The Gerontologist
cite as: *Gerontologist*, 2021, Vol. 61, No. 6, 878–887
doi:10.1093/geront/gnab081
Advance Access publication June 14, 2021

Research Article

Purpose in Life, Loneliness, and Protective Health Behaviors During the COVID-19 Pandemic

Yoona Kang, PhD,*, Danielle Cosme, PhD, Rui Pei, PhD, Prateekshit Pandey, MA, José Carreras-Tartak, BA, and Emily B. Falk, PhD

Annenberg School for Communication, University of Pennsylvania, Philadelphia, Pennsylvania, USA.

*Address correspondence to: Yoona Kang, PhD, Annenberg School for Communication, University of Pennsylvania, 3620 Walnut Street, Philadelphia, PA 19104, USA. E-mail: yoona.kang@asc.upenn.edu

Received: February 12, 2021; Editorial Decision Date: June 4, 2021

Decision Editor: Suzanne Meeks, PhD, FGSA

Abstract

Background and Objectives: Social distancing, while effective in slowing the spread of the coronavirus disease 2019 (COVID-19), can increase social isolation. The current preregistered study examined purpose in life as a psychological resource that may buffer against loneliness and increase intentions to engage in health-protective behaviors.
Research Design and Methods: During the COVID-19 pandemic, 517 adults (mean = 37.71, *SD* = 11.30; range = 19–73) reported their levels of purpose in life, current and prepandemic levels of loneliness, and degrees to which they intended to engage in behaviors known to prevent the spread of COVID-19.
Results: Across age, having a stronger sense of purpose in life was associated with lower loneliness, as well as greater intentions to engage in COVID-protective behaviors. Higher loneliness was associated with lower intentions to maintain social distance and engage in additional health promotion behaviors such as handwashing. However, this link was not present at higher levels of purpose in life. Older age was also associated with less loneliness, but not for individuals with lower levels of purpose in life.
Discussion and Implications: Results suggest that psychological resources such as purpose in life are associated with increased protective health behaviors. Furthermore, purpose in life may reduce loneliness and counteract the negative effects of stressors that diminish the willingness to engage in health-protective behaviors. Our data also highlight resilience among older individuals in times of isolation during a global pandemic.

Keywords: Health, Meaning in life, Resilience, Social isolation, Stress and coping, Well-being

The pandemic caused by the coronavirus disease 2019 (COVID-19) has threatened the health of millions across the globe. Avoiding close contact with others by putting physical distance between people, or "social distancing," is one of the most effective strategies to slow the spread of the virus along with other health-promoting recommendations such as handwashing. While social distancing is critical to stay safe during the pandemic, it also has increased stress associated with social isolation and loneliness. Research on the psychological impact of the COVID-19 pandemic shows that stay-at-home orders increased loneliness (Tull et al., 2020), and social isolation exacerbated the negative effect of pandemic-related life changes on well-being (Birditt et al., 2021; Losada-Baltar et al., 2021; Minahan et al., 2021). Furthermore, people may cope with stress by engaging in unhealthy behaviors (Mezuk et al., 2017). Stress associated with loneliness and/or loneliness itself as a stressor during a pandemic may diminish people's engagement with protective health behaviors against the COVID-19. Following the call to identify protective fac-

tors for at-risk populations during the pandemic (Resnick et al., 2021), the current study examined whether greater availability of psychological resources would be associated with increased resilience and protection against illness in the face of challenges. Specifically, we tested purpose in life as a psychological resource that may protect individuals from loneliness during social isolation and encourage health-protective behaviors to counteract COVID-19 risk.

Purpose in Life as a Health-Protective Factor

Purpose in life refers to having a sense that one's life has meaning, a sense of direction, and a set of goals derived from personal values (Ryff, 1989). Purpose in life is one of the six components of well-being in the Six-factor Model of Psychological Well-being, which identifies psychological resources that contribute to health (Ryff, 1995, 2014; Ryff & Keyes, 1995). The conviction to find meaning and purpose even at times when the world seems meaningless and horrific is at the core of human flourishing and eudaimonic well-being (Ryff, 2014; Ryff & Singer, 2003, 2008). In the face of adversity, purpose in life provides an orientation toward goals and motivates actions that are aligned with personal values, thereby promoting resilience and protection against illness (Ryff et al., 1998). Supporting this framework, purpose in life has been consistently associated with reduced stress, enhanced well-being, and greater openness to health-protective behaviors (Roepke et al., 2014; Ryff & Singer, 1998). Specifically, having a stronger sense of purpose in life was uniquely associated with increased longevity (Boyle et al., 2010), reduced risk of age-related conditions such as heart diseases (Cohen et al., 2016) and cognitive impairment (Lewis et al., 2017), and healthier lifestyles that are key to successful aging, including physical activity (Hooker & Masters, 2016) and the use of preventive health services (Kim et al., 2014).

In the face of challenges that threaten health and well-being, individuals use various coping strategies based on their appraisal of the stressor and resource availability (e.g., stress and coping model; Lazarus & Folkman, 1984). When resources are scarce, individuals may engage in dysfunctional coping strategies that temporarily relieve but eventually exacerbate the stress (Biggs et al., 2017). For example, stress may create a trade-off between mental well-being and physical health behaviors (Mezuk et al., 2010) or deprioritize health behaviors (Mezuk et al., 2017). If, instead, protective resources such as purpose in life are available, individuals are more able to effectively fight off the deleterious effects of stress (Ryff & Singer, 2003). Some evidence from prepandemic research suggests that purpose in life may benefit individuals during the COVID-19 pandemic: A stronger sense of purpose has been associated with less perceived loneliness among older adults aged 60 and older (Neville et al., 2018). Furthermore, purpose in life may promote receptivity to health-protective behaviors. For example, individuals with a greater sense of self-transcendent purpose showed lower neural activity associated with defensiveness in response to self-relevant health messages (Kang et al., 2017) and lower conflict-related processing in the brain while exposed to health messages, which in turn predicted the likelihood of endorsing protective health recommendations (Kang et al., 2019). Taken to the context of a global pandemic, having clear goals that give meaning to life and knowing which actions would bring oneself closer to those goals may reduce the conflict between the stress of loneliness and the need to engage in health behaviors to protect oneself and others (Kang et al., 2019; Ryff & Singer, 1998).

