The relationship between cognitive reserve and change in cognition during the first 3 months post-stroke

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Background

Impaired memory and executive function (EF) are commonly seen post-stroke. Cognitive reserve (CR), the brain’s ability to adapt from damage and degeneration, has been suggested as a protective factor for cognitive impairment in stroke research. However, the association between CR and post-stroke cognition has not been sufficiently studied.

We aimed to study:

- The association between CR and cognitive function (memory and EF) at 1 week and 3 months post-stroke
- The association between CR and change in cognitive function during the first 3 months post-stroke

Method

Patients with ischemic stroke were assessed with a battery of neuropsychological tests within 1 week and followed up at 3 months post-stroke. Multiple linear regression was used to estimate the relationship of CR proxies with cognition, controlling for age and sex.

CR variables:
- Years of education
- Career (ISCO-88; 4: intellectuals, 3: mixed, 2: elementary occupations, 1: none)
- IQ (composite variable: National Adult Reading Test, Matrix Reasoning (WASI) & Vocabulary (WASI))

Measures of cognition (Using composite variables):
- Memory: RAVLT (immediate and delayed recall), Digit Span (WAIS-III) & Spatial Span (WMS-III)
- EF: Trail Making Test A&B (Halstead-Reitan), Digit Symbol Coding (WAIS-III), Colour-Word Interference Test 3&4 (D-KEFS)

Change in cognitive function: Memory/EF scores at 1 week subtracted from Memory/EF scores at 3 months

Results

Patient characteristics (N=79)

Sex: 34.0% female
Age: (M±SD) 64.4 ± 9.0 years
Education: 11.0 ± 2.9 years
NIHSS score first day in hospital (M±SD): 3.6 ± 3.3
NIHSS score at 3 months post-stroke (M±SD): 0.66 ±1.59

Table 1:
Relationship of CR proxies with cognitive function at 1 week and 3 months

<table>
<thead>
<tr>
<th></th>
<th>Memory 1 week</th>
<th>Memory 3 months</th>
<th>EF 1 week</th>
<th>EF 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>β=.13</td>
<td>β=.15</td>
<td>β=.18</td>
<td>β=.26*</td>
</tr>
<tr>
<td>IQ</td>
<td>β=.48**</td>
<td>β=.67**</td>
<td>β=.63**</td>
<td>β=.68**</td>
</tr>
<tr>
<td>Career</td>
<td>β=.10</td>
<td>β=.03</td>
<td>β=.10</td>
<td>β=.05</td>
</tr>
</tbody>
</table>

Note: **p<.00833 (Bonferroni correction), *p<.05; Controlled for age and sex.

Table 2:
Relationship of CR proxies with change in cognitive function during the first 3 months post-stroke

<table>
<thead>
<tr>
<th></th>
<th>Change in memory</th>
<th>Change in EF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>β=.42*</td>
<td>β=.15</td>
</tr>
<tr>
<td>IQ</td>
<td>β=.26</td>
<td>β=.13</td>
</tr>
<tr>
<td>Career</td>
<td>β=.20</td>
<td>β=.24</td>
</tr>
</tbody>
</table>

Note: **p<.00833 (Bonferroni correction), *p<.05; Controlled for age and sex.

Conclusion

Of the studied CR proxies, only IQ was significantly associated with cognitive function at 1 week and 3 months post-stroke. The association between CR and change in cognitive function was not significant, indicating that CR may not promote improvement of cognitive function during the first 3 months post-stroke. More research exploring how different factors (e.g. stroke severity or time since stroke) may affect the association between CR and cognitive change is needed.