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ORIGINAL

Frequently endorsed cognitive and physical activities among community-dwelling older adults

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D Data Interpretation
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abstract

Background Despite the established benefits of cognitive and physical activity, a paucity of research examines the specific activities older adults favor, particularly those meeting the nationally recommended minimum duration of > 30 minutes per session.

Material/Methods 260 non-demented, community-dwelling participants aged 70 and above self-reported the duration of their participation in 26 cognitive and physical activities during a typical week. Overall activity engagement was investigated by sex and educational level.

Results The most endorsed physical activities were walking, stretching/yoga and gardening, while the most endorsed cognitive activities were reading magazines/newspapers, reading books, and doing crosswords. Walking (p = .048), swimming (p = .008), reading magazines/newspapers (p=.011), writing (p=.001), and attending lectures (p = .007) were more common among those with > 12 years of education, while reading books (p = .039) and sewing/knitting (p = .040) were more common among those with ≤ 12 years of education. Doing crossword puzzles (p = .003), sewing/knitting (p = .001), and dancing (p = .015) were more common among females, while weight training (p = .009) and fishing (p = .003) were more common among males.

Conclusions Overall, results revealed several statistically significant activity engagement differences by sex and education. Findings are discussed in relation to enhancing older adults' participation in activities that may improve their overall functioning.

Key words leisure activity, physical activity, cognitive activity, older adults

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INTRODUCTION

Declines in mental and physical health in older adulthood are of great concern, particularly as they relate to the risk of dementia, functional immobility, increased dependence on others, chronic health conditions, and psychological distress [1, 2]. Among the elderly, sedentariness is associated with more physical health problems and increased depression [3]. Poor participation in intellectual leisure activities is also related to cognitive impairment [4], memory decline [5], and neurodegenerative conditions such as Alzheimer's disease [6].

Physical exercise engagement is associated with neurophysiological benefits among older adults, [7] and research suggests that physical activity may buffer against cognitive decline in impaired and healthy older adults [8, 9,10], potentially improve cognitive capacities [11], and reduce overall cognitive decline [8]. Psychological and physiological pathologies, such as depression, anxiety, loneliness, psychological stress reactions, and increased circulating levels of cortisol may also be reduced via engagement in physical activity [12,13, 14]. Furthermore, physical leisure activities (e.g., gardening, running) may promote psychological well-being, feelings of mastery, and higher self-efficacy [13]. Physical activities may also be associated with enjoyment, fulfillment, and a sense of belonging [15]. Recent research demonstrates that among older adults the benefits of exercise may be achieved by consistent engagement in and adherence to an exercise regimen; this finding supports a dose-response relationship between physical exercise and improved cognitive outcomes [16].

Engagement in intellectual leisure activities among older adults is also beneficial and may act as a buffer against global cognitive decline and dementia [4] and improve the quality of life [6,17]. Reading positively impacts various cognitive domains (i.e., global cognition, episodic memory, working memory) [18] and is associated with increased gray matter volume in multiple brain regions [19]. Cognitive training improves certain aspects of cognition, such as executive functioning [20]. Meta-analysis suggests that cognitive interventions may mitigate cognitive decline in healthy individuals by augmenting the brain's capacity to use alternative neural networks or its ability to utilize established networks more efficiently in the face of neuropathological damage [6].

In general, participation in physical and cognitive leisure activities may become more important for older adults after they retire [21]. Maintained engagement in physical and cognitive activities is instrumental in successful aging, as engagement may serve to attenuate social isolation and functional decline while augmenting quality of life [22]. The choice of activities older adults participate in, the satisfaction derived from them, and the importance ascribed to them may depend on diverse contextual factors, such as age, gender or health status [21].

Similarly, the benefits derived from physical and cognitive activity engagement by older adults may depend on the specific type and the frequency of the activity, although there is limited research on these topics. In terms of duration, it is recommended that older adults engage in physical activity for at least 30 minutes per day [23]. A recent longitudinal study reported that physical exercise routines with durations of 30 minutes or longer yielded the most positive association with the cognitive function and may also have a protective effect against cognitive decline [24].

