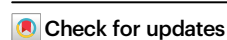


How people think about being alone shapes their experience of loneliness

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Loneliness is a widespread issue routinely targeted by the media and public health campaigns. We propose that these efforts, though well-intentioned, may exacerbate this problem by negatively influencing a potential driver of loneliness: people's beliefs about being alone. Supporting this thesis, we show that contemporary U.S. news articles are 10 times more likely to describe being alone as harmful than beneficial (Study 1, $N = 144$ articles) and that exposure to such articles causally impacts people's beliefs about being alone (Study 2, $N = 456$). Further, a 2-week experience-sampling study (Study 3, $N = 161$) demonstrates that people with negative beliefs about being alone experience a steep increase in loneliness after spending time alone in daily life, whereas those with positive beliefs feel less lonely after spending time alone. Finally, multi-national studies demonstrate the generalizability of these results across nine countries spanning six continents (Studies 4 and 5, $N = 2930$). Together, these findings reveal the critical role of beliefs about being alone in shaping loneliness.

Loneliness is often described as a global epidemic^{1–3} that is linked to negative outcomes that span the gamut from depression to cardiovascular disease to premature death^{4,5}. These stark realities compelled the World Health Organization to declare loneliness a major health concern in 2019^{6,7} and the U.S. to release a Surgeon General's Advisory in 2023⁸. In response, media articles and public health campaigns have proliferated with warnings about the dangers of being alone^{9,10}. For example, the United States' *Commit to Connect* campaign's priority is to "increase awareness about the harms of social isolation and loneliness across all segments of society"². Likewise, a report by the United Kingdom's *Campaign to End Loneliness* notes that "isolation can be as harmful to health as smoking 15 cigarettes a day and is more damaging than obesity"¹¹. Here we suggest that this discourse, though well-intentioned, may paradoxically contribute to the problem of loneliness by influencing a potential driver of this state: people's beliefs about being alone.

This argument is grounded in the observation that being alone is not inherently harmful. Although experiences of being alone and loneliness are often conflated¹², they are distinct states^{13–15}. Some people are content spending time alone^{13,16,17}, whereas others interact with people frequently and still feel lonely¹⁴. Indeed, a study of over

11,000 participants revealed that the strength of the relationship between being alone and feeling alone (i.e., loneliness) was weak ($r = 0.20$)¹⁸. More recent studies demonstrate similarly modest associations (r range: 0.13 to 0.25 across studies)^{19–21}.

Although loneliness is a negative state that people generally try to avoid²², time alone can be a desirable part of daily life^{16,23}. Consider that American adults spend ~30–65% of their waking hours alone^{20,24} and often intentionally seek out such experiences^{17,25}. According to one recent estimate, for example, 85% of the time that people spend by themselves is deliberately chosen²⁶. Being alone can of course induce loneliness^{27,28}. Yet, a less frequently heralded literature indicates that spending time alone can also promote well-being^{13,16}, emotion regulation^{29–32}, and cognitive restoration³³. Conversely, spending less time alone than one would like is associated with increased stress and depression³⁴. Thus, there is substantial variability in people's experiences of being alone²³.

One factor that may consequentially influence the emotional impact of being alone is how people think about this experience. Decades of research indicate that people's beliefs powerfully impact their emotional responses to a vast array of situations^{35,36} by systematically recruiting prefrontal and parietal networks that modulate

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affective reactions^{37,38}. The wide-ranging nature of these effects is well documented. For example, interventions that target beliefs positively impact experiences that range from stress³⁹ and depression⁴⁰ to weight loss⁴¹ and sleep⁴².

Drawing from this work, we reasoned that people's beliefs about being alone should influence their experiences of time alone. Preliminary evidence supporting this idea comes from two laboratory experiments which found that teaching people about the benefits of being alone increased how positive they felt after spending 10 min by themselves^{30,31}. Yet, whether these findings extend beyond a brief laboratory task is unclear.

Here, we provide evidence across five multi-method studies that people's beliefs about being alone, which are shaped by media discourse on this issue, influence experiences of loneliness in daily life. In Study 1, we find that contemporary U.S. news articles frequently portray being alone as harmful. Study 2 demonstrates that brief exposure to such portrayals causally influences people's beliefs about being alone. Study 3, a 2-week experience-sampling study, shows that people who hold negative beliefs about being alone experience a significant increase in loneliness after spending time alone in daily life, whereas those with positive beliefs experience a significant decrease in loneliness after spending the same amount of time alone. Finally, Studies 4 and 5 demonstrate the generalizability of these findings across nine countries spanning six continents. Together, these results reveal beliefs about being alone as a notable driver of loneliness, offering new directions for interventions aimed at reducing this widespread problem.

Results

Study 1: Analyzing U.S. media discourse about being alone

We begin by examining how contemporary U.S. news media portrays experiences of being alone (Study 1). A key assumption driving this work is that the media and public health campaigns may inadvertently contribute to loneliness by negatively portraying the experience of being alone, thus swaying people's beliefs. To test this

idea, we systematically reviewed every article published between 2020 and 2022 in the top ten most circulated U.S. newspapers that focused on being alone. Our initial search using the online ProQuest database yielded 691 articles, of which 144 met screening and eligibility criteria. Judges who were blind to the study hypotheses then coded the headlines and content of each article for how they described being alone (further methodological details can be found in *Methods*).

As Fig. 1 illustrates, U.S. newspaper headlines were 10 times more likely to frame being alone negatively than positively; $\chi^2(1) = 63.75$, $p < .001$, Cramér's $v = 0.83$. Negative headlines also appeared nearly twice as frequently as neutral headlines; $\chi^2(1) = 13.03$, $p < .001$, Cramér's $v = 0.32$. Analyses of the full text of each article revealed a similar pattern of results; U.S. news articles were five times more likely to mention the risks of being alone than its benefits; $\chi^2(1) = 41.78$, $p < .001$, Cramér's $v = 0.66$. Further, they were over seven times more likely to mention the risks of being alone than make neutral statements about being alone; $\chi^2(1) = 49.33$, $p < .001$, Cramér's $v = 0.74$.

We realized that these effects may be driven by articles that focus on *isolation*, which often connotes a more chronic lack of social connection compared to simply *being alone*. To explore this, we compared articles that exclusively use the term 'isolation' ($n = 49$) to the full sample of articles. No statistically significant differences emerged between these two groups in their mentions of either the benefits (6.1% isolation-only vs. 11.1% full sample; $\chi^2(1) = 0.54$, $p = .462$) or the risks (59.2% isolation-only vs. 52.6% full sample; $\chi^2(1) = 0.33$, $p = .567$) of being alone.

Study 2: Causal impact of media exposure on beliefs about being alone

A large body of research indicates that repeated media exposure impacts beliefs^{43,44}. This finding is illustrated by work on the availability heuristic, which demonstrates how ideas made more accessible through exposure inform people's judgments⁴⁵. Despite the evidence supporting this relationship, we nonetheless sought to show that

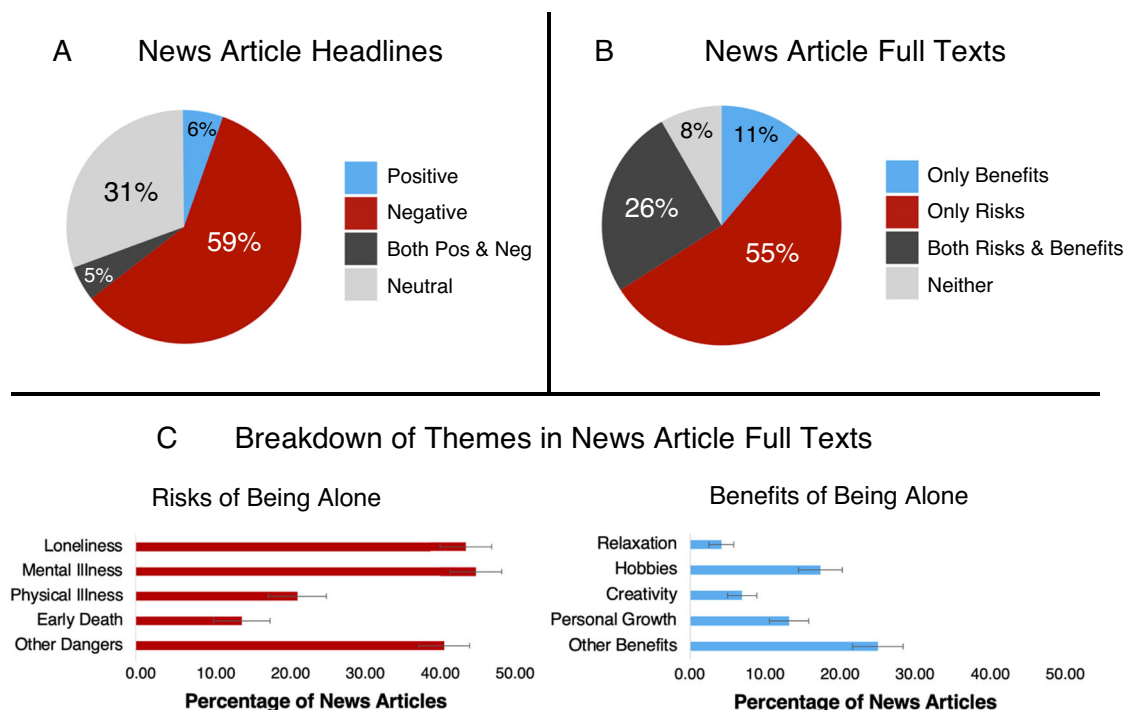


Fig. 1 | U.S. media portrays being alone as a harmful experience. **A** Among U.S. newspaper articles ($N = 144$) published between 2020–2022, news headlines are 10 times more likely to depict being alone negatively than positively. **B** News article

full texts are 5 times more likely to mention the risks of being alone than the benefits of being alone. **C** The percentage of news articles that mention different types of risks and benefits of being alone. Error bars indicate ± 1 Bootstrapped SE.

