A Preliminary investigation into the psychometric properties of the Dublin Extrapersonal Neglect Assessment (DENA): an MSc research study with MaryBeth Gallagher at the University of Limerick

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Presentation overview

- Presenting the research process
- Particular emphasis on the clinically relevant aspects to maximise knowledge translation of
  - the neglect syndrome
  - assessing neglect
  - implementation of the DENA
- Conclude with implications for research and clinical practice
Neglect is more than visual inattention

- Has been defined as

  “the impaired or lost ability to react to or process sensory stimuli (visual, auditory, tactile, olfactory, imaginal) presented in the hemispace contralateral to a lesioned cerebral hemisphere or to act upon such stimuli motorically (motor neglect)” (Kerkhoff and Rosetti 2006, p.201)

The Neglect Syndrome

- Can occur following injury to both right and left cerebral hemispheres
- Can affect three different regions of space with dissociations existing (Halligan et al 2003; Beschin and Robertson 1997)
  - Personal or body neglect
  - Spatial neglect
    - Peripersonal (reaching) space
    - Extrapersonal (beyond reaching) space
- Double dissociations for perceptual and imaginal/representational neglect (Doricci et al 2005)
Assessing Neglect: what is recommended

- Timely and accurate ax constitutes critical component of best practice in stroke rehab (Menon & Korner-Bitensky 2004)
- Should be assessed formally when suspected clinically (IHF 2010; RCP 2012)
- Presence of neglect should be assessed in all three regions of space (Menon-Nair et al 2007)
- Some authors recommend that all stroke patients be screened for neglect (Edwards et al 2006; Menon-Nair et al 2007).
Importance of accurate assessment of neglect

- Accurate ax of neglect by OTs is crucial to optimise functional outcomes in stroke rehabilitation (Menon-Nair et al 2007)
- Rehabilitation of neglect is most effective when interventions are tailored to specific neglect presentations (Bowen et al 2005)
- Neglect is associated with a
  - longer LOS (Cherney et al 2001)
  - lower performance on pADL and iADL measures (Katz et al 1999)
  - reading and writing difficulties (Cherney et al 2001)
  - less likelihood of returning home (Wee and Hopman 2008)
Assessing neglect: challenges

- Axs typically involve pen and paper tasks completed in peripersonal space
- Axs are largely impairment-based
- Not all clinical manifestations of neglect syndrome are assessed by instruments
  - Extrapersonal neglect
  - Motor neglect
  - Sensory modalities other than vision

Study Rationale

- Extrapersonal neglect is overlooked in table-top based assessments
- Paucity of extrapersonal neglect measures
  - Wheelchair Collision Test (Qiang et al 2005)
  - Catherine Bergego Scale (Azouvi et al 1996)
- Existing assessments have been criticised for lengthy administration times (Bowen et al 2005; Ting et al 2011)
- A time-efficient psychometrically sound screening tool for extrapersonal neglect would assist occupational therapists in
  - identifying clients who require further in-depth ax using the CBS
  - guiding OT interventions to maximise stroke rehabilitation outcomes.
Research Question

Does the Dublin Extrapersonal Neglect Assessment (DENA) have construct validity and inter-rater reliability?

Research Aim

- To establish the psychometric properties of a quick and easy to administer screening tool that measures extrapersonal neglect in the acute phase of stroke recovery.
Methodology

- Mater Research Ethics Committee granted ethical approval and all participants provided written, informed consent
- Method comparison study design
- Consecutive series, cross-sectional sample
- N=50 admitted with 1st time stroke
- Use of a healthy sample was avoided to minimise spectrum bias as healthy controls can over-estimate a measure’s diagnostic accuracy (Lijmer et al 1999).

Study Sample

- Inclusion criteria
  - Sufficient capacity to provide informed consent
  - Medically stable with sufficient postural control to be sat out to facilitate participation
- Exclusion criteria
  - Pre-existing visual impairment(s) that would preclude ability to view visual targets used in DENA i.e. macular degeneration

NB Information leaflet and consent form were universally designed to meet stroke population requirements
Study Sample

- 21 females
- Mean age 64.6yrs (SD: 16.8, range: 27-93)
- Mean days since stroke onset 12.84 (SD: 10.9, range 3-62)

Novel test - DENA

- 20 diamonds positioned at varying heights on both sides (10 per wall) 30m long corridor in therapy area
- Instruction sheet was presented and read aloud
- Participants were asked to point to diamonds they see
- Contralateral and ipsilateral omissions were recorded
Established test - Catherine Bergego Scale
(Azouvi et al 2003)

- Psychometrically sound occupation-based assessment of neglect
- Takes account of visual, auditory and motoric aspects of the neglect syndrome
- Assesses neglect in all three regions of space
- Involves naturalistic observation of 10 ADLs
- Scoring consists of a four point scale (0-3) for each item to determine severity; total score /30 is given.
  - Score of 0 = no neglect
  - Score of 1-10 = mild behavioural neglect
  - Score of 11-20 = mod behavioural neglect
  - Score of 21-30 = severe behavioural neglect
CBS SCORING SHEET

Name:____________________
Date:_____________________
Assessor:__________________
Lesioned Hemisphere:_______

