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Research Article

Coping patterns associations with cognitive function in older adults

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Abstract

Objective: Cognitive function may contribute to variability in older adults' ability to cope with chronic stress; however, limited research has evaluated this relationship. This study investigated the relationship between theoretically derived coping domains and cognitive function in 165 middle-to-older adults during the Omicron stage of COVID-19. **Method:** Participants completed a clinical interview and self-report measures of health. The National Alzheimer's Coordinating Center Uniform Data Set neuropsychological battery was used to evaluate memory, language, executive function/speed, and working memory. Structural equation modeling evaluated the underlying factor structure of the Brief COPE adapted for COVID-19. **Results:** The data supported the proposed second-order Approach factor comprised of Problem-Solving and Emotion Regulation (ER) strategies and a first-order Avoidance factor. Higher Avoidance was associated with greater depression symptoms, lower income and worse memory, executive function, working memory, and verbal fluency performance. Higher Problem-Solving was associated with better verbal fluency performance. ER strategies were not significantly associated with cognitive function. The use of Problem-Solving was not associated with less Avoidance. Greater use of Problem-Solving, ER, and Avoidance were all associated with higher levels of stress. Post-hoc analyses found that higher Acceptance was the only coping strategy associated with less stress. **Conclusions:** These findings demonstrate that older adults with worse cognitive function were more likely to use Avoidance during the pandemic, which could result in prolonged stress and adverse health consequences. Future research is warranted to investigate whether acceptance-based interventions reduce the avoidance and impact of stress on health in vulnerable older adults.

Keywords: Acceptance; stress; avoidance; problem-solving; memory; executive function

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Introduction

Approximately 55 million people globally are living with dementia in 2023, and this number is projected to increase by 10 million new cases each year without effective interventions (World Health Organization, 2023). Notably, the coronavirus disease (COVID-19) pandemic has introduced multiple exacerbating factors that further increase the risk for cognitive decline.

Since the COVID-19 pandemic, the prevalence of psychological distress has increased from 3.9% in 2018 to 13.6%, with evidence that older adults with cognitive decline were more vulnerable to mental health problems during the pandemic (Manchia et al., 2022). In addition, older adults were disproportionately impacted by the pandemic through increased risks of infection and mortality, with 81% of COVID-19-related deaths within the first year of the pandemic being older adults (Tejada-Vera & Kramarow, 2022). In addition to these direct health risks, many older adults have experienced negative changes in mood, social connection, and quality of life (Bailey et al., 2021; Birditt et al., 2021; Krendl & Perry, 2021; Lábadi et al., 2022; Samuel et al., 2022; Verhage et al., 2021).

The COVID-19 public health crisis is characterized as a universal and chronic stressor (Pfeifer et al., 2021). The extent of its impacts on older adults has also varied, with qualitative evidence that cognitively and socially vulnerable adults had more difficulty adapting to and coping with ongoing and uncontrollable pandemic-related stress (Birditt et al., 2021; Galica et al., 2022; Lee et al., 2022). Given that coping strategies are essential to stress management and health behaviors, this study aimed to improve understanding of the relationships between coping strategies and cognitive function in community-dwelling older adults within the context of a universal stressor, which involved heightened health risks and social isolation.

Approach-avoidance models of coping

Coping strategies, which are affected by chronicity, context, and availability of resources, are a dynamic process by which individuals adapt their thoughts and behaviors to manage internal and external stressors (Algorani & Gupta, 2023; Lazarus & Folkman, 1984). Roth and Cohen (1986) provide a seminal and well-replicated model (Pérez-Aradros et al., 2023; Wootton et al., 2022), indicating that there are two modes of coping with stressors: avoidance and approach. Avoidance coping involves actions that move the self away from the stressor and its mental or physical demands (e.g., denial, behavioral disengagement). Avoidance is

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more likely to occur when the individual feels overwhelmed or under-resourced to manage the stressor. Approach coping includes actions involving cognitive processes (e.g., planning, problem-solving, and taking action) to directly address the stressor and emotional activity (e.g., social support and venting) to regulate emotional distress (i.e., emotion-oriented).