Much of what we know about activity engagement in the elderly is based on research that has focused almost exclusively on participant-reported activity engagement without consideration of the amount of time spent on these activities. For instance, a Canada-based study found that walking, gardening, and home exercises were the most endorsed forms of physical activity [25]. A 6-year longitudinal study in Brazil found that walking was the most frequently engaged activity [26]. In the U.S., 69% of men and 75% of women endorsed walking, and 45% of men and 35% of women endorsed gardening [27]. However, in that study, almost 90% of the elderly participants were White and the study was conducted more than two decades ago. The reported physical activity engagement and preferences may not generalize to more racially/ethnicallydiverse community-dwelling older adults. A recent, nationally representative sample of adults 65 or more years of age inquired about participants' favorite activity over the last month [28]. Results revealed that older adults prefer to walk, jog, garden, or play sports more than they like to watch TV, attend religious services, or travel. However, this study did not inquire about the session frequency or duration. Finally, a longitudinal study also found for older adults that engagement frequency in select cognitive activities was associated with a lower incident rate of dementia [29]. However, the authors only explored a limited range of cognitive areas. Overall, such methodological limitations warrant further exploration of the patterns of physical and cognitive activity participation among older adults.

A further area of interest is possible sex differences in activity engagement. Inactive women, for example, are susceptible to chronic, degenerative ailments such as osteoporosis, diabetes mellitus, and diminished muscle strength [18]. Women are consistently found to be less physically active than men in adolescence and adulthood [30, 31] and sex disparities exist for older adults, with a significantly greater proportion of older men reporting engagement in regular physical activity as compared to older women [32, 33]. However, given the narrow range of items used to assess physical leisure activity engagement and the omission of cognitive activity engagement in these studies, additional research using a more comprehensive activity engagement assessment is needed.

Education is another key demographic variable that is positively correlated with physical activity engagement [27] and cognition [6] in later life. Higher educational attainment appears to have a protective impact on cognitive functioning in older adulthood. Education is strongly associated with late-life measures of cognition, chiefly global cognition, episodic memory, semantic memory, and visuospatial ability [18]. A longitudinal study with older adults found that low leisure activity engagement and low education was associated with an increased risk for dementia [34]. It is possible that differential educational attainment is reflected in differential activity engagement type among older adults. For example, there are significant differences among the frequency of cognitive activities for those who attended college relative to those that did not [29]. However, this was true only for some cognitive activities, while no difference was found for physical activity engagement. To our knowledge, no other research has explored differences in specific physical and cognitive activity engagement based on educational attainment.

Given the aforementioned gaps in the literature, the present study examined cognitive and physical activity engagement among a demographically diverse sample of non-demented, community dwelling adults aged 70 years and older. First, we identify the participants' most commonly endorsed physical and cognitive activities using more rigorous criteria for engagement than those utilized in many previous studies. This includes administering a questionnaire with 26 different activities and only examining data for individuals who reported engaging in a given activity for 30 minutes or more per session in a typical week. Second, we investigate possible sex and education differences in physical and cognitive activity engagement.

MATERIALS AND METHOD

PARTICIPANTS AND PROCEDURE

Participants were a subset of individuals from the Einstein Aging Study, a longitudinal, community-based study of cognitive aging based in the Bronx, New York (for details see [35, 36]). Eligible participants were at least 70 years old, Bronx residents, non-institutionalized, and English speaking. Exclusion criteria included sensory disturbances that preclude neuropsychological testing, active psychiatric symptomatology, non-ambulatory status, and having a diagnosis of dementia (determined at a consensus case conference, see [35] for details).

All participants provided written informed consent in accordance with procedures approved by the Institutional Committee for the Protection of Human Subjects. Participants were assessed during two sessions: first, on their annual Einstein Aging Study visit when they completed standard neuropsychological assessments, neurological and physical examinations (see [35] for details); second, approximately two weeks later when they completed study specific measures including the cognitive and physical activities questionnaire described below. Transportation to and from the Einstein Aging Study was provided, along with lunch and $25 for participation.

