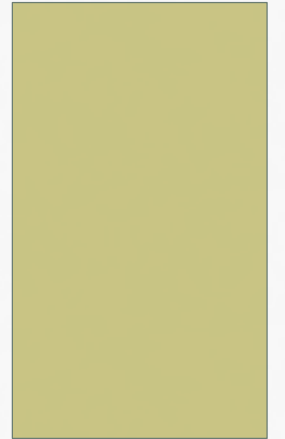


ASSESSMENT OF NEGLECT AND ANOSOGNOSIAS

MERVI JEKONEN
PHD, DOCENT IN CLINICAL NEUROPSYCHOLOGY
UNIVERSITY OF TAMPERE, FINLAND
AUGUST 30, 2016



CONTENTS

PART I ASSESSMENT OF NEGLECT

- Definition and anatomy of neglect syndrome
- Neglect and associated disorders
- Neglect recovery and its impact on assessment
- Quantitative and qualitative assessment of neglect
- Challenges in assessing neglect

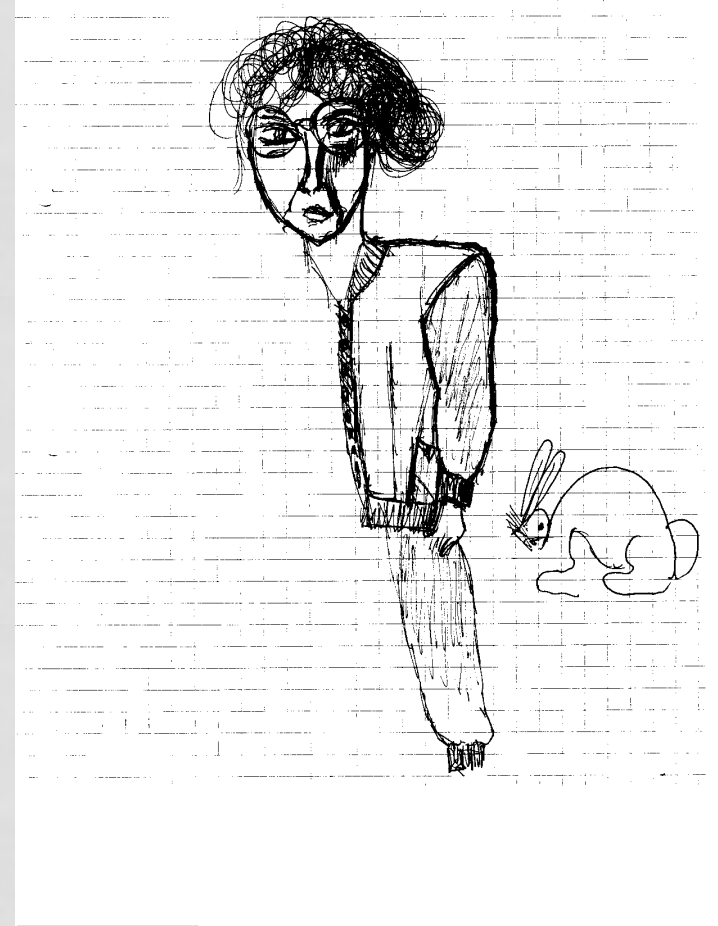
PART II ASSESSMENT OF ANOSOGNOSIAS

- Definition of anosognosia
- Subtypes of anosognosia
- Recovery of anosognosia and its impact on assessment
- Assessment of anosognosias
- Assessment of anosognosia for motor impairment

CONCLUSIONS

DEFINITION OF NEGLECT

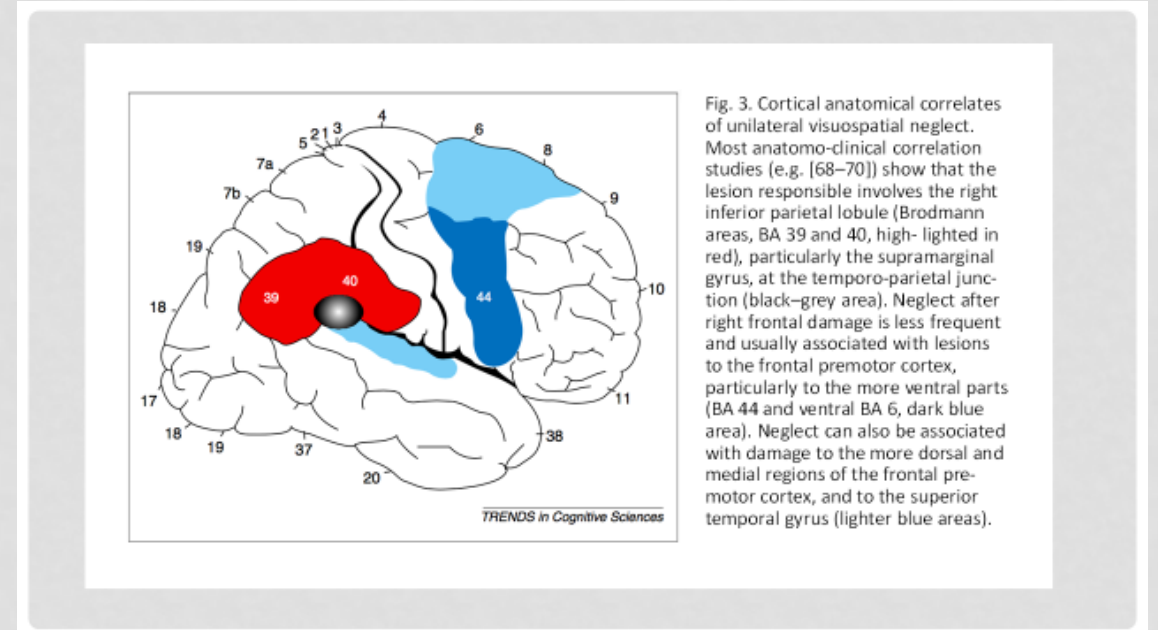
- Failure to orient, report, or respond to stimuli located predominantly on the side **opposite** to the site of the brain lesion (Heilman et al., 1985)
- AND: it cannot be explained by sensory or motor deficits
- A highly **heterogenous** syndrome, not a unitary disorder



