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# People's Beliefs and Expectations About How Cognitive Skills Change with Age: Evidence From a U.K.-Wide Aging Survey

*Eleftheria Vaportzis, Ph.D., Alan J. Gow, Ph.D.*

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**Objective:** We conducted a U.K.-wide survey to collect information on people's beliefs, fears, perceptions, and attitudes to cognitive aging. **Methods:** This community-based aging survey included 3,146 adults aged 40 years and over. **Results:** Respondents believed memory might be the earliest cognitive skill to decline (mean: 59.4 years), followed by speed of thinking (mean: 64.9). Those in their 40s were more pessimistic, because they estimated cognitive changes would start up to 15 years earlier than respondents aged over 70. Having a purpose in life, healthy eating, challenging the mind, sleep, and physical activity ranked higher in terms of perceived importance for maintaining or improving cognitive skills. However, less than 50% engaged in any of these activities. Although 91% believed there are things people can do to maintain or improve their cognitive skills, more than 40% were unsure or did not know how to do so. Respondents who strongly agreed that changes in cognitive skills might be a sign of something more serious were significantly more likely to do various activities to benefit their cognitive skills. **Conclusion:** Results suggest that people are less aware of the potential cognitive benefits of certain activities, such as exercise and diet. It is important to build awareness about the benefits of lifestyles and activities for cognitive health. (Am J Geriatr Psychiatry 2018; 26:797-805)

**Key Words:** Aging, cognitive skills, cognitive aging, cognitive decline, older adults, beliefs, attitudes

## Highlights

- This is the first U.K.-wide survey collecting information from adults aged 40 years and over on their beliefs, fears, perceptions, and attitudes to cognitive aging.
- Having a purpose in life, healthy eating, challenging the mind, sleep, and physical activity were perceived as important for maintaining or improving cognitive skills.
- Older respondents expected cognitive skills to begin to decline about 10-15 years later than younger respondents.

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- Most respondents believed it is possible to maintain or improve cognitive skills; however, 41.1% were unsure or did not know how to keep their brain healthy.
- People may not be aware of the benefits of certain activities, such as exercise and diet, on cognitive skills.

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### INTRODUCTION

Provision for the rising number of people living with dementia is a major challenge for public healthcare worldwide. Currently, around 850,000 people are living with dementia in the United Kingdom.<sup>1</sup> However, not everyone develops dementia or experiences cognitive decline, and the risk of cognitive decline can be reduced.<sup>2</sup> For example, although genetic factors are partially responsible for cognitive variability throughout life,<sup>3</sup> research has identified a number of potentially modifiable lifestyle and behavioral factors such as physical activity,<sup>4</sup> diet,<sup>5</sup> and social interaction.<sup>6</sup>

Although maintaining an active and engaged lifestyle is beneficial in terms of cognitive function in later life,<sup>7</sup> there appears to be a discrepancy between what people believe is important to maintain or improve cognitive function and the activities in which they engage. A nationwide U.S. survey of 1,563 adults aged 40 and over sought to understand attitudes toward and behaviors related to cognitive aging and to evaluate the activities that adults engaged in to improve their brain health. The survey found the largest discrepancy in stress management: 96% of respondents considered this important for the maintenance of brain health, but only 43% reported taking action to manage stress.<sup>8</sup> Similarly, more than 96% believed that diet and exercise were important for cognitive health, but only 56% either exercised or followed a healthy diet for that purpose. These results suggest that although people are aware of activities that could potentially maintain or improve their cognitive abilities, far fewer engage in these activities.

After the American Association of Retired Persons (AARP) survey,<sup>8</sup> we conducted "What Keeps You Sharp?", a U.K.-wide survey to gather information from adults aged 40 years and over on their beliefs, fears, perceptions, and attitudes to cognitive aging, including what they believe might affect individual rates of decline. The objectives of this survey were to understand people's beliefs about how cognitive skills change with age, whether actions can be taken to improve or maintain cognitive skills with age, what activities they believe influence cognitive change, whether or not they

engage in these activities, and whether those that considered changes in cognitive skills as a sign of something more serious are more engaged in these activities.

