was 0
##
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
##
## The harmonic number of observations is 580 with the empirical chi square 0 with prob < NA
## The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
##
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```
Graded-Response Model: Irritability

|   | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---|---------|---------|---------|---------|---------|---------|--------|
| Q37|  -3.013 | -1.493 | -0.510 |  0.211  |  1.123  |  2.158  |  0.823 |
| Q114| -0.386  |  0.857 |  1.726 |  2.639  |  3.518  |  4.816  |  0.707 |
| Q65 | -0.345  |  0.409 |  0.849 |  1.366  |  1.937  |  2.456  |  2.439 |

Test Information Function
Site 2

Reliability: Irritability

## Cronbach's alpha is 0.448.
## Mean item-total correlation is 0.227.
## If each item were dropped:
## | Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q37  | 0.41      | 0.42      | 0.264   | 0.264     | 0.72| 0.047 | NA | 0.264 |
| Q114 | 0.52      | 0.53      | 0.361   | 0.361     | 1.13| 0.038 | NA | 0.361 |
| Q65  | 0.11      | 0.11      | 0.056   | 0.056     | 0.12| 0.073 | NA | 0.056 |
Unidimensionality: Irritability

## [1] "Ratio of first to second eigenvalues: 1.56"

## [1] 1.4769570 0.9464731 0.5765699

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q37 0.35 0.124 0.8763 1
## Q114 0.26 0.065 0.9346 1
## Q65 1.00 1.001 -0.0011 1
##
## ## SS loadings 1.19
## Proportion Var 0.40
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  3  and the objective function was  0.22 with Chi Square of 127.94
## The degrees of freedom for the model are  0  and the objective function was  0
##
## The root mean square of the residuals (RMSR) is  0.02
## The df corrected root mean square of the residuals is NA
##
## The harmonic number of observations is  561  with the empirical chi square  1.5  with prob <  NA
## The total number of observations was  596  with Likelihood Chi Square =  1.37  with prob <  NA
##
## Tucker Lewis Index of factoring reliability =  -Inf
## Fit based upon off diagonal values = 0.99
Graded-Response Model: Irritability

|     | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|-----|---------|---------|---------|---------|---------|---------|--------|
| Q37 | -2.095  | -0.800  | -0.173  | 0.657   | 1.547   | 2.430   | 0.938  |
| Q114| -0.526  | 0.705   | 1.549   | 2.589   | 3.628   | 4.320   | 0.700  |
| Q65 | -0.217  | 0.560   | 0.992   | 1.426   | 1.853   | 2.076   | 3.688  |

Test Information Function

Ability

Item Information Curves
Gender-based DIF: Irritability

## No Gender-based DIF detected

Age-based DIF: Irritability

## No age-based DIF detected

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Self-Criticism

Site 1

Reliability: Self-Criticism

## Cronbach's alpha is 0.887.
## Mean item-total correlation is 0.492.
## If each item were dropped:

|   | raw_alpha | std.alpha | G6(smc) | average_r  | S/N | alpha se | var.r | med.r |
|---|-----------|-----------|---------|------------|-----|----------|-------|-------|
| Q67 | 0.88      | 0.88      | 0.88    | 0.52       | 7.5 | 0.0072   | 0.0082| 0.50  |
| Q38 | 0.88      | 0.88      | 0.87    | 0.50       | 7.0 | 0.0074   | 0.0101| 0.49  |
| Q126| 0.86      | 0.86      | 0.86    | 0.47       | 6.3 | 0.0082   | 0.0087| 0.49  |
| Q124| 0.88      | 0.88      | 0.87    | 0.51       | 7.4 | 0.0071   | 0.0092| 0.50  |
| Q129| 0.88      | 0.88      | 0.87    | 0.50       | 7.1 | 0.0073   | 0.0115| 0.50  |
| Q127| 0.87      | 0.87      | 0.86    | 0.49       | 6.7 | 0.0078   | 0.0103| 0.49  |
| Q128| 0.86      | 0.86      | 0.85    | 0.47       | 6.1 | 0.0084   | 0.0074| 0.47  |
| Q101| 0.86      | 0.86      | 0.85    | 0.47       | 6.3 | 0.0083   | 0.0084| 0.48  |
Unidimensionality: Self-Criticism

```r
## [1] "Ratio of first to second eigenvalues: 5.592"
## [1] 4.4803988 0.8012562 0.6479159 0.5681547 0.4740296 0.4219289 0.3351470
## [8] 0.2711690
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q67 0.58 0.34 0.66 1
## Q38 0.66 0.44 0.56 1
## Q126 0.79 0.63 0.37 1
## Q124 0.59 0.34 0.66 1
## Q129 0.64 0.41 0.59 1
## Q127 0.72 0.52 0.48 1
## Q128 0.83 0.69 0.31 1
## Q101 0.80 0.64 0.36 1
##
## MR1
## SS loadings 4.01
## Proportion Var 0.50
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 28 and the objective function was 3.73 with Chi Square of 2283.9
## The degrees of freedom for the model are 20 and the objective function was 0.19
##
## The root mean square of the residuals (RMSR) is 0.04
## The df corrected root mean square of the residuals is 0.05
##
```

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## The harmonic number of observations is 580 with the empirical chi square 59.83 with prob < 7.6e-06
## The total number of observations was 617 with Likelihood Chi Square = 117.19 with prob < 9.4e-16
## Tucker Lewis Index of factoring reliability = 0.94
## RMSEA index = 0.089 and the 90 % confidence intervals are 0.074 0.105
## BIC = -11.31
## Fit based upon off diagonal values = 0.99
## Measures of factor score adequacy
## Correlation of (regression) scores with factors 0.95
## Multiple R square of scores with factors 0.90
## Minimum correlation of possible factor scores 0.80

Graded-Response Model: Self-Criticism

|      | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|------|---------|---------|---------|---------|---------|---------|--------|
| Q67  | -2.121  | -1.359  | -0.541  | 0.256   | 1.027   | 2.086   | 1.413  |
| Q38  | -1.681  | -0.879  | -0.319  | 0.102   | 0.669   | 1.206   | 1.760  |
| Q126 | -1.205  | -0.715  | -0.220  | 0.210   | 0.662   | 1.205   | 2.636  |
| Q124 | -1.960  | -0.659  | -0.016  | 0.656   | 1.270   | 2.055   | 1.316  |
| Q129 | -0.528  | 0.131   | 0.476   | 0.887   | 1.421   | 1.944   | 1.694  |
| Q127 | -0.566  | -0.170  | 0.190   | 0.597   | 1.061   | 1.513   | 2.090  |
| Q128 | -1.056  | -0.544  | -0.209  | 0.188   | 0.666   | 1.185   | 2.947  |
| Q101 | -0.635  | -0.171  | 0.221   | 0.583   | 0.974   | 1.489   | 2.857  |
Site 2

Reliability: Self-Criticism

## Cronbach's alpha is 0.901.
## Mean item-total correlation is 0.529.
## If each item were dropped:

|    | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se  | var_r | med_r |
|----|-----------|-----------|---------|-----------|-----|-------|-----|-------|-------|
| Q67| 0.90      | 0.90      | 0.90    | 0.56      | 8.8 | 0.0063| 0.0074| 0.57  |
| Q38| 0.89      | 0.89      | 0.88    | 0.53      | 8.0 | 0.0067| 0.0100| 0.52  |
| Q126| 0.88     | 0.88      | 0.87    | 0.51      | 7.2 | 0.0075| 0.0072| 0.50  |
| Q124| 0.89     | 0.89      | 0.89    | 0.55      | 8.5 | 0.0065| 0.0087| 0.56  |
| Q129| 0.89      | 0.89      | 0.88    | 0.53      | 7.9 | 0.0069| 0.0105| 0.52  |
| Q127| 0.89      | 0.89      | 0.88    | 0.54      | 8.1 | 0.0067| 0.0088| 0.52  |
| Q128| 0.88      | 0.88      | 0.87    | 0.51      | 7.2 | 0.0075| 0.0072| 0.50  |
| Q101| 0.88      | 0.88      | 0.88    | 0.51      | 7.4 | 0.0073| 0.0089| 0.52  |
Unidimensionality: Self-Criticism