From a neuropsychological perspective, it is well-recognized that cognitive functions underlie the ability to problem-solve, initiate and execute plans, effectively communicate actions and needs, and recall important details (Lezak et al., 2012). In this respect, aspects of executive function, including cognitive flexibility, play an important role in planning, problem-solving abilities, and adapting to environmental demands, which theoretically facilitates approach coping. Similarly, working memory and verbal memory are involved in the initiation and formation of plans, the ability to recall details, and/or the ability to mentally manipulate information to problem-solve cognitively demanding tasks (Lezak et al., 2012). As such, these cognitive functions may promote approach and reduce avoidance coping strategies. However, while the relationship between coping strategies and cognitive functions is theoretically supported, limited empirical research has investigated the relationship between coping strategies and neuropsychological performance.

While the literature often characterizes self-distraction as avoidance, it is recognized as an important emotion regulation skill that engages cognitive processes to shift attention away from the situation to regulate emotion (Gross, 1998). Consequently, positive self-distraction may be beneficial in affective-laden or uncontrollable circumstances, such as environmental disasters (Gross, 1998; Shing et al., 2016). Indeed, several studies have found that positively distracting oneself by exercising, spending time outside, and maintaining routines has promoted positive adjustments and fewer feelings of distress in older adults within the context of the COVID-19 pandemic (Finlay et al., 2021; Fuller & Huseth-Zosel, 2021; Lee et al., 2022). As such, self-distraction may be better conceptualized as an emotion-oriented as opposed to an avoidance strategy.

The relationship between coping strategies and cognitive function

Limited research has investigated the relationship between coping strategies and cognitive function, and findings within older adult samples are mixed. For instance, in a rural sample of Italian older adults, better global cognition on the Mini-Mental Status Exam was associated with greater use of active approaches (e.g., problem-solving) and avoidance when distraction (e.g., going shopping and social distractions) was included in the conceptualization of avoidance (Poderico et al., 2006). This study also found that emotion-oriented coping was linked to worse global cognition. In contrast to these findings, Nieto et al. (2020) found that better inhibitory control performance was associated with fewer avoidance coping strategies and failed to find a relationship between approach coping and executive function measures in older adults. When considering cognitive status, there is evidence that older adults with normal cognition use more problem-solving than older adults with mild cognitive impairment (MCI) and Alzheimer's disease (AD; Meléndez et al., 2018). This lends clinical support to the notion that memory and other cognitive functions are useful to approach as opposed to avoidance coping strategies.

Other neuropsychological evidence supporting a relationship between coping strategies and cognitive function includes patients with schizophrenia who had greater cognitive impairments in executive function and memory used more avoidance and fewer problem-solving strategies (Lysaker et al., 2005). Similarly, multiple sclerosis patients with deficits in attention and executive function were shown to rely more on avoidance coping, with evidence that those with executive dysfunction were about two times more likely to use denial or substance abuse (Goretti et al., 2010; Grech et al., 2017). In contrast, better verbal fluency performance predicted the use of the approach coping strategies of "taking action" and seeking social support (Grech et al., 2017). Greater use of avoidance and less planning behaviors have also been found in response to a psychosocial stress test in adults with mild traumatic brain injury as compared to matched controls (Krpan et al., 2011). In patients with Parkinson's disease, those with worse global cognitive function were shown to use less approach coping, which in turn was associated with depression and worse quality of life (Hurt et al., 2012). Finally, the use of emotion-oriented and avoidance coping was associated with worse executive function, whereas better executive function was associated with the use of problem-solving strategies during the COVID-19 pandemic in college students (Borato et al., 2023).

The present study

The COVID-19 pandemic was a universally experienced stressor that disproportionately affected older adults. To improve understanding of the relationship between cognitive function and coping strategies in older adults in response to chronic stress, this study systematically investigated the relationship between specific cognitive functions and empirically derived coping domains in community-dwelling older adults.

As the context of coping strategies is understudied, the pandemic provides an opportunity to better understand coping patterns in response to a universally experienced stressor. The period that this took place was the Omicron stage, in which vaccines were available, and Maine where the study took place had loosened restrictions considerably.