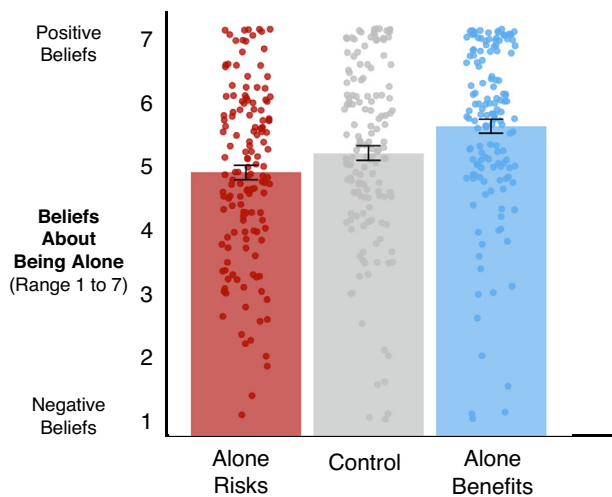


Fig. 2 | Exposure to information about being alone causally impacts beliefs.

Exposure to information about the benefits of being alone (versus the risks of being alone or a control article unrelated to being alone) improves people's beliefs about being alone. Dots represent individual data points ($N = 456$ U.S. adults). The height of the bars indicate mean values and error bars represent ± 1 SE.

exposure to information about being alone causally impacts people's beliefs about this experience. To this end, we performed a pre-registered experiment on “reading comprehension” in which 456 participants were randomly assigned to read about either the benefits of being alone (*Alone Benefits Condition*), the risks of being alone (*Alone Risks Condition*), or an article unrelated to being alone (*Control Condition*). To mask the true purpose of the experiment, each article was randomly presented along with three filler articles on topics irrelevant to being alone. After reading all four articles, participants were presented with a set of questions assessing their beliefs about a range of topics, including their beliefs about the effects of being alone. To rule out demand effects, we administered a funneled debriefing at the end of the study to identify participants who were knowledgeable of the study aims or hypotheses; 9 participants failed and were excluded (see *Methods*).

As expected, participants who read about the benefits of being alone reported significantly more positive beliefs about being alone than participants in each of the other conditions (*Alone Risks Condition*: $b = 0.73$, $SE = 0.16$, $p < .001$, $d = 0.54$, 95% CI [0.41, 1.04]; *Control Condition*: $b = 0.42$, $SE = 0.16$, $p = .008$, $d = 0.31$, 95% CI [0.11, 0.73]; see Fig. 2). Given popular discourse surrounding the dangers of being alone, we did not have a priori predictions about how participants exposed to the *Alone Risks* article and *Control* article would compare. Direct comparison of these groups revealed that exposure to the *Alone Risks* article descriptively led to more negative beliefs about being alone than *Control* but did not reach our criterion of statistical significance ($b = -0.31$, $SE = 0.16$, $p = .052$, $d = -0.22$, 95% CI [-0.62, 0.003]; see Fig. 2).

Study 3: Beliefs about being alone shape the experience of loneliness in daily life

The media's negative portrayal of being alone and its impact on beliefs is potentially meaningful only to the extent that people's beliefs about being alone shape loneliness in daily life. We addressed this issue in Study 3 by using experience sampling, the gold standard method for capturing in vivo experiences^{46,47}. One-hundred and sixty-one young adults rated their beliefs about being alone at the start of the study and were then text-messaged brief surveys five times a day for fourteen consecutive days. During each assessment, participants were asked to answer several questions about their mood and behavior, including (a) how lonely they felt (along with several other negative and positive

emotions) and (b) how much time they had spent alone since the last time we text-messaged them (9570 total observations; see *Methods*).

As Fig. 3 Panel A illustrates, people's beliefs about being alone moderated how spending time alone influenced loneliness; beliefs \times time spent alone interaction $b = -1.19$, $SE = 0.27$, $p < 0.001$, 95% CI [-1.73, -0.65]. People with negative beliefs about being alone (1 SD below the mean) felt significantly lonelier after spending time alone, and the size of this effect increased with the amount of time they spent by themselves (simple slope = 3.64, $SE = 0.43$, $p < 0.001$). In contrast, people with positive beliefs about being alone (1 SD above the mean) reported feeling less lonely after spending time alone, consistent with the notion that they view time alone as a source of rejuvenation and positivity (simple slope = 0.96, $SE = 0.43$, $p = 0.030$). Although the magnitude of this effect diminished the more time people spent alone, it remained significant regardless of how much time participants spent alone during any observation window.

To put the size of these effects in perspective, we next examined how people with positive versus negative beliefs about being alone who spent the most time by themselves between two text messages compared in terms of their loneliness levels. For people reporting an average level of loneliness at the previous time point (i.e., 23.4 out of 100), those with negative beliefs (1 SD below the mean) reported a 53% increase in loneliness (i.e., a 12.5-point increase on a 100-point scale) after spending “a great deal of time alone”, whereas those with positive beliefs (1 SD above the mean) reported a 13% decrease in loneliness (i.e., a 3-point decrease on a 100-point scale) after spending the same amount of time by themselves. Critically, these effects remained robust among the most socially isolated participants in our sample (i.e., those who spent the greatest amount of time alone over the 2-week study period; for detailed results, see Supplementary Information).

Loneliness is of course just one of the many emotions that people may experience after spending time alone. To capture a fuller spectrum of participants' emotional states, we also asked them to rate how they felt on several positive and negative dimensions each time we text-messaged them. As Fig. 3 Panel B illustrates, we observed a similar buffering effect of positive beliefs about being alone on each of these variables (for detailed results, see Supplementary Information). Notably, people who held negative beliefs about being alone (1 SD below the mean) experienced an increase in negative emotions (i.e., negative affect, boredom, stress) and a decrease in positive emotions (i.e., positive affect, contentment, gratitude) after spending time alone. In contrast, people who held positive beliefs about being alone (1 SD above the mean) experienced a decrease in negative emotions (i.e., negative affect, boredom, stress) and a boost in positive affect and contentment after spending time alone (see Fig. 3 Panel B).

Extensive research indicates that people who are extraverted or suffer from depression, anxiety, loneliness, and poor social support are particularly vulnerable to experiencing negative emotional outcomes when they are alone^{13,28,48}. Thus, we also examined whether individual differences in these dimensions influenced the protective role of positive beliefs about being alone on loneliness. None of these variables statistically significantly moderated any of the above findings (all p 's > 0.103), and controlling for them likewise did not substantively alter any of the results (for statistics, see Supplementary Information).

Studies 4 and 5: Cross-cultural generalizability

Our final set of studies examined the cross-cultural generalizability of these findings. To this end, we first performed a pre-registered study in the U.S. and Japan (Study 4). We administered a questionnaire that assessed beliefs about being alone, time spent alone over the past month, and general feelings of loneliness (see *Methods*). We focused on these two cultures because prior work suggests that time alone might be experienced more positively among East Asians than Americans, as it allows an

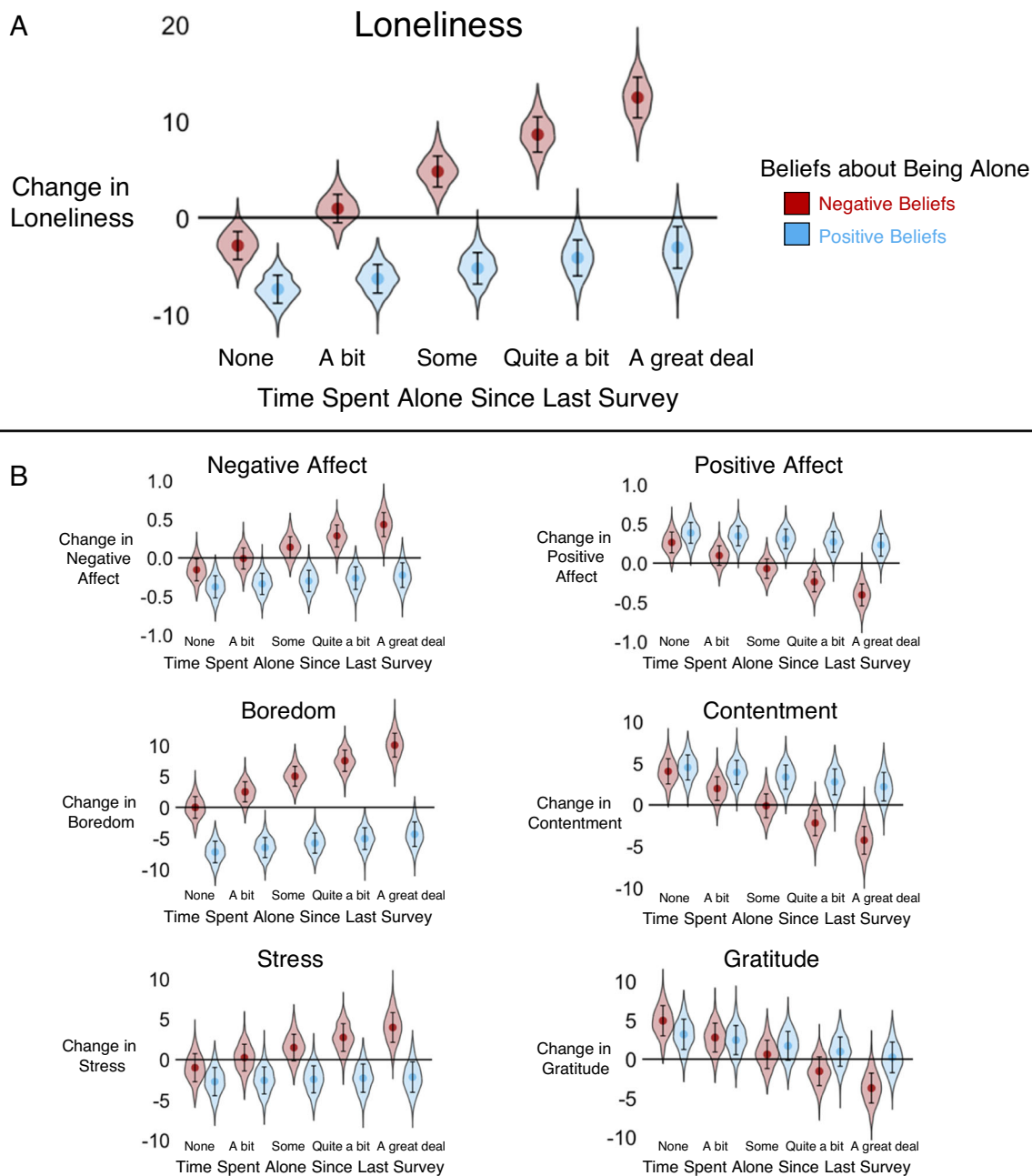


Fig. 3 | Beliefs about being alone moderate the relationship between time spent alone and changes in loneliness and other emotional outcomes in daily life.

