Original Article

The Importance of Cultivating Mindfulness for Cognitive and Emotional Well-Being in Late Life

Journal of Evidence-Based Complementary & Alternative Medicine
2015, Vol. 20(1) 35-40

DOI: 10.1177/2156587214553940
cam.sagepub.com
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Abstract

The cultivation of mindfulness has received increasing attention over the past 2 decades because of its association with increased psychological well-being and reduced stress-related health disorders. Given the robust positive association between perceived stress and cognitive impairment in late life, the current study evaluated the association between trait mindfulness, psychological well-being, and cognitive function in 73 healthy community-dwelling older adults. Controlling for a priori covariates, multivariate regression analyses showed a significant association between trait mindfulness and measures of psychological well-being, including self-reported depressive symptoms, quality of life, and stress profile. Analyses further showed a significant association between trait mindfulness and executive function, namely set shifting. No association was found for declarative memory. Mediation analyses showed that the association between mindfulness and cognitive function is mediated by perceived stress. This research supports the importance of cultivating mindfulness in late life to ensure cognitive and emotional well-being.

Keywords

aging, mindfulness, stress, cognition, well-being

Received August 3, 2014. Accepted for publication September 11, 2014.

Introduction

With an aging population, there is increasing interest in understanding predictors and underlying mechanisms associated with cognitive health and well-being in late life. One of the most significant consequences of aging is cognitive decline, with decrements most often observed in memory, executive function, processing speed, and reasoning.[1] A decline in cognitive function is associated with reductions in functional status, independence, and overall quality of life.[2] Executive functioning is particularly important in maintaining quality of life as it enables individuals to successfully engage in independent, purposive, and self-serving behaviors[3]. As long as executive function is intact, individuals with substantial cognitive impairment can still continue to be independent and productive.[4] Although it is often thought that cognitive decline is an inevitable byproduct of aging, individual differences exist that can either protect the individual from this process or accelerate cognitive deterioration.

Stress exposure is an insidious psychosocial factor that has been found to correlate with a number of poor health outcomes including anxiety,[5] depression,[6] insomnia,[7] and chronic fatigue syndrome.[8] A robust association between stress and cognitive function in late life has also been reported, with high levels of stress associated with declines in cognitive function, particularly in the areas of executive functioning and declarative memory.[9] According to popular theories of stress, periods of transition and change may cause psychological distress in individuals that in turn may compromise physical health and psychological well-being.[10]

Contrary to the stereotype that older adults are stress-free and have few concerns following retirement, older adults are faced with a number of changes that may be perceived as stressful, including changes in identity, lifestyle and income following retirement, change in living conditions, and the loss of close friends and loved ones. Nonetheless, research has shown that it is the *perception* of stress and not the number of stressful events per se that contributes to negative heath outcomes.[7] Consequently, individual differences in how one perceives their surroundings may determine level of resilience in late life.

The cultivation of mindfulness has received increasing attention over the past 2 decades as a way to decrease perceived stress and stress-related disorders. Mindfulness is defined as moment-to-moment awareness of what we are experiencing, both internally and externally, without judgment.[11] Instead of reflexively reacting to environmental challenges, being mindful enables one

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to respond to life's demands by recontextualizing and reframing automatic fear-based feelings and reactions.

Although a number of studies have suggested positive effects of mindfulness-based training on psychological well-being,[12-14] few studies have evaluated these effects in the older adult population. In particular, few studies have evaluated how mindfulness associates with cognitive function and psychological well-being in late life.

The objective of this study was 3-fold: (*a*) to assess the association between trait mindfulness and cognitive function in older adults, including declarative memory and executive function; (*b*) to assess the association between trait mindfulness and psychological well-being in older adults, including reported mood, quality of life, and stress profile; and (*c*) to assess whether reported stress mediates the relationship between mindfulness and cognitive outcomes. Given the documented robust association between perceived mindfulness and overall well-being, it was hypothesized that increasing levels of trait mindfulness would associate with enhanced cognitive and psychological outcomes. It was further hypothesized that perceived stress would mediate the relationship between mindfulness and cognitive outcomes.

Methods

Participants

As part of a larger study, 75 older adult men and women were recruited through a combination of online recruitment advertisements, educational community talks, and through a Ryerson University–maintained database of older adult participants. Eligible individuals were required to be at least 65 years of age and living independently in the community. Participants were excluded if they endorsed any medical or psychiatric conditions that might significantly affect cognitive performance, such as dementia, recently diagnosed psychopathology, cancer, stroke, transient ischemic attack, and diabetes. Furthermore, individuals were excluded if they learned English after the age of 6 years or had undergone neuropsychological testing in the past year (using a similar cognitive battery). Two of the 75 participants were removed from the study because of failure to disclose an exclusionary medical diagnosis and participation in a concurrent and related study.