Structural equation modeling (SEM) evaluated the underlying factor structure of the Brief COPE (Carver, 1997) adapted for the COVID-19 pandemic during the Omicron Stage. During this period, vaccines were available, and Maine where the study took place had loosened restrictions considerably. However, this period was characterized by the chronicity of the stressor and the high degree of uncertainty (uncontrollable stress) about whether the vaccines would work for the new variants and/or if these variants would be more severe than the earlier variants (Karim et al., 2021). Participants were asked to consider ways that they have been coping with the stress in their lives since the COVID-19 pandemic regardless of their effectiveness. To reduce data, we aimed to form empirically derived composite scores for the 14 coping scales. Based on prior empirical models, we hypothesized that the data would support a first-order Avoidance variable and a second-order Approach variable, comprised of Emotion Regulation and Problem-Solving. Based on neuropsychological evidence that attention/working memory and executive function contribute to Problem-Solving skills (Lezak et al., 2012), we specifically hypothesized that working memory and executive function would positively associate with Problem-Solving coping, whereas Avoidance coping strategies would associate worse memory, language, executive function/speed, and working memory. Finally, we examined the relationship between demographic

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factors, perceived stress, and depression symptoms with coping strategies to better characterize these relationships.

Method

Participants

Participants were recruited as part of the second wave of the Maine-Aging Behavior Learning Enrichment (M-ABLE) Study at the University of Maine. Study visits were conducted via Zoom and/or phone with 165 adults aged 50–90 years old in a Maine sample during the Delta and Omicron periods of the pandemic (November 2021 to May 2022). Study exclusion criteria included: physical limitations that prohibited testing, diagnosis of intellectual disability or dementia, any untreated or severe psychiatric conditions, and/or receiving medical treatment for any form of dementia. Participants were recruited through flyers distributed through community stakeholders, low-income community-dwelling sites, regional aging research registries, social media, and word of mouth.

Ethics of human subjects and procedures

Participants were first screened for eligibility and underwent informed consent procedures approved by the University of Maine Institutional Review Board. Human data included in this manuscript was obtained in accordance with the Helsinki Declaration. Participants were screened for eligibility via phone and underwent a brief auditory assessment to determine eligibility. The National Alzheimer's Coordinating Center (NACC) Uniform Data Set (UDS) remote procedure protocol (NACC, 2020) was followed. This study controlled for the time of day on cognitive performance by scheduling study visits in the morning that were in accord with participants' sleep-wake cycles. Participants received a twenty-five-dollar gift card to a supermarket chain for completing the study. Trained research assistants administered neuropsychological assessments.

Measures

Clinical characteristics

Clinical and demographic history was collected via a structured clinical interview. The Geriatric Depression Scale (GDS)-15 item measured depression symptoms (Sheikh & Yesavage, 1986). The Perceived Stress Scale (PSS; Cohen & Williamson, 1988), which demonstrated good internal consistency within this sample ($\alpha = .89$), evaluated subjective stress and emotional responses to stress in the past month.

Neuropsychological tests

The well-validated NACC UDS-Version 3 neuropsychological battery (Weintraub et al., 2018) that was adapted for remote delivery by telephone and videoconference (T-Cog, Form C2T) was administered. In-person and remote instructions for the T-Cog measures were the same and have demonstrated feasibility in older adults with normal cognition, MCI, and AD (Hackett et al., 2021) with good test-retest reliability (Howard et al., 2023; Smith et al., 2023). The NACC neuropsychological battery consists of measures of attention, processing speed, executive function, episodic memory, and language that were selected due to their sensitivity to detect neurocognitive change in older adults (see Weintraub et al., 2018).

Four composites were formed based on the empirical literature (e.g., Hayden et al., 2011; Lezak et al., 2004; MacAulay et al., 2018; Weintraub et al., 2009). Total scores from the Number Span Test, a variation of the well-established Digit Span Forward and Backward tests, measured auditory attention and working memory. These tests ask participants to repeat back a sequence of numbers in increasing length exactly as they hear them (Digit Span Forward test) and to repeat back a sequence of numbers in backward order (Digit Span Backward test). Verbal memory was measured using the Rey Auditory Verbal Learning (RAVLT) Immediate and Delayed recall tests. Verbal Fluency was measured using the Category Fluency and Phonemic Fluency (F-L) tests, with one point given for each word correctly generated within one minute on each test, respectively. The Executive Function/Processing Speed composite was comprised of brief measures of mental sequencing speed and cognitive flexibility, the Oral Trail Making Tests (OTMT-A and B). The time to complete each task is recorded in seconds, with shorter times reflecting better Executive Attention/Processing Speed. Raw scores for each test were transformed into z-scores to place measures on the same scale before creating composite scores for each specific cognitive function.

