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Online engagement and cognitive function among older adults

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Aim: Social engagement is known to serve an important role in cognitive health, but there has been limited information on the role of online engagement. The present study aimed to identify the benefits of different online activities for the cognitive function of older adults.

Methods: Data came from the National Health and Aging Trend Study, Round I–V (2011–2015), with >8000 respondents from Medicare beneficiaries. Cognitive function was measured by the Clock Drawing Test and immediate 10-word recall. The respondents were also asked if they carried out any of the online activities listed.

Results: Some online activities, such as email, texting and seeking medical information, can reduce the risk of cognitive decline. Whereas contacting a medical provider using online can increase the risk of cognitive decline.

Conclusions: Given the findings, the development of new technologies for online social engagement needs to be one of the priorities for researchers and policymakers in the field of aging and dementia. **Geriatr Gerontol Int 2019; 19: 918–923**.

Keywords: cognitive function, dependency, loneliness, social engagement, social network.

Introduction

From the sociological standpoint, aging represents changing social roles expected in later stages of the life course. When older adults are assumed to be unable to carry out their social roles due to disabilities and diseases, they will be marginalized and gradually disengaged from social roles. After a while, the social engagement domain for older adults might be limited to family support, friends, significant others, mealtime enjoyment, and the perceived friendliness of the formal and informal caregivers, all of which will typically be weakened in advanced, later life stages.[1]

The power of spirituality, which helps older adults adapt to limitations and challenges, requires connections with family, representing important cultural and social bonds.[2] Furthermore, social interactions and engagement in various activities have a significant impact on the physiological functioning of the brain, and ultimately the level of cognitive function.[3] The level of cognition is significantly related to social connections and interactions, particularly social activities.[3]

Cognitive function can be defined based on the activities of thinking, understanding, attention and learning, memory, judgment, and executive function.[4] Normal aging can cause slower physical performance due to neuromuscular changes.[5] Hence, people in advanced age generally require more time to prepare themselves for talking, as longer pauses might help them process the conversation and execute their response throughout a conversation. This slow pace of talking might cause some problems in communication with members of younger age groups who can usually speak at a faster pace.

Physical distance would be one of the barriers for maintaining meaningful social connections.[6] Non-visual contact via the telephone with adult children can preserve cognitive function among older adults.[7] Using telecommunication technologies, such as telephone and social media has, therefore, become one of the prominent factors in social interaction among older adults, in particular.[8] Hence, certain online activities might facilitate social interaction and reduce the risk of cognitive decline. This process has not yet been examined using longitudinal data with a large sample of older adults.

There exists some empirical evidence that suggests benefits of using the Internet for older adults' cognition. When compared with their non-user counterparts, Internet users among older adults tend to show better performance in delayed recall.[9] Online literacy intervention can not only improve cognitive performance,[10] but also lower the risk of dementia in middle-aged adults.[11] Although some studies showed the potential cognitive benefits of learning and using Facebook, an online social networking site, for healthy older adults, reliance on a small sample size and cross-sectional data significantly limits the discussion of a causal relationship between online social engagement and cognitive function.[12]

Considering the high cost of cognitive impairment for the public, and the need for more affordable, non-medical interventions, the present study aimed to assess the potential benefits of online activities for cognitive function among older adults, with the hypothesis that the level of cognitive impairment is significantly associated with the extent of online activities.[13]

Methods

Data

We used data collected in the National Health and Aging Trend Study (2011–2015), with >8000 respondents from Medicare beneficiaries, ages ≥65 years. Three-stage stratified sampling was used in order to select the respondents from the Medicare beneficiaries aged ≥65 years as of 30 September 2011. The primary sample units were composed of 95 counties or group of counties across

the USA. The secondary sample units were selected based on the ZIP codes, and respondents in each ZIP code were selected upon considering the proportion of the race/ethnicity (non-Hispanic Black, Hispanic, White and other) and age in the population of the same ZIP code.[14]

Measurement

The dependent variable was cognitive function, which was measured by self-rated memory, orientation and executive function (Clock Drawing Test [CDT]), and retrieval information (word recall test).[14] The latter was tested by using three lists of 10 words, and respondents were randomly assigned to one of the three lists, which was read to the respondents. After a delay, the respondents were asked to name the words.

