

# An Investigation into the Relationship Between Perceptions of Aging and Cognitive Engagement

James D Cully<sup>1</sup>, Mike Murphy<sup>1\*</sup>

<sup>1</sup>School of Applied Psychology, University College Cork, Ireland

## Corresponding Author

Mike Murphy, School of Applied Psychology, University College Cork, Ireland.

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## Abstract

The stereotype embodiment theory suggests that as we enter older adulthood we internalize our feelings about aging. This study explored the association between perceptions of aging and cognitive engagement, which is associated with a reduced risk of developing Alzheimer's disease; it also examined the relationship between age and perceptions of aging. Participants (154) aged between 50 and 75 with a mean age of 64.77 (SD = 6.85) completed validated questionnaires that measured perceptions of aging, level of cognitive activity, depressive symptoms and demographic items. Confounding variables were controlled for. Data were analyzed using bivariate analyses and hierarchical linear regression. A weak association between age and perceptions of aging was identified. Greater engagement in cognitive activities was predicted by more positive perceptions of aging. Age and sex were also found to be significantly related to level of cognitive engagement, with older people and females having a lifestyle higher in cognitive activities. There are no previous publications examining the association between a person's perception of aging and the level of cognitive pastimes in later life. This study suggests that how one feels about aging may have an important role in maintaining a healthy lifestyle high in cognitive activities in older adulthood.

## Introduction

The average life expectancy worldwide continues to rise and so too does the prevalence of age-related diseases. If the current progression rates of Alzheimer's disease (AD) are sustained its prevalence will quadruple by 2050, leading to 1 in 85 people worldwide suffering from AD [1]. An estimate by Brookmeyer et al. suggests that if the onset of AD were delayed by 1 year there would be almost 9.2 million fewer cases worldwide by 2050. Cognitively stimulating activities are a possible protective factor against the onset of AD [2]. Vemuri et al. report that having a lifestyle high in cognitive activity during middle-age (50-65 years of age) and old-age (65+) provides a person with between 3 and 7 years of protection from the onset of AD compared to similarly aged individuals with a lower level of cognitive activity [3].

Cognitive activities are considered a potential protective factor because they enhance a person's cognitive reserve [4]. The theory of cognitive reserve postulates that as we age individual differences emerge in our ability to withstand pathological damage before exhibiting clinical symptoms of AD [4]. A person with a higher level of cognitive reserve can suffer higher amounts of pathology before being diagnosed with AD [4].

A large body of research has accumulated on the efficacy of cognitively stimulating activities as a means of sustaining and even improving cognitive functioning across the lifespan. Ferreira

et al. found that the frequency of engaging in Sudoku puzzles was significantly associated with grammatical reasoning, spatial working memory and working memory in a group of people aged 18-65 and in a 65+ group [5]. Dartigues et al. report that over the course of a 20-year longitudinal study participants who regularly played board games showed less of a decline in the Mini-Mental State Examination (MMSE) than those who did not play, controlling for confounding variables including age, sex and education [6].

Recent studies that have implemented an intervention to alter a person's level of cognitive activity have yielded results that support the theory that cognitive activity is a viable means of increasing cognitive reserve [7-9].

A variable that may influence the amount of cognitively stimulating activity a person engages in is their self-perception of aging, a self-perception that is formed through the internalization of attitudes towards aging in their environment [10]. Ageism is a negative stereotype that is ubiquitous in modern society, found in birthday cards, television and advertising [11]. Ageism in society is reported more by people in late middle-age than old-aged adults, a finding that guides the selection of the age-group in this study [12]. A longitudinal study by Levy et al. found that people with a negative self-perception of aging when they were approximately 30 years old suffered a decline in memory performance over a 38-year period that was 30.2% greater than that

of people who had a positive perception of aging [13]. Negative perceptions of aging have been tested in short-term experimental studies also, where a significant negative effect was found on memory performance when older participants were primed by negative stereotypes of aging [14].