Coping strategies

The Brief COPE is comprised of 14 scales made up of two items that capture the respective coping strategies: acceptance, active coping, behavioral disengagement, denial, emotional support, humor, instrumental support, planning, positive reframing, religion, self-blame, self-distraction, substance use, and venting. The original 28 items and instructions were used verbatim with the exception that it was modified to measure how participants have been coping since the COVID-19 pandemic Specifically, participants were instructed "These items deal with ways you've been coping with the stress in your life since the COVID-19 pandemic". They were then instructed to rate their use of the 28 items on a 4-point Likert scale (1 = *I haven't been doing this at all* to 4 = *I've been doing this a lot*) and to answer each item independently without judging the effectiveness of the strategy to make the answers "as true FOR YOU as you can". For full instructions, see https://www.psy.miami.edu/faculty/ccarver/brief-cope.html (Carver, n.d.).

Based on empirical findings, three first-order variables were formed. Behavioral Disengagement, Substance Use, Self-Blame, and Denial were indicators of Avoidance. Emotional Support, Acceptance, Positive Reframing, Religion, Humor, Self-Distraction, and Venting were indicators of Emotion Regulation. Active, Instrumental Support, and Planning were indicators of Problem-Solving. As an update to existing models that is consistent with evidence that positive distraction is beneficial to emotion regulation, we posited that the Self-Distraction scale would reflect emotion regulation and not avoidance in the model.

Statistical analyses

Preliminary analyses examined variable distributions and sample characteristics. Winsorization was used to mitigate the effect of outliers by replacing them with less extreme values when appropriate (<1% of cases replaced). Statistical power (defined as $1\text{-}\beta = 0.80$) was computed using G*Power 3.1 (Faul et al., 2009) and assuming a medium effect size ($f2 = 0.15$) indicated that a sample size of 103 was required for the multiple linear regression model with seven predictors. As such, our sample size of 165 was sufficient to detect change in R^2 for the regression analyses and was excellently powered for the simple correlational analyses.

One-way ANOVAs evaluated sample characteristics. Spearman's rank correlation coefficient examined associations with the ordinal

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data. To better understand the relationship between coping and cognitive functions, the coping data was reduced by creating Emotion Regulation, Problem-Solving, and Avoidance composite scores based on the SEM analyses. Hierarchal multiple regression analyses evaluated the effect of the sociodemographic variables and cognitive function on avoidance coping. Adjusted R^2 and standardized beta values are reported for the final regression models as measures of effect size. Reported effect sizes are based on conventions for r (small $r = .10$; medium $r = .30$, and large $r = .50$; Cohen, 1988). Statistical analyses were performed via SPSS (Version 28) and AMOS (Version 28). All tests of significance were two-tailed.

Structural equation model

A theoretically driven model evaluated the composition of the Brief COPE in response to COVID-19 using SEM. The model specification was performed according to Bryne (2010) using Maximum Likelihood Estimates in AMOS (Version 28). Recommended bootstrap procedures were used to manage multivariate non-normal data. A scaling reference variable set to unity was used to create the first-order factors and the critical ratio difference method was used to impose equality constraints at the upper level for the second-order model (Bryne, 2010). Modification indices and standardized residual errors were inspected for sources of model misspecification. Several fit indices were evaluated to determine which model best represented the data (Kline, 2011). These included the root-mean-squared error of approximation (RMSEA), comparative fit index (CFI), degrees of freedom (df), Akaike information criterion (AIC), and Bollen-Stine bootstrap. CFI values greater than .90 and RMSEA cutoff values less than .08 suggested an adequate model fit. For competing models, lower AIC values indicated a better model fit. Nonsignificant Bollen-Stine bootstrap values indicated good model fit in the presence of non-normality.

The analysis first investigated how well the indicator variables represented the latent variables. Consistent with prior evidence, modification indices suggested that removing Self-Blame, which cross-loaded on Avoidance and Emotion Regulation, would improve the model specification. Additionally, the Acceptance scale inversely loaded on Avoidance, suggesting that low levels of acceptance were a form of avoidance. The Acceptance scale was thus reverse-scored to place on a similar scale for interpretation purposes. Other minor modifications included the addition of error covariances between the Religion and Humor coping scales, and between the Instrumental and Emotional Support coping scales. There was a modest association between Emotion Regulation and Avoidance and a strong association between Emotion Regulation and Problem-Solving. As there was no statistically significant association between Problem-Solving and Avoidance, this path was removed. While analyses revealed that this model resulted in a good fit to the data (CFI = .937; RMSEA = .052, 90% CI = .025–.075, $df = 61$; AIC = 174.07), the strong correlation between Emotion Regulation and Problem-Solving (standardized estimate = . 911) supported our *a priori* hypothesis that these factors are best understood by a second-order Approach factor (comprised of the first-order Emotion Regulation and Problem-Solving factors).

