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Research paper

Purpose in life and stress: An individual-participant meta-analysis of 16 samples

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ABSTRACT

Background: Purpose in life is a psychological resource that has been associated with better regulation of stress. The present research reports a coordinated analysis of the association between purpose in life and subjective stress and evaluates potential sociodemographic and mental health moderators of this association.

Methods: With individual participant data from 16 samples (total $N = 108,391$), linear regression examined the association between purpose in life and general subjective feelings of stress, controlling for sociodemographic characteristics.

Results: Greater purpose in life was associated with less subjective stress (meta-analytic estimate = -0.228 , 95 % Confidence Interval = -0.292 , -0.164 ; $p < .001$). Interaction terms between sociodemographic factors and purpose tested in the individual samples and synthesized with meta-analysis were not significant, which indicated that the association between purpose and stress was similar across age, sex, race, ethnicity, and education. The association was also not moderated by psychological distress. Meta-regressions further indicated that this association was generally similar across scale length, content of the purpose measure, and across samples from Eastern and Western countries.

Limitations: The associations reported are observational. Experimental work is needed to evaluate causality.

Conclusions: Purpose in life is associated with less subjective stress across populations. Less subjective stress may be one mechanism through which purpose contributes to better mental and physical health.

Purpose in life, the feeling that one's life is goal oriented and has direction (Ryff, 1995), is a psychological resource that has been associated with better physical (Musich et al., 2018), cognitive (Sutin et al., 2023a), and mental (Laird et al., 2019) health. Purpose is associated with these better health outcomes in part through behavioral and clinical mechanisms. Individuals with more purpose, for example, engage in more physical activity (Sutin et al., 2021b), have better clinical markers of health (Ryff et al., 2006), and are more likely to use preventative health care services (Kim et al., 2014) than individuals lower in purpose. These factors do not account for all the association between purpose and better health outcomes and thus there are likely to be other potential mechanisms that may contribute to why purpose is associated with better health. Stress could be one such mechanism since it is a prominent factor in many models of health (Cohen et al., 1983; Lazarus and Folkman, 1984; O'Connor et al., 2021; Salsman et al., 2020).

Given the importance of stress to health, the NIH Stress Measurement Network developed a typology to bring more coherence and a standard language to the study of stress (Epel et al., 2018). Within this typology, subjective stress (or perceived stress) is conceptualized as a psychological response to stimuli (e.g., acute stressors, daily hassles, stressful life events, etc.). The present research focuses on the relation between purpose and global subjective stress because of its importance to mental and physical health across the lifespan. Adolescents who report more subjective stress, for example, are at greater risk of developing a diagnosed mental health disorder over time (Lindholdt et al., 2022). Older adults who report more subjective stress are at greater risk of developing new onset depression over time (Cristóbal-Narváez et al., 2022). And, during the pandemic, greater subjective stress was prospectively associated with poor mental health during lockdowns (Li et al., 2023). Among physical health outcomes, greater subjective stress is associated

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with physiological markers of stress (Knight et al., 2021), the development of incident hypertension (Spruill et al., 2019) and cognitive impairment (Katz et al., 2016), and, ultimately, greater risk of premature mortality (Prior et al., 2016; Santosa et al., 2021).

Purpose in life has been associated previously with subjective stress. It was associated negatively with general perceived stress in a validation study of the Life Engagement Test, which consisted primarily of patient samples (e.g., patients with osteoarthritis or breast cancer; Scheier et al., 2006) and with less work-related stress among healthcare workers during the pandemic (O'Higgins et al., 2022). Purpose has been associated with lower perceived stress among older adults in Brazil (de Oliveira et al., 2020), mariners from Poland (Peplińska et al., 2014), women undergoing menopause in Jordan (Abdelrahman et al., 2014), and older African Americans in Chicago (Glover et al., 2021), as well as adults from diverse backgrounds across the United States (Sutin et al., 2023b) and in cohort studies, such as the Health and Retirement Study (Luo et al., 2022b).

