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Changes in social connection during COVID-19 social distancing:

It's not (household) size that matters, it's who you're with

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## 22 **Abstract**

23 To slow the transmission of COVID-19, countries around the world have implemented social  
24 distancing and stay-at-home policies—potentially leading people to rely more on household  
25 members for their sense of closeness and belonging. To understand the conditions under which  
26 people felt the most connected, we examined whether changes in overall feelings of social  
27 connection varied by household size and composition. In two pre-registered studies,  
28 undergraduates in Canada ( $N_{\text{Study 1}}=548$ ) and adults primarily from the U.S. and U.K. ( $N_{\text{Study 2}}=336$ )  
29 reported their perceived social connection once before and once during the pandemic. In  
30 both studies, living with a partner robustly and uniquely buffered shifts in social connection  
31 during the first phases of the pandemic ( $\beta_{\text{Study 1}}=.22$ ,  $\beta_{\text{Study 2}}=.16$ ). In contrast, neither household  
32 size nor other aspects of household composition predicted changes in connection. We discuss  
33 implications for future social distancing policies that aim to balance physical health with  
34 psychological health.

35 **Keywords:** COVID-19; Social Connection; Public Policy; Loneliness

36 Changes in social connection during COVID-19 social distancing:  
37 It's not (household) size that matters, it's who you're with

## 38 **Introduction**

39 On March 11, 2020, the Centers for Disease Control and Prevention (1) declared the  
40 COVID-19 outbreak a pandemic. By early April, COVID-19 had already spread to nearly 1.5  
41 million people worldwide (2). In an effort to slow down its transmission, countries around the  
42 world implemented social/physical distancing guidelines (3), compelling individuals to stay at  
43 least 6 feet (2 meters) away from anyone outside their household (4). Early in its  
44 implementation, the WHO (2) announced that it would be moving away from the term “social  
45 distancing” and begin using “physical distancing” to more accurately describe the practice.  
46 However, the original term stuck, especially in the U.S., U.K., Australia, Italy, France, Poland,  
47 Russia, India, South Korea, and Hong Kong, even though the very label of “social distancing”  
48 arguably undermines feelings of social connection. We use “social distancing” in this paper to  
49 reflect common usage. Such non-pharmaceutical public health interventions have been long  
50 proposed to reduce the spread of infectious disease. For example, mathematical modeling  
51 suggests that social distancing can reduce transmission of influenza by over 90% (5), and  
52 retrospective analyses of past pandemics (e.g., in 1918-1919) show that areas that implemented  
53 social distancing measures earlier were slower to reach peak and total mortality rates (6).  
54 However, although social distancing policies have historically helped protect physical health  
55 worldwide, these policies have also greatly limited people's range of social interactions, an  
56 important cost to weigh against their benefits.

57 Understanding the ways in which policy makers can balance physical health and  
58 psychological health while continuing social distancing has generated recent interest (7-9). This

59 calculus is crucial, as social distancing for extended periods of time may strain people's needs  
60 for social connection to such an extent that they may eventually disregard policy guidelines.  
61 Social connection, or a sense of belonging and closeness with others, is fundamental to human  
62 development and well-being (10-13). For example, having frequent social interactions and  
63 spending more time talking with others are both associated with greater well-being (14-16).  
64 Furthermore, experiments have shown that people prompted to engage in more social  
65 interactions relative to control activities report higher levels of positive emotion and social  
66 connectedness (17-19). In sum, understanding the conditions under which social connection is  
67 maximized during COVID-19 social distancing may inform future policies that can strike a  
68 balance between ensuring that people continue to social distance to protect physical health and  
69 ensuring that they stay socially connected to protect psychological health.

70         Social distancing initiatives have led millions of people globally to stay in their homes  
71 (20), abruptly forcing individuals to rely on their household members for their sense of overall  
72 social connection. This shift may pose a risk for those living alone, who report experiencing  
73 relatively more loneliness even under normal circumstances (21, 22). Living in a larger  
74 household has been shown to be protective of loneliness (23), suggesting that living in larger  
75 households may safeguard people from declines in social connection during the pandemic. In  
76 light of the stressful and uncertain nature of the pandemic, a larger household may offer not only  
77 more opportunity for social interactions but greater social support, which is associated with well-  
78 being (24). However, living in bigger households, which requires sharing a space day in, day out  
79 with the same people, may lead to greater tension, conflict, and sense of being crowded (25).

80         Living with a partner in particular may offer unique advantages (21), especially during  
81 stressful times (26). Living with a partner is also protective of loneliness compared to being

82 single and living alone—and even compared to having a partner but not cohabiting (21). In a  
83 large study following 30,000 people, the most important social behavior that predicted well-  
84 being was the amount of time spent with a partner (27). However, although the weight of the  
85 evidence supports the benefits of living with partners on social connection, the stress caused by  
86 the pandemic—and the friction associated with couples forced to spend all day together in close  
87 quarters (see 28, for examples)—may also negatively impact relationships (29).

88         Aside from partners, other household members may also provide feelings of closeness  
89 and opportunities for interaction. For example, living with children is linked with higher well-  
90 being (30) and lower levels of loneliness (31), and so is sharing a household with pets (32).  
91 However, such benefits may be limited during a pandemic in which children are homeschooled,  
92 parents are working remotely from home or else looking for work, and neither pet owners nor  
93 their pets are able to interact socially with their peers.

94         Unlike social distancing policies during past pandemics, COVID-19 is unique because  
95 people today have the ability to connect digitally not only by phone, but through the use of social  
96 media, video calling, and text messaging. However, although connecting via digital and social  
97 media has been found to enhance offline relationships (33, 34), digital communication often feels  
98 unnatural and lacks rich nonverbal cues, which may hinder mutual understanding (35) and be  
99 cognitively taxing (36). In times of stress and crisis, these forms of online communication may in  
100 turn promote other negative outcomes, such as “Zoom fatigue” (37). Thus, face-to-face  
101 interactions with household members are likely to be essential to increased feelings of social  
102 connectedness.

103         In sum, social connection is crucial for both psychological and physical health, perhaps  
104 especially so during an unprecedented global pandemic that has claimed more lives than

105 World War I (38). How can future policy guidelines balance protecting physical health through  
106 social distancing with protecting psychological health by maintaining feelings of connection? To  
107 understand the conditions under which people felt the most connected, we examined whether  
108 changes in overall feelings of social connection varied as a function of household size and  
109 composition.

