Supplement to

**Coping With COVID: Risk and Resilience Factors for Mental Health in a German Representative Panel Study**

By Riepenhausen et al.

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**Table S1**

*Studies on Mental Health During the COVID-19 Pandemic Using Representative Samples with Pre-Pandemic Baseline Measurement or Several Peri-Pandemic Survey Waves*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Study* | *Country* | *Period of measurement* | *Baseline measurement* | *Instrument for mental health* | *Change in mental health* |
| (Breslau et al., 2020) | USA | 05/2020 | 02/2019 (same sample) | Kessler-6 scale of mental distress | = |
| (Cheng et al., 2021)\* | UK | 04-05/2020 | 2017-2018 (same sample) | GHQ-12 (general mental health problems) | + (particularly in working parents) |
| (Daly & Robinson, 2020) | USA | 03-07/2020 (8 waves in the same sample) | / | PHQ-4 (depressive & anxiety symptoms) | + (but quick recovery to baseline levels) |
| (Daly et al., 2020)\* | UK | 04-06/2020 (3 waves in the same sample) | 2017-2019 (same sample) | GHQ-12 (general mental health problems) | + (particularly in young people, women, and people with high income and education) |
| (Daly et al., 2021) | USA | 03-04/2020 (2 waves in the same sample) | 2017-2018 (different sample) | PHQ-2 (depressive symptoms) | + (particularly in young people) |
| (Dawel et al., 2020) | Australia | 03/2020 | Comparison to validation studies of instruments | PHQ-9 (depressive symptoms) & GAD-7 (anxiety symptoms) | + |
| (Ettman et al., 2020) | USA | 03-04/2020 | 2017-2018 (different sample) | PHQ-9 (depressive symptoms) | + |
| (Holman et al., 2020) | USA | 03-04/2020 (3 waves in different samples) | / | Brief Symptom Inventory (depressive symptoms) | + |
| (Niedzwiedz et al., 2020)\* | UK | 04/2020 | 2017-2019 (same sample) | GHQ-12 (general mental health problems) | + |
| (Peters et al., 2020) | Germany | 04-05/2020 | 2014-2019 (partly same sample) | PHQ-9 (depressive symptoms), GAD-7 (anxiety symptoms) & PHQ-Stress (perceived stress) | + (particularly in young women) |
| (Pieh et al., 2020) | Austria | 04/2020 | 2014 (different sample) | PHQ-9 (depressive symptoms) & GAD-7 (anxiety symptoms) | + |
| (Pierce et al., 2020)\* | UK | 04/2020 | 2014-2018 (same sample) | GHQ-12 (general mental health problems) | + (particularly in young people, women, and people with children) |
| (Sibley et al., 2020) | New Zealand | 03-04/2020 | 10-12/2019 (different sample) | Kessler-6 scale of mental distress | + |
| (Twenge & Joiner, 2020) | USA | 04/2020 | 2018 (same sample) | Kessler-6 scale of mental distress | + (particularly in young people and people with children) |
| (van der Velden et al., 2020) | The Netherlands | 03/2020 | 03/2019 (same sample) | MHI-5 (anxiety and depressive symptoms) | = |
| (Winkler et al., 2020) | Czechia | 05/2020 | 2017 (different sample) | MINI psychiatric interview | + |
| (Zajacova et al., 2020) | Canada | 03+05/2020 (2 waves in different samples) | / | Self-rated mental health & GAD-7 (anxiety symptoms; only in May) | + (particularly in young people and women) |
| SOEP-CoV | Germany | 04-07/2020 (9 waves in different samples); 01-02/2021 (follow-up on all 9 waves) | 2016, 2019 (same sample) | PHQ-4 (depressive and anxiety symptoms) |  |

*Note.* \*same sample used in these studies. Change in mental health: increase (+), decrease (-) or no change (=) in symptoms.

**Table S2**

*Information on Sample Size and Timing of Different Tranches*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Tranche | Time frame | Planned N | Actual N | N with non-zero survey weight |
| 2020 | 1 | 01/04/2020-14/04/2020 | 3,000 | 1,687 | 1,680 |
| 2020 | 2 | 15/04/2020-28/04/2020 | 3,000 | 1,928 | 1,919 |
| 2020 | 3 | 29/04/2020-12/05/2020 | 2,000 | 978 | 977 |
| 2020 | 4 | 13/05/2020-26/05/2020 | 1,000 | 632 | 631 |
| 2020 | 5 | 27/05/2020-02/06/2020 | 600 | 308 | 308 |
| 2020 | 6 | 03/06/2020-09/06/2020 | 600 | 302 | 299 |
| 2020 | 7 | 10/06/2020-16/06/2020 | 600 | 286 | 285 |
| 2020 | 8 | 17/06/2020-23/06/2020 | 600 | 298 | 293 |
| 2020 | 9 | 24/06/2020-28/06/2020 | 600 | 265 | 265 |
| 2020 | 1-9 | 01/04/2020-28/06/2020 | 12,000 | 6,684 | 6,657 |
| 2021 |  | 18/01/2021-15/02/2021 | 6,684 | 6,006 | 5,981 |

**Table S3**

*Comparison Between Multiple Linear Regression With and Without Survey Weights to Allow for Interpretation of Unweighted LASSO Analysis*

|  | *ΔPHQ 2020 w* | *ΔPHQ 2020 unw* | *ΔPHQ 2021 w* | *ΔPHQ 2021 unw* | *ΔPHQ 2019 w* | *ΔPHQ 2019 unw* |
| --- | --- | --- | --- | --- | --- | --- |
| *(Intercept)* | 0.243 (0.174) | 0.030 (0.083) | -0.105 (0.138) | -0.121 (0.076) | **-0.666 (0.149)\*\*\*** | **-0.646 (0.087)\*\*\*** |
| *PREAP* | -0.069 (0.052) | **-0.118 (0.027)\*\*\*** | 0.031 (0.040) | -0.009 (0.027) | -0.027 (0.046) | 0.003 (0.027) |
| *PERSP* | 0.083 (0.049) | 0.044 (0.024) | 0.011 (0.046) | 0.025 (0.026) | **0.101 (0.042)\*** | **0.056 (0.026)\*** |
| *ACC* | -0.069 (0.051) | **-0.050 (0.024)\*** | -0.041 (0.040) | -0.030 (0.026) | -0.014 (0.045) | -0.019 (0.026) |
| *PAC* | **-0.115 (0.044)\*\*** | **-0.093 (0.025)\*\*\*** | **-0.119 (0.045)\*\*** | **-0.083 (0.028)\*\*** | -0.069 (0.045) | **-0.068 (0.025)\*\*** |
| *SUPP* | **0.161 (0.052)\*\*** | **0.192 (0.025)\*\*\*** | **0.128 (0.046)\*\*** | **0.087 (0.028)\*\*** | 0.016 (0.046) | 0.027 (0.025) |
| *CATA* | **0.452 (0.052)\*\*\*** | **0.430 (0.028)\*\*\*** | **0.185 (0.050)\*\*\*** | **0.157 (0.028)\*\*\*** | 0.051 (0.044) | **0.051 (0.025)\*** |
| *REC* | **-0.358 (0.058)\*\*\*** | **-0.278 (0.028)\*\*\*** | **-0.242 (0.046)\*\*\*** | **-0.184 (0.028)\*\*\*** | -0.018 (0.051) | -0.047 (0.026) |
| *OPT* | -0.072 (0.063) | **-0.085 (0.024)\*\*\*** | **-0.156 (0.042)\*\*\*** | **-0.161 (0.026)\*\*\*** | **-0.327 (0.041)\*\*\*** | **-0.299 (0.027)\*\*\*** |
| *LOC* | 0.000 (0.002) | 0.001 (0.001) | -0.001 (0.002) | -0.002 (0.001) | -0.002 (0.002) | **-0.005 (0.001)\*\*\*** |
| *NEU* | **0.165 (0.053)\*\*** | **0.212 (0.024)\*\*\*** | **0.246 (0.045)\*\*\*** | **0.248 (0.026)\*\*\*** | **0.519 (0.057)\*\*\*** | **0.509 (0.034)\*\*\*** |
| *Age: 18-24* | **0.645 (0.269)\*** | **0.556 (0.174)\*\*** | **1.043 (0.278)\*\*\*** | **0.990 (0.211)\*\*\*** | 0.185 (0.267) | **0.483 (0.174)\*\*** |
| *Age: 25-34* | **0.448 (0.193)\*** | **0.325 (0.089)\*\*\*** | **0.407 (0.164)\*** | **0.452 (0.101)\*\*\*** | 0.168 (0.155) | **0.199 (0.095)\*** |
| *Age: 35-44* | 0.085 (0.139) | **0.149 (0.070)\*** | **0.300 (0.141)\*** | **0.333 (0.081)\*\*\*** | 0.026 (0.150) | 0.050 (0.078) |
| *Age: 55-64* | 0.094 (0.126) | 0.033 (0.068) | -0.029 (0.130) | -0.089 (0.076) | -0.007 (0.120) | -0.021 (0.070) |
| *Age: 65-74* | -0.020 (0.152) | -0.106 (0.077) | -0.093 (0.163) | **-0.272 (0.086)\*\*** | **-0.254 (0.125)\*** | **-0.298 (0.076)\*\*\*** |
| *Age: 75-84* | -0.047 (0.182) | -0.021 (0.089) | -0.058 (0.158) | **-0.220 (0.098)\*** | -0.174 (0.194) | **-0.254 (0.096)\*\*** |
| *Age: 85+* | 0.272 (0.380) | 0.135 (0.199) | 0.079 (0.254) | 0.174 (0.208) | -0.108 (0.223) | -0.160 (0.164) |
| *Gender: female* | 0.095 (0.089) | **0.221 (0.047)\*\*\*** | **0.339 (0.080)\*\*\*** | **0.278 (0.053)\*\*\*** | 0.019 (0.088) | -0.004 (0.052) |
| *Household net income: low* | 0.130 (0.120) | 0.080 (0.058) | 0.066 (0.108) | 0.127 (0.065) | 0.229 (0.116) | 0.193 (0.068)\*\* |
| *Household net income: high* | -0.085 (0.111) | -0.028 (0.057) | -0.086 (0.093) | -0.044 (0.061) | 0.034 (0.104) | 0.006 (0.061) |
| *Education: low* | 0.077 (0.122) | 0.052 (0.065) | 0.016 (0.107) | 0.046 (0.069) | -0.021 (0.106) | 0.104 (0.067) |
| *Education: high* | 0.094 (0.122) | 0.069 (0.055) | 0.160 (0.106) | 0.109 (0.058) | -0.103 (0.127) | -0.023 (0.057) |
| *History of diagnosed depression* | **0.516 (0.169)\*\*** | **0.332 (0.091)\*\*\*** | **0.873 (0.214)\*\*\*** | **0.566 (0.110)\*\*\*** | **1.549 (0.206)\*\*\*** | **1.392 (0.117)\*\*\*** |
| *COVID-19 risk group* | -0.195 (0.101) | 0.012 (0.052) | -0.109 (0.097) | 0.068 (0.055) | 0.175 (0.097) | **0.151 (0.052)\*\*** |
| *Lockdown* | -0.010 (0.097) | 0.038 (0.048) |  |  |  |  |
| *Mean PHQ-4 2016/2019* | **-1.271 (0.067)\*\*\*** | **-1.266 (0.035)\*\*\*** | **-1.186 (0.059)\*\*\*** | **-1.199 (0.043)\*\*\*** |  |  |
| *PHQ-4 in 2016* |  |  |  |  | **-1.723 (0.066)\*\*\*** | **-1.742 (0.045)\*\*\*** |
| R2 | 0.329 | 0.326 | 0.267 | 0.253 | 0.461 | 0.465 |
| N | 6657 | 6657 | 5981 | 5981 | 6657 | 6657 |