A Data from a 2-week experience sampling study ($N = 161$ U.S. adults) indicate that people with negative beliefs about being alone display significant increases in loneliness after spending time alone in daily life, and the size of this effect increases with the amount of time they spent alone. Conversely, people with positive beliefs about being alone experience significant decreases in loneliness after spending any amount of time alone. **B** There is a similar buffering effect of positive beliefs about being alone on other negative emotions (i.e., negative affect, boredom, and stress). Further, people with positive beliefs also experience an increase in positive affect

and contentment after spending any amount of time alone. **A, B** Time spent alone since the last survey represents the amount of time spent alone between two surveys (between T1 and T2). Change in emotion (y-axis) represents the change in emotion between T1 and T2 (i.e., T2 emotion – T1 emotion) controlling for emotion reported at T1. Positive/negative beliefs represent one SD above/below the mean on beliefs about being alone. Data are presented as model estimated mean values ± 1 SE. Uncentered model estimates are presented for illustration purposes. Violin plots demonstrate the distribution of model predicted values. Note that full range of y-axis values is -100 to 100 for changes in loneliness, boredom, contentment, stress, and gratitude, and -10 to 10 for changes in negative and positive affect.

escape from the social pressures of collectivistic cultures with tight social norms^{49,50}. By comparing these two distinct cultural contexts, we aimed to elucidate whether people's beliefs about being alone vary cross-culturally and whether they shape the relationship between time spent alone and loneliness.

In line with our pre-registered hypotheses, Japanese adults ($M = 5.56$) held more positive beliefs about being alone than Americans ($M = 5.13$; $M_{\text{diff}} = 0.43$, $t(1568.10) = 7.60$, $p < .001$, $d = 0.38$, 95% CI [0.32,

0.54]), and beliefs about being alone correlated with overall levels of loneliness in the theoretically expected direction in both cultures (U.S.: $r(818) = -.29$, $p < .001$, 95% CI [-0.35, -0.22]; Japan: $r(764) = -.21$, $p < .001$, 95% CI [-0.27, -0.14]). Critically, conceptually replicating our experience sampling results and consistent with our pre-registered predictions, the buffering effect of positive beliefs about being alone on loneliness increased as people spent more time alone (beliefs \times time spent alone interaction: $b = -0.33$, $SE = 0.06$, $p < .001$, $f^2 = 0.013$, 95% CI

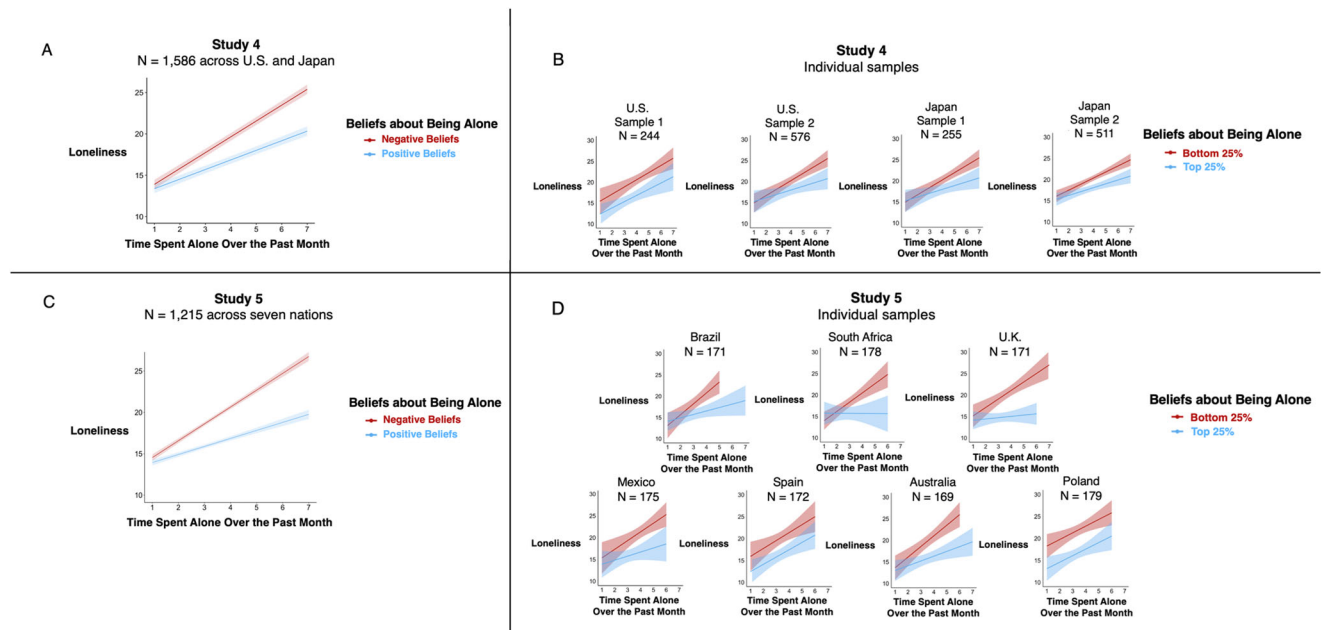


Fig. 4 | Across nine countries, the benefits of possessing positive beliefs about being alone increase the more time people spend alone. In two mega-analyses across a total of nine countries spanning six continents, the buffering effect of positive beliefs about being alone on loneliness increases the more time people spend alone. **A** Mega-analytic results from Study 4 (combined data from U.S. and Japan). **C** Mega-analytic results from Study 5 (combined data from Brazil, South Africa, U.K., Mexico, Spain, Australia, and Poland). **A–C** Positive/negative beliefs

represent one SD above/below the mean on beliefs about being alone. **B–D** Panels present the raw values for individual samples, where positive/negative beliefs represent the top 25% and bottom 25% of beliefs about being alone scores. **A–D** Data are presented as regression slope ± 1 SE. *Note.* Some countries in Study 5 do not have data for high values of time spent alone (e.g., 7) because no one in the sample reported spending that much time alone.

$[-0.45, -0.20]$; slope for positive beliefs [1SD above mean of beliefs] $b = 1.16$, $SE = 0.10$, $p < .001$, slope for negative beliefs [1 SD below mean of beliefs] $b = 1.91$, $SE = 0.11$, $p < .001$; see Fig. 4 Panel A; see Fig. 4 Panel B for raw values for each sample). Further analyses revealed no statistically significant evidence that culture moderated this effect (beliefs \times time spent alone \times culture interaction: $b = 0.02$, $SE = 0.13$, $p = .861$, 95% CI $[-0.24, 0.28]$), and this remained true when controlling for several theoretically relevant cultural dimensions (i.e., individualism-collectivism, relational mobility, tightness) and demographic variables (i.e., age and gender; see Supplementary Information).

Next, we examined whether our findings generalize to a broader range of cultures that varied in their country-level loneliness. To do so, we conducted a pre-registered study (Study 5) using the same paradigm from Study 4 in seven countries spanning five continents: Brazil, South Africa, U.K., Mexico, Spain, Australia, and Poland. We selected nations characterized by varying levels of loneliness, determined by country-level mean loneliness scores derived from Wave 1 of the Global Flourishing Study, a large-scale multinational dataset released in 2024⁵¹ ($N = 202,898$ across 22 countries). Countries included in the Global Flourishing Study were grouped into low, moderate, and high loneliness clusters, and final selections were based on ease of recruiting online participants and ensuring geographical representation (more detailed information provided in *Methods*). We recruited 180 participants in each of the seven countries (total $N = 1260$ completed the study; $N = 1215$ remained after pre-registered exclusions; see *Methods*).