ANATOMY OF VISUOSPATIAL NEGLECT

- Neglect is more severe and persistent following **right** hemisphere damage
- Damage to **any part** of a complex cortico-subcortical neural circuit consisting of:
 - the right inferior-posterior parietal regions
 - the posterior and medial portions of the thalamus **and**
 - the premotor frontal cortex

⇒ can produce unilateral neglect! (see Fig. Halligan et al. 2003)
- The anatomical evidence concerning **right** spatial **neglect** is less definite



NEGLECT SYNDROME

- Plenty of **terms** to describe the condition:
 - hemi-inattention, hemispacial neglect, visuospatial neglect, spatial neglect, unilateral (visual) neglect etc.
- Neglect syndrome consists of a set of behaviours, actually a set of **attentional disorders**, which forms a *clinical syndrome*
- Neglect can involve different sensory **modalities**:
 - visual, auditory, motor or tactile
 - visual neglect is most studied (most easily observable and dramatic)
- Left-sided neglect is characterised by different types of deficits:
 - **rightward orienting bias (ROB)**: a tendency to initially orient attention to the right side
 - difficulties in **attending** to the left side
 - **generalised** decline in attentional capacity

NEGLECT SYNDROME...

- Neglect may impair several different **spatial** domains:
 - personal space: body
 - peripersonal space: space within reaching or grasping
 - extrapersonal space: stimuli beyond reaching space, e.g. where we navigate when we walk
 - representational or imaging space: mental images, even dreams and hallucinations
- Frames of reference: what is neglect "left" of?
 - **egocentric**: based on the direction of the viewer's gaze
 - includes eye-, head-, torso-, shoulder-, arm- and hand-centred coordinates
 - **allocentric**: based on intrinsic characteristics of an object or its environment
 - for example: an object may be ignored irrespective of its position in relation to the patient
 - it can be seen in drawing and copying performance of neglect patients

NEGLECT AND ASSOCIATED DISORDERS

- **Neurological** disorders:
 - hemianopia
 - hemiplegia or hemiparesis
 - sensory deficits
 - **Neuropsychological** deficits:
 - **anosognosia:**
 - Is anosognosia a self-evident part of the neglect syndrome or not? At least, it can be dissociated from neglect.
 - visual memory deficit
 - visuoconstructive and visuospatial disorders
 - disorders of body image and dressing
 - dysprosody
- ⇒ All these associated disorders should be taken into account when assessing the the neglect syndrome and its severity!
- ⇒ Pure neglect is rare!

GENERAL PRINCIPLES OF NEGLECT RECOVERY

- Neglect may recover **spontaneously**, recovery may be **partial**, or recovery may show brief **remission** periods
- When assessed with conventional methods (such as cancellation tasks) most patients recover from neglect, at least substantially, in **2 to 6 months** after RH stroke, but:
 - Neglect may **persist** from one year up to several years!
- Different types of neglect-related deficits do **not** recover **simultaneously**, for example:
 - **left-sided** attentional difficulties typically resolve within few months after stroke
 - **rightward orienting bias** is often present 6 to 12 months poststroke
 - **processing speed** recovers more slowly in neglect patients than in RH patients without neglect

=> THE RECOVERY PROFILE OF NEGLECT SYNDROME HAS AN ESSENTIAL IMPACT ON THE ASSESSMENT OF NEGLECT!

NEGLECT RECOVERY...

- **Residual neglect** manifests in complex, non-structured situations and/or when the patient is tired.
 - => When can the clinician be sure that neglect has really recovered?
 - => When we can make decisions about patient's **working** or **driving** ability?
 - Larger lesions, severe neglect and anosognosia at the baseline often predict persistent neglect.
 - Lateralized symptoms of visual inattention are more often associated with persistent visual inattention and severe neurological symptoms (Viken et al. 2012)
- => TIMING OF ASSESSMENT IS ESSENTIAL; A LONG ENOUGH FOLLOW-UP IS NEEDED!**

RECOVERY OF QUALITATIVE FEATURES

- Our preliminary results (Nurmi et al. 2015) show:
 - **Starting points** in patients with neglect or visual inattention differ from those of healthy controls still at 12 months
 - Study 1: 25 RH infarct patients (11 N+, 14 N-); 40 controls
 - According to the laterality index neglect patients' performance is **lateralized** only at the acute phase, no more at 6 or 12 months
 - Study 2: 42 RH infarct patients (24 N+, 18 N-); 40 controls
- => It seems, that **rightward orienting bias** is a long-lasting symptom, whereas **lateralized** attentional symptoms turn into more generalized inattention relatively soon after the acute phase

