



Published in final edited form as:

J Adult Dev. 2009 December ; 16(4): 199–208. doi:10.1007/s10804-009-9066-y.

Engaged Lifestyle, Personality, and Mental Status Among Centenarians

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Abstract

This study assessed engaged lifestyle activities (e.g., volunteering, traveling, and public speaking) for centenarians of the Georgia Centenarian Study. A total of 285 centenarians and near-centenarians (i.e., 98 years and older) and their proxy informants participated in this study. The Mini-Mental Status Examination (MMSE) was assessed for all centenarians, and proxy informants reported on lifestyle activities and personality traits of the centenarians. Results suggested that participants who had volunteered, traveled, and those who had given public talks and balanced their checkbooks were more likely to show relatively high mental status scores (i.e., MMSE > 17). Personality traits were found to be moderators in the relationship between engaged lifestyle and mental status: Participants with high levels of Emotional Stability, Extraversion, Openness, and Conscientiousness and with high levels of engaged lifestyle were more likely to show relatively high mental status scores (i.e., MMSE > 17), whereas participants with low levels of Emotional Stability, Extraversion, Openness, Agreeableness, and Conscientiousness and with low levels of engaged lifestyle were more likely to show relatively low mental status scores (i.e., MMSE < 18). The results suggest that engaged lifestyle, particularly in combination with personality traits, plays an important role in the level of cognitive functioning among oldest old adults.

Keywords

Activities; Centenarians; MMSE; Personality; Lifestyle

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“This study is conducted for the Georgia Centenarian Study.”

Additional authors for the “Georgia Centenarian Study” include S. M. Jazwinski, R. C. Green, M. Gearing, W. R. Markesbery, J. L. Woodard, M. A. Johnson, J. S. Tenover, W. L. Rodgers, D. B. Hausman, C. Rott, A. Davey, and J. Arnold.

Introduction

There is no doubt that reaching 100 years of age signifies an extraordinary accomplishment. Even though the 100th birthday is an extraordinary event for individuals and their families, some have questioned the quality of life in very old age (Andersen-Ranberg et al. 2001; Baltes and Baltes 1990). We have pointed out four critical areas that centenarians have to come to terms with in very late life: physical health, functional health, mental health, and economic dependency (Martin et al. 2006). For these four areas of functioning, we wonder why some centenarians continue to do relatively well, whereas others seem to be more functionally impaired. The purpose of this article was to assess the role of a past engaged lifestyle in predicting mental status among centenarians, and to test whether personality traits serve as moderators in the past engaged lifestyle–mental status relationship. In the following sections, we review evidence concerning the mental status of centenarians, the role of engaged lifestyle over the life span, and personality as an important individual difference variable.

Mental Status in Very Late Life

There is conflicting evidence about the prevalence rates of cognitive impairment among the oldest old. Ritchie and Kildea (1995) in their meta-analysis reported dementia prevalence rates of about 40% for older adults at age 95. Jeune and Andersen-Ranberg (2000), Baucó et al. (1998), and Jorm et al. (1987), on the other hand, noted a prevalence rate as high as 62% by the age of 95. Recent research on centenarians and mental status in the Heidelberg Centenarian Study found that about half of centenarians showed moderate to severe cognitive impairment but that one quarter was found to be cognitively intact (Kliegel et al. 2004). Results of the Heidelberg study further showed that cognitive decline was slightly but significantly accelerated in the last 6 months prior to death. Finally, a recent Japanese study reported that 24.3% of their centenarian sample had no dementia, 13.8% were classified as showing probably no dementia, and 61.8% were classified as mildly to severely demented. The authors also reported a significant main effect for gender indicating that men were generally more cognitively intact than women (Gondo et al. 2006).

The Role of Engaged Lifestyle

Whether older adults decline in cognitive performance may have different reasons, including genetic disposition, educational experience, and cognitive activity patterns. “The disuse” perspective on cognitive aging (Hultsch et al. 1999; Salthouse 1991) characterizes the impact of changes in lifelong activity patterns resulting in disuse and consequently deterioration of cognitive skills. If disuse of cognitive skills exacerbates age-related cognitive decline, then deliberate practice of such skills would at least result in stable performance by maintenance or enhancement of the original skills (Ericsson and Charness 1994).