Purpose may be associated with less stress through healthier regulation of stressors. Individuals with more purpose, for example, increase less in negative affect and have fewer physical symptoms on days with more stressors (Hill et al., 2018a), are less likely to use harmful substances to cope with stress (Kim et al., 2020), and recover faster from collective stressful experiences, such as after natural disasters (Feder et al., 2013), than individuals with less purpose. Such findings have led models of purpose and health to include stress as a potential mechanism of this association. Kim et al. (2019), for example, suggest that purpose in life may serve as a stress buffering pathway that contributes to better cardiovascular health across the lifespan. One component of this pathway may be less subjective perception of feeling stressed. In addition to cardiovascular health, such a pathway is also likely to operate between purpose in life and the numerous aspects of mental (e.g., lower risk of depression; Laird et al., 2019), cognitive (e.g., lower risk of incident dementia; Sutin et al., 2023a), and physical (e.g., lower risk of premature mortality; Cohen et al., 2016) health.

The current literature has been critical for showing that greater purpose is associated with less subjective stress. The present study builds on this foundation by taking a broad approach to purpose in life and subjective stress to provide a meta-analytic estimate of the effect size and evaluate the robustness and generalizability of this association. To that end, we use a coordinated analysis of 16 samples from 12 cohort studies drawn from the United States, Europe, and Asia. The results across these samples are then combined in a meta-analysis. This individual-participant meta-analysis relies on raw data from each study to be able to apply the same analytic strategy across samples rather than aggregate estimates from the published literature. We expect that higher purpose will be associated with less stress because individuals higher in purpose tend to have healthier coping and emotion regulation strategies (Balzarotti et al., 2016; Kim et al., 2020) and purpose has been associated with less perceived stress in specific populations (de Oliveira et al., 2020; Glover et al., 2021; Scheier et al., 2006). Such coordinated analyses are helpful to rigorously test whether sociodemographic factors moderate the association and evaluate the generalizability of the findings. As such, in each sample, we test whether age, sex, race, ethnicity, or education moderate the association between purpose and stress. In addition, we test psychological distress as a moderator because lower purpose may amplify the association between psychological distress and feelings of stress, and/or higher purpose may diminish this association. We further test sample-level moderators with meta-regression, including length of the purpose and stress scales, differences in the content of the purpose scales, and sample location (Eastern versus Western countries). The moderation analyses are exploratory, and we do not make specific hypotheses about moderation.

1. Method

1.1. Participants and procedure

Studies were selected that had measures of purpose in life and stress from cohort studies with publicly available data or data collected by the authors and made publicly available. Samples were included if they had a validated measure of purpose in life or had items with content consistent with any of the four items of the validated short form of the NIH PROMIS (Salsman et al., 2020) measure of purpose and meaning (purpose, meaning, fulfilling life, worthwhile life). These items are also consistent with theoretical conceptions of purpose, such as the bidirectional relationship between purpose and meaning (McKnight and Kashdan, 2009) and fulfillment as an outcome of goal attainment and thus an affective expression of purpose (Martela and Steger, 2016). Stress was conceptualized as recent feelings of being stressed in general rather than in response to a particular situation (e.g., stressful life events) or a specific domain (e.g., work stress; with one exception, see ACL below) because the focus of this work was on the global subjective stress component of the NIH Stress Measurement Network typology. The studies included in the analysis were the Health and Retirement Study (HRS; Sonnega et al., 2014), the Midlife in the United States study (MIDUS; Brim et al., 2004), the Midlife in Japan study (MIDJA; Yoo and Ryff, 2019), the Panel Study of Income Dynamics (PSID; McGonagle et al., 2012), the National Study of Caregiving (NSOC; Freedman and Kasper, 2019), the Americans' Changing Lives study (ACL; House, 2018), the English Longitudinal Study of Ageing (ELSA; Steptoe et al., 2013), the British Household Panel Study (BHPS; University of Essex, 2018), the Osaka Global Center of Excellence (COE; Osaka University, n.d.), the Survey of Health, Ageing and Retirement in Europe (SHARE; Börsch-Supan et al., 2013), The Irish Longitudinal Study on Ageing (TILDA; Donoghue et al., 2018), and the Behavioral, Psychological, and Social Response to the coronavirus pandemic study (BPSR; Sutin et al., 2020). These studies were selected based on their available measures of purpose and stress; a systematic search to identify datasets with publicly available relevant data was not conducted. Note that a previous study using HRS data reported the expected negative association between purpose in life and stress aggregated across numerous domain-specific measures (Luo et al., 2022b). It did not, however, include the measure of subjective stress analyzed in this study. Participants were selected from each study if they had complete data on sociodemographic characteristics (age, sex, race [where applicable/available], ethnicity [where applicable/available], education), purpose in life, and stress. Supplemental Table S1 provides an overview of the measures used and the dates of data collection of each sample.