*Note.* PHQ-4 = Patient Health Questionnaire; w = survey-weighted; unw = unweighted; PREAP = positive reappraisal; PERSP = putting into perspective; ACC = acceptance; PAC = positive appraisal specific to the COVID-19 pandemic; SUPP = asking for instrumental support; CATA = catastrophizing; REC = perceived stress recovery; OPT = optimism; LOC = locus of control; NEU = neuroticism, ΔPHQ 2020 = change in PHQ-4 from 2019 to 2020, ΔPHQ 2021 = change in PHQ-4 from 2019 to 2021, ΔPHQ 2019 = change in PHQ-4 from 2016 to 2019, unw = unweighted, w = weighted. Parameter estimates of psychological factors and factor levels of covariates that significantly predicted the respective outcome are displayed in bold for increased readability.

**Table S4**

*Beta Coefficients and Standard Errors of Multiple Linear Regression Models (Outcome: ΔPHQ 2020)*

|  | *Base Model* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* | *Model 6* | *Model 7* | *Model 8* | *Model 9* | *Model 10* |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *(Intercept)* | 0.155 (0.170) | 0.155 (0.170) | 0.153 (0.170) | 0.131 (0.169) | 0.151 (0.171) | 0.132 (0.168) | 0.230 (0.168) | 0.207 (0.166) | 0.178 (0.172) | 0.145 (0.182) | 0.145 (0.165) |
| *PREAP* |  | **-0.192 (0.053)\*\*** |  |  |  |  |  |  |  |  |  |
| *PERSP* |  |  | -0.052 (0.055) |  |  |  |  |  |  |  |  |
| *ACC* |  |  |  | -0.129 (0.050) |  |  |  |  |  |  |  |
| *PAC* |  |  |  |  | -0.096 (0.046) |  |  |  |  |  |  |
| *SUPP* |  |  |  |  |  | **0.282 (0.052)\*\*\*** |  |  |  |  |  |
| *CATA* |  |  |  |  |  |  | **0.553 (0.054)\*\*\*** |  |  |  |  |
| *REC* |  |  |  |  |  |  |  | **-0.473 (0.057)\*\*\*** |  |  |  |
| *OPT* |  |  |  |  |  |  |  |  | -0.057 (0.061) |  |  |
| *LOC* |  |  |  |  |  |  |  |  |  | 0.001 (0.003) |  |
| *NEU* |  |  |  |  |  |  |  |  |  |  | **0.214 (0.053)\*\*** |
| *Age: 18-24* | 0.750 (0.298) | 0.732 (0.295) | 0.755 (0.297) | 0.750 (0.292) | 0.738 (0.299) | 0.642 (0.283) | 0.778 (0.279) | 0.735 (0.298) | 0.742 (0.299) | 0.737 (0.303) | 0.744 (0.291) |
| *Age: 25-34* | 0.454 (0.207) | 0.449 (0.204) | 0.460 (0.208) | 0.459 (0.205) | 0.454 (0.207) | 0.421 (0.207) | 0.498 (0.197) | 0.441 (0.195) | 0.452 (0.211) | 0.449 (0.209) | 0.459 (0.198) |
| *Age: 35-44* | 0.112 (0.158) | 0.118 (0.160) | 0.115 (0.158) | 0.110 (0.156) | 0.106 (0.157) | 0.076 (0.155) | 0.149 (0.156) | 0.088 (0.152) | 0.114 (0.158) | 0.110 (0.156) | 0.102 (0.150) |
| *Age: 55-64* | 0.114 (0.143) | 0.097 (0.140) | 0.114 (0.143) | 0.119 (0.140) | 0.105 (0.143) | 0.129 (0.139) | 0.085 (0.129) | 0.119 (0.141) | 0.103 (0.142) | 0.114 (0.143) | 0.142 (0.148) |
| *Age: 65-74* | -0.071 (0.170) | -0.091 (0.171) | -0.073 (0.170) | -0.056 (0.169) | -0.081 (0.169) | -0.018 (0.167) | -0.061 (0.168) | -0.034 (0.158) | -0.086 (0.173) | -0.069 (0.171) | -0.055 (0.162) |
| *Age: 75-84* | 0.035 (0.173) | 0.022 (0.175) | 0.037 (0.174) | 0.055 (0.174) | 0.021 (0.173) | 0.060 (0.175) | -0.044 (0.170) | 0.024 (0.168) | 0.012 (0.176) | 0.042 (0.182) | 0.058 (0.185) |
| *Age: 85+* | 0.460 (0.389) | 0.474 (0.389) | 0.464 (0.392) | 0.475 (0.392) | 0.456 (0.387) | 0.479 (0.386) | 0.208 (0.380) | 0.463 (0.392) | 0.444 (0.387) | 0.465 (0.395) | 0.487 (0.398) |
| *Gender: female* | 0.248 (0.091) | **0.263 (0.090)\*** | **0.253 (0.090)\*** | **0.263 (0.091)\*** | **0.260 (0.090)\*** | 0.247 (0.091) | 0.172 (0.088) | 0.151 (0.089) | 0.248 (0.091) | 0.251 (0.092) | 0.200 (0.091) |
| *Household net income: low* | 0.246 (0.122) | 0.247 (0.122) | 0.245 (0.122) | 0.230 (0.123) | 0.248 (0.122) | 0.228 (0.122) | 0.174 (0.119) | 0.217 (0.118) | 0.246 (0.122) | 0.245 (0.122) | 0.220 (0.123) |
| *Household net income: high* | -0.173 (0.115) | -0.159 (0.116) | -0.173 (0.115) | -0.178 (0.114) | -0.177 (0.115) | -0.175 (0.116) | -0.122 (0.114) | -0.113 (0.110) | -0.166 (0.112) | -0.174 (0.114) | -0.180 (0.119) |
| *Education: low* | 0.184 (0.131) | 0.162 (0.129) | 0.189 (0.133) | 0.175 (0.131) | 0.182 (0.131) | 0.214 (0.133) | 0.087 (0.127) | 0.159 (0.125) | 0.188 (0.131) | 0.183 (0.131) | 0.173 (0.128) |
| *Education: high* | -0.005 (0.129) | 0.013 (0.133) | 0.001 (0.130) | 0.013 (0.130) | -0.003 (0.130) | -0.014 (0.125) | 0.071 (0.135) | 0.028 (0.119) | -0.005 (0.129) | -0.006 (0.129) | 0.006 (0.127) |
| *History of diagnosed depression* | **0.697 (0.203)\*\*** | **0.705 (0.202)\*\*** | **0.705 (0.202)\*\*** | **0.713 (0.202)\*\*** | **0.696 (0.202)\*\*** | **0.684 (0.200)\*\*** | **0.718 (0.186)\*\*** | **0.539 (0.189)\*** | **0.659 (0.201)\*** | **0.697 (0.203)\*\*** | **0.674 (0.202)\*\*** |
| *COVID-19 risk group* | -0.115 (0.106) | -0.128 (0.105) | -0.115 (0.106) | -0.108 (0.106) | -0.116 (0.106) | -0.094 (0.107) | -0.157 (0.107) | -0.156 (0.102) | -0.120 (0.105) | -0.114 (0.105) | -0.134 (0.103) |
| *Lockdown* | -0.055 (0.101) | -0.053 (0.100) | -0.062 (0.103) | -0.043 (0.103) | -0.041 (0.100) | -0.043 (0.102) | -0.099 (0.097) | -0.008 (0.095) | -0.054 (0.101) | -0.055 (0.101) | -0.054 (0.102) |
| *Mean PHQ-4 2016/2019* | **-1.087 (0.070)\*\*\*** | **-1.096 (0.069)\*\*\*** | **-1.087 (0.070)\*\*\*** | **-1.092 (0.070)\*\*\*** | **-1.092 (0.069)\*\*\*** | **-1.091 (0.071)\*\*\*** | **-1.140 (0.067)\*\*\*** | **-1.147 (0.064)\*\*\*** | **-1.096 (0.070)\*\*\*** | **-1.087 (0.070)\*\*\*** | **-1.174 (0.072)\*\*\*** |
| *R2* | 0.217 | 0.224 | 0.217 | 0.220 | 0.219 | 0.232 | 0.279 | 0.262 | 0.218 | 0.217 | 0.231 |
| *ΔR2* | / | 0.007 | 0 | 0.003 | 0.002 | 0.015 | 0.062 | 0.045 | 0.001 | 0 | 0.014 |
| *Observations* | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 |

*Note.* \*\*\*p < 0.0001; \*\*p < 0.001; \*p < 0.005 (due to Bonferroni correction). PREAP = positive reappraisal; PERSP = putting into perspective; ACC = acceptance; PAC = positive appraisal specific to the COVID-19 pandemic; SUPP = asking for instrumental support; CATA = catastrophizing; REC = perceived stress recovery; OPT = optimism; LOC = locus of control; NEU = neuroticism. Parameter estimates of psychological factors and factor levels of covariates that significantly predicted ΔPHQ-4 2020 are displayed in bold for increased readability.