Consistent with our pre-registered predictions, across countries, people who held more positive beliefs about being alone reported significantly lower levels of loneliness; $r(1213) = -.32$, $p < .001$, 95% CI $[-0.32, -0.27]$ (correlations in individual countries: Brazil $r(169) = -.16$, $p = .032$, 95% CI $[-0.31, -0.01]$; South Africa $r(176) = -.10$, $p = .168$, 95% CI $[-0.25, 0.04]$; U.K. $r(169) = -.50$, $p < .001$, 95% CI $[-0.61, -0.38]$; Mexico $r(173) = -.37$, $p < .001$, 95% CI $[-0.49, -0.24]$; Spain $r(170) = -.38$, $p < .001$, 95% CI $[-0.50, -0.25]$; Australia $r(167) = -.29$, $p < .001$, 95% CI $[-0.42,$

$-0.14]$; Poland $r(177) = -.46$, $p < .001$, 95% CI $[-0.57, -0.34]$). Further consistent with our pre-registered predictions, across the seven countries, the buffering effect of positive beliefs about being alone on loneliness increased as people spent more time alone (beliefs \times time spent alone interaction: $b = -0.40$, $SE = 0.07$, $p < .001$, $f^2 = 0.028$, 95% CI $[-0.54, -0.27]$; slope for positive beliefs [1SD above mean] $b = 0.97$, $SE = 0.13$, $p < .001$, slope for negative beliefs [1SD below mean] $b = 2.04$, $SE = 0.13$, $p < .001$; see Fig. 4 Panel C). Notably, allowing the interaction effect to vary across cultures did not statistically significantly improve model fit, indicating that these effects were consistent across cultures (see Supplementary Information). In addition, controlling for several theoretically relevant cultural dimensions (i.e., individualism-collectivism, relational mobility, tightness) and demographic variables (i.e., age, gender) did not meaningfully alter the results (see Supplementary Information). For illustration purposes, Fig. 4 Panel D displays raw values for each country separately (see Supplementary Information for model estimated effects in individual countries).

Discussion

Together, these findings highlight the role that people's beliefs about being alone play in shaping their experience of loneliness. We find replicable evidence across methodologies, timescales, and cultures that people who hold more negative beliefs about being alone experience a steep increase in loneliness after spending time alone, whereas those who hold positive beliefs are buffered against this rise in loneliness. Our fine-grained, longitudinal analyses indicate that positive beliefs not only buffer people against an increase in loneliness—they predict a decrease in loneliness after spending any amount of time alone within a 3-h period in daily life. Finally, it is noteworthy that across studies participants who spent the most time alone—and were thus at the theoretically greatest risk of experiencing loneliness—benefited the most from possessing positive beliefs about being alone.

These findings further suggest that the media's portrayal of being alone as harmful may inadvertently contribute to the problem of loneliness by negatively influencing people's beliefs. We demonstrate that even brief exposure to information about the effects of being alone can causally impact these beliefs. This is noteworthy given that in daily life, people are repeatedly exposed to media messages about these issues, which may cumulatively reinforce these beliefs over time^{43–45}. Indeed, extensive evidence shows that consistent media messaging shapes beliefs and attitudes across contexts ranging from advertising and politics to public health^{52–55}. By establishing the causal impact of a single exposure, we highlight the potential for these effects to be magnified through the pervasive nature of media messaging in everyday life.

To be sure, the media discourse about the dangers of being alone stems from a well-intentioned and worthwhile effort to encourage social contact. The importance of social connection is unquestionable: decades of research have documented robust associations between social connection and health, and chronic social isolation—which is distinct from momentary experiences of time alone—is likewise linked to negative health outcomes^{4,9,56}. Yet, as we noted earlier, spending time alone is a virtually inevitable facet of everyday life and can be enjoyable^{13,16,23}. Thus, the notion that being alone is *de facto* harmful is not only false; it may also prevent people from experiencing time alone positively and intensify how lonely people feel when they are alone.

These results contribute to a growing body of research on the important role of cognition in shaping experiences of loneliness. Loneliness is an inherently subjective experience that arises not merely from a lack of social interactions but also from our thoughts and beliefs about those interactions. For instance, the cognitive discrepancy model of loneliness posits that loneliness emerges from a mismatch between desired and actual social contact⁵⁷. Our work extends this framework by revealing that loneliness is also influenced by our perceptions and beliefs about the time we spend alone. We encourage future work to explore how beliefs about being alone might relate to other cognitive factors, such as expectations of social interaction and social comparisons. By doing so, we can gain a deeper understanding of the cognitive processes that contribute to loneliness and develop targeted interventions to mitigate its effects.

Moreover, it is important to consider that the relationship between loneliness and beliefs about being alone may be bidirectional. When individuals experience loneliness, they may perceive the state of being alone as a threat or an indicator of personal inadequacy, leading to the development of increasingly negative beliefs about being alone³¹. This, in turn, could reinforce the very beliefs that exacerbate loneliness, creating a cyclical pattern. This possibility aligns with prior work showing that loneliness can alter cognitive processes, such as increasing sensitivity to social threats and reinforcing maladaptive thinking patterns^{58–60}. Future research should explore this potential bidirectionality to better understand how loneliness and beliefs about being alone interact over time.

Despite the strength of our multi-method study package and use of time-lagged analyses where appropriate, the non-experimental nature of our findings in Studies 3–5 prevents us from drawing causal inferences about the effect of beliefs about being alone on loneliness. Nevertheless, previous experimental work has shown that manipulating people's beliefs about being alone causally affects their emotional experiences of being alone^{30,31}. Another limitation is that we did not assess individuals' levels of exposure to media about being alone, as this is challenging to measure accurately due to recall biases. Additionally, our focus on U.S. news articles limits our understanding of how culturally distinct media narratives in other countries might produce different results. Future research could address this gap by examining media coverage in other regions. Furthermore, by focusing on news articles, we did not account for how other influential media forms (e.g., social media, television, and

film) frame being alone. This represents another important future research direction^{43,44}.

Before concluding, it is also important to note that we examined people's beliefs about being alone in this research, not their preferences. Beliefs and preferences are separate constructs (i.e., it is possible to prefer to engage in activities that you believe are harmful to you). This distinction is noteworthy because prior research indicates that adolescents' preferences for being alone predict greater loneliness and impoverished well-being^{61,62}. Thus, we encourage future work to distinguish between these constructs.

Although loneliness interventions are abundant, most focus on increasing social contact and decreasing time spent alone^{63,64}. These findings highlight new avenues for intervention that do not necessarily involve increasing social contact—i.e., interventions that focus on reshaping how we think about being alone. Specifically, programs could be developed to foster more positive beliefs about the time we spend alone and motivate people to engage in activities that provide intrinsic enjoyment or promote personal growth when alone. Targeting such beliefs may constitute a novel and cost-effective intervention target that may provide the largest benefit to people who are at greater risk of loneliness: people who spend the most time alone. We encourage future research to develop and test these interventions with populations who are particularly vulnerable to loneliness, such as young adults and the elderly⁶⁵, and assess whether their effects on loneliness are sustained over time.

Methods

The R code and de-identified datasets for Studies 1–5 are publicly available on Open Science Framework (<https://doi.org/10.17605/OSF.IO/6GX8R>). All original data collection with human participants (Studies 2–5) followed ethical regulations and was approved by the Institutional Review Board at the University of Michigan.

Study 1

Study 1 used archival data to examine how the contemporary U.S. news media portrays being alone.

Data collection. We retrieved print and online news media records published between January 1, 2020, and December 31, 2022, in the top ten daily U.S. newspaper outlets by print circulation⁶⁶ (i.e., *New York Times*, *Wall Street Journal*, *Washington Post*, *Chicago Tribune*, *USA Today*, *Tampa Bay Times*, *New York Post*, *Los Angeles Times*, *Newsday*, and *Star Tribune*) from the ProQuest database (<https://www.proquest.com/>). We searched for articles containing the following terms: “being alone,” “time alone,” “solitude,” “solitary,” “aloneness,” or “isolation”. We attest that we adhered to the Terms of Service of the ProQuest database.

Our initial search yielded a total of 691 news articles. Sixteen duplicate articles were excluded. Two independent coders screened the remaining 675 titles to identify articles relevant to the topic of interest (Cohen's Kappa $\kappa = 0.65$). A third coder resolved discrepancies. Of these, 298 were deemed irrelevant to interpersonal aloneness based on their title (e.g., “Russia, blocked from the global internet, plunges into digital isolation”; “U.S. risks diplomatic isolation with bid to reimpose U.N. sanctions on Iran”; “Gweru isolation hospital ready to receive COVID-19 patients”). Next, the same two coders reviewed the remaining 377 full texts of the articles and excluded articles not directly relevant to the topic of interest (e.g., “Minorities sent to solitary more often: Black, Indian inmates face disproportionately higher rates”; Cohen's Kappa $\kappa = 0.78$). Disagreements after full-text review were resolved by a third coder. Two articles were excluded because we could not access their full texts. In addition, articles that focused primarily on solitary confinement ($n = 13$) were removed given that solitary confinement, which includes sensory deprivation and enforced isolation as a form of punishment,

represents a fundamentally different experience from being alone. These articles about solitary confinement were, indeed, significantly more likely to discuss the risks of being alone compared to the full sample of articles ($\chi^2 = 8.24$, $p = .004$). Although removing these articles made our analyses more conservative, none of the results substantively changed. A total of 144 articles were included in the final analyses (see Supplementary Information for a flow diagram of the article screening process).

Headline analysis. Four independent coders rated each headline based on how it framed being alone: neutral (coded 0; e.g., “A Star Who Doesn’t Mind Being Alone”), negative (coded 1; e.g., “Social Isolation’s High Physical and Psychological Toll”), positive (coded 2; e.g., “Blissful Solitude by Boat”), or both negative and positive (coded 3; e.g., “The Double-Edged Sword of Isolation”). Coder agreement was substantial (Fleiss’s Kappa $\kappa = 0.82$).