## [1] "Ratio of first to second eigenvalues: 6.461"

## [1] 4.7610683 0.7368737 0.6321382 0.4909212 0.4723034 0.3888566 0.2959108
## [8] 0.2219279

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q67 0.60 0.36 0.64 1
## Q38 0.70 0.49 0.51 1
## Q126 0.84 0.70 0.30 1
## Q124 0.64 0.41 0.59 1
## Q129 0.72 0.52 0.48 1
## Q127 0.70 0.49 0.51 1
## Q128 0.84 0.70 0.30 1
## Q101 0.81 0.65 0.35 1
##
## MR1
## SS loadings 4.33
## Proportion Var 0.54
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 28 and the objective function was 4.33 with Chi Square of 2562.83
## The degrees of freedom for the model are 20 and the objective function was 0.26
##
## The root mean square of the residuals (RMSR) is 0.04
## The df corrected root mean square of the residuals is 0.05
##

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The harmonic number of observations is 561 with the empirical chi square 60.11 with prob < 6.8e-06.

The total number of observations was 596 with Likelihood Chi Square = 156.05 with prob < 4.3e-23.

Tucker Lewis Index of factoring reliability = 0.925
RMSEA index = 0.107 and the 90 % confidence intervals are 0.092 0.123
BIC = 28.24
Fit based upon off diagonal values = 0.99

Measures of factor score adequacy
Correlation of (regression) scores with factors 0.96
Multiple R square of scores with factors 0.91
Minimum correlation of possible factor scores 0.83

Graded-Response Model: Self-Criticism

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q67     | -1.752  | -0.985  | -0.248  | 0.522   | 1.290   | 2.241  | 1.537  |
| Q38     | -0.937  | -0.215  | 0.190   | 0.623   | 1.069   | 1.627  | 1.943  |
| Q126    | -0.660  | -0.185  | 0.235   | 0.635   | 1.076   | 1.514  | 3.248  |
| Q124    | -1.026  | -0.066  | 0.531   | 1.125   | 1.659   | 2.276  | 1.696  |
| Q129    | 0.016   | 0.543   | 0.867   | 1.218   | 1.622   | 1.996  | 2.355  |
| Q127    | -0.056  | 0.420   | 0.700   | 1.019   | 1.389   | 1.869  | 2.219  |
| Q128    | -0.583  | -0.074  | 0.298   | 0.714   | 1.058   | 1.499  | 3.337  |
| Q101    | -0.156  | 0.232   | 0.602   | 1.001   | 1.432   | 1.870  | 2.994  |

Test Information Function
Item Information Curves

Site DIF

## Call:
lobe::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 1 of 8
##
## Items flagged: 1
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## | item | ncat | chi12 | chi13 | chi23 |
##|------|------|------|------|------|
##| 1    | 1    | 7    | 0.0004 | 0.0018 | 0.7988 |
##| 2    | 2    | 7    | 0.2185 | 0.2951 | 0.3357 |
##| 3    | 3    | 7    | 0.6728 | 0.6772 | 0.4381 |
##| 4    | 4    | 7    | 0.1250 | 0.1393 | 0.2076 |
##| 5    | 5    | 7    | 0.8057 | 0.6126 | 0.3376 |
##| 6    | 6    | 7    | 0.7231 | 0.9270 | 0.8717 |
##| 7    | 7    | 7    | 0.4443 | 0.6562 | 0.6118 |
##| 8    | 8    | 7    | 0.4284 | 0.3017 | 0.1835 |
**Trait Distributions**

![Graph showing density distributions for Site 1 and Site 2.](image)

**Item True Score Functions – Item 1**

- Item Score: $Pr(\chi_{12} | 1) = 4e^{-0.04}, R_{12} = 0.0032, \Delta(\beta_{1}) = 0.035$
- Item Score: $Pr(\chi_{13} | 2) = 0.0018, R_{13} = 0.0032$
- Item Score: $Pr(\chi_{23} | 1) = 0.7988, R_{23} = 0$

**Differences in Item True Score Function**

- Item Score: $Pr(\chi_{12} | 1)$
- Item Score: $Pr(\chi_{13} | 2)$
- Item Score: $Pr(\chi_{23} | 1)$

**Item Response Functions**

- Probability: $1.5, -1.73, -1, -0.2, 0.53, 1.26, 2.25$
- Size: $1.53, -1.99, -1.21, -0.47, 0.31, 1.11, 2.12$

**Impact (Weighted by Density)**
Gender-based DIF: Self-Criticism

```r
# Call:
# lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
#
# Number of DIF groups: 2
```
## Number of items flagged for DIF: 0 of 8
## Items flagged:
## Number of iterations for purification: 1 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

### Age-based DIF: Self-Criticism

```r
Call:
lordif::lordif(resp.data = as.data.frame(age.data), group = age)

Number of DIF groups: 2
Number of items flagged for DIF: 3 of 8
Items flagged: 2, 4, 8
Number of iterations for purification: 3 of 10
Detection criterion: Chisqr
Threshold: alpha = 0.01
```

| item | ncat | chi12 | chi13 | chi23 |
|------|------|-------|-------|-------|
| 1    | 1    | 0.9889| 0.2715| 0.1064|
| 2    | 2    | 0.0021| 0.0020| 0.0867|
| 3    | 3    | 0.2060| 0.4493| 0.9805|
| 4    | 4    | 0.3001| 0.0013| 0.0005|
| 5    | 5    | 0.0638| 0.1449| 0.5139|
| 6    | 6    | 0.1421| 0.2190| 0.3474|
| 7    | 7    | 0.0197| 0.0625| 0.7424|
| 8    | 8    | 0.0009| 0.0036| 0.6409|
Item True Score Functions

- Item 4

Item Score

| Female | Male |
|--------|------|
| 0.3001 | 3e-04 |
| 0.0054 | 0.0029 |
| 0.0149 |

Pr(χ12, 1) = 0.3001, R12 = 3e-04, Δ(β1) = 0.0054

Pr(χ13, 2) = 0.0013, R13 = 0.0033

Pr(χ23, 1) = 5e-04, R23 = 0.003

Differences in Item True Score Functions

- Item 8

Item Score

| Female | Male |
|--------|------|
| 9e-04 | 0.0029 |
| 0.0029 |
| 1e-04 |

Pr(χ12, 1) = 9e-04, R12 = 0.0029, Δ(β1) = 0.0149

Pr(χ13, 2) = 0.0036, R13 = 0.0029

Pr(χ23, 1) = 0.6409, R23 = 1e-04

Item Response Functions

- Item 4

Probability

- Item 8

Probability

Impact (Weighted by Density)
Situational Avoidance

Site 1

Reliability: Situational Avoidance
## Cronbach's alpha is 0.645.
## Mean item-total correlation is 0.377.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N alpha se | var.r | med.r |
|------|-----------|-----------|---------|-----------|--------------|-------|-------|
| Q119 | 0.50      | 0.50      | 0.34    | 0.34      | 1.01 0.040   | NA    | 0.34  |
| Q17  | 0.68      | 0.68      | 0.52    | 0.52      | 2.16 0.026   | NA    | 0.52  |
| Q118 | 0.43      | 0.43      | 0.28    | 0.28      | 0.77 0.045   | NA    | 0.28  |

