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Perseverative Cognitions and Stress Exposure: Comparing Relationships With Psychological Health Across a Diverse Adult Sample

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Abstract

Background Both exposure to stress and perseverative cognitions (PCs)—repetitive cognitive representations of real or imagined stressors—are linked with poor psychological health. Yet, stress exposure and PCs are correlated, thus potentially obscuring any unique effects.

Purpose The purpose of this paper is to concurrently test associations between stress exposure and PCs and psychological health to examine the independent relationship of each with psychological health. Moreover, we examined whether these relationships are similar across sex, age, and race.

Methods An adult community sample (n = 302) completed a measure of stress exposure, three PCs scales, and questionnaires assessing self-reported psychological health, including emotional well-being, vitality, social functioning, role limitations due to personal problems, subjective well-being, depressive symptoms, and poor sleep quality.

Results Structural equation modeling was used to test a model in which both stress exposure and PCs predict psychological health. PCs consistently predicted all the psychological health outcomes, but stress was largely unrelated to the outcomes despite bivariate correlations suggesting a relationship. A follow-up model identified indirect effects of stress exposure on psychological health via PCs. Results were fairly consistent regardless of one's sex, age, or race.

Conclusions PCs robustly predicted all of the psychological health outcomes, intimating PCs as a common pathway to poor psychological health. Results have implications for stress interventions, including the need to address PCs after experiencing stress.

Keywords Perseverative cognitions • Stress • Depression • Sleep quality • Quality of life

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Introduction

A defining contribution of behavioral medicine is the increased understanding that stress contributes to poor psychological health [1]. Yet, stress is not a simple construct and includes multiple dimensions as part of the stress process. For example, stress can include the exposure to the negative events and how one responds to them. Moreover, a related but potentially distinct process [2] consists of how one thinks about stress, such as ruminating about a past argument or worrying about

an upcoming event, herein called perseverative cognitions (PCs) [3]. Conceptual models of stress suggest that stress exposure and PCs have unique relationships with psychological health [3], yet empirical work testing this proposition is limited. The purpose of this paper is to concurrently test the relationships of stress exposure and PCs with psychological health, so as to determine whether PCs have an independent relationship with poor psychological health. A secondary goal is to consider whether these relationships are similar for individuals of varying demographics (i.e., age, sex, and race).

Operationalizing Stress and PCs

Stress can be operationalized in many ways. Some measures count the exposure to a range of negative events, both in the recent [4] and distant past [5]. Other measures look at how one perceives their environment and the capacity to manage the stressors [6]. Still others consider the effect of stress on how the body responds in the short and long term [7]. Finally, some work looks to identify environments that are chronically negative and taxing and explore the health of those individuals [8]. We believe that there is no single "correct" way to operationalize stress, and each approach has its own advantages and drawbacks. In this paper, we focus on the exposure to stressful events in the recent past (i.e., the last year) as we feel that this approach represents a conservative assessment of "stress" in this context. That is, this measure represents a reasonable approach to approximate an objective assessment of stressors with self-report measures that minimizes confounding with cognitive appraisals of the stressor and/or other responses to the event. This is in contrast to measures such as the Perceived Stress Scale [6] that ask whether a person feels they have the resources available to overcome obstacles they are confronted with. Reports of one's past or perceptions of coping are clearly important, yet how stress is reported can be influenced by the outcome of that stress experience—someone who was able to cope with a stressor may report perceiving it as less severe upon later reflection even if it was an intense stressor at the time of the experience.

Our measure of stress exposure concerns events in one's environment; PCs, in contrast, represent an internal process. PCs are defined as repeated cognitive representations of stressors [2]. Furthermore, PCs can be a representation of any stressor, real or imagined, that is typically negative, intrusive, and unconstructive [3]. PCs differ from other cognitive strategies that may aim to address stressors in a positive way (e.g., proactive coping) and also differ from cognitive strategies meant to avoid thinking about stressors (e.g., suppression). Multiple umbrella terms exist to describe this class of negative thought patterns, such as unconstructive repetitive thoughts [9, 10] or intrusive thoughts or cognitions [11]; for clarity, we use PCs throughout this paper. In sum, PCs result in individuals repetitively and nonconstructively recreating past events, creating new concerns, and sustaining negative experiences in their minds.

Do Stress Exposure and PCs Have Independent Effects on Psychological Health?

In focusing on psychological health, we are deliberately broad to measure social, emotional, psychological, and behavioral dimensions. Such an approach fits in with a view of health that is aimed at allowing an individual to cope with demands of life and establish an equilibrium in himself or herself [12]. Extant research has indicated that both exposure to stress and the tendency to engage in PCs have negative associations with one's psychological health. For example, stress exposure is related to poor subjective well-being and quality of life [13, 14], depression [8, 15], and poor sleep quality [16, 17]. Likewise, individuals who engage in PCs report worse quality of life and subjective well-being [18–22], more depressed mood [21–23], and poor sleep quality [22, 23].

Although robust associations between stress exposure and PCs and psychological health have each been observed, past work has not typically compared whether or not stress exposure and PCs have unique associations with psychological health. Of the work that has looked at stress exposure and PCs concurrently, PCs tended to be more important in predicting psychological health, including higher levels of negative affect [24, 25] and poorer sleep quality [26]. For example, for participants with generalized anxiety disorder and/or major depressive disorder, engaging in rumination after a stressful event explained the relationship between the stressful event and poorer affect, more mood disorder symptoms, and greater anxiety in a subsequent measure [25]. Despite testing only a few aspects of psychological health, this work comparing stress exposure and PCs is important because often stress exposure and PCs are related (e.g., we ruminate about the negative events happening in our lives). For example, ruminative thoughts and post-traumatic stress disorder symptoms, including intrusive thoughts, increased after the 1989 Loma Prieta earthquake [27]. Since this seminal study, research has shown associations between greater stress and intrusive thoughts [28], worrying [29], and rumination [30]. Thus, although both stress exposure and PCs have each been associated with psychological health and well-being, it is necessary to replicate and extend prior work to test whether they hold unique/independent value or rather load on the same underlying risk construct due to their conceptual and practical overlap.