1.2. Measures

1.2.1. Purpose in life

Participants in HRS, MIDUS, MIDJA, and BPSR completed a 7-item (e.g., "I have a sense of direction and purpose in my life.") version of the Purpose in Life subscale of the Ryff Scales of Psychological Well-Being (Ryff, 1989). Items were rated on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*) in HRS, from 1 (*strongly agree*) to 7 (*strongly disagree*) in MIDUS and MIDJA, and from 1 (*strongly disagree*) to 5 (*strongly agree*) in BPSR. The ACL used a 3-item version with items rated from 1 (*strongly agree*) to 4 (*strongly disagree*). All other studies used a single item that had similar content to items on either the Ryff measure of purpose (Ryff, 1989) and/or the PROMIS measure of purpose (Salsman et al., 2020). ELSA, BHPS, SHARE, TILDA used the item, "I feel that my life has meaning" rated from 1 (*Often*) to 4 (*Never*). PSID and NSOC used the item, "I lead a purposeful and meaningful life" rated from 1 (*strongly agree*) to 5 (*strongly disagree*) and from 1 (*agree strongly*) to 4 (*disagree strongly*), respectively. Finally, all the COE samples used the item, "My daily life is fulfilling" rated from 1 (*particularly true for me*) to 5 (*doesn't hold true at all for me*). Items were reverse scored when

necessary, and for multi-item scales, the mean taken across items. Within each sample, the measure was scored in the direction of higher purpose.

1.2.2. Subjective stress

Current subjective stress was assessed in each study. HRS, PSID, NSOC, ELSA and SHARE asked participants about their stress specifically experienced yesterday. In HRS, the item, “Yesterday, did you feel stressed?” was rated on a scale from 1 (*not at all*) to 5 (*very*). In PSID, the item, “Thinking about the whole day yesterday, how much of the day did you feel each of the following? Stressed?” was rated on a scale from 1 (*all of the day*) to 5 (*none of the day*). In NSOC, participants completed a daily diary with an interviewer that assessed participants’ activities the previous day. Participants were asked to rate up to six activities with the item, “From 0 to 6, how stressed did you feel during this time, where 0 means not at all stressed and 6 means very stressed?” The mean of ratings across the activities was used. In ELSA and SHARE, participants were asked, “Please think about YESTERDAY, from the morning until the end of the day. Think about where you were, what you were doing, who you were with, and how you felt. Was yesterday a normal day for you or did something unusual, bad or good happen?” Response options were, “Yes - just a normal day,” “No - my day included unusual bad or stressful things,” and “No - my day included unusual good things.” These responses were recoded to compare a day with unusual bad or stressful things (=1) to a day that was normal or included unusual good things (=0). The Perceived Stress Scale (Cohen et al., 1983) was administered in MIDUS, MIDJA and TILDA. Items (e.g., “In the last month, how often have you... felt nervous and ‘stressed?’”) were rated on a scale from a 1 (*never*) to 5 (*very often*) and summed. Participants in MIDUS and MIDJA completed the 10-item version; participants in TILDA completed the 4-item version. In every COE cohort, stress was assessed with the item, “I have been feeling stressed lately” rated on a scale from 1 (*doesn’t hold true at all for me*) to 5 (*particularly true for me*). In the BHPS, the item, “I have just lately felt constantly under strain” was rated from 1 (*not at all*) to 4 (*much more than usual*). ACL measured stress in the domains (as relevant) of marriage, parenting, financial, and occupational. We standardized scores for each domain and took the mean as an overall measure of stress so that it would not be domain specific. Finally, in the BPSR, participants rated their stress with the item, “I am feeling a lot of stress right now,” from 1 (*strongly disagree*) to 5 (*strongly agree*). Across all samples, items were reverse scored, when necessary, in the direction of greater stress (higher scores indicated greater feelings off stress).