Other researchers have proposed that through a variety of potential compensatory mechanisms cognitive skills could improve (Dixon and Backman 1995). In addition, further extrapolation would lead to the possibility that practice by individuals of “rusty” skills would lead to a reversal in age-related declines (Schaie and Willis 1986). Baltes and Baltes (1990) demonstrated that older adults possess considerable reserve capacity that permits them to benefit from exposure to performance-enhancing environments. Several studies have also shown that older adults have a large amount of plasticity in their performance, but that their reserve capacity does decline with age (Schaie and Willis 1986; Verhaeghen 1993).

Whether specific past positive achievements could slow down or attenuate cognitive decline in late life was examined by Pushkar et al. (1995). They reported a significant but small effect of engaged lifestyle on the maintenance of verbal intellectual function in late life. Another study found that factors such as education and maintenance of cognitive stimulation may slow the rate of cognitive decline (Wilson et al. 2002). Finally, Ghisletta et al. (2006) recently reported that activity engagement lessened the decline in perceived speed, but not in verbal fluency or performance.

Hultsch et al. (1999) posed the question, “Does stimulation provided by typical everyday activities facilitate the maintenance and improvement of general cognitive skills in a manner that is analogous to exposure to cognitive training?” (pp. 245–246). Hultsch et al.'s (1999) study provides evidence that specific engaging activities were related to working memory and other cognitive measures. Individuals who participated in intellectually challenging activities were less likely to show cognitive decline, and those individuals who maintained their participation in such activities were also less likely to show cognitive change over time. As Hultsch et al. pointed out, their results could alternatively be explained in that high-ability adults lead intellectually active lives. Kliegel et al. (2004) also noted that lifelong intellectual activities were important predictors of cognitive impairment in centenarians.

The approach of this study is consistent with the environmental complexity hypothesis (Schooler 1987) stating that complex environments characterized by diverse stimuli allow individuals who engage in activities that make significant demands on their cognitive skills show greater maintenance or improvement of their abilities than individuals who are exposed to less complex environments with more minimal cognitive demands (Hultsch et al. 1999; Schooler 1987).

Personality as Individual Difference Characteristics

The evidence reviewed suggests that active, engaged lifestyle is related to the maintenance of cognitive performance in older adults. However, the relationship between lifestyle and cognitive performance may also be influenced by individual difference characteristics. Personality traits may be considered as individual difference variables that moderate between active lifestyle and cognitive performance (Hultsch et al. 1999).

Higher cognitive functioning is often associated with Openness to Experience (Ackerman and Heggestad 1997; Austin et al. 2002), Conscientiousness (Duchek et al. 2007; Moutafi et al. 2004), and Extraversion (Ackerman and Heggestad 1997; Moutafi et al. 2005), but negatively correlated with Neuroticism (Ackerman and Heggestad 1997; Duchek et al. 2007; Gow et al. 2005). Wilson et al. (2005) noted that higher levels of Neuroticism were associated with an increased risk of Alzheimer's disease incidence. In their prospective study, the odds of developing Alzheimer's disease were more than doubled in individuals with high scores in Neuroticism when compared to those with relatively low scores, even though the effect was stronger in Whites compared to African Americans. Chamorro-Premuzic and Furnham (2004) also noted that an increasing number of studies acknowledge the interface of personality and cognition. Their model includes an interaction of personality with measures of intelligence.

One way to assess individual differences in engaged lifestyle patterns is by using a typology approach. The approach taken is the “type as distinctive form” perspective (Block and Ozer 1982) based on the notion that a discrete structure of individual differences exists underlying an observed variation on quantitative measures. As Meehl (1992) aptly pointed out, the question whether a particular phenomenon is viewed as dimensional, taxonic, or some mix thereof is largely an empirical question. Taxometric methods include techniques such as

cluster analysis, mixture models, latent class analyses, and configural frequency analysis (CFA) (MacCallum et al. 2002).

