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Kessler Foundation Neglect Assessment Process uniquely measures spatial neglect during activities of daily living

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Abstract

Objective—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—121 participants 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, Functional Independence Measure (FIM™) and Barthel Index (BI).

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Previous presentation of the data: Results of the present study were partially presented in the 2014 annual conference of the American Congress of Rehabilitation Medicine.

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 three scales were correlated. 67.8% of the participants at admission and 47.2% at discharge presented with symptoms of spatial neglect (KF-NAP > 0). 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.

Keywords

spatial neglect; stroke rehabilitation outcome; functional assessment

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 right brain-damaged and 30% of left brain-damaged survivors (Table 1).¹⁻⁷ Individuals with spatial neglect demonstrate a failure or slowness to respond, orient, or initiate action towards contra-lesional stimuli.⁸ Therefore, spatial neglect disrupts mobility and navigation (walking,⁹ wheelchair ambulation,¹⁰ and 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 to those without spatial neglect.^{14, 15}

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 (e.g., the letter “A”) embedded among non-targets (e.g., “E” and “Z”) on a piece of paper, such as the Bells Test¹⁶ or Star Cancellation.¹⁷ These assessments are widely available in the clinical setting, but create two challenges: (1) functional performance of daily activities related to spatial neglect is poorly captured, and (2) they may under-diagnose auditory, proprioceptive, or motor-intentional symptoms of spatial neglect.¹⁸ To address these deficiencies, our group developed the Kessler Foundation Neglect Assessment Process (KF-NAPTM)^{19, 20} based upon the Catherine Bergego Scale (CBS).^{21, 22} The CBS comprehensively examines functional performance in personal (body surface), peri-personal (within arm's reach), and extra-personal 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 (ADLs).

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 ten original CBS categories of behavior (Figure 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 CBS²² is revised to “limb awareness” on the KF-NAP. The 2012 version included one 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 “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 vs. 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 ADLs. 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 ten categories are observed during one 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 KF-NAP's psychometric properties, 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), using the KF-NAP and two common functional outcome measures — the Functional Independence Measure (FIMTM)²⁴ and the Barthel Index (BI).²⁵ We had three objectives:

1. To determine the internal consistency and factor structure of the KF-NAP.
2. To examine whether the KF-NAP uniquely measures ADL deficits that the FIM or BI does not.
3. To evaluate the prevalence of spatial neglect and examine how the severity of spatial neglect predicts functional independence at the time of IRF discharge.

Methods

This study was approved by the Institutional Review Boards of the authors' organizations. A consecutive sample of 121 stroke survivors (July 2012 – March 2014) met inclusion criteria, gave informed consent, and completed the first assessment within 72 hours of admission to three campuses of an IRF. Inclusion criteria were first stroke, unilateral brain damage, and adult (18 to 99 years old). Due to unexpected early discharge, 13 participants were not

reassessed within 72 hours of IRF discharge. Participating patients had no previous neurological damage or psychiatric conditions.

Following a certification procedure established in 2012, two occupational therapists (OTs) per IRF campus were trained to use the KF-NAP to competency standards for observing and scoring. They screened patients' eligibility, and scheduled and administered both assessment sessions (40-60 minutes per session), during which they measured patients' function with the KF-NAP, FIM, and BI. OTs were instructed to assess the same patient both at admission and at discharge. However, due to busy clinical duties, it was tolerated when occasionally one OT performed the admission assessment and the other performed the discharge assessment.

Kessler Foundation Neglect Assessment Process (KF-NAP™)

The KF-NAP^{19, 20} consists of 10 categories: limb awareness, personal belongings, dressing, grooming, gaze orientation, auditory attention, navigation, collisions, eating, and cleaning after meal. Each is scored from 0 to 3, with higher scores indicating more severe neglect. The final score is the sum of all category scores, ranging from 0 to 30. If a category is impossible to score due to the patient's condition (e.g., not able to use a wheelchair, eating restrictions), it is not included in the final score. In this case, the final score is calculated by averaging scores in the valid categories: $(\text{sum score} \div \text{number of scored categories}) \times 10 = \text{final score}$.²²

