Intellectual and physical activities, but not social activities, are associated with better global cognition: a multi-site evaluation of the cognition and lifestyle activity study for seniors in Asia (CLASSA)

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Abstract

Background: population ageing will lead to a leap in the dementia population in Asia. However, information about potentials for low-cost and low-risk interventions is limited.

Objectives: to study the associations between lifestyle activities and global cognition from the Cognitive and Lifestyle Activity Study for Seniors in Asia (CLASSA).

Design: a cross-sectional study.

Methodology: we studied the association between global cognition and lifestyle activity participation in community living older adults (60 years or over) across nine sites in East Asia. A standardised lifestyle activity questionnaire exploring activities from four categories (intellectual, physical, social and recreational) was used to measure the pattern. Global cognition was categorised by locally validated versions of Mini-mental state examination (MMSE) or Montreal Cognitive Assessment (MoCA) (good cognition, GC—scored at the top 25% among participants with no significant cognitive deficit (SCD); normal cognition, NC—middle 50% among participants with no SCD; mild cognitive deficit, MCD—lowest 25% among participants with no SCD; SCD—below local cut-offs for dementia).

Results: two thousand four hundred and four (1,009 men; 1,395 women) participants were recruited. The mean age was 71.0 (7.2) years. A higher variety of intellectual and physical activities were associated with GC; more social activities were associated with higher risks of having impaired cognition (multinomial logistic regression). The same association was found in participants with no SCD and had regular activities for over 10 years (n = 574).

Conclusion: intellectual activity and physical exercise were associated with better cognitive states in Asian older adults. Community-based intervention may take considerations into specific types of activities to optimise cognition.

Keywords: cognition, intellectual activities, physical exercise, dementia, Asia, older people
An inevitable consequence of global population ageing is the increase in the proportion of older people living with dementia. The World Alzheimer Report 2009 estimated that there would be an 89 and 117% increase in dementia population in the developed Asia Pacific and developing East Asia in the next two decades [1, 2]. Despite intensive research in the past few decades, the search for disease-modifying pharmacological treatment for dementia has largely been unsuccessful [3]. On the other hand, increasing evidences suggest that lifestyle activities that optimise the use of compensatory cognitive strategies may help to preserve cognition at late life [4]. Epidemiologic and prospective observational studies suggested potential benefits of physical exercise and intellectual activities on cognition in late life. Long-term practice might help to delay cognitive decline and possibly delay the onset of dementia and mortality [5–9]. Recent neuroimaging studies showed that older adults with regular intellectual and physical activities were more resistant to age-related brain atrophy and may result in changes of default mode network connectivity [10–13]. This opens up a possibility that specially designed lifestyle activities may be developed into adjuvant intervention to attenuate cognitive decline in people at risks of developing dementia.

Lifestyle activity interventions to combat cognitive decline are of great interests to the developing Asia due to the low risks and low-cost implications. However, lifestyle activities are cultural specific issues. In the Asian societies with diverse cultural and ethnic background, it is important to explore whether lifestyle activities would be classified and evaluated with a standardised uniform framework. The Cognitive and Lifestyle Activity Study for Seniors in Asia (CLASSA) is a collaborative project under the Workgroup on Non-pharmacological Intervention for Dementia of the Asian Society Against Dementia (ASAD). It aims to (i) explore the lifestyle activity patterns among senior adults in Asia, (ii) examine the association between global cognition function and specific lifestyle activities and (iii) develop structured lifestyle activity intervention protocols for the preservation of cognitive function across different countries in this region. The present report focused on the classification and profiles of lifestyle activity participation and the association between global cognitive states and lifestyle activity patterns from nine participating sites in East Asia. We hypothesised that regular practice of intellectual activities and physical exercise would be associated with better cognition, and the number of activities performed is positively correlated with higher global cognitive function.

Methods

Study design

This is a cross-sectional evaluation of the association between global cognitive function and lifestyle activity participation.