Indirect Effects of Stress on Psychological Health Through PCs

Because exposure to stress can induce engagement in PCs, it is also possible that stress has negative psychological health effects due to PCs. More specifically, as has been proposed by the PC hypothesis and other theoretical work [2, 3], the extent to which one engages in PCs may in part explain the deleterious effects of stress on psychological health. This argument suggests that most stressful situations represent relatively short-lived acute experiences that are unlikely to pose long-term risk. In contrast, engagement in PCs can produce and prolong negative affect, behavior, physiology, and/or other responses experienced in response to the stressor [2, 3]; this in turn prolongs the effects of stress exposure and ultimately results in worse psychological health outcomes. Some preliminary work supports PC as an explanatory mechanism. Among middle school students, intrusive thoughts, physiological arousal, and impulsive action mediated the association between perceived stress and depression [28]. Among school teachers, greater worry mediated the effect of stressful events on somatic complaints [29]. Among college students, rumination and trait anxiety mediated the association between loneliness—a social stressor—and depressed mood and poor sleep quality [23]. Finally, among minority college students, ruminating mediated the effect of perceived discrimination on depressive symptoms [30]. In the present paper, we extend this work by examining the tendency to engage in PCs as explaining the relationship between reported stress exposure in the past year and a range of psychological health outcomes in a highly generalizable community sample. Although tested with cross-sectional data, and thus preventing causal conclusions to be drawn, this approach tests whether PCs can be used to stratify risk to a wide range of poor psychological health.

Are Stress and PCs Equally Important Across Sex, Age, and Race?

In considering the relationships between stress exposure, PCs, and psychological health, it is also important to consider whether these associations are equally strong for all individuals. For example, it has long been recognized that older adults cope differently with stressors than younger adults [31], perhaps due to older adults being less likely to notice and attend to negative stimuli [32]. Some work suggests women ruminate and worry more than men [33, 34] and that minority students in the USA might ruminate more than students of European descent [35]. Moreover, work has shown stronger effects of stress on depression for White compared with Black men [36] but that economic and psychological resources that help manage stress among other factors may be less beneficial to Black communities [37]. Yet, these studies largely test whether there are differences in levels of stress exposure, PCs, and psychological health by sex, age, and race. We extend this work by examining whether the *relationship* between stress exposure and PCs on psychological health is different across one's sex, age, and race.

The Present Paper

We collected data from a diverse community sample in which we assessed stress exposure, PCs, and psychological health (i.e., emotional well-being, vitality, social functioning, role limitations due to emotional/personal problems, subjective well-being, depressive symptoms, and poor sleep quality). This range of outcomes allowed the testing of whether stress exposure and PCs have independent relationships with a wide range of psychological health states (Research Question 1 [RQ1]) and, further, whether PCs might explain why stress exposure is related to psychological health (Research Question 2 [RQ2]). By testing this wide range of psychological health outcomes, we were better able to assess a more comprehensive view of psychological health and move beyond potential idiosyncratic relationships between any individual stress exposure or PCs scale with a particular psychological health outcome. The diverse community sample also enabled the testing of whether the relationships of stress exposure and PCs with psychological health are similar across sex, age, and race (Research Question 3 [RQ3]).

To test these questions, we used structural equation modeling (SEM) as it affords several advantages for the present study. First, we used multiple scales to comprehensively and more reliably assess PCs, and SEM allows the modeling of PCs as a latent variable. We used this approach to avoid relying on single measures often used to assess PCs, such as the Ruminative Response Scale [27] or Penn State Worry Questionnaire [38], as these scales can have large overlaps with depression [39] and anxiety [40]. Second, SEM allows the simultaneous testing of psychological health variables that are correlated and controls for those relationships. Third, it allows for a direct comparison of whether all pathways between stress exposure, PCs, and psychological health are similar across individuals via the use of multiple groups SEM. Accordingly, this study used SEM to test the following three research questions:

RQ1: Does stress exposure and/or PCs independently predict psychological health?
RQ2: Are there indirect effects of stress exposure on psychological health through PCs?
RQ3: Are the relationships observed between stress exposure, PCs, and psychological health similar across sex, age, and race?

Method

Participants

Participants (n = 322) were recruited using advertisements in local newspapers, flyers in community centers and other public venues (e.g., libraries, senior centers), and through referrals from community leaders (e.g., local church) for a study of health, life experiences, and cognition. Each participant was compensated commensurate with his or her level of participation, up to $75 for completion of all components of the protocol. Although initially enrolled, 20 participants had missing data on the psychological health outcomes and were excluded from the analyses. The final sample thus consisted of 302 participants: 147 men and 155 women; aged 19–83 years (M = 49.64, SD = 17.17), and 163 White/Caucasian, 112 Black, and 27 non-White and non-Black.

Procedure

Participants were given a brief introduction to the study, and informed consent was obtained. All procedures were approved by the relevant institutional review boards. Participants were told that they were participating in a study examining the relations among health, cognition, and personality throughout the lifespan. As part of a larger study measuring cognitive and physical functioning and daily health, participants completed measures assessing stress exposure, PCs, and psychological health (see below) during in-lab sessions.

Measures

Demographics

A series of demographic characteristics were collected, including sex, age, and race. To reduce the number of categories explored in the multiple groups SEM, age was recorded as younger (19–39 years old), middle-aged (40–59 years old), and older (60–83 years old). Only 27 participants did not identify as White or Black and were dispersed over multiple other racial groups; thus, only White and Black were used for the race multiple groups SEM.