Measures

Following written consent, participants completed a cognitive battery and a set of self-report questionnaires. Participants' height and weight were also measured to calculate Body Mass Index (weight (kg)/(height [m])^2).

Cognitive Measures

Global Cognitive Function. The Mini-Mental State Examination (MMSE)[15] is a brief cognitive screening tool of global cognitive functioning rated on a 30-point scale. The MMSE has been judged to have satisfactory sensitivity and construct validity to cognitive impairment.[16]

Declarative Memory. The California Verbal Learning Test (CVLT)–Second Edition[17] was used to measure declarative memory, which is sensitive to both aging and stress.[18] This is a word-list task in which 16 words are orally presented, and participants are instructed to recall them in any order, and to remember as many as they can. Immediate recall, short delay and 30-minute long-delay recall trials are administered. The CVLT has been widely used to examine memory in older adults.[19]

Executive Function. Trail Making Test A and B (TMT)[20] was used to evaluate frontal-dependent abilities including information processing speed, visual scanning ability, integration of visual and motor functions, mental flexibility, and set shifting. TMT-A requires participants to connect 25 consecutively numbered circles using straight lines. TMT-B requires subjects to connect consecutive numbers and letters, alternating between the 2 sequences (ie, 1-A-2-B-3-C). TMT-B is a timed task and is sensitive to age-related decline in executive functioning.[21]

The Controlled Oral Word Association Task (COWAT)[22] was used to measure verbal fluency, another frontal-dependent ability. It has been found to be a sensitive indicator of executive dysfunction. Participants are asked to verbally generate as many words as they can think of when prompted with a letter of the alphabet (F, A, and S) and a category (animals). This measure is sensitive to age-related decline in verbal fluency.[23]

Psychological Measures

Mindfulness. The Mindful Attention Awareness Scale (MAAS)[24] was used as a dispositional measure of mindfulness. It has been used previously to measure mindfulness in older adults and has a Cronbœch's alpha level of .87 among the general adult population in the United States.[25]

Depression. The Geriatric Depression Scale (GDS)[26] was used to measure depressive symptoms. It has demonstrated good capacity for discriminating between depressed and nondepressed elderly people.[27]

Quality of Life. The Quality of Life Scale (QOLS)[28] measures satisfaction with needs met. It contains 16 items representing 6 domains of quality of life: physical and material well-being, relationships with other people, social and civic activities, personal development, and independence. Cronbœch's coefficient has been documented at .87 for the general adult population.[29]

Stress Profile. The Stress Assessment Inventory (StressScan)[30] is a comprehensive 123-item validated instrument for the assessment of stress and health risk. StressScan is composed of the following subscales: Stress, Global Health Habits (Exercise, Nutrition/Eating, Rest/Relaxation), Social Support Network, Type A Behavior, Cognitive Hardiness, Coping (Problem-Focused, Threat Minimization/Avoidance, Negative and Positive Internalizing Thoughts), and Response Distortion. StressScan has been used in older adult populations[31] and demonstrates good validity and reliability, with internal consistency of subscales ranging from .69 to .93.[32]

Perceived Stress. The Perceived Stress Scale (PSS)[33] measures the degree to which situations in one's life are appraised as stressful. The scale includes items designed to measure how often individuals find

their lives unpredictable, uncontrollable, and overloaded during the last month. Internal consistency is good (a = .85), and the stability of the test–retest coefficients ranges from .75 to .86.[33] This scale has been used among older adult populations[34] and is used in the current study to assess the mediating role of perceived stress in the relationship between mindfulness and cognitive outcome.

Statistical Analyses

Independent multivariate regression analyses were conducted to test study hypotheses. For cognitive outcomes, a priori covariates included body mass index (BMI), presence of hypertension, age, education, and sex; all these variables are reported to play a mediating role in cognitive function.[35-37] For psychological outcomes, a priori covariates included education, age, and sex. Independent analyses were conducted for declarative memory, executive function, and psychological well-being. In addition, the association between trait mindfulness and subscales on StressScan were further evaluated using multiple regression analysis, controlling for education, age and sex. Finally, the mediating role of stress in the relationship between trait mindfulness and cognitive outcomes was analyzed using Baron and Kenny's[38] approach. Three regression analyses were conducted to determine (*a*) the total effect of trait mindfulness on cognitive outcome, (*b*) the association between trait mindfulness and perceived stress (measured by PSS), and (*c*) the association between the perceived stress and cognitive outcome after adjusting for trait mindfulness.

Analyses were conducted using STATA (version 10, StataCorp, College Station, TX). Results were considered significant at $P < .05$.

