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## Resuming social contact after months of contact restrictions: Social traits moderate associations between changes in social contact and well-being

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1 **Resuming Social Contact After Months of Contact Restrictions: Social Traits**  
2 **Moderate Associations Between Changes in Social Contact and Well-Being**

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**Abstract**

33

34 Humans possess a need for social contact. Satisfaction of this need benefits well-being,  
35 whereas deprivation is detrimental. However, how much contact people desire is not  
36 universal, and evidence is mixed on individual differences in the association between  
37 contact and well-being. This preregistered longitudinal study ( $N = 190$ ) examined changes  
38 in social contact and well-being (life satisfaction, depressivity/anxiety) in Germany during  
39 pervasive contact restrictions, which exceed lab-based social deprivation. We analyzed how  
40 changes in personal and indirect contact and well-being during the first COVID-19  
41 lockdown varied with social traits (e.g., affiliation, extraversion). Results showed that  
42 affiliation motive, need to be alone, and social anxiety moderated the resumption of  
43 personal contact under loosened restrictions as well as associated changes in life  
44 satisfaction and depressivity/anxiety.

45 *Keywords:* social contact, well-being, social traits, need regulation, affiliation  
46 motive, mental health, COVID-19

## **Resuming Social Contact After Months of Contact Restrictions: Social Traits Moderate Associations Between Changes in Social Contact and Well-Being**

Humans have an innate need to seek social contact and form relationships (Baumeister & Leary, 1995; Hofer & Hagemeyer, 2018). At the same time, people differ in how they satisfy this need in daily life: Some enjoy being around others a lot and feel unwell in ongoing solitude, whereas others seek less social contact and are less affected in well-being by little contact.

Our study examines social contact and well-being as part of a dynamic need regulation in the context of the COVID-19 pandemic, which required a population-wide reduction in personal contact to curtail virus transmission (Flaxman et al., 2020). Harnessing the unique situation of a gradual reboot of social contact over three months, our study provides insights into social need regulation and individual differences in social behavior during the pandemic. The contact restrictions introduced to reduce the spread of COVID-19 provide an unprecedented opportunity to study social need regulation outside the laboratory. We investigate longitudinally (a) how social contact changes in relation to social traits, and (b) how well-being changes with increased social contact depending on social traits. Under a broad conceptualization of well-being, we examine both life satisfaction and depressivity/anxiety as potential markers of social need satisfaction.

### **Social Need Regulation**

Social need regulation is conceptualized as continuous internal comparisons between a person's ideal level of social contact and the level currently experienced (i.e., both amount and quality; Hall & Davis, 2017; Nezlek, 2001; Sheldon, 2011). Deviations from the ideal level in both directions are theorized to reduce well-being and motivate individuals to align social behavior towards need satisfaction (Hall & Davis, 2017; Sheldon, 2011). For example, experience sampling studies have shown that higher momentary need motivation leads to higher need satisfaction through need-relevant behavior (Neubauer et al., 2018;

73 Zygar et al., 2018). Social need regulation therefore represents a dynamic process in which  
74 past social contact influences future contact through need satisfaction or dissatisfaction  
75 (Carver & Scheier, 1998).

76 Satisfying one's social needs is linked to higher well-being (Demir & Özdemir, 2010;  
77 J. Sun et al., 2020; Tay & Diener, 2011). Early motive theories (e.g., McClelland, 1987) and  
78 recent empirical work suggest that, depending on social need strength, people's well-being  
79 is differently affected by need satisfaction (Dufner et al., 2015; Zygar et al., 2018).

80 Evidence on the extent to which indirect contact (e.g., texting, videocalls) satisfies  
81 social needs remains inconclusive (Kushlev et al., 2019; Orben & Przybylski, 2019, 2020).  
82 Indirect contact might substitute personal contact during the pandemic lockdown  
83 (Gabbiadini et al., 2020). Daily diary data indicate, however, that only personal contact is  
84 robustly related to well-being (Lades et al., 2020; R. Sun et al., 2020). In terms of mental  
85 health, the prevalence of depression and anxiety symptoms increased during the COVID-19  
86 pandemic (Ettman et al., 2020; Twenge & Joiner, 2020), and there is associative evidence  
87 that being alone due to contact restrictions—thereby unable to satisfy social  
88 needs—negatively affects mental health (Benke et al., 2020; Fried et al., 2021).

## 89 **Social Traits**

90 People differ in the ideal level of social contact to which they compare their current  
91 experiences (Sheldon, 2011). Thus, the same situation such as being alone for several days  
92 can elicit either an appetitive (i.e., enjoying and maintaining solitude) or an aversive  
93 response (i.e., disliking solitude and seeking social contact; Hagemeyer et al., 2013)  
94 depending on the individual's ideal level, which is captured in social traits.

95 Of the Big Five traits (Soto & John, 2017), extraversion is closely related to  
96 interpersonal behavior (DeYoung et al., 2013). Extraversion predicts, among other things,  
97 how much someone likes the company of others (Breil et al., 2019), and whether someone  
98 leaves situations when they are alone (Wrzus et al., 2016).

99           The affiliation motive describes the need to initiate and maintain close relationships  
100 (Hofer & Hagemeyer, 2018). With a higher affiliation motive, people partake in more social  
101 interactions such as visiting friends or phone calls and are more likely to crave social  
102 contact when alone (Hill, 2009).

103           Although humans have social needs, they also seek solitude, for example, to pursue  
104 a hobby or wind down after a long day of meetings (Lay et al., 2019). Individuals vary in  
105 the strength of this need to be alone (Coplan et al., 2019; Hagemeyer et al., 2013). A  
106 higher need to be alone reduces the likelihood of social contact (Hall, 2017).

107           Another reason why people avoid others is that they experience anxiety when  
108 anticipating social contact. Subclinically low to moderate anxiety about social contact is  
109 prevalent in the general population (Peters et al., 2012). Higher social anxiety is associated  
110 with smaller social networks (Van Zalk et al., 2011), being disliked by interaction partners  
111 more frequently (Tissera et al., 2020), and lower momentary well-being (Brown et al.,  
112 2007).

### 113 **Current Study**

114           In this longitudinal study, we assessed social contact and well-being four times over  
115 three months—beginning during most rigorous contact restrictions and continuing during  
116 gradual resumption of social contact. Governmental restrictions limiting personal contact  
117 for several weeks in early 2020 constitute a strong situation with limited room to express  
118 social traits (Cooper & Withey, 2009). In contrast, person effects of social traits are  
119 presumably more pronounced in weak situations that do not constrain social activity and  
120 allow behavioral expression of traits (Blum et al., 2018; Schmitt et al., 2013). Successively  
121 eased restrictions therefore represent a transition from a strong situation curbing the  
122 person-situation interaction into a more normal interplay of the two (Schmitt et al., 2013).  
123 However, as Cooper and Withey (2009) state, the “personality-dampening effect of strong  
124 situations” (p. 62) has not been shown convincingly because truly strong situations are

125 difficult to induce in laboratory settings or to observe under regular situational  
126 circumstances. The first COVID-19 lockdown, thus, represents a unique opportunity to  
127 study social need regulation because it caused long-lasting and pervasive restrictions of  
128 social contact with widespread deprivation of social needs, which considerably exceed  
129 laboratory-based deprivation.

130         The “lockdown” to manage the COVID-19 pandemic in Germany in early 2020  
131 initially created strong situational constraints severely restricting everyday mobility in all  
132 age groups and regions (Becher et al., 2021; Bönisch et al., 2020). Compared to  
133 pre-pandemic levels, social contact frequency was estimated to have decreased by 61-90%,  
134 reaching a nadir in April 2020 (Del Fava et al., 2021; Tomori et al., 2021). This time  
135 period, during which our longitudinal study started, also represents the maximum extent of  
136 governmental contact restrictions in all German federal states during the first COVID-19  
137 wave (Aravindakshan et al., 2020). Following federal decrees on 6 May 2020  
138 (Bundesregierung, 2020), restrictions were gradually eased (until the second wave of  
139 infections in the fall of 2020), and people in Germany resumed social contact accordingly,  
140 although not yet to pre-pandemic levels by late June 2020 (Tomori et al., 2021). In  
141 addition to these mean-level increases of social contact frequency, its variance had  
142 substantially increased over this period of eased restrictions (Tomori et al., 2021). This is  
143 consistent with evidence that personality traits were associated with differences in  
144 precautionary behavior and adherence to contact restrictions (Aschwanden et al., 2021;  
145 Götz et al., 2020; Zajenkowski et al., 2020; Zettler et al., 2021).

146         Although contact restrictions undoubtedly presented a strong situation  
147 unprecedented in the second half of the 20th century, evidence is ambiguous regarding  
148 resiliency and well-being during this period (Luchetti et al., 2020; Zacher & Rudolph,  
149 2020). German population-representative panel data indicate stability in well-being but an  
150 increase in loneliness during contact restrictions, which affects extraverted people more  
151 severely (Entringer et al., 2020; Entringer & Gosling, 2021). In contrast, providing



152 preliminary support for the strong situation hypothesis, the association between  
153 extraversion and well-being was lower during lockdown than before the pandemic in a  
154 cross-sectional study (Anglim & Horwood, 2021). We go beyond previous work by  
155 considering multiple social traits, distinguishing personal and indirect social contact, and  
156 making use of the strong situation of the COVID-19 pandemic.

157 Specifically, we address how social traits influence two steps of social need  
158 regulation: First, we investigate whether individual differences in social traits were  
159 associated with diverging trends in pursuing social contact when restrictions were gradually  
160 being eased. Second, we probe the well-being consequences of increased social contact and  
161 differences therein related to social traits.

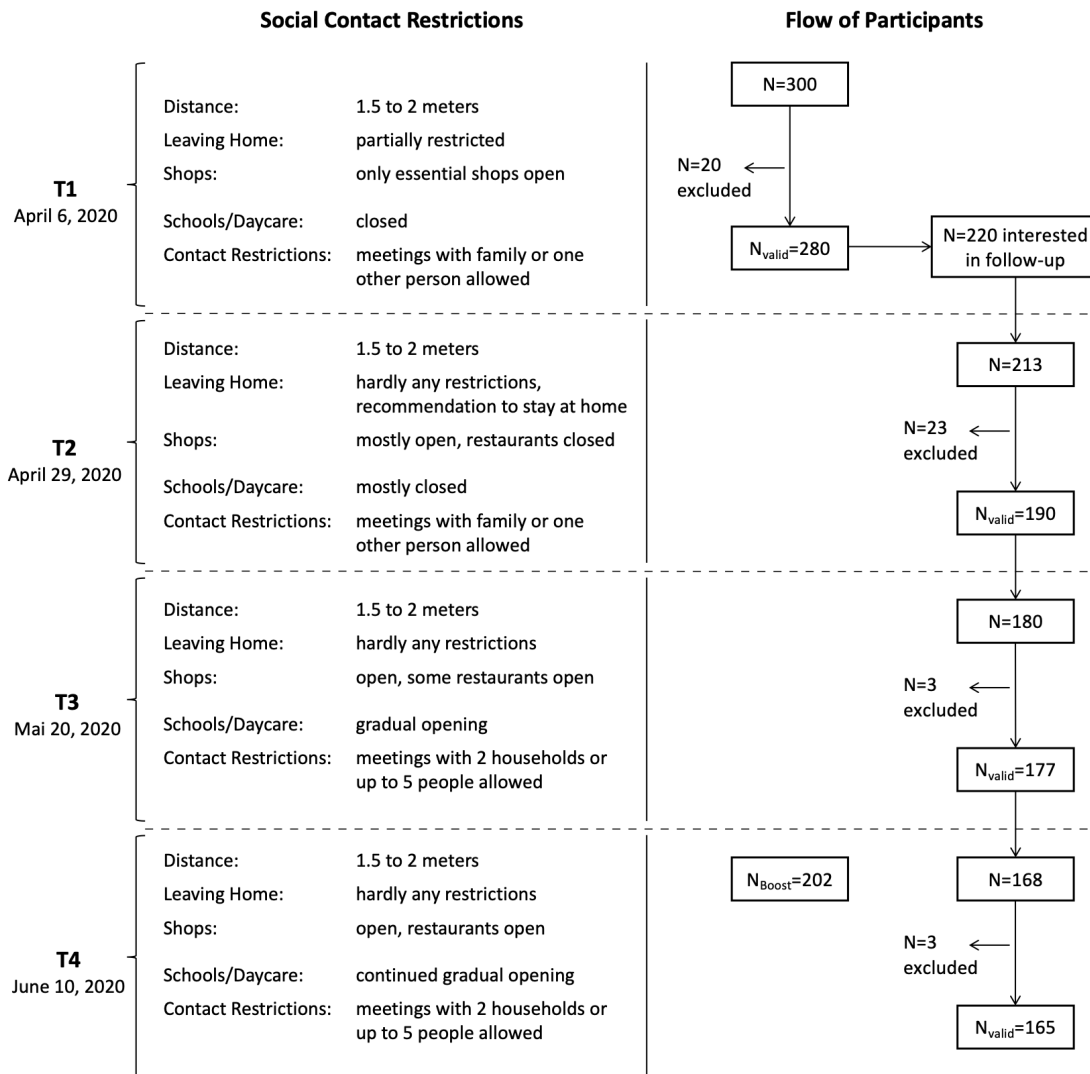
162 We preregistered the following hypotheses<sup>1</sup> (<https://osf.io/n8jrv>):

- 163 • H1a: Social contact will increase over time more strongly for people higher in  
164 extraversion and affiliation motive.
- 165 • H1b: Social contact will increase less over time for people higher in the need to be  
166 alone and social anxiety.
- 167 • H2a: Social contact and personality (extraversion, affiliation motive) will moderate  
168 effects of time on well-being, that is, well-being will be lowest for people with low  
169 social contact and high extraversion or affiliation motive.
- 170 • H2b: With higher need to be alone and social anxiety<sup>2</sup>, well-being will be less  
171 strongly related to social contact.