The interviewers, as part of a cognitive function test, instructed the respondents to carry out the CDT on the provided piece of paper. The results of the CDT were categorized into six levels from 0 to 5, when 5 was the most accurate performance and 0 the least, which is highly correlated with the Mini-Mental State Examination.[15] An immediate 10-word recall test was carried out to evaluate memory.[14] The cut-off for the 10-word list was six or above being considered as normal[16] and less than three as impaired.[14] Using the combination of the immediate 10-word recall test and the CDT, cognitive function was categorized into five levels: normal, mild, mild-to-moderate, moderate and severe cognitive function.[17]

If the respondent had a severe illness, hearing loss or diagnosed dementia at the time of the study, a proxy respondent, who was involved in daily activities of the respondent, answered the questions other than the CDT and word recall test.[14] The proportion of the self-respondents who had severe cognitive impairment is shown in Table 1.

Independent variables

Online activities considered as the independent variables are using email/texting for communication, seeking medical information online, surfing the Internet for medical information, contact medical provider (online), online banking, online refill prescriptions and online grocery shopping, which are dichotomous (Yes = 1; No = 0). After creating global observed variables including all waves, we also created a latent variable called online engagement by adding the scores of the aforementioned (observed) variables. The results of structural equation modeling showed that all of the observed variables significantly explained the variation of the latent variable, online activities ($P < 0.001$; Table 2). Although the likelihood ratio χ^2-test was statistically significant and the large sample size can be the reason, both the root mean square error of approximation and comparative fit index show that it was a fit model (Table 2).

Table 1 Characteristics of the participants

Age (years)	Year, *n* (%)				
	2011	2012	2013	2014	2015
65–69	1325 (17.94)	923 (14.04)	473 (8.97)	198 (4.57)	1063 (13.23)
70–74	1481 (20.05)	1.280 (19.49)	1129 (21.40)	988 (22.80)	1784 (22.19)
75–79	1447 (19.59)	1293 (19.67)	1040 (19.71)	861 (19.87)	1623 (20.19)
80–84	1399 (18.94)	1308 (19.90)	1080 (20.46)	918 (21.19)	1501 (18.67)
85–89	961 (13.01)	989 (15.05)	855 (16.21)	756 (17.45)	1145 (14.25)
≥90	773 (10.47)	779 (11.85)	699 (13.25)	612 (14.12)	922 (11.47)
Male	2966 (40.16)	–	2300 (39.66)	1857 (39.58)	3407 (40.88)
Ethnicity					
White (non-Hispanic)	5212 (71.32)	–	4085 (70.96)	3369 (71.64)	5703 (70.13)
Black (non-Hispanic)	1495 (20.46)	–	1231 (21.38)	982 (20.88)	1710 (21.03)
Other‡	208 (2.84)	–	141 (2.45)	113 (2.40)	244 (3.00)
Hispanic	387 (5.30)	–	296 (5.14)	235 (4.99)	467 (5.74)
More than one	6 (0.08)	–	4 (0.07)	4 (0.09)	8 (0.10)
Levels of cognition					
Normal	934 (19.94)	932 (25.77)	814 (25.96)	1086 (40.21)	1769 (35.79)
Mild	1583 (33.80)	1264 (34.96)	1061(33.84)	680 (25.18)	1475 (29.84)
Mild-to-moderate	1269 (27.10)	809 (22.37)	679 (21.66)	548 (20.29)	1035 (20.94)
Moderate	558 (11.92)	473 (13.08)	322 (10.27)	242 (8.96)	490 (9.91)
Severe	339 (7.24)	138 (3.82)	259 (8.26)	145 (5.37)	174 (3.52)
Function					
Walking 6 blocks	3148 (41.73)	2586 (43.18)	2133 (44.49)	1781 (45.07)	3102 (41.63)
Climbing 20 stairs	2633 (35.02)	2154 (36.16)	1714 (35.86)	1459 (37.01)	2555 (34.25)
Moving out of bed	1665 (21.88)	1254 (20.72)	1017 (20.82)	906 (22.44)	1704 (22.49)
Going out	1547 (20.69)	1247 (21.04)	1013 (21.19)	889 (22.51)	1545 (20.76)
Moving inside home	1538 (20.26)	1175 (19.43)	906 (18.62)	811 (20.17)	1493 (19.77)
Bathing	1379 (18.12)	1071 (17.68)	903 (18.49)	812 (20.11)	1357 (17.91)
Meal preparation	653 (13.28)	494 (12.74)	408 (12.74)	397 (15.00)	737 (14.63)
Dressing	936 (12.39)	1109 (17.23)	1056 (19.87)	925 (21.13)	1259 (16.15)
Shopping	496 (12.16)	383 (11.68)	288 (10.76)	279 (12.43)	575 (13.20)
Showering	914 (10.71)	1132 (17.40)	1028 (19.23)	868 (19.67)	1093 (13.93)
Laundry	438 (9.68)	310 (8.63)	255 (8.73)	212 (8.87)	450 (9.68)
Bank/money management	400 (8.45)	284 (7.54)	222 (7.37)	226 (8.95)	439 (8.91)
Eating	505 (6.64)	376 (6.22)	335 (6.87)	387 (7.12)	483 (6.38)
Toilet	331 (4.36)	579 (8.90)	552 (10.31)	469 (10.62)	515 (6.56)
Use telephone	282 (3.72)	197 (3.27)	174 (3.58)	149 (3.71)	250 (3.31)