Study sites and participants

Participants were recruited from nine sites in East Asia from 2011 to 2013 (Beijing (China), Hong Kong SAR (China), Bandung (Indonesia), Cipacing (Indonesia), Cilayung (Indonesia), Bangkok (Thailand), Taipei (Taiwan), Marikina (Philippines) and Kuala Lumpur (Malaysia)). Community living participants, aged 60 years or over, were recruited from the above nine sites through local community networks and social centres for senior adults. To recruit participants with a broad cognitive profile, we did not set strict criteria for inclusion. Major inclusion criteria were participants should be ambulatory and should not suffer from major medical conditions that grossly limit strength and mobility to participate in different lifestyle activities. Informed consent was obtained from the participants before assessment. Ethics approvals from the Institutional Review Board of respective sites were obtained before data collection.

Assessment tools

Classification and measurement of lifestyle activities

A study on classification of lifestyle activity commonly endorsed by Chinese seniors had been validated in Hong Kong. In the validation study, a focus group comprising care-for-the-elderly professionals was invited to identify leisure activities commonly practiced by Chinese older adults. An independent panel of occupational therapists was then invited to classify the activities into physical, intellectual, social and recreational categories according to the core characteristics of the activity [14]. Activities with predominantly cognitive efforts were classified as intellectual activities, whether they are conducted in groups or alone. Physical exercise was categorised according to the major modality of exercise, which included aerobic, mind-body or stretching exercise. Social activities referred to activities conducted in a social context, but they were mainly passive participation with low requirements for cognitive efforts. Recreational activities referred to activities with low cognitive or physical efforts, and were not necessarily conducted in a group gathering or requiring social interaction. The classification was further validated against the opinion of a convenience sample of healthy older adults. Thirty-three activities were identified, 13 were classified as intellectual, 8 as social, 9 as recreational and 3 as physical activities. The categorisation of activities in the CLASSA took reference to the checklist developed in Hong Kong. For each activity reported, the duration (years) and frequency of practice per week were documented. Activity was counted with a minimum regular attendance of once every 2 weeks.

Global cognitive states

As normative data for global cognitive tests vary in different centres, we adopted a simple reference guide to decide on global cognitive states across different centres. Global cognition states were evaluated by the locally validated versions of Mini-mental State Examination (MMSE) [15] or Montreal Cognitive Assessment (MoCA) [16]. Four categories of global cognitive states were derived from the MMSE or MoCA
Association of intellectual and physical activities with better global cognition

Sample size estimation

Sample size was estimated by G*Power 3.1. In a previous study conducted in community-dwelling older adults in Hong Kong, the number of intellectual activities was associated with a lower incidence of global cognitive decline as measured by the Cantonese version of MMSE in 2 years (odds ratio 0.74, 95% CI 0.58–0.95). Taking a more conservative estimation of odds ratio as 0.85 in a cross-sectional design, 1,469 participants should be assessed to achieve a power of 0.8 with alpha 0.05.

Data analyses

The pattern of activity participation in relation to demographic profiles of participants was reported. Association between the number of activities participated in each category and global cognitive states was evaluated. As the questionnaire has been validated in the Chinese older community, we analysed the demographic correlates of leisure activities in Chinese and non-Chinese communities, respectively, to examine whether the questionnaire would be appropriately adapted in other centres. Regression analyses were carried out to study the effects of associative factors for global cognition (dependent variable). Factors of interests included the number of activity participated in each category and significant correlates including age, gender and education attainment as they are significantly associated with cognitive status (independent variables). To address the effects of possible lifestyle activity pattern changes due to cognitive decline, regression analyses on the effects of activity on global cognition were also conducted in a subgroup of participants who had at least one activity practiced for 10 or more years in each category. Analyses were conducted with the PWAS 20.0, and significance was set at \( P < 0.05 \). Reporting followed the STROBE checklist for observational study.

Table 1. Demographic characteristics and lifestyle activities of different cognitive groups