FLUCTUATION IN NEGLECT RECOVERY

- Recovery process of neglect may also be characterised by fluctuation.
- In our study (Jehkonen et al. 2007) we identified **3 recovery groups**:
 - 56 consecutive patients with first acute RH infarct; 4 time-points (10 days, 3, 6 and 12 months)
 - 1) a **continuous** recovery group: exceeded the cutoff score (BITC) at a certain time-point and subsequently remained above it (Fig. 1a)
 - 2) a **fluctuating** recovery group: exceeded the cutoff score at some time-points and at others fell short of it (Fig. 1b)
 - 3) a **poor** recovery group: did not reach the cutoff score at any time-point and still showed severe neglect at one-year follow-up
- The fluctuation in visual neglect may partly be explained by the **baseline** factors, such as size of infarct, severity of stroke and level of basic ADL
 - for example: large infarcts are commonly associated with persistent neglect

**=> FLUCTUATION SHOULD BE TAKEN INTO ACCOUNT IN THE ASSESSMENT PRODECURE!
FOLLOW-UP TIME SHOULD BE AT LEAST SEVERAL MONTHS!**

Fluctuation in Spontaneous Recovery of Left Visual Neglect: A 1-Year Follow-Up

M. Jehkonen^a M. Laihosalo^a A.-M. Koivisto^b P. Dastidar^c J.-P. Ahonen^a

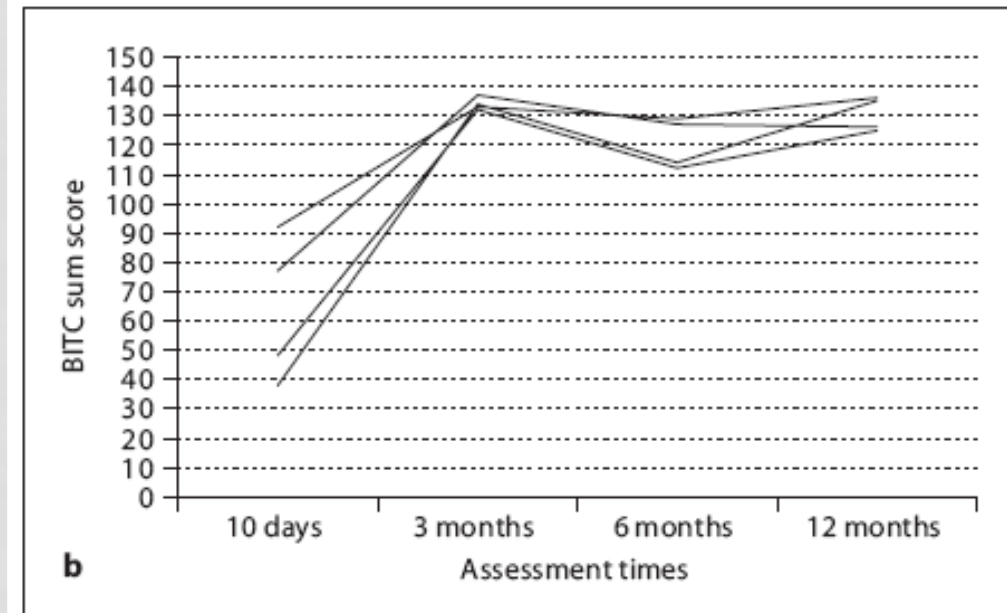
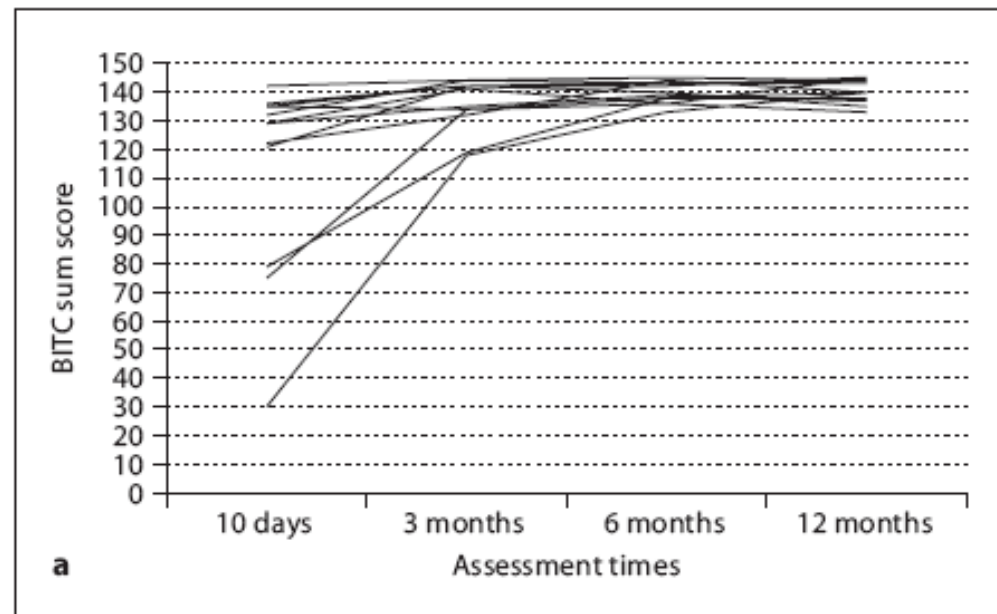


Fig. 1. Individual recovery profiles of visual neglect (BITC sum scores) in the continuous (**a**, $n = 12$) and in the fluctuating (**b**, $n = 4$) recovery groups during the 1-year follow-up. Range 0–146. The cutoff score for visual neglect is 129 (0–129 = neglect; 130–146 = normal).