Age and Loneliness During a Pandemic

Older populations face the highest risk of severe illness and mortality from COVID-19 worldwide (Jordan et al., 2020; Shahid et al., 2020), with over nine out of 10 deaths caused by COVID-19 being adults 55 years and older in the United States (CDC.gov as of January 2021). In addition to the physical risk, however, it is unclear whether older individuals are also more vulnerable to psychological risks such as loneliness during a pandemic. On the one hand, recent studies highlight remarkable resilience among older populations, such that older compared to younger adults during the COVID-19 pandemic reported *lower* levels of stress (Birditt et al., 2021; Knepple Carney et al., 2021; Nelson & Bergeman, 2021) and loneliness (Losada-Baltar et al., 2021; Minahan et al., 2021; Polenick et al., 2021). On the other hand, evidence generally points to increased age-related vulnerability for loneliness, from research conducted both prior (Pinquart & Sorensen, 2001) and during (Luchetti et al., 2020; Portacolone et al., 2021) the COVID-19 pandemic.

The Current Study

The unfortunate paradox of the pandemic is that people are forced to choose protective health behavior potentially at the cost of psychological health: Those who adhere to social distancing measures may end up experiencing increased isolation. Trade-offs between mental well-being and physical health behaviors may further exacerbate physical health risks. The current study tested purpose in life as a component of well-being that can confer protection against illness, increase resilience, and promote protective health behaviors during a health crisis. Specifically, we examined the relationships among purpose in life, loneliness, and intentions to engage in COVID-protective behaviors such as social distancing and handwashing across age, with a specific focus on outcomes among older age groups. We publicly preregistered our prediction that purpose in life would be associated with decreased loneliness and enhanced preventive health intentions (https://osf.io/39vfg/). We also

tested whether purpose in life may moderate the links between age and loneliness, as well as the link between loneliness and intentions to engage in COVID-protective behaviors.

Method

Participants

We recruited 865 adults through Amazon's Mechanical Turk (MTurk) as part of a larger study about COVID-19 prevention behaviors. A subset of 659 participants was randomly chosen to answer questions relevant to the current report. Data from 142 participants were excluded following preregistered data quality assessment standard operating procedures (https://osf.io/xwbhu/; Supplementary Material SI1), leaving the final sample of 517 participants who had usable data ($mean_{age}$ = 37.71; $median_{age}$ = 35, SD_{age} = 11.29; $range_{age}$ = 19–72; 282 men, 232 women, 2 other, 1 not reported; 362 White, 92 Black or African American, 39 Asian, 7 American Indian or Alaska Native, 1 Native Hawaiian or Other Pacific Islander, 16 Other). The sample size was determined by the larger data collection protocol, but the available sample size of n = 517 allowed us to detect an effect size of f^2 = 0.02 with 80% power (alpha = 0.05, two-tailed).

Procedures

We collected data from April 4 to April 6, 2020, shortly after the global outbreak of COVID-19. All participants provided informed consent approved by the University of Pennsylvania Institutional Review Board, filled out an online survey, and were compensated via MTurk. The survey items used in this study were a subset of a larger project that tested message framing effects by exposing participants to health messages related to COVID-19 framed in different ways. Please see https://osf.io/bydv3/ for the complete list of survey measures included in the project and https://osf.io/xwbhu/ for data quality assessment standard operating procedures.

Measures

Purpose in life

Individual differences in purpose in life were measured by a modified seven-item version of the Psychological Well-Being Scales (WBS; Ryff, 1989) that includes a purpose in life subscale that assesses individuals' sense of purpose as one of the key components of eudaimonic well-being (Ryff, 2014; Ryff & Singer, 2008). WBS has shown reliability and validity in nationally representative samples (Ryff, 2014), and the modified seven-item purpose in life subscale used in the current study was psychometrically evaluated and validated in a previous large-scale study (Abbott et al., 2006). Participants rated the degree to which they agreed with statements such as "I have a sense of direction and purpose in life," rated on a 1 (*strongly disagree*) to 6 (*strongly agree*) scale. Scores were averaged across seven items, with higher scores reflecting a greater sense of purpose in life (Cronbach α = 0.81).

Loneliness

As preregistered, participants' current perceived level of loneliness was assessed by a single-item measure of loneliness ("Currently, how lonely are you?") using a 1 (*not lonely at all*) to 7 (*very lonely*) scale. In addition, to explore whether the results are specific to the pandemic context, we asked participants how lonely they felt prior to the COVID-19 pandemic ("Prior to the outbreak of COVID-19, how lonely were you?"). The current and prepandemic levels of loneliness were highly correlated (r = 0.72, p < .001, 95% CI [0.68–0.76]).

A global single-item question on loneliness has been used among older adults in previous studies (Jylhä, 2004; Sundström et al., 2020), and was suggested to be sufficient to gauge the prevalence of loneliness (Luanaigh & Lawlor, 2008), able to capture a subjective experience of loneliness as understood by the participants and not as predefined by the researcher (Jylhä & Saarenheimo, 2010). Furthermore, a single-item loneliness question showed reliability and validity comparable to a multiitem scale across six ethnic groups aged 40 and older (Victor et al., 2021).