## 110 **Present Research**

111 In two pre-registered studies of undergraduates at a Canadian university ( $N_{\text{Study 1}} = 548$ )  
112 and adults primarily residing in the United States and United Kingdom ( $N_{\text{Study 2}} = 336$ ), we  
113 followed individuals before and during the COVID-19 pandemic to examine changes in feelings  
114 of social connection based on (1) household size and (2) household composition. Using two-  
115 tailed tests, we tested the following primary hypotheses. First, we expected people in larger  
116 households to show relatively smaller declines (or bigger increases) in social connection as a  
117 result of the COVID-19 pandemic. Second, we hypothesized that household composition would  
118 predict changes in social connection as a result of the COVID-19 pandemic. In examining  
119 household composition, we focused on whether participants lived with a partner (or not), lived  
120 with a pet (or not), and were caregivers (or not). Feelings of social connection were assessed  
121 with three different measures—the Social Connectedness Scale (Study 1; 39), the relatedness  
122 subscale of the Balanced Measure of Psychological Needs (BMPN; Study 2; 40), and the UCLA  
123 Loneliness Scale (Study 2; 41).

## 124 **Study 1**

125 Undergraduates at the University of British Columbia completed our measures as part of  
126 two separate surveys. We obtained ethics approval from the Behavioral Research Ethics Board at

127 the University of British Columbia, and participants provided written consent to be part of our  
128 study. The first survey was completed before the COVID-19 pandemic (Time<sub>1</sub>), and the second  
129 survey was completed during the COVID-19 pandemic (Time<sub>2</sub>). We pre-registered our analysis  
130 plan and stopping rules on the OSF and they are available at [<https://tinyurl.com/yddwt28v>]. A  
131 separate pre-registered study that used a portion of the data to answer a different research  
132 question can also be found on the OSF at [<https://tinyurl.com/ybwz8ufb>].

## 133 **Method**

134 **Time<sub>1</sub>.** Between January 6, 2020 and the end of March 2020, 3,504 participants  
135 completed demographic questions and a social connection measure alongside other items as part  
136 of an optional department-wide pre-screening. For consistency with Study 2, we only included  
137 participants who completed this questionnaire on or before February 12, 2020, resulting in a  
138 Time<sub>1</sub> sample of 2,903 students. After removing participants who were missing more than two  
139 items on the social connection measure (as pre-registered), we obtained a total sample of 2,708  
140 eligible participants.

141 **Time<sub>2</sub>.** We invited participants who had completed pre-screening at Time<sub>1</sub> to complete a  
142 second survey between April 1 - 8<sup>th</sup>, 2020. The Time<sub>2</sub> survey consisted of the same measure of  
143 social connection as in the Time<sub>1</sub> survey, as well as measures assessing students' living  
144 arrangements, behaviors, and experiences during the COVID-19 pandemic. A total of 1,059  
145 participants completed the Time<sub>2</sub> survey. As pre-registered, 8 participants were removed for  
146 responding 12 or more times in a row with the same answer on the social connectedness measure  
147 and 1 participant was removed for failing to answer more than 2 items on the social  
148 connectedness measure. Although not pre-registered, we also removed participants who did not

149 supply an ID number to link responses ( $n = 125$ ) or completed the survey twice ( $n = 22$ ), For  
150 those who completed the survey twice, we only included their responses from the first survey.

151 Of the remaining 903 participants, 548 participants ( $M_{age} = 20.78$ ,  $SD_{age} = 2.96$ ; 77%  
152 women) completed both surveys and met our inclusion criteria. Participants in this final dataset  
153 did not significantly differ from the remaining eligible participants who completed the Time<sub>1</sub>  
154 survey in Time<sub>1</sub> social connection ( $p = .359$ ) or household income ( $p = .154$ ). Because we aimed  
155 to recruit as many participants as possible, we did not conduct an a priori power analysis;  
156 however, based on sensitivity analyses using GPower (47) and assuming two-tailed  $\alpha = 0.05$  and  
157 80% power, we should have been able to detect a small effect size of  $f^2 = .01$  ( $R_{adj}^2 = .02$ ) in a 2-  
158 predictor regression model and  $f^2 = .01$  ( $R_{adj}^2 = .001$ ) in a 5-predictor regression model.  $R^2$  is  
159 reported in the manuscript. The dataset for the final sample can be found on the OSF at  
160 [<https://tinyurl.com/y7nvg5vf>].

## 161 **Measures**

162 The measures for Study 1 can be found on OSF at [<https://tinyurl.com/y7jfk4al>].

163 **Social Connection.** Social connection was assessed with the revised 20-item Social  
164 Connectedness Scale (39). Participants indicated their level of agreement with items such as, “I  
165 feel close to people” and “I feel understood by the people I know” (1 = *strongly disagree*, 6 =  
166 *strongly agree*). We removed the item, “I feel comfortable in the presence of strangers” from  
167 both time points, because it may have had a different meaning in the midst of the pandemic.  
168 Participants completed the measure at Time<sub>1</sub> with reference to their general view of themselves  
169 ( $\alpha = .94$ ). At Time<sub>2</sub> however, due to the rapid changes to daily life that participants were  
170 experiencing, we asked them to think about the past week ( $\alpha = .93$ ).

171           **Household Size and Composition.** To assess household size, we asked participants  
172 “other than yourself, how many people are currently living in the same place you are now?” with  
173 answer choices ranging from “living alone” to “10+ people.” For each person in their household,  
174 participants specified whether the person was a “spouse/partner/girlfriend/boyfriend”  
175 (subsequently referred to as *partner*), “child,” “parent,” “brother/sister,” “other family member,”  
176 “friend,” “roommate/acquaintance,” “live-in help,” or “other.” Participants could only select one  
177 option per household member.

178           **Living with Pets.** We asked whether participants were “currently living with any pets”  
179 (yes/no).

180           **Being a Caregiver.** Participants were asked whether they were “currently the primary  
181 caregiver for anyone else (e.g., children or elderly family members)” (yes/no).

182           **Social/Physical distancing.** Participants indicated whether they were “currently  
183 practicing social or physical distancing,” and to indicate how many people aside from their  
184 household members got to within 6 feet or less of them on the previous day.