For parsimony, we also evaluated a competing first-factor model consisting of Approach and Avoidance. Comparative examination of these fit indices suggested that the hierarchical structure of our proposed second-order model provided a better fit to the data than the first-factor model (CFI = .906; RMSEA = .063, 90% CI = .040–.084, $df = 62$; AIC = 159.94), as well as the statistically significant Bollen-Stine bootstrap test ($p = .050$) suggesting that the competing model should be rejected. In sum, the data supported the proposed second-order factor structure for Approach coping, comprised of Emotion Regulation and Problem-Solving strategies that are presented within the Results section.

Results

Table 1 presents the sample characteristics by visit modality. One hundred and sixty-five participants were included in this study. There was a higher proportion of women than men in the study. The sample was primarily white, which reflects the 94.5% non-Hispanic white demographics of Maine (U.S. Census Bureau, 2018). Education levels ranged from 11 to 20 years. Income levels ranged from less than $10,000 to greater than $100,000 (Median = $55,000). Phone participants were significantly older and had lower category fluency performance than Zoom participants. Scores on the PSS ($M = 21.84$, $SD = 6.40$) reflected that participants on average were experiencing moderate levels of stress within the past month. A count-based approach, which solely evaluated the number of strategies used as opposed to their frequency, indicated that participants were using a wide array of the 14 strategies ($M = 9.50$, $SD = 2.62$).

Coping domains

Figure 1 presents the factor structure of the Brief COPE adapted for COVID-19. The preliminary SEM analyses supported a second-order Approach factor, comprised of Emotion Regulation (Emotional Support, Acceptance, Positive Reframing, Religion, Humor, Self-Distraction, and Venting) and Problem-Solving (Active, Instrumental Support, and Planning) and first-order Avoidance variable (Behavioral Disengagement, Substance Use, Self-Blame, and Denial). Instrumental and Emotional Support shared variance in the model, which likely reflects item overlap in seeking social support. The negative shared error covariance between the Humor and Religion scales indicates that as humor increased, the use of religion decreased and vice versa. Additionally, the Acceptance scale, which was reverse-scored for interpretation, reflects that low levels of acceptance are indicative of avoidance. Because Self-Blame cross-loaded on Avoidance and Emotion Regulation, it was removed from the model to improve the overall model fit. Results indicated an adequate fit (CFI = .915; RMSEA = .060, 90% CI = .036–.081, $df = 62$; AIC = 156.09). Given evidence of a well-fitting model, model-based composite scores were formed for the coping domains to evaluate their relationship with cognitive function.

Table 2 presents the correlation coefficients for the relationships among cognitive functions, coping strategies, perceived stress, and depression. As Table 2 shows, no significant associations with age or education were found with the Emotion Regulation, Problem-Solving, or Avoidance variables. As hypothesized, Avoidance was significantly associated with worse working memory, executive attention/processing speed, verbal memory, verbal fluency, lower income, and higher levels of stress and depression symptoms. Problem-Solving was significantly associated with better verbal fluency and higher stress. Emotion Regulation was positively associated with stress, and women reported greater use of these strategies.

Hierarchical regression analysis investigated the relative contributions of cognitive functions to Avoidance, while adjusting for the potential effect of demographics (age and education) and

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Table 1. Group differences in participant characteristics by modality

Variable	Total ($N = 165$)	Zoom ($n = 141$)	Phone ($n = 24$)	*p*-value
Age (years), range 50–90	72.17 (7.46)	71.68 (7.44)	75.04 (7.07)	.040*
Education (years), range 11–20	16.24 (2.25)	16.33 (2.18)	15.71 (2.60)	.274
Sex (Female, $n = 122$)	73.9%	74.5%	70.8%	.708
Depression	1.52 (2.03)	2.50 (3.30)	1.35 (1.69)	.108
Avoidance, range 8–21	10.10 (2.48)	10.06 (2.33)	10.33 (3.28)	.615
Emotional Regulation, range 6–24	13.69 (3.33)	13.87 (3.21)	12.63 (3.86)	.145
Problem-Solving, range 6–21	15.09 (4.13)	15.19 (3.90)	14.50 (5.34)	.549
Oral Trail Making Test-A (sec)	8.86 (2.49)	8.80 (2.21)	9.22 (3.77)	.597
Oral Trail Making Test-B (sec)	39.34 (42.55)	36.63 (36.59)	55.14 (66.61)	.196
RAVLT Sum of T1–T5	46.69 (10.49)	47.28 (10.06)	43.25 (12.39)	.142
RAVLT Delayed	9.33 (3.71)	9.52 (3.61)	8.25 (4.21)	.122
Digit Span Total	16.54 (3.95)	16.48 (3.73)	16.88 (5.13)	.654
Category Fluency Total	39.67 (8.40)	38.76 (9.27)	33.42 (12.21)	.002*
Phonemic Fluency Total	28.90 (8.68)	29.37 (8.12)	26.17 (11.30)	.095†