COVID-preventive intentions

Participants rated the degree to which they intended to engage in protective health behaviors that prevent contracting and spreading the coronavirus over the next 2 weeks, using a scale ranging from 1 (*definitely won't*) to 7 (*definitely will*). Please see Supplementary Material SI2 for the full description of the items. In addition, participants' perceived norms and beliefs regarding COVID-protective behaviors were assessed (Supplementary Material SI2 and SI3). Ten protective behavior items included avoiding social contact, that is, social distancing (n = 4), hand hygiene (n = 4), and staying at home (n = 2). As preregistered, items were averaged to create a single COVID-preventive intention score per participant (Cronbach α = 0.82). We also conducted exploratory analyses to determine whether effects were driven by specific types of prevention behaviors that are more (e.g., social distancing) or less (e.g., handwashing) directly linked to loneliness versus stress in general. Results suggested that the overall relationships were not specific to the types of protective health behaviors (Supplementary Material SI4) and so we treated them together as a single measure as planned (https://osf.io/39vfg/). Questions were selected based on recommendations made by the Centers for Disease Control and Prevention at the time of study designing (March 2020), which placed the greatest emphasis on social distancing and handwashing.

Demographics

Participants self-reported their age, ethnicity, gender, the number of household members, and socioeconomic status (SES) measured by the MacArthur Scale of Subjective Social Status (Adler et al., 2000).

Analysis Plan

Separate regression analyses tested preregistered and exploratory hypotheses regarding the associations among purpose in life, age, loneliness, and COVID-preventive intentions. First, we tested whether purpose in life was associated with loneliness, as well as COVID-preventive intentions. Second, we tested whether loneliness was associated with COVID-preventive intentions. Third, we tested whether purpose in life moderated the link between age and loneliness. Finally, although not preregistered, we explored whether the relationship between loneliness and COVID-preventive intentions differed across different levels of purpose in life. Following our preregistered standard operating procedures, outliers larger than 3 *SD* from the mean were replaced with mean ±3 *SD*. As preregistered, all analyses controlled for the condition assignment for which participants received health messages related to COVID-19 framed in different ways as part of a parent study. All reported *p* values are two-tailed. Analyses were performed in R (v3.6.1, www.r-project.org) using the R-studio interface (v1.2.1335).

Results

Our analyses focused on the relationships among purpose in life, feelings of loneliness, age, and intentions to engage in COVID-protective behaviors. We further tested whether the links between (a) age and loneliness and (b) loneliness and COVID-preventive intentions differed by purpose in life. Please see Table 1 for the bivariate correlations among main study variables and demographics and Table 2 summarizing results from regression analyses testing associations among purpose in life, loneliness, age, and COVID-preventive intentions. All the data, analysis scripts, and output reported in this manuscript are available at https://github.com/cnlab/covid_purpose.

Purpose in Life Predicting Loneliness and COVID-Preventive Intentions

First, we tested whether having a stronger sense of purpose in life was associated with lower loneliness and higher COVID-preventive intentions. We found that across participants, individuals with stronger purpose in life were less lonely, such that a stronger sense of purpose was associated with lower loneliness for both the current (B = −0.77, t (511) = −9.13, p < .001, 95% CI [−0.93 to −0.60]) and prepandemic levels of loneliness (B = −0.94, t (511) = −13.05, p < .001, 95% CI [−1.08 to −0.80]). Furthermore, having a greater sense of purpose was associated with stronger intentions to engage in COVID-protective behaviors (B = 0.33, t (511) = 9.10, p < .001, 95% CI [0.26–0.41]). A stronger sense of purpose was also associated with higher levels of perceived norms and beliefs that COVID-protective behaviors are socially approved and effective (Supplementary Material SI2 and SI3).

Loneliness Predicting COVID-Preventive Intentions

Next, we tested whether loneliness was associated with COVID-preventive intentions. As predicted, individuals who reported higher levels of loneliness, for both the current (B = −0.11, t (511) = −5.89, p < .001, 95% CI [−0.15 to −0.07]) and prepandemic levels of loneliness (B = −0.18, t (511) = −9.28, p < .001, 95% CI [−0.22 to −0.14]), also reported lower intentions to engage in COVID-protective behaviors. Higher current levels of loneliness were also associated with lower perceived norms and beliefs that COVID-protective behaviors are socially approved and effective (Supplementary Material SI5).

Purpose in Life Moderating the Relationship Between Age and Loneliness

We examined purpose in life as a potential moderator of the relationship between age and loneliness. First, we found that age was negatively associated with loneliness, such that older compared to younger individuals reported feeling less lonely currently (B = −0.02, t

Table 1. Bivariate Correlations Between Main Study Variables and Demographics

Variable	1	2	3	4	5	6	7
1. Purpose in life	—						
2. Loneliness (current)	−0.37**	—					
3. Loneliness (prepandemic)	−0.50**	0.72**	—				
4. COVID-preventive intentions	0.37**	−0.25**	−0.38**	—			
5. Age	0.08	−0.13*	−0.14*	0.14*	—		
6. Socioeconomic status	0.10*	0.03	0.04	−0.28**	0.00	—	
7. Number of household members	−0.08	−0.01	0.04	−0.07	−0.09*	0.11*	—

Note: COVID = coronavirus disease.
*p < .05, **p < .01.

Table 2. Regression Analyses Testing Associations Among Purpose in Life, Loneliness, Age, and COVID-Preventive Intentions

Model (M)	β	*B*	95% CI	SE_B	*t*	*p*
M1: Purpose in life → Loneliness (current)	−0.37	−0.77	−0.93 to −0.60	0.08	−9.13	<.001
M2: Purpose in life → Loneliness (prepandemic)	−0.50	−0.94	−1.08 to −0.80	0.07	−13.05	<.001
M3: Purpose in life → COVID-preventive intentions	0.37	0.33	0.26 to 0.41	0.04	9.10	<.001
M4: Loneliness (current) → COVID-preventive intentions	−0.25	−0.11	−0.15 to −0.07	0.02	−5.89	<.001
M5: Loneliness (prepandemic) → COVID-preventive intentions	−0.38	−0.18	−0.22 to −0.14	0.02	−9.28	<.001
M6: Age → Loneliness (current)	−0.13	−0.02	−0.04 to −0.01	0.01	−2.86	.004
M7: Age → Loneliness (prepandemic)	−0.14	−0.02	−0.04 to −0.01	0.01	−3.19	.001
M8: Purpose in life × Age → Loneliness (current)						
Purpose in life	−0.21	−0.44	−1.04 to 0.16	0.31	−1.43	.154
Age	0.10	0.02	−0.05 to 0.08	0.03	0.51	.608
Purpose in life × Age	−0.26	−0.01	−0.02 to 0.01	0.01	−1.07	.287
M9: Purpose in life × Loneliness (current) → COVID-preventive intentions						
Purpose in life	0.22	0.20	0.06 to 0.34	0.07	2.74	.006
Loneliness (current)	−0.41	−0.18	−0.33 to −0.03	0.08	−2.28	.023
Purpose in life × Loneliness	0.27	0.03	−0.01 to 0.07	0.02	1.61	.109