OUTCOME MEASURES

The type and frequency of cognitive and physical activity participants engaged in during a typical week over the past year was measured using a 26-item self-report questionnaire (see Table 2). The approximate duration spent on each activity per session was measured with choices of 30 minutes, 1 hour, or greater than one-hour. There were 15 cardiovascular and strength exercise items (e.g., walking, weight training) and 11 cognitive items (e.g. reading books, attending lectures). Physical and cognitive exercise scores were calculated by summing the number of times that participants reported engaging in each physical or cognitive activity for at least 30 minutes.

ANALYSES

We used descriptive statistics to identify the most frequently endorsed physical and cognitive activities. Additionally, we compared physical and cognitive activities based on two relevant dichotomized demographic designations, the first being education (12 years or less versus greater than 12 years) and the second being sex (male versus female). Mann Whitney-U tests compared scores for each of the physical and cognitive activities based on the education level and sex. All p-values were two-tailed. IBM SPSS Statistics Version 23 was used for all analyses [36].

RESULTS

DEMOGRAPHICS

Table 1 shows the overall sample characteristics. The mean age was almost 81 years.Those with over 12 years of education comprised roughly two-thirds of the sample. Women comprised slightly more than two-thirds of the sample and almost one-third were of African American race/ethnicity.

Table 1. Sample characteristics of 260 participants

Variable	Mean (SD)	Frequency (percentage)
Age (years)	80.80 (5.55)	
Education		
≤12 years	10.84 (2.04)	90 (34.6%)
>12 years	16.38 (2.22)	170 (65.4%)
Sex		
Women		176 (67.7%)
Men		84 (32.3%)
Race/ethnicity		
Caucasian		156 (60.0%)
African American		79 (30.4%)
Other		25 (9.6%)

Table 2 describes participation in physical and cognitive activities ranked by overall frequency and the percentage of study participants who reported engaging in the various activities. The top 5 most endorsed physical activities were walking, stretching/yoga, gardening, weight training, and dancing. The top 5 most endorsed cognitive activities were reading magazines or newspapers, reading books, doing crossword puzzles, surfing the internet, and attending lectures.

Table 2. Physical and cognitive activities ranked by overall frequency (n = 260)

Rank	Physical Activity	Weekly Session Frequency Mean (SD)	Overall Frequency (Percentage)
1	Walking	5.2 (4.83)	224 (86.2%)
2	Stretching/yoga	1.7 (2.70)	108 (41.5%)
3	Gardening	0.9 (2.02)	65 (25.0%)
4	Weight training	0.6 (1.54)	47 (18.1%)
5	Dancing	0.3 (1.20)	42 (16.2%)
6	Pilates/aerobics class	0.3 (1.22)	35 (13.5%)
7	Biking (stationary or real)	0.3 (1.24)	32 (12.3%)
8	Swimming	0.3 (1.12)	31 (11.9%)
9	Climbing/hiking	0.1 (0.71)	12 (4.6%)
10	Fishing	0.08 (0.57)	9 (3.5%)
11	Tennis	0.07 (0.54)	6 (2.3%)
12	Running	0.05 (0.38)	5 (1.9%)
12	Bowling	0.03 (0.24)	5 (1.9%)
14	Golfing	0.05 (0.50)	4 (1.5%)
15	Skiing	0.01 (0.15)	3 (1.2%)
Rank	Cognitive Activity	Weekly Session Frequency Mean (SD)	Overall Frequency (Percentage)
1	Reading magazines or newspapers	5.7 (3.61)	235 (90.4%)
2	Reading books	3.9 (4.17)	176 (67.7%)
3	Doing crossword puzzles	2.2 (3.04)	117 (45.0%)
4	Surfing the Internet	1.2 (2.33)	75 (28.8%)
5	Attending lectures	0.3 (1.01)	70 (26.9%)
6	Writing poems/stories/letters	0.7 (1.70)	62 (23.8%)
7	Playing card games	0.7 (2.03)	59 (22.7%)
8	Sewing/knitting	0.5 (1.88)	39 (15.0%)
9	Playing board games	0.3 (1.12)	35 (13.5%)
10	Doing crafts/pottery	0.1 (0.93)	15 (5.8%)
11	Playing a musical instrument	0.1 (0.68)	14 (5.4%)