‡Native American, Asian, Native Hawaiian, Pacific Islander, other non-Hispanic.

Table 2 Structural equation model: Online engagement

Online activities	Coefficient (SE)	95% CI
Email/texting	1* (Constrained)	0.82–0.83
Medical information online	1.76* (0.06)	1.63–1.88
Internet for insurance	1.35* (0.05)	1.25–1.45
Contact medical provider online	1.79* (0.06)	1.67–1.92
Online banking	1.92* (0.07)	1.79–2.06
Online refill prescription	1.56* (0.06)	1.45–1.68
Online grocery shopping	1.48* (0.06)	1.37–1.60

Total n = 11 352. Log likelihood −40 064.25. LR baseline versus saturated: $\chi^2(14) = 743.21$***. Comparative Fit Index 0.923. Root mean square error approximation = 0.068*** (95% CI 0.064–0.072). *$P < 0.001$. CI, confidence interval; LR, likelihood-ratio; SE, standard error.

Control variables

The control variables in the present study were self-reported health status (excellent, good and fair), falling down, functional limitations in the activity of daily living: laundry, shopping, meal preparation, money management, walking six blocks, climbing 20 stairs, going out, moving inside the house/apartment/unit, getting out of bed, taking a shower, dressing, eating and bathing were considered as functional limitations. Age and living status (alone *vs* partner/spouse) were reported by the respondents. Level of education was collected in the first and fifth waves, and categorized into nine levels: no school, 1–8th grade, 9–12th grade/high school diploma, vocational/some college degree, Associate degree, Bachelor's degree and Master's/Doctoral degree.

Statistical analysis

The dependent variable (cognitive function) is an ordinal variable with five levels ranging from normal to severe and very severe impairment. The independent variables are self-reported activities: using email or online texting, collecting medical information on the websites, searching the Internet for health insurance, communicating with a medical provider through online platforms, refilling prescription online, shopping groceries online, online banking, working for payment, participating in religious activities, membership in clubs, walking, going out for enjoyment, caring for another person, vigorous physical activities, visiting family members regularly and volunteer activities.