Notes: COVID = coronavirus disease. Standardized (β) and unstandardized (*B*) regression coefficients, 95% confidence intervals (CIs), and standard error for unstandardized regression coefficients (SE_B) are displayed. All analyses controlled for the condition assignment as part of a larger study; the control variable was not included in the table. Please see https://github.com/cnlab/covid_purpose for all the model output statistics.

(511) = −2.86, p = .004, 95% CI [−0.04 to −0.01]) and recalled having felt less lonely prior to the COVID-19 pandemic (B = −0.02, t (511) = −3.19, p = .001, 95% CI [−0.04 to −0.01]).

Contrary to our preregistered prediction, we did not detect a significant interaction between purpose in life and age in predicting current levels of loneliness (B = −0.01, t (509) = −1.07, p = .287, 95% CI [−0.02 to 0.01]); rather, the purpose was related to reduced loneliness across age. Although this is consistent with previous evidence linking purpose in life to enhanced well-being (Roepke et al., 2014), recent work suggests that lower levels of purpose in life are especially harmful to at-risk populations, predictive of increased mortality risk among individuals aged 50 and older (Shiba et al., 2021). As such, we further explored the relationship between age and loneliness for people with different levels of purpose in life. Simple slopes analyses (Aiken et al., 1991) examined whether age predicted loneliness at 1 *SD* below the mean (3.3), at the mean (4.3), and 1 *SD* above the mean (5.3) levels of purpose. Following procedures by Aiken et al. (1991), all variables were mean-centered for simple slopes analyses. Results indicated purpose as a protective factor for older ages, such that older age was associated with less loneliness only at high and mean, but not lower levels of purpose in life (Figure 1). Please see Supplementary Material SI6 for median-split analysis results for additional robustness checks.

Exploratory Analyses: The Relationship Between Loneliness and COVID-Preventive Intentions at Different Levels of Purpose in Life

Although not preregistered, we further explored purpose in life as a protective psychological resource that may buffer against the deleterious effect of loneliness on COVID-protective behaviors, based on previous work suggesting that psychological resources promote resilience in the face of stress (Ryff & Singer, 2003). Specifically, we tested whether the negative relationship between loneliness and COVID-preventive intentions differed across three levels of purpose. Although the interaction between purpose and loneliness on preventive intentions was marginal (B = 0.03, t (509) = 1.61, p = .109, 95% CI [−0.01 to 0.07]), results from exploratory simple slopes analysis indicated that higher loneliness was associated with lower COVID-preventive intentions only at the lower and mean, but not high levels of purpose in life (Supplementary Figure S1A). Please see Supplementary Material SI6 for median-split analysis results for additional robustness checks and Supplementary Figure S1B for results that further parsed out these relationships at four different levels of age.

All results remained parallel when we controlled for gender, ethnicity, SES, the total number of household members, and age (in models that did not include age as a predictor variable; Supplementary Material SI7) and repeated the analyses using a subset of the sample who were

randomly assigned to a condition where they did not receive any COVID-19 messages as part of a larger project that included additional messaging manipulations (n = 178; Supplementary Material SI8).

Discussion

Psychological resources can protect individuals from illness and increase resilience against stress (Lazarus & Folkman, 1984; Ryff, 1989), such as in times of a health crisis. The current study examined purpose in life as a psychological resource and a key component of well-being (Ryff, 2014) that may help buffer against loneliness and promote protective health behaviors during the COVID-19 pandemic. Purpose in life was strongly associated with lower loneliness across age in the current study. This result is consistent with previous studies that linked a stronger sense of purpose to lower loneliness among older populations (Neville et al., 2018). However, little is known about the relationship between purpose and loneliness among younger age groups, and the current finding is among the first to show that purpose predicted lower loneliness across a wider range of ages. Furthermore, having a stronger sense of purpose was associated with both the current and prepandemic levels of loneliness, suggesting some degree of generalizability of the current findings beyond the specific context of the COVID-19 pandemic. We note, however, that the prepandemic loneliness was measured at the same time point as the current loneliness and represents how lonely participants thought they were, which might not be a correct reflection of how lonely they actually were prior to the pandemic.

Purpose in life was also associated with greater intentions to engage in health behaviors (i.e., disease-protective behaviors including social distancing and handwashing) in our data. This result complements previous literature on purpose in life and health, further supporting that having a strong sense of purpose in life can enhance well-being by promoting openness to health-protective behaviors and counteracting stress (Roepke et al., 2014). The current result also extends previous findings that showed purpose in life increased the use of preventive health care service (Kim et al., 2014) to wider areas of daily life and habits. That is, beyond enhancing individuals' health, purpose in life may promote the health of communities by reducing the preventable infectious diseases burden and may have important public health implications, especially in times of epidemic and pandemic health emergencies.