Full-text content analysis. We also examined whether the article text mentioned the benefits and risks of being alone. Due to the intensity of coding full texts compared to headlines, we recruited a larger team of eight coders. After establishing reliability using a training data set of 25 articles from 2019 that were not included in our search, four pairs of independent coders were each assigned a quarter of the articles in our final set (36 articles each). Each coder independently assessed whether articles mentioned the following benefits of being alone (relaxation [4.2%], personal growth [13.2%], creativity [6.9%], engagement in hobbies [17.4%], and other benefits [25.0%]) and risks of being alone (loneliness [45.1%], mental health problems [46.5%], physical health problems [22.2%], early death [14.6%], and other dangers [42.4%]) using a binary (0 = no mention; 1 = mention) coding scheme. The four pairs of coders demonstrated excellent interrater reliability (overall mean Cohen’s Kappa $\kappa = 0.93$; Pair 1: $\kappa = 0.96$, Pair 2: $\kappa = 0.91$, Pair 3: $\kappa = 0.92$, Pair 4: $\kappa = 0.94$).

Study 2

This experiment examined whether exposure to information about being alone affects beliefs about being alone. We pre-registered our hypotheses and analyses on AsPredicted (#148930, October 28, 2023, <https://aspredicted.org/5xt83.pdf>).

Participants. An a priori power analysis using G*Power indicated that a sample size of 417 was necessary to achieve 90% power to detect a small-to-medium effect size (Cohen’s $d = 0.30$) at an alpha level of 0.05. To account for potential participant exclusions, we recruited 456 adults who were fluent in English via Prolific, an online crowdsourcing platform designed for academic research. Of these, 439 were included in analyses (see *Exclusions* below; $M_{\text{age}} = 44.75$, $SD_{\text{age}} = 14.24$; 47.4% Female, 50.1% Male, 2.5% Non-binary/Other; 76.9% White, 10.0% Black, 6.9% Latino, 5.6% Asian, 0.7% Other Race; 0.2% Less Than High School, 12.1% Completed High School, 20.3% Some College, 10.3% Associate’s Degree, 38.3% Bachelor’s Degree, 15.5% Master’s Degree, 2.3% Professional Degree, 1.1% Doctorate Degree). To meet inclusion criteria, participants had to be at least 18 years of age and fluent in English. Participants were paid \$ 3.00 USD.

Procedure

Cover story. To minimize potential demand effects, we developed a cover story. Participants were told that the study examined reading comprehension. After providing informed consent, they read the following instructions: “In this study, we are examining reading comprehension and different ways of measuring how people understand what they read. You will read several passages, highlight key points, and answer brief free-response questions. You will be asked questions about what you read, so please read carefully, and take your time.” Then, participants were presented with four articles (each 150 words in

length) in randomized order. Three filler articles discussed (1) the global success of the social media company TikTok, (2) the health benefits of red wine, and (3) the risks of cold plunges (see Supplementary Information). These three articles were drafted by ChatGPT and revised by the first author (M.R.) for clarity.

Experimental manipulation. For the fourth article, we randomly assigned participants to read about either the benefits of being alone (*Alone Benefits*; $n = 151$), the risks of being alone (*Alone Risks*; $n = 152$), or a control article unrelated to being alone (*Control*; $n = 153$). The *Alone Benefits* and *Alone Risks* articles were standardized in content; they contained identical phrases and only keywords were changed (e.g., “So, the evidence is clear: Spending time alone is healthy/unhealthy”):

Alone benefits “Psychological research has revealed that spending time alone is good for our health and well-being. A recent study shows that people who spend a lot of time alone report overall better health than people who spend a lot of time with other people. In addition, people who spend a lot of time alone are also substantially happier and more satisfied with their lives. This is because when we’re alone, we reflect on our experiences and focus on what truly matters to us. Other research conducted by leading neuroscientists shows that spending time alone reduces stress and anxiety. As a result, spending time alone can decrease our risk of mental disorders like depression. So, the evidence is clear: spending time alone is healthy. Although it can be hard to find time to be alone when we have busy schedules, we should try and spend more time alone—we will feel better.”

Alone risks “Psychological research has revealed that spending time alone is bad for our health and well-being. A recent study shows that people who spend a lot of time alone report overall worse health than those who spend a lot of time with other people. In addition, people who spend a lot of time alone are substantially less happy and less satisfied with their lives. This is because when we’re alone, we tend to experience loneliness and crave the presence of others. Other research conducted by leading neuroscientists shows that spending time alone increases stress and anxiety. As a result, spending time alone can increase our risk of mental disorders like depression. So, the evidence is clear: spending time alone is unhealthy. Although it can be hard to find time to be with others when we have busy schedules, we should try and spend less time alone—we will feel better.”

Control “On April 20, SpaceX launched its first test flight of Starship, the biggest rocket ever built. The 400-foot-tall, stainless-steel ship took off from Starbase, a spaceport in southern Texas. No people were on board. “I’m not saying it will get to orbit, but I am guaranteeing excitement,” SpaceX founder Elon Musk said of the planned launch. As it turned out, Starship did *not* get into orbit. The plan was for it to make a 90-min trip partway around the planet. But about 4 min after liftoff, the rocket exploded. Even so, just getting the rocket off the launchpad was a major success for SpaceX. For now, the company is focused on getting a Starship rocket ready to take NASA astronauts to the moon by 2025, and eventually, to Mars. For at least a few minutes, people who gathered on nearby South Padre Island to watch the launch got their excitement.”

Attention check. After reading each article they were exposed to (including, but not limited to, the experimental manipulation article), participants were instructed to highlight the key takeaway of the article using the highlight functionality embedded in Qualtrics. They were also asked to summarize the article via an open-ended question. Their responses served as an attention check to ensure participants read and understood the articles. Participants who either did not highlight the passages as instructed or did not accurately summarize any of the four articles they read were excluded from analyses (see *Exclusions*).

Dependent variables. In the second part of the study, we administered four brief questionnaires that probed participants' beliefs about a range of topics. The four questionnaires were presented in randomized order, and each comprised four items. To distract from the true purpose of the experiment, three filler questionnaires asked participants to report their beliefs about climate change, the effects of spending time in nature, and keeping busy at work (see Supplementary Information). In the fourth questionnaire, participants reported their beliefs about the effects of being alone using an abbreviated version of the beliefs measure included in Studies 3–7 (Study 2 was conducted after Studies 3–7 to supplement the claim that media exposure causally impacts beliefs; for details on the abbreviated measure see Supplementary Information). They rated the extent to which they believe being alone is (a) not enjoyable–enjoyable, (b) discouraging–hopeful, (c) bad–good, and (d) unhealthy–healthy using a 1 (most negative) to 7 (most positive) scale. As this measure demonstrated excellent internal consistency ($\alpha = .93$), we created a composite index by taking the average of the four items ($M = 5.18$, $SD = 1.38$).

Funneled debriefing. Next, we administered a funneled debriefing to systematically probe participants about their perceptions of the study aims and hypotheses. We asked three open-ended questions that decreased in their level of generality: (Q1) “What did you think the study was about?”, (Q2) “If you had to guess, what do you think the researchers were testing or looking for?”, and (Q3) “Was there anything odd that stood out to you as you completed the study?”. Participants who correctly identified the study purpose and/or hypotheses were excluded from analyses (see *Exclusions*).

Demographics. Lastly, we collected information about participants' age, gender, race/ethnicity, and highest level of education.

Exclusions. Exclusion criteria included (A) not highlighting the passages as instructed, (B) providing inaccurate summaries for any of the four articles, or (C) correctly identifying the study's purpose during the funneled debriefing. We pre-registered criteria (A) and (B). We accidentally omitted criterion (C) from our pre-registration and thus added it after creating our pre-registration but before collecting data. Critically, none of the results change if we include these participants.

Exclusion criterion A All participants highlighted the articles as instructed. Thus, none were excluded.

Exclusion criterion B Two independent coders reviewed participant summaries for each article and coded whether they accurately reflected the articles (1 = accurate, 0 = inaccurate; interrater reliability for TikTok article: Gwet's AC1 = 0.996; Red Wine article: AC1 = 1.00; Cold Plunge article: AC1 = 0.998; Alone Risks article: AC1 = 1.00; Alone Benefits article: AC1 = 0.993; Control article: AC1 = 1.00). A third coder resolved any discrepancies. Seven participants failed to provide accurate summaries for any of the articles and were subsequently excluded from analyses.

Exclusion criterion C The same two independent coders reviewed the funneled debriefing responses and coded for whether participants correctly guessed the purpose and/or hypotheses of the study (interrater reliability for Q1: Gwet's AC1 = 0.993, Q2: AC1 = 0.993, Q3: AC1 = 0.998). Nine participants who correctly identified the study goals were excluded.

A total of sixteen participants were excluded, leaving a final sample of 440 included in analyses. These exclusions did not meaningfully affect any of the results reported in the main text.

Analysis. Following our pre-registration, we performed planned contrasts in R (Version 14.1717)⁶⁷ to test our theory-driven predictions about the effects of exposure to information about being alone on people's beliefs. We tested for significant differences in beliefs about being alone between the *Alone Benefits* and *Control* conditions, and

between the *Alone Benefits* and *Alone Risks* conditions. The resulting negative beta values in the R code are an artifact of the designating *Alone Benefits* as the reference group and results are reported in the manuscript in absolute terms. We also tested whether there were significant differences in beliefs about being alone between the *Control* and *Alone Risks* conditions, although we had no a priori hypotheses for this effect (i.e., we reasoned that many participants might come into the study with more negative beliefs about being alone, although we also recognized the possibility that reading about the risks of being alone could further exacerbate negative beliefs about being alone). The data met the assumptions of normality and heterogeneity of variance for the statistical tests employed.

Study 3

This experience sampling study examined whether people's beliefs about being alone influence the extent to which they experience changes in loneliness and other emotional states after spending time alone in daily life. This study was not pre-registered.