**Table S5**

*Beta Coefficients and Standard Errors of Multiple Linear Regression Models (Outcome: ΔPHQ 2021)*

|  | *Base Model* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* | *Model 6* | *Model 7* | *Model 8* | *Model 9* | *Model 10* |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *(Intercept)* | -0.254 (0.145) | -0.255 (0.145) | -0.261 (0.144) | -0.260 (0.144) | -0.248 (0.145) | -0.250 (0.142) | -0.226 (0.144) | -0.192 (0.143) | -0.211 (0.146) | -0.238 (0.148) | -0.239 (0.142) |
| *PREAP* |  | -0.065 (0.038) |  |  |  |  |  |  |  |  |  |
| *PERSP* |  |  | -0.052 (0.046) |  |  |  |  |  |  |  |  |
| *ACC* |  |  |  | -0.076 (0.040) |  |  |  |  |  |  |  |
| *PAC* |  |  |  |  | -0.116 (0.043) |  |  |  |  |  |  |
| *SUPP* |  |  |  |  |  | **0.170 (0.044)\*\*** |  |  |  |  |  |
| *CATA* |  |  |  |  |  |  | **0.259 (0.049)\*\*\*** |  |  |  |  |
| *REC* |  |  |  |  |  |  |  | **-0.332 (0.048)\*\*\*** |  |  |  |
| *OPT* |  |  |  |  |  |  |  |  | **-0.139 (0.046)\*** |  |  |
| *LOC* |  |  |  |  |  |  |  |  |  | -0.001 (0.002) |  |
| *NEU* |  |  |  |  |  |  |  |  |  |  | **0.255 (0.049)\*\*\*** |
| *Age: 18-24* | **1.118 (0.293)\*\*** | **1.117 (0.294)\*\*** | **1.122 (0.294)\*\*** | **1.119 (0.291)\*\*** | **1.109 (0.294)\*\*** | **1.034 (0.285)\*\*** | **1.144 (0.290)\*\*\*** | **1.126 (0.288)\*\*\*** | **1.104 (0.294)\*\*** | **1.140 (0.299)\*\*** | **1.089 (0.286)\*\*** |
| *Age: 25-34* | 0.408 (0.173) | 0.409 (0.173) | 0.414 (0.172) | 0.409 (0.173) | 0.409 (0.173) | 0.371 (0.173) | 0.439 (0.169) | 0.405 (0.169) | 0.409 (0.172) | 0.416 (0.172) | 0.406 (0.173) |
| *Age: 35-44* | 0.326 (0.158) | 0.330 (0.159) | 0.329 (0.158) | 0.324 (0.158) | 0.315 (0.157) | 0.304 (0.157) | 0.356 (0.155) | 0.306 (0.150) | 0.331 (0.155) | 0.330 (0.157) | 0.317 (0.157) |
| *Age: 55-64* | -0.053 (0.139) | -0.054 (0.139) | -0.051 (0.139) | -0.048 (0.139) | -0.056 (0.140) | -0.048 (0.138) | -0.053 (0.135) | -0.033 (0.138) | -0.071 (0.135) | -0.052 (0.139) | -0.023 (0.146) |
| *Age: 65-74* | -0.108 (0.181) | -0.112 (0.181) | -0.109 (0.181) | -0.098 (0.182) | -0.115 (0.180) | -0.080 (0.179) | -0.100 (0.175) | -0.084 (0.173) | -0.136 (0.179) | -0.108 (0.181) | -0.106 (0.179) |
| *Age: 75-84* | 0.012 (0.162) | 0.008 (0.162) | 0.015 (0.161) | 0.026 (0.162) | -0.005 (0.161) | 0.022 (0.161) | -0.014 (0.161) | 0.010 (0.158) | -0.040 (0.160) | 0.002 (0.164) | 0.028 (0.168) |
| *Age: 85+* | 0.266 (0.253) | 0.267 (0.251) | 0.269 (0.250) | 0.271 (0.252) | 0.244 (0.247) | 0.281 (0.254) | 0.111 (0.260) | 0.242 (0.252) | 0.214 (0.260) | 0.258 (0.255) | 0.282 (0.249) |
| *Gender: female* | **0.486 (0.081)\*\*\*** | **0.491 (0.081)\*\*\*** | **0.491 (0.081)\*\*\*** | **0.493 (0.081)\*\*\*** | **0.498 (0.081)\*\*\*** | **0.475 (0.081)\*\*\*** | **0.442 (0.080)\*\*\*** | **0.414 (0.081)\*\*\*** | **0.493 (0.081)\*\*\*** | **0.483 (0.081)\*\*\*** | **0.412 (0.083)\*\*\*** |
| *Household net income: low* | 0.166 (0.116) | 0.168 (0.116) | 0.166 (0.115) | 0.152 (0.117) | 0.170 (0.115) | 0.150 (0.115) | 0.130 (0.113) | 0.126 (0.112) | 0.161 (0.114) | 0.165 (0.116) | 0.141 (0.112) |
| *Household net income: high* | -0.121 (0.098) | -0.117 (0.099) | -0.121 (0.098) | -0.121 (0.098) | -0.125 (0.098) | -0.125 (0.098) | -0.108 (0.097) | -0.098 (0.095) | -0.117 (0.098) | -0.120 (0.098) | -0.109 (0.097) |
| *Education: low* | 0.052 (0.113) | 0.044 (0.112) | 0.058 (0.113) | 0.047 (0.113) | 0.052 (0.113) | 0.061 (0.112) | 0.005 (0.110) | 0.036 (0.109) | 0.060 (0.112) | 0.053 (0.112) | 0.046 (0.112) |
| *Education: high* | 0.091 (0.114) | 0.098 (0.115) | 0.099 (0.116) | 0.101 (0.115) | 0.095 (0.114) | 0.084 (0.112) | 0.129 (0.115) | 0.124 (0.109) | 0.095 (0.116) | 0.092 (0.114) | 0.107 (0.109) |
| *History of diagnosed depression* | **1.063 (0.217)\*\*\*** | **1.067 (0.218)\*\*\*** | **1.072 (0.217)\*\*\*** | **1.074 (0.217)\*\*\*** | **1.063 (0.218)\*\*\*** | **1.061 (0.218)\*\*\*** | **1.082 (0.211)\*\*\*** | **0.973 (0.209)\*\*\*** | **0.982 (0.223)\*\*\*** | **1.063 (0.218)\*\*\*** | **1.012 (0.217)\*\*\*** |
| *COVID-19 risk group* | -0.050 (0.104) | -0.057 (0.104) | -0.053 (0.104) | -0.049 (0.105) | -0.056 (0.104) | -0.032 (0.103) | -0.069 (0.102) | -0.085 (0.102) | -0.063 (0.102) | -0.051 (0.104) | -0.069 (0.104) |
| *Mean PHQ-4 2016/2019* | **-0.994 (0.062)\*\*\*** | **-0.998 (0.062)\*\*\*** | **-0.995 (0.062)\*\*\*** | **-0.997 (0.062)\*\*\*** | **-1.002 (0.061)\*\*\*** | **-0.998 (0.062)\*\*\*** | **-1.019 (0.061)\*\*\*** | **-1.048 (0.061)\*\*\*** | **-1.021 (0.062)\*\*\*** | **-0.994 (0.062)\*\*\*** | **-1.095 (0.060)\*\*\*** |
| *R2* | 0.208 | 0.208 | 0.208 | 0.209 | 0.211 | 0.214 | 0.222 | 0.232 | 0.213 | 0.208 | 0.225 |
| *ΔR2* | / | 0 | 0 | 0.001 | 0.003 | 0.006 | 0.004 | 0.014 | 0.005 | 0 | 0.017 |
| *Observations* | 5981 | 5981 | 5981 | 5981 | 5981 | 5981 | 5981 | 5981 | 5981 | 5981 | 5981 |

*Note.* \*\*\*p < 0.0001; \*\*p < 0.001; \*p < 0.005 (due to Bonferroni correction). PREAP = positive reappraisal; PERSP = putting into perspective; ACC = acceptance; PAC = positive appraisal specific to the COVID-19 pandemic; SUPP = asking for instrumental support; CATA = catastrophizing; REC = perceived stress recovery; OPT = optimism; LOC = locus of control; NEU = neuroticism. Parameter estimates of psychological factors and factor levels of covariates that significantly predicted ΔPHQ-4 2021 are displayed in bold for increased readability.

**Table S6**

*Beta Coefficients and Standard Errors of Multiple Linear Regression Models (Outcome: ΔPHQ 2019; Control Analyses)*