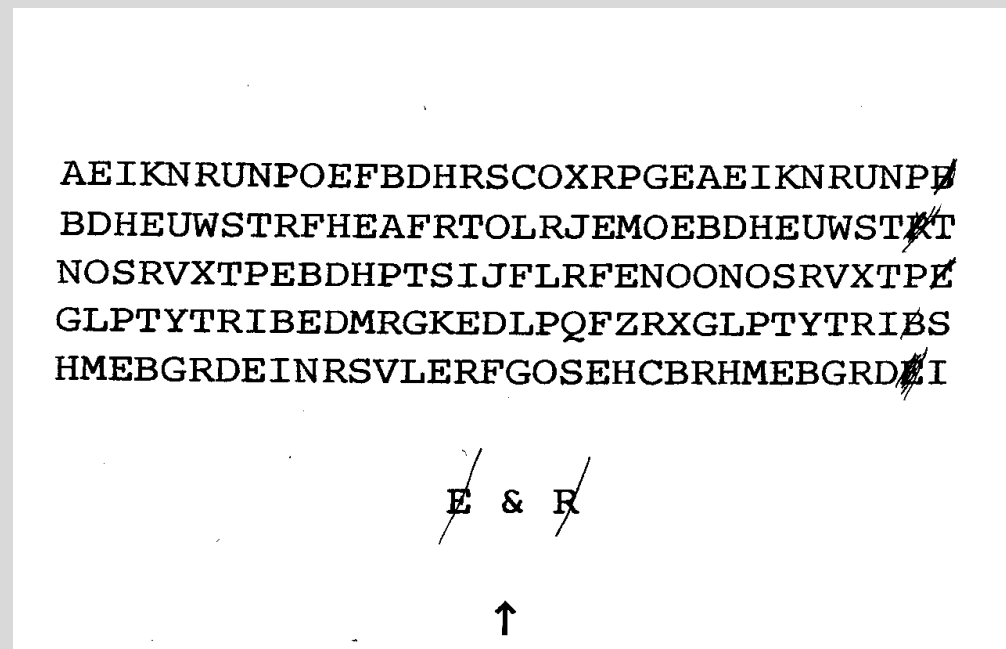
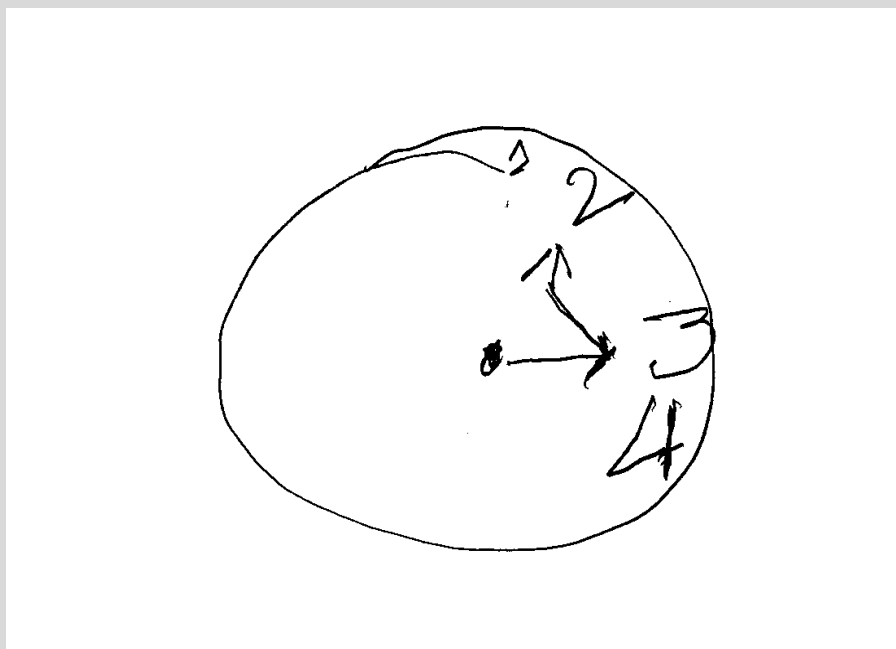
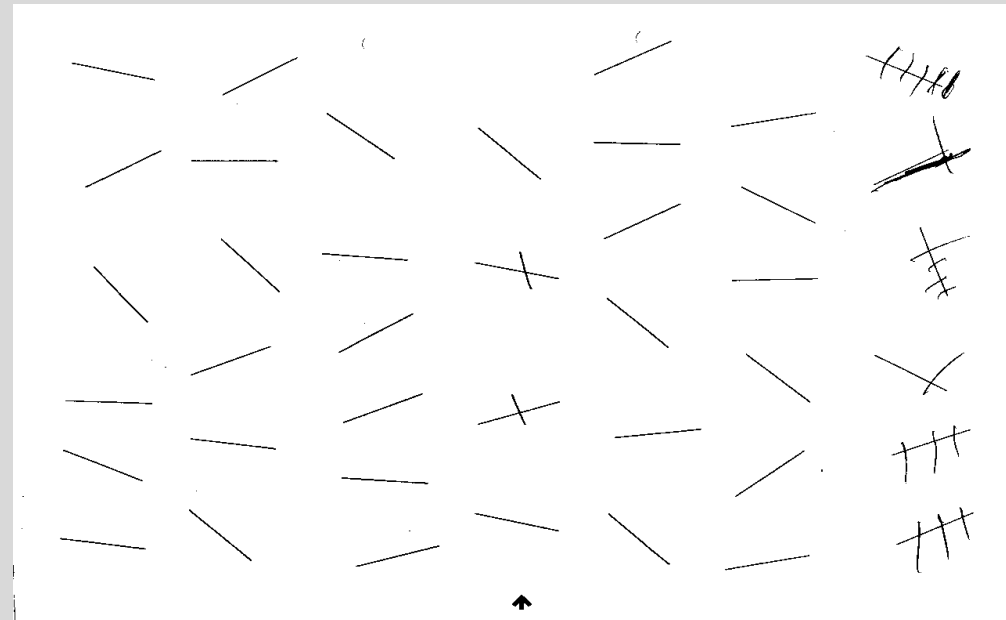
THE ASSESSMENT OF NEGLECT: SOME EXAMPLES