Results

Participant Characteristics

The sample consisted of 73 nondemented men and women (75% women) with a mean age of 69.15 years (SD = 4.55). Participants had an average of 16.12 years (SD = 3.59) of education and the mean MMSE score was 28.79 (SD = 1.45). Eighty-six percent of the sample was Caucasian, 34% of the sample reported having controlled hypertension, and the average BMI was 25.46 kg/m^2 (SD = 3.71).

The Association Between Trait Mindfulness and Cognitive Function

Controlling for BMI, hypertension status, age, education, and sex, multivariate regression analyses showed that mindfulness is significantly associated with executive function measures associated with set shifting (TMT-B: $\beta = -13.19$, $P = .03$). While results approached significance for attention (TMT-A: $\beta = -3.61$, $P = .08$) and cost of shifting ((TMT-A)–(TMT-B): $\beta = -9.58$, $P = .08$), trait mindfulness was not associated with verbal fluency ($P = .11$). Furthermore, multivariate regression did not detect a significant association between trait mindfulness and declarative memory (all Ps > .05; Table 1). Variance in declarative memory was largely determined by sex, with females performing better than males on all subtests of the CVLT (all Ps < .05).

Table 1. Association Between Trait Mindfulness and Cognitive Function.[a]

Cognitive Outcome	Coefficient	95% Confidence Interval	*P* Value
Executive function			
TMT-A	−3.61	−7.81, 0.59	.09
TMT-B	−13.19	−25.22, −1.15	.03
TMT-AB	−9.58	−20.45, 1.29	.08
Verbal fluency	3.08	−0.73, 6.88	.11
Declarative memory			
CVLT–immediate	2.35	−1.65, 6.35	.24
CVLT–short delay	0.69	−0.55, 1.93	.27
CVLT–long delay	0.92	−0.28, 2.12	.13

Abbreviations: CVLT, California Verbal Learning Test; TMT, Trail Making Test.
[a]Mutlivariate regression analyses controlling for age, education, sex, hypertension, and body mass index.

Table 2. Association Between Trail Mindfulness and Psychological Well-Being.[a]

Psychological Outcome	Coefficient	95% Confidence Interval	*P* Value
Depressive symptoms	−3.70	−5.61, −1.96	<.001
Quality of life	6.29	1.97, 10.61	.005
Stress profile	47.04	23.61, 70.46	<.001
Stress Assessment Inventory subcomponents			
Stress	−4.48	−7.70, −1.26	.007
Psychological well-being	6.07	2.68, 9.46	.001
Problem-focused coping	4.03	−0.54, 8.61	.08
Threat minimization	4.13	0.29, 7.96	.03
Intrusive negative thoughts	−6.00	−9.58, −2.43	.001
Intrusive positive thoughts	4.74	1.39, 8.08	.006
Cognitive hardiness	5.06	1.93, 8.19	.002
Type A behavior	−3.38	−7.04, 0.28	.07
Social support network	2.85	−2.27, 7.96	.27
Exercise	−0.26	−3.74, 3.21	.88
Rest/relaxation	1.63	−1.22, 4.48	.26
Eating/nutrition	5.51	2.26, 8.76	.001

[a]Multivariate regression analyses controlling for age, sex, education, and response bias.

The Association Between Trait Mindfulness and Psychological Well-Being

Controlling for education, age, and sex, multivariate regression analyses showed that trait mindfulness was significantly associated with self-reported depressive symptoms, quality of life, and the stress profile as measured by the StressScan. In line with the stated hypotheses, higher trait mindfulness was associated with lower depressive symptoms ($\beta = -3.79$, $P < .001$), greater quality of life ($\beta = 6.29$, $P = .005$) and a more positive stress profile ($\beta = 47.03$, $P < .001$; Table 2).

To further investigate the association between trait mindfulness and subscales of the StressScan, multivariate analyses were conducted, incorporating each subscale in a multivariate model, controlling for scale response bias. Analyses showed that trait mindfulness was significantly associated with reported Stress ($\beta = -4.48$, $P = .007$), Psychological

Well-Being ($\beta = 6.07$, $P = .001$), Threat Minimization/Avoidance ($\beta = 4.13$, $P = .03$), Intrusive Negative Thoughts ($\beta = -6.0$, $P = .001$), Intrusive Positive Thoughts ($\beta = 4.74$, $P = .006$), Cognitive Hardiness ($\beta = 5.06$, $P = .002$), and Eating/Nutrition ($\beta = 5.51$, $P = .001$). Trait mindfulness was not statistically associated with Problem-Focused Coping, Type-A Behavior, Social Support Network, Exercise, or Rest/Relaxation (all Ps > .05; Table 2).