<table>
<thead>
<tr>
<th></th>
<th>Good cognition</th>
<th>Normal cognition</th>
<th>Mild cognitive deficits</th>
<th>Major cognitive deficits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>68.9 (6.3)</td>
<td>70.8 (7.0)</td>
<td>72.5 (7.5)</td>
<td>74.5 (7.9)</td>
</tr>
<tr>
<td>Gender (Men/Women)</td>
<td>349/407 (56%/54%)</td>
<td>376/470 (45%/56)</td>
<td>209/322 (39%/61%)</td>
<td>75/196 (28%/72%)</td>
</tr>
<tr>
<td>Education (years)</td>
<td>7.0 (4.7)</td>
<td>7.1 (4.3)</td>
<td>4.7 (3.7)</td>
<td>3.6 (3.3)</td>
</tr>
<tr>
<td>MMSE score</td>
<td>29.5 (0.5)</td>
<td>27.2 (0.8)</td>
<td>23.2 (1.6)</td>
<td>14.6 (4.2)</td>
</tr>
<tr>
<td>Intellectual activities (a)</td>
<td>2.5 (1.5)</td>
<td>1.5 (1.2)</td>
<td>1.1 (1.1)</td>
<td>0.6 (0.8)</td>
</tr>
<tr>
<td>Physical activities (a)</td>
<td>1.5 (0.9)</td>
<td>1.2 (0.8)</td>
<td>1.0 (0.8)</td>
<td>0.6 (0.7)</td>
</tr>
<tr>
<td>Social activities (a)</td>
<td>2.3 (1.8)</td>
<td>1.8 (1.6)</td>
<td>1.8 (1.5)</td>
<td>2.5 (1.5)</td>
</tr>
<tr>
<td>Recreational activities (a)</td>
<td>3.1 (1.6)</td>
<td>2.6 (1.6)</td>
<td>2.5 (1.6)</td>
<td>2.5 (1.5)</td>
</tr>
<tr>
<td>Total number of activity</td>
<td>9.5 (4.2)</td>
<td>7.2 (3.8)</td>
<td>6.5 (3.6)</td>
<td>5.5 (3.0)</td>
</tr>
</tbody>
</table>

Number of activity was counted with a minimum regular attendance of every 2 months. Comparison between groups, one-way ANOVA, \( P < 0.001 \).
and recreational activities (at least once weekly participation). Global cognitive states were associated with the number of activities engaged in each category and total number of activities in all categories combined ($P < 0.001$). Advancing age was associated with a reduction in all kinds of activities (Pearson correlation, $P < 0.001$), whereas higher educational attainment was positively correlated with the number of activities performed in all categories (Pearson correlation, $P < 0.001$). There was also a positive correlation between activity categories. A higher number of participation in any activity category was associated with higher participation in other categories ($P < 0.001$).

There was no gender difference in the total number of lifestyle activities participated (Mann-Whitney U test). Men were more likely to participate in more types of intellectual activities (average number, 1.9 versus 1.5, $t$-test, $P < 0.001$). Women participated in more recreational activities (average number of recreational activities in men and women, 2.5 versus 2.9, $P < 0.001$). Women had a higher variety in social and physical activities in Chinese communities, whereas men in non-Chinese communities had a higher variety of social and physical activities.

**Global cognition and lifestyle activities**

There was a decrease in the number of intellectual and physical activity participation from groups with high to low cognition (ANOVA, post hoc comparison, $P < 0.001$). In addition to physical and intellectual activities, the GC group participated with a higher variety of social and recreational activities. There was no difference in participation of social and recreational activity number among the NC, MCD and SCD groups (ANOVA, post hoc comparisons).

After controlling for the effects of age, education and gender, a higher variety of intellectual activities and physical exercise was associated with a higher chance to have GC. Participation in a greater number of social activities was associated with higher risks of having impaired cognition with MCD or SCD cognitive deficit (multinomial logistic regression, $P < 0.001$) (Table 2).

Regression analyses repeated in the subgroup of participants having regular participation in at least one activity in each category for over 10 years ($n = 574$) showed that education and the number of intellectual activities were higher in the GC compared with those in the NC group. Compared with the GC group, the MCD group had lower educational attainment, participated in fewer intellectual activities and physical exercise, and more social activities (Table 3).

**Discussion**

This study is the first multi-national survey that examined the lifestyle activity profiles of East Asian older adults and its relationship with global cognition. In spite of the diverse cultural and ethnic background, it was feasible to adopt a standardised classification of lifestyle activity participation in ageing research. The findings suggested that intellectual activities, and possibly physical exercise, were independently associated with a higher chance of having better global cognition.