The Present Study

The purpose of the current study was to assess the relationship between specific engagement tasks and cognitive mental status among centenarians. A secondary goal was to assess the role of the five personality traits Extraversion, Neuroticism, Conscientiousness, Agreeableness, and Openness to Experience in the relationship between engaged lifestyle and mental status. Based on the literature, we predicted that cognitive engagement tasks would be positively associated with mental status and that Extra-version, Emotional Stability, Conscientiousness, Agreeableness, and Openness to Experience would enhance the association of cognitive engagement with mental status functioning, whereas Introversion, Neuroticism, and low levels of Conscientiousness, Agreeableness, and Openness to Experience would diminish the association of engaged lifestyle with mental status functioning.

Method

Participants and Procedure

This study used population-based data from the second Georgia Centenarian Study (Poon et al. 2007), including a sample of centenarians and near-centenarians (98 year and older) from northern Georgia. The overall purpose of the study was to investigate factors related to survival and optimal functioning of centenarians.

A total of 285 centenarians participated in the study. The average age was $M = 100.33$ years. As would be expected, 82.1% older adults in this sample were women ($n = 234$) and the majority (77.5%) was Caucasian. With regard to marital status, 85.9% were widowed. The average Mini-Mental Status Examination (MMSE) score for the centenarians was $M = 16.92$. A total of 48.2% were severely cognitively impaired ($MMSE < 18$), whereas 32.4% showed little or no cognitive impairment ($MMSE > 17$). A summary of demographic characteristics in this study is presented in Table 1.

The names of the participants were obtained from the voter registration rolls from the State of Georgia and from calls to a random subset of nursing home facilities. The sampling frame included 44 counties in Northeast Georgia within a 2-h drive from Athens. Participants were first recruited by telephone and mail, and subsequent face-to-face interviews were conducted.

The Georgia Centenarian Study collected data from centenarians and proxy informants. Informants included 240 proxies who provided additional information on our centenarian participants. The majority of the proxies were their adult children (61.1%). Additional proxies included nieces and nephews (13.9%), granddaughters (9.9%), and miscellaneous informants, such as spouses, siblings, or friends (15.1%).

Measures

Engaged Lifestyle—Past engaged lifestyle activities were defined by educational attainment and by a series of cognitive engagement tasks (Hultsch et al. 1999), and were assessed from surveys with proxy informants. Education was a dichotomized variable defined as relatively low level of education (up to high school completion) or relatively high level of education (post-high school education). Questions pertaining to cognitive engagement tasks included, “Did he/she ever learn a foreign language,” “Did he/she ever go back to school for more education,” “Did he/she ever do volunteer work for an organization

such as a hospital, church, school, or political party,” “Did he/she ever travel within his/her country,” “Did he/she ever travel to a foreign country,” “Did he/she typically prepare his/her own taxes,” “Did he/she ever give a public talk or lecture (to a club, service organization, etc.),” and “Did he/she typically balance his/her checkbook (take care of finances).” Participants answered “yes” or “no” to these questions. These items were used separately in the first part of the analysis and combined to a summary score in the second part. The eight cognitive engagement items had an internal consistency of $\alpha = .68$. Because it is unclear to what extent centenarians and proxies agree on the occurrence of lifestyle tasks and personality, inter-rater agreement (self-ratings and proxy ratings) were computed for those centenarians who were able to report about their activities and personality. Inter-rater agreement of whether a task had occurred or not ranged from 70.4% for “going back to school” to 96.0% for “traveling within his/her country.” Average agreement for all items was 81.6%.

Personality—The NEO Personality Inventory (NEO PI-R) was used to obtain personality assessments by caregiver proxies (Costa and McCrae 1992). This measure includes 240 items. We used this measure with proxies in order to assess centenarians’ personalities. The NEO PI-R uses a 5-point scale that ranges from SD = strongly disagree ($= -2$), D = disagree ($= -1$), N = neutral ($= 0$), A = agree ($= 1$), and SA = strongly agree ($= 2$). Higher scores indicate higher levels of the personality trait assessed. Some of the questions asked were “she/he really likes most people she/he meets” (Extraversion), “sometimes she/he feels completely worthless” (Neuroticism), and “she/he is known for his/her prudence and common sense” (Conscientiousness). In this study, the reliability for Neuroticism was $\alpha = .85$, .77 for Extraversion, .69 for Openness, .88 for Agreeableness, and .90 for Conscientiousness. For Neuroticism, the opposite end of the scale (i.e., Emotional Stability) is used for ease of interpretation.