### Unidimensionality: Situational Avoidance

## [1] "Ratio of first to second eigenvalues: 2.325"
## [1] 1.7623073 0.7580802 0.4796126
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1   h2  u2  com
## Q119 0.65 0.43 0.57 1
## Q17  0.42 0.18 0.82 1
## Q118 0.79 0.62 0.38 1
##
## SS loadings 1.23
## Proportion Var 0.41
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 3 and the objective function was 0.45 with Chi Square of 273.38
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
##
## The harmonic number of observations is 585 with the empirical chi square 0 with prob < NA
## The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
##
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.85
## Multiple R square of scores with factors 0.72
## Minimum correlation of possible factor scores 0.45

Graded-Response Model: Situational Avoidance

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q119    | 1.017   | 0.258   | -0.119  | -0.597  | -1.036  | -1.438 | -1.615 |
| Q17     | 0.071   | -0.774  | -1.079  | -1.540  | -1.944  | -2.785 | -0.986 |
| Q118    | 0.807   | 0.224   | -0.201  | -0.566  | -0.950  | -1.379 | -2.816 |

Test Information Function

![Graph of Test Information Function](image)
Site 2

Reliability: Situational Avoidance

## Cronbach's alpha is 0.632.
## Mean item-total correlation is 0.365.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha_se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|----------|-------|-------|
| Q119 | 0.44      | 0.44      | 0.29    | 0.29      | 0.80| 0.046    | NA    | 0.29  |
| Q17  | 0.70      | 0.70      | 0.54    | 0.54      | 2.34| 0.025    | NA    | 0.54  |
| Q118 | 0.43      | 0.43      | 0.27    | 0.27      | 0.74| 0.047    | NA    | 0.27  |
Unidimensionality: Situational Avoidance

## [1] "Ratio of first to second eigenvalues: 2.215"

## [1] 1.7485400 0.7895052 0.4619548

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##       MR1 h2  u2 com
## Q119 0.71 0.51 0.49 1
## Q17  0.38 0.15 0.85 1
## Q118 0.75 0.57 0.43 1

## MR1
## SS loadings 1.22
## Proportion Var 0.41

## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 3 and the objective function was 0.45 with Chi Square of 266.84
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 564 with the empirical chi square 0 with prob < NA
## The total number of observations was 596 with Likelihood Chi Square = 0 with prob < NA
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy

275
## MR1
## Correlation of (regression) scores with factors  0.85
## Multiple R square of scores with factors  0.72
## Minimum correlation of possible factor scores  0.43

Graded-Response Model: Situational Avoidance

Test Information Function

### Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
### Q119  0.472 -0.048 -0.382 -0.765 -1.171 -1.507 -2.178
### Q17   -0.124 -0.938 -1.436 -1.818 -2.334 -3.146 -0.796
### Q118  0.705  0.069 -0.326 -0.741 -1.174 -1.640 -2.276
Gender-based DIF: Situational Avoidance

## No Gender-based DIF detected

Age-based DIF: Situational Avoidance

## No age-based DIF detected

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Social Avoidance

Site 1

Reliability: Social Avoidance

## Cronbach’s alpha is 0.747.
## Mean item-total correlation is 0.497.
## If each item were dropped:

|    | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|----|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q64| 0.59      | 0.59      | 0.42    | 0.42      | 1.4 | 0.033 | NA | 0.42  |       |
| Q120| 0.67    | 0.67      | 0.50    | 0.50      | 2.0 | 0.027 | NA | 0.50  |       |
| Q121| 0.72    | 0.72      | 0.57    | 0.57      | 2.6 | 0.022 | NA | 0.57  |       |
Unidimensionality: Social Avoidance

```r
## [1] "Ratio of first to second eigenvalues: 3.423"
## [1] 2.0008696 0.5845459 0.4145844
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q64 0.83 0.68 0.32 1
## Q120 0.69 0.47 0.53 1
## Q121 0.62 0.38 0.62 1
##
## SS loadings 1.53
## Proportion Var 0.51
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 3 and the objective function was 0.72 with Chi Square = 444.54
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 572 with the empirical chi square 0 with prob < NA
## The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```

Scree Plot
Graded-Response Model: Social Avoidance

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q64     | -1.159  | -0.485  | -0.075  | 0.326   | 0.783   | 1.313  | 3.428  |
| Q120    | -1.456  | -0.729  | -0.161  | 0.308   | 0.810   | 1.467  | 1.845  |
| Q121    | -1.274  | -0.478  | 0.056   | 0.587   | 1.124   | 2.045  | 1.562  |

Test Information Function
Reliability: Social Avoidance

## Cronbach’s alpha is 0.789.
## Mean item-total correlation is 0.556.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q64  0.63  0.63  0.46  0.46  1.7  0.030 NA  0.46
## Q120 0.73  0.73  0.57  0.57  2.7  0.022 NA  0.57
## Q121 0.78  0.78  0.64  0.64  3.5  0.018 NA  0.64
Unidimensionality: Social Avoidance

```r
## [1] &quot;Ratio of first to second eigenvalues: 3.885&quot;
## [1] 2.1162198 0.5447536 0.3390266
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1 h2 u2 com
## Q64  0.89  0.78  0.22  1
## Q120  0.72  0.52  0.48  1
## Q121  0.64  0.41  0.59  1
##
## MR1
## SS loadings 1.72
## Proportion Var 0.57
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 3 and the objective function was 0.94 with Chi Square 557.26
## The degrees of freedom for the model are 0 and the objective function was 0
##
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 574 with the empirical chi square 0 with prob < NA
## The total number of observations was 596 with Likelihood Chi Square = 0 with prob < NA
##
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```
Graded-Response Model: Social Avoidance

### Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
### Q64  -0.930 -0.284  0.199  0.574  1.013  1.524  3.766
### Q120 -1.072 -0.457  0.037  0.484  0.926  1.438  2.104
### Q121 -1.110 -0.308  0.156  0.821  1.362  2.044  1.567

Test Information Function
Gender-based DIF: Social Avoidance

## No Gender-based DIF detected

Age-based DIF: Social Avoidance

## No age-based DIF detected

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Worry

Site 1

Reliability: Worry

## Cronbach’s alpha is 0.792.
## Mean item-total correlation is 0.56.
## If each item were dropped:

| Item   | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|--------|-----------|------------|---------|-----------|-----|----------|-------|-------|
| Q39    | 0.73      | 0.73       | 0.58    | 0.58      | 2.7 | 0.022    | NA    | 0.58  |
| Q116   | 0.75      | 0.75       | 0.60    | 0.60      | 3.0 | 0.020    | NA    | 0.60  |
| Q117   | 0.67      | 0.67       | 0.50    | 0.50      | 2.0 | 0.027    | NA    | 0.50  |
Unidimensionality: Worry

## 1.0
## 1.5
## 2.0
## 2.5
## 3.0
## 0.5
## 1.0
## 1.5
## 2.0

Scree Plot

## Ratio of first to second eigenvalues: 4.253
## 2.1263888 0.4999869 0.3736244
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1   h2   u2  com
## Q39   0.72 0.52 0.48 1
## Q116  0.69 0.48 0.52 1
## Q117  0.84 0.70 0.30 1
##
## SS loadings  1.71
## Proportion Var 0.57
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 3 and the objective function was 0.92 with Chi Square of 567.03
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 591 with the empirical chi square 0 with prob < NA
## The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
### MR1