Longitudinal ordinal logistic regression was used in Stata 15 (StataCorp, College Station, TX, USA), as the dependent variable was an ordinal variable. Appending all the five waves of the National Health and Aging Trend Study in one file, global dependent, independent and control variables were created considering the year. To test the proportional odds assumption, Brant's test of ordered logistic regression was used. The results suggested that the assumptions were met (χ^2 for all the independent variables = 29.44 $P > \chi^2 = 0.104$).

The possibilities of selective and random attrition over the five waves, which is beyond the scope of the current study, were examined and reported elsewhere.[18] The weighting method used for all waves significantly reduced the impact of both the intermittent and terminal non-response bias in the data analyses.[18] We excluded those cases with missing values from our statistical analysis to reduce the potential impact of non-response bias.

Results

Cognitive impairment

The proportion of participants with mild-to-severe cognitive impairment declined, unlike the proportion of those with normal cognitive function, which showed an increasing trajectory from 19.94% in 2011 to 35.79% in 2015 (Table 1). One of the possible reasons can be attributed to mortality as a significant correlation between cognitive function in the previous term, and mortality was found in cross-tabulation in all four waves ($\chi^2 = 72.71$, $P < 0.0001$; 62.21, $P < 0.0001$; 38.99 $P < 0.0001$; 46.67, $P < 0.0001$ for 2012–2015, respectively).

Online activities

The proportion of participants who reported at least one online activity continuously increased from 42.12% (2011) to 50.74% (2015). Among all of the activities, visiting family members had the highest rate in five waves; >85% of the participants visited their family members regularly. Going out for enjoyment was in the second rank of activities, followed by religious activities and walking. Among online activities, online banking (42.86–50.79%) was the most common, and showed an increasing trend throughout the five waves. Email and texting was the second most common, followed by seeking medical information online, online grocery shopping, online refill of prescriptions, communicating with medical provider online and surfing the Internet for insurance (Table 3).

Table 3 Proportions of activities 2011–2015

Activities	Year % (n)				
	2011	2012	2013	2014	2015
Online engagement	42.12 (2536)	44.45 (2163)	46.07 (1813)	47.41 (1564)	50.74 (3299)
Visit family regularly	85.29 (6482)	87.29 (5281)	86.60 (4221)	85.00 (3428)	84.93 (6427)
Out for enjoyment	73.60 (5594)	75.28 (4557)	74.72 (3641)	74.75 (3014)	74.81 (5662)
Religious	57.98 (4408)	58.21 (3520)	58.10 (2830)	57.99 (2338)	57.89 (4382)
Walking	57.79 (4395)	57.60 (3485)	57.71 (2814)	56.08 (2261)	57.97 (4390)
Online banking	42.86 (1086)	44.54 (963)	45.17 (819)	46.71 (730)	50.79 (1675)
Email/texting	39.82 (2397)	41.20 (2005)	43.40 (1709)	45.94 (1515)	50.61 (3291)
Medical information online	35.28 (894)	36.11 (781)	36.96 (670)	38.49 (602)	39.25 (1295)
Club meetings	34.37 (2613)	36.86 (2229)	36.62 (1784)	38.08 (1535)	35.84 (2714)
Vigorous activities	33.83 (2572)	34.53 (2090)	34.76 (1693)	34.12 (1375)	35.69 (2702)
Online grocery shopping	29.98 (760)	30.19 (653)	33.09 (600)	32.44 (507)	36.78 (1213)
Volunteer activities	22.54 (1714)	23.07 (1396)	23.12 (1127)	24.13 (973)	24.14 (1828)
Online refill prescription	17.55 (445)	19.02 (411)	21.46 (389)	22.31 (349)	22.04 (727)
Care another person	16.44 (1250)	16.44 (995)	16.52 (805)	16.50 (665)	17.41 (1318)
Contact medical provider online	15.58 (395)	16.98 (367)	19.96 (357)	24.82 (388)	27.86 (918)
Work for payment	11.61 (826)	11.25 (633)	11.41 (505)	10.44 (374)	12.42 (853)
Internet for insurance	11.44 (290)	12.49 (270)	12.47 (226)	13.64 (213)	16.72 (551)

