Cognitive Reserve: Implications for Research in Dementia among People with Down’s syndrome
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COGNITIVE RESERVE

Concept of reserve is basis of a theory to explain disparity between degree of brain damage/brain pathology and observed clinical manifestations of dementia (Stern, 2009).

Individual differences in physiological attempts to manage brain damage reflect use of pre-existing cognitive processes (actively accumulated in cognitive reserve) and determine how well the individual will cope with brain pathology.

A systematic review on brain reserve and dementia. (Valenzuela and Sachdev 2006) found based on over 29,000 individuals, that high brain reserve was associated with an approximate 50% reduction in measured incidence of dementia.

DOWN’S SYNDROME AND DEMENTIA

Brain phenotype in people with Down’s syndrome (DS) supports overall neuropathological dysfunction with specific deficits in prefrontal, hippocampal and cerebellar functions.

Increased production of Aβ peptide due to an extra copy of the amyloid precursor gene on chromosome 21 results in a Dementia Syndrome in later life among people with DS that is phenotypically similar to Alzheimer’s disease (Krasuski et al, 2001). However, brain pathology is measureable much earlier than clinical symptoms.

Theories to explain the difference between when neuropathological and observable clinical features appear include:
- Amyloid plaques may not point to Alzheimer’s, but rather to another disorder
- People with DS may be protected from clinical onset
- Clinical dementia may be under detected due to difficulty with diagnosis

COGNITIVE RESERVE, DOWN’S SYNDROME AND DEMENTIA

Reserve hypotheses developed in the 1990s have moved from the testing of anatomical concepts to consideration of the functional implications. (Fragliotti et al., 2007).

High reserve is seen as likely to delay onset of clinical symptoms (Barulli & Stern, 2013).

Cognitive reserve is often estimated using variables such as occupation, educational attainment and degree of literacy. (Prakash et al., 2011).

People with Down’s syndrome often have not had the same opportunities for education, experiential learning and employment, i.e., to build reserve, and thus, brain insults such as Alzheimer’s disease may more rapidly reduce functioning.

IMPLICATIONS AND NEXT STEPS

Building and maintaining cognitive reserve is an active model - cognitive training may increase levels of reserve. Research on cognitive training may also provide information on the extent and mechanisms of brain plasticity in older adults.

Evidence that cognitive reserve is closely related to executive function capacity (Tucker, Stern, 2011), and to activity in the frontal lobe (Roldan-Tapia et al, 2012).

After 4 years of following a cohort of 700 older adults, those engaged activities such, reading newspapers, playing puzzle games and visiting museums on a regular basis were found, on average, to have 47% less at risk of developing Alzheimer’s disease than those who rarely engaged in these activities (National Institute on Ageing, 2012).

Growing body of work on cognitive training for older adults does not include older adults with DS despite adults with DS being at much greater risk of developing dementia than adults with ID from other aetologies and without ID.

Study currently underway to examine feasibility of cognitive training in people with Down’s syndrome and how this may influence levels of executive function and cognitive reserve.

Research Aim: To test the feasibility of using a cognitive training programme with adults with DS

Sample: A cohort of 20-30 individuals with Down’s syndrome aged 30-49 with a mild level of intellectual disability and without a diagnosis of dementia will be drawn from Memory Clinics at two services providers in Ireland

Intervention: Scientific Brain Training PRO, a program previously used successfully with individuals with intellectual disabilities offers a series of standard and specialized programs using fun and interactive games to target stimulation of key cognitive functions. Training using individual iPADS will be 20 minutes each day, five days per week for three months

Measures: Cambridge Executive Function Assessment (CEFA); Behaviour Rating Inventory of Executive Function – Adult (BRIEF – A); Cognitive Reserve Index questionnaire

Analysis Plan: Pre and post interventions scores on outcome measures will be compared.

REFERENCES


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