Note: SD = standard deviation

Table 3 shows comparisons for the mean weekly session frequency of engagement in physical and cognitive activities by the dichotomized education levels. For physical activities, walking (p = .048) and swimming (p = .008) each had statistically significantly higher mean values for participants with education > 12 years as compared to those with education ≤ 12 years. Bowling (p = .031) had statistically significantly higher mean values for participants with education ≤ 12 years as compared to those with education > 12 years. For cognitive activities, reading newspapers or magazines (p = .011), writing poems, stories, or letters (p = .001), and attending lectures (p=.007) each had significantly higher mean values for participants with education > 12 years as compared to those with education ≤ 12 years. Reading books (p = .019) and sewing or knitting (p = .040) each had statistically significantly higher mean values for participants with education ≤ 12 years as compared to those with education > 12 years.

Table 3. Education comparisons for mean weekly session frequency for activity engagement (n = 260)

Physical Activity	≤12 Years Mean (SD) (n=90)	>12 Years Mean (SD) (n=170)	Mann Whitney U value	P value
Walking	5.1 (6.72)	5.3 (3.46)	6532.500	.048
Stretching/yoga	1.6 (2.78)	1.7 (2.67)	7254.000	.442
Gardening	0.7 (1.78)	1.0 (2.14)	7268.500	.384
Weight training	0.4 (1.39)	0.7 (1.61)	7120.500	.171
Dancing	0.2 (1.53)	0.3 (1.00)	7160.500	.185
Pilates/aerobics class	0.2 (1.15)	0.4 (1.26)	7138.000	.135
Biking	0.5 (1.68)	0.2 (0.92)	7467.000	.578
Swimming	0.1 (0.86)	0.4 (1.23)	6788.500	.008
Climbing/hiking	0.1 (0.75)	0.1 (0.69)	7499.000	.472
Fishing	0.04 (0.33)	0.1 (0.66)	7504.000	.426
Tennis	0.0 (0.00)	0.1 (0.67)	7380.500	.072
Running	0.0 (0.00)	0.7 (0.47)	7425.000	.101
Bowling	0.1 (0.40)	0.0 (0.07)	7354.000	.031
Golfing	0.1 (.080)	0.01 (0.23)	7440.000	.088
Skiing	0.0 (0.00)	0.02 (0.18)	7515.000	.206
Cognitive Activity	**≤12 Years Mean (SD)**	**>12 Years Mean (SD)**	**Mann Whitney U value**	**P value**
Reading magazines or newspapers	5.0 (3.62)	6.0 (3.56)	6333.500	.011
Reading books	4.4 (4.46)	3.9 (4.17)	6336.000	.019
Doing crossword puzzles	2.3 (3.05)	2.2 (3.04)	7172.500	.361
Surfing the internet	0.9 (1.94)	1.4 (2.49)	7107.500	.239
Attending lectures	0.3 (1.02)	0.4 (1.00)	6426.000	.007
Writing poems/stories/letters	0.3 (1.19)	0.9 (1.89)	6271.000	.001
Playing card games	0.6 (1.61)	0.8 (2.22)	7492.000	.709
Sewing/knitting	0.8 (2.71)	0.3 (1.21)	6915.000	.040
Playing board games	0.1 (0.40)	0.4 (1.35)	7087.500	.100
Doing crafts/pottery	0.5 (0.27)	0.2 (1.13)	7483.000	.474
Playing a musical instrument	0.02 (0.14)	0.1 (0.84)	7274.000	.096

Note: SD = standard deviation

Table 4 shows comparisons for mean weekly session frequency of engagement in physical and cognitive activities by sex. For physical activities, weight training (p = .009) and fishing (p = .003) each had statistically significantly higher mean values for males as compared to females. Dancing (p = .015) had a statistically significantly higher mean value for females as compared to males. For cognitive activities, reading books (p = .039), doing crossword puzzles (p = .003), and sewing or knitting (p = .001) each had statistically significantly higher mean values for females as compared to males.