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### METHODS

The survey questions were developed based on the AARP survey<sup>8</sup> and the cognitive aging literature and were improved and verified through consultation with research panel members (e.g., Age UK, Age Scotland, the National Health Service) and experts in cognitive aging. The survey was distributed in hardcopy and via an online survey platform, Qualtrics (<https://www.qualtrics.com/uk/>). To ensure a representative sample, a number of recruitment strategies were used. A market research company, Survey Sampling (Survey Sampling International, London, United Kingdom), distributed our online survey link to eligible participants in their database and collected responses (N = 2,327) until they reached certain quota: approximately 500 responses for people in their 40s, 50s, 60s, and 70s and as many responses as possible for those over 80 years (the oldest group was not well represented in their databases). Those collated online by Survey Sampling represented Scotland (8.5%), England (82.1%), Wales (5.9%), and Northern Ireland (1.8%), broadly consistent with the population distributions across the four nations of the United Kingdom. A small percentage (1.7%) had not disclosed their region.

We also distributed the online survey via various social groups, Age UK and Age Scotland, general practitioners, and our volunteer database. There were no exclusion criteria related to cognitive status, although in terms of perception of their own thinking skills/mental sharpness, 7% of respondents rated these as fair and 1% as poor (15% rated these as excellent, 48% as very good, and 29% as good). We collected 883 online responses and 120 hardcopy responses by these methods. Hardcopy responses were collected face-to-face or by postal mail.

We obtained ethics approval from the School of Social Sciences at Heriot-Watt University. All respondents

provided written informed consent or agreed to consent questions at the start of the online survey. The survey ran between November 2016 and February 2017 and collected responses from a total of 3,330 respondents. Respondents that did not provide their age or did not complete most of the questionnaire were removed, leaving 3,146 respondents to be included in the analyses. The total number of respondents may vary slightly between questions, because we included respondents who missed only a few questions. The number of respondents who completed all questions was 3,024.

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## MEASURES

Structured questions were used to examine people's beliefs about how cognitive skills change with age. Throughout the survey the term "thinking skills" was used based on user-engagement in the survey development; in reporting the findings we refer to cognitive skills. We gave respondents a list of cognitive skills (e.g., ability to remember things) and asked them to write the age they believed each skill may start to decline. If they believed the skill never declined, they were instructed to write 100. Responses ranged between 0 and 100.

We asked respondents if they believed there are things people could do to maintain or improve their cognitive skills as they grow older and also if they knew how to keep their brain healthy. Responses could be yes, no, or not sure. The latter item was taken from the AARP survey.<sup>8</sup>

We presented a list of activities (e.g., eating a healthy diet) and asked respondents to rate how important they believed each was for maintaining or improving cognitive skills as we age. Responses could be very important, somewhat important, not very important, and not at all important. We also asked respondents to tell us which of these activities they regularly do and to state whether they do it because it is good for their cognitive skills. Responses could be don't do, regularly do, and do because it is good for your thinking skills. These items were taken from the AARP survey.<sup>8</sup> Standard demographic items were also included.

### Statistical Methodology

Univariate analysis of variance was used to evaluate the effect of age group on estimates at which

individual cognitive skills start to decline, as well as gender and educational differences. Post hoc multiple comparisons were performed with a Bonferroni correction applied.

Multinomial logistic regression was conducted to examine: (1) whether respondents who believed there are things people can do to maintain or improve cognitive skills knew how to keep the brain healthy; and (2) whether respondents were involved in activities they believed were important to maintain or improve cognitive skills, and, if yes, whether they did so because of the cognitive benefits of the activities. The not sure group served as the reference category for yes and no groups. The model controlled for age, gender, and education.

The  $\chi^2$  analysis was used to compare categorical variables. Post hoc comparisons were conducted by converting the adjusted z scores to  $\chi^2$  values, estimating the p-values and comparing those against the Bonferroni corrected p-value.<sup>9</sup>

Education was recategorized. We grouped together those who completed: (1) primary school, some secondary, or secondary school (i.e., lower education); (2) college or other training or some professional qualification (i.e., middle education); and (3) an undergraduate or postgraduate university degree (i.e., higher education). Thirty-nine respondents chose other education, and 31 were classified based on respondents' explanations; 8 respondents were not classified.