Participants with GC practiced more lifestyle leisure activities of all kinds (intellectual, physical, social and recreational). A high participation of leisure activities demands good organisation and prioritisation of time and schedule. This
may become challenging when different cognitive abilities such as attention, executive function and memory became compromised. It is thus possible that people with cognitive decline were not able to keep up with the activity schedule that they usually performed. A progressive reduction in the number of intellectual activities and physical exercise was observed with increasing cognitive deficit. While causative influence would not be demonstrated by a cross-sectional survey, our data were consistent with available literature supporting that intellectual and physical activities might help to preserve cognition [24–26]. The effects of intellectual activities appeared to be stronger in this sample, especially when the good and NC groups were compared. Apart from possible different effect sizes of intellectual activities versus physical exercise in cognition, the generally more sedentary lifestyles of senior citizens in Asia may also influence the findings.

It is of interests to note that more social activities were not protective of cognitive function in our study. The negative association between social activities and cognitive function persisted when subgroup analyses with participants who had activities for over 10 years were performed. Although it is possible that there is a gradual relinquishment of more challenging intellectual and physical activities to passive social participation with ageing and progressive cognitive decline, the findings may also suggest that simple social activities are not be particularly helpful in optimizing cognition in the long term. Under the current classification, social activities were categorised on the characteristics of activities conducted in a social context, but with relatively passive participation and low cognitive demand. The passivity may not be particularly beneficial to for enhancing cognitive reserve. However, it important to examine the specific effects of social interactions independent of cognitive demands on brain health in future studies.

The hypotheses on the benefits of intellectual and physical activities are related to enhancing neuroplastic response with better employment of compensatory cognitive strategies. An active cognitive lifestyle appeared to be associated with neurotrophic changes in the prefrontal lobes consistent with a compensatory process [27]. A common element between intellectual activities and physical exercise is the need for cognitive efforts, highlighting the importance of active participation.

The results of CLASSA should be interpreted in the context of its limitations. Assessment of global cognition was based on either MMSE or MoCA, as they were the only commonly used cognitive assessment that had been validated locally. We were not able to conduct a comprehensive set of cognitive evaluation, as a standardised comprehensive cognitive battery across all nine sites had not yet been available. Also, clinical diagnosis of dementia was not ascertained by standardised diagnostic criteria or neuroimaging investigation. We tried to adopt a simple grouping of global cognitive states for cross-centre comparison. Second, there were variations in cognitive profiles of participants in different centres as the recruitment had been on convenient samples of community-dwelling subjects from a diversity of cultural background. Thirdly, as different activity types possess different characteristics in terms of frequency and duration of practice, we limited our interpretation to the variety (number) of activity performed to reduce biases in interpretation. Fourthly, this was only a cross-sectional evaluation with limited power to infer causative influence of findings. Also, the activity classification had been developed in the Chinese community, and Chinese old adults were over-represented. As the associations between demographic characteristics, global cognition and activity participation were similar between the Chinese and non-Chinese communities, we hoped that the analyses with the whole sample would be able to give an accurate reflection of the characteristics of older adults across East Asia.

In this study, we managed to prepare a minimal data set about cognition and lifestyle activity profiles with a uniform activity classification. It provides useful information for the design of activity intervention in community-based dementia prevention programs. Selection of choice and activity types should be carefully planned to optimise potential benefits. While social activities may help to engage older adults with potentially positive emotion, a more focused approach on combined intellectual activity and physical exercise may be alternative options to enhance cognitive benefits in the older populations at risk of cognitive decline.

**Key points**

- The pattern of lifestyle leisure activities is associated with global cognitive function in older adults.
- Long-term participation of intellectual activities and physical exercise may be associated with better cognition.
- Social activities with not much cognitive demands are not protective for global cognition.

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**Conflicts of interest**

None declared.

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The study was approved by the ethics committees of all participating sites.

Authors’ contributions

L.C.W.L. designed the study, analysed and interpreted the data, wrote the manuscript. A.W.T.F. and K.L. contributed to the data collection in Hong Kong and data interpretation. P.A.O., J.D., H.W., N.Z., W.X., J.D., V.Z., S.Y. and J.L.F. contributed to the study design, conducted data collection in respective sites, made significant contribution to the manuscript. All authors declare that they accept full responsibility for the conduct of the study, had access to the data and authorised the decision to publish. They also agreed for sharing of data in the study as appropriate.

References


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