1.2.3. Sociodemographic covariates

In each sample, self-reported age in years, sex (0 = male, 1 = female), race, ethnicity, and education were included as covariates. Race in HRS, MIDUS, PSID, and COE-US was coded into two dummy variables for Black (=1) and otherwise identified (=1) both compared to White (=0). Race in NSOC, ACL, ELSA, and BPSR compared race other than white (=1) to white (=0). Race was not available in the other samples. Hispanic/Latino ethnicity was assessed in HRS, MIDUS, COE-US, and BPSR (0 = no, 1 = yes). Education was reported in years in HRS, PSID, and ACL, on a scale from 1 (no schooling or some grade school) to 12 (Ph.D., ED.D., MD, DDS, LLB, LLD, JD, or other professional degree) in MIDUS, from 1 (8th grade) to 8 (graduate school) in MIDJA, from 1 (no qualification) to 7 (nvq4/nvq5/degree or equivalent) in ELSA, from 1 (no qualification) to 6 (degree) in BHPS, from 1 (middle school or less) to 11 (doctoral degree) in COE-Japan, from 1 (no education) to 8 (graduate degree) in COE-India, from 1 (no education) to 9 (graduated from college) in COE-China, from 1 (grade school) to 9 (doctoral degree) in COE-US, from 0 (pre-primary level of education) to 6 (second stage of tertiary education) in SHARE, from 1 (no schooling completed) to 9 (master’s, professional, or doctoral degree) in NSOC, from 1 (no schooling completed) to 9 (master’s, professional, or doctoral degree) in TILDA, and from 1 (less than high school) to 7 (PhD or equivalent) in BPSR.

1.2.4. Psychological distress

Psychological distress was assessed with measures of depressive symptoms in each sample. HRS, ELSA, ACL, and TILDA used versions of the Center for Epidemiological Studies Depression (CESD) scale. HRS and ELSA used an 8-item version, ACL used a 10-item version, and TILDA used the original 20-item version. Distress was classified as ≥ 3 , ≥ 9 , and ≥ 16 for the 8-, 10-, and 20-item scales, respectively (Bergmans et al., 2019; Weissman et al., 1977; Wood and Joseph, 2010). MIDUS measured psychological distress with the Composite International Diagnostic Interview Short Form (CIDI-SF), and distress was defined as four or more symptoms of depressed affect felt most or all day for at least two weeks (Kessler et al., 1998). SHARE measured psychological distress with the EURO-D scale (Prince et al., 1999) and defined distress as a score ≥ 4 (Castro-Costa et al., 2007). NSOC and BPSR measured psychological distress with the Patient Health Questionnaire-2 that defined distress as a score ≥ 3 (Kroenke et al., 2003). PSID and MIDJA measured psychological distress with the K6 Distress Scale that defined distress as a score ≥ 13 (Kessler et al., 2003). BHPS measured psychological distress with the General Health Questionnaire-12 (Goldberg and Williams, 1988). An 11-item version (removing the item on stress) was used with a threshold of ≥ 12 for distress. The COE samples had a single item (“I have been feeling depressed lately”) rated on a 5-point scale that was classified into distress (particularly true for me) versus not distress (the four other response options combined).

1.3. Statistical approach

All samples were analyzed separately. Variables were standardized within sample before analysis to facilitate the meta-analysis and interpretation. Linear regression was used to test the association between purpose in life and stress, controlling for sociodemographic covariates. Moderation was tested with an interaction term between purpose and age, sex, race, ethnicity, education, and psychological distress entered in separate regressions and controlling for the main effects and other covariates. Age, sex, education, and psychological distress were tested as moderators in all cohorts. Race was tested as a moderator in HRS, MIDUS, PSID, COE-US, NSOC, ACL, ELSA, and BPSR and ethnicity was tested as a moderator in HRS, MIDUS, COE-US, and BPSR. Results from the individual samples were summarized with a random-effect meta-analysis. Q and I^2 were used as measures of heterogeneity. The moderation analyses were likewise summarized with a random effects meta-analysis. Meta-regression was used to test potential sample-level moderators of the association between purpose and stress: whether the purpose measure was a single-item or a multiple-item scale, whether the stress measure was a single-item or a multiple-item scale, measures of meaning in life and fulfillment in life compared to purpose in life, and whether the sample was from Eastern or Western countries.