Control variables

The most frequent functional limitation across the five waves was walking six blocks (41.73% in 2011, 45.07% in 2014), followed by climbing 20 stairs, moving out of bed, going out, moving inside the home and so forth (Table 1). In fact, functional limitations were more likely to restrict their physical movements and potentials for social interactions. Hence, online activities could be a partial substitute for face-to-face interactions.

More than half (61.5%) of the respondents had completed high school or some college degrees, 12.09% and 10.17% had a Bachelor's degree and Master's or Doctoral degree, respectively. The proportion of respondents with no schooling and 1–8th grade education was 1.04% and 11.68%, respectively.

Regression model

Two different models were created using longitudinal ordinal regression to examine the impact of online engagement and online activities on cognitive function, controlling for function and other control variables (Table 4). The first model considered the latent variable, online activities, whereas the second model included the observed online activities. Based on model 1, online engagement can significantly reduce the odds of cognitive impairment by 54% ($P < 0.001$). Meeting people in clubs (19%, $P = 0.016$), going out (39%, $P < 0.001$), visiting family members (37%, $P = 0.001$), volunteer activities (25%, $P = 0.002$) and education (26% for each level increase in education, $P < 0.001$) are other significant factors with similar effects as online engagement. Meanwhile, living alone

Table 4 Online engagement/online activities and cognitive impairment 2011–2015

Predictors		Model 1		Model 2	
		OR	95% CI	OR	95% CI
Online engagement/online activities		0.46***	0.38–0.55	–	–
Email/texting		–	–	0.49***	0.35–0.69
Medical information online		–	–	0.71*	0.55–0.93
Internet for insurance		–	–	1.23	0.84–1.80
Contact medical provider online		–	–	1.50*	1.07–2.10
Online refill prescription		–	–	0.97	0.76–1.32
Online grocery shopping		–	–	0.85	0.65–1.11
Online banking		–	–	1.00	0.76–1.32
Living alone		1.11***	1.05–1.17	1.13**	1.05–1.22
Falling injury		0.80*	0.67–0.96	0.82	0.62–1.08
Work for payment		0.94	0.75–1.18	0.86	0.62–1.18
Religious		1.13	0.95–1.34	1.04	0.79–1.36
Club meetings		0.81*	0.68–0.96	0.84	0.65–1.10
Walking		1.13	0.95–1.35	0.99	0.74–1.34
Out for enjoyment		0.61***	0.50–0.76	0.44***	0.30–0.65
Care another person		0.86	0.72–1.03	0.88	0.67–1.16
Vigorous activities		1.09	0.92–1.28	1.18	0.91–1.51
Visit family regularly		0.63***	0.48–0.82	0.69*	0.43–1.12
Volunteer activities		0.75**	0.63–0.91	0.74*	0.57–0.97
Use telephone		1.48	0.80–2.73	1.81	0.65–5.03
Laundry		0.90	0.61–1.32	1.07	0.55–2.07
Shopping		0.82	0.62–1.10	0.65	0.39–1.07
Meal preparation		0.74	0.53–1.02	0.81	0.46–1.42
Bank/money management		1.74**	1.22–2.49	3.08***	1.71–5.55
Showering		0.38	0.09–1.55	0.13	0.01–4.14
Toilet		1.82	0.18–18.77	–	–
Dressing		1.11	0.57–2.15	0.98	0.34–2.86
Walking 6 blocks		1.06	0.85–1.34	0.84	0.56–1.26
Climbing 20 stairs		1.03	0.81–1.30	1.07	0.70–1.65
Going out		0.75	0.54–1.04	0.63	0.35–1.12
Moving inside home		1.31	0.97–1.79	1.11	0.65–1.88
Moving out of bed		1.07	0.82–1.39	1.08	0.69–1.72
Eating		0.63	0.30–1.35	0.72	0.21–2.41
Bathing		1.05	0.72–1.53	0.72	0.36–1.45
Age groups (years)†	75–79	1.25	0.98 – 1.59	1.45*	1.01–2.13
	80–84	1.94***	1.50–2.51	2.71***	1.80–4.09
	85–89	2.20***	1.61–3.01	4.13***	2.38–7.17
	≥90	0.89	0.71–1.10	1.04	0.76–1.44
Health status	Fair	2.00***	1.57–2.55	2.75***	1.75–4.33
	Good	1.37***	1.15–1.63	1.88***	1.42–2.47
Education		0.74***	0.69–0.80	0.77***	0.70–0.84
Year		0.78***	0.74–0.82	0.75***	0.70–0.82
σ_u^2		2.73	2.25–3.33	3.60	2.69–4.81
		$n = 4860$		$n = 2492$	
		Wald $\chi^2(35) = 592.14$***		Wald $\chi^2(41) = 236.85$***	
		Log likelihood = −5848.31		Log likelihood = −2624.96	
		LR *vs* ologit $\chi^2(01) = 325.62$***		LR *vs* ologit $\chi^2(2) = 166.82$***	

