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Which Psychosocial Factors Best Predict Cognitive Performance in Older Adults?

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Abstract

Negative affect (e.g., depression) is associated with accelerated age-related cognitive decline and heightened dementia risk. Fewer studies examine positive psychosocial factors (e.g., emotional support, self-efficacy) in cognitive aging. Preliminary reports suggest that these variables predict slower cognitive decline independent of negative affect. No reports have examined these factors in a single model to determine which best relate to cognition. Data from 482 individuals 55 and older came from the normative sample for the NIH Toolbox for the Assessment of Neurological and Behavioral Function. Negative and positive psychosocial factors, executive functioning, working memory, processing speed, and episodic memory were measured with the NIH Toolbox Emotion and Cognition modules. Confirmatory factor analysis and structural equation modeling characterized independent relations between psychosocial factors and cognition. Psychosocial variables loaded onto negative and positive factors. Independent of education, negative affect and health status, greater emotional support was associated with better task-switching and processing speed. Greater self-efficacy was associated with better working memory. Negative affect was not independently associated with any cognitive variables. Findings support the conceptual distinctness of negative and positive psychosocial factors in older adults. Emotional support and self-efficacy may be more closely tied to cognition than other psychosocial variables. (*JINS*, 2014, *20*, 487–495)

Keywords: Social support, Self efficacy, Personal satisfaction, Executive function, Memory, Aging

INTRODUCTION

Negative affect (e.g., depression) is associated with accelerated age-related cognitive decline and heightened dementia risk (Ownby, Crocco, Acevedo, John, & Loewenstein, 2006; Royall, Palmer, Chiodo, & Polk, 2012). Fewer studies have examined the role of positive psychosocial factors in cognitive aging. Positive psychosocial factors include eudaimonic and hedonic well-being, social support, and self-efficacy. While these factors are often related to negative affect, they represent independent aspects of an individual's psychosocial experience (Diener, 2000; Watson & Tellegen, 1985). For example, both depression and self-rated life satisfaction independently predict mortality in older adults (Collins, Glei, & Goldman, 2009). Similarly, positive affect is observed to decline among older adults in the absence of a corresponding increase in negative affect (Charles, Reynolds, & Gatz, 2001). In fact, negative affect also declines with age (Charles et al., 2001; Costa et al., 1987; Rossi & Rossi, 1990).

Preliminary reports suggest that certain positive psychosocial variables are associated with better cognitive performance among older adults, independent of negative affect. For example, positive affect was related to better performance on a composite of verbal fluency, perceptual speed, and verbal knowledge (Lang & Heckhausen, 2001). Perceived control (i.e., self efficacy) was related to better memory, speed, and verbal intelligence (Windsor & Anstey, 2008). Even more compelling is longitudinal evidence for associations between positive psychosocial variables and cognitive aging. For example, baseline positive affect independently predicted risk of cognitive decline in the Victoria Longitudinal Study (Dolcos, MacDonald, Braslavsky, Camicioli, & Dixon, 2012). Similarly, greater well-being and social participation predicted less subsequent decline in perceptual speed, but not vice versa, in the Berlin Aging Study (Gerstorf, Lövdén,

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Röcke, Smith, & Lindenberger, 2007; Lövdén, Ghisletta, & Lindenberger, 2005). Finally, both social support and self-efficacy beliefs at baseline predicted better subsequent cognitive performance among participants in the MacArthur Studies of Successful Aging (Seeman, McAvay, Merrill, Albert, & Rodin, 1996; Seeman, Lusignolo, Albert, & Berkman, 2001).

Together, these studies suggest that positive psychosocial factors may represent independent modifiers of cognitive risk in late life. Because previous studies typically examined only one or two of these positive psychosocial variables, it is unclear which are most strongly related to cognition. Furthermore, most previous research has focused on a single cognitive domain, or only on global cognitive status. Therefore, which specific cognitive domains are most strongly related to different positive psychosocial variables is unknown. Awareness of these relationships will inform our understanding of the manifold contributors to late-life cognitive decline.