Stress exposure

After the demographics, a modified form of the Life Experiences Survey (LES [4]) was administered; the present study only assessed potential negative events (vs. positive events that can also be measured). The LES asks participants whether any of 43 provided specific stressful events had occurred over the previous year; there was also space to write in additional events if necessary. For each event that did occur, participants indicated on a 0 (*no impact*) to 3 (*extremely negative*) scale the extent to which that event had a negative impact when it first occurred and then rated separately the impact of that event now. Sample events include death of a spouse, foreclosure on mortgage or loan, and change of residence.

In preliminary analyses, we explored different life event constructions of this scale, including the total number of events that one was exposed to, the total number of only negative events (i.e., the event had an impact of >0), the total negative impact of all of events when they occurred, and the total negative impact of all events now. Bivariate correlations suggested that each of these measures was highly related (rs > .81, ps < .001) and had similar relationships to the three scales used to measure PCs and the psychological health outcomes. As such, we chose to only focus on total events measure (i.e., occurrence, not weighted by negative impact) as this conceptually represents a measure of exposure that should be maximally distinct from how that exposure was perceived, which may be impacted by PCs.

PCs

Next, PCs were assessed using three scales chosen based on prior work and theory as they measure diverse aspects of PCs, including the extent to which the thoughts are intrusive, repetitive, nonproductive, and hard to control [41], elements that are not captured entirely with any one scale. First, participants completed the 30-item Thought Control Questionnaire (TCQ [42]). The TCQ asks about the strategies individuals typically use to control their intrusive thoughts when they experience one (e.g., "I punish myself for thinking the thought."). Strategies were recorded on a 1 (*never*) to 5 (*almost always*) scale. Items group into the following subscales: worry (α = .74), punishment (α = .72), distraction (α = .74), social control (α = .72), and reappraisal (α = .71). The worry and self-punishment subscales are the most relevant for the present analysis as they consist of items measuring the occurrence and experience of the thoughts themselves; the other subscales assess how individuals reappraise, cope with, or change their thoughts and thus measure secondary processes after the initial PC. Supporting this decision, although the worry and self-punishment scale had a strong correlation with each other (r = .63, p < .001), their correlations with the other subscales were nonsignificant (rs < |.05|, ps > .396). Thus, the worry and self-punishment subscales were averaged such that higher values indicated greater engagement in PCs.

Next, participants responded to the 28-item Thought Occurrence Questionnaire (TOQ [43]). The TOQ assesses the types of thoughts individuals have while "they have to concentrate on something" (e.g., "I think about how poorly I am doing."). Occurrence of thoughts

was recorded on a 1 (*never*) to 5 (*very often*) scale. Items were averaged (α = .93) such that higher values indicated greater engagement in PCs.

Finally, participants completed the 15-item White Bear suppression inventory (WB [44]). The WB assesses the experience of intrusive thoughts and what is done to these thoughts as they are occurring (e.g., "I often do things to distract myself from my thoughts."). Responses were recorded on a 1 (*strongly disagree*) to 5 (*strongly agree*) scale. Items were averaged (α = .93) such that higher values again reflect greater engagement in PCs.

Psychological health

Multiple measures were used to measure the range of dimensions of psychological health. Participants completed the 36-item Health Survey–Short Form 36 (SF-36 [45, 46]). The SF-36 assessed the state of individuals' health in the past 4 weeks. This form produces eight subscales across physical and psychological dimensions. For the present analysis, the four subscales from the psychological dimension are used—emotional well-being, vitality, social functioning, and role limitations due to emotional health. We also included the general health subscale, which functions as a measure of subjective well-being and correlates with psychological health [47]. Emotional well-being uses five items (α = .84) to assess the extent to which the participant experiences psychological distress (e.g., "Have you felt so down in the dumps that nothing could cheer you up?"). Vitality uses four items (α = .82) to assess whether participants report feeling tired and worn out (e.g., "Did you have a lot of energy?"). Social functioning uses two items (α = .85) to assess the extent to which the participant is able to perform normal social activities or is limited due to interference from physical or emotional problems (e.g., "During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities?"). Role limitations due to emotional problems use three items (α = .93) to assess the extent to which the participant has problems with work or other activities as a result of emotional problems (e.g., "During the past 4 weeks, have you had to cut down the amount of time you spent on work or other activities as a result of any emotional problems?"). Finally, subjective well-being uses five items (α = .80) to assess the extent to which the participant rates his or her own personal health (e.g., "I am as healthy as anybody I know."). All items were assessed using a 1 (*all of the time* or *extremely* or *poor*) to 5 (*none of the time* or *not at all* or *excellent*) scale. As per scoring instructions, items were then recoded onto a 0–100 scale, with items for each subscale averaged together with higher scores indicating greater emotional well-being, vitality, social functioning, and subjective well-being, and fewer role limitations.

Symptoms of depression were assessed with the 20-item Center for Epidemiological Studies Depression Scale (CESD [48]). Items were rated for how the participant was feeling at the current time on a 1 (*not at all*) to 5 (*very much*) scale (e.g., "I feel that I cannot shake the blues even with help from my family and friends."). Items were averaged (α = .90) such that higher values indicated greater depressive symptoms.

Sleep quality was assessed with the 24-item Pittsburgh Sleep Quality Index (PSQI [49]). The PSQI assesses reported sleep quality over the past month in terms of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Scores are combined, per standardized instructions, to yield a global score of self-reported sleep quality with higher numbers indicating worse sleep quality. The global score has been shown to have good test–retest reproducibility and to have high sensitivity and specificity in distinguishing good and poor sleepers [49].