2. Results

Descriptive statistics for all samples are in Table 1. Results for each sample and the meta-analysis are in Fig. 1 and Supplemental Table S2. Purpose in life was associated with less subjective stress in 13 out of the 16 samples; purpose was unrelated to stress in COE-India Urban, COE-China, and SHARE. The meta-analysis supported the negative association between purpose and less subjective stress (meta-analytic estimate = -0.228 , 95 % Confidence Interval = -0.292 , -0.164 ; $p < .001$; $N = 108,391$). There was significant heterogeneity across studies ($Q = 2073.75$, $p < .001$, $I^2 = 99.20$).

There was little evidence that the association was moderated by sociodemographic factors. Although some interactions were significant in the individual samples, when aggregated in the meta-analysis, none of the meta-analytic associations for the interactions with any of the sociodemographic factors was significant (Supplemental Table S3). This finding indicates that the association between purpose and less stress was similar across age, sex, race, ethnicity, and education. The meta-

Table 1
Descriptive statistics for all samples.

Variable	HRS	MIDUS	MIDJA	PSID	NSOC	ACL	ELSA	BHPS
Age (years)	65.90 (11.10)	55.26 (11.77)	54.15 (14.13)	50.41 (14.28)	64.97 (13.15)	61.78 (14.38)	67.52 (10.04)	45.09 (18.34)
Age range	18–104	34–84	30–79	30–97	19–98	40–98	33–90	15–96
Sex (female)	59.0 % (10633)	54.7 % (573)	51 % (513)	56.2 % (4624)	67.2 % (852)	63.0 % (1065)	56.2 % (4078)	54.8 % (9479)
Race (Black)	18.3 % (3291)	2.2 % (23)	–	30.5 % (2505)	30.8 % (391) ^a	27.2 % (460) ^a	4.1 % (294) ^a	–
Race (Otherwise)	9.4 % (1689)	8.0 % (84)	–	4.3 % (357)	–	–	–	–
Ethnicity	13.3 % (2402)	3.5 % (37)	–	–	–	–	–	–
Education	12.93 (3.09)	7.74 (2.45)	4.48 (2.07)	14.04 (2.20)	5.96 (2.06)	12.71 (2.70)	4.51 (2.08)	2.98 (1.75)
Distress	19.6 % (3526)	9.4 % (99)	3.2 % (32)	6.1 % (504)	13.8 % (175)	10.6 % (179)	17.8 % (1294)	27.9 % (4822)
Purpose in life	4.57 (0.96)	39.61 (6.49)	31.79 (5.05)	4.13 (0.87)	3.74 (0.57)	3.40 (0.64)	3.51 (0.72)	3.46 (0.69)
Stress	1.87 (1.12)	21.67 (6.16)	26.10 (5.76)	1.91 (1.02)	1.18 (1.48)	0.00 (0.75)	0.08 (0.27)	2.11 (0.78)
N	18,012	1048	1005	8226	1268	1690	7259	17,285

Variable	COE-Japan	COE-China	COE-India Urban	COE-India Rural	COE-US	SHARE	TILDA	BPSR
Age (years)	53.40 (12.86)	44.06 (13.97)	46.63 (13.56)	38.93 (13.41)	52.83 (16.74)	70.62 (9.01)	66.11 (8.64)	52.09 (15.49)
Age range	23–79	20–71	23–72	20–69	14–95	32–103	53–84	20–100
Sex (female)	54 % (2427)	50 % (690)	55.8 % (465)	32.6 % (357)	53.7 % (1491)	57.7 % (20058)	56.0 % (2919)	47.7 % (1025)
Race (Black)	–	–	–	–	11.1 % (308)	–	–	16.2 % (347)
Race (Otherwise)	–	–	–	–	7.5 % (207)	–	–	–
Ethnicity	–	–	–	–	10.8 % (299)	–	–	10 % (215)
Education	4.25 (1.99)	5.04 (1.38)	4.19 (1.46)	3.71 (1.69)	4.77 (1.80)	3.00 (1.45)	2.15 (0.75)	4.24 (1.49)
Distress	5.1 % (229)	5.3 % (73)	14.0 % (117)	13.5 % (148)	7.7 % (214)	25.2 % (8765)	9.4 % (488)	19.0 % (383)
Purpose in life	3.45 (0.85)	3.88 (0.72)	4.26 (0.85)	3.84 (1.19)	3.79 (0.99)	3.59 (0.69)	3.65 (0.65)	3.58 (0.76)
Stress	3.21 (1.08)	3.13 (1.03)	2.84 (1.41)	3.10 (1.45)	3.01 (1.28)	0.05 (0.22)	4.10 (3.08)	2.88 (1.33)
N	4495	1380	833	1095	2777	34,783	5215	2020