**Correlation of (regression) scores with factors**: 0.90

**Multiple R square of scores with factors**: 0.81

**Minimum correlation of possible factor scores**: 0.63

**Graded-Response Model: Worry**

| Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|--------|
| Q39     | -2.109  | -1.523  | -1.007  | -0.593  | 0.071   | 0.661  | 1.958  |
| Q116    | -1.872  | -1.550  | -1.176  | -0.691  | -0.202  | 0.280  | 1.992  |
| Q117    | -1.844  | -1.286  | -1.005  | -0.603  | -0.104  | 0.356  | 3.439  |

**Test Information Function**

![Test Information Function Graph](image)

| Information | Ability |
|-------------|---------|
| 0 1 2 3 4 5 6 | -4 -2 0 2 4 |

285
Site 2

Reliability: Worry

## Cronbach's alpha is 0.807.
## Mean item-total correlation is 0.583.
## If each item were dropped:

|      | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q39  | 0.74      | 0.74      | 0.59    | 0.59      | 2.9 | 0.021 | NA | 0.59  |       |
| Q116 | 0.77      | 0.77      | 0.63    | 0.63      | 3.4 | 0.018 | NA | 0.63  |       |
| Q117 | 0.69      | 0.69      | 0.53    | 0.53      | 2.2 | 0.025 | NA | 0.53  |       |
Scree Plot

Unidimensionality: Worry

```r
## [1] "Ratio of first to second eigenvalues: 4.596"
## [1] 2.178763 0.474076 0.347161
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                  MR1
## Q39   0.76 0.57 0.43 1
## Q116  0.70 0.49 0.51 1
## Q117  0.85 0.72 0.28 1
##
## SS loadings 1.78
## Proportion Var 0.59
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 3 and the objective function was 1.03 with Chi Square of 608.35
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 572 with the empirical chi square 0 with prob < NA
## The total number of observations was 596 with Likelihood Chi Square = 0 with prob < NA
## Tucker Lewis Index of factoring reliability = NaN
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```
## MR1

**Correlation of (regression) scores with factors** 0.91  
**Multiple R square of scores with factors** 0.83  
**Minimum correlation of possible factor scores** 0.66

**Graded-Response Model: Worry**

| Extrmt1  | Extrmt2  | Extrmt3  | Extrmt4  | Extrmt5  | Extrmt6  | Dscrmn |
|----------|----------|----------|----------|----------|----------|--------|
| Q39      | -1.844   | -1.087   | -0.577   | -0.154   | 0.365    | 0.849  | 2.352  |
| Q116     | -1.844   | -1.403   | -0.961   | -0.565   | -0.112   | 0.497  | 2.106  |
| Q117     | -1.682   | -1.157   | -0.780   | -0.394   | 0.167    | 0.718  | 3.147  |

**Test Information Function**

![Test Information Function Graph](image-url)
Gender-based DIF: Worry

## No Gender-based DIF detected

Age-based DIF: Worry

## No age-based DIF detected

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Cognitive Problems

Site 1

Reliability: Cognitive Problems

## Cronbach's alpha is 0.893.
## Mean item-total correlation is 0.581.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|----------|-------|-------|
| Q142 | 0.87      | 0.87      | 0.87    | 0.58      | 7.0 | 0.0081   | 0.0133| 0.58  |
| Q143 | 0.87      | 0.87      | 0.86    | 0.58      | 6.9 | 0.0081   | 0.0074| 0.58  |
| Q144 | 0.86      | 0.86      | 0.86    | 0.55      | 6.1 | 0.0091   | 0.0120| 0.51  |
| Q145 | 0.87      | 0.87      | 0.86    | 0.58      | 6.9 | 0.0082   | 0.0079| 0.58  |
| Q146 | 0.89      | 0.89      | 0.89    | 0.61      | 7.8 | 0.0074   | 0.0118| 0.63  |
| Q147 | 0.88      | 0.88      | 0.87    | 0.58      | 7.0 | 0.0080   | 0.0141| 0.53  |
Unidimensionality: Cognitive Problems

## [1] "Ratio of first to second eigenvalues: 4.882"

## [1] 3.9111337 0.8010990 0.5190344 0.3259243 0.2476788 0.1951297

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
##
## MR1  h2  u2  com
## Q142 0.76 0.58 0.42 1
## Q143 0.77 0.60 0.40 1
## Q144 0.86 0.75 0.25 1
## Q145 0.77 0.60 0.40 1
## Q146 0.66 0.44 0.56 1
## Q147 0.74 0.55 0.45 1

## SS loadings 3.51
## Proportion Var 0.58

## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.

## The degrees of freedom for the null model are 15 and the objective function was 3.66 with Chi Square
## The degrees of freedom for the model are 9 and the objective function was 0.56

## The root mean square of the residuals (RMSR) is 0.08
## The df corrected root mean square of the residuals is 0.11

## The harmonic number of observations is 590 with the empirical chi square 125.13 with prob < 1.2e-22
## The total number of observations was 617 with Likelihood Chi Square = 341.82 with prob < 3.4e-68
Graded-Response Model: Cognitive Problems

|   | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---|---------|---------|---------|---------|---------|---------|--------|
| Q142 | -1.448  | -0.902  | -0.382  | 0.054   | 0.566   | 1.003   | 2.293  |
| Q143 | -1.257  | -0.678  | -0.309  | 0.096   | 0.608   | 1.173   | 2.414  |
| Q144 | -0.941  | -0.460  | -0.023  | 0.410   | 0.823   | 1.310   | 3.496  |
| Q145 | -0.808  | -0.267  | 0.077   | 0.494   | 1.009   | 1.514   | 2.397  |
| Q146 | -1.341  | -0.702  | -0.190  | 0.479   | 1.069   | 1.977   | 1.563  |
| Q147 | -1.378  | -0.737  | -0.295  | 0.149   | 0.761   | 1.354   | 2.060  |

Test Information Function

![Test Information Function](attachment:plot.png)
Site 2

Reliability: Cognitive Problems

## Cronbach's alpha is 0.9.
## Mean item-total correlation is 0.6.
## If each item were dropped:
## raw_alpha  std.alpha  G6(smc)  average_r  S/N  alpha  se  var.r  med.r
## Q142  0.88  0.88  0.88  0.60  7.6  0.0076  0.0073  0.60
## Q143  0.88  0.88  0.87  0.60  7.4  0.0077  0.0061  0.60
## Q144  0.87  0.87  0.87  0.57  6.8  0.0085  0.0078  0.53
## Q145  0.88  0.88  0.87  0.60  7.4  0.0077  0.0061  0.60
## Q146  0.89  0.89  0.89  0.62  8.3  0.0071  0.0087  0.65
## Q147  0.88  0.88  0.88  0.60  7.4  0.0077  0.0096  0.55
Unidimensionality: Cognitive Problems

```
## [1] "Ratio of first to second eigenvalues: 5.771"
## [1] 4.0091280 0.6946725 0.5250306 0.3042152 0.2494068 0.2175470