Again, it is unclear to what extent centenarian self-ratings corresponded with proxy ratings for personality. Other studies have reported that personality rating agreements between older adults and proxy informants are quite good (Duchek et al. 2007; Rankin et al. 2005). In this study, centenarians only responded to a few traits and facets of the NEO. Paired *t*-tests were therefore computed for Neuroticism, Extraversion, Ideas (a facet of Openness), Competence (a facet of Conscientiousness), and Trust (a facet of Agreeableness). No mean differences were obtained for Extraversion, $t(103) = 0.15$, $p > .05$ and Ideas, $t(82) = 0.82$, $p > .05$. Significant differences were obtained for Neuroticism, $t(111) = 4.26$, $p < .001$, Competence, $t(91) = 4.50$, $p < .001$, and Trust, $t(104) = 5.23$, $p < .001$, indicating that centenarians rated themselves lower in Neuroticism, but higher in Competence and Trust when compared to their proxies.

Mental Status—Cognitive performance was assessed with the MMSE (Folstein et al. 1975). A high score on the MMSE indicates higher cognitive performance. There is continued debate about the appropriate cutoff score for cognitive impairment when using the MMSE. After their extensive review of the literature, Tombaugh and McIntyre (1992) suggested that a score < 18 be used for severe cognitive impairment, whereas a score ≥ 18 would indicate mild cognitive impairment or no cognitive impairment. The authors point out that lower educational levels and ethnicity may yield lower scores than would be expected in highly educated or majority populations. In very old populations, vision impairment may also account for lower MMSE scores (Holtsberg et al. 1995). For the purposes of this study, the MMSE was dichotomized into high and low status by dividing the sample with a score of ≥ 18 in the relatively high mental status category and a score of ≤ 17 in the relatively low mental status category.

Design and Analyses

The general analytic strategy of this article was to assess underlying categories (“types”) of centenarians that fall in relatively high or low categories of mental status functioning. CFA is used in this study. CFA is a multivariate statistical method that identifies discrete and uniquely constituted groups of individuals (von Eye 1990) by comparing observed to expected frequencies in a cross tabulation. Significant differences suggest the presence of groups (configurations) that include either more or less individuals than would be expected under an assumption of complete independence. The significant configurations are referred to as types and antitypes (von Eye 1990). Any configuration with a probability value $<.05$ could be considered a significant type or antitype. Because each configuration is tested for significance, Bonferroni adjustments for number of tests are applied. The program also computes relative risk values. The relative risk of a configuration indicates the relative frequency of the occurrence of a configuration, given the expectation from the base model. A score of $RR = 2$, for example, suggests that twice as many cases were observed as expected from the base model (von Eye 2000).

CFAs were computed using education, the cognitive engagement variables, personality, and mental status as cross-configuration variables. First, education and each cognitive engagement variable were related to mental status alone, and then the summary variable of cognitive engagement was related to each personality trait and mental status. For the configural frequency analyses, personality traits were dichotomized at the median level. Scores for all scales could range from -96 to 96 with zero as the scale midpoint. For Neuroticism, the median split occurred at -26 , for Extraversion at 9 , for Openness at -4 , for Agreeableness at 29 , and for Conscientiousness at 30 .

Results

General descriptive results separated by mental status are provided in Table 2. In general, traveling in the United States and balancing one's checkbook were the most frequent engaged lifestyle activities used by centenarians, whereas preparing a tax return and learning a foreign language were the least frequent lifestyle activities. Significant differences were obtained for all engaged lifestyle tasks favoring the higher MMSE group. For example, 63.2% of the high MMSE group but only 32.7% of the low MMSE group had ever visited a foreign country. Similarly, 84.3% of the high MMSE group but only 56.5% of the low MMSE group had ever volunteered.

Centenarians had low scores on Neuroticism and Openness but relatively high scores on Extraversion, Agreeableness, and Conscientiousness. Personality differences by mental status were obtained for Neuroticism, Extraversion, and Openness. Centenarians with high levels of cognitive functioning were less likely to be neurotic, but more extraverted, open to experience, and conscientious. No differences were obtained for Agreeableness.