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<sup>1</sup> In the preregistration, H1=H2 and H2=H3.

<sup>2</sup> We intended H2a/H2b to mirror H1a/H1b in constructs but forgot to include social anxiety in H2b in our preregistration. Deviations from our preregistration are listed at <https://osf.io/8xubm/>.



**Figure 1**

*Participant flowchart with information on COVID-19 contact restrictions in Germany during the four assessment waves. The start date of each wave is shown on the left. For the analyses in this article we included  $N = 190$  participants with valid responses at least for the first and second wave. We did not include the refreshment sample ( $N_{Boost}$  at  $T_4$ ). We also provide a detailed timeline of contact restrictions for two exemplary federal states on the OSF (see document [Timeline\\_restrictions.pdf](#)).*

## Methods

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. The preregistration (and deviations from it), data, documentation of assessed variables, and R-scripts to reproduce this manuscript are available at <https://osf.io/8xubm/>. The current data stem from a project aimed at developing a questionnaire on social dynamics.

### Participants

Our preregistered sample size rationale of  $N = 195$  relied on an a-priori power estimation based on a repeated measures ANOVA with  $\alpha = .05$ ,  $(1 - \beta) = .90$  and a small effect size of  $f = .10$  which we performed when we were uncertain about the ultimate temporal progression of the study (see document *Deviations\_preregistration.pdf* on the OSF). Anticipating attrition, we recruited 300 German-speaking participants balanced by gender and five age groups (18-29, 30-39, 40-49, 50-59, 60-75) via the crowdsourcing service [www.clickworker.com](http://www.clickworker.com). Of these, 220 initially agreed to participate in up to three longitudinal follow-ups (see Fig. 1).

We screened participants for non-compliant response behavior (Meade & Craig, 2012) and—out of the 220 interested in follow-ups—excluded those with unrealistically short response times for the longest page of the online survey ( $< 70$  seconds for a 39-item scale on social dynamics;  $n = 9$  at T2,  $n = 3$  each at T3/T4). We did not need to exclude further participants solely based on other signs of non-compliant responding (unusual response patterns, failed attention check). Additionally, a few participants gave invalid identifiers for follow-up preventing matching to the previous wave ( $n = 8$ ) or opted out of the longitudinal part of the study ( $n = 5$ ).

For longitudinal analyses, we included  $N = 190$  participants who provided valid responses at least for the first and second wave. Participants ranged in age from 16 to 70 ( $M = 44.24$ ,  $SD = 14.18$ ) and 47% were women. Most participants were married (34%) or

198 in a romantic relationship (31%); 42% were parents and 23% had children living in their  
199 household. Regarding occupational status, 39% of participants were employed full-time, 9%  
200 part-time, 21% were self-employed, 9% were students, 11% were pensioners, and the  
201 remaining were marginally employed or not employed. About 46% of participants held a  
202 university degree, and 43% came from urban areas.

203         At the first measurement, 85% of participants reported that they currently stayed  
204 at home most of the time, either as a voluntary precaution for themselves and others  
205 (52%), because they were working from home (32%), because of closed (pre-)schools (11%),  
206 illness (6%), short-time work (6%), unemployment (5%), or compulsory quarantine (1%;  
207 multiple answers allowed). 32% indicated that they or someone in their household belonged  
208 to an at-risk group for COVID-19. Over three further assessment waves, the proportion of  
209 participants staying at home most of the time decreased: 83% at the second (50% as a  
210 voluntary precaution; 10% due to closed schools), 76% at the third (38% as a voluntary  
211 precaution; 5% due to closed schools), and 67% at the fourth wave (27% as a voluntary  
212 precaution; 4% due to closed schools). The proportion of participants staying at home  
213 most of the time due to work-related reasons remained roughly the same. Overall, this  
214 progression is in line with contact survey data demonstrating that contact frequency had  
215 substantially increased by June 2020, though not yet to pre-pandemic levels (Tomori et al.,  
216 2021). Note that the phrasing of the item asking whether participants stayed home *most of*  
217 *the time* includes the possibility that changes in social contact occurred even if answered in  
218 the affirmative, as we see in the measurement of personal contact frequency (see Table S1).

### 219 ***Attrition Analysis***

220         We performed two kinds of attrition analyses: First, we compared participants who  
221 provided valid responses in all four waves (165) with participants who initially expressed  
222 interest in participating in follow-ups but later dropped out (55). Those who provided valid  
223 responses in all waves had a lower affiliation motive,  $d = -0.39$ ,  $p = .013$ , were on average

224 5.82 years younger,  $p = .010$ , and had a lower indirect contact frequency,  $d = -0.42$ ,  $p =$   
225  $.008$ . All other variables included in analyses did not differ significantly between the two  
226 groups (all  $p > .05$ ). Second, in the final longitudinal analysis sample ( $N = 190$ ), we  
227 compared participants who provided valid responses in all four waves (165) with those who  
228 dropped out (25), and found no significant group differences (all  $p > .05$ ) as well as smaller  
229 mean differences than in the first comparison (in 8 out of 10 variables).

## 230 **Procedure**

231 Participants answered four online surveys approximately every three  
232 weeks—starting on April 6, 2020, and ending on June 14, 2020 (722 longitudinal  
233 observations). At the first assessment, to reduce COVID-19 transmissions in Germany, all  
234 (pre-)schools, leisure activities, and shops besides supermarkets and drug stores were  
235 closed, and people were only allowed to meet with one other person (but were discouraged  
236 from doing so). Over the course of the two and a half months of the study, contact  
237 restrictions were gradually eased (see Aravindakshan et al., 2020; Tomori et al., 2021). At  
238 the time of the last assessment, shops, restaurants, and schools had reopened, recreational  
239 activities were again allowed, and warmer weather attracted people to meet outdoors  
240 (Yakubenko, 2021). Figure 1 summarizes the progression of the main contact restrictions in  
241 Germany. On the OSF, we provide a detailed timeline of restrictions for two exemplary  
242 federal states along with federal decrees (document *timeline\_restrictions.pdf*).

243 Participants gave informed consent and received 4.50 to 5.00 euros per wave as  
244 compensation. The study adhered to the principles of the Declaration of Helsinki for  
245 research involving human subjects and was declared exempt from IRB evaluation.

## 246 **Measures**

### 247 *Extraversion*

248 Extraversion was assessed at the first wave as part of the Big Five Inventory-2  
249 (BFI-2; Soto & John, 2017; German version: Danner et al., 2016) consisting of 60 items, 12

250 of which measure extraversion ( $\omega = 0.88$ ). A sample item reads “I am someone who is  
251 outgoing, sociable”. Items were answered on a 5-point Likert-scale (1 = *disagree strongly*, 2  
252 = *disagree a little*, 3 = *neutral*, 4 = *agree a little*, 5 = *agree strongly*).

### 253 ***Affiliation Motive***

254 We used the six-item version of the affiliation subscale of the Unified Motive Scales  
255 (Schönbrodt & Gerstenberg, 2012) at the first measurement occasion ( $\omega = 0.87$ ). A sample  
256 item is “I try to be in company of friends as much as possible”. The Unified Motive Scales  
257 include items formulated as statements, which require an agreement rating (1 = *strongly*  
258 *disagree*, 2 = *disagree*, 3 = *rather disagree*, 4 = *rather agree*, 5 = *agree*, 6 = *strongly agree*),  
259 and items formulated as goals, which require an importance rating (1 = *not important to*  
260 *me*, 2 = *of little importance to me*, 3 = *of some importance to me*, 4 = *important to me*, 5  
261 = *very important to me*, 6 = *extremely important to me*).

### 262 ***Need to be Alone***

263 The need to be alone was assessed at the first wave using the four-item appetite  
264 subscale of the desire for being alone ( $\omega = 0.74$ ) included in the ABC model of social  
265 desires (Hagemeyer et al., 2013). A sample item is “I like to be completely alone”. Items  
266 were answered on a 7-point frequency scale ranging from 1 to 7 (1 = *never*, 4 = *sometimes*,  
267 7 = *always*).

### 268 ***Social Anxiety***

269 We measured social anxiety at the first wave using the Social Interaction Anxiety  
270 Scale (SIAS-6; Peters et al., 2012; German version: Stangier et al., 1999). One of the items  
271 reads “I have difficulty talking with other people”. The six items were answered on a  
272 5-point scale (1 = *not at all*, 2 = *slightly*, 3 = *moderately*, 4 = *very*, 5 = *extremely*) and  
273 showed high internal consistency,  $\omega = 0.85$ .

### 274 *Social Contact*

275 At each wave, participants were asked “How often did you engage in social  
276 interactions during the last week?” for three different relationship categories (family,  
277 friends, coworkers) and four channels of social contact (personal contact, calls, video calls,  
278 texts). Personal contact referred to in-person interactions. These 12 items were answered  
279 on a 5-point scale (1 = *not at all*, 2 = *once*, 3 = *multiple days*, 4 = *daily*, 5 = *multiple*  
280 *times a day*). Personal contact frequency was computed as the average of personal contact  
281 from all relationship categories. To calculate indirect contact frequency, we averaged the  
282 frequency ratings of calls, video calls, and texts from all relationship categories.

### 283 *Well-Being*

284 To capture several aspects of the broad construct well-being, we measured both life  
285 satisfaction, representing a general, cognitive appraisal of well-being, and  
286 depressivity/anxiety, representing negative affect, which we deemed likely to have been  
287 affected by the pandemic lockdown.

288 We measured life satisfaction at each wave with an 11-point Likert scale item  
289 adapted from the Socio-Economic Panel (SOEP; see Richter et al., 2017): “How satisfied  
290 are you with your life, all things considered?” (0 = *completely dissatisfied*, 10 = *completely*  
291 *satisfied*). This single-item measure has been shown to perform very similarly to longer  
292 scales in terms of criterion validity (Cheung & Lucas, 2014; Lucas & Donnellan, 2012).

293 We used the four-item screening tool Patient Health Questionnaire for Depression  
294 and Anxiety (PHQ-4; Kroenke et al., 2009; Löwe et al., 2010) to assess depressivity and  
295 generalized anxiety symptoms at each wave. We asked “Over the last week, how often have  
296 you been bothered by any of the following problems?” The four items “Little interest or  
297 pleasure in doing things”, “Feeling down, depressed, or hopeless”, “Feeling nervous,  
298 anxious, or on edge”, and “Not being able to stop or control worrying” were each answered  
299 on a 4-point scale (1 = *not at all*, 2 = *several days*, 3 = *more than half the days*, 4 = *nearly*

300 *every day*). Internal consistency was high,  $\omega = 0.81$ .

301 A raw correlation plot of the constructs analyzed is shown in Figure S1.

### 302 **Analytical Strategy**

303 As preregistered, we winsorized outliers with scores outside  $M \pm 3 \times SD$  to the  
 304 respective upper or lower bound. This procedure was used for eleven observations of  
 305 depressivity/anxiety, eight observations of social anxiety, two and five observations of  
 306 personal and indirect contact frequency, respectively.

307 We employed multilevel modeling (Hoffman, 2015) with observations (Level 1)  
 308 nested in participants (Level 2). Intra-class correlations for all time-varying variables along  
 309 with means and standard deviations over time can be found in Table S1. All models were  
 310 estimated using maximum likelihood with random intercepts. We included random slopes  
 311 of the Level-1 predictors of interest in those instances where likelihood ratio tests indicated  
 312 that the addition of the random slope significantly improved model fit (Hoffman &  
 313 Walters, 2022). If this was the case, we report the results of the random slope model herein  
 314 and of the fixed slope model in the Supplemental Material (Tables S2-S6), and vice versa.  
 315 As Level-2 variables, all social traits were grand-mean centered and, thus, represent the  
 316 between-person effect of deviation from the average trait level in the sample. To test our  
 317 hypotheses, we estimated two different types of models. First, to predict personal and  
 318 indirect contact frequency (H1a, H1b), we estimated models with a cross-level interaction  
 319 of *time* (linear effect, zero at the first wave) and each trait:

$$contact_{ti} = \gamma_{00} + \gamma_{01}trait_i + \gamma_{10}time_{ti} + \gamma_{11}time_{ti}trait_i + v_{0i} + e_{ti} , \quad (1)$$

320 where at time  $t$  for person  $i$   $e_{ti} \sim N(0, \sigma_e^2)$  and  $v_{0i} \sim N(0, \tau_{00})$  (for a fixed slope model).

321 We estimated separate models for the two dependent variables personal and indirect  
 322 contact and each of the four traits, extraversion, affiliation motive, need to be alone, and  
 323 social anxiety.



324 Second, we predicted variation in well-being over time (life satisfaction and  
 325 depressivity/anxiety) with contact frequency as a time-varying predictor (either personal or  
 326 indirect contact) and each social trait as a Level-2 predictor (person level):

$$\begin{aligned}
 \text{wellbeing}_{ti} = & \gamma_{00} + \gamma_{01}\text{trait}_i + \gamma_{02}\text{contactBP}_i + \gamma_{03}\text{trait}_i\text{contactBP}_i \\
 & + \gamma_{10}\text{time}_{ti} + \gamma_{20}\text{contactWP}_{ti} + \gamma_{21}\text{contactWP}_{ti}\text{trait}_i \\
 & + \nu_{0i} + e_{ti} ,
 \end{aligned} \tag{2}$$

327 where  $e_{ti} \sim N(0, \sigma_e^2)$  and  $\nu_{0i} \sim N(0, \tau_{00})$  (for a fixed slope model). We included *time* as a  
 328 linear predictor centered at the first assessment wave to detrend the effects (Wang &  
 329 Maxwell, 2015). Contact was centered on the person-specific baseline (T1) to distinguish  
 330 between-person from within-person variation in contact (Hoffman, 2015, 2020): With  
 331 baseline-centering, the between-person component (*contactBP<sub>i</sub>*) was each person's contact  
 332 frequency at the first assessment, from which the grand mean was subtracted. The  
 333 within-person component (*contactWP<sub>ti</sub>*) was the baseline-centered contact frequency, that  
 334 is, a person's contact frequency at each wave, from which their contact frequency at the  
 335 first wave was subtracted. Thus, *contactWP<sub>ti</sub>* represented the within-person effect of a  
 336 higher contact frequency at that wave than at the first wave. To test H2a and H2b, we  
 337 estimated a cross-level interaction between contact frequency (personal or indirect) and  
 338 each social trait (*contactWP<sub>ti</sub>trait<sub>i</sub>*).