The present study sought to address both of these lingering issues using normative data that was collected for the NIH Toolbox, a standardized set of Web-based neurobehavioral measures. The first aim was to statistically verify the conceptual separation of negative affect and positive psychosocial factors in the NIH Toolbox Emotion module using confirmatory factor analysis. We hypothesized that a two-factor model of negative affect and positive psychosocial factors would fit significantly better than a one-factor model in which all variables were forced to load on a single factor. The second aim was to characterize the pattern of independent associations between positive psychosocial variables and cognitive domains using structural equation modeling. Based on previous research summarized above, we hypothesized that well-being, social support, and self-efficacy would each be associated with better cognition.

METHODS

Participants and Procedures

The 482 individuals in this sample were participants in the NIH Toolbox norming study (Beaumont et al., 2013). In brief, study participants were randomly selected from existing databases maintained by several market research companies following a sampling strategy defined by age, sex, and primary language (English or Spanish). Inclusion criteria for the NIH Toolbox norming study were: (1) community-dwelling and non-institutionalized; (2) ages 3–85 years; (3) capable of following test instructions (English or Spanish); and (4) able to give informed consent. It should be noted that participants were *not* excluded for the presence of an Axis I disorder or cognitive impairment.

Participants in the NIH Toolbox norming study travelled to a research site to participate in the study and were supervised by a trained administrator. Of the 487 individuals over age 55 with available data on Emotion and Cognition modules at the time of the current study, 5 were excluded for the self-reported presence of a neurological condition (dementia, seizures, multiple sclerosis, or stroke/TIA). This study complied with the ethical rules for human experimentation that are stated in the Declaration of Helsinki, including approval of the local institutional review boards and informed consent. Characteristics of this community-dwelling, older adult sample are shown in Table 1.

Primary Measures

Negative affect, positive psychosocial variables, and cognition were assessed with the NIH Toolbox. The NIH Toolbox for the Assessment of Neurological and Behavioral Function (www.nihtoolbox.org) is a standardized set of Web-based measures developed through a contract initiated by the NIH Blueprint for Neuroscience Research (Gershon et al., 2013).

Table 1. Characteristics of the sample

	Mean	*SD*	Range
Demographics			
Age	69.6	8.8	[55, 85]
Sex (% Female)	54.1	-	-
Ethnicity (% Hispanic)	27.4	-	-
Race			
% White	83.7	-	-
% Black or African American	9.3	-	-
% Native American	4.6	-	-
% Asian	2.3	-	-
% Pacific Islander	0.2	-	-
Education (0-20)	12.7	3.9	[0, 20]
Health (0-7)	0.7	0.7	[0, 2]
Cognition			
Dimensional Change Card Sort (0-10)	6.6	1.9	[2, 9.7]
Flanker (0-10)	7.6	1.3	[3.4, 9.7]
List Sorting (0-26)	14.2	3.7	[3, 26]
Pattern Comparison (0-130)	35.4	10.5	[4, 64]
Picture Sequence Memory	-1.0	0.8	[-3.1, 1.4]
Negative Affect			
Anger Affect	-0.4	0.8	[-1.8, 2.4]
Anger Hostility	-0.3	0.9	[-1.3, 3.0]
Anger Physical Aggression	-0.2	0.7	[-0.7, 3.3]
Sadness	-0.1	0.8	[-1.3, 2.7]
Fear Affect	0.1	0.8	[-1.4, 3.2]
Fear Somatic Arousal	-0.1	0.8	[-1.0, 2.6]
Positive Psychosocial			
Life Satisfaction	0.1	0.9	[-3.1, 2.5]
Meaning & Purpose	0.0	1.0	[-3.6, 1.9]
Positive Affect	-0.0	1.0	[-3.6, 2.0]
Friendship	-0.2	1.0	[-3.2, 1.7]
Loneliness	-0.1	1.0	[-1.2, 3.3]
Emotional Support	-0.1	1.0	[-3.4, 1.3]
Instrumental Support	0.1	1.0	[-2.8, 1.3]
Self-Efficacy	-0.1	1.0	[-3.3, 1.8]

Note. Picture Sequence Memory, negative affect, and positive psychosocial variables reflect Item Response Theory-based theta scores, similar to z-scores, derived from the entire NIH Toolbox adult normative sample (ages 18-85). Possible ranges for other cognitive tests and covariates are provided next to the variable name. None of the scores in this table are age-corrected.