Levy's Stereotype Embodiment Theory (SET) suggests that older people's lives are affected by perception of aging through multiple intertwined pathways: psychological, behavioral and physiological [10]. People with a perception of aging that is negative begin to internalize this perception of aging as they age [10]. An example of this internalization is a person's locus of control with regard to their health. People with a negative perception of aging are more inclined to believe that they are dependent on external factors with regard to their own health, and thus less likely to engage in behavior that has positive benefits for their health [15]. Cross-sectional research has found that positive self-perceptions of aging are associated with higher levels of physical leisure activities in a sample of people aged 41 - 97 [16]. A longitudinal study on the behavioral pathway of the SETs effect on a person's health found that having a positive perception of aging was associated with high levels of physical activity [17]. Beyer and colleagues speculate that the behavioral pathway from one's self-perception of aging to their health may be a self-fulfilling prophecy; a person with a positive self-perception of aging engages in activities associated with healthy aging and as a result of this engagement aging-related ailments are reduced or avoided, which serves to reinforce the positive perceptions regarding aging.

It is proposed in this study that having a more negative perception of aging is associated with less time spent engaged in cognitive activities. As of yet there are no publications that examine this relationship.

Older adults have in recent research been associated with more positive perceptions of aging than middle-aged adults [18]. This finding was somewhat surprising given that an association was also reported between higher age and increased age-related disease and decline in functioning [18]. A further prediction in this study is that age is positively correlated with positive perceptions of aging.

There are two hypotheses in this study:

- That increased age will be associated with improved perceptions of aging;
- That more positive perceptions of aging will be associated with increased levels of cognitive activities.

Previous research has reported an association between a person's level of cognitive activity and a number of variables, each of which were controlled for in this study. The sex of a participant can have an impact on their level of cognitive activity with females being reported to have higher levels of cognitive activity in their lifestyle [19]. Education has been found to be positively associated with levels of cognitive activity across the lifetime [20]. Depression is associated with levels of engagement in cognitive activity, with high levels of depression associated with lower levels of engagement in cognitive activities [21].

## Method

### Participants

210 people began this study, all of whom were residing either in Ireland, the UK or Australia at the time of participation. Of this 210 there were 56 participants excluded from the final analysis as they had left multiple sections of the survey incomplete. Where no more than two items on the CES-D depression scale were missing, the person-mean score was imputed. For other measures, this approach was used where only one item was missing. The 154 participants included in the analysis (60.3% female) were all aged between 50 and 75 with a mean age of 64.77 (SD = 6.85) and a cross-sectional quantitative survey design. The survey consisted of 92 items.

### Materials

The Cognitive Activity Questionnaire assessed level of cognitive activity (CAQ) [22]. Participants were asked to rate how often they engaged in particular cognitive activities over the past month on a 6-point Likert-style questionnaire (1 = Once a month or never, 6 = Everyday) with lower scores representing someone who is less cognitively active. Vemuri et al. report it to be a 10-item, single factor model with a Cronbach's alpha of .57 [3]. A large scale study among older adults by Geda et al., examining the relationships between cognitive activities in the previous year and cognitive status at time of interview, found that five of the cognitive activity domains assessed – reading books, playing games, craft activities, social activities and computer activities – differentiated between cognitively normal older people and those with Mild Cognitive Impairment [22]. Thus, these five domains were selected for analysis in this study. The mean inter-item correlation of these five items was 0.17 – as the recommended mean inter-item correlation range for scale items is .15-.5, it was felt appropriate to total the scores for these five items, yielding one cognitive activity score – labelled CAQ-5 [23].