339 To probe significant cross-level interactions, we utilized simple-slopes plots at  
 340 conditional values and regions-of-significance plots via the Johnson-Neyman technique  
 341 (McCabe et al., 2018; Preacher et al., 2006). To compare the models' predictive power, we  
 342 computed  $R^2$  for the proportion of total variance explained by the model fixed effects  
 343 (Hoffman, 2015), which is the squared Pearson correlation between the actual outcome and  
 344 the outcome predicted by the model fixed effects. To gauge how robust the multilevel  
 345 models were to violated assumptions regarding multivariate normality and contamination

346 by outliers, we re-estimated all models with robust linear mixed-effects models (see  
347 Supplemental Material and Tables S7 to S11; Koller, 2016).

348 We used R (Version 4.0.4; R Core Team, 2020) and the R-packages *lme4* (Version  
349 1.1.27.1; Bates et al., 2015), and *lmerTest* (Version 3.1.3; Kuznetsova et al., 2017) for  
350 multilevel modeling, as well as *tidyverse* (Wickham, Averick, Bryan, Chang, McGowan,  
351 François, et al., 2019) for data wrangling, and *papaja* (Aust & Barth, 2020) for  
352 reproducible manuscript production. A complete list of software we used and full model  
353 equations are provided in the Supplemental Material.

## 354 Results

### 355 Social Contact

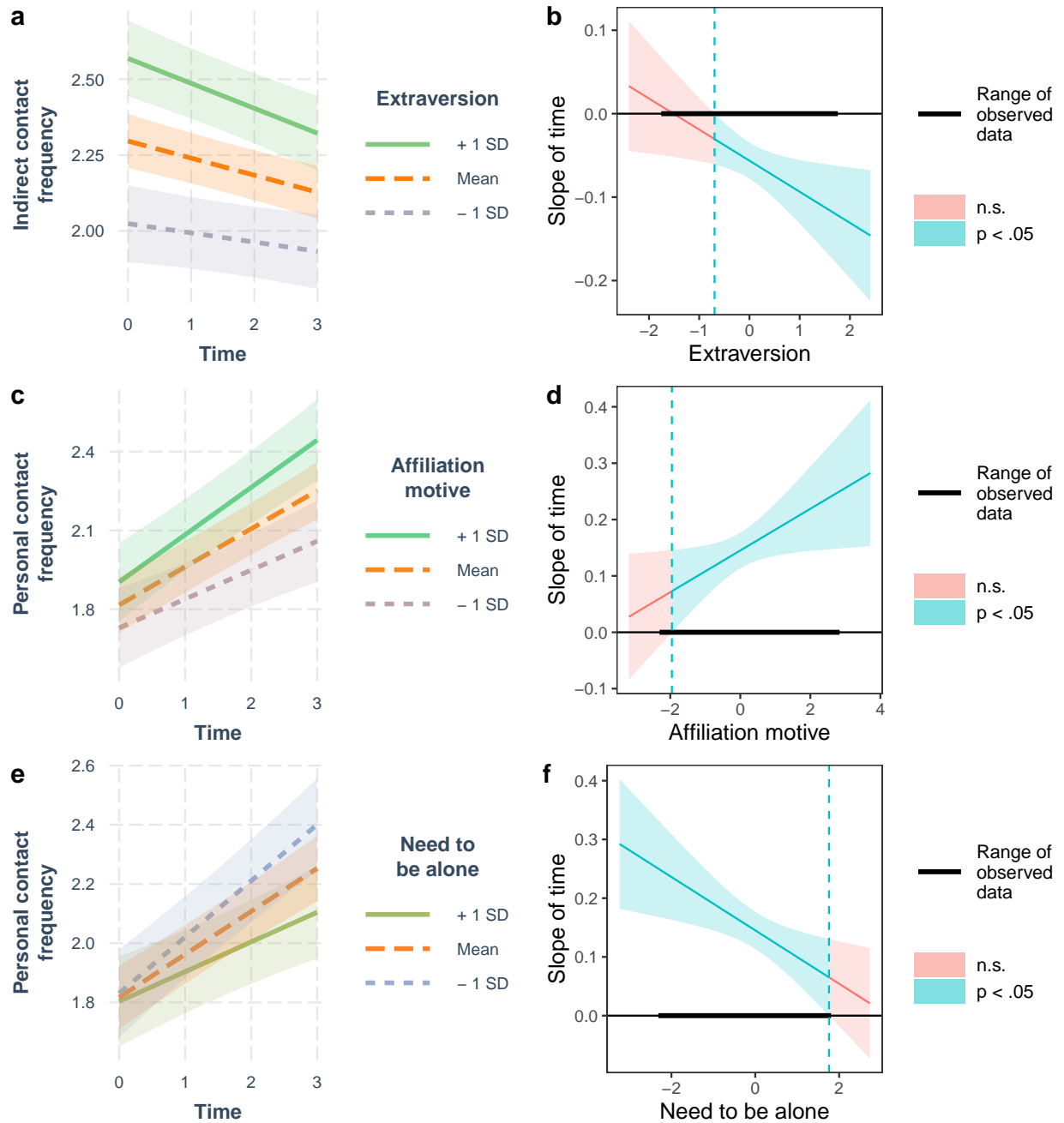
356 At the first assessment, that is, when shops, restaurants, and schools were closed  
357 and people were only allowed to meet with one other person, participants reported on  
358 average less frequent personal contact,  $\hat{\gamma}_{00} = 1.82$ , 95% CI [1.71, 1.93], than indirect  
359 contact,  $\hat{\gamma}_{00} = 2.30$ , 95% CI [2.21, 2.39]. Notably, social traits were not associated with  
360 personal contact during the week of the strictest contact restrictions but predicted the level  
361 of indirect contact at this time (see Table 1): with higher extraversion,  $\hat{\gamma}_{01} = 0.39$ , 95% CI  
362 [0.26, 0.52], higher affiliation motive,  $\hat{\gamma}_{01} = 0.26$ , 95% CI [0.17, 0.36], or lower social anxiety,  
363  $\hat{\gamma}_{01} = -0.16$ , 95% CI [-0.29, -0.04], people reported more frequent indirect contact at the  
364 first assessment during the strictest contact restrictions.

365 As restrictions were eased over time, personal contact frequency rose,  $\hat{\gamma}_{10} = 0.14$ ,  
366 95% CI [0.11, 0.18], while indirect contact frequency decreased,  $\hat{\gamma}_{10} = -0.06$ , 95% CI  
367 [-0.08, -0.03] (see Table 1). Partly supporting H1a, social traits moderated changes in  
368 social contact over time: With higher extraversion, decreases in indirect contact frequency  
369 were more pronounced,  $\hat{\gamma}_{11} = -0.04$ , 95% CI [-0.07, -0.01] (see Figs. 2a and 2b). The  
370 regions-of-significance analysis reveals that this interaction was significant for values of  
371 extraversion above 2.33 (i.e., above -0.70 for the centered variable). In addition, with a

**Table 1**  
*Fixed Effects of Social Contact Frequency Predicted by Time and Social Traits*

Parameter	Personal contact			Indirect contact				
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
<b>Extraversion (M1a, M1b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.93]	32.87	< .001	2.30	[2.21, 2.39]	50.59	< .001
Time, $\hat{\gamma}_{10}$	0.14	[0.11, 0.18]	8.94	< .001	-0.06	[-0.08, -0.03]	-5.11	< .001
Extraversion, $\hat{\gamma}_{01}$	0.05	[-0.11, 0.20]	0.59	.557	0.39	[0.26, 0.52]	6.02	< .001
Time * Extraversion, $\hat{\gamma}_{11}$	0.01	[-0.03, 0.06]	0.51	.611	-0.04	[-0.07, -0.01]	-2.34	.020
<b>Affiliation motive (M2a, M2b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.92]	33.39	< .001	2.30	[2.21, 2.39]	49.92	< .001
Time, $\hat{\gamma}_{10}$	0.15	[0.11, 0.18]	9.01	< .001	-0.06	[-0.08, -0.03]	-5.03	< .001
Affiliation motive, $\hat{\gamma}_{01}$	0.09	[-0.02, 0.20]	1.63	.105	0.26	[0.17, 0.36]	5.49	< .001
Time * Affiliation motive, $\hat{\gamma}_{11}$	0.04	[0.00, 0.07]	2.15	.032	-0.01	[-0.03, 0.01]	-0.80	.425
<b>Need to be alone (M3a, M3b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.92]	33.10	< .001	2.30	[2.20, 2.40]	46.83	< .001
Time, $\hat{\gamma}_{10}$	0.15	[0.11, 0.18]	9.02	< .001	-0.06	[-0.08, -0.03]	-5.03	< .001
Need to be alone, $\hat{\gamma}_{01}$	-0.01	[-0.12, 0.09]	-0.25	.799	-0.09	[-0.19, 0.00]	-1.86	.064
Time * Need to be alone, $\hat{\gamma}_{11}$	-0.05	[-0.08, -0.01]	-2.73	.006	0.00	[-0.03, 0.02]	-0.39	.695
<b>Social anxiety (M4a, M4b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.93]	32.87	< .001	2.30	[2.21, 2.40]	47.25	< .001
Time, $\hat{\gamma}_{10}$	0.14	[0.11, 0.18]	8.94	< .001	-0.06	[-0.08, -0.03]	-5.08	< .001
Social anxiety, $\hat{\gamma}_{01}$	0.01	[-0.13, 0.15]	0.16	.876	-0.16	[-0.29, -0.04]	-2.53	.012
Time * Social anxiety, $\hat{\gamma}_{11}$	-0.04	[-0.08, 0.01]	-1.71	.088	0.02	[-0.01, 0.05]	1.09	.277

*Note.* Two models were computed for each social trait: as predictors of personal contact frequency (models MXa) and of indirect contact frequency (models MXb). Models MXb feature random slopes of time. CI = confidence interval.  $R^2_{M1a} = 0.04$ ,  $R^2_{M1b} = 0.13$ ,  $R^2_{M2a} = 0.07$ ,  $R^2_{M2b} = 0.13$ ,  $R^2_{M3a} = 0.05$ ,  $R^2_{M3b} = 0.03$ ,  $R^2_{M4a} = 0.04$ ,  $R^2_{M4b} = 0.04$ .



**Figure 2**

Simple-slopes plots (a, c, e) and Neyman-Johnson regions-of-significance plots (b, d, f) for significant cross-level interaction effects predicting contact frequency. Confidence bands represent 95% confidence intervals. Variables presented on the X-axis (b, d, f) are grand-mean centered; original scale values can be computed by adding the mean of the respective variable reported in Table S1.

373 higher affiliation motive, the increase in personal contact frequency was more pronounced,  
374  $\hat{\gamma}_{11} = 0.04$ , 95% CI [0.00, 0.07]. This interaction was significant for values of affiliation  
375 motive above 1.28 (i.e., above -1.95 for the centered variable), nearly the complete range of  
376 observed values (see Figs. 2c and 2d). In partial support of H1b, with a higher need to be  
377 alone, increases in personal contact frequency were less pronounced,  $\hat{\gamma}_{11} = -0.05$ , 95% CI  
378 [-0.08, -0.01] (see Table 1 and Figs. 2e and 2f). This interaction was significant for the  
379 whole range of observed values in the need to be alone. We did not observe social anxiety  
380 to be related to rates of change in personal or indirect social contact.

381 The practical significance and size of the effects can be inferred from the scaling of  
382 personal contact on the y-axis in Figure 2. For example, in Figure 2c, participants low (-1  
383 *SD*) and high (+1 *SD*) in affiliation motive reported roughly the same amount of personal  
384 contact at the first assessment, which was a little less than “once” during the last week  
385 (corresponding to 2 on the 5-point scale). At the last assessment, participants low in  
386 affiliation motive reported on average 0.33 scale points more personal contact just passing  
387 2 on the 5-point scale (i.e., “once” during the last week). In contrast, participants high in  
388 affiliation motive reported 0.54 higher personal contact, which corresponded to 2.44 on the  
389 5-point scale (i.e., in between “once” and “multiple days” during the last week).

### 390 **Well-Being**

391 Over time, life satisfaction declined linearly,  $\hat{\gamma}_{10} = -0.11$ , 95% CI [-0.20, -0.03],  
392 whereas depressivity/anxiety remained stable on average (see Tables 2 to 5). During strict  
393 contact restrictions at the first assessment, life satisfaction was higher with higher  
394 extraversion,  $\hat{\gamma}_{01} = 1.18$ , 95% CI [0.76, 1.60], higher affiliation motive,  $\hat{\gamma}_{01} = 0.40$ , 95% CI  
395 [0.08, 0.73], and lower social anxiety,  $\hat{\gamma}_{01} = -0.85$ , 95% CI [-1.22, -0.47]. At the same  
396 time, the lower the participants’ extraversion,  $\hat{\gamma}_{01} = -0.26$ , 95% CI [-0.38, -0.15], and the  
397 higher their social anxiety,  $\hat{\gamma}_{01} = 0.38$ , 95% CI [0.29, 0.47], the higher their  
398 depressivity/anxiety. More frequent initial personal and indirect contact (i.e.,

399 between-person differences at T1) was associated with higher life satisfaction, although  
400 these effects were significant in only five out of eight models (see Tables 2 to 5).