Table 2. Study measures from the NIH Toolbox Emotion module

Broad categories	Constructs	NIH Toolbox Surveys	Description	Reference period
Negative affect	Anger	Anger Affect	Affective experience of anger	Past 7 days
		Anger Hostility	Attitudes of hostility or cynicism	Past 7 days
		Anger Physical Aggression	Extent to which one engages in threats or physical aggression	Past 7 days
	Anxiety	Fear Affect	Affective and cognitive experiences of anxiety	Past 7 days
		Fear Somatic Arousal	Physical experiences of anxiety	Past 7 days
	Depression	Sadness	Affective and cognitive indicators of depression	Past 7 days
Positive psychosocial	Well-being	Positive Affect	Feelings that reflect a level of pleasurable engagement with the environment	Past 7 days
		Life Satisfaction	One's cognitive evaluation of both general and domain-specific life experiences	Present tense
		Meaning & Purpose	The extent to which an individual feels his/her life matters or makes sense	Present tense
	Social support	Emotional Support	Perceptions that people in one's social network are available to listen to one's problems with empathy, caring, and understanding	Past month
		Instrumental Support	Perceptions that people in one's social network are available to provide material or functional aid in completing daily tasks, if needed	Past month
	Companionship	Friendship	Perceptions of the availability of friends or companions with whom to interact or affiliate	Past month
		Loneliness	Perceptions that one is alone, lonely, or socially isolated from others	Past month
	Self-efficacy	Self-efficacy	One's belief in his/her capacity to manage his/her functioning and have control over meaningful events	In general

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It contains four modules: Motor, Sensation, Cognition, and Emotion. Emotion and Cognition modules were the focus of the present study.

Table 2 summarizes measures from the Emotion module used in the present study. As shown, the NIH Toolbox surveys of anger, anxiety, depression, and positive affect query a period of 7 days, suggesting that these measures target more chronic, rather than acute, emotional states. The NIH Toolbox surveys comprise Likert-type items presented using computerized adaptive testing based on item response theory (Salsman et al., 2013). These items are completed by the participant, under the supervision of a trained administrator. This module takes approximately 12–20 min to complete for ages 18–85. Reliability (Cronbach α) for surveys included in the present study has been reported to range from 0.83 (Anger Physical Aggression) to 0.97 (Sadness and Emotional Support), and convergent validity (absolute values of associations with gold-standard measures) ranges from 0.61 (Anger Affect) to 0.92 (Positive Affect) in adults (Salsman et al., 2013).

The Cognition module comprises computerized tests of executive function, working memory, processing speed, episodic memory, vocabulary and reading, and it takes approximately 30 min to complete (Weintraub et al., 2013). The present study analyzed data from tests of executive functioning (Flanker Inhibitory Control & Attention, Dimensional Change Card Sort), working memory (List Sorting), processing speed (Pattern Comparison), and episodic memory (Picture Sequence Memory) due to the known sensitivity of these cognitive domains to age-related cognitive differences (e.g., Salthouse, 2010). Specific details of the NIH Toolbox Cognition module, including evaluation of its psychometric properties, are available elsewhere (Weintraub et al., 2013). In brief, test–retest reliability of each instrument is good, with intraclass correlation coefficients ranging from 0.72 (Pattern Comparison) to 0.94 (Flanker) in adults. Convergent validity for each instrument was demonstrated through significant, moderately-sized correlations with gold-standard measures, ranging from 0.48 (Flanker) to 0.69 (Picture Sequence Memory).

Trained research personnel administered the cognitive measures using a dual-monitor set-up. The Flanker test requires participants to indicate the direction of a central arrow that is flanked by arrows pointing in the same or

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different direction. The Dimensional Change Card Sort test (DCCS) requires participants to alternately choose which of two pictures matches a central picture based on shape or color. The Pattern Comparison test requires participants to indicate whether as many pairs of pictures are the same or different in 90 s. The Picture Sequence Memory test requires participants to view a series of related scenes presented in an arbitrary order, and then to reproduce this order.