|  | *Base Model* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* | *Model 6* | *Model 7* | *Model 8* | *Model 9* | *Model 10* |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *(Intercept)* | **-0.886 (0.140)\*\*\*** | **-0.885 (0.139)\*\*\*** | **-0.881 (0.141)\*\*\*** | **-0.891 (0.140)\*\*\*** | **-0.879 (0.138)\*\*\*** | **-0.890 (0.140)\*\*\*** | **-0.874 (0.140)\*\*\*** | **-0.859 (0.140)\*\*\*** | **-0.805 (0.147)\*\*\*** | **-0.886 (0.146)\*\*\*** | **-0.874 (0.140)\*\*\*** |
| *PREAP* |  | -0.057 (0.048) |  |  |  |  |  |  |  |  |  |
| *PERSP* |  |  | 0.045 (0.044) |  |  |  |  |  |  |  |  |
| *ACC* |  |  |  | -0.035 (0.052) |  |  |  |  |  |  |  |
| *PAC* |  |  |  |  | -0.109 (0.049) |  |  |  |  |  |  |
| *SUPP* |  |  |  |  |  | 0.064 (0.050) |  |  |  |  |  |
| *CATA* |  |  |  |  |  |  | 0.127 (0.049) |  |  |  |  |
| *REC* |  |  |  |  |  |  |  | -0.141 (0.057) |  |  |  |
| *OPT* |  |  |  |  |  |  |  |  | **-0.175 (0.051)\*** |  |  |
| *LOC* |  |  |  |  |  |  |  |  |  | 0.000 (0.002) |  |
| *NEU* |  |  |  |  |  |  |  |  |  |  | **0.421 (0.060)\*\*\*** |
| *Age: 18-24* | 0.259 (0.277) | 0.254 (0.276) | 0.255 (0.278) | 0.259 (0.277) | 0.245 (0.275) | 0.234 (0.281) | 0.264 (0.280) | 0.254 (0.275) | 0.227 (0.276) | 0.259 (0.283) | 0.235 (0.273) |
| *Age: 25-34* | 0.192 (0.177) | 0.191 (0.177) | 0.187 (0.177) | 0.193 (0.176) | 0.191 (0.176) | 0.185 (0.178) | 0.202 (0.175) | 0.186 (0.179) | 0.181 (0.178) | 0.192 (0.175) | 0.187 (0.169) |
| *Age: 35-44* | 0.050 (0.143) | 0.051 (0.143) | 0.048 (0.143) | 0.049 (0.142) | 0.042 (0.141) | 0.041 (0.144) | 0.058 (0.144) | 0.041 (0.142) | 0.054 (0.142) | 0.050 (0.143) | 0.026 (0.156) |
| *Age: 55-64* | 0.005 (0.129) | 0.000 (0.129) | 0.005 (0.129) | 0.007 (0.128) | -0.005 (0.129) | 0.009 (0.129) | -0.002 (0.128) | 0.007 (0.129) | -0.032 (0.129) | 0.005 (0.129) | 0.060 (0.130) |
| *Age: 65-74* | -0.227 (0.130) | -0.233 (0.129) | -0.225 (0.130) | -0.223 (0.130) | -0.239 (0.130) | -0.215 (0.129) | -0.224 (0.130) | -0.216 (0.130) | -0.274 (0.133) | -0.227 (0.130) | -0.176 (0.129) |
| *Age: 75-84* | -0.068 (0.193) | -0.072 (0.192) | -0.070 (0.194) | -0.063 (0.196) | -0.083 (0.194) | -0.062 (0.191) | -0.086 (0.194) | -0.072 (0.194) | -0.143 (0.208) | -0.068 (0.194) | -0.012 (0.176) |
| *Age: 85+* | -0.041 (0.255) | -0.037 (0.253) | -0.044 (0.256) | -0.036 (0.253) | -0.045 (0.253) | -0.036 (0.252) | -0.098 (0.258) | -0.040 (0.253) | -0.098 (0.272) | -0.041 (0.256) | 0.024 (0.222) |
| *Gender: female* | 0.175 (0.092) | 0.180 (0.093) | 0.171 (0.093) | 0.179 (0.093) | 0.188 (0.091) | 0.175 (0.092) | 0.157 (0.092) | 0.145 (0.090) | 0.173 (0.092) | 0.175 (0.093) | 0.066 (0.091) |
| *Household net income: low* | 0.333 (0.132) | 0.333 (0.131) | 0.333 (0.132) | 0.329 (0.130) | 0.335 (0.131) | 0.329 (0.132) | 0.315 (0.132) | 0.322 (0.132) | 0.330 (0.129) | 0.333 (0.131) | 0.258 (0.123) |
| *Household net income: high* | -0.001 (0.109) | 0.003 (0.110) | -0.001 (0.109) | -0.003 (0.108) | -0.005 (0.109) | -0.002 (0.109) | 0.011 (0.110) | 0.016 (0.109) | 0.021 (0.109) | -0.001 (0.109) | -0.015 (0.105) |
| *Education: low* | 0.006 (0.120) | -0.000 (0.120) | 0.001 (0.120) | 0.004 (0.120) | 0.004 (0.119) | 0.013 (0.121) | -0.016 (0.120) | -0.002 (0.120) | 0.018 (0.122) | 0.006 (0.120) | -0.015 (0.109) |
| *Education: high* | -0.140 (0.153) | -0.135 (0.151) | -0.145 (0.153) | -0.135 (0.149) | -0.138 (0.153) | -0.142 (0.150) | -0.121 (0.151) | -0.130 (0.151) | -0.140 (0.158) | -0.140 (0.152) | -0.113 (0.129) |
| *History of diagnosed depression* | **2.060 (0.229)\*\*\*** | **2.061 (0.229)\*\*\*** | **2.053 (0.230)\*\*\*** | **2.064 (0.230)\*\*\*** | **2.053 (0.227)\*\*\*** | **2.056 (0.231)\*\*\*** | **2.057 (0.230)\*\*\*** | **2.002 (0.225)\*\*\*** | **1.920 (0.226)\*\*\*** | **2.060 (0.229)\*\*\*** | **1.883 (0.219)\*\*\*** |
| *COVID-19 risk group* | 0.297 (0.116) | 0.293 (0.117) | 0.298 (0.117) | 0.299 (0.115) | 0.295 (0.116) | 0.302 (0.117) | 0.286 (0.117) | 0.284 (0.115) | 0.277 (0.121) | 0.297 (0.116) | 0.237 (0.097) |
| *PHQ-4 2016* | **-1.575 (0.075)\*\*\*** | **-1.577 (0.076)\*\*\*** | **-1.573 (0.075)\*\*\*** | **-1.576 (0.076)\*\*\*** | **-1.578 (0.075)\*\*\*** | **-1.574 (0.075)\*\*\*** | **-1.583 (0.075)\*\*\*** | **-1.588 (0.077)\*\*\*** | **-1.592 (0.074)\*\*\*** | **-1.575 (0.075)\*\*\*** | **-1.666 (0.071)\*\*\*** |
| *R2* | 0.383 | 0.384 | 0.384 | 0.383 | 0.385 | 0.384 | 0.386 | 0.387 | 0.391 | 0.383 | 0.431 |
| *ΔR2* | / | 0.001 | 0.001 | 0 | 0.002 | 0.001 | 0.003 | 0.004 | 0.008 | 0 | 0.048 |
| *Observations* | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 | 6657 |

*Note.* \*\*\*p < 0.0001; \*\*p < 0.001; \*p < 0.005 (due to Bonferroni correction). PREAP = positive reappraisal; PERSP = putting into perspective; ACC = acceptance; PAC = positive appraisal specific to the COVID-19 pandemic; SUPP = asking for instrumental support; CATA = catastrophizing; REC = perceived stress recovery; OPT = optimism; LOC = locus of control; NEU = neuroticism. Parameter estimates of psychological factors and factor levels of covariates that significantly predicted ΔPHQ-4 2019 are displayed in bold for increased readability.

**Table S7**

*Inclusion Frequencies (in %) and Average Beta Coefficients of 100 Repeated LASSO Runs*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *ΔPHQ 2020* | | *ΔPHQ 2021* | | *ΔPHQ 2019* | |
|  | *Inclusion Frequencies (%)* | *Average Betas* | *Inclusion Frequencies (%)* | *Average Betas* | *Inclusion Frequencies (%)* | *Average Betas* |
| *(Intercept)* | 100 | 0.2471062527 | 100 | 0.07395450 | 100 | -0.56438776 |
| *PREAP* | 100 | -0.0725328845 | 0 | 0 | 0 | 0 |
| *PERSP* | 87 | 0.0051351919 | 0 | 0 | 0 | 0 |
| *ACC* | 3 | -0.0007375404 | 0 | 0 | 0 | 0 |
| *PAC* | 100 | -0.0742353369 | 0 | 0 | 100 | -0.01608382 |
| *SUPP* | 100 | 0.1800027211 | 0 | 0 | 0 | 0 |
| *CATA* | 99 | 0.4021195695 | 100 | 0.10231924 | 100 | 0.01992610 |
| *REC* | 100 | -0.2712046879 | 100 | -0.15002694 | 100 | 0 |
| *OPT* | 100 | -0.0210856747 | 100 | -0.05848769 | 100 | -0.30329354 |
| *LOC* | 99 | -0.0936932852 | 86 | -0.04830433 | 100 | -0.05477911 |
| *NEU* | 100 | 0.2395316404 | 100 | 0.24687970 | 100 | 0.57997029 |
| *Age: 18-24* | 100 | 0.3146536347 | 100 | 0.50971729 | 100 | 0.18037820 |
| *Age: 25-34* | 100 | 0.2033174028 | 100 | 0.22735077 | 81 | 0.03476280 |
| *Age: 35-44* | 99 | 0.0494492996 | 100 | 0.18822001 | 0 | 0 |
| *Age: 55-64* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Age: 65-74* | 22 | -0.0167714512 | 10 | -0.01050292 | 19 | -0.01565519 |
| *Age: 75-84* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Age: 85+* | 1 | 0.0004905986 | 0 | 0 | 0 | 0 |
| *Gender: female* | 100 | 0.1388253960 | 100 | 0.14765066 | 0 | 0 |
| *Household net income: low* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Household net income: high* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Education: low* | 1 | 0.0006190500 | 0 | 0 | 100 | 0.03518836 |
| *Education: high* | 0 | 0 | 0 | 0 | 0 | 0 |
| *History of diagnosed depression* | 0 | 0 | 10 | 0.03198905 | 100 | 1.30236217 |
| *COVID-19 risk group* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lockdown* | 0 | 0 | / | / | / | / |
| *Mean PHQ-4 2016/2019* | 100 | -1.1960413193 | 100 | 1.00956338 | / | / |
| *PHQ-4 in 2016* | / | / | / | / | 100 | -1.63749717 |

**Table S8**

*Correlations Among Predictors*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PREAP | PERSP | ACC | PAC | SUPP | CATA | REC | OPT | LOC | NEU |
| PREAP | 1 |  |  |  |  |  |  |  |  |  |
| PERSP | .34 | 1 |  |  |  |  |  |  |  |  |
| ACC | .15 | .11 | 1 |  |  |  |  |  |  |  |
| PAC | .36 | .16 | .15 | 1 |  |  |  |  |  |  |
| SUPP | .07 | .05 | -.01 | .13 | 1 |  |  |  |  |  |
| CATA | -.15 | -.10 | -.05 | .04 | .19 | 1 |  |  |  |  |
| REC | .16 | .10 | .12 | .09 | -.07 | -.18 | 1 |  |  |  |
| OPT | .09 | .06 | .03 | .14 | .01 | -.10 | .18 | 1 |  |  |
| LOC | .09 | .01 | .07 | .05 | .01 | -.17 | .23 | .25 | 1 |  |
| NEU | -.07 | -.02 | -.03 | -.03 | .07 | .16 | -.31 | -.28 | -.30 | 1 |

*Note.* PREAP = positive reappraisal; PERSP = putting into perspective; ACC = acceptance; PAC = positive appraisal specific to the COVID-19 pandemic; SUPP = asking for instrumental support; CATA = catastrophizing; REC = perceived stress recovery; OPT = optimism; LOC = locus of control; NEU = neuroticism.

1. **Details on Predictor Selection**

The goal of this study was to investigate related constructs to those investigated in a cross-sectional convenience sample on resilience factors during COVID-19 (Veer et al., 2021) in order to investigate their relationship with psychological distress in a representative sample with pre-pandemic data. To this end, we included psychological factors hypothesized to be important for stress resilience that we had previously included in the cross-sectional study (for details on initial reasons for variable selection, please see supplement of Veer et al., 2021). More precisely, we included items on perceived stress recovery and coping styles to the 2020 survey wave and could retrieve information on optimism, neuroticism, and locus of control (as a substitution for general self-efficacy) from previous survey waves.