185           **Hours Spent Video Calling with Family and Friends.** Participants were asked  
186 “yesterday, how many hours did you video call with family and friends” with answer choices  
187 ranging from “0” to “10+ hours.”

## 188 **Study 1 Results**

189           The code used to conduct the Study 1 analyses can be found on the OSF at  
190 [<https://tinyurl.com/y7b8cnw3>]. Correlations between all variables in Study 1 can be found in  
191 Table 1.

192 **Table 1. Correlations Among Variables (Study 1).**

|                        | Household Size | Living Alone | Living with Partner | Living with Child(ren) | Living with Pet | Being a Caregiver | Hours Video Calling | Social Distancing | T1 Connectedness | T2 Connectedness |
|------------------------|----------------|--------------|---------------------|------------------------|-----------------|-------------------|---------------------|-------------------|------------------|------------------|
| Household Size         | 1              |              |                     |                        |                 |                   |                     |                   |                  |                  |
| Living Alone           | -.50***        | 1            |                     |                        |                 |                   |                     |                   |                  |                  |
| Living with Partner    | -.06           | -.12**       | 1                   |                        |                 |                   |                     |                   |                  |                  |
| Living with Child(ren) | .05            | -.03         | .10*                | 1                      |                 |                   |                     |                   |                  |                  |
| Living with Pet        | .19***         | -.17***      | .04                 | .03                    | 1               |                   |                     |                   |                  |                  |
| Being a Caregiver      | .08            | -.03         | .07                 | .40***                 | .07             | 1                 |                     |                   |                  |                  |
| Hours Video Calling    | -.01           | .02          | -.07                | .10*                   | -.02            | .05               | 1                   |                   |                  |                  |
| Social Distancing      | .05            | -.10*        | .05                 | .01                    | -.02            | .01               | .03                 | 1                 |                  |                  |
| T1 Connectedness       | .06            | -.08         | -.01                | -.01                   | .05             | .03               | .12**               | .04               | 1                |                  |
| T2 Connectedness       | .06            | -.09*        | .08                 | -.03                   | -.03            | .03               | .14***              | .04               | .64***           | 1                |

193 Note. \*\*\* =  $p < .001$ . \*\* =  $p < .01$ . \* =  $p < .05$ .

194 ***Did household size buffer changes in social connection as a result of the COVID-19***  
 195 ***pandemic?***

196 As reported in Folk et al. (42), our sample exhibited a slight but significant decrease in  
 197 feelings of social connectedness from Time<sub>1</sub> to Time<sub>2</sub>, and 98% of participants indicated they  
 198 were social/physical distancing (see Table 2).

199 **Table 2. Means and Standard Deviations for Household Size and Composition (Study 1).**

| Household Variable         | Sample Size | Time 1 Connectedness | Time 2 Connectedness | Social Distancing | Six Feet    |
|----------------------------|-------------|----------------------|----------------------|-------------------|-------------|
| Full Sample                | 548         | 4.11 (0.85)          | 3.98 (0.83)          | 98% Yes           | 0.74 (1.35) |
| Living Alone               | 49          | 3.90 (0.95)          | 3.74 (0.82)          | 94% Yes           | 0.67 (1.18) |
| Not Living Alone           | 499         | 4.13 (0.84)          | 4.00 (0.83)          | 99% Yes           | 0.74 (1.37) |
| Living with Partner        | 67          | 4.10 (0.98)          | 4.16 (0.89)          | 100% Yes          | 0.91 (1.58) |
| Not Living with Partner    | 481         | 4.12 (0.84)          | 3.96 (0.82)          | 98% Yes           | 0.71 (1.31) |
| Living with Child(ren)     | 4           | 3.97 (1.22)          | 3.64 (1.07)          | 100% Yes          | 1.75 (2.06) |
| Not Living with Child(ren) | 544         | 4.11 (.85)           | 3.98 (0.83)          | 98% Yes           | 0.73 (1.34) |
| Living with Pet            | 184         | 4.18 (0.83)          | 3.94 (0.87)          | 98% Yes           | 0.82 (1.38) |
| Not Living with Pet        | 364         | 4.08 (0.86)          | 4.00 (0.82)          | 98% Yes           | 0.70 (1.34) |
| Being a Caregiver          | 6           | 4.38 (0.94)          | 4.24 (1.17)          | 100% Yes          | 0.67 (1.63) |
| Not Being a Caregiver      | 542         | 4.11 (0.85)          | 3.98 (0.83)          | 98% Yes           | 0.74 (1.35) |

200 **Pre-Registered Analyses.** First, we examined whether household size (i.e., number of  
 201 people in the household other than themselves) as a continuous measure ( $M = 2.54$ , range = 0 to  
 202 9 [with 77% living with 3 others or fewer],  $SD = 1.58$ ) was associated with Time<sub>2</sub> social  
 203 connectedness, controlling for Time<sub>1</sub> connectedness. After controlling for Time<sub>1</sub> connectedness,  
 204 household size did not significantly predict Time<sub>2</sub> connectedness,  $b = 0.01$ , 95% CI = [-0.02,  
 205 0.04],  $p = .532$  (see Table 3, Model 1). We then examined the association between living alone  
 206 and Time<sub>2</sub> social connectedness, controlling for Time<sub>1</sub> connectedness. In this model, living alone  
 207 ( $n = 49$ ) was not significantly associated with Time<sub>2</sub> connectedness  $b = -0.12$ , 95% CI = [-0.30,  
 208 0.07],  $p = .230$  (see Table 3, Model 2).

209 *Did household composition buffer changes in social connection as a result of the COVID-19*  
 210 *pandemic?*

211 **Pre-Registered Analyses.** While household size did not appear to play a role in changes  
 212 in social connectedness from before to mid-pandemic, we investigated whether features of  
 213 household composition were related to Time<sub>2</sub> connectedness. Controlling for Time<sub>1</sub>  
 214 connectedness, living with a partner ( $n = 67$ ) predicted significantly greater social connectedness  
 215 at Time<sub>2</sub>,  $b = 0.22$ , 95% CI = [0.06, 0.38],  $p = .008$  (see Table 3, Model 3). See Figure 1 for an  
 216 illustration of this finding. In contrast, living with a pet ( $n = 184$ ) was associated with lower  
 217 Time<sub>2</sub> connectedness after controlling for Time<sub>1</sub> connectedness,  $b = -0.12$ , 95% CI = [-0.24, -  
 218 0.01],  $p = .036$  (see Table 3, Model 4). Although we also pre-registered a similar analysis  
 219 investigating the effects of being a caregiver on social connection, we did not conduct it, as only  
 220 6 out of 548 participants reported being a caregiver.