401 Having more indirect contact as compared to the baseline (i.e., during the strictest  
402 contact restrictions) was associated with higher life satisfaction for people with a higher  
403 affiliation motive,  $\hat{\gamma}_{21} = 0.41$ , 95% CI [0.07, 0.74] (see Table 3). As Figures 3a and 3b show,  
404 life satisfaction increased with more frequent indirect contact for those with a higher  
405 affiliation motive, whereas it decreased for those with a lower affiliation motive. The  
406 regions-of-significance plot shows that the within-person association between indirect  
407 contact and life satisfaction was significant for values of affiliation motive below 2.26 (i.e.,  
408 below -0.97 for the centered variable) and above 5.18 (i.e., above 1.95 for the centered  
409 variable), albeit in opposite directions. Although non-significant at  $p = .050$ , we found a  
410 similar pattern for the cross-level interaction of affiliation motive and more frequent  
411 personal contact as compared to the baseline, which we present in Figure S2 for the sake of  
412 completeness.

413 Conversely, more frequent personal contact as compared to the first assessment was  
414 associated with higher life satisfaction for people with a lower need to be alone,  
415  $\hat{\gamma}_{21} = -0.20$ , 95% CI [-0.39, -0.02] (see Table 4 and Figs. 3c and 3d), the slope being  
416 significant for people scoring below 5.15 (i.e., below -0.10 for the centered variable) in the  
417 need to be alone. Participants' depressivity/anxiety increased with more frequent personal  
418 or indirect contact as compared to the baseline among people higher in social anxiety,  
419  $\hat{\gamma}_{21} = 0.08$ , 95% CI [0.00, 0.15],  $\hat{\gamma}_{21} = 0.14$ , 95% CI [0.00, 0.27] (see Table 5). Figures 3e to  
420 3h emphasizes the nature of these associations via simple-slopes and regions-of-significance  
421 plots: More frequent social contact than at the first wave was associated with higher  
422 depressivity/anxiety among people higher in social anxiety (above 3.23 in social anxiety for  
423 personal contact, i.e., above 1.47 for the centered variable; and above 3.78 for indirect  
424 contact, i.e., above 2.02 for the centered variable).

425 Overall, we found partial empirical support for H2a and H2b such that affiliation

426 motive, need to be alone, and social anxiety moderated the effects of increased social  
427 contact on well-being over the course of our study as contact restrictions were being eased.

### 428 **Exploratory Analyses**

429       Following an anonymous reviewer's suggestion to investigate overlap between the  
430 social trait constructs, we specified multilevel structural equation models in *Mplus*  
431 (Muthén & Muthén, 2019, Version 8.4), in which a latent social trait factor moderated the  
432 effects of time and of social contact. This latent factor represented the shared variance of  
433 the four social traits. The exploratory analyses suggested significant moderation of the  
434 resumption of personal contact by the latent social trait factor (see Table S12). For  
435 predicting well-being changes, we did not find significant moderation of the effects of  
436 increased contact by the latent social trait factor (see Table S13). This could indicate that  
437 the effects for well-being reported in the main manuscript are specific to each social trait.

**Table 2**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Extraversion*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	$t$	$p$	$\hat{\gamma}$	95% CI	$t$	$p$
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.72	[6.41, 7.03]	42.72	< .001	1.66	[1.57, 1.75]	38.07	< .001
Time, $\hat{\gamma}_{10}$	-0.11	[-0.20, -0.03]	-2.56	.011	0.00	[-0.03, 0.02]	-0.36	.717
Personal contact (BP), $\hat{\gamma}_{02}$	0.33	[-0.04, 0.70]	1.77	.078	-0.02	[-0.12, 0.09]	-0.31	.756
Personal contact (WP), $\hat{\gamma}_{20}$	0.19	[-0.02, 0.40]	1.81	.071	0.01	[-0.05, 0.06]	0.24	.810
Extraversion, $\hat{\gamma}_{01}$	1.18	[0.76, 1.60]	5.56	< .001	-0.26	[-0.38, -0.15]	-4.50	< .001
Personal contact (BP) * Extraversion, $\hat{\gamma}_{03}$	-0.05	[-0.59, 0.49]	-0.19	.847	0.01	[-0.14, 0.16]	0.12	.901
Personal contact (WP) * Extraversion, $\hat{\gamma}_{21}$	-0.03	[-0.30, 0.24]	-0.21	.830	-0.02	[-0.10, 0.05]	-0.63	.530
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.68	[6.36, 7.00]	40.78	< .001	1.66	[1.57, 1.74]	38.19	< .001
Time, $\hat{\gamma}_{10}$	-0.08	[-0.17, 0.00]	-1.99	.047	-0.01	[-0.03, 0.02]	-0.55	.583
Indirect contact (BP), $\hat{\gamma}_{02}$	0.22	[-0.22, 0.67]	0.98	.329	0.13	[0.01, 0.25]	2.12	.035
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.06	[-0.41, 0.29]	-0.35	.730	0.03	[-0.09, 0.14]	0.46	.645
Extraversion, $\hat{\gamma}_{01}$	1.17	[0.73, 1.61]	5.21	< .001	-0.32	[-0.44, -0.20]	-5.31	< .001
Indirect contact (BP) * Extraversion, $\hat{\gamma}_{03}$	-0.27	[-0.85, 0.32]	-0.90	.368	-0.04	[-0.19, 0.12]	-0.49	.628
Indirect contact (WP) * Extraversion, $\hat{\gamma}_{21}$	0.20	[-0.22, 0.63]	0.94	.350	-0.07	[-0.22, 0.08]	-0.95	.343

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). Model M2b features a random slope of within-person contact. CI = confidence interval; BP = between-person effect; WP = within-person effect.

$$R^2_{M1a} = 0.14, R^2_{M1b} = 0.08, R^2_{M2a} = 0.13, R^2_{M2b} = 0.10.$$



**Table 3**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Affiliation Motive*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.71	[6.38, 7.04]	39.95	< .001	1.66	[1.57, 1.75]	35.89	< .001
Time, $\hat{\gamma}_{10}$	-0.11	[-0.20, -0.03]	-2.59	.010	0.00	[-0.03, 0.02]	-0.33	.744
Personal contact (BP), $\hat{\gamma}_{02}$	0.31	[-0.09, 0.71]	1.53	.128	-0.02	[-0.13, 0.09]	-0.36	.720
Personal contact (WP), $\hat{\gamma}_{20}$	0.15	[-0.06, 0.36]	1.35	.176	0.01	[-0.05, 0.07]	0.38	.707
Affiliation motive, $\hat{\gamma}_{01}$	0.40	[0.08, 0.73]	2.43	.016	-0.05	[-0.14, 0.04]	-1.08	.280
Personal contact (BP) * Affiliation motive, $\hat{\gamma}_{03}$	0.12	[-0.31, 0.54]	0.53	.596	-0.02	[-0.13, 0.10]	-0.29	.774
Personal contact (WP) * Affiliation motive, $\hat{\gamma}_{21}$	0.22	[0.00, 0.43]	1.96	.050	-0.02	[-0.08, 0.04]	-0.70	.481
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.68	[6.35, 7.01]	39.85	< .001	1.66	[1.57, 1.75]	36.42	< .001
Time, $\hat{\gamma}_{10}$	-0.09	[-0.17, -0.01]	-2.13	.034	-0.01	[-0.03, 0.02]	-0.50	.619
Indirect contact (BP), $\hat{\gamma}_{02}$	0.48	[0.03, 0.94]	2.08	.039	0.03	[-0.10, 0.15]	0.45	.652
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.14	[-0.49, 0.21]	-0.79	.432	0.02	[-0.09, 0.14]	0.39	.700
Affiliation motive, $\hat{\gamma}_{01}$	0.41	[0.08, 0.74]	2.46	.015	-0.06	[-0.15, 0.03]	-1.34	.183
Indirect contact (BP) * Affiliation motive, $\hat{\gamma}_{03}$	-0.29	[-0.70, 0.13]	-1.36	.175	-0.01	[-0.13, 0.10]	-0.21	.830
Indirect contact (WP) * Affiliation motive, $\hat{\gamma}_{21}$	0.41	[0.07, 0.74]	2.39	.017	-0.04	[-0.16, 0.07]	-0.72	.476

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). Model M2b features a random slope of within-person contact. CI = confidence interval; BP = between-person effect; WP = within-person effect.  $R^2_{M1a} = 0.06$ ,  $R^2_{M1b} = 0.01$ ,  $R^2_{M2a} = 0.08$ ,  $R^2_{M2b} = 0.01$ .

**Table 4**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Need to be Alone*

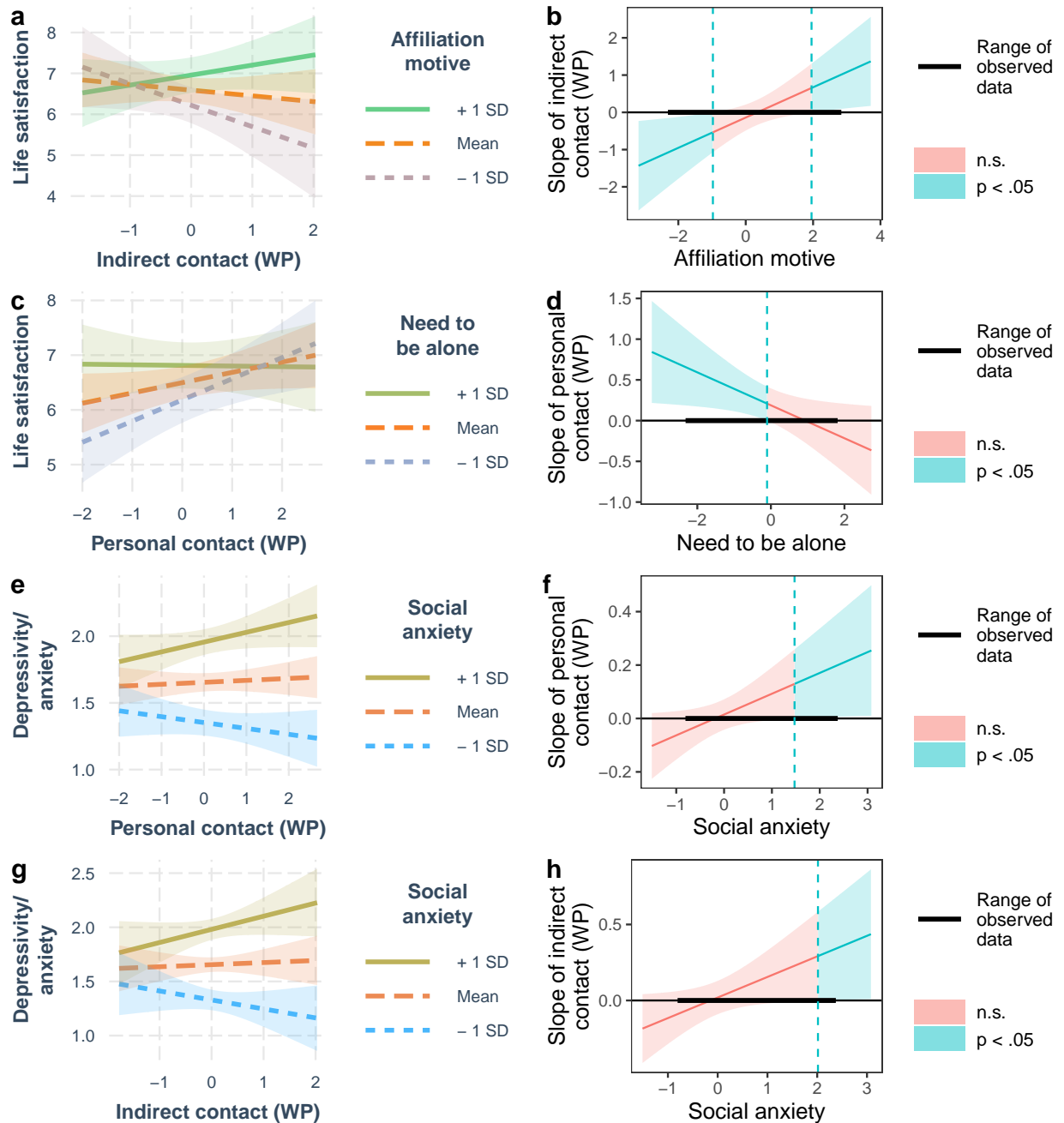
Parameter	Life satisfaction			Depressivity/anxiety				
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.75	[6.42, 7.07]	40.64	< .001	1.65	[1.57, 1.74]	36.60	< .001
Time, $\hat{\gamma}_{10}$	-0.12	[-0.21, -0.04]	-2.80	.005	0.00	[-0.03, 0.02]	-0.23	.816
Personal contact (BP), $\hat{\gamma}_{02}$	0.42	[0.03, 0.80]	2.11	.037	-0.04	[-0.14, 0.07]	-0.66	.513
Personal contact (WP), $\hat{\gamma}_{20}$	0.19	[-0.02, 0.40]	1.77	.077	0.01	[-0.05, 0.06]	0.21	.836
Need to be alone, $\hat{\gamma}_{01}$	0.28	[-0.03, 0.58]	1.75	.082	-0.04	[-0.13, 0.04]	-1.05	.295
Personal contact (BP) * Need to be alone, $\hat{\gamma}_{03}$	-0.26	[-0.70, 0.18]	-1.15	.252	0.08	[-0.04, 0.20]	1.26	.210
Personal contact (WP) * Need to be alone, $\hat{\gamma}_{21}$	-0.20	[-0.39, -0.02]	-2.17	.030	0.02	[-0.03, 0.07]	0.67	.502
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.61	[6.29, 6.93]	40.68	< .001	1.66	[1.57, 1.74]	37.85	< .001
Time, $\hat{\gamma}_{10}$	-0.09	[-0.17, -0.01]	-2.08	.038	-0.01	[-0.03, 0.02]	-0.52	.602
Indirect contact (BP), $\hat{\gamma}_{02}$	0.71	[0.27, 1.14]	3.20	.002	-0.01	[-0.13, 0.11]	-0.15	.877
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.01	[-0.35, 0.33]	-0.04	.965	0.01	[-0.11, 0.13]	0.19	.848
Need to be alone, $\hat{\gamma}_{01}$	0.29	[-0.03, 0.60]	1.80	.074	-0.05	[-0.14, 0.03]	-1.20	.231
Indirect contact (BP) * Need to be alone, $\hat{\gamma}_{03}$	0.07	[-0.36, 0.50]	0.32	.751	-0.02	[-0.13, 0.10]	-0.30	.767
Indirect contact (WP) * Need to be alone, $\hat{\gamma}_{21}$	-0.18	[-0.49, 0.14]	-1.10	.270	-0.01	[-0.13, 0.10]	-0.24	.808

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). Model M2b features a random slope of within-person contact. CI = confidence interval; BP = between-person effect; WP = within-person effect.  $R^2_{M1a} = 0.04$ ,  $R^2_{M1b} = 0.02$ ,  $R^2_{M2a} = 0.06$ ,  $R^2_{M2b} = 0.01$ .