The initial selection of specific coping strategies was inspired by positive appraisal style theory of resilience (PASTOR; Kalisch et al., 2015). Coping strategies predictive for resilience were identified in two on-going longitudinal studies, LORA (LOngitudinal Resilience Assessment, www.lora.studie.de; conducted by the University Medical Center of Johannes Gutenberg University in Mainz, Germany, and the University Hospital of Goethe University in Frankfurt, Germany; funded by Deutsche Forschungsgemeinschaft (DFG) Collaborative Research Center CRC1193 “Neurobiology of Resilience”; PIs: K. Lieb, Mainz, and A. Reif, Frankfurt; co-PIs: R. Kalisch, O. Tüscher, M. Wessa, Mainz, and U. Basten, C. J. Fiebach, M. Plichta, Frankfurt; N at inclusion: 1200; age at inclusion: 18-50 years) and MARP (MAinz Resilience Project, www.marp-studie.de; by the University Medical Center Mainz and the Leibniz Institute for Resilience Research in Mainz; funded by the State of Rhineland-Palatinate, Germany; PI: R. Kalisch; co-PIs: K. Lieb, O. Tüscher, M. Wessa; N at inclusion: 200; age at inclusion: 18-21 years). For an overview and first methodological publications, see Kampa et al. (2018, 2020) and Kalisch et al. (2020).

MARP and LORA employed two established instruments developed to capture various behavioral and cognitive coping and emotion regulation strategies and that include, among others, questions assessing various appraisal contents and processes, often in a mixed fashion: the brief COPE (Carver, 1997) and the CERQ-short (Garnefski and Kraaij, 2006). The brief COPE has 14, the CERQ-short has nine two-item subscales. In addition, the CERQ-short was amended with two own-formulated questions on a distanced (detached) stressor appraisal. In the baseline (T0) data from both samples, a factor analysis was conducted on the subscale level including both questionnaires and (in MARP) the additional distancing subscale. This reliably identified only three factors spanning the questionnaires. Several subscales loaded predominantly on one of the three factors, such that they could be qualified as factor characteristic subscales. Of these, the subscales distancing (own-formulated), positive reappraisal (CERQ), acceptance (CERQ, less COPE), putting into perspective (CERQ), positive reframing (COPE), and – to a lesser extent - refocus on planning (CERQ), positive refocusing (CERQ) and humor (COPE) strongly positively loaded on the first factor. Another factor was dominated by less cognitive, more behavioral coping subscales, namely instrumental support seeking, emotional support seeking, venting of emotions, and acting out, all from the COPE. Both factors were positively predictive of resilience (outcome-based, for details see below), though the first more so. A third factor was dominated by maladaptive coping strategies such as catastrophizing, self-blame and other-blame (CERQ). Detailed results from this factor analysis and the MARP and LORA studies will be published elsewhere.

Due to restrictions of the questionnaire battery, we were forced to sometimes include single items that were best representing specific instruments/subscales instead of the entire instrument:

The CERQ subscales positive reappraisal, putting into perspective and acceptance thus loaded most strongly on the first factor representing positive appraisal style, instrumental support seeking best reflected the second behavioral coping style factor, whereas catastrophizing best represented maladaptive coping. These subscales were therefore selected to be included in the current study.

The item that was selected to assess perceived stress recovery was the item with strongest factor loading in the German version of the BRS (Chmitorz et al., 2018).

1. **LASSO Regularized Regression Analysis**

In order to determine which of the significant predictors found are most strongly associated with the outcomes, we conducted LASSO (Least Absolute Shrinkage and Selection Operator) regularized regression analyses (Hastie et al., 2015) for multiply-imputed datasets using the miselect R package (Du et al., 2020; Rix & Du, 2020). Whereas ordinary least squares (OLS) linear regression analysis determines values for the intercept and slope parameters that minimize the mean squared error between actual and predicted outcome, LASSO minimizes a term that consists of the mean squared error plus the product of a penalty parameter λ and the absolute value of the slope parameter; with λ being determined using cross-validation. The LASSO approach eventually results in a sparser model and is therefore often used in the context of predictive modeling to prevent overfitting. In our case we applied the method in the context of explanatory modeling as a sensitivity analysis in the multi-variable setting, in order to select the set of most important predictors out of related constructs. Optimal λ was selected using 15-fold cross-validation and defined as the λ that minimizes cross-validation error + 1 standard error, which selects the simplest model that still shows comparable predictive accuracy to the overall best model (Friedman et al., 2010; Krstajic et al., 2014). In order to assess variable selection stability, inclusion frequencies were calculated by repeating the LASSO 100 times (Sauerbrei et al., 2015).

1. **Specification Curve Analysis**

In order to ensure that our results are stable and not majorly influenced by arbitrary decisions during data preprocessing and model specification, we conducted so called multiverse or specification curve analyses (Simonsohn et al., 2020; Steegen et al., 2016). For this, we reran the multiple regression analyses with combinations of the following specifications:

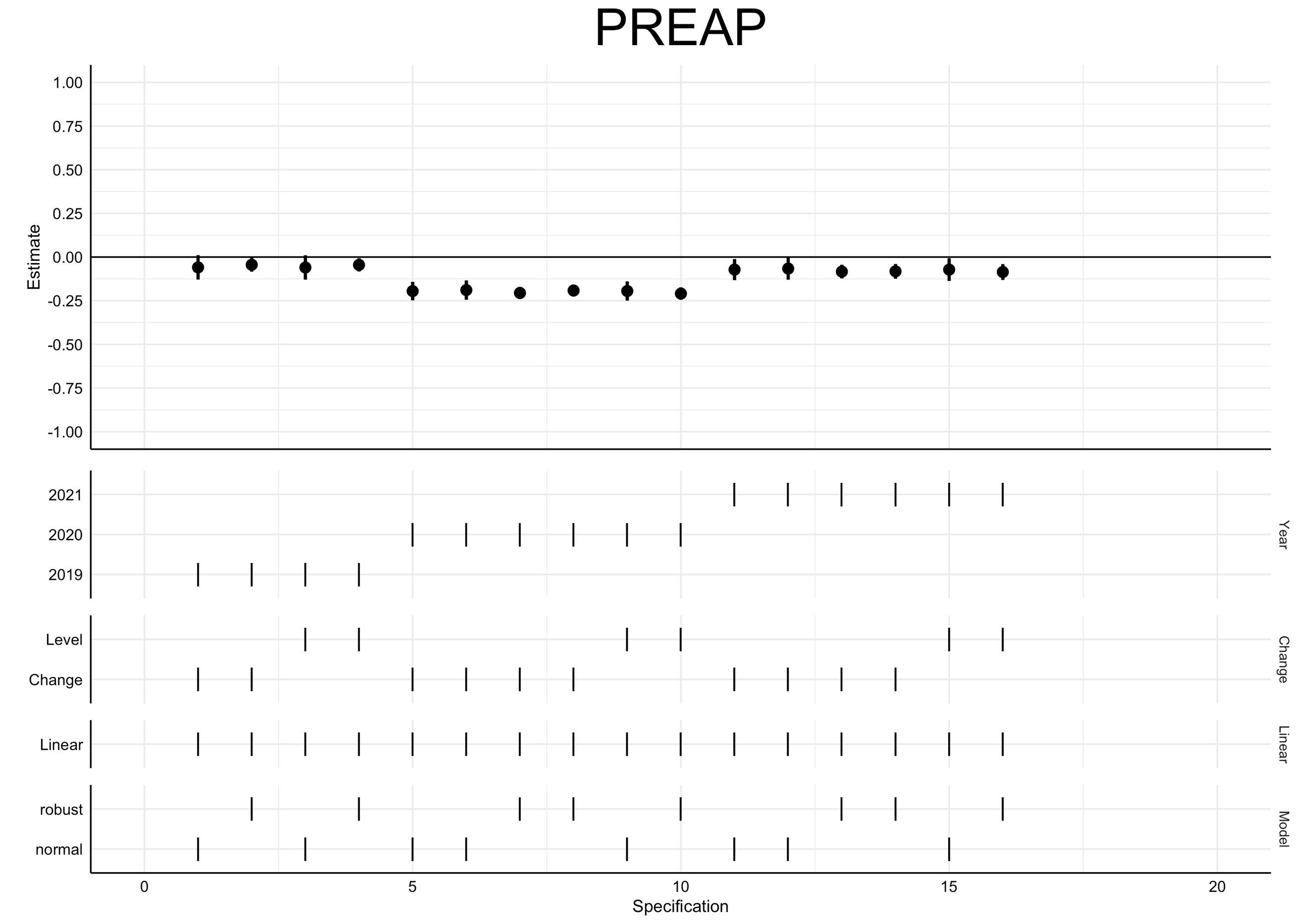
* Model: robust regression (‘robust’) vs. linear regression (‘normal’)
* Outcome: change score (‘Change’) vs. outcome in one year (‘Level’)
* Transformation of outcomes: cuberoot transform (‘Cuberoot’) vs. no transformation (‘Linear’).

In the graphs, the combination of ‘Year’ and ‘Change’ determines the respective outcome:

* ΔPHQ 2020: Year = 2020, Change = Change
* ΔPHQ 2021: Year = 2021, Change = Change
* ΔPHQ 2019: Year = 2019, Change = Change
* PHQ-4 in 2020: Year = 2020, Change = Level
* PHQ-4 in 2021: Year = 2021, Change = Level