221 **Exploratory Analyses.** To further investigate the relationship between household size  
 222 and composition and Time<sub>2</sub> social connection, we entered the household variables (household  
 223 size, living alone, living with a partner, and having a pet) into a single model predicting Time<sub>2</sub>  
 224 social connectedness while controlling for Time<sub>1</sub> connectedness. Consistent with the results of  
 225 our pre-registered analyses, in this full model, living with a partner was significantly associated  
 226 with higher Time<sub>2</sub> social connectedness,  $b = 0.22$ , 95% CI = [0.06, 0.39],  $p = .008$ , whereas  
 227 having a pet was significantly associated with lower Time<sub>2</sub> social connectedness,  $b = -0.15$ , 95%  
 228 CI = [-0.26, -0.03],  $p = .014$  (see Table 3, Model 5). No other effects were significant.

229 **Table 3. Results of Multiple Regression Models (Study 1).**

| Model: Predictor & Dependent Variable                     | Adjusted R <sup>2</sup> | $b$ (SE)    | 95% CI       | $\beta$ | $t$   | $p$   |
|---|-------------------------|-------------|--------------|---------|-------|-------|
| <i>Model 1: Household Size &amp; Time 2 Connectedness</i> | .41                     |             |              |         |       |       |
| Time 1 Connectedness                                      |                         | 0.63 (0.03) | [0.56, 0.69] | 0.64    | 19.44 | <.001 |

|  |     |              |                |       |        |       |
|--|-----|--------------|----------------|-------|--------|-------|
| Household Size   |     | 0.01 (0.02)  | [-0.02, 0.4]   | 0.02  | 0.625  | .532  |
| <i>Model 2: Living Alone &amp; Time 2 Connectedness</i>        | .41 |              |                |       |        |       |
| Time 1 Connectedness   |     | 0.62 (0.03)  | [0.56, 0.69]   | 0.64  | 19.37  | <.001 |
| Living Alone   |     | -0.12 (0.10) | [-0.30, 0.07]  | -0.04 | -1.20  | .230  |
| <i>Model 3: Living with Partner &amp; Time 2 Connectedness</i> | .41 |              |                |       |        |       |
| Time 1 Connectedness   |     | 0.63 (0.03)  | [0.56, 0.69]   | 0.64  | 19.64  | <.001 |
| Living with Partner  |     | 0.22 (0.08)  | [0.06, 0.38]   | 0.09  | 2.65   | .008  |
| <i>Model 4: Living with Pet(s) &amp; Time 2 Connectedness</i>  | .41 |              |                |       |        |       |
| Time 1 Connectedness   |     | 0.63 (0.03)  | [0.57, 0.69]   | 0.64  | 19.67  | <.001 |
| Living with Pet(s)   |     | -0.12 (0.06) | [-0.24, -0.01] | -0.07 | -2.10  | .036  |
| <i>Model 5: All Variables &amp; Time 2 Connectedness</i>       | .42 |              |                |       |        |       |
| Time 1 Connectedness   |     | 0.63 (0.03)  | [0.56, 0.69]   | 0.64  | 19.651 | <.001 |
| Household Size   |     | 0.01 (0.02)  | [-0.03, 0.05]  | 0.03  | 0.684  | .494  |
| Living Alone   |     | -0.09 (0.11) | [-0.31, 0.13]  | -0.03 | -0.774 | .439  |
| Living with Partner  |     | 0.22 (0.08)  | [0.06, 0.39]   | 0.09  | 2.656  | .008  |
| Living with Pet(s)   |     | -0.15 (0.06) | [-0.26, -0.03] | -0.08 | -2.472 | .014  |

230 *Was the relationship between household size and changes in social connection mediated by*  
 231 *total hours video calling with family and friends or social distancing?*

232 **Pre-Registered Analyses.** It is possible that we observed no relationship between  
 233 household size and shifts in social connection because individuals in smaller households may be  
 234 more likely to engage in video calling or may be less likely to socially distance from non-  
 235 household members. However, correlations among these variables were nonsignificant (see  
 236 Table 1), precluding mediation. The pre-registered mediation analyses are presented in S1 Table.

## 237 Study 2

238 Given our first study's reliance on college students, we sought to replicate its results with  
 239 a sample of adults from around the globe (U.S., U.K., and 26 other countries), who were  
 240 recruited to complete our survey at two timepoints: once prior (Time<sub>1</sub>) and once during (Time<sub>2</sub>)  
 241 the COVID-19 pandemic. We obtained ethics approval from the Institutional Review Board at  
 242 the University of California, Riverside, and participants provided written consent to join our  
 243 study. Our pre-registered stopping rules and analysis plans for Study 2 are available at

244 [<https://tinyurl.com/y8s5ssm9>] on the OSF website. A portion of the data was also included in  
245 another pre-registered study [<https://tinyurl.com/yc8b2n44>].

## 246 **Method**

247 **Time<sub>1</sub>**. On February 12, 2020, participants ( $N = 396$ ;  $M_{age} = 31.61$ ,  $SD_{age} = 11.88$ ; 55%  
248 Male; 80% White; 46% single/never married; 32% U.S.; 27% U.K.) completed measures of  
249 social connection, loneliness, and demographics (along with other measures that were not part of  
250 our pre-registered analysis plan). All participants were recruited from Prolific Academic™, a  
251 recruitment platform demonstrated to provide quality online data (43).