Bivariate correlations for high and low functioning centenarians are summarized in Table 3. For centenarians with low cognitive functioning scores, engaged lifestyle was significantly related to Extraversion, Conscientiousness, and cognitive functioning, indicating that centenarians with high levels of engaged lifestyle were more likely to be extraverted, conscientious, and cognitively functioning. Conscientiousness was also positively related to the engaged lifestyle for high functioning centenarians, but Extraversion and cognitive functioning were not related to the engaged lifestyle. In contrast to centenarians with low scores in cognitive functioning, highly functioning centenarians showed a significant correlation between Openness and engaged lifestyle.

The results of the configural frequency analyses are summarized in Table 4. Our hypothesis suggested that more participants should be found in the High Engagement and High Mental Status groups as well as in the Low Engagement in Low Mental Status Group. These groups should show up as significant types. In contrast, few participants would be expected in the Low Engagement High Mental Status and in the High Engagement–Low Mental Status group (antitypes).

Our hypotheses were partially supported. More participants fell in the group of High Engagement–High Mental Status (type) for the following activities: Volunteer work, traveling within the United States, foreign travel, giving a public talk, and balancing one's checkbook. The opposite configuration (low engagement, low mental status) was obtained for education, learning a foreign language, returning to school for more education, foreign travel, and preparing a tax return.

Unexpected types were obtained for learning a foreign language (low engagement and high mental status), returning to school (low engagement and high mental status), traveling within the United States (high engagement–low mental status), preparing a tax return (low engagement, high mental status), and balancing a checkbook (high engagement–low mental status). These results are perhaps best explained by the relatively low number of participants who had ever learned a foreign language, returned to school, and who had ever prepared a tax return, whereas an extremely large number of participants had traveled within the United States and balanced a checkbook.

Finally, configural frequencies analyses were computed by including personality traits. Tables 5, 6, 7, 8, and 9 depict frequencies for eight configurations relative to specific personality traits. For all personality traits, low trait levels combined with low levels of engaged lifestyle, and low levels of mental status were obtained more often than would be expected by chance. Conversely, the configuration of high engaged lifestyle, high personality trait (except for Agreeableness), and high mental status also occurred more often than would be expected by chance.

Discussion

The purpose of this study was to assess the relationship between engaged lifestyles and mental status in very late life. We hypothesized that a number of lifetime activities (e.g., traveling, volunteering, or balancing a checkbook) would be protective markers of relatively high mental status. Three major findings emerged from our analyses: descriptive analyses showed that traveling, volunteering, and balancing a checkbook were frequent activities, whereas learning a foreign language and preparing a tax return were relatively infrequent activities. Second, a number of activities were protective markers of late life mental status. Third, personality traits moderated the effect of activities on mental status: Emotional Stability, Extraversion, Openness, and Conscientiousness each in combination with high activity levels were associated with higher mental status scores.

It comes as no surprise that some activities are more likely to be reported than others. Traveling within the United States, for example, requires fewer resources than traveling abroad, and volunteer opportunities exist in most communities of the United States. Foreign language learning, on the other side, was not particularly frequent when centenarians attended school more than 80 years ago. If only a small number of participants report an activity, then it becomes likely that an “antitype” configuration is obtained.

The analysis of statistical configurations, however, did demonstrate that for almost all individual activities high engaged activity was associated with high mental status: for volunteering, traveling, public speaking, and balancing a checkbook, a larger number of

participants was obtained in the higher mental status group than would be expected by chance. It is important to note, however, that participants who had not engaged in these activities were not more likely to show low mental status scores, except for foreign travel. Not a single pattern of high activity–high mental status along with low activity–low mental status emerged, although for public speaking a statistical trend for both configurations was obtained.

The results confirm earlier research indicating that engaged activities are important. Pushkar et al. (1995), for example, noted that past positive achievements could slow down or attenuate cognitive decline in late life. Hultsch et al. (1999) also noted that intellectually engaging activities served to buffer individuals against potential decline. Another centenarian study by Kliegel et al. (2004) had also reported that lifelong intellectual activities were important predictors of cognitive functioning in very late life. The results partially confirm the “disuse perspective” of cognitive aging (Hultsch et al. 1999), because the lack of engagement was not as strongly and consistently associated with lower cognitive functioning scores, but it is possible that lifetime engagement in specific activities builds “reserve capacities” (Baltes and Baltes 1990) that serve as protective factors in very late life.