The Brief Aging Perceptions Questionnaire was employed to assess how participants felt about aging [24]. This is a 17-item scale, reported by the authors to be a 5 factor scale with responses to each question scored on a 5 point likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) [24]. The five factors are timeline-chronic (PoA.TC - e.g. "I feel my age in everything that I do"), consequences-positive (PoA.cons.pos -e.g. "As I get older I get wiser"), consequences-and-control-negative (PoA.CCN - e.g. "Getting older makes me less independent"), control-positive (PoA.cont.pos – e.g. "The quality of my social life in later years depends on me") and emotional representations (PoA.ER – e.g. "I feel angry when I think about getting older" – where items relate to worry, depression and anger). Cronbach's alpha values for the five subscales in this study ranged from .73 to .93.

Data on age and sex were gathered through appropriate questions. Education was assessed as years spent in formal education. Physical activity was measured by asking participants if they exercise for 30 minutes a day 3 times a week [25].

Symptoms of depression were measured by the Center for Epidemiological Depression Scale (CES-D) [26]. This is a 20 item scale with potential scores ranging from 0 to 60. The scale has been reported as having a high level of internal consistency in

the general population (Cronbach's alpha of .85) [26]. In the present study the scale had a Cronbach's alpha of .83.

### Procedure

The survey was designed using online software. A pilot study was conducted in order to assess the amount of time needed to complete the survey and to check if issues arose. After the completion of the pilot study the survey was distributed through email. A number of non-profit organizations were contacted and agreed to distribute the survey to their members. These groups were all voluntary organizations working with community-dwelling people, and were not related to any sections of the population who required particular assistance. Organizations that work with older adults throughout Ireland, Australia and the UK were approached and those that agreed to participate distributed the questionnaire to their members. A number of forums that are specifically focused on middle- and old-aged adults were utilized as a means of gathering data also.

### Ethics

This study was conducted in accordance with code of ethics of

Psychological Society of Ireland. Ethical approval was obtained from the School of Applied Psychology Ethics Committee, University College Cork.

### Methods of Analysis

Descriptive statistics for all of the variables were computed. Correlations were conducted to assess the relationship between age and the different domains of perceptions of aging. Bivariate analysis was carried out between the cognitive activity score and all of the independent variables in the study. Any of the independent variables that were found to have a significant relationship with the DV were included in the multivariate analysis. Mean-centered interaction variables were computed to test for moderation. No formal test of mediation was carried out as the results did not indicate a requirement.

### Results

Descriptive statistics for both the categorical and continuous variables were first produced. Data for the continuous variables are presented in Table 1.

**Table 1: Means, Standard Deviations and Medians of Continuous Variables**

	Mean	SD	Median
Age	64.77	6.86	65
Education	15.66	5.82	16
PoA.TC	7.60	2.44	8
PoA.cons.pos	12.01	1.94	12
PoA.CCN	12.53	3.44	12
PoA.cont.pos	12.64	2.37	12
PoA.ER	6.91	2.44	7
CES-D	28.60	7.51	26
CAQ-5	17.44	4.60	18

In order to assess hypothesis 1, a correlation was conducted between age and each of the PoA subscales – results can be seen in the correlation matrix presented in Table 3. The only significant correlation was with PoA.cont.pos ( $p=.03$ ), though the correlations for PoA.CCN ( $p=.09$ ) and PoA.cons.pos ( $p=.09$ ) tended to significance; in each of these cases, however, the direction was the opposite of that hypothesized and the effect size was small [27].

The categorical variables exercise (112 = yes, 42 = no), sex (60 = Male, 91 = Female) and country of residence (Ireland = 102, UK = 41 and Australia = 8) were all tested for differences in relation to level of cognitive activity. T-tests and one-way ANOVAs were conducted to investigate if there were significant differences in the CAQ-5 score for the categorical variables. A significant

difference was found between males' and females' ( $t[149]=2.64$ ,  $p=.009$ ), such that females engaged more than males. Sex was thus included in the regression analysis. No significant differences emerged for either exercise ( $t[152]=1.35$ ,  $p=.18$ ) or country of residence ( $F[3,148]=.43$ ,  $p=.73$ ), Pearson correlational analyses were then conducted to assess the uncontrolled relationships between CAQ-5 and each of the continuous independent variables. Results are presented in Table 2. In accordance with hypothesis 2, higher scores on the positive perceptions of aging subscales were related to higher levels of cognitive activity, and higher levels on the negative subscales were associated with lower levels of cognitive activity. Each variable which was significantly correlated with CAQ-5 – age and all PoA subscales- was included in the subsequent multiple regression analysis.