**Table 5**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Social Anxiety*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.76	[6.45, 7.07]	42.89	< .001	1.65	[1.57, 1.73]	42.23	< .001
Time, $\hat{\gamma}_{10}$	-0.11	[-0.20, -0.03]	-2.57	.011	0.00	[-0.03, 0.02]	-0.27	.786
Personal contact (BP), $\hat{\gamma}_{02}$	0.48	[0.11, 0.85]	2.54	.012	-0.05	[-0.14, 0.04]	-1.04	.299
Personal contact (WP), $\hat{\gamma}_{20}$	0.18	[-0.02, 0.39]	1.73	.085	0.01	[-0.04, 0.07]	0.51	.613
Social anxiety, $\hat{\gamma}_{01}$	-0.85	[-1.22, -0.47]	-4.37	< .001	0.38	[0.29, 0.47]	8.07	< .001
Personal contact (BP) * Social anxiety, $\hat{\gamma}_{03}$	0.62	[0.08, 1.16]	2.27	.024	-0.11	[-0.24, 0.02]	-1.67	.097
Personal contact (WP) * Social anxiety, $\hat{\gamma}_{21}$	0.07	[-0.20, 0.35]	0.52	.602	0.08	[0.00, 0.15]	2.02	.044
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.65	[6.34, 6.96]	42.07	< .001	1.66	[1.58, 1.73]	44.18	< .001
Time, $\hat{\gamma}_{10}$	-0.09	[-0.17, -0.01]	-2.09	.037	-0.01	[-0.03, 0.02]	-0.44	.660
Indirect contact (BP), $\hat{\gamma}_{02}$	0.50	[0.08, 0.92]	2.34	.020	0.08	[-0.02, 0.18]	1.60	.112
Indirect contact (WP), $\hat{\gamma}_{20}$	0.00	[-0.34, 0.33]	-0.03	.978	0.02	[-0.09, 0.13]	0.35	.731
Social anxiety, $\hat{\gamma}_{01}$	-0.86	[-1.24, -0.48]	-4.49	< .001	0.43	[0.34, 0.51]	9.42	< .001
Indirect contact (BP) * Social anxiety, $\hat{\gamma}_{03}$	0.27	[-0.28, 0.83]	0.97	.331	0.07	[-0.05, 0.20]	1.15	.252
Indirect contact (WP) * Social anxiety, $\hat{\gamma}_{21}$	0.14	[-0.28, 0.55]	0.65	.519	0.14	[0.00, 0.27]	2.00	.048

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). Model M2b features a random slope of within-person contact. CI = confidence interval; BP = between-person effect; WP = within-person effect.  
 $R^2_{M1a} = 0.12$ ,  $R^2_{M1b} = 0.23$ ,  $R^2_{M2a} = 0.11$ ,  $R^2_{M2b} = 0.23$ .



**Figure 3**

Simple-slopes plots (a, c, e, g) and Neyman-Johnson regions-of-significance plots (b, d, f, h) for significant cross-level interaction effects predicting well-being. Confidence bands represent 95% confidence intervals. Variables presented on the X-axis (b, d, f, h) are grand-mean centered; original scale values can be computed by adding the mean of the respective variable reported in Table S1.

## Discussion

442

443 Based on the assumption that people differ in the need to maintain social  
444 relationships (Hall & Davis, 2017; Nezlek, 2001; Sheldon, 2011), we investigated how four  
445 social traits predicted changes in both contact frequency and well-being during successively  
446 eased contact restrictions.

447 At the first assessment when personal contact was severely restricted  
448 (Aravindakshan et al., 2020; Becher et al., 2021; Bönisch et al., 2020; Del Fava et al., 2021;  
449 Tomori et al., 2021), only indirect but not personal contact varied with individual  
450 differences in social traits: Extraversion and affiliation motive were associated with more  
451 frequent indirect contact (Harari et al., 2019), and higher social anxiety with less frequent  
452 indirect contact. These results are especially noteworthy given robust associations between  
453 higher extraversion or affiliation motive and more frequent social contact under  
454 unrestricted circumstances (Breil et al., 2019; Hall, 2017; Wrzus et al., 2016). The  
455 difference between personal and indirect contact further suggests that governmental  
456 contact restrictions created a strong situation overriding individual differences (Cooper &  
457 Withey, 2009). As restrictions were eased, social traits predicted the resumption of  
458 personal contact. People with a higher affiliation motive increased their personal contact  
459 more, whereas people with a higher need to be alone increased their personal contact less.  
460 This supports our preregistered hypotheses and theoretical considerations of social need  
461 regulation (Hall & Davis, 2017; Sheldon, 2011): People experienced contact  
462 restrictions—on average—as deviations from their ideal level of social contact (Entringer &  
463 Gosling, 2021). With increasing situational opportunities to pursue their social needs,  
464 people resumed personal contact. The intensity of this increase varied depending on  
465 people's affiliation motive and need to be alone. Likewise, recent studies have found  
466 personality traits to be associated with differences in self-reported pandemic precautions  
467 and adherence to governmental contact restrictions (Aschwanden et al., 2021; Götz et al.,  
468 2020; Zajenkowski et al., 2020; Zettler et al., 2021).

469           The results for well-being offer further insights into how social traits shape the  
470 response to this strong situation: Well-being was still higher with higher extraversion when  
471 social contact was severely restricted during lockdown, yet extraverts' well-being did not  
472 benefit more from resumed social activity. This is in line with research that extraverts'  
473 higher well-being is due primarily to the energy level facet and not to being more active  
474 socially (Anglim et al., 2020; Lucas et al., 2008; Margolis et al., 2020). Instead, differences  
475 in affiliation motive, need to be alone, and social anxiety moderated how well-being  
476 changed with increased contact: As predicted, more frequent indirect or personal contact  
477 compared to the first assessment during strict contact restrictions was associated with  
478 higher life satisfaction among people with a higher affiliation motive or a lower need to be  
479 alone, respectively—in line with previous research on romantic relationships (Zygar et al.,  
480 2018). In addition, people high in social anxiety increased in depressivity/anxiety as their  
481 social contact increased. Possibly, unwanted social contact amid an ongoing pandemic  
482 increased worries and fears among socially anxious people (Brown et al., 2007; Olivera-La  
483 Rosa et al., 2020). Results for indirect contact further emphasize the importance of  
484 individual differences in social need regulation: Affiliation motive and social anxiety  
485 moderated effects of changes in indirect contact frequency on well-being. This could  
486 explain divergent results on the role of digital technologies regarding well-being and coping  
487 with COVID-19-related distress (Boursier et al., 2020; Gabbiadini et al., 2020). The  
488 moderating effects of social traits on well-being, however, only occurred with certain trait  
489 manifestations (see Fig. 3) and, thus, warrant further investigation. It is possible that the  
490 regulation of life satisfaction, a cognitive component of well-being, is more closely linked to  
491 affiliation motive and need to be alone, whereas the regulation of depressivity/anxiety, an  
492 affective component of well-being, is linked to social anxiety.

493           Together, these results provide novel, real-life evidence of differential regulation of  
494 social needs (Hall & Davis, 2017; McClelland, 1987) under unique nationwide external  
495 constraints on social contact that would not be possible in laboratory experiments or in

496 observational studies under regular circumstances. After initial social deprivation during  
497 strict contact restrictions, people resumed personal contact to differing degrees, and  
498 increases in social contact were differentially associated with changes in well-being—with  
499 both effects depending on people’s social traits.

## 500 **Limitations**

501         Despite following an age- and gender-stratified sample longitudinally during  
502 governmental contact restrictions, some limitations need to be addressed. First, we did not  
503 measure participants’ pre-pandemic traits, contact frequency, and well-being. We assume  
504 that personal contact was at a nadir in Germany in early April 2020 (see mobility and  
505 social contact survey data, Bönisch et al., 2020; Becher et al., 2021; Del Fava et al., 2021;  
506 Tomori et al., 2021) and social need satisfaction thwarted at the first measurement.  
507 Relatedly, we assessed experiences during the previous week instead of moment to moment.  
508 Combined with an average time lag of 22 days between assessments, our design may have  
509 missed more short-term fluctuations in social contact and well-being as well as reciprocal  
510 links. For example, unmet social needs presumably reduce well-being within the next  
511 hours, and low well-being likely initiates seeking social contact (Zygar et al., 2018).  
512 Instead, the present study’s timing and reference frame of contact measurements allowed  
513 for an examination of a particular person-situation interaction, with changes to the strong  
514 situation unfolding over the course of weeks. Second, more culturally diverse samples would  
515 have allowed us to test effects of contact restrictions in different countries. Given previous  
516 cross-cultural work on social relationships and need satisfaction (Chen et al., 2015; Tay &  
517 Diener, 2011), however, we assume that the current results generalize relatively broadly to  
518 cultures other than Germany, when they underwent similar contact restrictions. Third, we  
519 focused on life satisfaction and depressivity/anxiety, yet did not measure positive affect,  
520 which was also affected in the COVID-19 pandemic (e.g., Anglim & Horwood, 2021; Lades  
521 et al., 2020), and is important to social need satisfaction (Tay & Diener, 2011). Fourth, we

522 cannot completely rule out nonrandom attrition over time. Attrition analyses indicate  
523 differences in affiliation motive and indirect contact frequency between participants  
524 completing the study and those initially indicating interest in participating in follow-ups  
525 but not taking part in all waves. There are no meaningful differences if only attrition in the  
526 longitudinal analysis sample is considered. Still, attrition might have led us to  
527 underestimate effects involving affiliation motive and indirect contact frequency. Finally,  
528 relying on self-reports, our results are subject to common method bias (Podsakoff et al.,  
529 2003). Future studies could incorporate experience sampling and smartphone sensing data  
530 (Harari et al., 2019; Zygar et al., 2018), for which we expect similar results.

### 531 **Conclusions**

532 Our study demonstrates that social traits such as affiliation motive and need to be  
533 alone play an important role in the regulation of social contact. Experiencing a situation  
534 that imposed strict constraints on the expression of social traits, people nonetheless  
535 demonstrated trait differences in their levels of indirect contact and well-being.  
536 Afterwards—as the situation opened up—social traits moderated both the resumption of  
537 personal contact and changes in well-being associated with more frequent contact. This  
538 illuminates the regulation of social needs and also provides support to the theoretical  
539 assumption that social need satisfaction feels different depending on someone’s traits. The  
540 COVID-19 pandemic has restricted many people in their satisfaction of social needs with  
541 little leeway to evade. Our study adds further evidence that the ways in which people react  
542 or adapt to this restricted situation differ depending on their personality traits, in this case  
543 their affiliation motive, need to be alone, and social anxiety.



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## Appendix

### Supplemental Material

#### 941 Full Equations

942 First, to predict personal and indirect contact frequency (H1a, H1b), we estimated  
 943 models with a cross-level interaction of  $time_{ti}$  (linear effect, zero at the first wave) and each  
 944 trait:

$$\begin{aligned}
 contact_{ti} &= \beta_{0i} + \beta_{1i}time_{ti} + e_{ti} \\
 \beta_{0i} &= \gamma_{00} + \gamma_{01}trait_i + v_{0i} \\
 \beta_{1i} &= \gamma_{10} + \gamma_{11}trait_i
 \end{aligned} \tag{A1}$$

$$945 \quad contact_{ti} = \gamma_{00} + \gamma_{01}trait_i + \gamma_{10}time_{ti} + \gamma_{11}time_{ti}trait_i + v_{0i} + e_{ti} , \quad (\text{Reduced-form})$$

946 where at time  $t$  for person  $i$   $e_{ti} \sim N(0, \sigma_e^2)$  and  $v_{0i} \sim N(0, \tau_{00})$  (for a fixed slope model).

947 We estimated separate models for the two dependent variables, personal and indirect  
 948 contact, and for each of the four traits. Second, to predict well-being, that is, life  
 949 satisfaction and depressivity/anxiety (H2a, H2b), we estimated cross-level interactions of  
 950 the within-person effect of higher-than-baseline contact (either personal or indirect  
 951 contact),  $contactWP_{ti}$ , with each social trait:

$$\begin{aligned}
 wellbeing_{ti} &= \beta_{0i} + \beta_{1i}time_{ti} + \beta_{2i}contactWP_{ti} + e_{ti} \\
 \beta_{0i} &= \gamma_{00} + \gamma_{01}trait_i + \gamma_{02}contactBP_i + \gamma_{03}trait_icontactBP_i + v_{0i} \\
 \beta_{1i} &= \gamma_{10} \\
 \beta_{2i} &= \gamma_{20} + \gamma_{21}trait_i
 \end{aligned} \tag{A2}$$

$$\begin{aligned}
 952 \quad wellbeing_{ti} &= \gamma_{00} + \gamma_{01}trait_i + \gamma_{02}contactBP_i + \gamma_{03}trait_icontactBP_i \\
 &+ \gamma_{10}time_{ti} + \gamma_{20}contactWP_{ti} + \gamma_{21}contactWP_{ti}trait_i \quad (\text{Reduced-form}) \\
 &+ v_{0i} + e_{ti} ,
 \end{aligned}$$

953 where  $e_{ti} \sim N(0, \sigma_e^2)$  and  $v_{0i} \sim N(0, \tau_{00})$  (for a fixed slope model). Again, we estimated  
954 separate models for the two dependent variables life satisfaction and depressivity/anxiety,  
955 for personal and indirect contact, and for each social trait.