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## RESULTS

### Characteristics of Respondents

Of 3,146 respondents, 21.5% (N = 683) were aged 40–49 years, 26.2% (N = 831) were 50–59 years, 28.8% (N = 915) were 60–69 years, 19.8% (N = 628) were 70–79 years, and 2.8% (N = 89) were over 80 years. Most respondents were white British (91.3%, N = 2,895), and 58.6% (N = 1860) were women; four respondents did not identify as male or female. In terms of educational attainment, 0.5% (N = 16) had completed primary school, 2.1% (N = 67) had completed some secondary school, 24.4% (N = 775) had completed secondary school, 20.2% (N = 640) middle education, and 16.3% (N = 517) had completed a professional qualification; 20.9% (N = 664) had an undergraduate university

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degree and 14.0% (N = 444) a postgraduate university degree. Responses may not total 3,146 because of missing data.

### At What Age Do Cognitive Skills Start to Decline?

Of the 8 cognitive skills presented, respondents expected memory to decline the earliest (mean age: 59.4, standard deviation [SD]: 15.1). Only 2.4% of the respondents (N = 75) believed memory would not decline. Wisdom and knowledge were skills believed to decline the latest (mean age: 86.1, SD: 16.4), with 39.81% of respondents (N = 1262) believing it would not decline (Table 1).

When grouped by age (Figure 1), a similar pattern emerged across all cognitive skills: Younger respon-

dents were more pessimistic about the age at which they expected cognitive decline to begin. These differences were significant for most comparisons ( $p < 0.05$ ), except differences between 40 versus 50 year olds for speed, word, and number skills, and most comparisons between 70 versus 80+ year olds (only speed of thinking was significantly different).

When grouped by gender, we found that women believed cognitive skills declined significantly later than men ( $p < 0.05$ ); exceptions were memory and number skills where there were no gender differences. There were also significant education differences. For example, those with lower education believed wisdom and knowledge and problem-solving skills declined significantly earlier (mean age<sub>wisdom</sub>: 83.3, SD: 18.4; mean age<sub>problem-solving</sub>: 71.6, SD: 16.7) than those with higher education (mean age<sub>wisdom</sub>: 88.8, SD: 14.6; mean age<sub>problem-solving</sub>: 78.2, SD: 16.9). The full age group, gender, and education comparisons are presented in Supplementary Table S1.

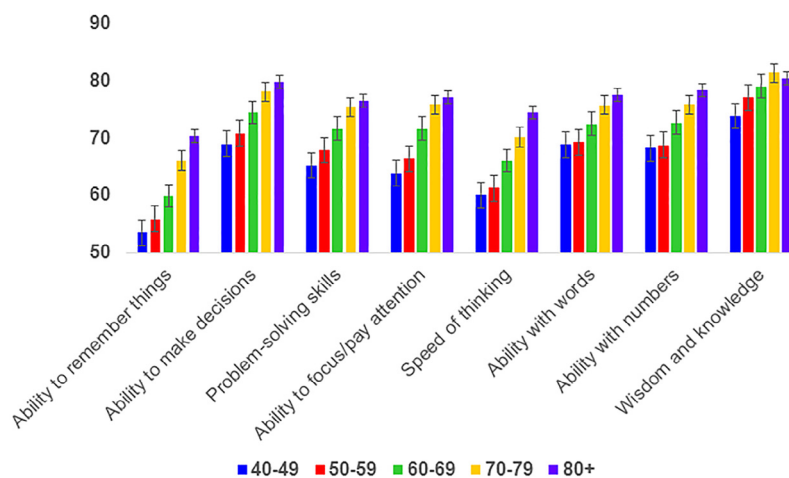
**TABLE 1. Mean Perceived Ages at Which Cognitive Skills Start to Decline and Number of Respondents Who Believed They Do Not Decline**

	Mean (SD)	Does Not Decline N (%)
Ability to remember things	59.4 (15.1)	75 (2.4)
Speed of thinking	64.9 (14.9)	83 (2.6)
Ability to focus/pay attention	71.4 (17.8)	286 (9.0)
Problem-solving skills	72.9 (16.4)	358 (11.3)
Ability with numbers	73.7 (17.2)	360 (11.3)
Ability with words	74.6 (17.1)	414 (13.1)
Ability to make decisions	76.9 (16.9)	534 (16.8)
Wisdom and knowledge	86.1 (16.4)	1,262 (39.8)