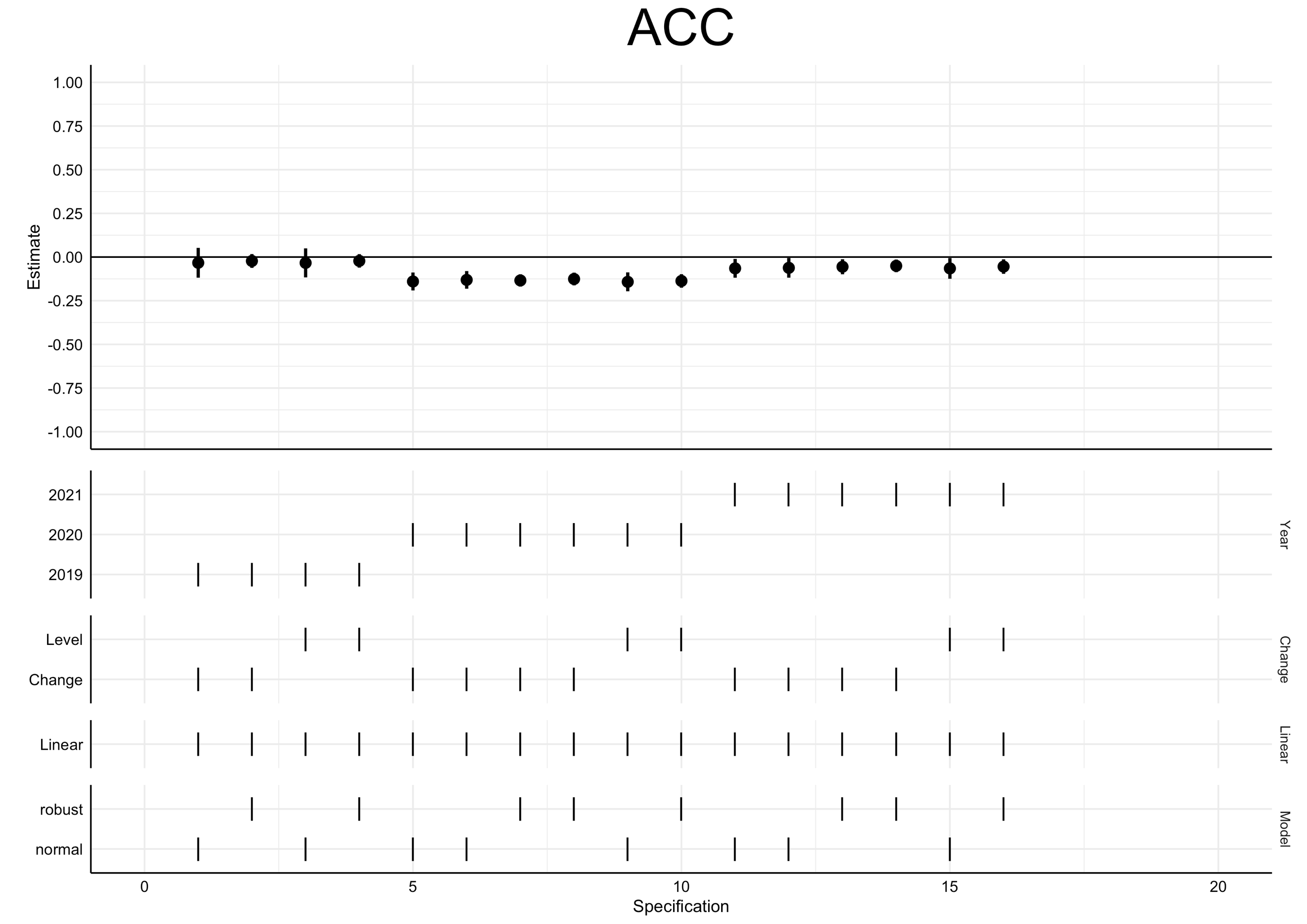
Beta estimates for the respective combination of specifications and outcome are depicted in the upper part of the graph. Results are interpreted as stable if the estimates are comparable across specifications and within outcomes (i.e., Year/Change combinations). Note: since the outcomes are not normalized, absolute values of coefficients cannot be compared between models with cuberoot-transformed and non-transformed outcomes.

PERAP = positive reappraisal; PERSP = putting into perspective; ACC = acceptance; SUPP = asking for instrumental support; CATA = catastrophizing; REC = perceived stress recovery; OPT = optimism, LOC = locus of control; NEU = neuroticism.



Ein Bild, das Tisch enthält.

Automatisch generierte Beschreibung



Ein Bild, das Tisch enthält.

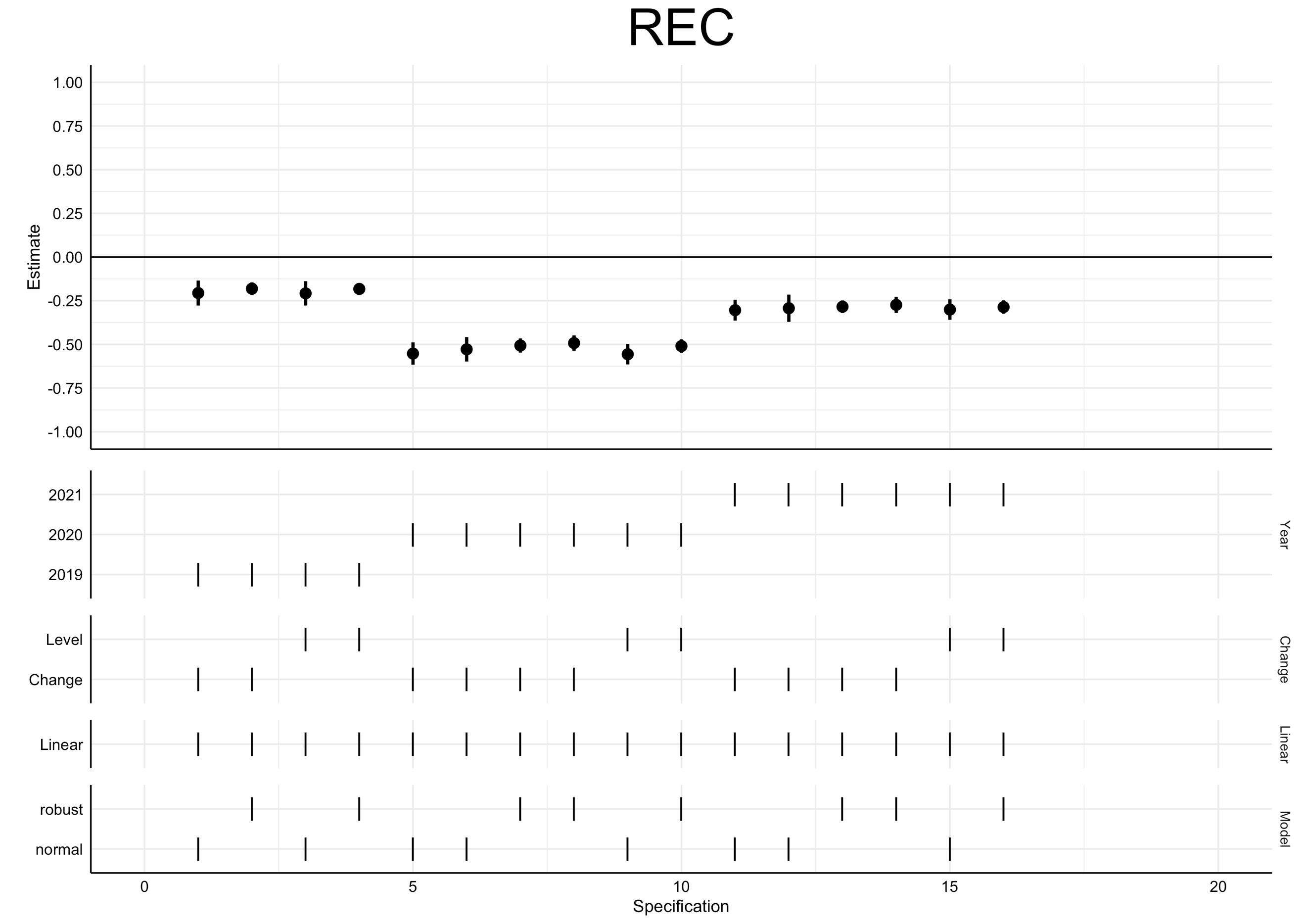
Automatisch generierte Beschreibung

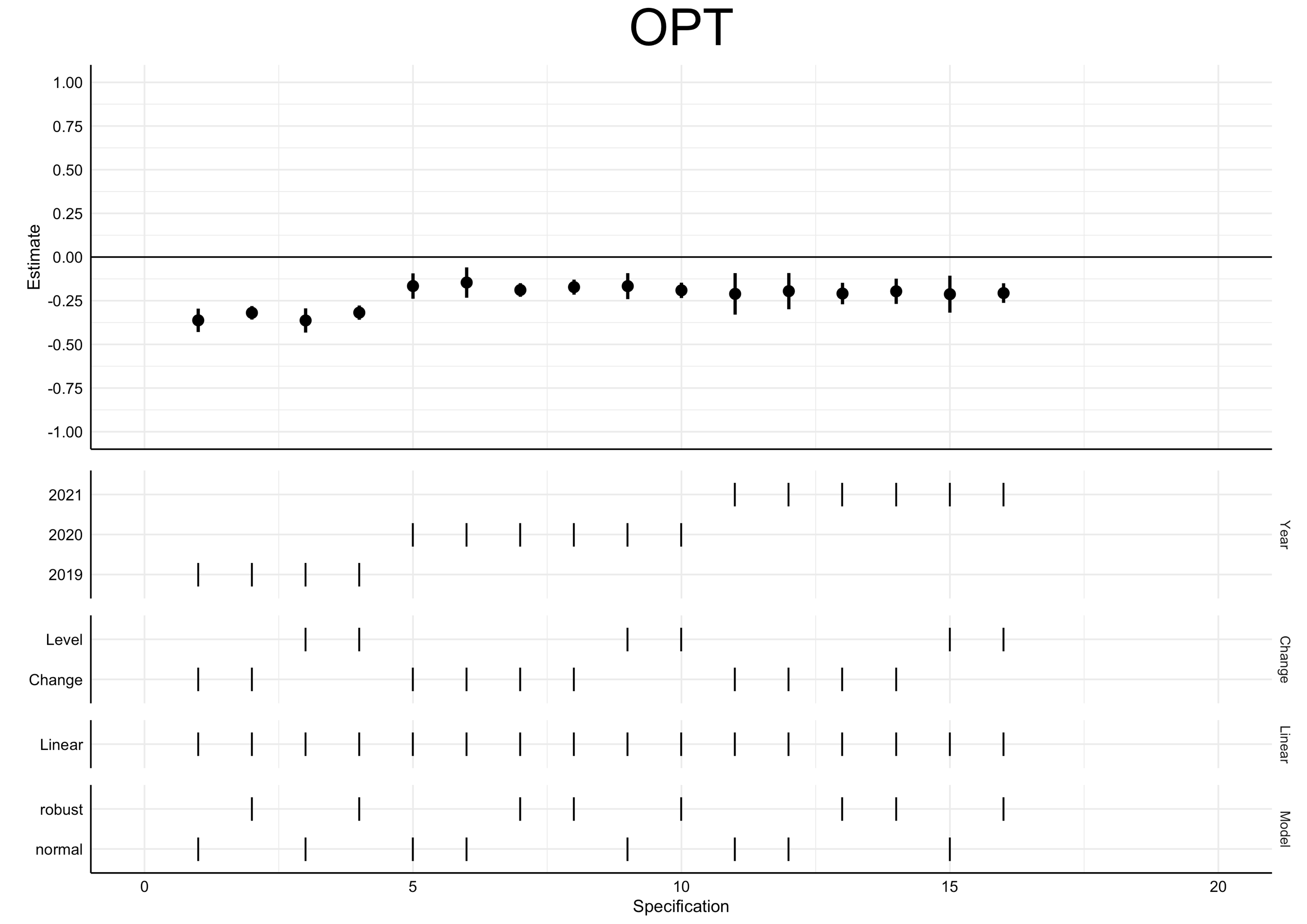
Ein Bild, das Tisch enthält.