Table 4. Sex comparisons for mean weekly session frequency for activity engagement (n = 260)

Physical Activity	Male Mean (SD) (n = 84)	Female Mean (SD) (n = 176)	Mann Whitney U value	P value
Walking	5.2 (4.18)	5.3 (5.13)	7322.000	.900
Stretching/yoga	2.0 (2.98)	1.56 (2.56)	6980.500	.416
Gardening	1.1 (2.11)	0.8 (1.98)	7061.000	.442
Weight training	1.08 (2.04)	0.4 (1.17)	6393.000	.009
Dancing	0.1 (0.37)	0.4 (1.43)	6506.500	.015
Pilates/aerobics class	0.2 (1.15)	0.4 (1.26)	7082.500	.357
Biking	0.4 (1.13)	0.3 (1.18)	7170.000	.493
Swimming	0.2 (0.94)	0.3 (1.20)	7363.500	.929
Climbing/hiking	0.1 (0.83)	0.09 (0.64)	6993.500	.053
Fishing	0.2 (0.97)	0.01 (0.10)	6855.000	.003
Tennis	0.05 (0.39)	.07 (0.60)	7384.500	.959
Running	0.07 (0.40)	0.3 (0.37)	7214.500	.188
Bowling	0.1 (0.10)	0.3 (0.29)	7311.000	.548
Golfing	0.07 (0.46)	0.4 (0.53)	7300.000	.447
Skiing	0.03 (0.24)	0.0 (0.07)	7257.500	.200
Cognitive Activity	Male Mean (SD)	Female Mean (SD)	Mann Whitney U value	P value
Reading magazines or newspapers	6.2 (3.92)	5.4 (3.44)	6807.000	.249
Reading books	3.2 (3.74)	4.3 (4.33)	6257.000	.039
Doing crosswordpuzzles	1.5 (2.75)	2.5 (3.12)	5888.500	.003
Surfing the internet	1.3 (2.43)	1.2 (2.28)	7352.000	.930
Attending lectures	0.3 (1.03)	0.4 (1.00)	6910.500	.276
Writing poems/stories/letters	0.5 (1.62)	0.7 (1.74)	6963.500	.312
Playing card games	0.5 (1.67)	0.8 (2.18)	6861.000	.201
Sewing/knitting	0.08 (0.49)	0.7 (2.23)	6245.000	.001
Playing board games	0.2 (0.64)	0.3 (1.29)	7360.000	.924
Doing crafts/pottery	0.2 (1.15)	0.1 (0.80)	7297.000	.678
Playing a musical instrument	0.1 (0.80)	0.1 (0.63)	7326.500	.768

Note: SD = standard deviation

DISCUSSION

Despite the extensive benefits associated with engagement in physical and cognitive activity [38, 39,13, 40, 41], comparatively little is known about the types of activities in which older adults regularly engage that correspond with the World Health's Organization and Centers for Disease Control and Prevention's minimum recommendation for physical activity [42, 43]. Therefore, we explored physical and cognitive activity engagement patterns and identified sex and education differences in a community-dwelling sample of non-demented older adults. We utilized a questionnaire that inquired about the duration of both physical and cognitive activities.