### 956 **Robustness Check**

957 In order to judge how robust the multilevel models were to violated assumptions  
958 regarding multivariate normality and contamination by outliers, we re-estimated all models  
959 presented in the main part of the article with robust linear mixed-effects models using the  
960 *robustlmm* package (Koller, 2016, 2019). Based on the random effects contamination model  
961 and the central contamination model, this method supports hierarchically grouped data  
962 structures such as observations nested in participants. There is no universally accepted way  
963 to obtain confidence intervals or  $p$ -values based on the method implemented in the  
964 *robustlmm* package (Koller, 2019) which is why we decided not to report these robust  
965 models in the main part of the article. Generally, the results reported in the main part of  
966 the article were very similar to these robust estimates (see Tables S7, S8, S9, S10, & S11),  
967 especially for models related to hypotheses H1a and H1b. Differences between robust and  
968 non-robust models were slightly larger for models testing hypotheses H2a and H2b, where  
969 *trait \* contactWP* effects were slightly reduced in magnitude for affiliation motive and  
970 social anxiety in the robust models.

971 **Supplemental Tables****Table S1***Means and Standard Deviations of the Included Variables Over Time and their ICCs*

	$M_1$	$SD_1$	$M_2$	$SD_2$	$M_3$	$SD_3$	$M_4$	$SD_4$	$ICC$
Personal contact frequency	1.85	0.78	1.9	0.83	2.14	0.78	2.25	0.83	0.62
Indirect contact frequency	2.30	0.69	2.25	0.72	2.15	0.64	2.13	0.64	0.8
Life satisfaction	6.75	2.36	6.46	2.42	6.44	2.37	6.48	2.32	0.74
Depressivity/anxiety	1.67	0.65	1.67	0.62	1.6	0.59	1.65	0.68	0.72
Extraversion	3.05	0.70							
Affiliation motive	3.25	0.96							
Need to be alone	5.23	1.01							
Social anxiety	1.76	0.77							

*Note.* Presented are the uncentered variables. Personal and indirect contact frequency have a range from 1 to 5 (observed ranges: 1 – 4.5, 1 – 4.25), life satisfaction from 0 to 10, depressivity/anxiety from 1 to 4 (observed range: 1 – 3.6), extraversion from 1 to 5 (observed range: 1.25 – 4.75), affiliation motive from 1 to 6, need to be alone from 1 to 7 (observed range: 2.75 – 7), and social anxiety from 1 to 5 (observed range: 1 – 4.08).  $M_1$  = mean at the first wave.  $SD_1$  = standard deviation at the first wave.  $ICC$  = intra-class correlation, that is, proportion of variance that lies at the between-person level.

**Table S2**  
*Fixed Effects of Social Contact Frequency Predicted by Time and Social Traits (Alternative Random Slope Configuration to Table 1)*

Parameter	Personal contact				Indirect contact			
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
<b>Extraversion (M1a, M1b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.92]	33.60	< .001	2.30	[2.21, 2.38]	52.25	< .001
Time, $\hat{\gamma}_{10}$	0.15	[0.11, 0.18]	8.29	< .001	-0.06	[-0.08, -0.04]	-5.70	< .001
Extraversion, $\hat{\gamma}_{01}$	0.05	[-0.11, 0.20]	0.60	.552	0.39	[0.27, 0.52]	6.24	< .001
Time * Extraversion, $\hat{\gamma}_{11}$	0.01	[-0.04, 0.06]	0.50	.616	-0.04	[-0.07, -0.01]	-2.72	.007
<b>Affiliation motive (M2a, M2b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.92]	33.79	< .001	2.30	[2.21, 2.38]	52.31	< .001
Time, $\hat{\gamma}_{10}$	0.15	[0.11, 0.18]	8.41	< .001	-0.06	[-0.08, -0.04]	-5.63	< .001
Affiliation motive, $\hat{\gamma}_{01}$	0.09	[-0.02, 0.20]	1.65	.100	0.26	[0.17, 0.35]	5.77	< .001
Time * Affiliation motive, $\hat{\gamma}_{11}$	0.04	[0.00, 0.07]	1.97	.051	-0.01	[-0.03, 0.01]	-0.98	.326
<b>Need to be alone (M3a, M3b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.92]	33.53	< .001	2.30	[2.21, 2.39]	49.25	< .001
Time, $\hat{\gamma}_{10}$	0.15	[0.11, 0.18]	8.45	< .001	-0.06	[-0.08, -0.04]	-5.62	< .001
Need to be alone, $\hat{\gamma}_{01}$	-0.01	[-0.12, 0.09]	-0.26	.796	-0.09	[-0.18, 0.00]	-1.97	.050
Time * Need to be alone, $\hat{\gamma}_{11}$	-0.05	[-0.08, -0.01]	-2.53	.012	0.00	[-0.02, 0.02]	-0.40	.690
<b>Social anxiety (M4a, M4b)</b>								
Intercept, $\hat{\gamma}_{00}$	1.82	[1.71, 1.92]	33.58	< .001	2.30	[2.21, 2.39]	49.43	< .001
Time, $\hat{\gamma}_{10}$	0.14	[0.11, 0.18]	8.31	< .001	-0.06	[-0.08, -0.04]	-5.66	< .001
Social anxiety, $\hat{\gamma}_{01}$	0.01	[-0.13, 0.15]	0.17	.868	-0.16	[-0.28, -0.04]	-2.65	.009
Time * Social anxiety, $\hat{\gamma}_{11}$	-0.04	[-0.08, 0.01]	-1.63	.106	0.02	[-0.01, 0.04]	1.27	.205

*Note.* Two models were computed for each social trait: as predictors of personal contact frequency (models MXa) and of indirect contact frequency (models MXb). CI = confidence interval. Models MXa feature random slopes of time.

**Table S3**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Extraversion (Alternative Random Slope Configuration to Table 2)*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	$t$	$p$	$\hat{\gamma}$	95% CI	$t$	$p$
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.73	[6.42, 7.04]	42.33	< .001	1.66	[1.58, 1.75]	38.24	< .001
Time, $\hat{\gamma}_{10}$	-0.11	[-0.20, -0.03]	-2.60	.010	0.00	[-0.03, 0.02]	-0.28	.782
Personal contact (BP), $\hat{\gamma}_{02}$	0.33	[-0.03, 0.70]	1.78	.077	-0.02	[-0.12, 0.09]	-0.32	.747
Personal contact (WP), $\hat{\gamma}_{20}$	0.22	[0.00, 0.44]	1.96	.052	0.00	[-0.06, 0.06]	-0.01	.990
Extraversion, $\hat{\gamma}_{01}$	1.16	[0.74, 1.58]	5.37	< .001	-0.26	[-0.38, -0.15]	-4.51	< .001
Personal contact (BP) * Extraversion, $\hat{\gamma}_{03}$	-0.09	[-0.62, 0.44]	-0.33	.740	0.01	[-0.14, 0.16]	0.12	.906
Personal contact (WP) * Extraversion, $\hat{\gamma}_{21}$	-0.01	[-0.29, 0.27]	-0.07	.944	-0.02	[-0.10, 0.06]	-0.51	.613
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.68	[6.36, 7.00]	41.16	< .001	1.66	[1.57, 1.75]	37.10	< .001
Time, $\hat{\gamma}_{10}$	-0.08	[-0.17, 0.00]	-1.99	.047	0.00	[-0.03, 0.02]	-0.39	.696
Indirect contact (BP), $\hat{\gamma}_{02}$	0.23	[-0.21, 0.68]	1.03	.306	0.13	[0.00, 0.25]	2.03	.044
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.11	[-0.49, 0.27]	-0.56	.578	0.01	[-0.09, 0.11]	0.22	.824
Extraversion, $\hat{\gamma}_{01}$	1.16	[0.72, 1.60]	5.20	< .001	-0.32	[-0.44, -0.20]	-5.23	< .001
Indirect contact (BP) * Extraversion, $\hat{\gamma}_{03}$	-0.26	[-0.84, 0.33]	-0.86	.391	-0.03	[-0.19, 0.13]	-0.37	.709
Indirect contact (WP) * Extraversion, $\hat{\gamma}_{21}$	0.19	[-0.30, 0.67]	0.76	.451	-0.09	[-0.21, 0.03]	-1.49	.137

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). CI = confidence interval; BP = between-person effect; WP = within-person effect. Models M1a, M1b, and M2a feature random slopes of within-person contact.

**Table S4**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Affiliation Motive (Alternative Random Slope Configuration to Table 3)*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.71	[6.38, 7.05]	39.54	< .001	1.66	[1.57, 1.75]	36.09	< .001
Time, $\hat{\gamma}_{10}$	-0.11	[-0.20, -0.03]	-2.61	.009	0.00	[-0.03, 0.02]	-0.22	.825
Personal contact (BP), $\hat{\gamma}_{02}$	0.30	[-0.10, 0.69]	1.45	.149	-0.02	[-0.13, 0.09]	-0.38	.703
Personal contact (WP), $\hat{\gamma}_{20}$	0.17	[-0.05, 0.39]	1.54	.126	0.00	[-0.06, 0.07]	0.14	.891
Affiliation motive, $\hat{\gamma}_{01}$	0.41	[0.08, 0.74]	2.43	.016	-0.05	[-0.14, 0.04]	-1.08	.280
Personal contact (BP) * Affiliation motive, $\hat{\gamma}_{03}$	0.12	[-0.30, 0.54]	0.56	.575	-0.02	[-0.13, 0.10]	-0.27	.786
Personal contact (WP) * Affiliation motive, $\hat{\gamma}_{21}$	0.21	[-0.02, 0.43]	1.80	.076	-0.03	[-0.09, 0.04]	-0.84	.403
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.68	[6.36, 7.01]	40.19	< .001	1.66	[1.57, 1.75]	35.61	< .001
Time, $\hat{\gamma}_{10}$	-0.09	[-0.17, -0.01]	-2.11	.035	0.00	[-0.03, 0.02]	-0.27	.789
Indirect contact (BP), $\hat{\gamma}_{02}$	0.49	[0.03, 0.95]	2.10	.037	0.03	[-0.10, 0.15]	0.41	.684
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.17	[-0.55, 0.21]	-0.89	.373	0.01	[-0.09, 0.11]	0.20	.840
Affiliation motive, $\hat{\gamma}_{01}$	0.41	[0.09, 0.74]	2.49	.014	-0.07	[-0.16, 0.03]	-1.41	.161
Indirect contact (BP) * Affiliation motive, $\hat{\gamma}_{03}$	-0.29	[-0.70, 0.12]	-1.40	.164	0.00	[-0.12, 0.11]	-0.08	.933
Indirect contact (WP) * Affiliation motive, $\hat{\gamma}_{21}$	0.40	[0.03, 0.77]	2.14	.035	-0.07	[-0.17, 0.02]	-1.55	.122

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). CI = confidence interval; BP = between-person effect; WP = within-person effect. Models M1a, M1b, and M2a feature random slopes of within-person contact.

**Table S5**  
*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Need to be Alone (Alternative Random Slope Configuration to Table 4)*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.75	[6.42, 7.08]	40.48	< .001	1.65	[1.57, 1.74]	36.81	< .001
Time, $\hat{\gamma}_{10}$	-0.12	[-0.21, -0.04]	-2.79	.006	0.00	[-0.03, 0.02]	-0.10	.917
Personal contact (BP), $\hat{\gamma}_{02}$	0.41	[0.03, 0.80]	2.10	.037	-0.04	[-0.14, 0.07]	-0.67	.501
Personal contact (WP), $\hat{\gamma}_{20}$	0.21	[-0.01, 0.43]	1.87	.064	0.00	[-0.06, 0.06]	-0.02	.980
Need to be alone, $\hat{\gamma}_{01}$	0.27	[-0.04, 0.58]	1.69	.093	-0.04	[-0.13, 0.04]	-1.04	.300
Personal contact (BP) * Need to be alone, $\hat{\gamma}_{03}$	-0.27	[-0.71, 0.17]	-1.20	.233	0.08	[-0.04, 0.19]	1.25	.214
Personal contact (WP) * Need to be alone, $\hat{\gamma}_{21}$	-0.19	[-0.39, 0.00]	-1.93	.057	0.02	[-0.03, 0.08]	0.87	.385
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.61	[6.30, 6.93]	40.99	< .001	1.66	[1.57, 1.75]	36.96	< .001
Time, $\hat{\gamma}_{10}$	-0.09	[-0.17, 0.00]	-2.06	.040	0.00	[-0.03, 0.02]	-0.32	.748
Indirect contact (BP), $\hat{\gamma}_{02}$	0.71	[0.27, 1.14]	3.19	.002	-0.01	[-0.13, 0.11]	-0.21	.835
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.07	[-0.45, 0.31]	-0.35	.724	-0.02	[-0.11, 0.08]	-0.35	.727
Need to be alone, $\hat{\gamma}_{01}$	0.28	[-0.03, 0.59]	1.76	.079	-0.05	[-0.14, 0.03]	-1.24	.216
Indirect contact (BP) * Need to be alone, $\hat{\gamma}_{03}$	0.08	[-0.34, 0.51]	0.37	.711	-0.02	[-0.13, 0.10]	-0.28	.782
Indirect contact (WP) * Need to be alone, $\hat{\gamma}_{21}$	-0.20	[-0.56, 0.16]	-1.10	.274	-0.01	[-0.10, 0.07]	-0.31	.753

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life satisfaction (models MXa) and depressivity/anxiety (models MXb). CI = confidence interval; BP = between-person effect; WP = within-person effect. Models M1a, M1b, and M2a feature random slopes of within-person contact.