Note. Depression (Geriatric Depression Scale) Seconds (sec); Rey Auditory Verbal Learning tests (RAVLT). Values reflect the Mean (*M*) and Standard Deviation (*SD*) unless otherwise noted; *p*-values are based on Brown's Forsythe test except for sex which reflects Chi-square test. †$p < .10$; *$p < .05$; **$p < .01$.

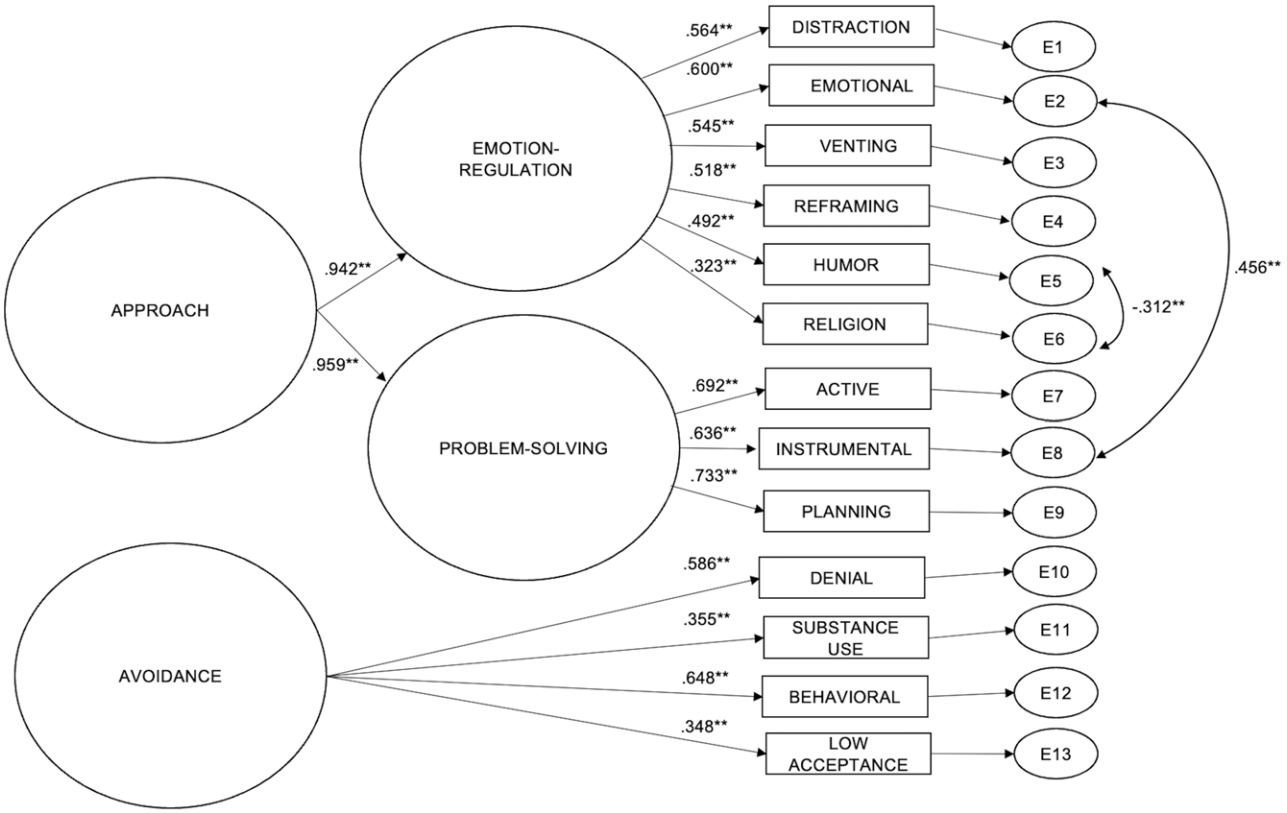

Figure 1. Structural equation model of the second-order factor structure of the Brief COPE. Path estimates reflect the standardized correlation coefficients. Ellipses represent the latent variables with their indicator variables represented by rectangles. Circles represent residual terms. *$p < .05$; ** $p < .01$.