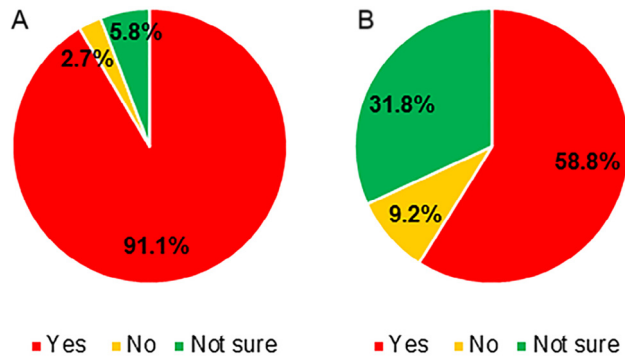
### IMPROVING COGNITIVE SKILLS AND KEEPING THE BRAIN HEALTHY

Most respondents (91.4%, N = 2,875) believed it is possible for people to maintain or improve their cognitive skills with age. However, 41.1% were either unsure (N = 1,003) or did not know (N = 289) how to

**FIGURE 1. The age at which respondents believed cognitive skills start to decline. Standard error bars are included.**



**FIGURE 2.** [A] Respondents' opinions about whether people can maintain or improve their cognitive skills with age. [B] Respondents' responses regarding whether they know how to keep their brain healthy.



keep their brain healthy (Figure 2). Women were significantly more likely to believe it is possible to maintain or improve cognitive skills compared with men (93% versus 89.1%;  $F(1, 3136) = 5.00, p = 0.002$ ). Women were also significantly more likely to report knowing how to keep their brain healthy (63.0% of women responded yes to this question, compared with 52.8% of men;  $F(1, 3139) = 5.860, p = 0.001$ ).

Respondents with middle and higher education were significantly more likely to believe it is possible to maintain or improve cognitive skills with age compared to those with lower education (91.7%, 94.8%, and 86.5%, respectively;  $F(3, 3134) = 12.96, p < 0.001$ ). Higher education was also associated with reporting knowing how to keep the brain healthy; 50.8% respondents with lower education responded positively to this question. The differences with respondents with middle (61.0%) and higher education (62.7%) were significant ( $F(3, 3134) = 8.99, p < 0.001$ ).

A multinomial logistic regression showed that compared with respondents who were unsure about things people could do to maintain or improve their cognitive skills, those who were positive (i.e., believed there are things people could do to maintain or improve their cognitive skills) were also more likely to report knowing what those things were. The ratio of the probabilities of respondents who knew how to keep the brain healthy versus being unsure (odds ratio: 4.89; 95% confidence interval: 3.37–7.10) was similar for those who did not know how to keep the brain healthy versus

being unsure (odds ratio: 5.04; 95% confidence interval: 2.71–10.76).

