Trajectories of different cognitive domains in community-dwelling older adults

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Age-associated cognitive decline

• Healthy older adults have decreased performance in executive function, verbal memory, and processing speed (Deary et al. 2009; Hedden and Gabrieli 2004; van Hooren et al., 2013)

• People differ in the degree to which their brains decline with age

• Engagement in mind stimulating activities in daily life may build one’s cognitive reserve capacity

Protective effect of cognitive activities

Cognitively normal elderly individuals who engage in specific mental stimulating activities even in late life have a deceased risk of incident mild cognitive impairment.

Krell-Roesch JAMA Neurology; 74(3):332-338.
Background of the study: A longitudinal study of an Ageing-In-Place Scheme

• An Ageing-In-Place (AIP) Scheme was implemented in 11 public housing estates managed by the Hong Kong Housing Society
• The Scheme aims to improve older tenants’ health and wellbeing so that they are more willing to age in place
• Group-based cognitive activities would be organized for older tenants with lower cognitive function
• Assessment was conducted at baseline (before the AIP Scheme) and at 1 year
Q1. What is the difference in the rate of change in different cognitive domains among a cohort of healthy older adults?

Q2. Are daily mind stimulating activities and structured cognitive activities effective in maintaining cognitive function or delaying the decline? If yes, which type of activity will have a stronger effect?

Methods

**Design**
A prospective cohort study of older adults living in public rental estates with an Ageing-in-Place Scheme

**Participants**
1 300 older residents (65+) without a dementia diagnosis

**Sampling**
Random quota-sampling by age-group (65 – 74; 75 – 84; 85 and above)

**Measures**
Baseline and 1-year follow up assessment on MoCA, lifestyle, health status, & demographics

**Cognitive activity**
Engagement in daily mind stimulating activities and structured cognitive activities

**Data analysis**
Random-effects regression models to assess the trajectory of cognitive function
Demographics and cognitive change over one year

MoCA T0: mean = 20.0 (SD=5.6)
MoCA T1: mean = 20.3 (SD=5.8)

Paired t-test
\[ t = 2.1, P = 0.035 \]

The change became n.s. when age, education, and gender were controlled for.
Significant improvement in visual-spatial ability ($P = 0.014$)

Younger age groups had greater improvement (time x age, $P = 0.039$)
Cognitive domains remained stable over time

- No significant change in delayed recall, naming, attention, orientation, & language over time
- Age does not modify the rate of cognitive change
Cognitive domain declined at 1 year

Significant decline in abstract thinking ($P = 0.001$)

Cognitive decline diminished in the older age group (time x age, $P = 0.039$)
Q2. Are daily mind stimulating activities and structured cognitive activities effective in maintaining cognitive function or delaying the decline? If yes, which type of activity will have a stronger effect?
Cognitive Activity Participation

Daily Mind Stimulating Activities (Baseline)
• In a typical week, do you do activities that challenge and stimulate your mind most days of the week? For example, reading, writing, playing a musical instrument, doing crosswords or learning new activities/skills.
  • 5 days or more a week
  • 3-4 days a week
  • 0-2 days a week

Structured Cognitive Activities in the past year
• Group-based cognitive stimulating activities and training organized by the public housing estates. For example, memory training, cognitive stimulation therapy, Six Arts, reminiscence therapy etc.
Cognitive Activity Participation

Daily mind stimulating activities (baseline)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 2 days a week</td>
<td>70%</td>
</tr>
<tr>
<td>3 – 4 days a week</td>
<td>9%</td>
</tr>
<tr>
<td>5 days or more a week</td>
<td>21%</td>
</tr>
</tbody>
</table>

Structured cognitive activities in the past year

<table>
<thead>
<tr>
<th>Participation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>32%</td>
</tr>
<tr>
<td>No</td>
<td>68%</td>
</tr>
</tbody>
</table>
# Cognitive Activity Participation

<table>
<thead>
<tr>
<th></th>
<th>No participation (49%)</th>
<th>Daily mind stimulating activities only (25%)</th>
<th>Structured cognitive activities only (19%)</th>
<th>Participated in both types of activities (7%)</th>
<th>Between group comparison, $p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>78.54 (7.70)</td>
<td>77.77 (8.47)</td>
<td>80.48 (6.96)</td>
<td>81.63 (7.43)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Female gender</td>
<td>352 (55%)</td>
<td>149 (47%)</td>
<td>161 (67%)</td>
<td>54 (61%)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Education</td>
<td>4.44 (3.85)</td>
<td><strong>5.49 (4.13)</strong></td>
<td>3.48 (4.09)</td>
<td>3.39 (3.82)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>MoCA at T0</td>
<td>20.52 (5.74)</td>
<td><strong>21.77 (5.11)</strong></td>
<td>17.13 (4.73)</td>
<td>18.01 (4.45)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>MoCA at T1</td>
<td>20.09 (5.96)</td>
<td><strong>21.84 (5.49)</strong></td>
<td>18.76 (5.48)</td>
<td>19.81 (5.88)</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Younger, more educated, and better general cognition
General cognition

Key Findings

- Older residents who joined structured activities had lower baseline MoCA scores
- After adjusting for activity pattern and other factors, MoCA decreased by 0.38 points in 1 year (coef. = -0.38; P = 0.029)
- The SCA and MSA+SCA groups showed improved general cognitive performance
- Daily mind stimulating activities alone did not modify the rate of change
Cognitive change predicted by both daily mind stimulating activities and structured cognitive activities

Key Findings

- **Naming** ability was maintained one year later, but cognitive activity participation predicted significant improvement in scores.
- Effect of participation in structured activities > daily mind stimulating activities.
- Greatest improvement in the group which participate both types of cognitive activities.
Cognitive change predicted by structured cognitive activities

Key Findings

- Delayed recall, language, attention and abstract thinking were maintained one year later and participation in structured cognitive activities predicted significant improvement in scores.

- No effect for daily mind stimulating activities alone.

- Greater improvement in the group which participate both types of cognitive activities (except for delayed recall).
Cognitive change not predicted by cognitive activity participation

- **Visual-spatial** ability improved regardless of cognitive activity participation
- **Orientation** ability declined regardless of cognitive activity participation
Summary of findings

• Cognitive functioning of this cohort of 1300 healthy older adults was largely maintained over 1 year. Cognitive activity participation did not predict the overall change in general cognition, but in selected cognitive domains.

• Lifestyle pattern in late-life was associated with early life factors (i.e., education). Older adults with higher education tended to engage in more mind stimulating activities in daily life in late life, subsequently building a greater cognitive reserve. But the activities did not predict the rate of cognitive decline/change.

• Structured cognitive activities, especially for older adults with mild cognitive impairment, reduced the risk of cognitive decline. However, these activities showed little positive effect on orientation.

• Greater positive change when older adults engaged in both types of activities

• Unknown longer term benefit of structured cognitive activities
Discussion and Implications

• An unique community sample that could simultaneously examine the effects of daily mind stimulating activities and cognitive-based interventions

• Late life cognitive activities – a reflection of early life education? Does it independently influence the cognitive reserve and cognitive functioning in late life?

• Structured cognitive activities bring short-term benefit; longer term studies to examine the sustained effect are warranted

• The positive change in visual-spatial ability could not be explained by cognitive activity participation, but possibly by other interventional components and practice effect.