The reported likelihood-ratio test shows that there is enough variability between individuals (respondents) to favor a random-effects ordered logistic regression over a standard ordered logistic regression. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$. †65–74 years is the reference age group. CI, confidence interval; LR, likelihood-ratio; OR, odds ratio.

(11%, $P < 0.001$), limitations in bank/money management (74%, $P = 0.002$) and self-reported health status ("fair" twice as "excellent," "good" 37% more than "excellent"; $P < 0.001$) are the predictors for cognitive deficit over time. In addition to other predictors, people in age categories 75–79 years (25%, $P = 0.073$), 80–84 years (94%, $P < 0.001$) and 85–89 years (220%, $P < 0.001$) are more likely to have more severe cognitive impairment compared with the 65–74 years category. In the second model, among online activities, email and online texting (51%, $P < 0.001$), seeking medical information online (29%, $P = 0.013$), and contacting a medical provider (150%, $P = 0.020$) significantly predicted the cognitive impairment. The significance level of club meeting disappeared in the second model, whereas the odds of going out (56%, $P < 0.001$) and limitation in bank/money management (308%, $P < 0.001$) significantly changed. Participants in the 75–79 years (145%, $P = 0.042$), 80–84 (271%, $P < 0.001$) and 85–89 years (413%, $P < 0.001$) age groups were more likely to have more severe cognitive impairment compared with the 65–74 years age group. Those who rated their health status as good and fair were 88% ($P < 0.001$) and 275% ($P < 0.001$) more likely to experience more severe cognitive impairment, respectively, compared with those reporting an excellent health status.

Discussion

The results of the present study showed that cognitive function declined over the course of 5 years, although the number of cases with moderate-to-severe and severe impairment decreased significantly (see "year" in Table 4). Participant mortality and attrition can be the main reasons for this trend. The relationship between age and cognitive decline that we found is consistent with other reports.[19] The new approach to brain and cognitive function is tending toward functional reorganization and compensation with new situations in old age, which can open new doors to maintaining cognitive function through non-pharmacological interventions.[20]

Although Bäckman *et al*. reported the correlation between social network and cognitive decline, we found from the present study that online activities can reduce the risk of cognitive decline.[19] The present findings are consistent with a longitudinal study of social network and cognition, in that engaging in online activities can significantly prevent cognitive impairment over time.[21] Some of the activities are more effective than others, including using email and texting, and seeking medical information on websites. Carlson reported that those social contacts stimulating prefrontal cortex are necessary for brain health in general, and cognitive function in particular.[22] Nevertheless, we do not know yet what type of activities and contacts can preserve brain function, and the mechanism of online social contacts preventing cognitive decline. Thus, some neurobiological and neuroimaging research in this regard can be promising.