**Table 2: Pearson Correlations of CAQ-5 and Continuous IVs**

IV	CAQ-5	p-value
Age*	.27	.001
Education	.13	.11
PoA.TC*	-.17	.04
PoA.cons.pos*	.21	.009
PoA.CCN*	-.30	<.0005
PoA.cont.pos*	.18	.03
PoA.ER*	-.28	<.0005
CES-D	-.11	.17

\* significant at p<.05

A number of variables were significantly correlated with CAQ-5 scores and were therefore used in the hierarchical regression analysis. The independent variables were entered in two blocks – age and sex in block 1, and the PoA variables in block 2. The correlation matrix is presented in Table 3, and the final regression model is presented in Table 4.

**Table 3: Correlation Matrix for Multiple Regression IVs**

IV	Sex	Age	PoA.TC	PoA.cons.pos	PoA.CCN	PoA.cont.pos	PoA.ER
Sex	1.0	.01	-.17	.17	-.15	.02	.01
Age		1.0	.12	-.14	.14	-.18	-.03
PoA.TC			1.0	-.22	.57	-.13	.44
PoA.cons.pos				1.0	-.33	.34	-.22
PoA.CCN					1.0	-.24	.51
PoA.cont.pos						1.0	-.06
PoA.ER							1.0

**Table 4: Hierarchical Multiple Regression with CAQ-5 as DV**

IV	B	SE	$\beta$	p	Part correlation
Age	.22	.05	.32	<.0005	.31
Sex	1.63	.70	.17	.02	.17
PoA.TC	.07	.17	.04	.67	.03
PoA.cons.pos	.19	.19	.08	.32	.07
PoA.CCN	-.25	.13	-.18	.06	-.14
PoA.cont.pos	.29	.15	.15	.06	.14
PoA.ER	-.32	.17	-.17	.06	-.14

F (7, 141) = 7.19, p<.0005. R<sup>2</sup> = 26.3%

The entry of the first block of IVs yielded a significant model (F[2,146]=9.64, p<.0005), which accounted for 11.7% of the variance in CAQ-5 scores. The addition of the block containing the PoA variables added significantly to the model (F[5,141]=5.6, p<.0005), and added an extra 14.6% to the proportion of variance explained by the model. In the final model both age and sex were significant unique predictors, while three of the PoA subscales – consequences and control negative, control positive, and emotional representations - approached significance (p=.06 for each), each accounting uniquely for 2% of the variance.

In order to assess the potential moderating effects of both age and education on the relationship of PoA to CAQ-5 scores, two further regression analyses were conducted – in each case the first two blocks entered were identical to the regression already described, while five age-PoA interaction terms were entered

as block 3 in the first of the extra regressions, and five education-PoA interaction terms were entered as block 3 in the final regression. In neither case did the interactions add significantly to the model (p=.64, R<sup>2</sup> change = 1.8%; p=.49, R<sup>2</sup> change = 2.4% respectively).

### Discussion

The present study had two hypotheses – that older age would be associated with more positive perceptions of aging, and that more positive perceptions of aging would be associated with greater participation in cognitive activities.