Note. HRS=Health and Retirement Study. MIDUS= Midlife in the United States study. MIDJA=Midlife in Japan study. PSID=Panel Study of Income Dynamics. NSOC=National Study of Caregiving. ACL=Americans’ Changing Lives study. ELSA=English Longitudinal Study of Ageing. BHPS=British Household Panel Study. COE=Osaka Global Center of Excellence. SHARE=Survey of Health, Ageing and Retirement in Europe. TILDA=The Irish Longitudinal Study on Ageing. BPSR=Behavioral, Psychological, and Social Response to the coronavirus pandemic study.

^a Compared non-white (=1) to white (=0).

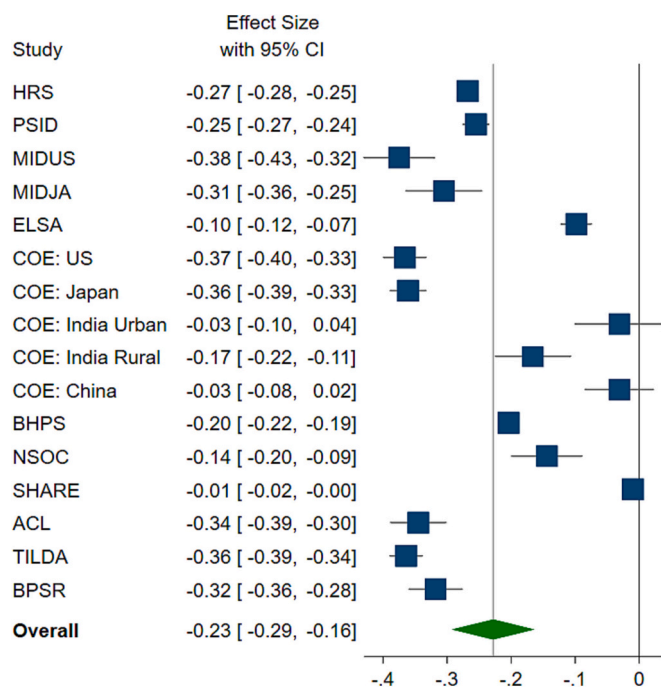


Fig. 1. Forest plot of the association between purpose and stress in 16 samples.

regressions were all non-significant and thus did not reveal any sources of heterogeneity, except one: The negative association between purpose and stress was slightly weaker when purpose was measured with a single item than with multiple items (meta-regression estimate = 0.136, standard error = 0.064, $p = .034$). The associations were, however, similar regardless of the number of items on the stress measure, whether the content of the purpose measure was focused on meaning or a

fulfilling life compared to purpose in life or across samples from Eastern (Japan, China, India) versus Western (United States, United Kingdom, Europe) countries (all coefficients *ns*; Supplemental Table S4).

Finally, the association between purpose and subjective stress was not moderated by psychological distress (Supplemental Table S3). Although the interaction term was significant in some individual studies, it was not significant when aggregated in the meta-analysis (meta-analytic estimate = 0.035, 95 % CI = -0.220, 0.092; $p = .228$). This result indicated that the association between purpose and stress was the same among participants experiencing significant psychological distress and participants who were not. Notably, when psychological distress was included in the model, the association between purpose and subjective stress remained significant in the individual studies and in the meta-analysis (meta-analytic estimate = -0.175, 95 % CI = -0.233, -0.117; $p < .001$; Supplemental Table S5), which indicated that this association was independent of psychological distress.