Covariates

The structural equation model controlled for education, negative affect, and illness burden. Years of education was measured *via* self report. Negative affect was modeled as a latent variable with six indicators from the NIH Toolbox Emotion module: Sadness, Fear Affect, Fear Somatic Arousal, Anger Affect, Anger Hostility, and Anger Physical Aggression. To index overall illness burden, one point was assigned for the self-reported presence of each of the following conditions: hypertension, peripheral vascular disease, other heart problem, diabetes, thyroid problems, joint problems, and breathing problems. These points were summed to create an index of illness burden with a minimum value of 0 and a maximum value of 7.

Statistical Analysis

Descriptive statistics were computed using SPSS version 19 (IBM Corp., Armonk, NY). Bivariate associations between the variables of interest were computed using product-moment correlation coefficients (Pearson's r). Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were conducted in Mplus version 7.11 (Muthén & Muthén, Los Angeles, CA) using maximum likelihood estimation.

A CFA tested the *a priori* hypothesis that negative affect and positive psychosocial variables are conceptually distinct. Changes in fit between one- and two-factor models were evaluated statistically with the chi square test.

A SEM tested for relationships between the positive psychosocial and cognitive variables, independent of negative affect. In the SEM, five observed cognitive variables were regressed on the eight observed positive psychosocial factors and three covariates (i.e., latent negative affect, observed health, and observed education) in a single model. Importantly, regression estimates in this model represent independent effects, controlling for all other structural relations in the model and covariates. Correlations were allowed among cognitive variables, among positive psychosocial variables, among covariates, and between positive psychosocial variables and covariates. Given the large number of parameters estimated by the model, a false discovery rate of 0.05 was used to control for multiple comparisons (Benjamini & Hochberg, 1995). This approach is more appropriate in SEM than controlling family-wise error rate for multiple, independent comparisons (e.g., Bonferroni correction) because the parameters in SEM are not independent. The model's correlation matrix was examined to identify potential issues of multicollinearity, which can lead to Type II errors in SEM when above 0.6 (Grewal, Cote, & Baumgartner, 2004). If a potential issue of multicollinearity was identified, parameter estimates were interrogated using univariate regression. Model fit was evaluated with the following commonly-used criteria: RMSEA < 0.08; SRMR < 0.05; CFI > 0.95.

A path analysis tested for relationships between all psychosocial variables (both positive and negative) and cognition. This analysis explored the possibility that associations between individual indicators of negative affect and cognition were being obscured by their inclusion only as a latent factor in the SEM. The difference between this path analysis and the SEM described above is that the indicators of negative affect were modeled as separate, observed variables rather than a latent factor. In the path analysis, the five observed cognitive variables were regressed on the eight positive psychosocial variables, the six negative affect variables, and two observed covariates (i.e., health and education). Importantly, regression estimates in this model represent independent effects, controlling for all other structural relations in the model and covariates. Correlations were allowed among cognitive variables, among and between positive psychosocial and negative affect variables, and among and between the covariates and the positive psychosocial and negative affect variables. Procedures for managing multiple comparisons and multicollinearity were identical to those used for the SEM described above. By definition, the fit of this path analysis model was perfect.

RESULTS

Separating Negative Affect and Positive Psychosocial Factors

A CFA modeled negative and positive variables as separate latent factors. Specifically, a two-factor CFA was run in which scores purported to measure negative affect were forced to load exclusively onto one factor, and scores purported to measure positive psychosocial variables were forced to load exclusively onto a separate factor. All residual variances were freely estimated and independent in this initial model. Model fit was marginal (RMSEA = 0.10; SRMR = 0.06; CFI = 0.89). A subsequent model was run in which residual variances were allowed to correlate within lowest-order subdomains, as defined by the NIH Toolbox manual. Specifically, residual correlations were allowed among anger scores (Anger Affect, Anger Hostility, Anger Physical Aggression), fear scores (Fear Affect, Fear Somatic Arousal), social support scores (Emotional Support, Instrumental Support), companionship scores (Friendship, Loneliness), and well-being scores (Positive Affect, Life Satisfaction, Meaning and Purpose). This slightly modified model fit well (RMSEA = 0.07; SRMR = 0.04; CFI = 0.95).