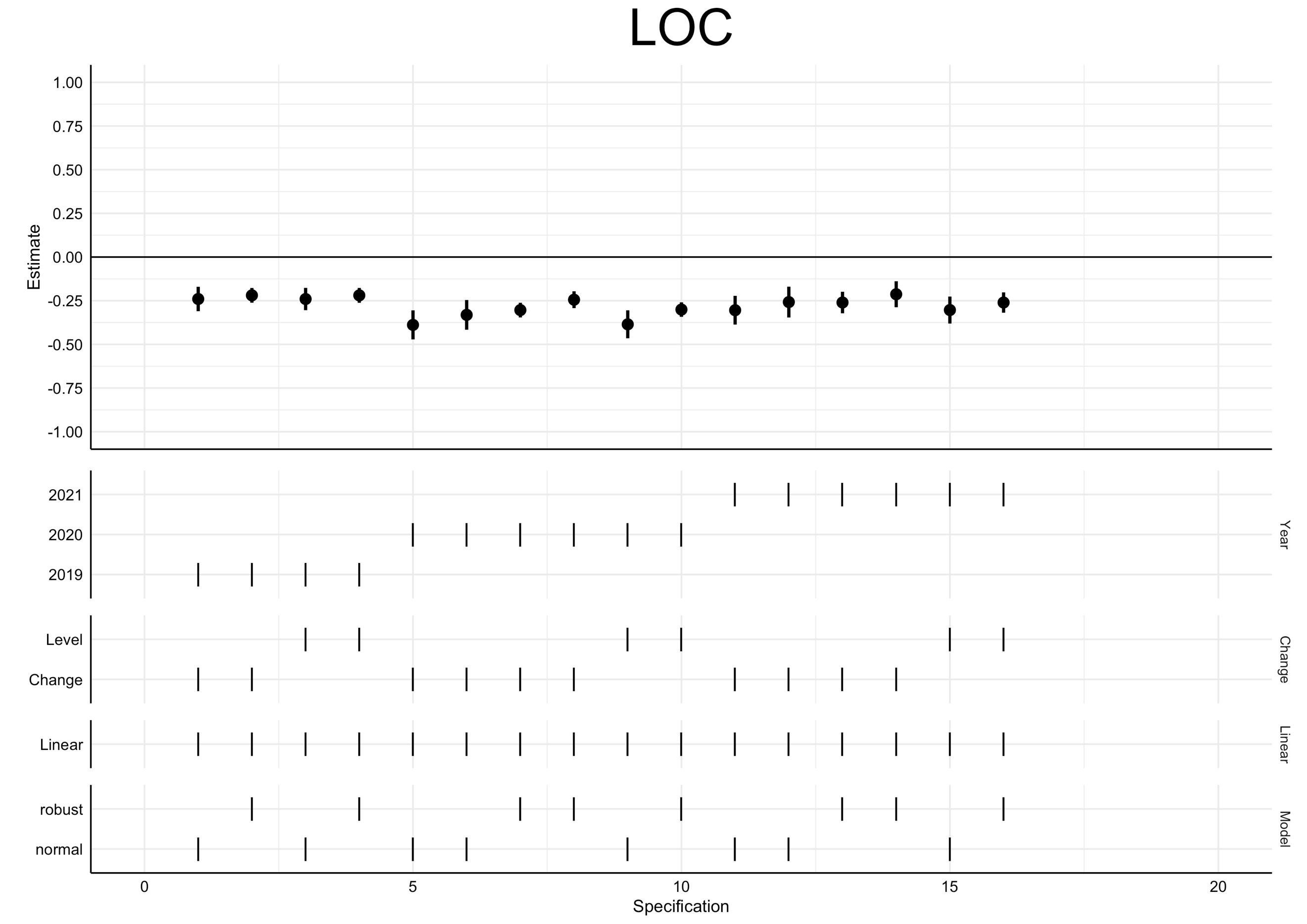
Automatisch generierte Beschreibung

Ein Bild, das Tisch enthält.

Automatisch generierte Beschreibung







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Automatisch generierte Beschreibung

1. **Linear Mixed Models**

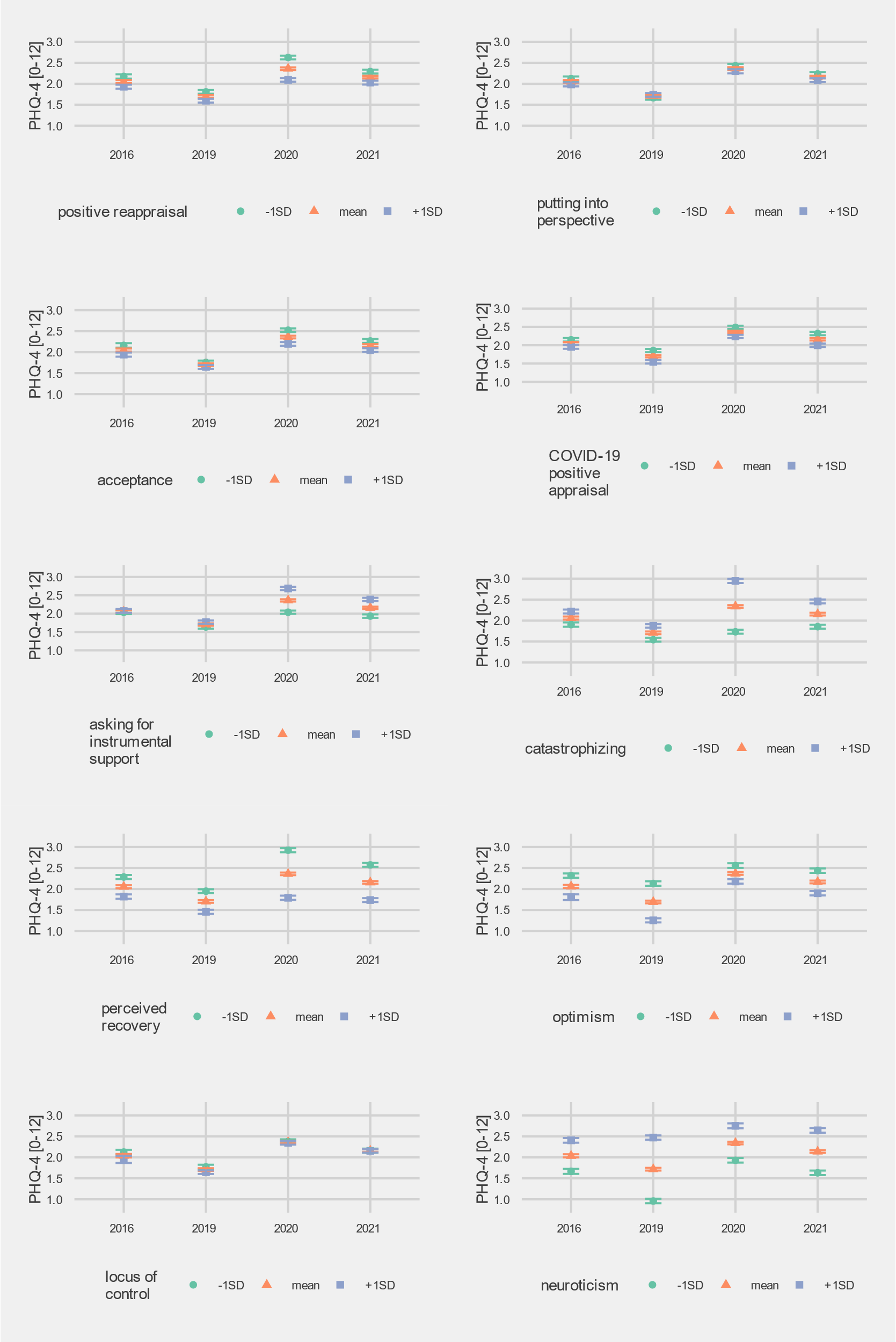
To investigate how the psychological factors are associated with PHQ-4 in the individual years (vs. the change between years), we ran linear mixed models with PHQ-4 as the outcome. As fixed effects we included the respective psychological factor, all covariates, year, and the interaction of psychological factor x year, next to a random intercept for subject. Given that we investigated ten psychological factors, this resulted in 10 individual linear mixed models. Results of these mixed models are displayed in Table S9.

For each psychological factor, we then predicted marginal effects at mean±1SD of the respective psychological factor, using the ggeffect() function of the ggeffects R package (Lüdecke et al., 2021), which holds all covariates constant at their respective marginal mean. Results of these predictions are shown in Figure S1. The graphs of Figure S1 can be interpreted as follows, here using the example of neuroticism in 2021: A hypothetical individual whose neuroticism score is exactly at the mean of the entire sample is predicted to have a PHQ-4 score of 2.1. An individual with a neuroticism score exactly one standard deviation lower than the mean will have a PHQ-4 score of 1.6, and an individual with a neuroticism score exactly one standard deviation higher than the mean is expected to have a PHQ-4 score of 2.6.