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2   u2   com
## Q142 0.77 0.59 0.41 1
## Q143 0.79 0.62 0.38 1
## Q144 0.86 0.74 0.26 1
## Q145 0.76 0.59 0.41 1
## Q146 0.70 0.49 0.51 1
## Q147 0.78 0.61 0.39 1
##
## MR1
## SS loadings  3.62
## Proportion Var 0.60
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are  15 and the objective function was  3.72 with Chi Square of
## The degrees of freedom for the model are  9 and the objective function was  0.44
##
## The root mean square of the residuals (RMSR) is  0.07
## The df corrected root mean square of the residuals is  0.09
##
## The harmonic number of observations is  574 with the empirical chi square  85.01 with prob <  1.6e-13
## The total number of observations was  596 with Likelihood Chi Square =  258.79 with prob <  1.4e-50
```
## Tucker Lewis Index of factoring reliability = 0.81
## RMSEA index = 0.216 and the 90% confidence intervals are 0.194 0.239
## BIC = 201.27
## Fit based upon off diagonal values = 0.99
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.95
## Multiple R square of scores with factors 0.91
## Minimum correlation of possible factor scores 0.81

Graded-Response Model: Cognitive Problems

```
# Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrnm
# Q142 -1.085 -0.441 -0.075  0.395  0.849  1.295  2.682
# Q143 -1.275 -0.628 -0.164  0.284  0.716  1.205  2.315
# Q144 -0.650 -0.131  0.251  0.564  0.949  1.307  3.817
# Q145 -0.900 -0.198  0.223  0.745  1.188  1.685  2.234
# Q146 -0.838 -0.120  0.241  0.881  1.482  2.113  1.903
# Q147 -0.858 -0.307  0.105  0.645  1.108  1.643  2.578
```

![Test Information Function](image)
## Site DIF

```
## Call:
## lordif::lordif(resp.data = as.data.frame(merged_data), group = site)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 4 of 6
##
## Items flagged: 2, 4, 5, 6
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
```

```
## item ncat chi12 chi13 chi23
## 1 1 7 0.0160 0.0478 0.5980
## 2 2 7 0.0052 0.0091 0.2078
## 3 3 7 0.6611 0.2717 0.1202
## 4 4 7 0.0115 0.0002 0.0011
## 5 5 7 0.0006 0.0028 0.9669
## 6 6 7 0.0000 0.0002 0.9054
```
Item True Score Functions – Item 6

\[ \Pr(\chi_{12}, 1) = 0.004, R_{12} = 0.004, \Delta(\beta_1) = 0.0019 \]

\[ \Pr(\chi_{13}, 2) = 2e^{-0.04}, R_{13} = 0.004 \]

\[ \Pr(\chi_{23}, 1) = 0.9054, R_{23} = 0.004 \]

Differences in Item True Score Functions

Item Score

Differences

Site 1

Site 2

Impact (Weighted by Density)

Probability

Size

Item Response Functions

\[ 2.25, -1.22, -0.61, -0.18, 0.24, 0.92, 1.37 \]

\[ 2.48, -1, -0.45, -0.03, 0.53, 1.02, 1.56 \]

All Items

DIF Items

TCC

Site 1

Site 2

theta

theta
Gender-based DIF: Cognitive Problems

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 2 of 6
##
## Items flagged: 5, 6
##
## Number of iterations for purification: 2 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
##
## | item ncat | chi12 | chi13 | chi23 |
##|----------|------|------|------|
##| 1 | 1  | 7  | 0.3749 0.1503 0.0831 |
##| 2 | 2  | 7  | 0.2049 0.2124 0.2220 |
##| 3 | 3  | 7  | 0.2336 0.3152 0.3455 |
##| 4 | 4  | 7  | 0.2022 0.2066 0.2165 |
##| 5 | 5  | 7  | 0.0097 0.0336 0.7521 |
##| 6 | 6  | 7  | 0.0054 0.0160 0.4660 |
```
Trait Distributions

Item True Score Functions – Item 5

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)
### Item True Score Functions – Item 6

**Differences in Item True Score Function**

- $\text{Pr}(\chi_{12}^2, 1) = 0.0054$, $R_{12} = 0.0017$, $\Delta(\beta_1) = 0.0081$
- $\text{Pr}(\chi_{13}^2, 2) = 0.016$, $R_{13} = 0.0018$
- $\text{Pr}(\chi_{23}^2, 1) = 0.466$, $R_{23} = 1e^{-04}$

### Item Response Functions

**Impact (Weighted by Density)**

- **All Items**
  - $2.2, -1.11, -0.54, -0.07, 0.46, 0.97, 1.53$
  - $2.51, -1.19, -0.58, -0.24, 0.28, 0.87, 1.37$

- **DIF Items**
  - $2.51, -1.14, -0.58, -0.24, 0.28, 0.87, 1.37$
Age-based DIF: Cognitive Problems

```r
# Call:
# lordif::lordif(resp.data = as.data.frame(age.data), group = age)
#
# Number of DIF groups: 2
#
# Number of items flagged for DIF: 4 of 6
#
# Items flagged: 1, 2, 4, 6
#
# Number of iterations for purification: 2 of 10
#
# Detection criterion: Chisqr
#
# Threshold: alpha = 0.01
#
# item ncat chi12 chi13 chi23
# 1 1 1 7 0.0000 0.0000 0.7268
# 2 2 2 7 0.0008 0.0015 0.1834
# 3 3 3 7 0.2718 0.3282 0.3123
# 4 4 4 7 0.0011 0.0046 0.7475
# 5 5 5 7 0.6536 0.1278 0.0479
# 6 6 6 7 0.0000 0.0000 0.1619
```
Item True Score Functions – Item 2

\[ \Pr(\chi_{12}^2, \theta) = 8 \times 10^{-4}, R_{12}^2 = 0.0025, \Delta(\beta_1) = 0.0099 \]

\[ \Pr(\chi_{13}^2, \theta) = 0.0015, R_{13}^2 = 0.0029 \]

\[ \Pr(\chi_{23}^2, \theta) = 0.1834, R_{23}^2 = 4 \times 10^{-4} \]

Differences in Item True Score Functions

\[ \theta \]

| Female | Male |
|--------|------|
| 0.0011 | 0.0024 |
| 0.0046 | 0.0024 |
| 0.7475 | 0.0000 |

Item Response Functions

\[ \Pr(\theta | x) \]

| Probability |
|-------------|
| 2.22, -1.70, -0.63, -0.22, 0.21, 0.72, 1.24 |
| 2.64, -1.31, -0.76, -0.33, 0.07, 0.54, 1.08 |

Impact (Weighted by Density)

\[ \text{Size} \]

Differences in Item True Score Functions

\[ \theta \]

| Female | Male |
|--------|------|
| 0.0011 | 0.0024 |
| 0.0046 | 0.0024 |
| 0.7475 | 0.0000 |

Item Response Functions

\[ \Pr(\theta | x) \]

| Probability |
|-------------|
| 2.29, -0.8, 0.21, 0.19, 0.66, 1.12, 1.58 |
| 2.45, -0.96, -0.82, 0.03, 0.5, 0.99, 1.53 |

Impact (Weighted by Density)

\[ \text{Size} \]
Item True Score Functions – Item 6

Differences in Item True Score Function

Item Response Functions

Impact (Weighted by Density)