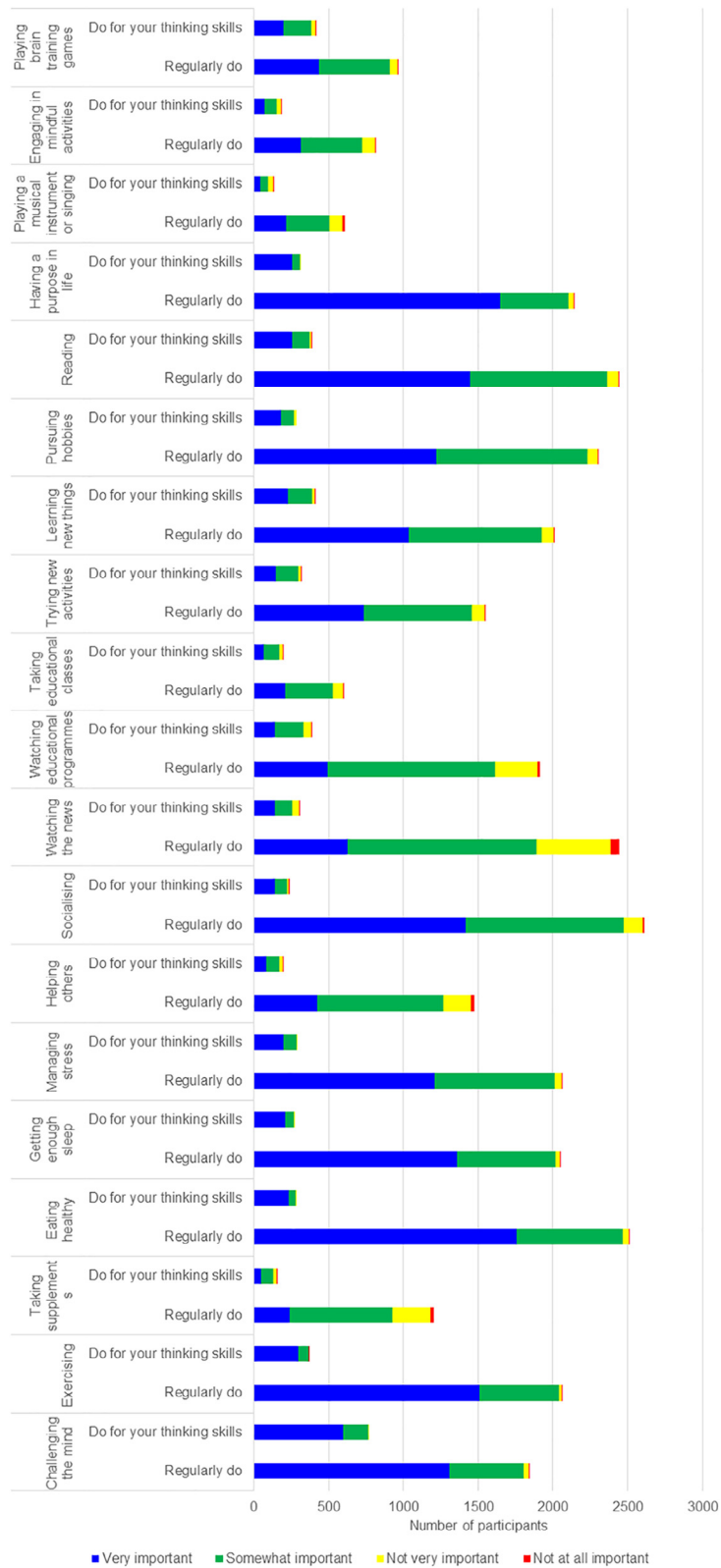
### ACTIVITIES TO IMPROVE COGNITIVE SKILLS

The activities that were ranked higher in terms of importance for maintaining or improving cognitive skills were; having a purpose in life (71.3%, 2,242 very important; 25.7%, 808 somewhat important); eating healthy (67.3%, 2,116 very important; 29.9%, 940 somewhat important); challenging the mind (67.2%, 2,114 very important; 29.6%, 931 somewhat important); sleep (65.5%, 2,060 very important; 32.4%, 1,020 somewhat important); and physical activity (65.2%, 2,050 very important; 31.9%, 1,004 somewhat important). These five activities were the highest ranked for both women and men, with women being significantly more likely to rate all of them as important for cognitive skills: purpose in life ( $F(3, 3139) = 29.62, p < 0.001$ ), eating healthy ( $F(3, 3142) = 42.49, p < 0.001$ ), challenging the mind ( $F(3, 3141) = 10.06, p < 0.001$ ), sleep ( $F(3, 3142) = 34.92, p < 0.001$ ), and physical activity ( $F(3, 3141) = 14.63, p < 0.001$ ).

Having a purpose in life was ranked the most important for maintaining or improving cognitive skills by women (77.2% very important, 20.9% somewhat important) and men (62.7% very important, 32.5% somewhat important), although women were significantly more likely to consider it important ( $F(3, 3139) = 29.62, p < 0.0001$ ). Similarly, having a purpose in life was rated as most important for respondents with lower education (66.6% very important, 29.6% somewhat important), middle education (72.4% very important, 24.6% somewhat important), and higher education (73.7% very important, 23.9% somewhat important), with respondents with higher education significantly more likely to consider it important ( $F(3, 3139) = 4.62, p = 0.002$ ).

Respondents rated whether they did the 19 activities regularly and whether they did them because it is good for their cognitive skills. Interaction among the importance of the activities for cognitive skills and respondents' engagement in them are presented in a cross-classification table shown in Figure 3. The number of respondents who regularly performed an activity they believe to be very important or somewhat important for cognitive skills was much higher than the

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number of respondents who did the activity to benefit their cognitive skills. This finding was consistent across all 19 activities. Although 91.1% believed there are activities that can maintain or improve cognitive skills, only 38.6% were currently engaged in at least one activity for that reason (women: 55.0%, 667; men: 45.2%, 548; lower education: 29.1%, 353; middle education: 40.9%, 496; higher education: 29.7%, 360).