Participants. One-hundred-and-sixty-one participants were recruited via Prolific for a study on “Emotions in Daily Life”. Participants were not told that the research team was specifically interested in time spent alone or loneliness. To meet inclusion criteria, participants had to be between 18 and 30 years of age, live in the U.S., be fluent in English, and own an Android smartphone. We determined our target sample size by referencing recent experience sampling studies that assess time spent alone in daily life^{68,69}. After exclusions (see *Procedure*), a total of 138 participants (9570 total observations) were included in analyses ($M_{\text{age}} = 25.04$, $SD_{\text{age}} = 3.37$; 42.8% Female, 50.7% Male, 6.5% Non-binary/Other; 55.1% White, 13.0% Asian, 13.8% Black, 13.0% Latino, 5.1% Other Race; 1% Some High School; 21.7% Completed High School, 30.4% Some College, 37.7% Bachelor's Degree, 8.0% Master's Degree, 1.4% Doctorate Degree). Participants lived in areas across the mainland U.S. (42.0% Eastern Time, 34.8% Central Time, 2.2% Mountain Time, 21.0% Pacific Time).

Procedure

Phase 1: Background questionnaire. After providing informed consent, participants completed a set of questionnaires. Of primary interest was a six-item version of the beliefs about being alone scale. Participants rated the extent to which they believe being alone is (a) not enjoyable–enjoyable, (b) discouraging–hopeful, (c) bad–good, (d) boring–interesting, (e) lonely–connected, and (f) unhealthy–healthy using a 1 (most negative) to 7 (most positive) scale ($M = 4.82$, $SD = 1.13$, Cronbach $\alpha = .88$). Of secondary interest, we administered the UCLA Loneliness Scale-8⁷⁰ ($M = 19.40$, $SD = 5.97$, Cronbach $\alpha = .90$), Multidimensional Scale of Perceived Social Support⁷¹ ($M = 57.04$, $SD = 16.54$, Cronbach $\alpha = .91$), Patient Health Questionnaire-2 ($M = 4.00$, $SD = 1.67$, Cronbach $\alpha = .85$), Generalized Anxiety Disorder-7 ($M = 13.96$, $SD = 5.16$, Cronbach $\alpha = .89$), Big Five Inventory-Extraversion Subscale⁷² ($M = 18.72$, $SD = 7.48$, Cronbach $\alpha = .89$), and demographics (i.e., age, gender, race/ethnicity, and highest level of education). At the end of the survey, participants watched a brief video where the first author (M.R.) explained Phase 2 in detail to ensure that participants understood how to properly complete the experience sampling surveys and fulfill the study requirements (see Supplementary Information). Participants received \$3.00 USD for completing Phase 1.

Phase 2: Experience sampling. Participants were text-messaged 5 times per day between 9am and 9 pm over the course of 14 days. Text messages were sent using Qualtrics SMS Distributions at fixed intervals of 3 h (i.e., 9am, 12 pm, 3 pm, 6 pm, and 9 pm)⁷³. Each text message contained a link to a brief online survey, which prompted participants to answer the following questions: (1) How lonely do you feel right

now? (Not at all [0] to extremely [100]; $M = 23.43$, $SD = 27.19$); (2) How much time have you spent alone since the last time we asked? (None at all [1] to a lot [5]; $M = 2.99$, $SD = 1.50$; “alone” was defined as “physically by yourself, with no one [excluding pets] around you”).

At each text message, participants were also prompted to indicate their feelings of overall negative affect (Not at all [0] to extremely [10]; $M = 3.02$, $SD = 2.60$), boredom (Not at all [0] to extremely [100]; $M = 31.88$, $SD = 28.20$), stress (Not at all [0] to extremely [100]; $M = 35.38$, $SD = 29.79$), overall positive affect (Not at all [0] to extremely [10]; $M = 6.10$, $SD = 2.41$), contentment (Not at all [0] to extremely [100]; $M = 57.41$, $SD = 27.09$), and gratitude (Not at all [0] to extremely [100]; $M = 52.18$, $SD = 29.08$).

Participants responded to an average of 88.7% of surveys (range: 1.4%–100%). They received \$0.50 USD for each survey they completed (up to \$35.00 USD total). To encourage compliance, participants with high response rates (i.e., those who completed $\geq 85\%$ of experience sampling surveys) were entered into a raffle to receive one of four \$50 Amazon gift cards. See Supplementary Information for a list of other questionnaires we administered during Phase 1 to address questions outside the scope of this study.

Exclusions. Following prior experience sampling research⁷⁴, we excluded 23 participants who completed 60% or fewer surveys (< 41 of 70 surveys) on a priori grounds. This left a final sample size of 138 participants.

Analysis. We examined the relationship between time spent alone and loneliness using multilevel analyses to account for the nested data structure (i.e., observations nested within participants). Specifically, we examined whether change in loneliness between T_{n-1} and T_n (i.e., loneliness at T_n – loneliness at T_{n-1}) was predicted by time spent alone (i.e., How much time have you spent alone since the last time we asked?) between T_{n-1} and T_n , controlling for T_{n-1} loneliness (between-day lags were excluded). Note that although this analysis assesses time spent alone at T_n , the question refers to time spent alone between T_{n-1} and T_n . This analysis allowed us to investigate whether time spent alone during the span between T_{n-1} and T_n predicted changes in loneliness over this period. We tested for moderation by examining whether the moderator variable of interest (i.e., beliefs about being alone, measured in Phase 1) was related to the slope of time spent alone between T_{n-1} and T_n when predicting changes in loneliness between T_{n-1} and T_n , controlling for T_{n-1} loneliness.

Linear mixed-effects models were used for all analyses using the lme4⁷⁵ (Version: 1.1-26) and lmerTest⁷⁶ (Version 3.1-3) packages in R⁷⁷ (Version 1.4.1717). Intercepts and slopes were allowed to vary randomly across participants. Results did not differ when we only allowed intercepts (and not slopes) to vary randomly. Additionally, predictors were centered on the person mean for Level 1 predictors (e.g., time spent alone) and grand mean for Level 2 predictors (e.g., beliefs about being alone). Following prior work⁷⁷, we excluded between-day lags from the lagged analysis (i.e., participants’ first ratings in the morning were not predicted by their last ratings on the previous day). To assess robustness, we conducted an additional linear mixed-effects model where we added five theoretically relevant individual differences (i.e., depression, anxiety, trait loneliness, perceived social support, and extraversion) as covariates. The data met the assumptions for the statistical tests employed (i.e., independence of residuals, normality of residuals, and homoscedasticity).

Study 4

Across four multi-national samples (two in the U.S. and two in Japan), we examined whether beliefs about being alone influence the extent to which time spent alone over the past month is associated with loneliness. Study 4 was pre-registered (AsPredicted #139022 for U.S./Japan Sample 1, July 21, 2023, <https://aspredicted.org/ss2k7.pdf>; AsPredicted

#141255 for U.S./Japan Sample 2, August 17, 2023, <https://aspredicted.org/iq4tj.pdf>).

Overview of studies. First, we conducted U.S./Japan Sample 1. An a priori power analysis using G*Power indicated that a sample size of 178 per country was necessary to achieve 95% power to detect a small-to-medium effect size (Cohen’s $d = 0.35$) in our independent sample t -tests (two-tailed) at an alpha level of 0.05. We aimed to recruit 250 per country to account for potential participant exclusions. To test for replicability, we replicated this study with larger samples (U.S./Japan Sample 2). An a priori power analysis using G*Power indicated that a sample size of 542 per country was necessary to achieve 95% power to detect the smallest effect size observed in U.S./Japan Sample 1 ($d = 0.20$) at an alpha level of 0.05. We aimed to recruit 600 participants in each country to account for potential participant exclusions.

Participants. In U.S. Sample 1, a total of 251 American participants were recruited via Prolific, of which 244 were included in analyses (see *Exclusions*; $M_{\text{age}} = 37.32$, $SD_{\text{age}} = 12.73$; 46.3% Female, 50.4% Male, 3.3% Non-binary/Other; 67.2% White, 10.2% Asian, 9.8% Black, 8.2% Latino, 4.5% Other Race; 1.6% Some High School, 13.9% Completed High School, 26.2% Some College, 40.2% Bachelor’s Degree, 17.6% Master’s Degree, 0.004% Doctorate Degree). To participate, individuals were required to be 18 years of age or older, have grown up in the U.S., and currently live in the U.S. Participants were paid \$2.00 USD.

In Japan Sample 1, 269 Japanese participants were recruited via Lancers (www.lancers.jp), a Japanese online crowdsourcing platform. Of these, 255 were included in analyses (see *Exclusions*; $M_{\text{age}} = 41.83$, $SD_{\text{age}} = 9.25$; 38.4% Female, 61.2% Male, 0.004% Non-binary/Other; 100% Japanese origin; 2.4% Some High School, 29.4% Completed High School, 22.4% Some College, 39.2% Bachelor’s Degree, 4.7% Master’s Degree, 2.0% Doctorate Degree). To participate, individuals were required to be 18 years of age or older, have grown up in Japan, and currently live in Japan. Participants were paid ¥200 (roughly equivalent to \$1.50 USD).

In U.S. Sample 2, 604 American participants were recruited via Prolific, of which 576 were included in analyses (see *Exclusions*; $M_{\text{age}} = 41.27$, $SD_{\text{age}} = 13.58$; 49.7% Female, 48.8% Male, 1.6% Non-binary/Other; 74.0% White, 7.5% Asian, 7.8% Black, 7.3% Latino, 3.5% Other Race; 1.0% Some High School, 14.1% Completed High School, 28.6% Some College, 41.8% Bachelor’s Degree, 11.5% Master’s Degree, 3.0% Doctorate Degree). Inclusion criteria were identical to those in U.S. Sample 1. Participants were paid \$2.00 USD.