Of the participants, 112 were scored in all KF-NAP categories. Five participants missed one category (3 collisions, 1 eating, and 1 auditory attention), 3 missed 2 (2 missed both eating and cleaning after meal; 1 missed both navigation and collisions), and 1 patient missed 3 (collisions, eating and cleaning after meal). Of the 108 participants completing the discharge assessment, 104 were scored in all categories: 3 missed 2 (2 missed both eating and cleaning after meal; 1 missed both navigation and collisions), and 1 missed 3 (collisions, eating and cleaning after meal). Overall, the most commonly omitted categories were, with the omission rate in parentheses (all vs. participants with KF-NAP > 0): collisions (3.1% vs. 5.3%), eating (3.1% vs. 5.3%), cleaning after meal (2.6% vs. 4.5%), navigation (.9% vs. 1.5%), and auditory attention (.4% vs. .8%).

Functional Independence Measure (FIM™)

The FIM^{24, 26} consists of 18 items assessing level of independence. The motor domain includes 13 items in the categories of self care, bladder and bowel management, transfers, and mobility; and the cognition domain includes 5 items in comprehension, expression, social interaction, problem solving, and memory. OTs scored each FIM item using the instructions in the Patient Assessment Instrument (IRF-PAI) Training Manual.²⁷ Each item is scored from 1 to 7, with higher scores indicating better function. Final scores ranged from 18 to 126.

Barthel Index (BI)

The BI^{25, 28} consists of 10 items. The range of scores is different for each item: feeding (0,5,10), bathing (0,5), grooming (0,5), dressing (0,5,10), bowels (0,5,10), bladder (0,5,10),

toilet use (0,5,10), transfers – bed to chair and back (0,5,10,15), mobility on level surfaces (0,5,10,15), and stairs (0,5,10). The total score is the sum of the 10 items and ranges from 0 to 100, with higher scores indicating better function.

Data Analyses

Because all the continuous variables were distributed in a non-normal fashion, we report medians and inter-quartile ranges (IQR). All analyses were performed with STATA/SE 12.1.

Objective 1: Reliability and factor structure of KF-NAP—We examined internal consistency with Cronbach's alpha among those with admission KF-NAP scores greater than zero (n=82). In regards to factor structure, the KF-NAP categories were based on the CBS, for which Azouvi et al. reported one underlying factor,²³ but Goedert et al. found two.¹⁸ To examine the factor structure, we included patients with KF-NAP greater than zero at admission and no missing items (n=73). Following a confirmatory factor analysis in which the previously-reported one and two-factor solutions performed similarly (see Supplementary Data), we performed an exploratory factor analysis with an oblique promax rotation, because this rotation method is appropriate when latent factors are likely correlated.^{29, 30} We retained factors with eigenvalues (λ) greater than 1.0 that were not also produced by parallel analysis of random data structures with 50 repetitions.^{30, 31}

Objective 2: Uniqueness of KF-NAP—Many studies choose FIM or BI as the functional outcome measure because they share similar factor structures.³² The KF-NAP may capture neglect-specific ADL performance not captured by the FIM or BI. To examine this hypothesis, we performed an exploratory factor analysis with oblique promax rotation, using all items from the KF-NAP, FIM, and BI. We reverse-coded KF-NAP so that higher scores indicate better function on all scales. We used the same factor retention principles as in Objective 1.

Objective 3: Prevalence of spatial neglect and its impact on functional outcome at IRF discharge—Some clinicians assume that spatial neglect will resolve completely during inpatient hospitalization. We calculated the percent of patients with spatial neglect at admission and discharge. Additionally, we examined whether neglect severity at admission predicted rehabilitation outcome (FIM scores) at discharge, using a linear regression analysis, controlling for age, side of stroke, admission FIM, and length of IRF stay.

Results

Of 121 participants (68 females, 53 males), the median age was 70 years, 36 participants had left brain stroke, and 85 had right brain stroke. Participants were admitted to IRF a median of 6 days post stroke. There was no significant difference in sex ratio, age, handedness, ethnicity or race between participants who had spatial neglect (KF-NAP > 0) and those who had no symptoms (Table 2).