Older compared to younger individuals reported feeling less lonely in our study. This result seemingly contradicts the broader literature on age-related risk for loneliness (Berg-Weger & Morley, 2020; Pinquart & Sorensen, 2001); however, it bolsters growing evidence that people may cultivate resilience as they grow older (van Kessel, 2013). In the context of the COVID-19 pandemic, at least

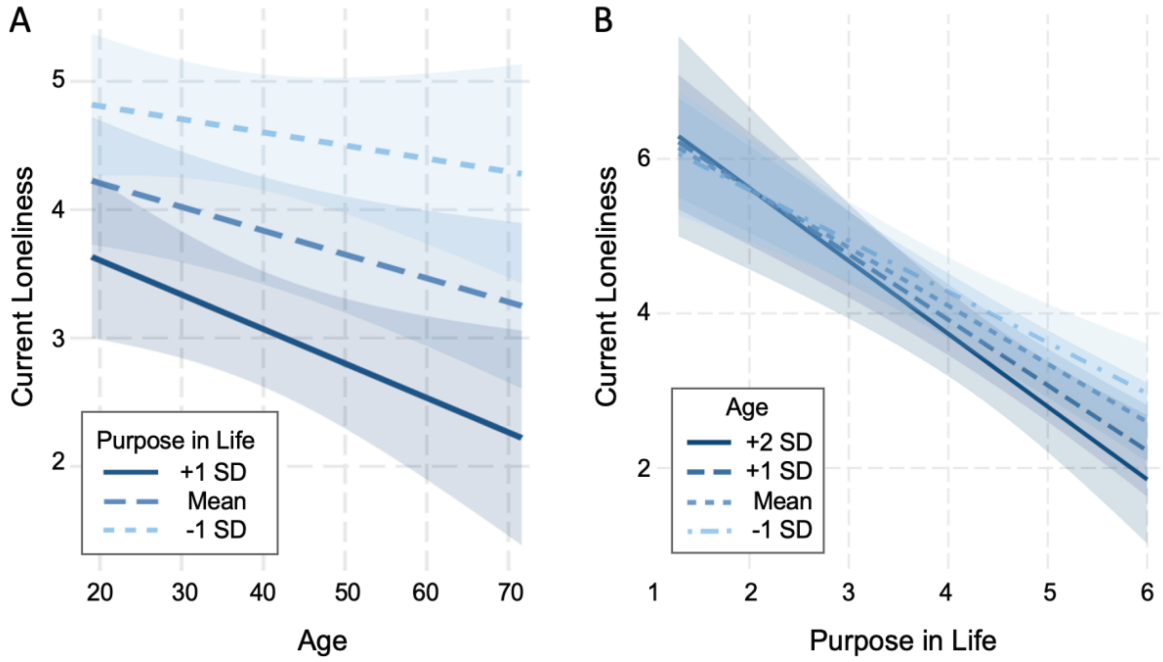

Figure 1. Simple slopes analyses. (A) At higher and mean levels of purpose in life, older age was associated with less loneliness, at 1 *SD* above the mean (B = –0.03, t (509) = –2.41, p = .016, 95% CI [–0.05 to –0.00]) and mean levels of purpose in life (B = –0.02, t (509) = –2.52, p = .012, 95% CI [–0.03 to –0.00]). However, this relationship weakened at lower levels of purpose, such that age was no longer associated with current loneliness at 1 *SD* below the mean purpose (B = –0.01, t (509) = –1.00, p = .319, 95% CI [–0.03 to 0.01]). However, the slopes did not significantly differ from one another (ps > .50). (B) Simple slopes analysis showing the relationship between purpose in life and current loneliness across age, at 1 *SD* below the mean (26.4 years), mean (37.7 years), 1 *SD* above the mean (49 years), and 2 *SD* above the mean (60.3 years) ages. The association between purpose and loneliness did not differ significantly by age but was directionally strongest for older individuals (B).

six recent studies reported "unexpected" findings that older individuals outpaced younger counterparts in terms of their ability to cope with stress and loneliness (Birditt et al., 2021; Knepple Carney et al., 2021; Losada-Baltar et al., 2021; Minahan et al., 2021; Nelson & Bergeman, 2021; Polenick et al., 2021). Our result continues to highlight extraordinary resilience among older adults and challenges ageism prevalent during a global crisis (Colenda et al., 2020; Vervaecke & Meisner, 2021), indicating that older adults are not uniformly vulnerable. Instead, the link between age and loneliness differed by purpose in life, suggesting that older individuals with a weaker sense of purpose may not benefit from age-related resilience. Therefore, interventions that enhance purpose in life may be particularly effective for older adults who tend to experience a decline in purpose after 60 years of age (Pinquart, 2002).

Feeling lonelier was associated with lower intentions to engage in COVID-protective behaviors. This result is consistent with prior research that showed stress may prompt individuals to rely on dysfunctional coping strategies (Biggs et al., 2017; Lazarus & Folkman, 1984) and diminish people's engagement in health behavior (Mezuk et al., 2017). In the context of a pandemic, the desire to reach out to others, even at the expense of risking health, might be a natural response in times of extreme social isolation and loneliness (Mezuk et al., 2010). Nevertheless, loneliness was not associated with COVID-19 risk behaviors among individuals with a strong sense of purpose. This suggests that purpose in life may provide additional resources needed to engage in positive coping strategies, even when the health behavior (e.g., social distancing) may temporarily result in increased isolation. By providing a clear sense of long-term goals that are aligned with personal values, purpose in life may protect individuals from illness (Ryff & Singer, 1998) and the deadly threat of social isolation (Pantell et al., 2013). Furthermore, previous work suggests that highly purposeful individuals may experience less conflict during health decision making (Kang et al., 2019). When presented with the options to resolve stress associated with loneliness by engaging in COVID-risk behaviors versus to maintain health behaviors that may result in greater isolation but will protect the self and others, individuals with a strong sense of purpose may experience less conflict in choosing the latter, having clear views about one's core values and goals.

Current results should be interpreted in the context of limitations inherent in the study design. First, the current study was conducted online via MTurk to expedite data collection within the constraints posed by the pandemic that made in-person data collection difficult. Researchers have warned against overgeneralizing MTurk data of older adults as they may differ from the general older adult population across demographics and health status (Ogletree & Katz, 2020). Please see Supplementary Material SI1 for measures we took to improve MTurk data quality control. Second, we used single-item measures to assess participants' levels of loneliness, which has been used successfully in past studies (Jylhä, 2004; Sundström et al., 2020). However, a single-item question cannot distinguish different types of loneliness, which would be important when considering interventions for loneliness (Luanaigh & Lawlor, 2008). Finally, while we intended to examine age differences across adulthood, our results focused on predictive models based on a sample with only a small number of older adults aged 55 and older (n = 49). Future work may oversample older adults aged 65 and older to match the age distribution of the general population.