Neuroticism

Participants also completed a 10-item measure of neuroticism from the International Personality Item Pool [50]. On a 1 (*very inaccurate*) to 5 (*very accurate*) scale, participants indicated how they perceived themselves in general (e.g., "often feel blue"). Items were averaged (α = .82) such that higher values indicated greater neuroticism. Neuroticism was used as a control variable in exploratory analyses to rule out that effects are due to a tendency to experience negative thoughts and distress that can be related to poor psychological health [51]. This is an important control as measures of PCs can be confounded with cognitive-emotional states that produce similar outcomes, including rumination with depression [39] and worry with anxiety [21, 40]. Thus, using neuroticism as a control allows a better isolation of PCs as having unique associations with psychological health.

Analytical Plan

First, bivariate correlations were conducted among all of the variables included in the study. Second, a measurement model was conducted to determine whether the three PC scales were strong indicators of a latent factor of PCs. Finally, a series of structural equation models were specified to test RQ1–RQ3. All models were tested using AMOS 24.0. For RQ1, both stress exposure and PCs were included in the same model as covarying predictors of the psychological health outcomes; such a model tests whether there are independent relationships between stress exposure and/or PCs on psychological health.

For RQ2, we tested a model consistent with PCs as a mediator between stress exposure and psychological health; that is, we modeled stress exposure as predicting PCs and both stress exposure and PCs predicting the psychological health outcomes. This was conducted to test the extent to which the total effect of stress on the psychological health variables was due to an indirect effect through PCs as opposed to a direct effect of stress on health. To test for indirect effects, a bootstrapping procedure was employed specifying 5,000 resamples and 95% bias-corrected confidence intervals (CIs) [52]. For the present purposes, we examined whether the CI for the proposed indirect effects includes zero, which would indicate a null effect within some subsample of the data.

Finally, for RQ3, multiple groups SEMs were conducted to examine whether the relationships detected in RQ1 were similar for men and women; for younger, middle-aged, and older participants; and for Black and White participants. We employed two types of multiple groups SEMs. First, we tested an unconstrained model that lets the data fit separately for different groups. This model allowed us to estimate all modeled pathways for each subgroup to determine whether similar patterns emerge when no assumptions are placed on the data. Second, we tested a fully constrained model that assumed equivalence between groups for all parameters in the model. Together, these models reveal whether the pathways between stress exposure, PCs, and psychological health are similar for individuals of varying demographics and, if there are differences, where those differences lie.

All psychological health outcomes were tested in the same model and were allowed to covary. Standardized estimates are reported for all pathways. In addition to the chi-square, the following were used to assist in making judgments about model fit: a comparative fit index (CFI) value >.95, a normed fit index (NFI) value >.95, and a root mean square error of approximation (RMSEA) ≤0.05 with a CI from 0.00 to 0.08 are all demonstrative of good model fit [53].

Results

Preliminary Analyses

First, we conducted bivariate correlations of all the measures. As shown in Table 1, more stress exposure had a small positive relationship with the three PC measures, and the three PC measures had moderate positive correlations with each other. Consistent with past work, greater stress exposure had a small relationship with all the psychological health outcomes (i.e., lower emotional well-being, lower vitality, lower social functioning, greater role limitations due to emotional health, lower subjective well-being, greater depressive symptoms, and greater sleep problems). Likewise, the three PC measures had small to moderate relationships with all the psychological health outcomes in the same direction as stress exposure.

In preparation for the proposed SEMs, we tested two sets of measurement models. First, we examined the potential for a latent PCs factor composed of the three PC scales as indicators (i.e., TCQ, TOQ, and WB).

Table 1 Bivariate correlations, means, and standard deviations for all variables included in the study

	1	2	3	4	5	6	7	8	9	10	11
1. Stress exposure	–										
2. PCs (TCQ)	.25*	–									
3. PCs (TOQ)	.28*	.57*	–								
4. PCs (WB)	.30*	.49*	.61*	–							
5. Emotional well-being	−.30*	−.45*	−.57*	−.49*	–						
6. Vitality	−.23*	−.23*	−.40*	−.36*	.71*	–					
7. Social functioning	−.37*	−.42*	−.50*	−.43*	.65*	.57*	–				
8. Fewer role limitations	−.30*	−.44*	−.51*	−.45*	.66*	.51*	.71*	–			
9. Subjective well-being	−.27*	−.45*	−.39*	−.34*	.57*	.61*	.60*	.52*	–		
10. Depressive symptoms	.30*	.53*	.66*	.52*	−.80*	−.61*	−.61*	−.61*	−.54*	–	
11. Poor sleep quality	.24*	.24*	.38*	.37*	−.37*	−.37*	−.43*	−.36*	−.42*	.42*	–
Possible range	0–43	1–5	1–5	1–5	0–100	0–100	0–100	0–100	0–100	1–5	0–21
Mean	5.45	1.58	1.63	3.09	65.99	55.05	69.33	72.30	60.28	1.75	6.71
SD	4.10	0.41	0.64	0.87	19.72	20.25	28.01	27.76	21.53	0.52	3.38

PCs perseverative cognitions; *TCQ* thought control questionnaire; *TOQ* thought occurrence questionnaire; *WB* white bear suppression inventory; *SD* standard deviation.

*$p < .001$.

The latent factor predicted each of the three PC scales (βs > .68, *p*s < .001), thus suggesting the appropriateness of using a latent factor to capture PCs. Second, the interrelationships between each of the psychological health variables were examined. Each was entered in a model as a manifest variable and allowed to covary with all the other variables. All correlations were significant (*r*s > |.32|, *p*s < .001).