In the slightly modified model, factors corresponding to negative affect and positive psychosocial factors were

Table 3. Standardized factor loadings in the final confirmatory factor analysis model

	Negative affect	Positive psychosocial factors
Anger Affect	0.71 (0.03)	-
Anger Hostility	0.59 (0.03)	-
Anger Physical Aggression	0.31 (0.05)	-
Sadness	0.88 (0.02)	-
Fear Affect	0.86 (0.02)	-
Fear Somatic Arousal	0.44 (0.04)	-
Life Satisfaction	-	0.64 (0.04)
Meaning & Purpose	-	0.65 (0.04)
Positive Affect	-	0.84 (0.02)
Friendship	-	0.58 (0.04)
Loneliness	-	−0.67 (0.03)
Emotional Support	-	0.65 (0.03)
Instrumental Support	-	0.51 (0.04)
Self-Efficacy	-	0.64 (0.03)

negatively correlated (r = -0.75; p < .001). Standardized factor loadings are shown in Table 3. As shown, all indicators loaded onto their hypothesized factor with an absolute value above 0.4, with the exception of Anger Physical Aggression, which exhibited a standardized loading onto the negative affect factor of 0.31. Sadness exhibited the largest standardized loading onto the negative affect factor (0.88), followed by Fear Affect (0.86). With regard to positive psychosocial factors, Positive Affect exhibited the largest standardized loading (0.84), and Instrumental Support exhibited the smallest standardized loading (0.51).

This final, two-factor model fit significantly better than a one-factor model in which all variables were forced to load onto a single factor, and residual variances were allowed to correlate within lowest-order subdomains as described above ($\Delta\chi^2(1)$ = -235.83; p < .001).

Associations between Positive Psychosocial Variables and Cognition

A SEM, in which negative affect variables were modeled as a single latent factor and positive psychosocial variables were modeled as separate observed variables, tested for relations between the cognitive variables and the positive psychosocial variables. The negative affect factor from the best-fitting CFA described above was retained as a covariate in the SEM. Because a primary aim of this study was to determine which positive psychosocial variable(s) best predicted performance within different cognitive domains, positive psychosocial and cognitive variables were included as separate observed variables, rather than single latent factors. For reference, unadjusted bivariate associations between the variables of interest are provided in Table 4.

A single model estimating associations between the positive psychosocial variables, cognitive variables, and covariates (i.e., negative affect, health, education) fit very well (RMSEA = 0.04; SRMR = 0.03; CFI = 0.97). Examination of the resultant correlation matrix identified multicollinearity issues (i.e., correlations above 0.6) involving only the variables Meaning & Purpose and Life Satisfaction. Specifically, these variables were highly correlated with each other (r = .71; p < .001) and with Positive Affect (Meaning & Purpose r = .64; p < .001; Life Satisfaction r = .68; p < .001).

Table 5 presents standardized regression path estimates involving the five cognitive variables of interest, estimated simultaneously in a single model. Significant associations

Table 4. Bivariate correlations between cognitive and psychosocial variables

	Executive functioning		Working memory	Processing speed	Episodic memory
	DCCS	Flanker	List Sorting	Pattern Comparison	Picture Sequence Memory
Negative					
Anger Affect	−0.01	−0.06	0.04	−0.05	0.18
Anger Hostility	−0.16**	−0.15**	−0.10*	−0.14**	−0.02
Anger Physical Aggression	−0.12**	−0.11*	−0.13**	−0.11*	−0.05
Fear Affect	−0.17**	−0.23**	−0.08	−0.17**	−0.08
Fear Somatic Arousal	−0.10*	−0.12**	−0.09	−0.09*	0.05
Sadness	−0.17**	−0.22**	−0.09	−0.15**	−0.05
Positive					
Life Satisfaction	0.02	0.06	−0.03	0.10*	0.03
Meaning & Purpose	−0.01	0.04	−0.01	0.02	−0.10
Positive Affect	0.08	0.09*	0.01	0.14**	−0.01
Friendship	0.08	0.06	0.13**	0.12*	0.01
Loneliness	−0.13**	−0.11*	−0.10*	−0.15**	0.03
Emotional Support	0.14**	0.09*	0.10*	0.18**	0.02
Instrumental Support	0.06	0.08	0.05	0.09	0.01
Self-efficacy	0.16**	0.17**	0.15**	0.18**	−0.02

* p < .05; ** p < .01.