modality (phone vs. Zoom). The first step in the model indicated that age, education, and modality were not significant predictors of Avoidance [Model 1: R^2 change = .011, F (3, 160) = .575, $p = 632$]. The fully adjusted model with age (β = −.068, $p = .388$), education (β = .033, $p = .684$), and modality (β = −.050, $p = .512$) as covariates, found that verbal memory (β = −.185, $p = .032$) and executive function/speed (ß = −.216, $p = .013$) but not verbal fluency (β = −.078, $p = .421$) or working memory (β = −.080, $p = .343$) significantly contributed to 13.3% of the variance in Avoidance, [Model 2: R^2 change = .133, F (4, 156) = 6.06, $p < .001$].

Discussion

This study extends current research by demonstrating that avoidance was associated with worse cognitive function in response to the COVID-19 pandemic in community-dwelling middle-to-older-aged adults. To our knowledge, this is the first study to characterize coping strategies associations with specific cognitive domains in older adults. Overall, older adults on average reported using numerous coping strategies and we did not find age or education-related differences in the underlying coping patterns. Consistent with the broader pre-pandemic literature, women used

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Table 2. Correlations amongst coping strategies with demographics, mood, and cognitive function

Measure	Avoidance	Problem-solving	ER
Age	−.079	.017	−.072
Education	−.106	.133	.020
Sex (Female)	−.030	−.002	.153*
Income	−.193*	−.131	−.054
Perceived Stress Scale	.302**	.262**	.161*
Geriatric Depression Scale	.198*	.053	−.091
Executive Attention†	.229**	−.119	−.014
Verbal Memory	−.209**	−.002	.043
Working Memory	−.196*	−.012	−.088
Verbal Fluency	−.245**	.158*	.125

Note. †Positive values reflect worse performance for Executive Attention; Emotion Regulation (ER); *$p < .05$; **$p < .01$.

more Emotion Regulation coping strategies than men during the pandemic.

Factor structure of the brief COPE during COVID-19

This study provides a theoretically derived SEM of coping domains in response to a chronic stressor that future research can build on. The second-order factor structure for Approach coping strategies, consisting of Emotion Regulation and Problem-Solving, demonstrates that these are distinct but highly correlated variables. Interestingly, there was not a statistically significant relationship between Problem-Solving and Avoidance. These findings indicate that utilizing more Problem-Solving during the pandemic did not lead to a decrease in avoidance or vice versa.

Although our primary hypotheses regarding the factor structure were largely supported, there were modifications made to the model that are worthy of discussion. In accordance with prior pre-pandemic research that has suggested its removal due to its failure to differentiate (Nes & Segerstrom, 2006; Solberg et al., 2022), the Self-Blame scale cross-loaded on the Emotion Regulation and Avoidance variables and its removal resulted in a better model fit. The negative shared error covariance between the Humor and Religion scales suggested that as humor (e.g., "making fun of the situation") increased, the use of religion ("praying or meditating") decreased and vice versa. Finally, and most interesting, the Acceptance scale inversely loaded on Avoidance, suggesting that the tendency to '*accept the situation*' and '*learn to live with it*' was associated with less avoidance. This finding aligns with established theories that acceptance and avoidance are opposing processes and that higher levels of acceptance reduce experiential avoidance (Hayes, 2004). Further, our follow-up analyses replicated Girma et al.s' (2021) finding that higher acceptance was the only Brief COPE scale significantly associated with less stress during the pandemic. In terms of resiliency, acceptance-based strategies appear to support positive thinking (Fuller & Huseth-Zosel, 2021) and reduce stress. In this respect, acceptance-based therapies may be useful for cognitively diverse older adults experiencing significant life stress.