<table>
<thead>
<tr>
<th>CBS items</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>1 Forgets to shave or groom the affected side of his/her face</td>
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<td>2 Experiences difficulty in adjusting his/her sleeve/slipper on affected side</td>
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<td>3 Forgets to eat food on the affected side of the plate</td>
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<td>4 Forgets to clean the affected side of his/her mouth after eating</td>
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<td>5 Experiences difficulty looking towards the affected side</td>
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<td>6 Forgets about an affected part of his/her body (e.g. forgets to put his/her affected limb on armrest, or his/her affected leg on footrest, or forgets to use his/her affected arm when he/she needs to)</td>
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<tr>
<td>7 Has difficulty paying attention to noise or people addressing him/her from the affected side.</td>
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<td>8 Collides with people or objects on the affected side, such as doors or furniture (either while walking or driving a wheelchair)</td>
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<tr>
<td>9 Experiences difficulty in finding his/her way towards the affected side when travelling in familiar places or in the rehabilitation unit</td>
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<tr>
<td>10 Experiences difficulty finding his/her personal belongings in the room or bathroom when they are on the affected side</td>
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</tbody>
</table>

Total /30

Study Protocol

- DENA was administered twice by 2 raters on consecutive days
- Raters were the 2 OTs working in the stroke service (LC and CF)
- CBS completed by LC with all study participants before DENA to avoid expectation bias
- Extrapersonal sub-score (CBS-E) was calculated in addition to total score for additional comparison with DENA
- CBS and CBS-E scores were compared with DENA scores as rated by CF to avoid expectation bias
Data Analysis

Inter-rater reliability
- Agreement between two DENA raters:
  - Kappa statistic
  - Intraclass Correlation Co-efficients (ICCs)
  - Bland Altman graphical method

Construct Validity
- Agreement between DENA and total CBS:
- Agreement between DENA and CBS-E:
  - Kappa statistic
  - Intraclass Correlation Co-efficients (ICCs)
  - Bland Altman graphical method
- Z-scores calculated prior to Bland Altman calculation as DENA and CBS use different rating scales

Biostatistician advised on data analysis

Results
- RH stroke n = 21 (16 had CBS score ≥1)
- LH stroke n = 20 (5 had CBS score ≥1)
- Bilateral strokes n = 5
- Subcortical stroke n = 4
- 21/50 (42%) pts scored as having neglect according to CBS
- 20/50 (40%) pts had extrapersonal neglect as per CBS-E
- 4 pts had confirmed VFD with a CBS score of 0 (no neglect).
Results

DENA score interpretation

- Cut-off score ≥2 contralateral omissions indicated extrapersonal neglect
- 20/50 (40%) sample presented with extrapersonal neglect on the DENA as rated by CF
  - 16/50 (32% of sample) had RHS
  - 4/50 (8% of sample) had LHS
- Of these 20 ptpts:
  - 19 (95%) had extrapersonal neglect as per CBS-E score
  - 18 (90%) had neglect as per DENA as rated by LC
  - 2 ptpts had R HH and omitted 2 and 4 contralateral diamonds, ptpts with left VFDs omitted no diamonds

Inter-rater reliability

- $k = 0.876$ (p < 0.001)
- ICC = 0.971 (95% CI: 0.949, 0.983)
- Bland Altman plot noted a mean difference = 0.4 (95% CI: -3.269, 2.469) indicating an acceptably small bias between raters.
DENA and CBS comparison

- Kappa = 0.793 (p < 0.001)
- ICC = 0.870 (95% CI: 0.781, 0.924).
- Bland Altman plot demonstrates consistent agreement between the two measures across the range of standardised mean scores, all scores fell between the 95% limits of agreement.

DENA and CBS-E comparison

- k = 0.833 (p < 0.001)
- ICC = 0.934 (95% CI: 0.886, 0.962)
- Plot indicates acceptable levels of agreement with a small mean difference = -0.017 (SD: 0.333)
- All scores fell between the 95% limits of agreement.
Discussion

- DENA detected extrapersonal neglect in 20/21 (95%) of participants scoring with extrapersonal neglect on CBS-E
  > usefulness of DENA as screening tool
- Initial results of DENA’s IRR are excellent
- Comparisons with the CBS and CBS-E would suggest the DENA assesses extrapersonal neglect
- Study limited by a small sample size, ideally raters should have been randomly sampled

Implications for research

- Preliminary results are promising and justify a larger, multi-centre validation study with random assignment of OTs
- Further investigation into predictive validity of the DENA
- Future research could record reaction times of viewing the diamonds to explore how extrapersonal neglect affects useful field of view.
- Explore the use of the DENA with visual field deficits.
Clinical Implications

- DENA provides clinicians with a fast and reliable screening tool for extrapersonal neglect
- DENA can assist in early detection of extrapersonal neglect to ensure this is addressed in stroke rehabilitation to maximise functional outcomes
- More lengthy behavioural neglect ax can be avoided for stroke patients who do not present with extrapersonal neglect on the DENA in addition to personal and peripersonal neglect screens such as the Comb and Razor Test, Star Cancellation and Line Bisection Tests

Thank you for your attention

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