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ORIGINAL RESEARCH

Kessler Foundation Neglect Assessment Process Uniquely Measures Spatial Neglect During Activities of Daily Living

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Abstract

Objectives: To explore the factor structure of the Kessler Foundation Neglect Assessment Process (KF-NAP), and evaluate the prevalence and clinical significance of spatial neglect among stroke survivors.

Design: Inception cohort.

Setting: Inpatient rehabilitation facility (IRF).

Participants: Participants (N = 121) with unilateral brain damage from their first stroke were assessed within 72 hours of admission to an IRF, and 108 were assessed again within 72 hours before IRF discharge.

Interventions: Usual and standard IRF care.

Main Outcome Measures: During each assessment session, occupational therapists measured patients' functions with the KF-NAP, FIM, and Barthel Index (BI).

Results: The KF-NAP showed excellent internal consistency with a single-factor structure. The exploratory factor analysis revealed the KF-NAP to be unique from both the FIM and BI even though all 3 scales were correlated. Symptoms of spatial neglect (KF-NAP>0) were present in 67.8% of the participants at admission and 47.2% at discharge. Participants showing the disorder at IRF admission were hospitalized longer than those showing no symptoms. Among those presenting with symptoms, the regression analysis showed that the KF-NAP scores at admission negatively predicted FIM scores at discharge, after controlling for age, FIM at admission, and length of stay.

Conclusions: The KF-NAP uniquely quantifies symptoms of spatial neglect by measuring functional difficulties that are not captured by the FIM or BI. Using the KF-NAP to measure spatial neglect, we found the disorder persistent after inpatient rehabilitation, and replicated previous findings showing that spatial neglect adversely affects rehabilitation outcome even after prolonged IRF care.

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Spatial neglect is a disorder of spatial attention, affecting perception and mental representation of spatial information, and planning and execution of motor action. It is common after a brain injury such as stroke, occurring in approximately 50% of survivors with right-sided brain damage and 30% of those with left-sided brain damage (table 1).[1-7] Individuals with spatial neglect demonstrate a failure or slowness to respond, orient, or initiate action toward contralesional stimuli.[8] Therefore, spatial neglect disrupts mobility and navigation (walking,[9] wheelchair ambulation,[10] driving),[11] reading,[12] and social interactions.[13] Patients with this disorder have poorer rehabilitation outcomes, experience greater safety risk during hospitalization, and are hospitalized longer as compared with those without spatial neglect.[14,15]

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Table 1 Prevalence of spatial neglect after stroke with unilateral brain damage

Report* (Ordered Chronically)	Neglect Prevalence (Out of a Given Sample Size)		Neglect Assessment	Setting	Country
	Right-Sided Brain Damage	Left-Sided Brain Damage			
Gainotti et al,[1] 1972	42% (n=114)	31% (n=108)	Confrontation examination	Outpatient clinic	Italy
Denes et al,[2] 1982	33% (n=24)	21% (n=24)	Figure copying	Geriatric hospital	Italy
Fullerton et al,[3] 1986	49% (n=88)	25% (n=117)	Postural examination, cancellation tests, drawing	General hospital	Ireland
Stone et al,[4] 1993	82% (n=69)	65% (n=102)	Object pointing, reading, cancellation tests, coin selection, figure copying	General hospital	UK
McGlone et al,[5] 1997	62% (n=71)	31% (n=67)	Figure copying and drawing, line bisection, cancellation tests	General hospital	Canada
Kalra et al,[6] 1997	43% (n=75)	21% (n=70)	Confrontation examination, line bisection, cancellation tests, figure copying and drawing	General hospital	UK
Ringman et al,[7] 2004	43% (n=356)	20% (n=394)	Confrontation examination	Acute care hospital	U.S.
Present study	76% (n=85)	47% (n=36)	KF-NAP	Acute inpatient rehabilitation	U.S.
Overall	51% (N=881)	29% (N=918)			

* Reports were selected for their inclusion of stroke survivors with left-sided brain damage and those with right-sided brain damage.

Conventional detection of spatial neglect uses visual/sensory examination or paper-and-pencil tests. One example is a cancellation task, which requires crossing out all targets (eg, the letter "A") embedded among nontargets (eg, "E" and "Z") on a piece of paper, such as the Bells Test[16] or Star Cancellation.[17] These assessments are widely available in the clinical setting but create 2 challenges: (1) functional performance of daily activities related to spatial neglect is poorly captured, and (2) they may underdiagnose auditory, proprioceptive, or motor-intentional symptoms of spatial neglect.[18] To address these deficiencies, our group developed the Kessler Foundation Neglect Assessment Process (KF-NAP)[19,20] based on the Catherine Bergego Scale (CBS).[21,22] The CBS comprehensively examines functional performance in personal (body surface), peripersonal (within arm's reach), and extrapersonal spaces (beyond arm's reach), as well as performance in perceptual, mental imagery, and motor domains. Thus, the CBS can capture the heterogeneity of spatial neglect and is more sensitive than paper-and-pencil tests[19,23] to problems in activities of daily living (ADL).

We found that additional instructions were needed for reliable CBS administration, and developed the KF-NAP, which provides detailed administration instructions and a scoring chart for the 10 original CBS categories of behavior (fig 1).[19,20] We modified some CBS category labels to better convey the purpose of an observation, to include right-sided neglect symptoms or to shorten the wording. For example, "knowledge of left limbs" on the CBS[22] is revised to "limb awareness" on the KF-NAP. The 2012 version included 1 page of instructions to reduce ambiguity and increase reliability.[19] The *KF-NAP 2014 Manual* provides more detailed scoring and observation information.[20] The examiner is instructed to provide the patients with verbal prompts to initiate or perform certain behavior/actions, such as the following: "I cannot find your reading glasses. Can you tell me where they are?" "Show me how you would put this coat on." "Show me how you wash your face." "Show me how to get to the therapy gym." Clearly, none of the prompts include spatial cues suggesting locations or directions. Even when the patient asks for item(s), the examiner must give a neutral answer. For example, if the patient asks, "Where is the coffee?" during a meal (in the observation category of "eating"), the examiner may answer, "It is on the tray. Can you find it?"

Additionally, the KF-NAP specifies the environment where the observation takes place and observation of left-versus-right asymmetric performance. However, rather than testing functional ability in a specific situation, the KF-NAP emphasizes direct observation of spontaneous behavior and awareness for right-versus-left space during ADL. The main objective is to allow patients to spontaneously explore the environment, move their eyes/head, and initiate actions. It is important that both sides of space are assessed, so that the examiner can compare performance on the right versus left before scoring. Another distinction is that all 10 categories are observed during 1 session, which was not stressed in the original CBS. Depending on the category, patients are rated immediately during or immediately after the observation. Thus, it is based on direct observation rather than summarized impressions from large amounts of behavior.

Standardizing an observational assessment may change its properties. We conducted the present study to demonstrate the psychometric properties of the KF-NAP, its clinical feasibility, and its uniqueness in measuring ADL difficulties specific to spatial neglect. We assessed stroke survivors with unilateral brain damage in an acute inpatient rehabilitation facility (IRF) by using the KF-NAP and 2 common functional outcome measures, the FIM[24] and the Barthel Index (BI).[25] We had 3 objectives: (1) to determine the internal consistency and factor structure of the KF-NAP; (2) to examine whether the KF-NAP uniquely measures

List of abbreviations:

ADL	**activities of daily living**
BI	**Barthel Index**
CBS	**Catherine Bergego Scale**
IQR	**interquartile range**
IRF	**inpatient rehabilitation facility**
KF-NAP	**Kessler Foundation Neglect Assessment Process**