Objective 1: Reliability and Factor Structure of KF-NAP

Cronbach's alpha was .96, indicating excellent internal consistency. The factor analysis suggested a one-factor solution with an eigenvalue of 6.86 (Table 3), accounting for 94.0% of the variance. The extracted second factor had an eigenvalue of only .37, and parallel analysis produced a second factor with a greater eigenvalue ($\lambda = .45$), suggesting this second factor resulted from noise in the data.

Objective 2: Uniqueness of KF-NAP

The FIM, BI, and KF-NAP were all inter-correlated (see Table 4), with all Bonferroni-corrected pairwise comparisons reaching significance. However, factor analysis revealed that the KF-NAP accounted for additional variance in patients' performance (11.6%) not captured by the FIM or BI (Table 5). The KF-NAP items loaded onto a single factor (factor loadings greater than 0.40) that was distinct from two other factors containing subsets of FIM and BI items.

Objective 3a: Prevalence of Spatial Neglect

At IRF admission, 67.8% of participants (n=82) showed symptoms of spatial neglect (Table 6), and their median KF-NAP score was 7 (IQR = 3-16). Among the 36 left brain-damaged participants, 17 had KF-NAP scores greater than zero, suggesting the presence of spatial neglect (median = 5, IQR = 2-7). Of the 85 right brain-damaged participants, 65 had positive KF-NAP scores (median = 8.9, IQR = 3-16). The presence of spatial neglect was more frequent after right than left brain damage (76.5% vs. 47.2%, Fisher's exact test: $p = .002$). However, side of stroke did not predict severity of spatial neglect (two-sample U test: $p = .138$).

At IRF discharge (Table 6), 47.2% of participants (n=51/108) showed symptoms of spatial neglect (KF-NAP > 0, median = 6, IQR = 3-12). Of the 34 left brain-damaged patients, 9 were discharged with symptoms of spatial neglect (median KF-NAP = 5, IQR = 3-13), as were 42 of the 74 right brain-damaged patients (median = 6, IQR = 2-11). Presence of spatial neglect remained more frequent after right than left brain damage at IRF discharge (56.8% vs. 26.5%, Fisher's exact test: $p = .004$), but severity of spatial neglect was again not predicted by side of stroke ($p = .833$).

In patients with spatial neglect at admission (n = 74), KF-NAP improved an average of .2 points per day over the hospitalization period, a rate significantly greater than zero (Kolmogorov-Smirnov test: $p < .001$). There was no difference in KF-NAP improvement between left and right brain-damaged participants (U test: $p = .648$).

Objective 3b: Clinical Impact of Spatial Neglect

Those with spatial neglect at admission (i.e., KF-NAP > 0) had lower admission FIM than those without neglect (median = 56 vs. 82; U test: $p < .001$). The same pattern emerged at IRF discharge (median = 88.5 vs. 112; U test: $p < .001$). However, patients with spatial neglect stayed almost 10 days longer in inpatient rehabilitation (Table 2). Thus, the presence of spatial neglect adversely affected rehabilitation outcomes.

We further examined whether severity, in addition to the presence, of spatial neglect impacted rehabilitation outcomes. Using a linear regression model, we found that greater neglect severity (KF-NAP score) at admission predicted lower FIM discharge scores (square-root transformed; $b = -.033$, $SE = .015$, $95\% \text{ CI} = [-.063, -.003]$, $\beta = -.23$, $p = .033$) after controlling for age, side of stroke, admission FIM, and length of stay. Thus, initial severity of spatial neglect predicted functional independence after inpatient rehabilitation.