All Items

DIF Items
General Functioning

Site 1

Reliability: General Functioning

---

Back to top
Unidimensionality: General Functioning

```r
## [1] "Ratio of first to second eigenvalues: 2.078"
## [1] 1.6288837 0.7840136 0.5871027
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1  h2  u2  com
## Q27  0.57  0.33  0.67  1
## Q140 0.71  0.51  0.49  1
## Q141 0.41  0.17  0.83  1
##
## MR1
## SS loadings 1.00
## Proportion Var 0.33
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are 3 and the objective function was 0.29 with Chi Square of 176.87
## The degrees of freedom for the model are 0 and the objective function was 0
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
## The harmonic number of observations is 575 with the empirical chi square 0 with prob < NA
## The total number of observations was 617 with Likelihood Chi Square = 0 with prob < NA
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```

---

Scree Plot

![Scree Plot](image-url)
## MR1

## Correlation of (regression) scores with factors 0.79
## Multiple R square of scores with factors 0.63
## Minimum correlation of possible factor scores 0.26

Graded-Response Model: General Functioning

##  Extrmt1 Extrmt2 Extrmt3 Extrmt4 Extrmt5 Extrmt6 Dscrmn
## Q27  -2.877 -2.249 -1.441 -0.541  0.313  1.495  1.396
## Q140 -2.067 -1.322 -0.638  0.014  0.774  1.793  1.928
## Q141 -3.260 -2.348 -1.573 -0.998 -0.140  0.909  0.772

Test Information Function
Site 2

Reliability: General Functioning

## Cronbach's alpha is 0.596.
## Mean item-total correlation is 0.338.
## If each item were dropped:
## raw_alpha std.alpha G6(smc) average_r S/N alpha se var_r med.r
## Q27 0.41 0.41 0.26 0.26 0.71 0.047 NA 0.26
## Q140 0.48 0.48 0.32 0.32 0.94 0.042 NA 0.32
## Q141 0.60 0.60 0.43 0.43 1.52 0.032 NA 0.43
Unidimensionality: General Functioning

```r
## [1] "Ratio of first to second eigenvalues: 2.225"

## [1] 1.6809103 0.7553387 0.5637510

## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1   h2   u2  com
## Q27 0.72 0.52 0.48 1
## Q140 0.59 0.35 0.65 1
## Q141 0.44 0.20 0.80 1
##
## MR1
## SS loadings 1.07
## Proportion Var 0.36
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
##
## The degrees of freedom for the null model are 3 and the objective function was 0.33 with Chi Square of 198.35
## The degrees of freedom for the model are 0 and the objective function was 0
##
## The root mean square of the residuals (RMSR) is 0
## The df corrected root mean square of the residuals is NA
##
## The harmonic number of observations is 548 with the empirical chi square 0 with prob < NA
## The total number of observations was 596 with Likelihood Chi Square = 0 with prob < NA
##
## Tucker Lewis Index of factoring reliability = -Inf
## Fit based upon off diagonal values = 1
## Measures of factor score adequacy
```

Scree Plot

[Scree Plot showing eigenvalues]
Graded-Response Model: General Functioning

| Ability | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrmn |
|---------|---------|---------|---------|---------|---------|---------|--------|
| Q27     | -1.684  | -1.243  | -0.599  | 0.101   | 0.728   | 1.640   | 1.933  |
| Q140    | -1.953  | -1.189  | -0.387  | 0.317   | 1.161   | 2.296   | 1.503  |
| Q141    | -2.124  | -1.291  | -0.639  | 0.087   | 0.912   | 1.693   | 0.953  |

Test Information Function
Gender-based DIF: General Functioning

## No Gender-based DIF detected

Age-based DIF: General Functioning

## No age-based DIF detected

Substance Recovery

Site 1

Reliability: Substance Recovery

## Cronbach’s alpha is 0.503.
## Mean item-total correlation is 0.22.
## If each item were dropped:

| Item | raw_alpha | std.alpha | G6(smc) | average_r | S/N | alpha | se | var.r | med.r |
|------|-----------|-----------|---------|-----------|-----|-------|----|-------|-------|
| Q109 | 0.34      | 0.38      | 0.32    | 0.17      | 0.61| 0.046 | 0.02251 | 0.14 |
| Q154 | 0.35      | 0.37      | 0.30    | 0.16      | 0.58| 0.044 | 0.01800 | 0.15 |
| Q108 | 0.43      | 0.45      | 0.37    | 0.22      | 0.83| 0.039 | 0.01512 | 0.15 |
| Q155 | 0.58      | 0.60      | 0.50    | 0.33      | 1.48| 0.028 | 0.00078 | 0.33 |
Unidimensionality: Substance Recovery

```r
## [1] "Ratio of first to second eigenvalues: 1.752"
## [1] 1.7091740 0.9757107 0.6794088 0.6357065
## Factor Analysis using method = minres
## Call: fa(r = grm_obj$X)
## Standardized loadings (pattern matrix) based upon correlation matrix
## MR1    h2    u2    com
## Q109 0.61 0.368 0.63   1
## Q154 0.62 0.388 0.61   1
## Q108 0.49 0.240 0.76   1
## Q155 0.20 0.039 0.96   1
##
## MR1
## SS loadings 1.04
## Proportion Var 0.26
##
## Mean item complexity = 1
## Test of the hypothesis that 1 factor is sufficient.
## The degrees of freedom for the null model are  6  and the objective function was  0.33 with Chi Square  201.42
## The degrees of freedom for the model are  2  and the objective function was  0.01
##
## The root mean square of the residuals (RMSR) is  0.03
## The df corrected root mean square of the residuals is  0.05
##
## The harmonic number of observations is  129 with the empirical chi square  1.35 with prob < 0.51
## The total number of observations was  617 with Likelihood Chi Square =  5.81 with prob < 0.055
##
## Tucker Lewis Index of factoring reliability =  0.941
## RMSEA index =  0.056  and the 90 % confidence intervals are  0 0.111
```
## BIC = -7.04
## Fit based upon off diagonal values = 0.99
## Measures of factor score adequacy
##
## Correlation of (regression) scores with factors 0.78
## Multiple R square of scores with factors 0.61
## Minimum correlation of possible factor scores 0.22

Graded-Response Model: Substance Recovery

|        | Extrmt1 | Extrmt2 | Extrmt3 | Extrmt4 | Extrmt5 | Extrmt6 | Dscrnn |
|--------|---------|---------|---------|---------|---------|---------|--------|
| Q109   |  0.560  |  0.515  |  1.032  |  1.451  |  1.827  |  2.743  |  1.149 |
| Q154   |  0.653  |  1.265  |  1.471  |  1.683  |  1.732  |  1.962  |  3.627 |
| Q108   | -0.298  |  0.952  |  1.774  |  2.772  |  3.164  |  3.793  |  1.187 |
| Q155   | -1.123  |  0.882  |  1.668  |  2.670  |  3.335  |  4.046  |  0.565 |

Test Information Function

![Information vs Ability Graph](image-url)
Site 2

Did not converge.

Gender-based DIF: Substance Recovery

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(sex.data), group = sex)
##
## Number of DIF groups: 2
##
## Number of items flagged for DIF: 0 of 4

## Items flagged:
##
## Number of iterations for purification: 1 of 10
##
## Detection criterion: Chisqr
##
## Threshold: alpha = 0.01
```

Age-based DIF: Substance Recovery

```r
## Call:
## lordif::lordif(resp.data = as.data.frame(age.data), group = age)
```
## Number of DIF groups: 2
## Number of items flagged for DIF: 0 of 4
## Items flagged:
## Number of iterations for purification: 1 of 10
## Detection criterion: Chisqr
## Threshold: alpha = 0.01