Despite limitations, the current study offers novel insights into the relationships among purpose in life, loneliness, age, and protective health behaviors during a global pandemic. Notwithstanding the physical susceptibility to COVID-19, older, compared to younger, individuals in our study were able to better adapt to the drastic shift in social life during a pandemic. Our results also suggest that purpose in life is a valuable psychological resource that may empower individuals to make life-saving health decisions that protect their own health and those around them. Furthermore, the buffering effects of purpose may particularly protect against loneliness and offset the relationship between loneliness and COVID-protective behaviors. More generally, the current results suggest potential value in testing interventions that foster a sense of purpose in life, which may help buffer negative consequences of stress related to loneliness that diminish people's motivation to engage with health-protective behaviors. That is, the purpose may help at-risk individuals to overcome threats to health and well-being by providing a sense of meaning and connection even in times of extreme isolation and stress.

Supplementary Material

Supplementary data are available at *The Gerontologist* online.

Funding

This work was supported by HopeLab (to Y. Kang and E. B. Falk); Mind and Life Institute (to Y. Kang) and funds from the Annenberg School for Communication, University of Pennsylvania (to E. B. Falk). The content is solely the responsibility of the authors and does not represent the views of the funding agencies.

Conflict of Interest

E. B. Falk is on the scientific advisory board for Kumanu, a digital well-being company, and consults for Google. The rest of the authors have no conflict of interest to declare.

Acknowledgments

We thank the members of the Communication Neuroscience Laboratory at the University of Pennsylvania. The current

preregistered study (https://osf.io/39vfg/) used a subset of data from a larger preregistered study (https://osf.io/8hn2g/). Please see https://osf.io/bydv3/ for the complete list of survey measures included in the project and https://osf.io/xwbhu/ for data quality assessment standard operating procedures. All the data, analysis scripts, and output statistics reported in the main manuscript and supplementary information are available at https://github.com/cnlab/covid_purpose.

Positionality Statement

Mindful that our identities can influence our approach to science (Roberts et al., 2020), the authors wish to provide the reader with information about our backgrounds. With respect to gender, when the manuscript was drafted, four authors self-identified as women and two authors as men. With respect to race, three authors self-identified as White, two as East Asian, and one as South Asian. With respect to age, all authors are younger than 40.

Citation Diversity Statement

Recent work in several fields has identified a bias in citation practices such that papers from women and other minority scholars are undercited relative to the number of such papers in the field (Caplar et al., 2017; Dion et al., 2018; Dworkin et al., 2020; Maliniak et al., 2013; McLaughlin Mitchell et al., 2013). Here we sought to consider choosing references that reflect the diversity of the field in thought, form of contribution, gender, and other factors. We obtained the predicted gender of the first and last authors of each reference by using databases that store the probability of a first name being carried by a woman (Dworkin et al., 2020; Zhou et al., 2020). By this measure (and excluding self-citations to the first and last authors of our current paper), our references contain 37.14% woman(first)/woman(last), 13.09% man/woman, 31.4% woman/man, and 18.38% man/man. This method is limited in that (a) names, pronouns, and social media profiles used to construct the databases may not, in every case, be indicative of gender identity, and (b) it cannot account for intersex, nonbinary, or transgender people.

References

Abbott, R. A., Ploubidis, G. B., Huppert, F. A., Kuh, D., Wadsworth, M. E., & Croudace, T. J. (2006). Psychometric evaluation and predictive validity of Ryff's psychological well-being items in a UK birth cohort sample of women. *Health and Quality of Life Outcomes*, **4**, 76. doi:10.1186/1477-7525-4-76

Adler, N. E., Epel, E. S., Castellazzo, G., & Ickovics, J. R. (2000). Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy white women. *Health Psychology*, **19**(6), 586–592. doi:10.1037//0278-6133.19.6.586

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Sage.

Berg-Weger, M., & Morley, J. E. (2020). Loneliness and social isolation in older adults during the COVID-19 pandemic: Implications for gerontological social work. *The Journal of Nutrition, Health & Aging*, **24**(5), 456–458. doi:10.1007/s12603-020-1366-8

Biggs, A., Brough, P., & Drummond, S. (2017). Lazarus and Folkman's psychological stress and coping theory. In C. L. Cooper, & J. C. Quick (Eds.), *The handbook of stress and health: A guide to research and practice* (pp. 351–364). Wiley.

Birditt, K. S., Turkelson, A., Fingerman, K. L., Polenick, C. A., & Oya, A. (2021). Age differences in stress, life changes, and social ties during the COVID-19 pandemic: Implications for psychological well-being. *The Gerontologist*, **61**(2), 205–216. doi:10.1093/geront/gnaa204

Boyle, P. A., Buchman, A. S., & Bennett, D. A. (2010). Purpose in life is associated with a reduced risk of incident disability among community-dwelling older persons. *The American Journal of Geriatric Psychiatry*, **18**(12), 1093–1102. doi:10.1097/JGP.0b013e3181d6c259

Caplar, N., Tacchella, S., & Birrer, S. (2017). Quantitative evaluation of gender bias in astronomical publications from citation counts. *Nature Astronomy*, **1**(6), 1–5. doi:10.1038/s41550-017-0141

Cohen, R., Bavishi, C., & Rozanski, A. (2016). Purpose in life and its relationship to all-cause mortality and cardiovascular events: A meta-analysis. *Psychosomatic Medicine*, **78**(2), 122–133. doi:10.1097/PSY.0000000000000274