Respondents stated whether they believed changes in cognitive skills as we age are a sign of something more serious. More than half of the sample neither agreed nor disagreed (51.5%, 1,621), 5.2% (N = 164) strongly agreed, 21.9% (N = 688) agreed, 19.7% (N = 619) disagreed, and 1.6% (N = 51) strongly disagreed. Across the different age groups most respondents neither agreed nor disagreed (40s: 47.1%, 322; 50s: 54.0%, 449; 60s: 53.9%, 493; 70s: 49.4%, 310; 80s: 52.8%, 47;  $F(4, 3140) = 7.09, p < 0.001$ ).

Those in their 40s were less likely to consider changes in cognitive skills as a sign of something more serious (40s versus 50s:  $p = 0.033$ ; 40s versus 60s:  $p < 0.001$ ; 40s versus 70s:  $p < 0.001$ ). Women (mean: 2.97, SD: 0.81) were significantly more likely to consider changes in cognitive skills as a sign of something more serious compared with men (mean: 2.81, SD: 0.85;  $F(3, 3142) = 9.44, p < 0.001$ ). Similarly, those with middle and higher education (middle education mean: 2.89, SD: 0.84; higher education mean: 2.95, SD: 0.80) were significantly more likely to consider changes in cognitive skills as a sign of something more serious ( $F(3, 3142) = 5.165, p = 0.001$ ).

We ran a  $\chi^2$  analysis to investigate whether those who considered changes in cognitive skills with age as potentially serious were more likely to do activities to benefit their cognitive skills. Respondents who strongly agreed (5.2%, N = 164) were significantly more likely to do a number of activities, including exercising ( $\chi^2(10) = 28.67, p = 0.001$ ), taking vitamins ( $\chi^2(10) = 33.03, p < 0.001$ ), having a healthy diet ( $\chi^2(10) = 37.12, p < 0.001$ ), sleeping ( $\chi^2(10) = 35.51, p < 0.001$ ), managing stress effectively ( $\chi^2(10) = 30.77,$

$p = 0.001$ ), volunteering ( $\chi^2(10) = 49.67, p < 0.001$ ), socializing ( $\chi^2(10) = 43.36, p < 0.001$ ), pursuing hobbies ( $\chi^2(10) = 25.829, p = 0.001$ ), having a purpose in life ( $\chi^2(10) = 34.46, p < 0.001$ ), playing a musical instrument ( $\chi^2(10) = 39.12, p < 0.001$ ), and engaging in mindful activities ( $\chi^2(10) = 46.82, p < 0.001$ ).

## DISCUSSION

This is the first U.K.-wide survey collecting information from adults aged 40 years and over on their beliefs, fears, perceptions, and attitudes to cognitive aging. Although research evidence suggests declines in processing speed are the earliest cognitive changes,<sup>10</sup> our respondents believed memory changes would be experienced first. People may be more afraid of, or more aware of, changes in their memory skills rather than being unable to perform tasks as quickly as they used to. Memory loss is a common health complaint in older people and has been found to reflect realistic self-observations of cognitive decline.<sup>11</sup> It has also been linked to dementias, such as Alzheimer disease. In recent years efforts have been made to increase community awareness about Alzheimer disease<sup>12</sup>; therefore, people may be more aware of this major symptom associated with it.

Older respondents were more positive about the age at which they expected declines to begin. In general, they expected cognitive skills to begin to decline about 10–15 years later than younger respondents. For those questions we did not ask respondents to report their personal experiences but rather the age at which they believed various cognitive skills start to decline in general. It is possible that older respondents responded retrospectively; they reflected on their own personal experiences and reported the age they experienced changes, if any. We also found gender and education differences in that women and respondents with higher education were more optimistic; they believed cognitive skills would decline later

**FIGURE 3.** Cross-classification of activities believed to maintain or improve cognitive skills and respondent's engagement in them. Interaction among the perceived importance of activities for cognitive skills and respondents' engagement with them is shown. In terms of engagement, the data presented show the number of participants who reported doing each activity regularly versus those reporting doing the activity to specifically benefit their cognitive skills. The different colors show how respondents perceived the activities in terms of their importance for improving/maintaining cognitive skills.