In Japan Sample 2, 546 Japanese participants were recruited via Lancers, of which 511 were included in analyses (see *Exclusions*; $M_{\text{age}} = 43.16$, $SD_{\text{age}} = 9.88$; 39.9% Female, 59.1% Male, 1.0% Non-binary/Other; 100% Japanese origin; 2.2% Some High School, 30.3% Completed High School, 22.3% Some College, 38.4% Bachelor’s Degree, 5.9% Master’s Degree, 1.0% Doctorate Degree). Inclusion criteria were identical to those in Japan Sample 1. Participants were paid ¥200 (roughly equivalent to \$1.50 USD). We attempted to reach a final sample size of 600, per our pre-registered plan, but subject intake stalled after 17 h despite multiple efforts to prioritize the study in the queues of potential participants. The data were not examined before terminating data collection.

Procedure. After providing informed consent, participants completed a battery of questionnaires. Following our pre-registrations, we assessed beliefs about being alone via the six-item questionnaire used in Study 3. This questionnaire displayed excellent internal consistency across samples and in both cultures (U.S. Sample 1: $\alpha = .91$; Japan Sample 2: $\alpha = .91$; U.S. Sample 1: $\alpha = .93$; Japan Sample 2: $\alpha = .90$). Thus, we created a composite index by taking the average of the six items (U.S. Sample 1: $M = 5.40$, $SD = 1.17$; Japan Sample 1: $M = 5.58$, $SD = 1.07$; U.S. Sample 1: $M = 5.02$, $SD = 1.23$; Japan Sample 2: $M = 5.56$, $SD = 1.02$).

We assessed loneliness using the UCLA Loneliness Scale 8-item version⁷⁰. Participants rated the extent to which they generally felt isolated (e.g., “There is no one I can turn to”) on a scale from 1 (never) to 4 (often; U.S. Sample 1: $M = 18.09$, $SD = 5.59$; Japan Sample 1: $M = 18.58$, $SD = 5.28$; U.S. Sample 2: $M = 16.59$, $SD = 5.47$; Japan Sample 2: $M = 18.49$, $SD = 4.70$). This scale demonstrated good internal consistency in both cultures (U.S. Sample 1: $\alpha = .87$; Japan Sample 1: $\alpha = .87$; U.S. Sample 2: $\alpha = .88$; Japan Sample 2: $\alpha = .83$).

We also assessed time spent alone using a set of questions from the Midlife in the United States (MIDUS) and Midlife in Japan (MIDJA) 2013 surveys⁷⁸. Three items assessed social contact with friends, family, and spouse/partner, respectively, in the past month (e.g., “In the past month, how often did you spend time with your friends?”) on a scale from 1 (never) to 3 (7 or more times). Total social contact in the past month was calculated by summing the responses to the three items. Total social contact scores were reverse-scored to provide an index for time spent alone in the past month (U.S. Sample 1: $M = 3.84$, $SD = 1.46$; Japan Sample 1: $M = 4.13$, $SD = 1.59$; U.S. Sample 2: $M = 3.47$, $SD = 1.41$; Japan Sample 2: $M = 3.80$, $SD = 1.58$).

We additionally administered the Relational Mobility Scale⁷⁹, the Tightness-Looseness Scale⁸⁰, and the Individualism and Collectivism Scale⁸¹, which tap into cultural dimensions that we reasoned could be theoretically relevant to loneliness. We controlled for these variables in our main analyses of interest. In no case did doing so substantively influence the results reported in the main text (see Supplementary Information).

Finally, we collected demographic information about participants’ age, gender, race/ethnicity, and highest level of education.

Japanese translation. We followed best practices for translating surveys^{82,83}. First, the original English version of the survey (used in U.S. Samples 1 and 2) was translated into Japanese by two independent bilingual translators who were blind to the purpose of the study. These individuals were proficient in both languages and possessed an understanding of psychological research to ensure terminological precision. The two Japanese translations were then integrated into a single version by a third bilingual translator. The first author (M.R.) met with this third translator and described the purpose and topic of the study to ensure the fidelity of the translation. Discrepancies between the translations were discussed and resolved by M.R. and the third translator. The consolidated Japanese version was then back-translated into English by a fourth independent translator, who was blind to the original English version and the purpose of the study. The original English version of the survey and the back-translated English version were compared side by side by the first author (M.R.). Any discrepancies or inconsistencies were identified. The Japanese version was then revised accordingly by the fourth translator to ensure that the intended meanings of the questions and responses were preserved. This Japanese survey was used for Japan Samples 1 and 2. The final Japanese survey can be found on the Open Science Framework page for this study (<https://doi.org/10.17605/OSF.IO/6GX8R>).

Exclusions. We filed separate pre-registrations for U.S./Japan Samples 1 and 2. We pre-registered four exclusion criteria for Sample 1, and an additional two exclusion criteria for Sample 2. Table 1 provides a breakdown of exclusions on these criteria for all four samples.

Criterion (A) excluded participants who completed the study too quickly—i.e., in under 3 min (Sample 1) or 4 min (Sample 2)—which we considered too rapid to have allowed for careful reading and thoughtful answering of survey questions. Our pre-registered cut-off differed between Sample 1 (i.e., 3 min) and Sample 2 (i.e., 4 min) because we included an additional question to Sample 2 (see Criterion F below). We applied criterion (A) rather than excluding participants who were three standard deviations below the sample mean of

duration to account for the skewed distribution of the duration data. On average, it took participants 11 min to complete the study (U.S. Sample 1: $M = 10.76$, $SD = 6.14$; Japan Sample 1: $M = 12.63$, $SD = 7.77$; U.S. Sample 2: $M = 10.47$, $SD = 5.51$; Japan Sample 2: $M = 11.86$, $SD = 6.76$).

Criterion (B) excluded participants who took an unusually long time to complete the study—i.e., more than three standard deviations above the sample mean of duration—as prolonged completion times typically indicate that participants were distracted and/or did not complete the survey in one sitting. We only pre-registered this criterion in Sample 2, but we applied criterion (B) to Sample 1 for consistency. Notably, applying Criterion B to Sample 1 did not meaningfully impact any of the reported results.

Criterion (C) excluded participants who did not finish the study.

Criterion (D) excluded participants who provided non-human responses to the open-ended question. We introduced this criterion as a safeguard against bot-generated data. Although differentiating between human and bot-generated content can be challenging, we planned to exclude responses that were irrelevant to the given prompt or otherwise incomprehensible. To do so, we had one rater look through the open-ended data and identify any incomprehensible responses.

We pre-registered two additional exclusion criteria for Sample 2 that we did not include in our pre-registration for Sample 1. As shown in Table 1, no participants were excluded based on these additional criteria (E and F). Criterion (E) excluded participants who did not follow study instructions (i.e., did not answer the open-ended question).

Criterion (F) excluded participants who did not agree to provide high-quality responses in an initial commitment check (i.e., those who responded “No” or “I can’t promise either way” to “We care about the quality of our survey data. For us to get the most accurate measures of your opinions, it is important that you provide thoughtful answers to each question in this survey. Do you commit to providing thoughtful responses to the questions we ask in this survey?”).

In our pre-registration for Sample 2, we additionally planned to remove any outliers in the variables of interest (i.e., beliefs about being alone, loneliness, and time spent alone), defined as cases that lie above or below 3 SDs from the sample mean. We found no such outliers in the dataset and thus did not exclude any cases.

Analysis. Following our pre-registered plan, we first conducted an independent sample *t*-test (two-tailed) to examine if Japanese versus Americans differed in their beliefs about being alone. Next, per our pre-registered plan for Sample 2, we mega-analyzed data across Samples 1 and 2 given that they used identical questionnaires and that the sample did not moderate the main moderation effect. To this end, we fit a linear mixed-effects model using the lme4 package⁷⁵ (Version: 1.1-26) in R (Version 1.4.1717). The model included the random intercept of sample (to account for any non-independence of observations within the same sample), two fixed effects (time spent alone and beliefs about being alone), and their interaction (time spent alone * beliefs about being alone) to predict loneliness. We re-ran this model controlling for theoretically relevant cultural dimensions and demographic variables (i.e., vertical individualism, horizontal individualism, vertical collectivism, horizontal collectivism, tightness, relational mobility, age, and gender; see Supplementary Information). The data met the assumptions for the statistical tests employed (i.e., independence of residuals, normality of residuals and random effects, homoscedasticity).

Additional pre-registered analyses. The main text reports all pre-registered analyses that were centrally relevant to the paper’s main arguments. Analyses that were pre-registered but of secondary interest are reported in Supplementary Information (pp. 20–27).

Bivariate correlations. In our pre-registrations, we planned to conduct bivariate correlations to assess relationships between all variables of

Table 1 | Exclusion criteria and final sample sizes for Study 4

Country/sample	Completed study	Crit. (A)	Crit. (B)	Crit. (C)	Crit. (D)	Crit. (E)	Crit. (F)	Total excluded	Final sample
U.S. Sample 1	251	3	4	0	0	–	–	7	244
Japan Sample 1	269	8	6	0	0	–	–	14	255
U.S. Sample 2	604	13	15	0	0	0	0	28	576
Japan Sample 2	546	24	11	0	0	0	0	35	511

interest. The main correlation of interest (between beliefs about being alone and loneliness) is highlighted in the main text. Bivariate correlations between all other variables for each individual sample in Study 4 can be found in Supplementary Information.

Self-reported media exposure. In Study 4, we administered the following item, “How often do you see, on the Internet/newspaper/TV, reference to being alone or social isolation?” (rated from 1 [never] to 5 [very often]), to examine how self-reported exposure to media about being alone correlates with culture (Sample 1) and loneliness and beliefs about being alone (Sample 2). Shortly after collecting data for Sample 2, but before analyzing these data, we discovered that self-report indices of media exposure are widely considered flawed given people’s failure to accurately recall exposure estimates^{84–87}. For example, studies comparing such self-report assays against objective measures reveal substantial individual differences in self-report inflation, suggesting that exaggerated responses are reliable but not consistent across people. This makes it difficult to adjust reported values to obtain accurate estimates of media exposure⁸⁴. As such, we report all pre-registered analyses involving this item in Supplementary Information but refrain from interpreting them.