The third major finding of this study relates to the role that personality might play as a moderator in the relationship between engaged lifestyle and mental status. Of the five major personality traits described by the Big-5 typology, low levels of all traits together with low levels of engaged activities were associated with low levels of mental status, whereas high trait levels together with engaged lifestyle activity were associated with high levels of mental status. These results suggest that it is not engaged lifestyle alone that contributes to higher or lower mental status. Rather, the relationship between engaged lifestyle and mental status is dependent on personality traits of participants. Only if centenarians exhibited high levels of emotional stability, extraversion, openness, and conscientiousness was engaged lifestyle associated with higher mental status functioning. The role of personality traits for survivorship has been pointed out in other research (Friedman et al. 1993; Martin et al. 2006).

As is true for all research, this study has a number of limitations. First, participants of this study were only recruited from one geographic area of the United States. Results can therefore not be generalized to other regions of the United States. Second, this study was conducted only with centenarians, a highly selective group of survivors. Results therefore cannot be generalized to other age groups or cohorts. Another limitation is that only a few selected dimensions of engaged lifestyle were part of this study. Surely there are many other activities that may play an important role and that should be investigated in the future. We also focused only on the question whether participants had ever engaged in these activities. To assess the last time or the frequency by which these activities were pursued would also be important to consider. Finally, all assessments (except for mental status) in this study were reported by proxies who may more or less accurately recall the activities of their centenarian family member. Other studies, however, have demonstrated that proxy reports can provide useful information in special populations (Sloane et al. 2005). It should be cautioned, however, that proxy reports can be biased because cognitively functioning centenarians (when compared with their cognitively impaired peers) could remind their close relatives or caregivers of their previous activities. As a result, informants of cognitively intact centenarians (when compared to their cognitively impaired peers) would have that information more readily available when being asked, thereby resulting in reporting of more activities in cognitively fit centenarians (when compared with their cognitively impaired peers).

In spite of these limitations, results of this study confirm that engaging in a number of challenging activities may have a lifelong protective effect on mental status. Furthermore, personality traits in combination with the lack of engaged lifestyle may point to risk factors of mental status in very late life. If these results can be confirmed in others studies, then centenarians may well point to specific pathways of optimal cognitive aging.

Acknowledgments

The Georgia Centenarian Study (Leonard W. Poon, PI) is funded by 1P01-AG17553 from the National Institute on Aging, a collaboration among The University of Georgia, Tulane University, Boston University, University of Kentucky, Emory University, Duke University, Wayne State University, Iowa State University, and University of Michigan. Authors acknowledge the valuable recruitment and data acquisition effort from M. Burgess, K. Grier, E. Jackson, E. McCarthy, K. Shaw, L. Strong, and S. Reynolds, data acquisition team manager; S. Anderson, E. Cassidy, M. Janke, and T. Savla, data management; M. Poon for project fiscal management.

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Table 1

Summary of demographic characteristics

Demographic characteristics	<i>n</i>	%
Gender		
Female	234	82.1
Male	51	17.9
Ethnicity		
White/Caucasian	221	77.5
Black/African American	64	22.5
Education		
0–4 years	12	5.2
5–8 years	55	23.9
Some high school	26	11.3
High school diploma	44	19.1
Trade school or vocational degree	30	13.0
Some college	22	9.6
College Degree	19	8.3
Graduate Degree	22	9.6
Marital status		
Never married	13	4.6
Married	16	5.7
Widowed	243	85.9
Divorced/separated	11	3.9
Cognitive functioning		
Severe impairment (MMSE 0-17)	137	48.2
Mild cognitive impairment (MMSE, 18-22)	55	19.4
No cognitive impairment (MMSE, 23-30)	92	32.4