Colenda, C. C., Reynolds, C. F., Applegate, W. B., Sloane, P. D., Zimmerman, S., Newman, A. B., Meeks, S., & Ouslander, J. G. (2020). COVID-19 pandemic and ageism: A call for humanitarian care. *Journal of the American Medical Directors Association*, **21**(8), 1005–1006. doi:10.1016/j.jamda.2020.05.054

Dion, M. L., Sumner, J. L., & Mitchell, S. M. (2018). Gendered citation patterns across political science and social science methodology fields. *Political Analysis*, **26**(3), 312–327. doi:10.1017/pan.2018.12

Dworkin, J. D., Linn, K. A., Teich, E. G., Zurn, P., Shinohara, R. T., & Bassett, D. S. (2020). The extent and drivers of gender imbalance in neuroscience reference lists. *Nature Neuroscience*, **23**(8), 918–926. doi:10.1038/s41593-020-0658-y

Hooker, S. A., & Masters, K. S. (2016). Purpose in life is associated with physical activity measured by accelerometer. *Journal of Health Psychology*, **21**(6), 962–971. doi:10.1177/1359105314542822

Jordan, R. E., Adab, P., & Cheng, K. K. (2020). COVID-19: Risk factors for severe disease and death [Review of COVID-19: Risk factors for severe disease and death]. *BMJ*, **368**, m1198. doi:10.1136/bmj.m1198

Jylhä, M. (2004). Old age and loneliness: Cross-sectional and longitudinal analyses in the Tampere Longitudinal Study on Aging. *Canadian Journal on Aging*, **23**(2), 157–168. doi:10.1353/cja.2004.0023

Jylhä, M., & Saarenheimo, M. (2010). Loneliness and ageing: Comparative perspectives. In D. Dannefer & C. Phillipson (Eds.), *Handbook of social gerontology* (pp. 317–328). Sage.

Kang, Y., O'Donnell, M. B., Strecher, V. J., Taylor, S. E., Lieberman, M. D., & Falk, E. B. (2017). Self-transcendent values and neural responses to threatening health messages. *Psychosomatic Medicine*, **79**(4), 379–387. doi:10.1097/PSY.0000000000000445

Kang, Y., Strecher, V. J., Kim, E., & Falk, E. B. (2019). Purpose in life and conflict-related neural responses during health decision-making. *Health Psychology*, **38**(6), 545–552. doi:10.1037/hea0000729

Kim, E. S., Strecher, V. J., & Ryff, C. D. (2014). Purpose in life and use of preventive health care services. *Proceedings of the National Academy of Sciences of the United States of America*, **111**(46), 16331–16336. doi:10.1073/pnas.1414826111

Knepple Carney, A., Graf, A. S., Hudson, G., & Wilson, E. (2021). Age moderates perceived COVID-19 disruption on well-being. *The Gerontologist*, **61**(1), 30–35. doi:10.1093/geront/gnaa106

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing Company.

Lewis, N. A., Turiano, N. A., Payne, B. R., & Hill, P. L. (2017). Purpose in life and cognitive functioning in adulthood. *Neuropsychology, Development, and Cognition. Section B, Aging, Neuropsychology and Cognition*, **24**(6), 662–671. doi:10.1080/13825585.2016.1251549

Losada-Baltar, A., Jiménez-Gonzalo, L., Gallego-Alberto, L., Pedroso-Chaparro, M. D. S., Fernandes-Pires, J., & Márquez-González, M. (2021). "We are staying at home." Association of self-perceptions of aging, personal and family resources, and loneliness with psychological distress during the lock-down period of COVID-19. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **76**(2), 10–16. doi:10.1093/geronb/gbaa048

Luanaigh, C. O., & Lawlor, B. A. (2008). Loneliness and the health of older people. *International Journal of Geriatric Psychiatry*, **23**(12), 1213–1221. doi:10.1002/gps.2054

Luchetti, M., Lee, J. H., Aschwanden, D., Sesker, A., Strickhouser, J. E., Terracciano, A., & Sutin, A. R. (2020). The trajectory of loneliness in response to COVID-19. *The American Psychologist*, **75**(7), 897–908. doi:10.1037/amp0000690

Maliniak, D., Powers, R., & Walter, B. F. (2013). The gender citation gap in international relations. *International Organization*, **67**(4), 889–922. doi:10.1017/s0020818313000209

McLaughlin Mitchell, S., Lange, S., & Brus, H. (2013). Gendered citation patterns in international relations. *International Studies Perspectives*, **14**(4), 485–492. doi:10.1111/insp.12026

Mezuk, B., Rafferty, J. A., Kershaw, K. N., Hudson, D., Abdou, C. M., Lee, H., Eaton, W. W., & Jackson, J. S. (2010). Reconsidering the role of social disadvantage in physical and mental health: Stressful life events, health behaviors, race, and depression. *American Journal of Epidemiology*, **172**(11), 1238–1249. doi:10.1093/aje/kwq283

Mezuk, B., Ratliff, S., Concha, J. B., Abdou, C. M., Rafferty, J., Lee, H., & Jackson, J. S. (2017). Stress, self-regulation, and context: Evidence from the Health and Retirement Survey. *SSM—Population Health*, **3**, 455–463. doi:10.1016/j.ssmph.2017.05.004

Minahan, J., Falzarano, F., Yazdani, N., & Siedlecki, K. L. (2021). The COVID-19 pandemic and psychosocial outcomes across age through the stress and coping framework. *The Gerontologist*, **61**(2), 228–239. doi:10.1093/geront/gnaa205

Nelson, N. A., & Bergeman, C. S. (2021). Daily stress processes in a pandemic: The effects of worry, age, and affect. *The Gerontologist*, **61**(2), 196–204. doi:10.1093/geront/gnaa187

Neville, S., Adams, J., Montayre, J., Larmer, P., Garrett, N., Stephens, C., & Alpass, F. (2018). Loneliness in men 60 years and over: The association with purpose in life. *American Journal of Men's Health*, **12**(4), 730–739. doi:10.1177/1557988318758807

Ogletree, A. M., & Katz, B. (2020). How do older adults recruited Using MTurk differ from those in a national probability sample? *International Journal of Aging & Human Development*. doi:10.1177/0091415020940197