Overall, among 15 physical activities, the top 5 most endorsed were walking, stretching/yoga, gardening, weight training, and dancing. Notably, walking was endorsed by the overwhelming majority (over 85%) of participants – with no other activity even coming close in terms of percentage of participants. This is not surprising as walking is easy to do (compared to other activities) and offers many widely known benefits. Additionally, our results are consistent with studies from other countries, for example those showing walking and gardening are among the most preferred methods of physical activity [26, 44]. Our study also showed high endorsement for stretching/yoga, weight training and dancing. With the exception of weight training, walking, gardening, stretching/yoga and dancing fall in the category of aerobic physical activities, or physical activities that stimulate and fortify the heart and lungs, thereby improving the body's utilization of oxygen. Executed in moderate intensity, aerobic exercise can slow the degeneration of telomeres, a genetic structure important in protecting chromosomes from certain age-related health conditions [45]. Moreover, recent research suggests that aerobic exercise, such as running, enhances adult hippocampal neurogenesis in rodents – especially when the aerobic exercise is sustained. Though running was not among the most frequently endorsed physical activities in our sample, it is worth bearing in mind recent neuroscientific findings on the potential benefits of specific types of activities when clinicians make activity recommendations for older adults [46].

With regard to cognitive activities, the top 5 were reading magazines/newspapers, reading books, doing crossword puzzles, surfing the Internet, and attending lectures. Notably, only the reading activities were endorsed by the majority of participants with 90% reporting that they regularly read magazines/newspapers and close to 70% reporting that they regularly read books. Our participants appear to select cognitive activities that can be done at home (with the exception of attending lectures) and that are solo activities that do not require a partner. For both the physical and cognitive activities, older adults may make choices based on the perceived cost, time constraints, and required intensity – though we did not inquire about such issues.

With regard to engagement differences in physical activity by educational level, walking and swimming were most endorsed for individuals with education > 12 years as compared to those with education ≤ 12 years. Bowling was most endorsed for individuals with education ≤ 12 years. A nationwide study determined that individuals with ≤ 12 years of education were more likely to sit during their daily activity and be less physically active and to carry heavy loads as compared to individuals with education > 12 years [47]. These results are consistent with our study as bowling entails more sitting than most other physical activities as well as carrying a heavy load. It is also possible that older adults with > 12 years of education are aware of the health benefits associated with various activities and purposefully choose to engage in those most beneficial, e.g., swimming is associated with numerous health benefits [48, 49].

Examining cognitive activity by educational level revealed that reading newspapers/magazines, writing poems, stories, or letters, and attending lectures were most endorsed for individuals with education > 12 years as compared to those with education ≤ 12 years. Conversely, reading books and sewing/knitting were most endorsed for participants with education ≤ 12 years compared to those with education > 12 years. To our knowledge, no studies have examined cognitive activity in relation to education using such an analysis and the current findings are novel and require replication in light of the fact that restricted or limited education opportunities may preclude access or exposure to the vast array of activities that those with higher education levels typically experience. Of interest, a recent study of U.S. adults aged 50 and over found that those who read books for an average of 30 min per day have a survival advantage, compared to those who do not read books. Moreover, this advantage is significantly greater than that observed for reading newspapers or magazines and the effect does not appear to be driven by education (i.e., the protective effect of reading is observed in both low- and high-education groups). The authors suggest that books may engage the mind to a greater degree than newspapers and magazines, resulting in cognitive benefits that drive the effect of reading on longevity. Additional research is clearly required to compare the health benefits of reading-material type among older adults.

With regard to engagement differences in physical activity by sex, weight training and fishing were more endorsed for males as compared to females. Dancing was most endorsed for females as compared to males. When cognitive activities were dichotomized by sex, reading books, doing crossword puzzles and sewing and knitting were most endorsed for females as compared to males. Both sets of findings are consistent with gender stereotypes about preference for activity participation and may relate to differences in early socialization and cultural norms and values [50]. To the extent that learning something new can be both stimulating and rewarding, clinicians might consider recommending gender inconsistent activities or encouraging older adults to pair with someone of the opposite sex for novel activity engagement.