RQ1: Stress Exposure, PCs, and Psychological Health

Given that the bivariate correlations indicated relationships between both stress exposure and PCs with psychological health, we tested a model in which stress exposure and PCs were covarying predictors of psychological health. The model fit the data well: $\chi^2(16) = 20.86$, $p = .184$, CFI = .997, NFI = .989, RMSEA = 0.03, RMSEA 90% CI = 0.00 to 0.07. As can been seen in Fig. 1, those with more stress exposure reported less social functioning ($p < .001$) and subjective well-being ($p = .032$); stress exposure was not significantly related to emotional well-being ($p = .193$), vitality ($p = .194$), role limitations ($p = .090$), depressive symptoms ($p = .485$), and poor sleep quality ($p = .113$). In contrast, those with more PCs reported less emotional well-being, vitality, social functioning, and subjective well-being, and greater role limitations, depressive symptoms, and poor sleep quality (*p*s < .001). The overall model predicted 46.2% in emotional well-being, 20.8% of the variance in vitality, 39.0% in social functioning, 38.5% in role limitations due to emotional health, 21.0% in subjective well-being, 58.6% in depressive symptoms, and 20.7% in sleep quality.

RQ2: PCs as a Mediator of Stress Exposure and Psychological Health

We tested a follow-up model, in which PCs were treated as a statistical mediator of the relationship between stress exposure and psychological health. Thus, we tested the same model presented in Fig. 1, except that now stress exposure predicted PCs (instead of covarying). Although this model has the same fit and estimates as the prior model, this model allows testing whether there are indirect effects between stress exposure and psychological health via PCs; in other words, these indirect effects may explicate how stress exposure relates to psychological health in bivariate correlations but becomes nonsignificant when PCs are included in analyses. A bootstrapping procedure was employed specifying 5,000 resamples and 95% bias-corrected CIs. As reported in Table 2, consistent with our prediction, there were significant indirect effects of stress exposure on psychological health via PCs for all outcomes.

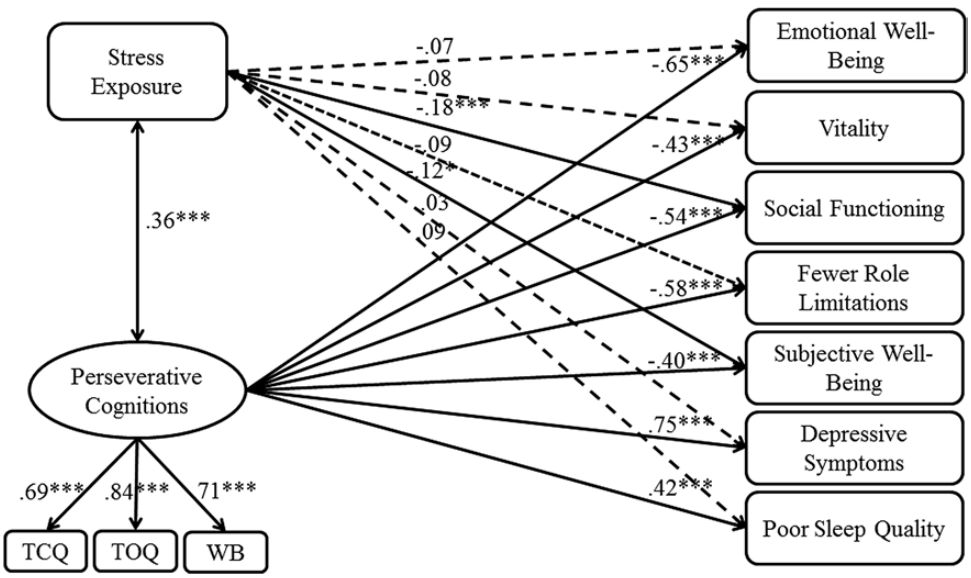

Fig. 1. The effects of stress exposure and perseverative cognitions (PCs) on psychological health. Standardized betas (β) are reported. For ease of interpretation, the following correlations between the psychological health variables were observed but not depicted: between emotional well-being and vitality ($r = .61$, $p < .001$), social functioning ($r = .40$, $p < .001$), role limitations ($r = .42$, $p < .001$), subjective well-being ($r = .41$, $p < .001$), depressive symptoms ($r = -.59$, $p < .001$), and poor sleep quality ($r = -.09$, $p < .154$); between vitality and social functioning ($r = .41$, $p < .001$), role limitations ($r = .32$, $p < .001$), subjective well-being ($r = .51$, $p < .001$), depressive symptoms ($r = -.46$, $p < .001$), and poor sleep quality ($r = -.21$, $p < .001$); between social functioning and role limitations ($r = .54$, $p < .001$), subjective well-being ($r = .45$, $p < .001$), depressive symptoms ($r = -.30$, $p < .001$), and poor sleep quality ($r = -.21$, $p = .001$); between role limitations and subjective well-being ($r = .34$, $p < .001$), depressive symptoms ($r = -.27$, $p < .001$), and poor sleep quality ($r = -.11$, $p < .095$); between subjective well-being and depressive symptoms ($r = -.34$, $p < .001$) and poor sleep quality ($r = -.27$, $p < .001$); and between depressive symptoms and poor sleep quality ($r = .13$, $p = .075$). *$p < .05$, **$p < .01$, ***$p < .001$.