Discussion

The KF-NAP provides comprehensive and clear observational methods for assessment and scoring of the CBS,^{19, 20} measuring patients' symptoms of spatial neglect while performing ADLs.^{21, 22} In the present study, we found excellent internal consistency and a single-factor structure in the KF-NAP, consistent with one study²³ but not another¹⁸ in both of which the CBS was examined without reporting a standardized assessment process. Thus, the process of the KFNAP may increase consistency among the observational categories. The majority (> 94%) of the participants were scored in all KF-NAP categories by OTs, suggesting excellent feasibility of using the assessment within the therapists' clinical routines. Omissions in scoring occurred less than 5% of time, and were likely to involve assessment of collisions, eating, cleaning after meal, navigation, or auditory attention. Since the KF-NAP measures one single factor, occasional missing observations should not diminish its validity; we recommend, however, that clinicians observe all categories to optimize its applicability.

Importantly, we found that the KF-NAP is different from the FIM or the BI but significantly correlated with them. All these assessment tools help examine deficits during ADLs but have different emphasis. The FIM measures burden of care, and the BI measures the assistance that patients need in daily life function. The FIM and BI both measure general functions, which may be affected by spatial neglect, but they do not provide specific information on whether poor functional performance is affected by spatial neglect. The KF-NAP measures patients' awareness of body-environment spatial relations during ADLs. Thus, the KF-NAP measures ADL performance deficits that are not captured by the FIM or BI.

Using the KF-NAP score to determine the presence of spatial neglect, we found the prevalence of the disorder to be high: 67.8% at admission and 47.2% at IRF discharge. It is not clear whether the decrease from admission to discharge is due to spontaneous stroke recovery, the effect of rehabilitation therapies, or a combination of the two. However, it is important to note that even after rehabilitation, a large proportion of patients were discharged with symptoms of spatial neglect. The present findings are consistent with reports of patients and caregivers that patients encounter difficulties with everyday tasks and community participation.^{33, 34} Thus, continued outpatient treatment for people with spatial neglect is desirable.

Lastly, consistent with previous research,^{14, 15} we found that spatial neglect and its severity predict poor rehabilitation outcomes even after prolonged IRF stay. This has important fiscal

and policy implications, in that spatial neglect can seriously hamper motor and functional improvement. Early detection and timely treatment may reduce its impact.

Study Limitations

While our findings suggest the potential of using KF-NAP as part of ADL assessment in clinical settings, there are a few limitations. OTs performed all the KF-NAP, FIM, and BI assessments in this study. However, in most IRFs, the FIM is assessed by a multi-disciplinary team including OTs, physical therapists, speech and language pathologists, and nurses. It is likely that the KF-NAP can also be administered by professionals from different disciplines who receive proper training. A study examining intra-rater reliability of examiners from multiple disciplines using KF-NAP may be warranted.

Another possible limitation is selection bias. It took 21 months to enroll and assess 121 study participants in the hosting IRF system, which admits more than 1,200 stroke survivors annually. Patients with multiple strokes and bilateral brain damage were not represented in the study. OTs also recruited two times more right than left brain-damaged stroke survivors. As a result, we were not able to separately examine the KF-NAP's psychometric properties for left vs. right brain-damage, because the sample of left stroke survivors was too small. Thus, a larger-scale study better representing the stroke population, including equal numbers of right and left brain-damaged stroke survivors, is needed.

Conclusions

The KF-NAP is a clinically feasible method to observe spatial neglect systematically during activities of daily living. With excellent internal consistency and a single-factor structure, the KF-NAP can be a standard process for measuring spatial neglect using the CBS items. Using the KF-NAP as the measure of spatial neglect, we found that spatial neglect is persistent after inpatient care is completed and adversely affects rehabilitation outcome even after prolonged IRF care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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List of Abbreviations

ADL	Activity of daily living
BI	Barthel Index

CBS	Catherine Bergego Scale
FIM	Functional Independence Measure
IQR	Interquartile range
IRF	Inpatient rehabilitation facility
KF-NAP	Kessler Foundation Neglect Assessment Process
OT	Occupational therapist

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KF-NAP™ Scoring Sheet

Date: _____ Name of Examinee: _____
 Time: _____ am/pm Examiner(s): _____

Kessler Foundation Neglect Assessment Process (KF-NAP™)