**Table S9**

*Results of Linear Mixed Models*

|  | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* | *Model 6* | *Model 7* | *Model 8* | *Model 9* | *Model 10* |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *(Intercept)* | **1.447 (0.108)\*\*\*** | **1.446 (0.106)\*\*\*** | **1.435 (0.106)\*\*\*** | **1.448 (0.106)\*\*\*** | **1.445 (0.104)\*\*\*** | **1.516 (0.110)\*\*\*** | **1.530 (0.106)\*\*\*** | **1.514 (0.107)\*\*\*** | **1.478 (0.112)\*\*\*** | **1.568 (0.101)\*\*\*** |
| *PREAP* | **-0.120 (0.034)\*\*** |  |  |  |  |  |  |  |  |  |
| *PERSP* |  | -0.064 (0.034) |  |  |  |  |  |  |  |  |
| *ACC* |  |  | **-0.108 (0.036)\*** |  |  |  |  |  |  |  |
| *PAC* |  |  |  | **-0.096 (0.034)\*** |  |  |  |  |  |  |
| *SUPP* |  |  |  |  | 0.017 (0.036) |  |  |  |  |  |
| *CATA* |  |  |  |  |  | **0.154 (0.032)\*\*\*** |  |  |  |  |
| *REC* |  |  |  |  |  |  | **-0.223 (0.033)\*\*\*** |  |  |  |
| *OPT* |  |  |  |  |  |  |  | **-0.231 (0.043)\*\*** |  |  |
| *LOC* |  |  |  |  |  |  |  |  | -0.004 (0.003) |  |
| *NEU* |  |  |  |  |  |  |  |  |  | **0.322 (0.038)\*\*\*** |
| *Age: 18-24* | 0.302 (0.215) | 0.317 (0.208) | 0.317 (0.207) | 0.318 (0.208) | 0.259 (0.215) | 0.314 (0.195) | 0.317 (0.203) | 0.331 (0.206) | 0.358 (0.204) | 0.201 (0.211) |
| *Age: 25-34* | 0.272 (0.100) | 0.280 (0.101) | 0.283 (0.100) | 0.280 (0.101) | 0.249 (0.097) | **0.286 (0.100)\*** | 0.281 (0.099) | **0.285 (0.100)\*** | 0.287 (0.101) | 0.216 (0.101) |
| *Age: 35-44* | 0.163 (0.157) | 0.159 (0.154) | 0.156 (0.154) | 0.156 (0.153) | 0.149 (0.157) | 0.166 (0.164) | 0.143 (0.152) | 0.178 (0.147) | 0.165 (0.148) | 0.120 (0.159) |
| *Age: 55-64* | -0.006 (0.099) | 0.005 (0.096) | 0.009 (0.097) | 0.001 (0.096) | 0.006 (0.100) | -0.019 (0.106) | 0.005 (0.093) | -0.022 (0.091) | 0.009 (0.095) | 0.026 (0.101) |
| *Age: 65-74* | **-0.369 (0.093)\*\*** | **-0.361 (0.091)\*\*** | **-0.345 (0.091)\*\*** | **-0.357 (0.091)\*\*** | **-0.334 (0.092)\*\*** | **-0.375 (0.091)\*\*\*** | **-0.347 (0.089)\*\*** | **-0.386 (0.090)\*\*\*** | **-0.358 (0.090)\*\*\*** | **-0.322 (0.096)\*** |
| *Age: 75-84* | -0.242 (0.107) | -0.234 (0.107) | -0.213 (0.107) | -0.233 (0.107) | -0.222 (0.108) | -0.280 (0.104) | -0.236 (0.106) | -0.279 (0.110) | -0.241 (0.107) | -0.204 (0.097) |
| *Age: 85+* | -0.038 (0.240) | -0.044 (0.248) | -0.024 (0.250) | -0.043 (0.248) | -0.052 (0.252) | -0.204 (0.239) | -0.064 (0.242) | -0.099 (0.240) | -0.046 (0.255) | 0.033 (0.239) |
| *Gender: female* | **0.354 (0.056)\*\*\*** | **0.341 (0.056)\*\*\*** | **0.349 (0.056)\*\*\*** | **0.351 (0.056)\*\*\*** | **0.336 (0.055)\*\*\*** | **0.302 (0.055)\*\*\*** | **0.280 (0.055)\*\*\*** | **0.344 (0.055)\*\*\*** | **0.334 (0.055)\*\*\*** | **0.190 (0.056)\*\*** |
| *Household net income: low* | **0.391 (0.080)\*\*\*** | **0.390 (0.080)\*\*\*** | **0.378 (0.080)\*\*\*** | **0.390 (0.080)\*\*\*** | **0.374 (0.080)\*\*\*** | **0.343 (0.076)\*\*\*** | **0.342 (0.078)\*\*** | **0.373 (0.078)\*\*\*** | **0.393 (0.081)\*\*\*** | **0.330 (0.080)\*\*** |
| *Household net income: high* | -0.118 (0.088) | -0.131 (0.087) | -0.128 (0.088) | -0.131 (0.087) | -0.128 (0.086) | -0.101 (0.088) | -0.101 (0.084) | -0.107 (0.085) | -0.127 (0.087) | -0.097 (0.082) |
| *Education: low* | 0.086 (0.098) | 0.103 (0.100) | 0.089 (0.100) | 0.099 (0.100) | 0.121 (0.102) | 0.051 (0.099) | 0.076 (0.100) | 0.097 (0.102) | 0.099 (0.101) | 0.071 (0.097) |
| *Education: high* | 0.051 (0.121) | 0.049 (0.122) | 0.052 (0.121) | 0.038 (0.121) | 0.039 (0.120) | 0.072 (0.115) | 0.060 (0.115) | 0.046 (0.121) | 0.044 (0.122) | 0.054 (0.119) |
| *History of diagnosed depression* | **1.772 (0.091)\*\*\*** | **1.784 (0.091)\*\*\*** | **1.791 (0.091)\*\*\*** | **1.769 (0.091)\*\*\*** | **1.766 (0.091)\*\*\*** | **1.748 (0.090)\*\*\*** | **1.611 (0.092)\*\*\*** | **1.597 (0.097)\*\*\*** | **1.784 (0.091)\*\*\*** | **1.452 (0.094)\*\*\*** |
| *COVID-19 risk group* | **0.224 (0.069)\*** | **0.235 (0.069)\*** | **0.239 (0.070)\*** | **0.229 (0.070)\*** | **0.248 (0.068)\*\*** | 0.204 (0.068) | 0.200 (0.070) | 0.206 (0.071) | **0.235 (0.070)\*** | 0.176 (0.066) |
| *Year: 2019* | **-0.350 (0.035)\*\*\*** | **-0.355 (0.035)\*\*\*** | **-0.350 (0.034)\*\*\*** | **-0.350 (0.034)\*\*\*** | **-0.351 (0.035)\*\*\*** | **-0.352 (0.034)\*\*\*** | **-0.350 (0.034)\*\*\*** | **-0.356 (0.034)\*\*\*** | **-0.343 (0.037)\*\*\*** | **-0.349 (0.035)\*\*\*** |
| *Year: 2020* | **0.309 (0.035)\*\*\*** | **0.311 (0.035)\*\*\*** | **0.310 (0.035)\*\*\*** | **0.312 (0.035)\*\*\*** | **0.308 (0.035)\*\*\*** | **0.273 (0.035)\*\*\*** | **0.313 (0.034)\*\*\*** | **0.302 (0.034)\*\*\*** | **0.287 (0.035)\*\*\*** | **0.302 (0.036)\*\*\*** |
| *Year: 2021* | **0.107 (0.035)\*** | **0.107 (0.035)\*** | **0.107 (0.035)\*** | **0.109 (0.035)\*** | **0.105 (0.035)\*** | 0.093 (0.035) | **0.107 (0.034)\*** | **0.108 (0.034)\*** | 0.074 (0.036) | 0.092 (0.036) |
| *PREAP\*year: 2019* | 0.017 (0.032) |  |  |  |  |  |  |  |  |  |
| *PREAP\*year: 2020* | **-0.142 (0.032)\*\*\*** |  |  |  |  |  |  |  |  |  |
| *PREAP\*year: 2021* | -0.010 (0.033) |  |  |  |  |  |  |  |  |  |
| *PERSP\*year: 2019* |  | 0.097 (0.034) |  |  |  |  |  |  |  |  |
| *PERSP\*year: 2020* |  | 0.001 (0.035) |  |  |  |  |  |  |  |  |
| *PERSP\*year: 2021* |  | -0.006 (0.035) |  |  |  |  |  |  |  |  |
| *ACC\*year: 2019* |  |  | 0.056 (0.032) |  |  |  |  |  |  |  |
| *ACC\*year: 2020* |  |  | -0.053 (0.033) |  |  |  |  |  |  |  |
| *ACC\*year: 2021* |  |  | 0.001 (0.032) |  |  |  |  |  |  |  |
| *PAC\*year: 2019* |  |  |  | -0.056 (0.032) |  |  |  |  |  |  |
| *PAC\*year: 2020* |  |  |  | -0.026 (0.032) |  |  |  |  |  |  |
| *PAC\*year: 2021* |  |  |  | -0.063 (0.033) |  |  |  |  |  |  |
| *SUPP\*year: 2019* |  |  |  |  | 0.049 (0.035) |  |  |  |  |  |
| *SUPP\*year: 2020* |  |  |  |  | **0.304 (0.037)\*\*\*** |  |  |  |  |  |
| *SUPP\*year: 2021* |  |  |  |  | **0.208 (0.038)\*\*\*** |  |  |  |  |  |
| *CATA\*year: 2019* |  |  |  |  |  | 0.008 (0.029) |  |  |  |  |
| *CATA\*year: 2020* |  |  |  |  |  | **0.444 (0.032)\*\*\*** |  |  |  |  |
| *CATA\*year: 2021* |  |  |  |  |  | **0.143 (0.032)\*\*\*** |  |  |  |  |
| *REC\*year: 2019* |  |  |  |  |  |  | -0.012 (0.032) |  |  |  |
| *REC\*year: 2020* |  |  |  |  |  |  | **-0.319 (0.041)\*\*\*** |  |  |  |
| *REC\*year: 2021* |  |  |  |  |  |  | **-0.178 (0.034)\*\*\*** |  |  |  |
| *OPT\*year: 2019* |  |  |  |  |  |  |  | **-0.163 (0.035)\*\*** |  |  |
| *OPT\*year: 2020* |  |  |  |  |  |  |  | 0.062 (0.036) |  |  |
| *OPT\*year: 2021* |  |  |  |  |  |  |  | -0.011 (0.038) |  |  |
| *LOC\*year: 2019* |  |  |  |  |  |  |  |  | 0.001 (0.003) |  |
| *LOC\*year: 2020* |  |  |  |  |  |  |  |  | 0.004 (0.003) |  |
| *LOC\*year: 2021* |  |  |  |  |  |  |  |  | 0.004 (0.003) |  |
| *NEU\*year: 2019* |  |  |  |  |  |  |  |  |  | **0.337 (0.036)\*\*\*** |
| *NEU\*year: 2020* |  |  |  |  |  |  |  |  |  | 0.035 (0.046) |
| *NEU\*year: 2021* |  |  |  |  |  |  |  |  |  | 0.118 (0.040) |
| *Observations* | 24542 | 24542 | 24542 | 24542 | 24542 | 24542 | 24542 | 24542 | 24542 | 24542 |



**Figure S1.** Predicted PHQ-4 levels in the individual years are displayed for a hypothetical individual with average values (orange triangle), or values one standard deviation below (green circle) or above (violet square) the mean regarding the respective psychological factor. All covariates are held constant at their marginal mean.

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