3. Discussion

The present research found that across an individual-participant meta-analysis of 16 samples, a greater sense of purpose in life was associated with lower concurrent subjective stress. There was significant heterogeneity in the association across samples, but it was consistent with published literature that indicates that purpose in life is associated with less stress in specific domains (e.g., work stress; [Peplíńska et al., 2014](#)) and among specific populations (e.g., African Americans [[Glover et al., 2021](#)], patients [[Scheier et al., 2006](#)]), as well as in general populations ([Sutin et al., 2023b](#)). The negative association between purpose and subjective stress was found in 13 out of the 16 samples, which suggests the association is replicable. The significant heterogeneity indicated that the magnitude of the effect varied across samples; we were unable to determine the reasons for the heterogeneity. Together, this evidence suggests that there is a negative association between purpose and subjective stress, but the exact magnitude is yet to

be fully determined. The current study further suggests that this association is consistent across age, sex, race, ethnicity, education, and culture and is independent of and not moderated by psychological distress.

When considering the results of this analysis, it is important to note that the data are observational, and causality cannot be determined. As such, the association can be interpreted as (a) higher purpose in life could reduce subjective stress or (b) less subjective stress could foster higher purpose in life. Of note, the measures of purpose in life asked participants to evaluate themselves as they are in general whereas the stress measures had a specific, recent time frame (e.g., yesterday, the last 30 days). Based on these measures, the direction of the association is conceptually from purpose to subjective stress. Still, it is likely that purpose and stress may contribute to each other over time. As such, it will be critical for future research to use longitudinal data to test bidirectional associations between purpose and stress over time to better identify their temporal associations and experimental methods to evaluate causality.

Several mechanisms may explain why purpose in life is associated with less stress. Purpose, for example, is associated with greater engagement in physical activity (Sutin et al., 2021b), which is one behavioral factor that helps reduce stress (Schultchen et al., 2019). Individuals higher in purpose also tend to have more dispositional organization and responsibility (Anglim et al., 2020), which may help to reduce the likelihood of stressful situations (Luo et al., 2022a). Individuals higher in purpose have better social support systems (Hill et al., 2018b) and are less likely to experience loneliness (Sutin et al., 2022). A support system that can be relied on when needed may further reduce stress. From the current study, it is unclear whether purpose is related to less stress because individuals higher in purpose are less likely to have situations that increase stress or whether they are better able to regulate it (or both).

There is evidence in the literature that purpose may help regulate stressful experiences in the moment. Higher purpose in life, for example, is associated with less increase in negative affect and fewer physical symptoms on days with more stressors (Hill et al., 2018a). These associations suggest that purpose is associated with better regulation of stressors in daily life. Purpose is also associated with physiological markers of acute stress regulation. Higher purpose, for example, is associated with faster cortisol recovery after being exposed to a stressor in a standard Trier Social Stress Test paradigm, but it is unrelated to baseline cortisol or cortisol reactivity to the stressor (Fogelman and Canli, 2015). In addition, when exposed to negative images, higher purpose is associated with faster recovery from the impact of those images, as indexed by the eyeblink startle response (Schaefer et al., 2013). Finally, higher purpose tends to be associated with better stress management strategies, and these strategies are one pathway between purpose and subjective health (Li et al., 2016) and may explain the association with subjective stress.

The long-term outcome of this better regulation of stress may be healthier physiological markers of chronic stress. Higher purpose among older adults, for example, is associated with less inflammation, as indexed by salivary IL-1Beta and IL-6 (Lee et al., 2022). Although purpose may be unrelated to the development of unhealthy levels of c-reactive protein (Guimond et al., 2022), it is associated with lower risk of allostatic load over time (Zilioli et al., 2015). Such healthier inflammatory profiles may contribute to the better longer-term health outcomes associated with purpose (Sutin et al., 2023c).

Subjective stress may be one mechanism between purpose in life and better health. Subjective stress is associated with the development of depression (Cristóbal-Narváez et al., 2022) and other poor mental health outcomes (Li et al., 2023; Lindholdt et al., 2022), as well as greater risk of morbidity (Katz et al., 2016; Spruill et al., 2019) and premature mortality (Prior et al., 2016; Santosa et al., 2021). Individuals higher in purpose may carry a lower burden of subjective stress, either through less exposure or better regulation, that subsequently helps lower risk of

developing incident mental health disorders. Purpose may even help protect against stress during periods of psychological distress. For example, the lack of moderation by depressive symptoms in the present study suggests that purpose is associated with lower subjective stress, even among individuals simultaneously struggling with psychological distress. Future longitudinal and experimental research is needed to test stress as a mechanism of the better mental health associated with purpose.