Table 2 Standardized total, direct, and indirect effects of model testing the relationship between stress exposure and psychological health through perseverative cognitions

	Total effects	Direct effects	Indirect effects
Emotional well-being	−0.30** [−0.45, −0.20]	−0.07 [−0.18, 0.05]	−0.23** [−0.35, −0.16]
Vitality	−0.23** [−0.37, −0.14]	−0.08 [−0.20, 0.05]	−0.15** [−0.28, −0.10]
Social functioning	−0.37** [−0.49, −0.30]	−0.18** [−0.31, −0.09]	−0.19** [−0.29, −0.11]
Fewer role limitations	−0.30** [−0.45, −0.21]	−0.09 [−0.21, 0.03]	−0.21** [−0.30, −0.13]
Subjective well-being	−0.27** [−0.38, −0.15]	−0.12 [−0.24, 0.04]	−0.14** [−0.25, −0.08]
Depressive symptoms	0.30** [0.20, 0.44]	0.03 [−0.07, 0.15]	0.27** [0.18, 0.40]
Poor sleep quality	0.24** [0.15, 0.36]	0.09 [−0.01, 0.24]	0.15** [0.09, 0.24]

In brackets are the 95% bias-corrected confidence intervals.

**$p < .01$.

RQ3: Multiple Groups Comparisons

Finally, we tested whether the observed patterns presented in Fig. 1 held when comparing the following groups: men and women; younger, middle-aged, and older adults; and Black and White participants. Two sets of multiple groups SEMs were conducted: an unconstrained model that allowed the data to fit separately for each group and a fully constrained model that assumed equivalence between groups for all parameters in the model.

For sex, both the unconstrained, $\chi^2(32) = 39.92$, $p = .159$, CFI = .996, NFI = .979, RMSEA = 0.03, RMSEA 90% CI = 0.00 to 0.05, and fully constrained, $\chi^2(82) = 100.15$, $p = .084$, CFI = .990, NFI = .947, RMSEA = 0.03, RMSEA 90% CI = 0.00 to 0.04, models were strong fits to the data, suggesting equivalence across men and women. Indeed, as reported in Table 3, the pathways between stress exposure, PCs, and psychological health from the unconstrained model were similar for men and women (excepting the significant relationship between stress exposure and poor sleep quality for men but not women).

For age, although the unconstrained model showed good fit to the data, $\chi^2(98) = 151.36$, $p < .001$, CFI = .967, NFI = .916, RMSEA = 0.04, RMSEA 90% CI = 0.03 to 0.06, the fit indices for the fully constrained model ranged from poor to good, $\chi^2(148) = 253.29$, $p < .001$, CFI = .935, NFI = .859, RMSEA = 0.04, RMSEA 90% CI = 0.04 to 0.06. Reasons for the poorer fit can be seen in Table 3: Although all the relationships between PCs and psychological health were fairly consistent across age in the unconstrained model, the effects of stress exposure on psychological health tended to be different for middle-aged compared with younger and older adults. For middle-aged adults, greater stress exposure predicted less social functioning and poorer sleep quality, but did not predict vitality; the opposite pattern was observed for older and younger adults.

For race, both the unconstrained, $\chi^2(32) = 34.77$, $p = .338$, CFI = .998, NFI = .978, RMSEA = 0.02, RMSEA 90% CI = 0.00 to 0.05, and constrained, $\chi^2(82) = 153.65$, $p < .001$, CFI = .952, NFI = .904, RMSEA = 0.06, RMSEA 90% CI = 0.04 to 0.07, models were acceptable fits to the data. As can be seen in Table 3, however, the unconstrained model was a better fit. This suggests that although many relationships were similar for Blacks and Whites, some differences exist. PCs predicted most of the psychological health outcomes for both Blacks and Whites, yet PCs were only significant predictors of subjective well-being for Whites. More differences between Blacks and Whites appeared for stress exposure, with stress exposure only significantly predicting emotional well-being for Whites and subjective well-being for Blacks.

Exploratory Analyses

To test the possibility that relationships between PCs and psychological health are an epiphenomenon of a person-level tendency toward negative thought patterns and the experience of distress, we repeated the analyses used to test RQ1 but also included neuroticism in the model (with neuroticism entered as a predictor of all other variables). The model fit the data well: $\chi^2(18) = 24.31$, $p = .145$, CFI = .997, NFI = .989, RMSEA = 0.03, RMSEA 90% CI = 0.00 to 0.07. Neuroticism significantly related to emotional well-being ($\beta = -.51$, $p < .001$), vitality ($\beta = -.47$, $p < .001$), subjective well-being ($\beta = -.14$, $p < .001$), and depressive symptoms ($\beta = .42$, $p < .001$) but was not significantly related to social functioning ($\beta = -.10$, $p = .177$), role limitations ($\beta = -.06$, $p = .455$), and sleep quality ($\beta = -.04$, $p = .657$). Importantly, despite these associations, controlling for neuroticism did not substantially change the relationships between stress exposure and psychological health. Stress exposure continued to be significantly related to social functioning ($\beta = -.18$, $p < .001$) and subjective well-being ($\beta = -.12$,

Table 3 Multiple groups SEM in unconstrained model testing relationships across women and men, younger, middle-aged, and older adults, and Black and White participants.

	Sex		Age			Race	
	Men	Women	Younger	Middle-aged	Older	Black	White
Stress exposure ↔ PCs	0.36***	0.37***	0.24**	0.35**	0.24**	0.22*	0.36***
Stress exposure → emotional well-being	−0.06	−0.06	−0.02	−0.08	−0.02	0.05	−0.19**
Stress exposure → vitality	−0.07	−0.08	−0.13	−0.01	−0.13	−0.07	−0.09
Stress exposure → social functioning	−0.20**	−0.15*	−0.11	−0.22**	−0.11	−0.21*	−0.16*
Stress exposure → fewer role limitations	−0.07	−0.10	−0.07	−0.11	−0.07	−0.04	−0.13
Stress exposure → subjective well-being	−0.13	−0.12	−0.01	0.32***	−0.01	−0.20*	−0.10
Stress exposure → depressive symptoms	0.04	0.03	−0.08	0.10	−0.08	0.03	0.10
Stress exposure → poor sleep quality	0.18*	0.001	−0.004	0.26**	−0.004	0.15	0.07
PCs → emotional well-being	−0.71***	−0.61***	−0.64***	−0.60***	−0.64***	−0.51***	−0.66***
PCs → vitality	−0.46***	−0.40***	−0.38***	−0.45***	−0.38***	−0.28*	−0.50***
PCs → social functioning	−0.49***	−0.58***	−0.52***	−0.48***	−0.52***	−0.39***	−0.55***
PCs → fewer role limitations	−0.58***	−0.59***	−0.56***	−0.54***	−0.56***	−0.39***	−0.59***
PCs → subjective well-being	−0.47***	−0.35***	−0.39***	−0.37***	−0.39***	−0.12	−0.50***
PCs → depressive symptoms	0.74***	0.76***	0.80***	0.66***	0.80***	0.67***	0.74***
PCs → poor sleep quality	0.32**	0.51***	0.42***	0.34***	0.42***	0.27*	0.41***