How to use the Catherine Bergego Scale to assess spatial neglect

	Category	0 no neglect	1 mild neglect	2 moderate neglect	3 severe neglect	NA (provide reasons)
1	Limb awareness					
2	Personal belongings					
3	Dressing					
4	Grooming					
5	Gaze orientation					
6	Auditory attention					
7	Navigation					
8	Collisions					
9	Eating					
10	Cleaning after meal					
Neglected side (circle one): <i>left-sided</i> spatial neglect; <i>right-sided</i> spatial neglect Number of scored categories = _____ Sum of the score = _____ Final Score = _____ Neglect severity (circle one): <i>Absent</i> (0); <i>Mild</i> (1-10); <i>Moderate</i> (11-20); <i>Severe</i> (21-30)						

See the *KF-NAP™ 2014 Manual* for detailed instructions of each category.

Figure 1.
 Scoring chart of the Kessler Foundation Neglect Assessment Process (KF-NAP™ 2014 Scoring Chart)

Table 1

Prevalence of spatial neglect following stroke with unilateral brain damage

Report* (ordered chronically)	Neglect prevalence (out of a given sample size)		Neglect assessment	Setting	Country
	Right-brain stroke	Left-brain stroke			
Gainotti et al., 1972	42% (n=114)	31% (n=108)	Confrontation examination	Outpatient clinic	Italy
Denes et al., 1982	33% (n=24)	21% (n=24)	Figure copying	Geriatric hospital	Italy
Fullerton et al., 1986	49% (n=88)	25% (n=117)	Postural examination, cancellation tests, drawing	General hospital	Ireland
Stone et al., 1993	82% (n=69)	65% (n=102)	Object pointing, reading, cancellation tests, coin selection, figure copying	General hospital	UK
McGlone et al., 1997	62% (n=71)	31% (n=67)	Figure copying & drawing, line bisection, cancellation tests	General hospital	Canada
Kalra et al., 1997	43% (n=75)	21% (n=70)	Confrontation examination, line bisection, cancellation tests, figure copying & drawing	General hospital	UK
Ringman et al., 2004	43% (n=356)	20% (n=394)	Confrontation examination	Acute care hospital	USA
Present study	76% (n=85)	47% (n=36)	Kessler Foundation Neglect Assessment Process (KF-NAP)	Acute inpatient rehabilitation	USA
Overall	51% (N=881)	29% (N=918)			

Note: Reports were selected for their inclusion of both left and right-brain-damaged stroke survivors.

Table 2

Demographic and clinical information of study participants at admission

		All N=121	No spatial neglect (KF-NAP = 0) n=39	Spatial neglect present (KF-NAP > 0) n=82	p value (Comparison between groups)
Sex	Male	53	16	37	.411 ^a
	Female	68	23	45	
Age	Years; median	70	69	71	.816 ^b
	(IQR)	(61-81)	(58-82)	(61-80)	
Handedness	Left	12	4	8	1.000 ^c
	Right	108	35	73	
	Ambidextrous	1	0	1	
Ethnicity	Hispanic	11	6	5	.096 ^a
	Non-Hispanic	110	33	77	
Race	White	78	20	58	.090 ^c
	Black	22	8	14	
	Asian	3	2	1	
	Other (including those identifying "Hispanic" as race)	17	8	9	
	Unknown	1	1	0	
Lesioned hemisphere	Left	36	19	17	.002 ^a
	Right	85	20	65	
Time post stroke	Days; median (IQR)	6 (4-9)	5 (4-9)	7 (4-9)	.458 ^b
Length of stay	Days; median (IQR)	20 (12-25)	13 (9-18)	22.5 (16-27)	< .001 ^b

Note

^aFisher's exact^bU test^cFreeman-Halton test

Table 3

Rotated factor loading pattern of the KF-NAP at admission (n = 73)

	Factor 1 ($\lambda=6.86$)
Grooming	.77 ^a
Eating	.68 ^a
Dressing	.53 ^b
Auditory attention	.33 ^a
Cleaning after meal	.33 ^a
Personal belongings	.28 ^a
Limb awareness	.25 ^b
Collisions	.25 ^b
Gaze orientation	.07 ^a
Navigation	-.02 ^b

Note

^a Items loading onto separate factors in the prior study of acute patients using the CBS,¹⁶ without the KF-NAP process.