252 **Time<sub>2</sub>**. From April 1 to April 8, 2020, we re-recruited the same Prolific users who had  
253 completed all Time<sub>1</sub> measures to participate in our Time<sub>2</sub> survey. Time<sub>2</sub> included the same  
254 measures assessed at Time<sub>1</sub>, as well as additional exploratory measures about participants'  
255 experiences during COVID-19. Our final sample comprised 336 participants ( $M_{age} = 32.03$ ,  
256  $SD_{age} = 11.94$ ; 55% Male; 80% White; 45% single/never married; 32% U.S.; 27% U.K.) who  
257 completed both Time<sub>1</sub> and Time<sub>2</sub> surveys and met our pre-registered inclusion criteria. A  
258 sensitivity analysis using GPower (47), assuming two-tailed  $\alpha = 0.05$  and 80% power, revealed  
259 the power to detect a small effect size of  $f^2 = .03$  ( $R_{adj}^2 = .02$ ) in a 2-predictor regression model  
260 and  $f^2 = .03$  ( $R_{adj}^2 = .01$ ) in a 7-predictor regression model.  $R^2$  is reported in the manuscript. The  
261 final dataset for Study 2 can be found on OSF at [<https://tinyurl.com/yc8b2n44>].

## 262 **Measures**

263 The measures for Study 2 can be found on OSF at [<https://tinyurl.com/yapg6tdt>]. The  
264 same measures of (1) household size, (2) household composition (i.e., living with a partner), (3)

265 living with pets, (4) being a caregiver, (5) social/physical distancing, and (6) hours spent video  
266 calling with family and friends were used as in Study 1.

267       **Social Connection.** Social connection in this study was assessed with two measures: (1)  
268 the 6-item relatedness subscale of the BMPN (1) and (2) the 20-item UCLA Loneliness Scale  
269 (41). The relatedness subscale asked participants to think about the past week and rate agreement  
270 with statements such as, “I felt close and connected with other people who are important to me”  
271 (1 = *strongly disagree*, 7 = *strongly agree*). Relatedness scores were highly reliable at both  
272 Time<sub>1</sub> ( $\alpha = .76$ ) and Time<sub>2</sub> ( $\alpha = .77$ ). The UCLA Loneliness Scale prompted participants to  
273 respond to statements based on how they feel in general (e.g., “People are around me but not  
274 with me”; 1 = *never*, 4 = *often*). Loneliness scores were highly reliable at both Time<sub>1</sub> ( $\alpha = .88$ )  
275 and Time<sub>2</sub> ( $\alpha = .88$ ).

276       **Hours Spent Working Outside the Home.** Participants were additionally asked “how  
277 many hours per week do you work outside the home?” with answer choices ranging from “0” to  
278 “40+ hours.”

279       **Additional Exclusion Criteria.** As pre-registered, to screen out inattentive participants,  
280 we planned to exclude those who provided the same answer 15 times in a row on the 20-item  
281 UCLA Loneliness Scale. We also pre-registered to exclude those who were missing more than 1  
282 item on the 6-item BMPN relatedness subscale and missing more than 2 items on the UCLA  
283 Loneliness Scale. However, we did not have any instances of inattentiveness or missing data.

## 284 **Study 2 Results**

285       The R code used for the analyses in Study 2 can be found on OSF at  
286 [<https://tinyurl.com/y7nhpx7h>]. Correlations among variables in Study 2 can be found in Table 4.

287 **Table 4. Correlations Among Variables (Study 2).**

|                        | Household Size | Living Alone | Living with Partner | Living with Child(ren) | Living with Pet | Being a Caregiver | Hours Video Calling | Social Distancing | T1 Relatedness | T2 Relatedness | T1 Loneliness | T2 Loneliness |
|------------------------|----------------|--------------|---------------------|------------------------|-----------------|-------------------|---------------------|-------------------|----------------|----------------|---------------|---------------|
| Household Size         | 1              |              |                     |                        |                 |                   |                     |                   |                |                |               |               |
| Living Alone           | -.62***        | 1            |                     |                        |                 |                   |                     |                   |                |                |               |               |
| Living with Partner    | .11*           | -.34***      | 1                   |                        |                 |                   |                     |                   |                |                |               |               |
| Living with Child(ren) | .29***         | -.24***      | .58***              | 1                      |                 |                   |                     |                   |                |                |               |               |
| Living with Pet        | .13*           | -.17**       | .20***              | .09                    | 1               |                   |                     |                   |                |                |               |               |
| Being a Caregiver      | .20***         | -.21***      | .47***              | .65***                 | .08             | 1                 |                     |                   |                |                |               |               |
| Hours Video Calling    | .11*           | -.08         | -.07                | -.03                   | .11             | .00               | 1                   |                   |                |                |               |               |
| Social Distancing      | .06            | -.04         | .01                 | .00                    | -.08            | -.02              | -.29***             | 1                 |                |                |               |               |
| T1 Relatedness         | -.01           | .02          | .15**               | .09                    | .14**           | .09               | .00                 | -.03              | 1              |                |               |               |
| T2 Relatedness         | -.01           | -.06         | .25***              | .14*                   | .15**           | .13*              | .00                 | -.02              | .50***         | 1              |               |               |
| T1 Loneliness          | -.10           | .15**        | -.22***             | -.16**                 | -.13*           | -.13*             | -.08                | .01               | -.67***        | -.47***        | 1             |               |
| T2 Loneliness          | -.11           | .12*         | -.20***             | -.12*                  | -.14*           | -.07              | -.04                | .04               | -.58***        | -.63***        | .80***        | 1             |

288 Note. \*\*\* =  $p < .001$ . \*\* =  $p < .01$ . \* =  $p < .05$ .

289 ***Did household size buffer changes in social connection as a result of the COVID-19***  
 290 ***pandemic?***

291 As reported by Folk et al. (2020), our sample showed no changes in relatedness and small  
 292 but significant improvements in loneliness from before to after the pandemic. Additionally, 93%  
 293 of participants reported that they were social distancing (see Table 5).