The number of participants in each subgroup are as follows: men (n = 147), women (n = 155), younger (n = 111), middle-aged (n = 96), older (n = 96), Black (n = 112), and White (n = 163).

SEM structural equation modeling; *PCs* perseverative cognitions.

*p < .05, **p < .01, ***p < .001.

p = .027) but continued to not be significantly predictive of emotional well-being (β = −.06, p = .153), vitality (β = −.07, p = .182), role limitations (β = −.09, p = .100), depressive symptoms (β = .03, p = .494), and poor sleep quality (β = .09, p = .121). Finally, PCs continued to predict emotional well-being (β = −.30, p < .001), social functioning (β = −.47, p < .001), role limitations (β = −.55, p < .001), depressive symptoms (β = .46, p < .001), and sleep quality (β = .44, p < .001); PCs were no longer significantly related to vitality (β = −.09, p = .285) and subjective well-being (β = −.14, p = .115), although the effects remained in the same direction.

Discussion

This paper tested whether stress exposure and PCs uniquely relate to psychological health. Replicating and extending previous work, the bivariate correlations suggested that both stress exposure and PCs were related to a wide range of psychological health. When stress exposure and PCs were tested concurrently as predictors of psychological health using SEM; however, effects for stress exposure were greatly diminished, whereas the effects of PCs remained consistent, again consistent with prior work [24–26]. Although we compared stress exposure and PCs, stress can be measured and operationalized in many other ways [4–6, 8]; as such, future work may wish to include more diverse stress (and PCs) measures to further explicate any unique and synergistic contributions to psychological health. For example, stress exposure may represent relatively acute experiences that are short-lived and have important in-the-moment effects that do not necessarily translate directly to predicting poorer long-term psychological health. In contrast, PCs may lengthen the impact of stress exposure in the moment (by increasing the intensity of stress and/or extending the experience by delaying return to baseline) and in the future (through a mental recreation of the stressor), which may lead to PCs having longer term psychological health implications. Additional moderators, such as the temporal distribution of events and event severity, remain to be carefully examined.

Another takeaway is that these results are consistent with theoretical perspectives that stress exposure may be particularly negative because (or when) it induces PCs, which in turn strongly relate to poor psychological health

[2, 3]. Supporting previous work, we found that greater stress exposure was associated with more PCs [23, 27, 28]. In turn, more PCs were associated with worse psychological health, including more depressive symptoms [21–23] and sleep problems [22, 23], lower vitality and social functioning, and worse emotional, mental, and global health [18, 19]. Extending prior work, we found that PCs statistically mediated the association between stress exposure and a diverse array of psychological health. Future work may wish to continue to explore the interplay between stress exposure and PCs, including the use of longitudinal and experimental designs so as to more carefully test causal relationships.

We also examined whether observed relationships were similar across people. Generally, the pathways were very similar for sex and mostly similar for race and age. Although work has found mean-level differences between how older and younger adults cope [31], between the frequency with which women and men ruminate [33, 34], and between rumination patterns for students of European descent and minorities in the USA [35], the present findings suggest relative consistency in the relationship between stress exposure, PCs, and psychological health. In other words, although certain individuals may have a tendency to engage in more PCs on average, when individuals engage in them, the deleterious relationship between PCs and psychological health may be a more universal finding. Describing findings in this way suggests two potential sites of intervention: first, targeting people who may be at greater risk for engaging in PCs, such as through cognitive behavioral therapy [54], and second, training individuals to disrupt the PC process when it is occurring, such as through seeking social support or engaging in meditation [55].

With that said, it is important to note places in which racial differences did emerge; in particular, this work may help inform understanding disparities in response to stress exposure. Race differences were primarily observed in the association between stress exposure and psychological health. For example, Whites had a stronger association between stress exposure and poorer emotional well-being and greater depression than did Blacks; this finding is in line with past research [36]. Yet, Blacks had stronger associations between stress exposure and worse subjective well-being and poorer sleep quality—two psychological health outcomes that connect strongly with physical health [47]. We speculate that this pattern of effects may reflect Whites typically being privileged in the USA relative to Blacks (and thus having negative psychological health consequences when events occur that do not match expectations associated with that privilege) but also having greater access to other resources than Blacks that might help mitigate the impact of stress on health outcomes [37]. Future work may wish to further explore the potential different mechanisms by which stress relates to psychological (and physical) health for Blacks and Whites, and whether access to resources differentially moderates these associations.