**Session Information**

**Functions**

Here is the code for the relevant custom functions created at the start of this analysis script. They are only reproduced here for presentation, not re-run here.

```r
# Test information function
tif <- function(x){
  # x is a grm object
  plot(x, type = "IIC", items = 0, zrange = c(-4, 4), plot = TRUE)
}

# Item information curve
iic <- function(x){
  # x is a grm object
  plot(x, type = "IIC", zrange = c(-4, 4), plot = TRUE)
}

# IRT summary convenience function
irt_summary <- function(x){
  # x is a grm object from package `ltm`
  print(coef(x))
  tif(x)
  iic(x)
}

# Internal consistency convenience function
alpha_summary <- function(x){
  # x is an object from ltm::grm()
  if(class(x) != "grm"){
    warning("Not an object of type 'grm'.")
  }
  temp_alpha <- psych::alpha(x$X, check.keys = TRUE)
  alph <- temp_alpha$total$raw_alpha
  r_item_tot <- temp_alpha$total$average_r
  cat("Cronbach's alpha is ", round(alph, 3), ", Mean item-total correlation is ",
      round(r_item_tot, 3), ".\nIf each item were dropped: \
", sep = "")
}```
print(temp_alpha$alpha.drop, digits = 2)
invisible(temp_alpha)
# The function will always print the raw alpha and mean item-total correlation when run.
# If called as a saved object, however, it functions as the output of a call to psych::alpha.
}

# ROC curve convenience function
roc_summary <- function(x){
  # x is an roc object from {pROC}
  plot(x)
  auc(x)
}

# Unidimensionality: Scree plot with simulated random data sets

# This is the complete function scree.plot() from {psy} version 1.1 by Bruno Falissard.
# Bruno Falissard (2012). psy: Various procedures used in
# psychometry. R package version 1.1.
# https://CRAN.R-project.org/package=psy
# Borrowing it here so as not to require the package, with altered default values
# that include simulations and pairwise comparisons.
scree.plot2 <- function(namefile, title = "Scree Plot", type = "R", use = "P", simu = 200) {
  mat <- namefile
  if (use == "complete.obs")
    mat <- na.omit(namefile)
  if (type == "R")
    eigenval <- eigen(cor(mat, use = "pairwise.complete.obs"), symmetric = TRUE)$values
  if (type == "V")
    eigenval <- eigen(cov(mat, use = "pairwise.complete.obs"), symmetric = TRUE)$values
  if (type == "E")
    eigenval <- eigen(namefile, symmetric = TRUE)$values
  nev <- length(eigenval)
  ### Added this code, using the eigenvalues later:
  eigenout <- eigenval
  ###
  plot(eigenval, type = "b", pch = 16, bty = "o", main = title,
       xlab = "Dimension", ylab = "Eigenvalue")
  # lines(c(1, nev), c(1, 1), lty = 2) # AAM moving this later
  if (is.numeric(simu) && (type == "R")) {
    n <- dim(mat)[1]
    p <- dim(mat)[2]
    matsimu <- matrix(nrow = n, ncol = p)
    int <- rep(1, n * p)
    attr(int, "dim") <- c(n, p)
    mat <- pmax(as.matrix(mat), int)
    for (i in 1:simu) {
      matnorm <- rnorm(n * p)
      attr(matnorm, "dim") <- c(n, p)
matsimu <- (mat/mat) * matnorm

eigenval <- eigen(cor(matsimu, use = "pairwise.complete.obs"))$values
points(eigenval, type = "l", col = gray(.3, .1))  # AAM changed col value.

lines(c(1, nev), c(1, 1), lty = 2)  # AAM moved this here for visibility
points(eigenout, type = "l", pch = 16, bty = "o")  # AAM added this as well.

### added this code:
print(paste0("Ratio of first to second eigenvalues: ",
round((eigenout[1]/eigenout[2]), 3)))

eigenout

###

# lordif() printing function
# All this does is removes the Quartz viewer device from the existing lordif::plot.lordif() function.
# This is necessary to create the report that you are reading, the code changes
# do not alter the analysis from the existing lordif package function.
plot2.lordif <- function(x, labels = c("Reference", "Focal"), width = 7, height = 7, ...
{
ndif <- sum(x$flag)
if (ndif == 0)
  stop(paste(deparse(substitute(x))), " contains no items flagged for DIF")
if (ndif == x$ni)
  stop("all items in ", paste(deparse(substitute(x))),
" have been flagged for DIF")
if (x$ng != length(labels))
  labels <- paste("Group", 1:x$ng)
sumpp <- function(pp) {
  ws <- rowSums(pp * (col(pp) - 1))
  return(ws)
}
maxcat <- ncol(x$ipar.sparse)
# Made into a comment by AAM
# sysname <- Sys.info()[["sysname"]]
# if (sysname == "Windows") {
#  # dev.new(width = width, height = height, record = TRUE)
# }  # else if (sysname == "Linux") {
#  # dev.new(width = width, height = height)
#  # par(ask = TRUE)
# }  # else {
#  # dev.new(width = width, height = height)
# }  
par(mfrow = c(1, 1))
theta <- seq(x$options$minTheta, x$options$maxTheta, x$options$inc)
difitems <- (1:x$ni)[x$flag]
difselecrions <- x$selection[x$flag]
itemnames <- row.names(x$ipar.sparse)
gpar <- array(NA, c(ndif, maxcat, x$ng))
cpar <- as.matrix(x$ipar.sparse[1:(x$ni - ndif), ])
pp <- array(NA, c(length(theta), ndif, maxcat, x$ng))
gtheta <- split(x$calib.sparse$theta, x$group)
gdensity <- matrix(0, length(theta), x$ng)
for (i in 1:x$ng) {
gdensity[, i] <- density(unlist(gtheta[names(table(x$group))][i])),
  n = length(theta),
  from = x$options$minTheta,
  to = x$options$maxTheta,
  bw = 0.25)
}
plot(theta, gdensity[, 1], type = "l", xlab = "theta", ylab = "Density",
  ylim = c(0, max(gdensity)), lty = 1, col = 1, main = "Trait Distributions",
...
)
for (g in 2:x$ng) {
  lines(theta, gdensity[, g], lty = g, col = g)
}
legend("topright", labels, lty = 1:x$ng, col = 1:x$ng, bg = "white")
par(mfrow = c(2, 2))
for (i in 1:length(difitems)) {
  ncat <- x$ncat[difitems[i]]
  plot(theta, seq(0, ncat - 1, along.with = theta), type = "n",
    xlab = "theta", ylab = "Item Score",
    main = paste0("Item True Score Functions - Item ",
      difselections[i]),
    ...
  )
  for (g in 1:x$ng) {
    gpar[i, , g] <- unlist(x$ipar.sparse[which(itemnames ==
      paste0("I",
      difselections[i], ",", g)), ])
    if (x$options$model == "GPCM")
      pp[, i, 1:ncat, g] <- lordif::probnpmc(theta, gpar[i, 1, g], gpar[i, 2:ncat, g])
    else pp[, i, 1:ncat, g] <- lordif::probarm(theta, gpar[i, 1, g], gpar[i, 2:ncat, g])
    lines(theta, sumpp(pp[, i, 1:ncat, g]), lty = g, col = g)
  }
  legend("bottomright", labels, lty = 1:x$ng, col = 1:x$ng, cex = 0.7,
    bg = "white")
  chi12 <- paste(x$stats[difitems[i], "df12"], "," =", x$stats[difitems[i],
    "chi12"], sep = "")
pseudo12 <- x$stats[difitems[i], paste("pseudo12.", x$options$pseudo.R2,
    sep = ")