Mediating Role of Perceived Stress in the Relationship Between Trait Mindfulness and Cognitive Outcome

To evaluate the mediating role of perceived stress (PSS) in the relationship between trait mindfulness and executive functioning (TMT-B), Baron and Kenny's[38] approach was used as described above. Analyses showed that perceived stress significantly mediates the effect of trait mindfulness on TMT-B. Specifically, introducing perceived stress into the model decreased the trait mindfulness coefficient from −13.19 (95% CI = −25.22 to −1.16) to −8.23 (95% CI = −21.23 to 4.77), no longer significantly explaining variance in TMT-B. In calculating the proportion due to indirect effects, approximately 23% of the effect of trait mindfulness on TMT-B was explained by perceived stress.

Discussion

With enhanced recognition of the detrimental effects that stress can have on physical and mental health, the cultivation of mindfulness has received increasing attention over the past 2 decades. Programs including mindfulness-based techniques have been incorporated into treatment programs for stress-related disorders, including depression, anxiety, and posttraumatic stress disorder.[11] It is proposed that the cultivation of mindfulness decreases stress-related symptoms by recontextualizing and reframing situations that may be perceived as stressful. While the majority of studies evaluating the effects of mindfulness have mostly concentrated on patient populations or individuals reporting heightened levels of distress, few studies have focused on healthy populations, including older adults. The present study sought to elucidate the association between trait mindfulness and cognitive and psychological health in nondemented community-dwelling older adults.

In support of the present hypothesis and aligning with previous literature, trait mindfulness was significantly associated with psychological well-being. Increased trait mindfulness was associated with lower depression scores and higher self-reported quality of life. Furthermore, increase in trait mindfulness was associated with a more favorable stress profile, assessed by a comprehensive questionnaire that measures stress and health risk behaviors. In particular, increased trait mindfulness was associated with decreased stress, enhanced psychological well-being and cognitive hardiness, and stress-reducing behaviors, including healthy eating, increased threat minimization and positive intrusive thinking, and decreased negative intrusive thinking. Trait mindfulness was not associated with social support network and exercise, which are both notable health-related behaviors associated with cognitive health and longevity.[39] One potential explanation is that mindfulness is more likely to be associated with behaviors that are more closely related to the cultivation of mindfulness, including decreased negative thinking, increased positive thinking and mindful eating.

In assessing the association between trait mindfulness and cognitive function, only executive function was found to significantly associate with mindfulness. In particular, set shifting significantly improved with increases in trait mindfulness. The absence of a relationship with declarative memory is not completely surprising given that the cognitive mechanisms involved in mindfulness are hypothesized to be sustained attention (to maintain awareness of current experience), attention switching (to bring attention back to the present moment when it wanders), attentional inhibition (to avoid cognitive rumination) and nondirected attention (to enhance awareness of present experience, without assumptions or expectations).[40] This research further corresponds with previous randomized waitlist-controlled trials assessing the effect of mindfulness training on cognitive function.[41,42] In a recent review of mindfulness training among participants ranging in age from 18 to 75 years old, Chiesa et al[43] concluded that mindfulness may significantly enhance several measures of cognition and that executive function in particular deserves further investigation given that the substantial psychological benefits following mindfulness training are thought to depend, at least partly, on executive function.[44]

While studies have reported a cognitive enhancing effect following the cultivation of mindfulness, no research to date has evaluated the underlying mechanism of this relationship.[45] Mediation analyses in the current study showed that the association between trait mindfulness and executive function was significantly mediated by perceived stress. This association coincides with the stress literature that has shown a robust association between perceived stress and poor cognitive function in older adults.[9] Thus, the cultivation of mindfulness, which may be considered a potent individual difference factor, may decrease perceived stress and the negative physiological reactions that ensue, which in turn enhances or maintains cognitive function. However, further investigation is required.

The current study supports the importance of cultivating mindfulness in late life in order to maintain cognitive function, especially executive function, which is vital for independent living and enhanced quality of life.[2] Future research by this group will determine whether trait mindfulness can be manipulated through mindfulness-based training in healthy older adults, using a standardized mindfulness-based stress reduction program and an active control condition.

Acknowledgments

Special thanks to Dr Kenneth Nowak for support and guidance in using the ScanStress and to Jennifer Boone and Prudence Leung for their dedicated assistance on the project.

Authors' Note

Results from this study have been presented in poster form at the 2014 Cognitive Aging Conference and the 2014 American Psychiatric Association meeting.

Author Contributions

Dr A. J. Fiocco was responsible for conceptualization and design of the study. Both Dr Fiocco and Sasha Mallya contributed to conducting the study, statistical analyses, and writing the article.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by the Ryerson Health Research Fund. Sasha Mallya is a graduate student funded by the Ontario Ministry of Training, Colleges and Universities.

Ethical Approval

The study protocol was approved by the Ryerson Research Ethics Board.

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