Some aspects of the present study are important to emphasize. The associations of PCs with psychological health remained even after controlling for neuroticism, suggesting that the effect of PCs is more than just a tendency to experience negative thoughts and distress. PCs were measured using three distinct measures and modeled as a latent factor using SEM. Each of these scales is thought to measure different facets of PCs, ranging from the types of ruminative, intrusive, and worrying thoughts individuals have to strategies used to control these intrusive thoughts as they are happening. Using multiple measures allowed for a comprehensive and reliable assessment of PCs. Although each of the scales was a strong indicator of the latent PC factor, it is possible that other aspects of PCs were not assessed that additionally may prove important for predicting particular psychological health outcomes. For example, although both rumination and worry predict depressed and anxious symptoms [56, 57], some work suggests that rumination is more closely tied to depression [39], whereas worry is to anxiety [21, 40]. As such, these differences could suggest somewhat distinct mechanisms for how PCs lead to disease, which could be explored in future work (e.g., rumination predicts higher disengagement from addressing or coping with problems than worry [21]).

It is possible that PCs were a more robust predictor of psychological health because it was more reliably measured than was stress exposure. That is, stress exposure relied on a single indicator, whereas PCs were a latent construct based on three distinct measures. Moreover, the overall rate of reporting events was low relative to the total number of events that could possibly be experienced/reported. Although the observed rate of negative events is similar to other studies employing community-based samples [4], greater variability in this measure may have increased power to detect effects. Finally, we focused only on negative events, but other work has explored exposure to both positive and negative events, using a total score of exposure in analyses [4]. This approach assumes that all events may cause disruption even if positive, and such total change is valuable to study. Future work may wish to explore measuring different aspects of stress exposure, such as type, duration, and frequency of events, and test whether any of these aspects have greater variability and differentially predict psychological health. Additionally, future work may wish to examine the potential for both positive and negative disruptive events to induce PCs and to test whether they differentially predict psychological health.

Psychological health was assessed using a wide range of outcomes ranging from quality of life measures to depressive symptoms to sleep quality. PCs had a strong relationship with each of these psychological health outcomes, with robust *r*-squares indicating substantial variance predicted largely by PCs and, in some cases, stress exposure. This pattern of findings supports the contention that PCs may represent a common pathway to psychological dysfunction. As individuals engage in PCs, they report worse cognitive and emotional states, including more depressed mood and pessimism [58, 59], more angry mood [60], more anxiety and difficulty concentrating [61], and less effective problem solving [58]. This pattern of thinking and feeling when repeated over time can disrupt all aspects of one's well-being, ranging from having negative social interactions to sleeping more poorly. Future work should continue to explore PCs as a particularly potent pathway in explaining poor psychological health.

Limitations and Future Directions

A few limitations should be noted. First, the cross-sectional nature of the data does not allow for strong inferences regarding causality. Thus, we cannot conclude that experiencing stress leads to poor psychological health or that exposure to stress leads to more PCs. However, our work was based on other research examining longitudinal relationships between stress, PCs, and psychological health in the short term [29] and long term [23], and is in line with theoretical work suggesting such pathways [2, 3]. Nevertheless, experimental work is needed to help determine causal processes; yet disentangling between stress exposure and PCs in the lab can be difficult (e.g., a manipulation to induce rumination is also likely a stressor). One approach has been to introduce a stressor and then to measure rates of recovery after the stressor manipulating whether one is distracted or not (and presumably ruminating) [62]. In addition to experimental work, measuring the real-time associations among stress exposure, engagement in PCs, and concurrent cognitive and emotional states would provide evidence of the momentary processes that are proposed to explain the negative effects of PCs. In the long term, measuring engagement in PCs after major life stressors with follow-up psychological health assessments could provide evidence as to whether PCs predict the development of depressive symptoms, disturbed sleep, and other psychological health problems.

Second, the psychological health scales in this study were self-report-type. As such, one's current mood state when responding to the scales and other such biases could have resulted in stronger associations across the measures. Although we were able to rule out that these results were not just due to differing levels of neuroticism, other personality facets such as the desire to respond in a more socially appropriate manner may have resulted in participants downplaying or underreporting psychological symptoms. Future work should consider assessing psychological health with observational, clinical, and objective measures.

Finally, a diverse sample in terms of age and sex was utilized; however, data were analyzed only for White and Black participants due to low enrollment rates for non-Whites and non-Blacks. It is possible that cultural factors among individuals of different ethnic and racial groups could affect the development of coping resources, thus either exacerbating or mitigating the potential impact of PCs on poor psychological health. For example, Asian Americans were found to ruminate more than European Americans, and this tendency to ruminate was an independent predictor of depressive symptoms, anxious symptoms, and life satisfaction more for the Asian Americans participants [35]. Future research may benefit from examining the relationships tested herein among a more racially diverse sample.

Conclusion

The results presented emphasize the importance of PCs in relation to psychological health. Although tested with cross-sectional data, the consistent relationship between PCs and psychological health in the present study, combined with theoretical work pointing to PCs as a contributing mechanism to poor psychological health [2, 3], suggests PCs may be a common and robust pathway from stress to a wide range of poor psychological health. This interpretation is bolstered by the indirect effects of stress exposure on psychological health via PCs, indicating that PCs may explain the deleterious effects of stress. Efforts to target PCs may be particularly effective by making these thoughts more productive for future planning and reflecting on past events to enhance understanding [10]. Many formalized programs already aim to accomplish this goal, including cognitive behavioral therapy [54], yet less formal approaches may also be useful, including expressive writing [63] and social support seeking [64]. Additionally, mindfulness and related approaches may also impact PCs [55]. Overall, these findings suggest potential targets for early prevention efforts—for those who have experienced stressful events and who may be prone to engaging in PCs—aimed at reducing the risk of developing depression, having poor subjective well-being, and other psychological health problems.

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Compliance with Ethical Standards

Conflict of Interest: The authors, M.J.Z., M.J.S., and J.M.S. have no conflict of interest to disclose.

Ethical Approval: The research was conducted in compliance with the American Medical Association and the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

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