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Table 5. Standardized regression path estimates in the structural equation model

	Executive functioning		Working memory	Processing speed	Episodic memory
	DCCS	Flanker	List Sorting	Pattern Comparison	Picture Sequence Memory
Life Satisfaction	0.04 (0.07)	0.07 (0.07)	0.01 (0.07)	0.13 (0.07)	0.03 (0.09)
Meaning & Purpose	− 0.20 (0.07)*	− 0.15 (0.07)*	− 0.11 (0.07)	− 0.23 (0.07)*	− 0.03 (0.09)
Positive Affect	0.01 (0.08)	− 0.01 (0.07)	− 0.11 (0.08)	0.05 (0.08)	− 0.06 (0.10)
Friendship	− 0.09 (0.05)	− 0.09 (0.05)	0.05 (0.06)	− 0.06 (0.06)	0.03 (0.07)
Loneliness	− 0.06 (0.06)	− 0.02 (0.06)	− 0.07 (0.07)	− 0.09 (0.07)	0.14 (0.08)
Emotional Support	0.17 (0.06)*	0.09 (0.06)	0.09 (0.06)	0.15 (0.06)*	0.09 (0.07)
Instrumental Support	− 0.04 (0.05)	0.00 (0.05)	0.01 (0.06)	− 0.03 (0.06)	− 0.01 (0.07)
Self-efficacy	0.08 (0.06)	0.06 (0.06)	0.14 (0.06)*	0.09 (0.06)	− 0.08 (0.07)
Negative affect	− 0.06 (0.08)	− 0.14 (0.07)	0.04 (0.08)	− 0.00 (0.08)	− 0.16 (0.10)
Education	0.44 (0.04)*	0.45 (0.04)*	0.33 (0.05)*	0.25 (0.05)*	0.11 (0.07)
Health	− 0.02 (0.04)	−0.06 (0.04)	0.06 (0.04)	0.02 (0.04)	0.00 (0.05)

*Significant after adjustment for multiple comparisons using the false discovery rate procedure.

maintained their significance after correction for a false discovery rate of 0.05. As shown, greater emotional support was independently associated with better performance on DCCS and Pattern Comparison. Greater self-efficacy was independently associated with better performance on List Sorting. Greater meaning and purpose was associated with lower performance on DCCS, Flanker, and Pattern Comparison. Given the multicollinearity issues involving the Meaning & Purpose variable described above, these associations were interrogated with follow-up univariate regression. In these follow-up analyses, Meaning & Purpose was not associated with DCCS (B = -0.02; SE = 0.08; p = .78), Flanker (B = 0.06; SE = 0.08; p = .42) or Pattern Comparison (B = 0.03; SE = 0.08; p = .68), suggesting that the significance of those parameter estimates in the SEM reflected type II error due to multicollinearity.

With regard to covariate effects, education was positively associated with all cognitive variables except Picture Sequence Memory. Neither health nor negative affect was uniquely associated with any cognitive variables. Negative affect was negatively correlated with education and all positive psychosocial variables except Loneliness, with which it was positively correlated. Education was positively correlated with Friendship and Self-Efficacy and negatively correlated with Loneliness. Health was not significantly correlated with any positive psychosocial variables.

To determine whether results would differ if individuals suspected of having cognitive impairment were excluded from the sample, we re-ran the above-described SEM excluding the 29 individuals who scored more than two standard deviations below the age-corrected mean on the Flanker test, which exhibited virtually no missing data. The pattern of significant results was unchanged at $p < .05$. To determine whether results would differ if a more commonly used definition of “older adults” had been used, we re-ran the above-described SEM including only the 309 individuals aged 65 or older. The pattern of significant results was unchanged at $p < .05$.