- Traditionally, the assessment of visual neglect is conducted with **paper-and-pencil** tests
 - cancellation tasks, line bisection, drawing from memory, and copying
 - most tests involve personal or peripersonal space
- Fluff test for personal neglect: (Cocchini, Beschin & Jehkonen, 2001)
 - the patient has to explore and find the body stickers with one's eyes closed
 - stickers attached symmetrically to left and right side of the body midline
- The Catherine Bergego Scale (CBS; Azouvi et al. 1996):
 - covers perceptual, motor and representational domains
 - evaluates performance in personal, peripersonal and extrapersonal spaces
 - measures neglect-related limitation on ADL
 - => the Kessler Foundation Neglect Assessment Process (KF-NAP) (Chen et al. 2012)

THE ASSESSMENT OF NEGLECT...

- The Behavioural Inattention test (BIT; Wilson, Cockburn & Halligan 1987):
 - 6 conventional subtests
 - 9 behavioural subtests
 - limitation: does not assess the extrapersonal space
- Computer-based assessment
 - principles of the tasks are the same as in paper-pencil tests
 - recommended particularly in assessing residual, mild neglect
 - enables to measure accurate reaction times and to detect even mild slowness of processing speed

EXAMPLES OF CONVENTIONAL
TASKS: A PATIENT WITH A
SEVERE VISUAL NEGLECT

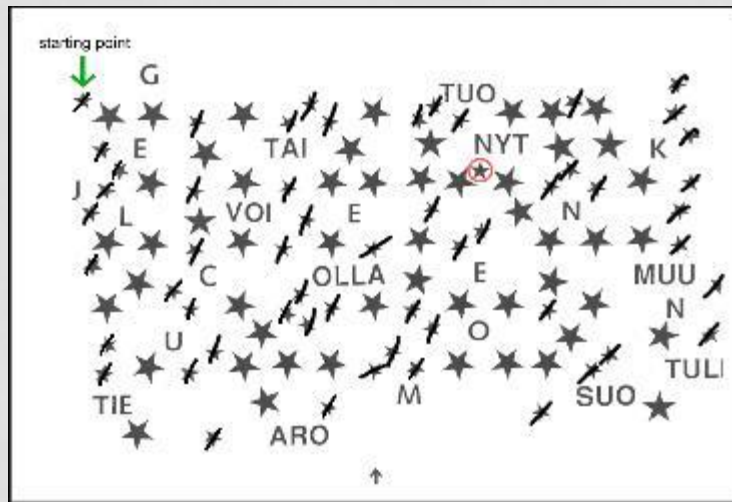


QUALITATIVE ASSESSMENT OF NEGLECT SYMPTOMS

- **Laterality index:**
 - measures the **asymmetry** of inattention: the stimuli detected from the right side divided by the stimuli detected from the whole test
- **Center of Cancellation (CoC) measure:**
 - measures the asymmetry of inattention: **the mean** of the all detected stimuli
 - more **sensitive** than the laterality index: takes into account the **severity** of neglect
- Analysis of **starting points** in most neglect tasks is useful (Nurmi et al. 2010; Kettunen et al. 2012)
 - Starting point measures rightward orienting bias, i.e. tendency to initially orient attention to the right side, which is a common symptom in neglect patients
 - Evaluating the starting points in BIT Star Cancellation and Line Cancellation subtests has shown to be particularly reliable and sensitive measures of rightward orienting bias
 - Analysis of SPs is sensitive in the assessment of mild or residual neglect
- Measuring **processing speed** increases the sensitivity of assessing especially residual neglect

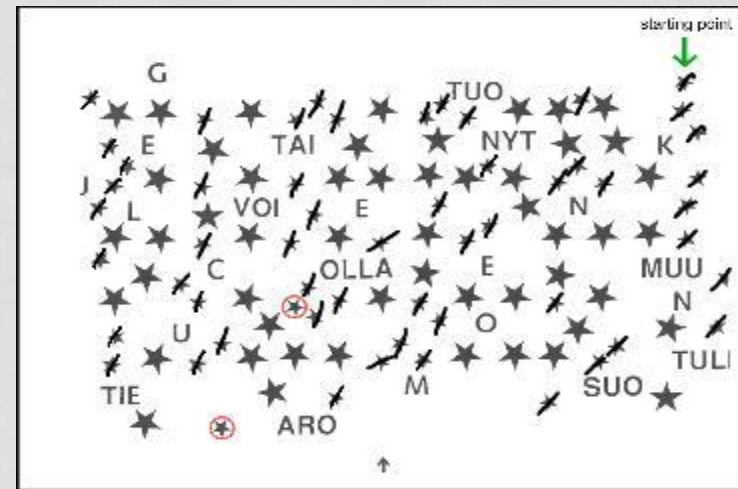
AN EXAMPLE: NEGLECT SYMPTOMS IN STAR CANCELLATION TASK

1) Healthy subject:



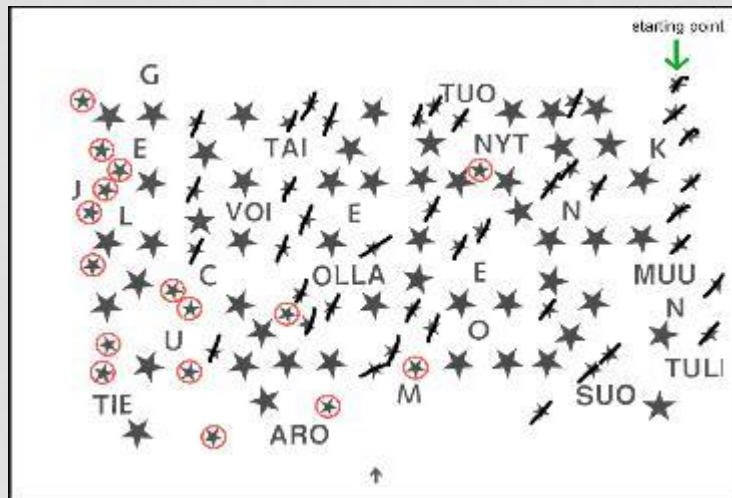
Left-sided starting point, none or few omissions = **normal performance**

3) Patient with milder neglect symptoms:



Right-sided starting point, none or few omissions = **rightward orienting bias**

2) Patient with more severe neglect symptoms:



Right-sided starting point and many omission on the left = **rightward orienting bias and difficulties in attending to the left**



CHALLENGES IN ASSESSING NEGLECT AND ITS RECOVERY

- **Variability in neglect performance:**

- the patient shows neglect in one test, but not in another
- the patient's performance varies on the same test considerably over time or
- the patient shows neglect for one part of a test, but not in another
- the patient shows neglect only in real-life situations, not in the structured neuropsychological examination

=> Neglect is a multifaceted, heterogenous syndrome; it can manifest in some tests, but not in others

- Large **variability in the assessments** used in diagnosing neglect

- many of the assessment methods are **not** standardized

⇒ Neglect should always be assessed with **various tasks** to consider all the core features of the syndrome!

⇒ Assessments of a **multidisciplinary team** (occupational therapist, physiotherapist and neuropsychologist) must be taken into account when drawing conclusions about patient's abilities in ADL.

PART II: ASSESSMENT OF ANOSOGNOSIAS

DEFINITION OF ANOSOgnosIAS

- A= without, Noso = disease, Gnosia = knowledge
 - "without knowlegde of disease"
 - the term was first introduced by Babinski 1914;
 - Cortex 2014;61 => 100 years of Babinski's finding
- DEFINITION: "...lack of awareness of motor, visual or cognitive impairments in patients with **neurological** diseases" (Prigatano & Schacter, 1991)
 - anosognosia can be **partial** (for particular functions) or **general** (for illness) *and*
 - it may involve a variety of neurological impairment or sensorimotor, visual, cognitive or behavioral functions
 - its degree can vary from mild to severe
- Anosognosia is associated with **RH-lesions**, particularly in the dorsolateral portions of frontal cortical areas and parieto-temporal and right insula lesions

RECOVERY AND SPECIAL FEATURES OF ANOSOGNOSIAS

- Anosognosia may **recover** quickly within a few days or weeks after an acute brain injury, it may **fluctuate** over time, and it may **persist** for years or even remain permanent
- There is no consensus of the cause of anosognosias
- Anosognosia is a very complex, multifaceted and variable phenomenon
 - challenges for the assessment of anosognosias!

SUBTYPES OF ANOSOGNOSIAS

- **Explicit** (verbal) vs. **implicit** (nonverbal) anosognosia:
 - The most common method to explore explicit anosognosia, i.e. the patient's self-evaluation, is a structured interview
 - Implicit anosognosia is usually evaluated by asking the patient to perform unimanual and/or bimanual tasks
- Anosognosia for:
 - illness (stroke etc.)
 - motor deficits
 - hemianopia
 - neglect
 - aphasia
 - hemiplegia
 - cognitive deficits
- Each of the subtypes can be assessed with particular questionnaires or clinical scales:
 - clinician-rated scale, self-rated scale, caregiver-rated scale, and discrepancy scores

THE MOST COMMON METHODS FOR ASSESSING ANOSOGNOSIAS

Review article

Anosognosia after stroke: assessment, occurrence, subtypes and impact on functional outcome reviewed

Jehkonen M, Laihosalo M, Kettunen J. Anosognosia after stroke: assessment, occurrence, subtypes and impact on functional outcome reviewed. *Acta Neurol Scand* 2006; 114: 293–306. © Blackwell Munksgaard 2006.

**M. Jehkonen, M. Laihosalo,
J. Kettunen**

Neurology and Rehabilitation, Tampere University
Hospital, Tampere, Finland

Table 1 The most commonly used procedures for assessing anosognosias in stroke patients

| Reference | Type of procedure | Patient population | Forms of anosognosia assessed |
|--------------------------|---|----------------------------------|---|
| Nathanson et al. (18) | Structured interview | Stroke | Verbal anosognosia for illness and hemiplegia |
| Cutting (7) | Structured questionnaire | Stroke | Verbal anosognosia for illness and hemiplegia |
| Bisiach et al. (19) | Rating scale | Stroke | Verbal anosognosia for hemiplegia and hemianopia |
| Anderson and Tranel (11) | Structured interview | Stroke, dementia and head trauma | Verbal anosognosia for motor and cognitive defects (visual perception, language, memory, orientation and general intellect) |
| Starkstein et al. (12) | Structured questionnaire | Stroke | Verbal anosognosia for motor and visual deficits |
| Berti et al. (17) | Assessment of direct and indirect knowledge based on questioning and observation of patient's behaviour | Stroke | Verbal and non-verbal anosognosia for hemiparesis and higher-order cognitive disabilities related to neglect |
| Azouvi et al. (20) | Questionnaire | Stroke | Verbal awareness of everyday neglect-related difficulties due to stroke |

Review article

Anosognosia after stroke: assessment, occurrence, subtypes and impact on functional outcome reviewed

Jehkonen M, Laihosalo M, Kettunen J. Anosognosia after stroke: assessment, occurrence, subtypes and impact on functional outcome reviewed. *Acta Neurol Scand* 2006; 114: 293–306. © Blackwell Munksgaard 2006.