294 **Table 5. Means and Standard Deviations for Household Size and Composition (Study 2).**

| Household Variable         | Sample Size | Time 1 Relatedness | Time 2 Relatedness | Time 1 Loneliness | Time 2 Loneliness | Social Distancing | Six Feet    |
|----------------------------|-------------|--------------------|--------------------|-------------------|-------------------|-------------------|-------------|
| Household Size             | 336         | 4.92 (1.09)        | 4.91 (1.14)        | 2.20 (0.51)       | 2.16 (0.49)       | 93% Yes           | 1.12 (1.75) |
| Living Alone               | 55          | 4.98 (1.02)        | 4.75 (1.10)        | 2.37 (0.52)       | 2.29 (0.50)       | 91% Yes           | 1.24 (2.01) |
| Not Living Alone           | 281         | 4.91 (1.10)        | 4.94 (1.15)        | 2.17 (0.50)       | 2.13 (0.48)       | 94% Yes           | 1.09 (1.70) |
| Living with Partner        | 124         | 5.14 (1.04)        | 5.29 (1.05)        | 2.06 (0.50)       | 2.03 (0.46)       | 94% Yes           | 1.14 (1.71) |
| Not Living with Partner    | 212         | 4.80 (1.09)        | 4.69 (1.14)        | 2.29 (0.50)       | 2.23 (0.49)       | 93% Yes           | 1.10 (1.78) |
| Living with Child(ren)     | 74          | 5.11 (1.08)        | 5.20 (1.06)        | 2.05 (0.49)       | 2.05 (0.47)       | 93% Yes           | 1.28 (1.69) |
| Not Living with Child(ren) | 262         | 4.87 (1.08)        | 4.83 (1.15)        | 2.25 (0.51)       | 2.19 (0.49)       | 93% Yes           | 1.07 (1.77) |
| Living with Pet            | 168         | 5.08 (1.10)        | 5.08 (1.20)        | 2.14 (0.51)       | 2.09 (0.49)       | 91% Yes           | 1.07 (1.69) |
| Not Living with Pet        | 168         | 4.77 (1.05)        | 4.74 (1.06)        | 2.27 (0.51)       | 2.22 (0.48)       | 95% Yes           | 1.17 (1.82) |
| Being a Caregiver          | 63          | 5.13 (0.96)        | 5.22 (1.07)        | 2.06 (0.47)       | 2.09 (0.47)       | 92% Yes           | 1.41 (1.71) |
| Not Being a Caregiver      | 273         | 4.88 (1.11)        | 4.84 (1.15)        | 2.24 (0.52)       | 2.17 (0.49)       | 93% Yes           | 1.05 (1.76) |

295 **Pre-Registered Analyses.** We first examined whether a continuous measure of  
 296 household size ( $M = 2.38$ , range = 0 to 5 [with 88% living with 2 others or fewer],  $SD = 0.98$ )  
 297 was associated with our two measures of Time<sub>2</sub> social connection (relatedness and loneliness),  
 298 after controlling for Time<sub>1</sub> social connection. Similar to Study 1, after controlling for Time<sub>1</sub>  
 299 social connection, household size did not predict Time<sub>2</sub> social connection for relatedness,  $b = -$   
 300  $.003$ , 95% CI = [-0.11, 0.10],  $p = .954$  (see Table 6, Model 1) or loneliness,  $b = -0.01$ , 95% CI [-  
 301  $0.04, 0.02$ ],  $p = .456$  (see Table 6, Model 2). Similarly, living alone ( $n = 55$ ) compared to not  
 302 living alone ( $n = 281$ ) was not reliably associated with Time<sub>2</sub> social connection for relatedness,  $b$   
 303  $= -.23$ , 95% CI [-0.51, 0.06],  $p = .119$  (see Table 6, Model 3) or loneliness,  $b = .004$ , 95% CI [  
 304  $-0.08, 0.09$ ],  $p = .925$  (see Table 6, Model 4) after controlling for Time<sub>1</sub> social connection.

305 ***Did household composition buffer changes in social connection as a result of the COVID-19***  
 306 ***pandemic?***

307 **Pre-Registered Analyses.** Next, we tested whether aspects of household composition  
 308 were associated with Time<sub>2</sub> social connection, controlling for Time<sub>1</sub> levels of social connection,  
 309 for our two measures of social connection (loneliness and relatedness). None of the household  
 310 composition variables were significantly associated with Time<sub>2</sub> loneliness, when controlling for  
 311 Time<sub>1</sub> loneliness (see Table 6). However, consistent with Study 1, living with a partner ( $n = 124$ )  
 312 was associated with greater Time<sub>2</sub> relatedness after controlling for Time<sub>1</sub> relatedness,  $b = .43$ ,  
 313 95% CI [0.21, 0.65],  $p < .001$  (see Table 6, Model 5; see Figure 1 for an illustration of this  
 314 finding). We repeated the same analysis with each of the other household composition variables.  
 315 Living with children was linked to marginally greater Time<sub>2</sub> relatedness after controlling for  
 316 Time<sub>1</sub> relatedness, ( $n = 74$ ;  $b = .25$ , 95% CI [-0.004, 0.51],  $p = .053$  (see Table 6, Model 7).  
 317 Finally, living with pets ( $n = 168$ ;  $b = .18$ , 95% CI [-0.03, 0.40],  $p = .093$  (see Table 6, Model 9)  
 318 and being a caregiver ( $n = 63$ ;  $b = .25$ , 95% CI [-0.02, 0.52],  $p = .074$  (see Table 6, Model 11)  
 319 showed similar marginal positive effects.

320 **Table 6. Results of Multiple Regression Models (Study 2).**

| Model: Predictor & Dependent Variable                   | Adjusted R <sup>2</sup> | $b$ (SE)    | 95% CI        | $\beta$ | $t$    | $p$    |
|---|-------------------------|-------------|---------------|---------|--------|--------|
| <i>Model 1: Household Size &amp; Time 2 Relatedness</i> |                         |             |               |         |        |        |
| Time 1 Relatedness                                      | .25                     | .53 (.05)   | [0.43, 0.63]  | .50     | 10.611 | < .001 |
| Household Size  |                         | -.003 (.05) | [-0.11, 0.10] | -.003   | -0.058 | .954   |
| <i>Model 2: Household Size &amp; Time 2 Loneliness</i>  |                         |             |               |         |        |        |
| Time 1 Loneliness                                       | .65                     | .77 (.03)   | [0.70, 0.83]  | .80     | 24.553 | < .001 |
| Household Size  |                         | -.01 (.02)  | [-0.04, 0.02] | -.02    | -0.747 | .456   |
| <i>Model 3: Living Alone &amp; Time 2 Relatedness</i>   |                         |             |               |         |        |        |
| Time 1 Relatedness                                      | .25                     | .53 (.05)   | [0.43, 0.63]  | .50     | 10.685 | < .001 |
| Living Alone  |                         | -.23 (.15)  | [-0.51, 0.06] | -.07    | -1.562 | .119   |
| <i>Model 4: Living Alone &amp; Time 2 Loneliness</i>    |                         |             |               |         |        |        |
| Time 1 Loneliness                                       | .65                     | .77 (.03)   | [0.71, 0.83]  | .80     | 24.464 | < .001 |