Coping and cognitive function

As anticipated, findings revealed that Avoidance was associated with worse verbal memory, executive function, working memory, and verbal fluency. Regression analyses indicated that verbal memory and executive function/speed were the largest contributors to avoidance in the fully adjusted model. Considering the broader context of these findings, these findings align with pre-pandemic work that indicates that those with worse executive function and memory are more prone to use avoidance (Goretti et al., 2010; Grech et al., 2017; Lysaker et al., 2005). Speculatively, it may be that individuals with less cognitive resources feel more overwhelmed in response to stressful situations, which leads to more avoidant behaviors. It is also possible that trouble recalling details and forgetfulness can lead to greater behavioral disengagement and avoidance of cognitively demanding tasks. Whereas, better cognitive function, particularly executive functioning may help individuals to inhibit and down-regulate physiological responses to stress (Nieto et al., 2020), which could reduce the use of avoidance coping.

Coping and distress

The COVID-19 pandemic provided a unique context to study the effect of chronic and uncontrollable stress. Higher perceived stress, which is linked to an increased risk of depression and unhealthy behaviors, was associated with all three coping domains. While this finding was unexpected, it is consistent with research that linked higher distress to both avoidance and approach coping strategies during the COVID-19 pandemic (Girma et al., 2021; Na et al., 2022). Although approach coping is largely considered to be adaptive, it can have negative consequences on mental health due to increased worry and rumination. Further, in the event of uncontrollable stress, it may prove to be less effective at reducing stress. In contrast, avoidance can attenuate physiological responses to stress temporarily (Carver et al., 1989; Roth & Cohen, 1986). However, while avoidance may provide temporary relief, it ultimately leads to increased distress and health problems in the long term, as the underlying issues causing distress are not addressed and can worsen over time. This latter explanation is consistent with our findings that linked avoidance to more depression symptoms, suggesting convergence with the broader literature.

Strengths and limitations

This study has strengths and limitations worth noting. First, the COVID-19 pandemic provided a relatively unprecedented context, which included increased health risks and isolation, to investigate coping strategies. Thus, a strength of this study is that it is the first study to our knowledge that adapted the well-validated Brief COPE to assess how older adults were coping with COVID-19 during the pandemic. The Brief COPE was designed to be adapted in this manner and it has been used in countless studies in numerous populations including older adult caregivers (Perez-Aradros et al., 2023), breast cancer survivors (Rand et al., 2019), natural disasters (Adhikari Baral & Bhagawati, 2019; Kannis-Dyman et al., 2020) with over 9,271 citations to date. When considering the ability of these findings to generalize to other chronic stressors, our findings largely align with the pre-pandemic literature suggesting that these patterns have broad implications for brain-behavior relationships in response to chronic stress, particularly when considering increased health risks and social isolation are common challenges that older adults face. However, while these findings are consistent with prior work, their directionality and the degree to which these cross-sectional findings reflect cyclical relationships between cognitive function and preferred coping strategies in response to stress is unclear. Further research is thus recommended to longitudinally explore the directionality of these relationships to investigate cause-effect.

Other limitations include that while the primarily white sample reflects the demographics of Maine (U.S. Census Bureau, 2018), it

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is possible the generalizability of these findings may be limited for other ethnicities. We also cannot determine whether group differences in verbal fluency are due to the modality or age, as those who participated via phone compared to Zoom were significantly older. However, our sensitivity analyses overall suggested similar patterns between groups. Finally, as executive function is an umbrella term, it is important to note that this study only measured one aspect of executive function. Thus, future research is warranted to further investigate the association between executive function and active strategies. Strengths of this study include that the coping data was reduced using a theoretically derived SEM model in response to the COVID-19 pandemic, a well-validated multidomain neuropsychological battery, and community-based recruitment procedures with broad eligibility criteria to increase the representation of non-college-educated and low-income older adults within the sample.

Summary

This study takes the first step to improve understanding of the relationships between coping and individual differences in cognitive function by comprehensively investigating neuropsychological test performance and specific coping strategies in response to the COVID-19 pandemic. Our results confirm and expand on the association between avoidance coping and cognitive function in older adults in the context of a natural stressor. Older adults with worse cognitive function and fewer financial resources utilized more avoidance, which could result in prolonged stress and adverse health consequences. Finally, our results suggest that acceptance may be an important factor in reducing perceived stress in the face of chronic stressors. Future research is needed to replicate these findings and evaluate the extent to which our model generalizes to other conditions and populations. Additionally, future clinical research that examines whether brief mindfulness-acceptance-based interventions help reduce the use of avoidance and distress in cognitively diverse older adults is recommended.

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