Associations between All Psychosocial Variables and Cognition

A path analysis, in which all negative affect and positive psychosocial variables were modeled as separate observed variables, tested for relations between these variables and cognition. After controlling for multiple comparisons using the false discovery rate method, the results of this model were similar. Specifically, higher emotional support was independently associated with higher scores on DCCS (β = .17; p = .003) and Pattern Comparison (β = .15; p = .015), and higher self-efficacy was independently associated with higher scores on List Sorting (β = .13; p = .028). In addition, higher scores on Fear Affect were independently associated with worse performance on Flanker Inhibitory Control & Attention (β = -.17; p = .017). There were no other significant associations between the cognitive variables and indicators of negative affect. The pattern of results did not change when cognitively impaired participants (as defined by Flanker task performance) were excluded or when analyses were limited to only those 65 or older.

DISCUSSION

This study supports the conceptual distinctness of negative affect and positive psychosocial factors in older adults. In this sample, the negative affect factor was best indicated by sadness and least indicated by anger/physical aggression. The positive psychosocial factor was best indicated by positive affect and least indicated by instrumental support. Results also showed that positive psychosocial indicators of emotional support and self-efficacy were positively associated with cognitive performance independent of other psychosocial variables, education, and general health status. Specifically, greater emotional support was associated with better executive functioning (i.e., task switching) and processing speed, while greater self-efficacy was associated with better working memory. With regard to negative affect, only psychic anxiety was independently associated with cognitive performance.

This study confirms prior work demonstrating positive associations between social support and self-efficacy and cognition (Windsor & Anstey, 2008; Seeman et al., 1996, 2001). It extends this prior work by showing that these associations were independent of other positive psychosocial variables and relevant covariates. In addition, this study demonstrated that associations between psychosocial factors and cognition may be unique to specific cognitive domains of task switching, processing speed and/or working memory, as opposed to episodic memory or inhibition. While the associations identified in the present study were purely cross-sectional, results could reflect a positive influence of emotional support and self-efficacy on cognitive performance. Alternatively, specific cognitive abilities may facilitate the creation and use of emotional supports and self-efficacy strategies, or merely enhance the perception of emotional support and self-efficacy beliefs.

Emotional support may contribute to cognitive reserve (Stern, 2012). For example, only 10 min of social interaction has been shown to facilitate cognitive performance in an experimental setting (Ybarra et al., 2008). Furthermore, situational emotional support was found to increase activity in the left lateral/medial prefrontal cortices and temporal regions, which in turn reduced maladaptive affective responses (Onoda et al., 2009). Of interest, multiple studies have shown the left lateral/medial prefrontal cortex to also underlie task-switching, one of the cognitive domains found to relate to emotional support in the present study (Bunge, Kahn, Wallis, Miller, & Wagner, 2003; Rushworth, Hadland, Paus, & Sipila, 2002; Shi, Zhou, Muller, & Schubert, 2011). That social support may confer resilience against cognitive impairment is supported by data from the Rush Memory and Aging project showing that social network size modified the association between Alzheimer's disease pathology and cognitive function among 89 older adults without dementia, independent of depressive symptoms, activity participation, and chronic diseases (Bennett, Schneider, Tanag, Arnold, & Wilson, 2006).

Self-efficacy may also contribute to cognitive reserve. According to Bandura's self-efficacy theory for research on cognitive aging, self-beliefs of efficacy can enhance performance *via* cognitive, affective, or motivational processes (Bandura, 1989). For example, stronger beliefs in one's abilities may have improved motivation and attention during the working memory task of the present study. Indeed, greater self-efficacy beliefs have been shown to predict cognitive improvement following a training program (Carretti, Borella, Zavagnin, & De Beni, 2011). Thus, self-efficacy may be associated not only with better cognitive performance in the moment, but also increased motivation to learn strategies that could result in further improvements in performance.