Cultural differences in variables of interest. In our pre-registration for Sample 1, we planned to examine whether Japanese versus Americans differ in beliefs about being alone, loneliness, social contact, and media exposure. We report cross-cultural differences in beliefs about being alone in the main text. Cross-cultural differences in loneliness, social contact (reversed scored to index time spent alone), and media exposure can be found in Supplementary Information. Per our pre-registered plan for Sample 1, we re-ran these models controlling for beliefs about being alone, vertical/horizontal individualism, vertical/horizontal collectivism, tightness, relational mobility, media exposure (except in the model that already includes media exposure as an outcome), age, and gender (see Supplementary Information).

Open-ended experiences of being alone. Per our pre-registered plan for Sample 1, we obtained qualitative data about people’s beliefs about being alone. We did not pre-register this item in Sample 2 but decided to include it in these studies for exploratory purposes. Thus, for all samples, we asked the following open-ended question:

“Spending time alone is a common experience. Nearly everyone spends time alone each day. However, people vary in how they think about being alone. Some people find time alone to be a positive, enjoyable, and peaceful experience. Other people find time alone to be a negative, unpleasant, and lonely experience. In the next part of the study, we would like to learn more about how you think about being alone. To what extent—and why—do you think spending time alone is a positive or negative experience for you? There are no right or wrong answers. Take as much space as you need to fully describe your thoughts about time alone.”

We have not yet analyzed these open-ended data for any of the studies and thus do not report on them.

Study 5

To test generalizability of our findings across a broader range of cultures, we reran the paradigm from Study 4 in seven countries spanning five continents (i.e., Brazil, South Africa, U.K., Mexico, Spain, Australia, Poland). Study 5 was pre-registered (AsPredicted #184189, July 24, 2024, <https://aspredicted.org/Siv7f.pdf>).

Selection of countries. We selected countries with varying rates of loneliness to see if our effects generalized across diverse cultural contexts. To do so, we computed country-level means of loneliness from the first wave of the Global Flourishing Study, a multi-national dataset released in 2024 ($N = 202,898$ adults across 22 countries). As of February 2025, the Global Flourishing Study is not publicly available online but is available to researchers upon request (<https://www.cos.io/gfs>). In the Global Flourishing Study, loneliness was assessed via the item “How often do you feel lonely?” (0 = Always, 10 = Never), which we reverse scored so that higher scores indicated greater loneliness. Country-level sample sizes and means of loneliness for the 22 countries can be found in Supplementary Information. Based on these country-level loneliness means, we used k-means clustering to identify three groups of countries: low, moderate, and high loneliness (see Supplementary Information). For each group, we selected countries based on the ease with which we could recruit online participants, while aiming for geographical representation. This resulted in the initial selection of Israel (low; see *Deviation from Pre-Registration* section below), Poland (low), U.K. (moderate), Australia (moderate), Spain (moderate), Mexico (moderate), South Africa (high), and Brazil (high).

Power analyses. We planned to combine data across the different countries and construct a mixed-effects linear regression model on the combined data (see *Analysis* below for more detailed information). To determine sample size, we performed a priori power analysis using the powerCurve function from the simr package in R. We set the fixed effect (unstandardized beta) of the interaction between time spent alone and beliefs to -0.3057 (which is the smallest interaction effect detected in Study 4), with the model’s random intercept variance and residual standard deviation as 1.05 and 4.465, respectively (based on model outcomes in Study 4). The analysis, which tested sample sizes of 50, 100, 150, 200, and 250 per country and ran 1000 simulations, revealed that a sample of 150 participants per country provides 97.10% power [CI 95.86, 98.05] to detect the interaction. To account for potential exclusions, we planned to recruit 180 participants per country.

Deviation from pre-registration. We initially planned to collect data in Israel. However, the geopolitical situation and ongoing war as of August 2024 created unforeseen difficulties. The circumstances changed significantly between the time of our pre-registration and when we planned to launch the study. Given the unique and highly stressful conditions in Israel, we determined that including data from this context would not be appropriate for demonstrating the generalizability of our findings. As such, we decided to not proceed with data collection in Israel. Below, we report methods and findings for the other seven countries we included in our pre-registration (i.e., Brazil, South Africa, U.K., Mexico, Spain, Australia, Poland).

Table 2 | Sample size and participant exclusions for Study 5

Country	Completed Study	Crit. (A)	Crit. (B)	Crit. (C)	Crit. (D)	Crit. (E)	Crit. (F)	Total Excl.	Final sample
Brazil	180	5	4	0	0	0	0	9	171
South Africa	180	0	2	0	0	0	0	2	178
U.K.	180	5	4	0	0	0	0	9	171
Mexico	180	1	4	0	0	0	0	5	175
Spain	180	3	5	0	0	0	0	8	172
Australia	180	9	2	0	0	0	0	11	169
Poland	180	0	1	0	0	0	0	1	179
Total	1260	23	22	0	0	0	0	45	1215

Participants. Participants were recruited online via the crowdsourcing platforms Prolific (South Africa, U.K., Mexico, Spain, Australia, Poland) and Besample (Brazil). We used Besample instead of Prolific to recruit participants from Brazil because fewer than 25 Brazilian participants were active Prolific users as of July 2024. To participate, individuals had to be (a) aged 18 or older, (b) raised in the respective country, and (c) currently living in the respective country. One-hundred-and-eighty participants from each country completed the study (total $N=1260$). Participant exclusions are reported below under *Exclusions*. Sample demographics for participants included in analyses can be found in Supplementary Information.

Procedure. The procedure was identical to that of Study 4, except that: (1) We no longer included the media exposure questions for reasons mentioned previously, and (2) participants in all countries were paid \$2.00 USD. Internal consistency ranged from good to excellent across countries for our key measures: the Beliefs about Being Alone Scale (Brazil: $\alpha = .91$; South Africa: $\alpha = .93$; U.K.: $\alpha = .94$; Mexico: $\alpha = .87$; Spain: $\alpha = .91$; Australia: $\alpha = .94$; Poland: $\alpha = .91$) and the UCLA Loneliness Scale (Brazil: $\alpha = .84$; South Africa: $\alpha = .77$; U.K.: $\alpha = .86$; Mexico: $\alpha = .83$; Spain: $\alpha = .85$; Australia: $\alpha = .86$; Poland: $\alpha = .86$).

Translations. Surveys conducted in countries where English is not the official language (i.e., Brazil, Mexico, Spain, Poland) were translated into the corresponding native languages (Portuguese, Spanish, Polish). First, we used Google Translate to generate a preliminary translation. Then, the first author (M.R.) met with a native speaker of each language to review the preliminary translation and discuss the study purpose and goals. Next, the native speaker reviewed the translation and made revisions as needed. Finally, M.R. back-translated the surveys into English using Google Translate to verify the fidelity of the translation. Survey translations can be found on the Open Science Framework page for this study (<https://doi.org/10.17605/OSF.IO/6GX8R>).

Exclusions. We pre-registered six exclusion criteria, which are identical to those used in Study 4 U.S./Japan Sample 2. Table 2 displays exclusions for each sample and final sample sizes.

Analysis. We pre-registered all of our analyses. First, we planned to conduct bivariate correlations (Pearson's r) in each country to test whether people who hold more positive beliefs about being alone are less lonely. Next, we planned to combine all countries' data and construct a mixed-effects linear regression model to test the effects of two predictors (time spent alone, beliefs about being alone) and their interaction on loneliness. This mixed-effects model includes country as a random intercept to account for variations across different cultural contexts. All analyses were conducted as two-tailed. The data met the assumptions for the statistical tests employed (i.e., independence of residuals, normality of residuals and random effects, homoscedasticity).

Additional pre-registered analyses. We pre-registered the following analyses as exploratory and report their results in Supplementary Information.

Cultural differences in beliefs about being alone. We planned to conduct an inferential test (i.e., ANOVA) to examine whether people's beliefs about being alone significantly differ across the various countries.

Cross-cultural variability in the interaction between beliefs and time spent alone. We planned to test if the hypothesized interaction effect between time spent alone and beliefs about being alone on loneliness varies significantly by culture.

Model estimates with covariates added. We planned to rerun the main interaction model presented in the main text with cultural dimensions (i.e., vertical/horizontal individualism, vertical/horizontal collectivism, tightness, relational mobility) and demographics (i.e., age, gender) as covariates.

Moderation of beliefs for individual countries. For each country separately, we planned to test if beliefs about being alone significantly moderate the link between time spent alone and loneliness.

Bivariate correlations. For each country separately, we planned to conduct bivariate correlations between variables of interest.

Reporting summary
Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability
All original data are publicly available online on the Open Science Framework (<https://doi.org/10.17605/OSF.IO/6GX8R>). Data from the Global Flourishing Study (Wave 1, released in 2024) is not publicly available online but is available to researchers upon request (<https://www.cos.io/gfs>).

Code availability
The code necessary to reproduce all analyses is publicly available online on the Open Science Framework at <https://doi.org/10.17605/OSF.IO/6GX8R>.

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Author contributions

M.R. developed the study concept. M.R., K.E.S., and E.K. designed the studies. M.R. collected the data. M.R. analyzed the data under the guidance of K.E.S. and E.K. K.E.S. reviewed all R code and data. M.R. drafted the manuscript, and E.K. and K.E.S. provided critical revisions. All authors approved the final version of the manuscript for submission. M.R. and E.K. acquired funding to support this project.

Competing interests

The authors declare no competing interests.

Additional information

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