|   |     |            |                |      |        |        |
|---|-----|------------|----------------|------|--------|--------|
| Living Alone  |     | .00 (.05)  | [-0.08, 0.13]  | .00  | 0.094  | .925   |
| <i>Model 5: Living with Partner &amp; Time 2 Relatedness</i>    | .28 |            |                |      |        |        |
| Time 1 Relatedness  |     | .50 (.05)  | [0.40, 0.60]   | .48  | 10.139 | < .001 |
| Living with Partner   |     | .43 (.11)  | [0.21, 0.65]   | .18  | 3.864  | < .001 |
| <i>Model 6: Living with Partner &amp; Time 2 Loneliness</i>     | .65 |            |                |      |        |        |
| Time 1 Loneliness   |     | .76 (.03)  | [0.70, 0.83]   | .80  | 24.006 | < .001 |
| Living with Partner   |     | -.03 (.03) | [-0.09, 0.04]  | -.03 | -0.801 | .424   |
| <i>Model 7: Living with Child(ren) &amp; Time 2 Relatedness</i> | .26 |            |                |      |        |        |
| Time 1 Relatedness  |     | .52 (.05)  | [0.42, 0.62]   | .49  | 10.452 | < .001 |
| Living with Child(ren)  |     | .25 (.13)  | [-0.004, 0.51] | .09  | 1.94   | .053   |
| <i>Model 8: Living with Child(ren) &amp; Time 2 Loneliness</i>  | .65 |            |                |      |        |        |
| Time 1 Loneliness   |     | .77 (.03)  | [0.71, 0.83]   | .81  | 24.465 | < .001 |
| Living with Child(ren)  |     | .01 (.04)  | [-0.07, 0.08]  | .01  | 0.194  | .846   |
| <i>Model 9: Living with Pet(s) &amp; Time 2 Relatedness</i>     | .25 |            |                |      |        |        |
| Time 1 Relatedness  |     | .52 (.05)  | [0.42, 0.62]   | .49  | 10.302 | < .001 |
| Living with Pet(s)  |     | .18 (.11)  | [-0.03, 0.40]  | .08  | 1.687  | .093   |
| <i>Model 10: Living with Pet(s) &amp; Time 2 Loneliness</i>     | .65 |            |                |      |        |        |
| Time 1 Loneliness   |     | .77 (.03)  | [0.70, 0.83]   | .80  | 24.432 | < .001 |
| Living with Pet(s)  |     | -.03 (.04) | [-0.09, 0.04]  | -.03 | -0.810 | .419   |
| <i>Model 11: Being a Caregiver &amp; Time 2 Relatedness</i>     | .26 |            |                |      |        |        |
| Time 1 Relatedness  |     | .52 (.05)  | [0.42, 0.62]   | .50  | 10.458 | < .001 |
| Being a Caregiver   |     | .25 (.14)  | [-0.02, 0.52]  | .08  | 1.793  | .074   |
| <i>Model 12: Being a Caregiver &amp; Time 2 Loneliness</i>      | .65 |            |                |      |        |        |
| Time 1 Loneliness   |     | .77 (.03)  | [0.71, 0.84]   | .81  | 25.742 | < .001 |
| Being a Caregiver   |     | .05 (.04)  | [-0.03, 0.13]  | .04  | 1.226  | .221   |

321 **Exploratory Analyses.** As in Study 1, we examined which aspects of household size and  
322 composition—when tested in a single model—best predicted Time<sub>2</sub> social connection after  
323 controlling for Time<sub>1</sub> social connection. None of the household size and composition variables  
324 were significantly associated with Time<sub>2</sub> loneliness, when controlling for Time<sub>1</sub> loneliness (see  
325 Table 7, Model 14). However, when we examined the same variables (household size, living  
326 alone, living with a partner, living with a child, living with a pet, and being a caregiver) in a  
327 single model predicting Time<sub>2</sub> relatedness, controlling for Time<sub>1</sub> relatedness, living with a  
328 partner was the only factor that buffered changes in social connection,  $b = .38$ , 95% CI. [0.09,  
329 0.67],  $p = .012$  (see Table 7, Model 13). This finding was consistent with Study 1.

330 **Table 7. Results of Exploratory Multiple Regression Models (Study 2).**

| Model: Predictor & Dependent Variable                         | Adjusted R <sup>2</sup> | b(SE)      | 95% CI        | β    | t      | p      |
|---|-------------------------|------------|---------------|------|--------|--------|
| <i>Model 13: Household Size/Composition &amp; Relatedness</i> | .27                     |            |               |      |        |        |
| Time 1 Relatedness  |                         | .49 (.05)  | [0.40, 0.59]  | .47  | 9.873  | < .001 |
| Household Size  |                         | -.06 (.07) | [-0.21, 0.08] | -.05 | -0.863 | .389   |
| Living Alone  |                         | -.13 (.20) | [-0.52, 0.26] | -.04 | -0.657 | .512   |
| Living with Partner   |                         | .38 (.15)  | [0.09, 0.67]  | .16  | 2.540  | .012   |
| Living with Child   |                         | -.02 (.19) | [-0.39, 0.36] | -.01 | -0.085 | .932   |
| Living with Pet   |                         | .12 (.11)  | [-0.10, 0.33] | .05  | 1.052  | .294   |
| Being a Caregiver   |                         | .04 (.18)  | [-0.32, 0.39] | .01  | 0.215  | .830   |
| <i>Model 14: Household Size/Composition &amp; Loneliness</i>  | .65                     |            |               |      |        |        |
| Time 1 Loneliness   |                         | .76 (.03)  | [0.70, 0.83]  | .81  | 23.789 | < .001 |
| Household Size  |                         | -.03 (.02) | [-0.07, 0.02] | -.06 | -1.280 | .202   |
| Living Alone  |                         | -.05 (.06) | [-0.17, 0.06] | -.03 | -0.904 | .367   |
| Living with Partner   |                         | -.07 (.04) | [-0.16, 0.02] | -.07 | -1.530 | .127   |
| Living with Child   |                         | .01 (.06)  | [-0.10, 0.12] | .02  | 0.142  | .887   |
| Living with Pet   |                         | -.02 (.03) | [-0.08, 0.05] | -.03 | -0.591 | .555   |
| Being a Caregiver   |                         | .09 (.05)  | [-0.02, 0.19] | .07  | 1.633  | .104   |