**Table S6**

*Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Social Anxiety (Alternative Random Slope Configuration to Table 5)*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}$	95% CI	t	p	$\hat{\gamma}$	95% CI	t	p
Personal contact frequency (M1a, M1b)								
Intercept, $\hat{\gamma}_{00}$	6.77	[6.46, 7.08]	42.68	< .001	1.65	[1.57, 1.73]	42.61	< .001
Time, $\hat{\gamma}_{10}$	-0.12	[-0.20, -0.03]	-2.63	.009	0.00	[-0.03, 0.02]	-0.22	.823
Personal contact (BP), $\hat{\gamma}_{02}$	0.48	[0.11, 0.85]	2.55	.012	-0.05	[-0.14, 0.04]	-1.07	.286
Personal contact (WP), $\hat{\gamma}_{20}$	0.20	[-0.02, 0.43]	1.79	.076	0.01	[-0.06, 0.07]	0.18	.856
Social anxiety, $\hat{\gamma}_{01}$	-0.84	[-1.22, -0.46]	-4.28	< .001	0.39	[0.30, 0.48]	8.27	< .001
Personal contact (BP) * Social anxiety, $\hat{\gamma}_{03}$	0.64	[0.10, 1.17]	2.32	.021	-0.11	[-0.24, 0.03]	-1.58	.115
Personal contact (WP) * Social anxiety, $\hat{\gamma}_{21}$	0.07	[-0.23, 0.36]	0.43	.670	0.07	[-0.01, 0.15]	1.64	.104
Indirect contact frequency (M2a, M2b)								
Intercept, $\hat{\gamma}_{00}$	6.65	[6.34, 6.96]	42.38	< .001	1.66	[1.58, 1.73]	42.43	< .001
Time, $\hat{\gamma}_{10}$	-0.09	[-0.17, 0.00]	-2.07	.039	0.00	[-0.03, 0.02]	-0.36	.719
Indirect contact (BP), $\hat{\gamma}_{02}$	0.50	[0.08, 0.92]	2.33	.021	0.08	[-0.03, 0.18]	1.46	.146
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.07	[-0.45, 0.31]	-0.37	.713	0.00	[-0.09, 0.09]	0.05	.961
Social anxiety, $\hat{\gamma}_{01}$	-0.86	[-1.23, -0.48]	-4.46	< .001	0.43	[0.34, 0.52]	9.24	< .001
Indirect contact (BP) * Social anxiety, $\hat{\gamma}_{03}$	0.27	[-0.28, 0.82]	0.95	.341	0.05	[-0.08, 0.18]	0.73	.464
Indirect contact (WP) * Social anxiety, $\hat{\gamma}_{21}$	0.14	[-0.31, 0.60]	0.62	.536	0.16	[0.05, 0.27]	2.76	.006

*Note.* Two models were computed for each personal and indirect contact frequency: predicting life

satisfaction (models MXa) and depressivity/anxiety (models MXb). CI = confidence interval; BP =

between-person effect; WP = within-person effect. Models M1a, M1b, and M2a feature random slopes of

within-person contact.



**Table S7***Robust Estimates: Fixed Effects of Social Contact Predicted by Time and Social Traits*

Parameter	Personal contact				Indirect contact			
	$\hat{\gamma}_r$	<i>SE</i>	<i>t</i>	$\Delta$	$\hat{\gamma}_r$	<i>SE</i>	<i>t</i>	$\Delta$
Extraversion								
Intercept, $\hat{\gamma}_{00}$	1.77	0.06	30.36	0.04	2.18	0.05	45.77	0.12
Time, $\hat{\gamma}_{10}$	0.14	0.01	9.64	0.00	-0.05	0.01	-6.26	0.00
Extraversion, $\hat{\gamma}_{01}$	0.04	0.08	0.46	0.01	0.39	0.07	5.70	0.00
Time * Extraversion, $\hat{\gamma}_{11}$	0.01	0.02	0.62	0.00	-0.04	0.01	-2.94	0.00
Affiliation motive								
Intercept, $\hat{\gamma}_{00}$	1.78	0.06	30.70	0.04	2.16	0.05	47.15	0.13
Time, $\hat{\gamma}_{10}$	0.14	0.01	9.78	0.00	-0.05	0.01	-5.98	0.00
Affiliation motive, $\hat{\gamma}_{01}$	0.08	0.06	1.33	0.01	0.28	0.05	5.83	-0.02
Time * Affiliation motive, $\hat{\gamma}_{11}$	0.04	0.02	2.62	0.00	-0.01	0.01	-0.72	0.00
Need to be alone								
Intercept, $\hat{\gamma}_{00}$	1.77	0.06	30.50	0.04	2.18	0.05	43.92	0.12
Time, $\hat{\gamma}_{10}$	0.14	0.01	9.78	0.00	-0.05	0.01	-5.95	-0.01
Need to be alone, $\hat{\gamma}_{01}$	-0.03	0.06	-0.49	0.01	-0.13	0.05	-2.54	0.03
Time * Need to be alone, $\hat{\gamma}_{11}$	-0.04	0.02	-2.60	-0.01	-0.01	0.01	-0.79	0.00
Social anxiety								
Intercept, $\hat{\gamma}_{00}$	1.78	0.06	30.32	0.04	2.19	0.05	42.48	0.11
Time, $\hat{\gamma}_{10}$	0.14	0.01	9.69	0.00	-0.05	0.01	-6.01	0.00
Social anxiety, $\hat{\gamma}_{01}$	0.02	0.08	0.21	0.00	-0.12	0.07	-1.71	-0.05
Time * Social anxiety, $\hat{\gamma}_{11}$	-0.03	0.02	-1.70	0.00	0.01	0.01	1.03	0.00

*Note.* CI = confidence interval. *SE* = standard error.  $\Delta$  = difference between non-robust and robust estimates.

**Table S8**  
*Robust Estimates: Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Extraversion.*

Parameter	Life satisfaction			Depressivity/anxiety				
	$\hat{\gamma}_r$	SE	t	$\Delta$	$\hat{\gamma}_r$	SE	t	$\Delta$
Personal contact frequency								
Intercept, $\hat{\gamma}_{00}$	6.93	0.15	46.20	-0.22	1.60	0.04	40.68	0.06
Time, $\hat{\gamma}_{10}$	-0.10	0.03	-3.44	-0.02	-0.01	0.01	-0.91	0.00
Personal contact (BP), $\hat{\gamma}_{02}$	0.33	0.19	1.76	0.01	-0.01	0.05	-0.13	-0.01
Personal contact (WP), $\hat{\gamma}_{20}$	0.12	0.07	1.73	0.07	0.01	0.02	0.28	0.00
Extraversion, $\hat{\gamma}_{01}$	1.22	0.21	5.78	-0.04	-0.26	0.05	-4.86	0.00
Personal contact (BP) * Extraversion, $\hat{\gamma}_{03}$	-0.06	0.27	-0.23	0.01	0.00	0.07	-0.04	0.01
Personal contact (WP) * Extraversion, $\hat{\gamma}_{21}$	-0.04	0.09	-0.50	0.01	-0.02	0.03	-0.68	0.00
Indirect contact frequency								
Intercept, $\hat{\gamma}_{00}$	6.92	0.16	44.01	-0.24	1.56	0.04	38.60	0.10
Time, $\hat{\gamma}_{10}$	-0.08	0.03	-2.91	-0.01	-0.01	0.01	-0.79	0.00
Indirect contact (BP), $\hat{\gamma}_{02}$	0.27	0.23	1.18	-0.04	0.13	0.06	2.35	0.00
Indirect contact (WP), $\hat{\gamma}_{20}$	0.02	0.11	0.16	-0.08	0.04	0.04	1.07	-0.02
Extraversion, $\hat{\gamma}_{01}$	1.21	0.22	5.40	-0.04	-0.27	0.06	-4.80	-0.05
Indirect contact (BP) * Extraversion, $\hat{\gamma}_{03}$	-0.40	0.30	-1.35	0.13	-0.08	0.07	-1.15	0.05
Indirect contact (WP) * Extraversion, $\hat{\gamma}_{21}$	0.05	0.14	0.37	0.15	-0.07	0.05	-1.39	-0.01

*Note.*  $\hat{\gamma}_r$  = robust estimate;  $\Delta$  = difference between non-robust and robust estimate; BP = between-person effect; WP = within-person effect.

**Table S9**  
*Robust Estimates: Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Affiliation Motive.*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}_r$	SE	t	$\Delta$	$\hat{\gamma}_r$	SE	t	$\Delta$
Personal contact frequency								
Intercept, $\hat{\gamma}_{00}$	6.97	0.16	43.58	-0.26	1.59	0.04	37.60	0.07
Time, $\hat{\gamma}_{10}$	-0.10	0.03	-3.42	-0.02	-0.01	0.01	-0.83	0.00
Personal contact (BP), $\hat{\gamma}_{02}$	0.33	0.20	1.62	-0.01	-0.01	0.05	-0.18	-0.01
Personal contact (WP), $\hat{\gamma}_{20}$	0.08	0.07	1.21	0.06	0.01	0.02	0.29	0.00
Affiliation motive, $\hat{\gamma}_{01}$	0.46	0.16	2.79	-0.05	-0.04	0.04	-1.04	-0.01
Personal contact (BP) * Affiliation motive, $\hat{\gamma}_{03}$	-0.01	0.21	-0.03	0.12	-0.01	0.06	-0.16	-0.01
Personal contact (WP) * Affiliation motive, $\hat{\gamma}_{21}$	0.12	0.07	1.69	0.10	-0.02	0.02	-0.62	-0.01
Indirect contact frequency								
Intercept, $\hat{\gamma}_{00}$	6.93	0.16	43.29	-0.25	1.53	0.04	36.08	0.13
Time, $\hat{\gamma}_{10}$	-0.08	0.03	-3.06	-0.01	-0.01	0.01	-0.84	0.00
Indirect contact (BP), $\hat{\gamma}_{02}$	0.52	0.23	2.24	-0.03	0.03	0.06	0.49	0.00
Indirect contact (WP), $\hat{\gamma}_{20}$	-0.04	0.11	-0.37	-0.10	0.02	0.04	0.60	0.00
Affiliation motive, $\hat{\gamma}_{01}$	0.48	0.17	2.88	-0.06	-0.03	0.04	-0.77	-0.03
Indirect contact (BP) * Affiliation motive, $\hat{\gamma}_{03}$	-0.36	0.21	-1.72	0.07	-0.03	0.05	-0.56	0.02
Indirect contact (WP) * Affiliation motive, $\hat{\gamma}_{21}$	0.22	0.11	1.98	0.19	-0.05	0.04	-1.23	0.01

Note.  $\hat{\gamma}_r$  = robust estimate;  $\Delta$  = difference between non-robust and robust estimate; BP = between-person effect; WP = within-person effect.

**Table S10**  
*Robust Estimates: Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Need to be Alone.*

Parameter	Life satisfaction				Depressivity/anxiety			
	$\hat{\gamma}_r$	SE	t	$\Delta$	$\hat{\gamma}_r$	SE	t	$\Delta$
Personal contact frequency								
Intercept, $\hat{\gamma}_{00}$	7.01	0.16	44.29	-0.26	1.58	0.04	38.69	0.07
Time, $\hat{\gamma}_{10}$	-0.10	0.03	-3.67	-0.02	-0.01	0.01	-0.77	0.00
Personal contact (BP), $\hat{\gamma}_{02}$	0.41	0.19	2.13	0.00	-0.02	0.05	-0.43	-0.01
Personal contact (WP), $\hat{\gamma}_{20}$	0.12	0.07	1.72	0.07	0.00	0.02	0.11	0.00
Need to be alone, $\hat{\gamma}_{01}$	0.29	0.16	1.88	-0.02	-0.06	0.04	-1.55	0.02
Personal contact (BP) * Need to be alone, $\hat{\gamma}_{03}$	-0.18	0.22	-0.84	-0.07	0.04	0.06	0.64	0.04
Personal contact (WP) * Need to be alone, $\hat{\gamma}_{21}$	-0.15	0.06	-2.55	-0.05	0.01	0.02	0.41	0.01
Indirect contact frequency								
Intercept, $\hat{\gamma}_{00}$	6.84	0.16	43.57	-0.23	1.52	0.04	37.65	0.14
Time, $\hat{\gamma}_{10}$	-0.08	0.03	-2.99	-0.01	-0.01	0.01	-0.84	0.00
Indirect contact (BP), $\hat{\gamma}_{02}$	0.71	0.22	3.20	0.00	0.00	0.06	0.07	-0.01
Indirect contact (WP), $\hat{\gamma}_{20}$	0.03	0.11	0.26	-0.04	0.00	0.04	0.00	0.01
Need to be alone, $\hat{\gamma}_{01}$	0.30	0.16	1.86	-0.01	-0.07	0.04	-1.69	0.02
Indirect contact (BP) * Need to be alone, $\hat{\gamma}_{03}$	-0.01	0.22	-0.05	0.08	-0.02	0.05	-0.28	0.00
Indirect contact (WP) * Need to be alone, $\hat{\gamma}_{21}$	-0.13	0.10	-1.31	-0.04	-0.03	0.04	-0.83	0.02