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compared with men and respondents with lower education, respectively.

Most respondents believed it might be possible to maintain or improve skills with age. This finding is consistent with four Australian surveys<sup>13</sup> that asked a total of 5,238 respondents to state whether or not it is possible to reduce the risk of developing dementia. Most respondents (51%) said it is possible, 20% said it is not possible, and 28% did not know. We also found that women and respondents with higher education were significantly more likely to believe that it is possible to maintain or improve cognitive skills with age compared with males and those with lower education.

Fewer of our respondents were certain of what they could do to maintain or improve their skills with age, suggesting that many people are unaware of the potentially positive effects of lifestyle factors on cognitive skills such as physical activity,<sup>14</sup> diet,<sup>15</sup> and sleep.<sup>16</sup> An Irish survey also reported that at least one-third of respondents were unsure or did not know whether diet was related to dementia risk.<sup>17</sup> People may be unaware of the beneficial effects of lifestyle factors on health either because they are not exposed to this information or receive conflicting findings, through the media for example, or because they ignore it, intentionally or unintentionally. Alternatively, they may be aware of the beneficial effects of various lifestyle factors on general health (e.g., cardiovascular) but have not linked this with cognitive aging. Nevertheless, women and respondents with higher education were more likely to report knowing how to keep the brain healthy compared with men and those with lower education.

We asked respondents what activities they believed might protect their cognitive skills, whether they completed these activities regularly, and also whether they did so for their cognitive skills. Although most believed there are activities that could help with maintaining or improving cognitive skills, less than 40% engaged in any of the listed activities for that reason. This finding contrasts with the AARP survey<sup>8</sup> reporting that 94% of respondents believed their brain health could be improved, and 83% were engaged in activities they believed are good for their brain health. However, the two surveys framed the question differently. The AARP survey asked respondents a general question: whether they currently engage in any activities they believe are good for their brain health. On the other hand, we gave respondents a list of specific activities and asked them to indicate whether or not

they do it for their cognitive skills. It is possible our respondents were less inclined to respond positively if they were involved in an activity for their enjoyment or for other general health benefits rather than for specific cognitive benefits, for example.

Despite that, the AARP also reported that although almost all adults believed that exercise (97%) and diet (96%) were important, only 56% exercised or ate a healthy diet. People often know what to do to maintain or improve their health; however, taking advice and keeping up with it can be difficult.<sup>18</sup> The low percentage of reported engagement with activities for the benefit of cognitive skills could be that respondents who do an activity regularly do not do it solely for the benefit of their cognitive skills.

Most of our respondents neither agreed nor disagreed that changes in cognitive skills with age are a sign of something more serious, although older respondents, women, and those with higher education were more likely to believe that might be so. However, those who strongly agreed that changes are a sign of something more serious were more likely to engage in a number of activities (e.g., healthy diet) to benefit their cognitive skills.

Our survey was conducted in the United Kingdom; therefore, the results may not be comparable with other countries. However, most of our findings are in line with surveys in the United States and Australia. Future surveys with non-Western countries will allow comparisons to be drawn between different cultures. In addition, our findings do not address why our sample responded in a certain way. For example, it remains unclear why respondents did not engage in activities for cognitive benefits. Qualitative research, such as focus groups or interviews, would be appropriate to answer the “why” questions.

Although not conclusive, our results may suggest that people are less aware of the benefits of certain activities, such as exercise and diet, on cognitive skills. Targeted messaging of the evidence supporting lifestyle factors that promote good cognitive health are necessary. Websites that are easily accessible do not always promote the benefits of activities for cognitive skills. For example, the Mayo Clinic<sup>19</sup> lists seven benefits of regular physical activity including weight control, preventing health conditions and diseases such as stroke, metabolic syndrome, type 2 diabetes, depression, some cancers, arthritis, and falls. However, there was no mention of physical activity benefits on

cognitive skills, although the evidence supports that.<sup>14</sup> There is also emerging evidence supporting that being active and engaged is also beneficial.<sup>20–22</sup> It is important to continue building awareness about the benefits of certain activities for cognitive health among people and, furthermore, that this messaging begins in midlife.

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## APPENDIX: SUPPLEMENTARY MATERIAL

Supplementary data to this article can be found online at doi:10.1016/j.jagp.2018.03.016.

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