Pantell, M., Rehkopf, D., Jutte, D., Syme, S. L., Balmes, J., & Adler, N. (2013). Social isolation: A predictor of mortality comparable to traditional clinical risk factors. *American Journal of Public Health*, **103**(11), 2056–2062. doi:10.2105/AJPH.2013.301261

Pinquart, M. (2002). Creating and maintaining purpose in life in old age: A meta-analysis. *Ageing International*, **27**(2), 90–114. doi:10.1007/s12126-002-1004-2

Pinquart, M., & Sorensen, S. (2001). Influences on loneliness in older adults: A meta-analysis. *Basic and Applied Social Psychology*, **23**(4), 245–266. doi:10.1207/s15324834basp2304_2

Polenick, C. A., Perbix, E. A., Salwi, S. M., Maust, D. T., Birditt, K. S., & Brooks, J. M. (2021). Loneliness during the COVID-19 pandemic among older adults with chronic conditions. *Journal of Applied Gerontology*. doi:10.1177/0733464821996527

Portacolone, E., Chodos, A., Halpern, J., Covinsky, K. E., Keiser, S., Fung, J., Rivera, E., Tran, T., Bykhovsky, C., & Johnson, J. K. (2021). The effects of the COVID-19 pandemic on the lived experience of diverse older adults living alone with cognitive impairment. *The Gerontologist*, **61**(2), 251–261. doi:10.1093/geront/gnaa201

Resnick, B., & Zimmerman, S.; Gerontological Society of America COVID-19 Task Force. (2021). COVID-19 recommendations for research from the Gerontological Society of America COVID-19 Task Force. *The Gerontologist*, **61**(2), 137–140. doi:10.1093/geront/gnaa200

Roberts, S. O., Bareket-Shavit, C., Dollins, F. A., Goldie, P. D., & Mortenson, E. (2020). Racial inequality in psychological research: Trends of the past and recommendations for the future. *Perspectives on Psychological Science*, **15**(6), 1295–1309. doi:10.1177/1745691620927709

Roepke, A. M., Jayawickreme, E., & Riffle, O. M. (2014). Meaning and health: A systematic review. *Applied Research in Quality of Life*, **9**(4), 1055–1079. doi:10.1007/s11482-013-9288-9

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, **57**(6), 1069. doi:10.1037/0022-3514.57.6.1069

Ryff, C. D. (1995). Psychological well-being in adult life. *Current Directions in Psychological Science*, **4**(4), 99–104. doi:10.1111/1467-8721.ep10772395

Ryff, C. D. (2014). Psychological well-being revisited: Advances in the science and practice of eudaimonia. *Psychotherapy and Psychosomatics*, **83**(1), 10–28. doi:10.1159/000353263

Ryff, C. D., & Keyes, C. L. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, **69**(4), 719–727. doi:10.1037//0022-3514.69.4.719

Ryff, C. D., & Singer, B. (1998). The role of purpose in life and personal growth in positive human health. In P. T. P. Wong (Ed.), *The human quest for meaning: A handbook of psychological research and clinical applications* (Vol. **462**, pp. 213–235). Lawrence Erlbaum Associates Publishers.

Ryff, C. D., & Singer, B. (2003). Flourishing under fire: Resilience as a prototype of challenged thriving. In C. L. M. Keyes (Ed.), *Flourishing: Positive psychology and the life well-lived* (Vol. **335**, pp. 15–36). American Psychological Association.

Ryff, C. D., & Singer, B. H. (2008). Know thyself and become what you are: A eudaimonic approach to psychological well-being.

Journal of Happiness Studies, **9**(1), 13–39. doi:10.1007/s10902-006-9019-0

Shahid, Z., Kalayanamitra, R., McClafferty, B., Kepko, D., Ramgobin, D., Patel, R., Aggarwal, C. S., Vunnam, R., Sahu, N., Bhatt, D., Jones, K., Golamari, R., & Jain, R. (2020). COVID-19 and older adults: What we know. *Journal of the American Geriatrics Society*, **68**(5), 926–929. doi:10.1111/jgs.16472

Shiba, K., Kubzansky, L. D., Williams, D. R., VanderWeele, T. J., & Kim, E. S. (2021). Associations between purpose in life and mortality by SES. *American Journal of Preventive Medicine*. doi:10.1016/j.amepre.2021.02.011

Sundström, A., Adolfsson, A. N., Nordin, M., & Adolfsson, R. (2020). Loneliness increases the risk of all-cause dementia and Alzheimer's disease. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **75**(5), 919–926. doi:10.1093/geronb/gbz139

Tull, M. T., Edmonds, K. A., Scamaldo, K. M., Richmond, J. R., Rose, J. P., & Gratz, K. L. (2020). Psychological outcomes associated with stay-at-home orders and the perceived impact of COVID-19 on daily life. *Psychiatry Research*, **289**, 113098. doi:10.1016/j.psychres.2020.113098

van Kessel, G. (2013). The ability of older people to overcome adversity: A review of the resilience concept. *Geriatric Nursing (New York, N.Y.)*, **34**(2), 122–127. doi:10.1016/j.gerinurse.2012.12.011

Vervaecke, D., & Meisner, B. A. (2021). Caremongering and assumptions of need: The spread of compassionate ageism during COVID-19. *The Gerontologist*, **61**(2), 159–165. doi:10.1093/geront/gnaa131

Victor, C. R., Dobbs, C., Gilhooly, K., & Burholt, V. (2021). Loneliness in mid-life and older adults from ethnic minority communities in England and Wales: Measure validation and prevalence estimates. *European Journal of Ageing*, **18**(1), 5–16. doi:10.1007/s10433-020-00564-9

Zhou, D., Cornblath, E. J., Stiso, J., Teich, E. G., Dworkin, J. D., Blevins, A. S., & Bassett, D. S. (2020). *Gender diversity statement and code notebook v1.0*. https://github.com/dalejn/cleanBib