Alternatively, the cross-sectional associations identified in the current study may reflect deleterious effects of lower cognitive abilities on certain positive psychosocial factors. For example, older adults with poorer executive functioning and processing speed may be more likely to withdraw from social interactions, resulting in reduced opportunities to create emotional bonds. Declining cognition has been associated with reduced subsequent leisure activity participation, but also vice versa (Small, Dixon, McArdle, & Grimm, 2012). With regard to self-efficacy, poorer working memory performance may reduce one's experience of success, thereby reducing the perception of control over one's environment. Conversely, better working memory may enhance the quantity and/or quality of social interactions and increase the perception that one has control over one's environment. While possible given the present results, these explanations seem less likely given substantial longitudinal evidence that social participation/support and self-efficacy *precede* cognitive changes in late life (Lövdén et al, 2005; Seeman et al., 1996, 2001).

Within the domain of social support, results indicated that emotional support, as opposed to instrumental support or companionship, is most related to cognition. These findings mirror those reported for physical functioning, which was similarly found to relate directly to emotional but not instrumental support in the MacArthur Studies of Successful Aging (Seeman et al., 1995). Similarly, Glymour, Weuve, Fay, Glass, and Berkman (2008) reported that emotional support, but not social ties or instrumental support, predicted 6-month cognitive improvement following stroke in the Families in Recovery from Stroke Trial. Thus, emotional support, but not instrumental support or mere social network size, may provide benefit to cognitive functioning.

In the current study, psychic anxiety (i.e., cognitive and affective aspects of anxiety, as opposed to somatic aspects) was the only negative affect variable that was independently associated with cognitive performance. This association was limited to a test of inhibition and attention. This result is in line with previous studies showing a link between greater anxiety and worse attention (Hogan, 2003) and executive functioning (Yochim, Mueller, & Segal, 2013) among older adults. The relationship between anxiety and cognitive difficulties in older adults appears to be bi-directional. Specifically, reduced inhibitory abilities may reduce older adults' ability to suppress anxious thoughts and feelings. The perception of cognitive decline may also increase anxiety (Seignourel, Kunik, Snow, Wilson, & Stanley, 2008). Conversely, anxiety has been shown to increase subsequent cognitive impairments (Sinoff & Werner, 2003), perhaps because the high cognitive load associated with the subjective experience of anxiety reduces available cognitive resources.

While depressive symptoms were associated with worse executive functioning and processing speed in bivariate analyses, these relationships were no longer significant in a larger model that considered all other positive and negative psychosocial factors. While a large number of studies report an association between depressive symptoms and cognitive performance among older adults (e.g., Zakzanis, Leach, & Kaplan, 1998; McDermott & Ebmeier, 2009; Rock, Roiser, Riedel, & Blackwell, 2013), very few of these studies simultaneously examined other, related psychosocial variables.

The current findings are consistent with other studies that have examined multiple psychosocial variables in a single model. For example, anxiety, but not depression, was associated with cognitive impairment in a sample of homebound older adults (Petkus, Gum, & Wetherell, 2013). Furthermore, positive affect, but not negative affect, was independently associated with a composite score reflecting verbal fluency, verbal knowledge, and perceptual speed in a sample of 160 older adults (Lang & Heckhausen, 2001). In the current study, other variables in the model that were related to depressive symptoms (e.g., anxiety, emotional support, self-efficacy) were stronger predictors of cognition than depressive symptoms.

This pattern of results provides support for positive psychosocial factors as potential modifiers of cognitive aging that are distinct from negative affect, but longitudinal studies are needed to confirm this possibility. A limitation of this study was the lack of objective measures of health and dementia status. However, omission of the poorest-performing participants did not alter the pattern of relationships between the psychosocial factors and cognitive domains. The novelty and significance of this study lies in its comprehensive evaluation of multiple psychosocial factors (both positive and negative) and multiple cognitive domains in a single model, in which all estimated structural relations controlled for all other variables in the model. This unique and rigorous approach allowed for the conclusion that emotional support and self-efficacy are more influential in cognitive aging than other psychosocial factors (e.g., well-being, instrumental support, depressive symptoms), above and beyond education and health status. In addition, certain cognitive domains (i.e., task switching, processing speed, working memory) appeared to be more sensitive to positive psychosocial factors than others (i.e., episodic memory, inhibition).

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