The present study suggests that the association between purpose and stress is similar across sociodemographic factors and measurement characteristics. Although there was significant heterogeneity in the association across samples, the moderators that we examined did not account for this variation. Purpose tends to be associated with better health outcomes across populations (Shiba et al., 2022). This generalizability extended to feelings of subjective stress in this study. In addition, how purpose and stress were measured did not account for this variation. The one exception was that the association was slightly weaker in samples that measured purpose with a single item. This pattern is not surprising because single-item measures tend to be less reliable than multi-item measures although are as valid (Cheung and Lucas, 2014). Still, the association was apparent for purpose measured with a single item, which suggests that there is strong signal that can be detected even with one item.

It is worth noting that the associations were similar regardless of how purpose was conceptualized. Although purpose can be distinguished theoretically from meaning (Martela and Steger, 2016), purpose and meaning tend to have similar health outcomes (Sutin et al., 2021a). Thus, regardless of whether participants distinguish between purpose and meaning, it may not matter for perceptions of stress. Further, the perception that one has a fulfilling life is likewise a critical aspect of purpose and a core item used to measure it (Salsman et al., 2020). And indeed, the association between purpose and stress was generally similar regardless of the specific content (meaning, fulfilling, purpose) of the items used to measure it. Of note, however, none of the studies included measures of all three content areas and thus direct comparisons within a single sample could not be evaluated.

While the evidence provided here suggests similarities across groups and measures, these similarities should be interpreted in the context of the differences in measurement and populations across studies that could confound the null associations. In addition, the comparison across countries could further be limited by the greater variation in the association within Eastern and Western countries than between countries. Of note, a recent meta-analysis of purpose and depression likewise did not find differences in the association by geographic region (Boreham and Schutte, 2023). This research will hopefully stimulate more work that can use the same measures on populations matched for similar characteristics (e.g., age, sex, education, etc.), so that more robust conclusions about similarities and differences can be made. The present research provides a useful foundation to develop the necessary international data collection efforts.

The present study had several strengths, including the coordinated analysis of 16 samples to evaluate the robustness and generalizability of the association between purpose and stress. There are, however, limitations that could be addressed in future work. First, the data in the meta-analysis were cross-sectional. Future research could use longitudinal data to examine how purpose is associated with the trajectory of stress over time and the potential bidirectional associations between purpose and stress. Second, we focused on the subjective experience of stress and not other aspects of the stress process (stimulus, regulation, life events, etc.). We likewise did not have physiological measures of stress or stress response. We focused on this aspect of stress because it is a major component of the conceptualization of stress (Epel et al., 2018) that is associated with significant health outcomes (e.g., mortality; Prior et al., 2016; Santosa et al., 2021). Future work could evaluate the association between purpose and each component of the stress process with stronger, more detailed measures and include biomarkers of stress

in addition to self-report. Third, many of the samples had a measure of purpose in life that was a single item; future research should include more validated, multi-item scales that measure purpose. The measures of stress likewise covered different recent periods of time (e.g., yesterday, the last month, etc.). Future research could use a more uniform assessment of stress across studies. Finally, although the samples included in the meta-analysis were diverse and included samples from countries in Asia as well as North America and Europe, we lacked samples from other areas of the world and most included samples came from high-income countries. Future work could test the association between purpose and stress in a greater range of countries to better evaluate the generalizability of the association.

Despite these limitations, the current research provides robust evidence that purpose in life is associated with less subjective stress and that the association may generalize across sociodemographic groups and some cultures. This work adds to models of purpose and health by suggesting that less stress may be one mechanism through which purpose is associated with better health outcomes.

CRedit authorship contribution statement

ARS designed the study, wrote the protocol, managed the analyses, and wrote the first draft of the manuscript. AT conducted the meta-analysis. ML, YS, AAS, and AT provided critical feedback on the protocol development, interpretation of the findings, and assisted in manuscript development. All authors contributed to and have approved the final manuscript.

Declaration of competing interest

None of the authors has a conflict of interest to report.

Data availability

Data from all studies are publicly available. Data and materials can be downloaded or access requested from parent studies. Data from the BPSR study can be found on OSF: <https://osf.io/b3pr>

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2023.10.149>.

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