^b Items loading onto separate factors in the prior study of acute patients using the CBS,¹⁶ without the KF-NAP process.

Table 4

Pairwise Spearman correlation coefficients (ρ) among KF-NAP, Motor FIM (mFIM), Cognitive FIM (cFIM), FIM, and BI

	Admission (n=82)				Discharge (n=51)			
	KF-NAP	mFIM	cFIM	FIM	KF-NAP	mFIM	cFIM	FIM
mFIM	-.61				-.65			
cFIM	-.43	.53			-.47	.54		
FIM	-.62	.96	.72		-.65	.98	.68	
BI	-.56	.93	.53	.91	-.58	.90	.49	.88

Note: All the p values < .00001

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Table 5

Rotated factor loading pattern of the reverse-coded KF-NAP, FIM, and BI at admission (n = 73)

Item	Factor # (λ) % of variance	1 ($\lambda=17.99$) 55.5%	2 ($\lambda=3.74$) 11.6%	3 ($\lambda=2.87$) 8.9%
FIM Transfers: Toilet		1.00 *	.07	-.03
FIM Transfers: Tub, Shower		.85 *	.06	-.04
FIM Toileting		.85 *	-.06	-.03
FIM Dressing-Lower Body		.79 *	.17	.15
FIM Transfers: Bed, Chair, Wheelchair		.67 *	.02	-.06
BI Toilet Use		.62 *	.04	.08
BI Transfers		.59 *	.04	.04
BI Mobility		.59 *	-.03	.02
FIM Stairs		.51 *	.01	-.03
BI Dressing		.49 *	.01	.15
FIM Bathing		.48 *	-.03	.20
FIM Walk/Wheelchair		.45 *	.00	-.01
KF-NAP Gaze orientation		.06	.92 *	-.06
KF-NAP Navigation		.01	.90 *	.08
KF-NAP Dressing		.07	.88 *	-.01
KF-NAP Personal belongings		.05	.88 *	-.03
KF-NAP Collisions		.02	.76 *	-.04
KF-NAP Grooming		.11	.75 *	.00
KF-NAP Eating		-.12	.72 *	-.05
KF-NAP limb awareness		-.04	.56 *	.03
KF-NAP Auditory attention		.04	.54 *	.01
KF-NAP Cleaning after meals		-.04	.51 *	.11
FIM Dressing-Upper Body		.40	.02	.67 *
FIM Expression		-.01	-.03	.14
FIM Grooming		.15	.05	.05
FIM Social Interaction		.02	.03	.04
FIM Problem Solving		.07	.05	.04
BI Bathing		-.04	.03	.02
BI Bowels		.08	-.02	.01
FIM Memory		-.01	-.04	.00

Item	Factor # (λ) % of variance	1 ($\lambda=17.99$) 55.5%	2 ($\lambda=3.74$) 11.6%	3 ($\lambda=2.87$) 8.9%
FIM Bladder Management		.14	.02	-.01
BI Grooming		.02	-.08	-.03
BI Bladder		.04	-.02	-.03

Note

* The factor loading that was the highest and with the value greater than .40 of a given item

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Table 6

Prevalence of spatial neglect.

	No neglect	Mild neglect	Moderate neglect	Severe neglect	Presence of spatial neglect
KF-NAP score	0	1 - 10	11 - 20	21 - 30	1 - 30
Admission					
Left-brain stroke (n=36)	19 (52.8%)	13	1	3	17 (47.2%)
Right-brain stroke (n=85)	20 (23.5%)	35	19	11	65 (76.5%)
Total (N=121)	39 (32.2%)	48	20	14	82 (67.8%)
Discharge					
Left-brain stroke (n=34)	25 (73.5%)	6	3	0	9 (26.5%)
Right-brain stroke (n=74)	32 (43.2%)	30	10	2	42 (56.8%)
Total (N=108)	57 (52.8%)	36	13	2	51 (47.2%)

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