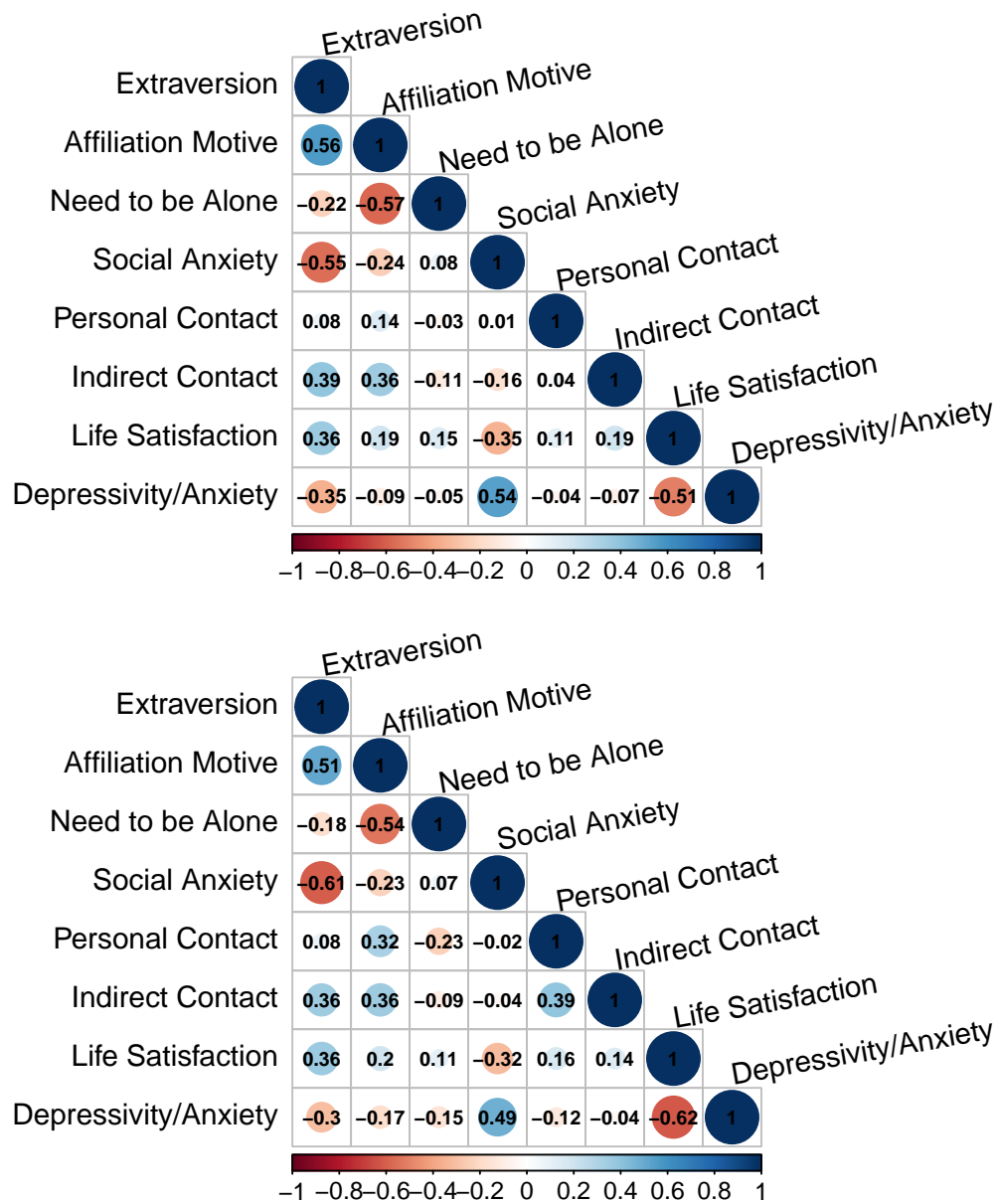
*Note.*  $\hat{\gamma}_r$  = robust estimate;  $\Delta$  = difference between non-robust and robust estimate; BP = between-person effect; WP = within-person effect.

**Table S11**  
*Robust Estimates: Fixed Effects of Well-Being Predicted by Time, Contact Frequencies, and Social Anxiety.*

Parameter	Life satisfaction			Depressivity/anxiety			
	$\hat{\gamma}_r$	SE	t	$\Delta$	$\hat{\gamma}_r$	t	$\Delta$
Personal contact frequency							
Intercept, $\hat{\gamma}_{00}$	6.95	0.15	46.16	-0.19	1.61	0.04	45.19
Time, $\hat{\gamma}_{10}$	-0.09	0.03	-3.37	-0.02	-0.01	0.01	-0.82
Personal contact (BP), $\hat{\gamma}_{02}$	0.60	0.19	3.24	-0.13	-0.07	0.04	-1.62
Personal contact (WP), $\hat{\gamma}_{20}$	0.12	0.07	1.79	0.06	0.02	0.02	0.66
Social anxiety, $\hat{\gamma}_{01}$	-0.96	0.19	-4.99	0.12	0.37	0.04	8.41
Personal contact (BP) * Social anxiety, $\hat{\gamma}_{03}$	0.74	0.27	2.71	-0.11	-0.16	0.06	-2.54
Personal contact (WP) * Social anxiety, $\hat{\gamma}_{21}$	0.14	0.09	1.57	-0.07	0.05	0.03	1.52
Indirect contact frequency							
Intercept, $\hat{\gamma}_{00}$	6.86	0.15	45.01	-0.21	1.58	0.04	44.52
Time, $\hat{\gamma}_{10}$	-0.08	0.03	-2.94	-0.01	-0.01	0.01	-0.60
Indirect contact (BP), $\hat{\gamma}_{02}$	0.60	0.22	2.80	-0.10	0.05	0.05	1.08
Indirect contact (WP), $\hat{\gamma}_{20}$	0.04	0.11	0.40	-0.05	0.07	0.04	1.80
Social anxiety, $\hat{\gamma}_{01}$	-0.87	0.19	-4.52	0.01	0.39	0.04	9.06
Indirect contact (BP) * Social anxiety, $\hat{\gamma}_{03}$	0.47	0.28	1.66	-0.19	0.05	0.06	0.77
Indirect contact (WP) * Social anxiety, $\hat{\gamma}_{21}$	0.10	0.14	0.75	0.03	0.15	0.05	3.11

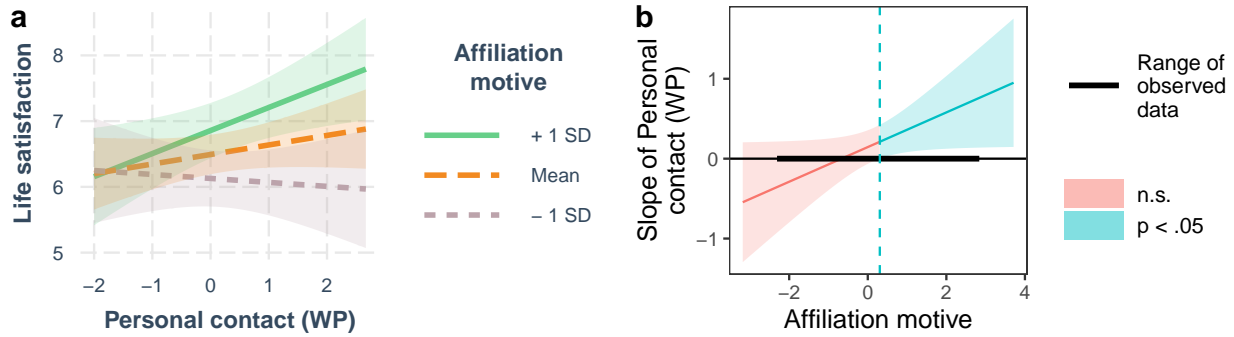
*Note.*  $\hat{\gamma}_r$  = robust estimate;  $\Delta$  = difference between non-robust and robust estimate; BP = between-person effect; WP = within-person effect.

981 Supplemental Figures



**Figure S1**

Raw correlation plots (Wei & Simko, 2017a) between the constructs included in analyses based on data from the first assessment (top plot; N = 190), and from the last assessment (bottom plot; N = 165).

**Figure S2**

*Simple-slopes plot (a) and Neyman-Johnson regions-of-significance plot (b) for the non-significant cross-level interaction effect of affiliation motive and higher-than-baseline personal contact predicting well-being. Confidence bands represent 95% confidence intervals. The variable presented on the X-axis (b) is grand-mean centered; original scale values can be computed by adding the mean of the respective variable reported in Table S1.*

## 982 Complete Software and Session Information

983 We used R (Version 4.0.4; R Core Team, 2020) and the R-packages *car* (Version  
984 3.0.12; Fox & Weisberg, 2019; Fox et al., 2020; Yentes & Wilhelm, 2018), *carData* (Version  
985 3.0.4; Fox et al., 2020), *careless* (Version 1.1.3; Yentes & Wilhelm, 2018), *citr* (Version  
986 0.3.2; Aust, 2019), *corrplot2017* (Wei & Simko, 2017b), *cowplot* (Version 1.1.1; Wilke,  
987 2020), *dplyr* (Version 1.0.7; Wickham, François, et al., 2020), *effects* (Version 4.2.0; Fox &  
988 Weisberg, 2018; Fox, 2003; Fox & Hong, 2009), *forcats* (Version 0.5.1; Wickham, 2020a),  
989 *Formula* (Version 1.2.4; Zeileis & Croissant, 2010), *ggplot2* (Version 3.3.5; Wickham, 2016),  
990 *GPArotation* (Version 2014.11.1; Bernaards & I.Jennrich, 2005), *Hmisc* (Version 4.6.0;  
991 Harrell Jr, 2021), *interactions* (Version 1.1.5; Long, 2019), *jtools* (Version 2.1.4; Long,  
992 2020), *lattice* (Version 0.20.41; Sarkar, 2008), *lme4* (Version 1.1.27.1; Bates et al., 2015),  
993 *lmerTest* (Version 3.1.3; Kuznetsova et al., 2017), *magick* (Version 2.7.3; Ooms, 2021),  
994 *MASS* (Version 7.3.53; Venables & Ripley, 2002), *Matrix* (Version 1.3.2; Bates & Maechler,  
995 2019), *MplusAutomation* (Hallquist & Wiley, 2018), *multcomp* (Version 1.4.18; Hothorn et  
996 al., 2008), *mvtnorm* (Version 1.1.1; Genz & Bretz, 2009), *nlme* (Version 3.1.152; Pinheiro et  
997 al., 2021), *papaja* (Version 0.1.0.9997; Aust & Barth, 2020), *patchwork* (Version 1.1.1;  
998 Pedersen, 2020), *png* (Version 0.1.7; Urbanek, 2013), *psych* (Version 2.1.9; Revelle, 2020),  
999 *purrr* (Version 0.3.4; Henry & Wickham, 2020), *readr* (Version 2.1.1; Wickham & Hester,  
1000 2020), *robustlmm* (Version 2.5.0; Koller, 2019), *scales* (Version 1.1.1; Wickham & Seidel,  
1001 2020), *shiny* (Version 1.7.1; Chang et al., 2020), *simr* (Green & MacLeod, 2016), *stringr*  
1002 (Version 1.4.0; Wickham, 2019), *survival* (Version 3.2.7; Terry M. Therneau & Patricia M.  
1003 Grambsch, 2000), *TH.data* (Version 1.0.10; Hothorn, 2019), *tibble* (Version 3.1.6; Müller &  
1004 Wickham, 2020), *tidyr* (Version 1.1.4; Wickham, 2020b), *tidyverse* (Version 1.3.1;  
1005 Wickham, Averick, Bryan, Chang, McGowan, François, et al., 2019), and *tinylabels*  
1006 (Version 0.2.2; Barth, 2020) for data wrangling, analyses, and plots.

1007 The following is the output of R's *sessionInfo()* command, which shows information  
1008 to aid analytic reproducibility of the analyses.



```
1009      R version 4.0.4 (2021-02-15) Platform: x86_64-apple-darwin17.0 (64-bit) Running
1010 under: macOS Big Sur 10.16
1011      Matrix products: default BLAS:
1012 /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRblas.dylib LAPACK:
1013 /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRlapack.dylib
1014      locale: [1]
1015 en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
1016      attached base packages: [1] grid stats graphics grDevices utils datasets methods
1017      [8] base
1018      other attached packages: [1] png_0.1-7 magick_2.7.3 corrplot_0.84
1019      [4] careless_1.1.3 car_3.0-12 scales_1.1.1
1020      [7] patchwork_1.1.1 effects_4.2-0 carData_3.0-4
1021      [10] cowplot_1.1.1 jtools_2.1.4 interactions_1.1.5
1022      [13] lmerTest_3.1-3 robustlmm_2.5-0 lme4_1.1-27.1
1023      [16] Matrix_1.3-2 GPArotation_2014.11-1 psych_2.1.9
1024      [19] forcats_0.5.1 stringr_1.4.0 dplyr_1.0.7
1025      [22] purrr_0.3.4 readr_2.1.1 tidyr_1.1.4
1026      [25] tibble_3.1.6 ggplot2_3.3.5 tidyverse_1.3.1
1027      [28] citr_0.3.2 papaja_0.1.0.9997 tinylabels_0.2.2
1028      loaded via a namespace (and not attached): [1] TH.data_1.0-10 minqa_1.2.4
1029 colorspace_2.0-2
1030      [4] ellipsis_0.3.2 estimability_1.3 fs_1.5.2
1031      [7] rstudioapi_0.13 farver_2.1.0 fansi_1.0.2
1032      [10] mvtnorm_1.1-1 lubridate_1.8.0 xml2_1.3.3
1033      [13] codetools_0.2-18 splines_4.0.4 mnormt_2.0.2
1034      [16] robustbase_0.93-6 knitr_1.37 jsonlite_1.7.3
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1038 [28] fastmap\_1.1.0 survey\_4.0 cli\_3.1.1  
1039 [31] later\_1.3.0 htmltools\_0.5.2 tools\_4.0.4  
1040 [34] coda\_0.19-4 gtable\_0.3.0 glue\_1.6.1  
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1043 [43] rvest\_1.0.2 mime\_0.12 miniUI\_0.1.1.1  
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1058 [88] httpuv\_1.6.5 numDeriv\_2016.8-1.1 munsell\_0.5.0  
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