M. Jehkonen, M. Laihosalo, J. Kettunen
Neurology and Rehabilitation, Tampere University Hospital, Tampere, Finland

Table 1 *Anosognosia questionnaire*

| <i>Anosognosia</i> | | <i>Anosognosic phenomena</i> | |
|---|--|--|--|
| <i>General questions</i> | <i>Procedure if denial elicited on general questions</i> | <i>Phenomenon</i> | <i>Questions</i> |
| Why are you here? | (Arm picked up) | What is this? | Anosodiaphoria Is it a nuisance? How much trouble does it cause you? What caused it? |
| What is the matter with you? | | Can you lift it? | Nonbelonging Do you ever feel that it doesn't belong? |
| Is there anything wrong with your arm or leg? | | You clearly have some problem with this? | Do you feel that it belongs to someone else? |
| Is it weak, paralysed or numb? | | Can't you see that the two arms are not at the same level? | Strange feelings Do you feel the arm is strange or odd? |
| How does it feel? | (Asked to lift arms) | | Misoplegia Do you dislike the arm? Do you hate it? Do you have strong feelings about it? |
| | | | Personification Do you ever call it names? |
| | | | Kinaesthetic hallucinations Do you ever feel it moves without your moving it yourself? |
| | | | Overestimation How's the other arm? |
| | | | Phantom Do you ever feel a strange arm lying beside you separate from the real arm? |
| | | | supernumerary limb |

AWARENESS INTERVIEW

I. *Awareness of the reason for hospitalization*

Ask, "Why are you in the hospital? What is wrong with you?" If the patient does not explicitly describe the primary reason for hospitalization, ask (for CVA patients) "Did you have a stroke?"; (for HT patients) "Did you have an accident or hit your head?"; (for DEM patients) "Did anything happen to you, or are you having any difficulties which may have brought you in?"

SCORING

- 3 Patient explicitly denies the primary reason for hospitalization.
- 2 Patient admits to, but does not initially state, the primary reason for hospitalization.
- 1 Patient describes the primary reason for hospitalization.

II. *Awareness of motor impairments.*

Question the patient regarding movement of his or her arms and legs; paying particular attention to deficits noted in neurological evaluation. For example, "How do your arms work? Can you move them normally? Both of them?"

SCORING

- 3 Patient denies any motor impairments.
- 2 Patient describes a *minimal* impairment of motor function.
1. Patient complains of a significant motor impairment.

III. *Awareness of impairments of intellect or "thinking ability."*

Ask "How is your thinking? Are you thinking as clearly as you normally do?"

SCORING

- 3 Patient describes clear thinking without any notable changes from the normal state.
- 2 Patient notes a mild change in one or several aspects of thinking (e.g., decreased ability to concentrate, solve problems, or respond to situations).
- 1 Patient complains of major difficulty or changes in thinking.

IV. *Awareness of orientation problems.*

Ask "Are you ever confused about where you are or what month or year it is?"

SCORING

- 3 Patient indicates no problems with disorientation.

- 2 Patient indicates disorientation to time *or* place.
- 1 Patient indicates disorientation to time *and* place.

V. *Awareness of memory impairment.*

Ask “Are you having any trouble with your memory?”

SCORING

- 3 Patient denies any problems or changes in memory.
- 2 Patient describes mild problems with memory, but denies any significant problems with or deterioration of memory.
- 1 Patient describes significant problems with memory.

VI. *Awareness of speech or language problems.*

Ask “How is your speech? Has it been affected at all? Do you have any difficulty understanding what other people say?”

SCORING

- 3 Patient denies any speech or language problems.
- 2 Patient describes mild speech or language problems (e.g., word finding problems, slurring).
- 1 Patient complains of impaired comprehension, aphasic speech, or severe dysarthria.

VII. *Awareness of visual perceptual problems.*

Ask “Are you having any trouble with your vision?”

SCORING

- 3 Patient denies any problems with visual perception.
- 2 Patient describes mild problems with visual perception.
- 1 Patient complains of significant visual perceptual impairment.

VIII. *Posttest questions: Awareness of quality of test performance and ability to return to normal activities.*

Ask, (1) “How do you think you did on these tests today?”

(2) “Based on how you are doing now, do you think you will be able to return to your normal activities in the next several weeks?” (Specify activities based on the patient’s current circumstances, i.e., employment, hobbies, activities of daily living.)

SCORING

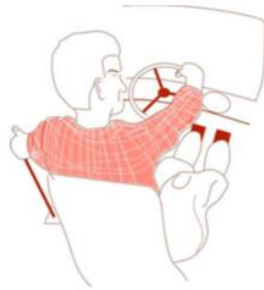
- 3 Patient indicates that test performances were normal and that there will be no problem returning to normal activities.
- 2 Patient indicates that either (a) test performance was defective, or (b) that there will be difficulty returning to normal activities, but not both.
- 1 Patient indicates that test performance was defective *and* that there will be difficulty returning to normal activities in the next several weeks.