  beta12 <- round(x$stats[difitems[i], "beta12"], 4)
  chi13 <- paste(x$stats[difitems[i], "df13"], "," =", x$stats[difitems[i],
    "chi13"], sep = "")
pseudo13 <- x$stats[difitems[i], paste("pseudo13.", x$options$pseudo.R2,
    sep = ")
  chi23 <- paste(x$stats[difitems[i], "df23"], "," =", x$stats[difitems[i],
    "chi23"], sep = "")
pseudo23 <- x$stats[difitems[i], paste("pseudo23.", x$options$pseudo.R2,
    sep = ")
  text(min(theta), ncat - 1, substitute(paste("Pr", chi12)^2,
\[ \text{plot}(\theta, \text{seq}(0, ncat - 1), \text{type} = "n", \text{xlab} = "\theta", \text{ylab} = "\text{Item Score}", \text{main} = "\text{Differences in Item True Score Functions}", ...) \]

for (g in 2:x$ng) {
    \text{lines}(\theta, \text{abs}(\text{sumpp}(p[; i, 1:ncat, 1]) - \text{sumpp}(p[; i, 1:ncat, g])), \text{lty} = g, \text{col} = g)
}

\text{plot}(\theta, \text{seq}(0, 1), \text{along.with} = \theta), \text{type} = "n", \text{xlab} = "\theta", \text{ylab} = "\text{Probability}", \text{main} = "\text{Item Response Functions}", ...) 

for (g in 1:x$ng) {
    for (k in 1:ncat) {
        \text{lines}(\theta, p[; i, k, g], \text{lty} = g, \text{cex} = 0.1, \text{col} = g)
    }
}

for (g in 1:x$ng) {
    \text{text}(x$options$minTheta, 0.8 - (g - 1) * par()$cxy[2], \text{paste}(\text{round}(\text{gpar}[i, , g][!\text{is.na}(\text{gpar}[i, , g])], 2), \text{collapse} = ", ", \text{col} = g, \text{adj} = c(0, 0), \text{cex} = 0.8)
    for (k in 2:ncat) {
        \text{if} (!\text{is.na}(\text{gpar}[i, k, g]))
        \text{text}(\text{gpar}[i, k, g], 0, ", ", \text{col} = g)
    }
}

\text{plot}(\theta, \text{seq}(0, ncat - 1), \text{along.with} = \theta), \text{type} = "n", \text{xlab} = "\theta", \text{ylab} = "\text{Size}", \text{main} = "\text{Impact (Weighted by Density)}", ...) 

for (g in 2:x$ng) {
    \text{lines}(\theta, \text{gdensity}[; g] * \text{abs}(\text{sumpp}(p[; i, 1:ncat, 1]) - \text{sumpp}(p[; i, 1:ncat, g])), \text{lty} = g, \text{col} = g)
}

\text{par(mfrow} = c(1, 2))
\text{plot}(\theta, \text{seq}(0, \text{sum}(!\text{is.na}(x$ipar)) - x$n, \text{along} = \theta), \text{xlab} = "\theta", \text{ylab} = "\text{TCC}", \text{type} = "n", \text{main} = "\text{All Items}", ...) 

for (g in 1:x$ng) {
apar <- rbind(cpar, gpar[, , g])
lines(theta, lordif::tcc(apar[, , gpar[, , g]], apar[, -1, drop = F], theta,
    model = x$options$model), lty = g, col = g)
}
legend("bottomright", labels, lty = 1:x$ng, col = 1:x$ng,
    bg = "white")
plot(theta, seq(0, sum(!is.na(gpar[, , 1])) - ndif, along = theta),
    xlab = "theta", ylab = "TCC", type = "n", main = "DIF Items",
    ...
)}

for (g in 1:x$ng) {
    lines(theta, lordif::tcc(gpar[, , g], matrix(gpar[, -1, g], nrow = ndif), theta,
        model = x$options$model), lty = g, col = g)
}
legend("bottomright", labels, lty = 1:x$ng, col = 1:x$ng,
    bg = "white")
layout(matrix(c(1, 2), ncol = 2), widths = c(1, 2))
boxplot(x$calib$theta - x$calib.sparse$theta, col = "light grey")
difference <- x$calib$theta - x$calib.sparse$theta
plot(x$calib$theta, difference, type = "n", xlab = "initial theta",
    ylab = "initial - purified", ...
) abline(h = 0)
abline(h = mean(x$calib$theta - x$calib.sparse$theta), lty = 2)
for (i in 1:x$ng) {
    points(x$calib$theta[x$group == as.numeric(names(table(x$group)))[i]],
        difference[x$group == as.numeric(names(table(x$group)))[i]],
        col = i, pch = i)
}
legend("topright", labels, pch = 1:x$ng, col = 1:x$ng, bg = "white")

# Need to reset the layout so that future plots don't also have the same layout.
layout(matrix(1)) # Added by AAM, 5/13/19

## making function to reverse score the integers
rev_score <- function(x){
    x * -1 + 8
}

# this interactively reverse codes items prior to scale analysis, only used for data
# combination reasons.
# More specifically, {mirt} and {ltm} have slightly different rules for automatically
# reverse-scoring items with negative correlations, which results in variable appearances for
# IRT parameters. Also, the different data collection and storage required across the samples
# in the study had different procedures for reverse scoring.
# The goal for this function is to standardize that reverse scoring across samples and analysis
# packages, so that it will reverse score any items that *should* be reverse scored based on
# empirical results.
# takes a tibble, returns one.
reverse_onfly <- function(data){
x <- cor(data)
    while(any(x < -.1)){ # are there any negative cells in the correlation matrix?
}
# Assumes full data, no NA.
# Do this over and over again until it's not true:
indices <- which(cor(data) < -.1, arr.ind = TRUE)
# Note: allows for some small negative correlations, which would be very bad item combinations
name_quo <- rownames(indices)[1]
print(paste("name_quo ", name_quo))
name_use <- as.name(name_quo)
print(paste("name_use", name_use))
data <- mutate(data, !!name_use := rev_score(!!name_use))
x <- cor(data)
}
data # returns the data frame.
}

Session Info

## R version 4.0.2 (2020-06-22)
## Platform: x86_64-apple-darwin17.0 (64-bit)
## Running under: macOS Mojave 10.14.6
##
## Matrix products: default
## BLAS: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRblas.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats4 stats graphics grDevices utils datasets methods
## [8] base
##
## other attached packages:
## [1] forcats_0.5.0 stringr_1.4.0 purrr_0.3.4 readr_1.4.0
## [5] tidyr_1.1.2 tibble_3.0.4 tidyverse_1.3.0 NORSEpkg_0.1.0
## [9] dplyr_1.0.2 lordif_0.3-3 rms_6.0-1 SparseM_1.78
## [13] Hmisc_4.4-1 ggplot2_3.3.1 Formula_1.2-4 survival_3.2-7
## [17] mirt_1.33.2 lattice_0.20-41 pROC_1.16.2 psych_2.0.9
## [21] ltm_1.1-1 polycor_0.7-10 msm_1.6.8 MASS_7.3-53
## [25] markdown_2.4 knitr_1.30
##
## loaded via a namespace (and not attached):
## [1] TH.data_1.0-10 colorspace_1.4-1 ellipsis_0.3.1
## [4] htmlTable_2.1.0 base64enc_0.1-3 fs_1.5.0
## [7] rstudioapi_0.11 Deriv_4.1.1 MatrixModels_0.4-1
## [10] fansi_0.4.1 mvtnorm_1.1-1 lubridate_1.7.9
## [13] xml2_1.3.2 codetools_0.2-16 splines_4.0.2
## [16] mnormt_2.0.2 jsonlite_1.7.1 broom_0.7.1
## [19] cluster_2.1.0 dbplyr_1.4.4 png_0.1-7
## [22] compiler_4.0.2 httr_1.4.2 backports_1.1.10
## [25] assertthat_0.2.1 Matrix_1.2-18 cli_2.1.0
## [28] htmltools_0.5.0 quantreg_5.73 tools_4.0.2
## [31] tibble_3.0.1 glue_1.4.2 Rcpp_1.0.5
## [34] cellranger_1.1.0 vctrs_0.3.4 nlm_3.1-149