Social interactions can increase a sense of coherence, consequently influencing physical and mental health, and particularly cognitive function among older adults.[23] The higher the level of social activity, the better the cognitive function reported in cross-sectional[3] and longitudinal studies.[24] In addition to physical disability, which is one of the barriers to social interaction, fear of rejection, exploitation and losing social identity can be other significant barriers against social interaction, leading to isolation and loneliness.[25] The feeling of being connected to the outside world can motivate older adults to learn how to use devices (e.g. computers and tablets) despite some barriers, such as sensory and motor limitations.[26] In fact, Chan *et al*. reported that using an iPad can enhance episodic memory in older adults.[27] Online social activities might lower barriers to social interaction, and help reduce the risk of loneliness among older adults and, ultimately, the risk of cognitive decline. Although there has been limited information about the role of online activities, the present results show that email, texting and seeking medical information can reduce the risk of cognitive decline.

It is not clear if cognitive function decline can cause such deficits, or contrarily, reduced social connections can increase the risk of cognitive decline. Either way, a longer reaction and processing time in conversations, and difficulties in finding familiar words that might cause language barriers are less likely to be problematic in asynchronous online social interactions. Importantly, online engagement does not require social motivation or some of the social skills necessary for face-to-face engagement, because it is asynchronous.

Although we did not have access to some determinants of health, such as blood pressure and blood sugar level, self-rated health status can be considered as the outcome measure of health.[28] The present study shows that self-rated health status is a significant predictor for cognitive function. We controlled for the role of function, which was missing in previous studies.

Although health service-seeking behaviors can affect health outcomes, the utilization process and illness response are also important.[29] The present findings unexpectedly showed that there is a significant positive correlation between online contact with medical providers and cognitive decline. To the best of our knowledge, there is no report about the frequency of online contact with providers and cognitive impairment. It is indeed puzzling why people who engage in contacting medical providers using online are more likely to experience cognitive decline. It is difficult for us to explain this inconsistent finding. Future research needs to examine this unexpected relationship more closely and in greater depth, maybe using a qualitative approach. Some factors that can affect the outcomes, such as delay in services and quality of care, would be another aspect to consider.

In conclusion, healthy aging is one of the most important objectives of Healthy People 2020. Research findings that show significant factors related to cognitive function can lead public health policymakers to develop research-based interventions in order to maintain or even enhance the health status of senior citizens. We believe that social engagement as one of the preventive factors for cognitive decline needs to be more actively explored. Online social activities capitalizing on emerging technology should be regarded in social, psychological, behavioral and neurobiological research in order to enrich impactful research findings and inform policymakers.

How can we then implement the results of the present study in policy and practice? Our policy recommendations include a three-prong approach where Department of Health and Human Services policy, Group Medical Insurance providers and Center for Medicare & Medicaid Services establish funds dedicated to preventing abnormal cognitive decline, funds for maintaining cognitive health, and funds to cover treatment and care for irreversible cognitive decline. The three-prong approach can support a national, state and local integrated policy (macro policy) according to which all government services can be offered fully online, with citizen care (i.e. client, customer, citizen service) driven by social media-style technology.

The lowering of red-tape barriers through increased citizen access to government and health-related services based on technology will require that older adults maintain online skills and social group networking skills well into their old-old years. Ideally, different local-level organizations, such as cities, counties and community partners, would implement programs that connect all older adults with access to computer technology in their homes, churches, libraries, community centers, senior centers, universities and so on.

We did not have access to the frequency of online social activities. Hence, we recommend collecting data about the number of activities in the next wave of the National Health and Aging Trend Study. Furthermore, variations in the older population make it difficult to generalize the results.

Disclosure statement

The authors declare no conflict of interest.

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