Table 2

Frequencies and means of engaged lifestyle tasks and personality traits

Lifestyle task	Total	Low MMSE (<18)		High MMSE (>17)		χ^2
		Yes, n	No, n	Yes, n	No, n	
Return to school	225	15	94	35	81	8.76**
Travel U.S.	227	100	10	114	3	4.57*
Balance checkbook	222	79	28	101	14	7.08**
Volunteer work	223	61	47	97	18	20.94***
Foreign travel	227	36	74	74	43	21.15***
Public lecture	219	37	68	70	44	14.98**
Tax return	217	18	88	39	72	9.23**
Foreign language	216	10	91	33	82	11.91***

	M	SD	M	SD	F
Neuroticism	-16.87	19.36	-29.16	21.45	15.65***
Extraversion	5.59	18.50	13.12	19.95	6.63*
Openness to experience	-8.22	13.58	-2.16	16.95	6.22*
Agreeableness	26.26	21.15	28.62	23.54	.50
Conscientiousness	24.72	21.93	32.02	21.96	4.68*

Table 3

Bivariate correlations

	1	2	3	4	5	6	7
1. Engaged lifestyle	1.00	-.13	.10	.24*	.01	.26*	.16
2. Neuroticism	-.06	1.00	-.39**	-.33**	-.54**	-.63**	.05
3. Extraversion	.27*	-.46**	1.00	.48**	.11	.40*	.04
4. Openness to experience	.09	.05	.46**	1.00	.23*	.35**	.13
5. Agreeableness	-.11	-.48**	.23*	.19	1.00	.39**	.06
6. Conscientiousness	.30*	-.57**	.47**	.22	.35**	1.00	.17
7. Cognitive functioning	.29**	.00	.31*	.14	.16	.02	1.00

Note: Values below the diagonal are for low cognitive functioning (MMSE < 18), whereas above the diagonal are for high cognitive functioning (MMSE > 17)

* $p < .05$

** $p < .01$

Table 4

Configural frequency analysis of engaged lifestyle and mental status

Engagement	Configuration	FO	FE	p	Type/antitype	RR
Education	Low–Low	80	57.00	.000	Type	1.40
	Low–High	56	57.00	.475		1.98
Foreign language	High–Low	28	57.00	.000	Antitype	.49
	High–High	64	57.00	.160		1.12
Return to school	Low–Low	91	54.00	.000	Type	1.68
	Low–High	82	54.00	.000	Type	1.52
Volunteer work	High–Low	10	54.00	.000	Antitype	.19
	High–High	33	54.00	.000	Antitype	.61
Travel U.S.	Low–Low	94	56.25	.000	Type	1.67
	Low–High	81	56.25	.000	Type	1.44
Foreign travel	High–Low	15	56.25	.000	Antitype	.27
	High–High	35	56.25	.000	Antitype	.62
Tax return	Low–Low	47	55.75	.100		.84
	Low–High	18	55.75	.000	Antitype	.32
Public talk	High–Low	61	55.75	.230		1.09
	High–High	97	55.75	.000	Type	1.74
Foreign travel	Low–Low	10	56.75	.000	Antitype	.18
	Low–High	3	56.75	.000	Antitype	.05
Tax return	High–Low	100	56.75	.000	Type	1.76
	High–High	114	56.75	.000	Type	2.01
Public talk	Low–Low	74	56.75	.006	Type	1.30
	Low–High	43	56.75	.019		.76
Foreign travel	High–Low	36	56.75	.001	Antitype	.63
	High–High	74	56.75	.006	Type	1.30
Tax return	Low–Low	88	54.25	.000	Type	1.62
	Low–High	72	54.25	.004	Type	1.33
Public talk	High–Low	18	54.25	.000	Antitype	.30
	High–High	39	54.25	.009	Antitype	.72
Foreign travel	Low–Low	68	54.75	.030		1.24

Engagement	Configuration	FO	FE	p	Type/antitype	RR
Balance checkbook	Low-High	44	54.75	.050		.80
	High-Low	37	54.75	.003	Antitype	.68
	High-High	70	54.75	.012	Type	1.28
	Low-Low	28	55.50	.000	Antitype	.51
	Low-High	14	55.50	.000	Antitype	.25
	High-Low	79	55.50	.000	Type	1.42
	High-High	101	55.50	.000	Type	1.82

The first column of each configuration refers to level of engaged life style (yes/no), the second column of each configuration refers to level of mental status (high/low)