The first hypothesis was not supported by the data. Indeed, a pattern opposite to that hypothesized was identified, with greater age being associated with more negative perceptions of aging in the case of one subscale, and tending to significance in the same

direction in the case of two others, albeit with small effect sizes. As noted in the introduction, the research by Jeste et al. which reported a positive association between ageing and perceptions thereof was somewhat surprising, in light of the fact that aging was also associated with greater disease burden and functional decline [18]. It is worthy of note, however, that Jeste et al.'s sample included a large number of participants who were aged over 80, while the sample in the present study was aged 50-75. It may be that the relationship between age and perceptions of aging is in fact U-shaped, with the reality proving more positive than anticipated. This pattern may be explained with reference to Terror Management Theory [12]. Middle-aged participants and the young-old may have an increased anxiety over aging and its association with decline and death. In order to create an anxiety buffer against this, people may potentially develop negative views against old-age as a means of distancing themselves from it. Further research could help to elucidate the nature of this relationship.

The second hypothesis was supported by the data. In uncontrolled correlational analyses, we found that more positive perceptions of aging were associated with higher reported levels of engagement with cognitive activities which had previously been found to differentiate cognitively normal older people from those with Mild Cognitive Impairment. Furthermore, controlling for the effect of age and sex, the perceptions of aging subscales still contributed significantly to a predictive model of cognitive activity levels, with three of the five dimensions approaching significance in the expected directions. The relationships were not moderated by either age or education level. Having a negative perception of aging has been associated with an external locus of control relative to your health, and so it is possible that people with such perceptions would be less likely to engage in cognitively engaging activities that may sustain cognitive functioning [15]. Likewise, it may be that having a lifestyle that is high in cognitive activities as you age may decrease the negative perceptions associated with the aging process. These findings indicate that a person's perception of aging may have an influence on elements of their lifestyle that impact upon their risk of developing AD. Although the nature of the study does not allow for the determination of causation the results support Levy's SET. Plausible interpretations of this finding are that participants who had higher negative perceptions of aging were either less likely to engage in cognitive activities as a result of the internalization of their psychological appraisal of aging, or their perception of aging had been affected by their lifestyle over time, or both. There is of course the possibility that there is another, as of yet not considered, variable that may further explain the relationship.

Age and sex were also significant contributors to the model, accounting for 11.7% of the variance in cognitive activity levels, with older people and females reporting higher levels of cognitive activity. The latter finding is similar to that of Lachman et al. and warrants further investigation, given that research relating to sex differences in cognitive functioning in old age is mixed in its findings [19, 28, 29]. The former finding seems somewhat contradictory – older participants reported more negative perceptions of aging, but also higher levels of cognitive activity.

However, this may be explicable with reference to the fact that the relationship between age and perceptions of aging was weak, and that the older participants in the study were more likely to be retired and so to have more time to devote to such activities.

### Impact

This study is the first of its kind to highlight the association between a person's perception of aging and the amount of cognitive activities in which they engage. Future research is necessary to develop a more in-depth understanding of the association between perceptions of aging and rate of engagement in cognitive activities, such as studies utilizing specific cognitive activities as a means of potentially improving a person's perception of aging. Perceptions of age may be a necessary factor to be controlled for in future studies looking at levels of cognitive activity and level of cognitive functioning.

### Limitations

Convenience sampling was used to access this specific age group and so it would be incorrect to assume that the sample in this study is representative of that population of people. As the electronic link to the survey was widely distributed across a number of forums and groups, the sample was largely self-selected. A further limitation of this study is its cross-sectional nature. Although there was a significant association found between a person's perceptions of aging and their level of engagement in cognitively activities, it is not possible to ascertain in which direction this causation lies. This limitation is prevalent in all correlational studies, but the significant associations reported are worthy of further attention, in the form of a longitudinal study looking at the same variables. A further limitation is that the measure used to measure regular exercise in this study did not measure individual variability in regards to type or duration of physical exercise; nor did it consider the possibility that lower levels of physical exercise might be related to physical limitations, which in turn could limit participants' capacity to engage in some of the cognitive activities assessed. Future research could address the issue of physical activity in a more detailed way, and in the context of physical limitations, in order to get a clearer sense of this relationship.

In conclusion the main prediction of this study, that there would be a significant association between a person's perception of aging and their level of engagement in cognitively engaging activities was supported by the findings. Further research is necessary to elucidate the nature of this association.

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