331 *Did working outside of the home moderate the effects of household size and composition on*  
332 *changes in social connection?*

333 **Pre-Registered Analyses.** We expected that household size and household composition  
334 might matter less for social connection for individuals who worked outside the home. However,  
335 we did not find that hours working outside the home moderated the relationship between  
336 household size (continuous and living alone) or composition (living with a partner, living with  
337 children, living with a pet, being a caregiver) and changes in relatedness or loneliness (see S2  
338 Table).

339 *Was the relationship between household size and changes in social connection mediated by*  
340 *total hours video calling with family and friends or social distancing?*

341 **Pre-Registered Analyses.** No significant correlations emerged between our outcome  
342 variable (relatedness, loneliness) and 1) our predictor variable (household size) and 2) our  
343 mediator variables (hours video calling, social distancing; see Table 4 for correlations). Thus,

344 parallel to Study 1, the number of hours spent video calling with family and friends or social  
345 distancing did not mediate the relationship between household size (continuous and living alone)  
346 and changes in relatedness or loneliness (see S3 Table).

## 347 **Discussion**

348         Across two pre-registered studies that followed the same participants from before the  
349 COVID-19 pandemic into its early stages, we found that living with a partner was the strongest  
350 predictor of shifts in social connection across time. This finding replicated across two different  
351 samples—a sample of undergraduates at a Canadian university and a sample of adults from  
352 mostly the U.S. and the U.K. Both of our studies revealed robust positive regression coefficients  
353 indicating that people living with a partner were more likely to improve in social connection  
354 after social distancing guidelines were in place than those not living with a partner. This finding  
355 is consistent with past research demonstrating that being in a relationship is one of the strongest  
356 predictors of connection and well-being (11, 44), in part because happier people are more likely  
357 to find partners (48,49). Additionally, during times of worry and uncertainty, partners have been  
358 found to be more valuable for coping than other types of household members (26). Moreover,  
359 recent research has shown that, on average, romantic relationships have not deteriorated over the  
360 course of the pandemic; indeed, people are relatively more willing to forgive their partners  
361 during COVID-19 (45). In light of this evidence, it is not surprising that partners showed the  
362 strongest effect, especially during a pandemic.

363         Contrary to our pre-registered hypotheses, changes in loneliness were not predicted by  
364 any other aspects of household composition. Furthermore, we found only nonsignificant trends  
365 for the impact of household size, including living alone, on social connection during COVID-19,  
366 perhaps because both our studies included small samples of those living in large households and

367 households of one. It is important to keep in mind that the pandemic has forced people to spend  
368 unusually large amounts of time confined to home. Given that interpersonal interactions must be  
369 positive to contribute to one's overall sense of connectedness (10), those who live in larger  
370 households—relative to those who live alone or in smaller households—may have had more  
371 interactions that were negative (e.g., due to bickering or lack of privacy and alone time) and, as a  
372 result, failed to experience benefits in terms of social connection. Moreover, our studies  
373 measured experiences fairly early in the pandemic (April 2020); thus, as people continue to  
374 distance over long periods of time, their feelings of social connection may suffer. Going beyond  
375 household size and structure, future studies should examine the effects of relationship quality on  
376 social connection over time.

377         When examining how other features of household composition were associated with  
378 shifts in social connection during the pandemic, we obtained mixed findings regarding living  
379 with pets and null findings for all other household variables. However, because households are  
380 multifaceted, larger sample sizes will be needed to fully dissect the household composition  
381 findings, as well as to reveal interactions (such as with household size, gender, or country of  
382 residence). For example, studies with larger sample sizes may uncover differences in connection  
383 between those in households of four (with a partner and two children) versus households of five  
384 (with a partner and three children), and so on. Importantly, future investigators may wish to  
385 further unpack the role of household dynamics, as some households include unhealthy  
386 relationships that may be exacerbated by social distancing measures and others include  
387 housemates that minimally interact. As such, the quality and frequency of interaction among  
388 household members—perhaps with experience sampling or daily diary measures—is an  
389 important factor to explore in future work.

## 390 **Implications and Conclusions**

391 Directed by social distancing interventions in the spring of 2020, millions of people were  
392 no longer commuting to work, attending school, or leaving their homes to spend time with  
393 friends and family. These extraordinary conditions likely led people to rely more on their  
394 household members to fulfill their needs for closeness, belonging, and connection (10). The  
395 results from our two studies revealed that living with a partner—but not how many people or  
396 who else one lives with—appeared to confer unique benefits during these uncertain and  
397 unprecedented times. Indeed, demonstrating its robustness, this finding replicated across our two  
398 studies, despite weak and opposite correlations between household size and living with a partner  
399 ( $r = -.06$  in Study 1 and  $.11$  in Study 2).

400 In light of these results, policy makers might consider developing guidelines for  
401 social/physical distancing that protect people's physical health while ensuring they retain a sense  
402 of closeness and connection by spending time in close proximity with partners, even outside their  
403 households. Some areas in the world, such as New Zealand, have already begun to implement a  
404 strategy known as the "social bubble," which is the easing of social distancing to allow close  
405 contact with another household (46). Such approaches might be especially helpful for individuals  
406 who have been unintentionally and disproportionately socially isolated by social distancing  
407 measures, such as those who are cut-off, separated from their partners, or generally struggling  
408 with staying at home. However, social bubbles pose a risk of increased infection rates (46).  
409 Hence, just as safe sex education aims to reduce the rate of sexually transmitted diseases and  
410 unintended pregnancy, education on safe social distancing (or social bubbling) strategies might  
411 guide individuals across the globe how to connect with others safely while simultaneously  
412 curtailing COVID-19 rates. In sum, recommendations that reduce the risk of transmission while

413 prioritizing social connection can ensure that people's physical and psychological health are  
414 optimally balanced.

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