Note: FO observed frequencies, FE expected frequencies, RR relative risk

Table 5

Configurations of engaged lifestyle, extraversion, and mental status

Configuration	FO	FE	p	Type/antitype	RR
Low ELS, Low E, Low MS	38	19.63	.013	Type	1.94
Low ELS, Low E, High MS	18	19.63	.000		.92
Low ELS, High E, Low MS	18	19.63	.320		.92
Low ELS, High E, High MS	17	19.63	.000		.87
High ELS, Low E, Low MS	8	19.63	.179	Antitype	.41
High ELS, Low E, High MS	15	19.63	.166		.76
High ELS, High E, Low MS	9	19.63	.036	Antitype	.46
High ELS, High E, High MS	34	19.63	.057	Type	1.73

Bonferroni-adjusted alpha = .0062500

Note: ELS engaged lifestyle, E extraversion, MS mental status, RR relative risk

Table 6

Configurations of engaged lifestyle, emotional stability, and mental status

Configuration	FO	FE	p	Type/antitype	RR
Low ELS, Low ES, Low MS	32	19.13	.002	Type	1.67
Low ELS, Low ES, High MS	14	19.13	.127		.73
Low ELS, High ES, Low MS	18	19.13	.451		.94
Low ELS, High ES, High MS	21	19.13	.358		1.10
High ELS, Low ES, Low MS	11	19.13	.025		.58
High ELS, Low ES, High MS	20	19.13	.451		1.05
High ELS, High ES, Low MS	6	19.13	.000	Antitype	.31
High ELS, High ES, High MS	31	19.13	.004	Type	1.62

Bonferroni-adjusted alpha = .0062500

Note: ELS engaged lifestyle, ES emotional stability, MS mental status, RR relative risk

Table 7

Configurations of engaged lifestyle, agreeableness, and mental status

Configuration	FO	FE	p	Type/antitype	RR
Low ELS, Low A, Low MS	34	19.63	.001	Type	1.73
Low ELS, Low A, High MS	13	19.63	.064		.66
Low ELS, High A, Low MS	19	19.63	.500		.97
Low ELS, High A, High MS	23	19.63	.239		1.17
High ELS, Low A, Low MS	11	19.63	.019		.56
High ELS, Low A, High MS	23	19.63	.239		1.17
High ELS, High A, Low MS	6	19.63	.000	Antitype	.31
High ELS, High A, High MS	28	19.63	.033		1.43

Bonferroni-adjusted alpha = .0062500

Note: ELS engaged lifestyle, A Agreeableness, MS mental status, RR relative risk

Table 8

Configurations of engaged lifestyle, openness, and mental status

Configuration	FO	FE	p	Type/antitype	RR
Low ELS, Low O, Low MS	31	18.25	.002	Type	1.70
Low ELS, Low O, High MS	18	18.25	.537		.99
Low ELS, High O, Low MS	16	18.25	.340		.88
Low ELS, High O, High MS	17	18.25	.437		.93
High ELS, Low O, Low MS	7	18.25	.002	Antitype	.38
High ELS, Low O, High MS	18	18.25	.537		.99
High ELS, High O, Low MS	8	18.25	.004	Antitype	.44
High ELS, High O, High MS	31	18.25	.002	Type	1.70

Bonferroni-adjusted alpha = .0062500

Note: ELS engaged lifestyle, O openness, MS mental status, RR relative risk

Table 9

Configurations of engaged lifestyle, conscientiousness, and mental status

Configuration	FO	FE	p	Type/antitype	RR
Low ELS, Low C, Low MS	33	18.75	.001	Type	1.76
Low ELS, Low C, High MS	18	18.75	.488		.96
Low ELS, High C, Low MS	16	18.75	.297		.85
Low ELS, High C, High MS	15	18.75	.214		.80
High ELS, Low C, Low MS	7	18.75	.001	Antitype	.37
High ELS, Low C, High MS	20	18.75	.415		1.07
High ELS, High C, Low MS	10	18.75	.015		.53
High ELS, High C, High MS	31	18.75	.003	Type	1.65

Bonferroni-adjusted alpha = .0062500

Note: ELS engaged lifestyle, C conscientiousness, MS mental status, RR relative risk