It is important to note that while we observed some differences in activity engagement by gender and the educational level, our findings revealed similar overall patterns, which suggests that activity interventions and recommendations may need to be minimally tailored to specific subgroups of older adults. Also, we opted to examine both physical and cognitive activity engagement because we feel it is important to increase participation inbothof these domains. Intervention studies focusing on increasing both physical and cognitive activity show greater improvement incognitive functioning than studies focusing on separately increasing either cognitive or physical activities [51]. Moreover, greater participation in cognitive, physical and social activity promotes better cognitive performance [52]. A meta-analysis study further suggested the additive benefits of combined physical and cognitive interventions for executive functions in a healthy sample of older adults [10], as well as pronounced cognitive and motor functioning improvements [53]. Lastly, a 6-year longitudinal study revealed that older adults' physical and cognitive engagement was associated with happiness, better functioning, and reduced mortality [54].

Even though growing health risks, disability, cognitive decline and mortality are associated with aging and a lack of exercise engagement [55, 56], close to two thirds of Americans are classified as having sedentary and underactive lifestyles, this being more so for females than males [47]. Engaging in physical activity for 30 minutes or more a day is most beneficial [23]. However, no minimum recommendation is known for cognitive activity. In the current study, we chose only to include the scores of individuals who engaged in cognitive activity for 30 minutes or more. Additional research is required to determine whether this is the optimal cut point (as it is for physical activities) and also to gauge whether or not older adults are meeting recommendations.

Our study had several strengths. We examined both physical and cognitive activities, unlike most studies that report them separately. We further investigated gender and education group differences across a broad range of diverse activities. Lastly, our study enrolled a healthy, high functioning ambulatory sample of older adults, which may serve as a comparison for future studies on institutionalized and non-ambulatory older adults. Several limitations also warrant mentioning. First, our relatively small sample size and access to older adults from a single geographic region (urban setting on the U.S. East Coast) limit the generalizability of our findings and may have diminished power to detect additional meaningful differences. Second, the self-report activity assessment precluded obtaining objective data since we are relying on subjective accounts, which may be over- or under-estimated due to recall bias. Third, the list of activities on the self-report questionnaire was not exhaustive and may have omitted relevant and often engaged-in items. For example, we neglected to inquire about watching television and listening to the radio, which are among the most engaged in activities for older adults. However, participants were provided with additional opportunities to list activities not already mentioned so this is less likely to be an issue. Lastly, beside examining the frequency and duration, as per current physical activity guidelines, future studies should examine intensity and individuals' physical capacity in order to tailor an appropriate activity dose.

CONCLUSIONS AND FUTURE DIRECTIONS

We offer several additional directions for future research. It would be helpful to understand the reasons why older adults engage or fail to engage in specific activities so that recommendations can be tailored based on preferences and accounting for recent research findings (e.g., possible health and survival benefits of reading books as compared to reading newspapers). Also, our findings, particularly for the cognitive activities, suggest that older adults tend to engage in cognitive activities that do not require a partner or partners. Future research should directly inquire about whether activities are engaged in alone or with others – as research has revealed the importance of social interactions in older adulthood and the benefits of leisure activities that have a social component [33, 22]. Our study and others [33, 21] underscore the importance of contextual factors in activity participation among the elderly. Future studies should also focus on interrelated variables, such as satisfaction with the activity, meaning/importance ascribed to the activity, as well as willingness to participate in the activity[33], and how these components are associated with the frequency or intensity of engagement.

Overall, our findings may be used to inform healthcare practitioners seeking to provide activity recommendations or design interventions to address and possibly modify mental and physical decline in the elderly. For instance, as women and those with less education may engage in fewer activities than their respective counterparts, presentation of a wider range of activity options from their clinicians may help to bridge this gap, potentially improving health outcomes and the quality of life. Likewise, as increasing functional limitations preclude engagement in typically endorsed activities, recommendations of other activities from which older adults can still derive the same or similar benefits may buffer against increased sedentariness and premature mortality. Finally government and/or social service agencies may create opportunities for older adults to carry out their favored activities in a safe and supportive setting (e.g., by organizing group walks, gardening clubs, or reading groups at community centers). Given the social and instrumental support component inherent in many leisure activities, increased engagement should help diminish the risk for social isolation and improve overall quality of life.

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