ASSESSING ANOSOGNOSIA FOR MOTOR IMPAIRMENT

- Della Sala et al. (2009): Visual-analogue test for Anosognosia for Motor Impairment (Vatam)
 - The VATAm: a questionnaire where patients are asked to rate their motor abilities
 - Questions are illustrated by simple drawings, and a visual-analogue 4-point scale is used to rate motor difficulties, e.g. “Do/would you have difficulty driving?”
 - 0 = no problem; 3 = serious difficulty
 - Patients can indicate their rating by means of **verbal** response (e.g. rating “3” or “problem”) or by means of **motor** response; enables also assessment of patients having aphasia
 - The test material is available:
http://homepages.gold.ac.uk/gcocchini/VATAm_material.pdf

EXAMPLES OF VATA-M QUESTIONS

Do/would you have difficulty driving?



No Problem



Problem

0-----1-----2-----3

Do you have difficulty walking?



No Problem



Problem

0-----1-----2-----3

CONCLUSIONS: ASSESSMENT OF NEGLECT (1/2)

1. Recovery from left-sided **attentional** difficulties is likely to **fluctuate** during the first year after stroke.
2. Moreover, the **attentional** difficulties are likely to change from left-sided lateral to more **generalized** difficulties during this period.
3. **Rightward orienting bias** and **slow processing speed** can be **long-lasting** symptoms after stroke.

CONCLUSIONS: NEGLECT (2/2)

4. These three symptoms (lateralized inattention, rightward orienting bias and processing speed) do not recover simultaneously.

5. The assessment of neglect should cover its core symptoms.

=> A **combination** of several conventional tests, time-limited tests and analysis of starting points is recommended.

=> The evaluations of a **multidisciplinary** team should be taken into account.

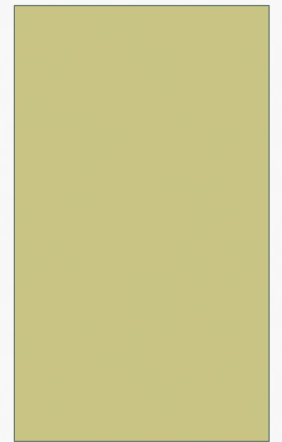
=> A **follow-up** period long enough after acute neglect is needed.

CONCLUSIONS: ASSESSMENT OF ANOSOgnosIAS

- Timing of the evaluation of anosognosia is crucial (recovery phase)
- Subtypes of anosognosias should be assessed each and their possible dissociations should be separately evaluated
- Associated disorders, e.g. neglect, should be thoroughly evaluated as well
- Both explicit and implicit forms of anosognosias should be assessed
- Use of visual analogue scales is recommended to overcome possible language impairments, particularly in LH patients
- Anosognosia is a multifaceted, heterogenous syndrome
 - It can not be assessed with any single scale or test method
 - Use of a good combination of methods is recommended

THANK YOU FOR YOUR ATTENTION!

CONTACT DETAILS:
MERVI.JEHKONEN@STAFF.UTA.FI



REFERENCES

- Azouvi P, Marchal F, Samuel C et al. Functional consequences and awareness of unilateral neglect: Study of an evaluation scale. *Neuropsychological Rehabilitation* 1996;6:133-150.
- Chen P, Hreha K, Fortis P, Goedert KM, Barrett AM. Functional assessment of spatial neglect: a review of the Catherine Bergego scale and an introduction of the Kessler foundation neglect assessment process. *Top Stroke Rehabil* 2012;19:423-35.
- Cocchini G, Beschin N, Jehkonen M. The Fluff Test: A simple task to assess body representation neglect. *Neuropsychological Rehabilitation* 2001;11:17-31.
- Della Sala S, Cocchini G, Beschin N, Cameron A. Vata-M: Visual-analogue test assessing anosognosia for motor impairment. *The Clinical Neuropsychologist* 2009;23:406-427.
- Halligan PW, Fink GR, Marshall JC, Vallar G. Spatial cognition: evidence from visual neglect. *TRENDS in Cognitive Sciences* 2003;7:125-133.
- Jehkonen M, Laihosalo M, Kettunen JE. Impact of neglect on functional outcome after stroke – a review of methodological issues and recent research findings. *Restorative Neurology and Neuroscience* 2006;24:209-15.
- Jehkonen M, Laihosalo M, Kettunen JE. Anosognosia after stroke: assessment, occurrence, subtypes and impact on functional outcome reviewed. *Acta Neurol Scand* 2006;114:293-306.
- Jehkonen M, Laihosalo M, Koivisto A-M, Dastidar P, Ahonen J-P. Fluctuation in spontaneous recovery of left visual neglect: a one-year follow-up. *Eur Neurol* 2007;58:210-4.
- Nurmi M.E., Jehkonen M. Assessing anosognosias after stroke: A review of the methods used and developed over the past 35 years. *Cortex* 2014;61:43-63.
- Robertson IH, Halligan PW. *Spatial neglect: a clinical handbook for diagnosis and treatment*. Psychology Press, Hove, 1999.
- Robertson IH, Marshall JC (eds.) *Unilateral neglect: Clinical and experimental studies*. Lawrence Erlbaum Associates, Hove, UK, 1993.
- Viken J, Samuelsson H, Jern C, Jood K, Blomstrand C. The prediction of functional dependency by lateralized and non-lateralized neglect in a large prospective stroke sample. *Eur J Neurol* 2012;19:128-134.
- Wilson B, Cockburn J, Halligan PW. *Behavioural Inattention test*. Manual. Titchfield, Hampshire: Thames Valley Test Company, 1987.