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Five Factor Behavioral Assessment List for Stroke Patients with Cognitive Dysfunction

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Abstract

Introduction: Post-stroke cognitive dysfunction is a common symptom of stroke and can have a significant effect on the patient's activities of daily living (ADLs). Observing the everyday state of such a patient accurately and briefly can be very helpful in providing better therapy. The ADLs are affected by cognitive dysfunction; therefore, it is possible to understand the condition of a patient by observing his or her everyday behaviors. In this study we attempted to construct a behavioral assessment list (BAL) to assess the clinical characteristics of post-stroke patients with cognitive dysfunction (SPCD) by observing their performance in ADLs.

Method: Thirty registered occupational therapists were asked to write down the characteristic behaviors of the SPCD and 245 items were obtained. Inter-item distance matrix of these were performed by the categorization method and analyzed by multidimensional scaling and cluster analysis. These analyses were repeated until a proper and reasonable number of items were obtained. From the resulting 66 items, SPCDs were assessed on a 5 point-scale, and the results were factor analyzed (maximum likelihood, promax rotation). Additionally, Coma grades (Japan Coma Scale: JCS), Functional Independence Measure (FIM), and Rating Scale of attentional behavior were administered. Reliability and validity measures were calculated.

Result: At the end of the item selection process, a list of 30 items was obtained and final factor analysis revealed 5 factors. These were labeled as Fac.1 executive function (8 items), Fac.2 memory (7), Fac.3 behavioral regulation (7), Fac.4 communication ability (5), and Fac.5 perseveration (3). Reliability measures like Cronbach's α and others were sufficiently high.

Conclusion: A BAL for SPCD was constructed, and it could be used to easily assess the everyday conditions of any SPCD and provide better therapy for them combined with other medical and neuropsychological tests. However, the current study is still in its early stage, and it is necessary to increase the number of cases and scrutinize the outcome carefully to attain a more sophisticated BAL.

Keywords: *Cognitive Dysfunction; Behavioral Assessment; ADL; Stroke; Occupational Therapy; Rehabilitation*

Abbreviations

ADL: Activities of Daily Living; FIM: Functional Independence Measure; BAL: Behavioral Assessment List; SPCD: Stroke Patients with Cognitive Dysfunction; OTR: Registered Occupational Therapist; JCS: Japan Coma Scale

Introduction

The most common cause of adult disability is stroke and it is the second cause of death around the world [1]. Annually, there are 15 million people who suffer from stroke in the world. Of these, 5 million are left permanently disabled [2]. Damages to both physical and cognitive function are major complications in stroke. Cognitive deficits are found in 35% of stroke patients [3] and those patients have less recovery of physical functions [4,5]. These damages can have a significant effect on the patient's participation in rehabilitation [6], outcome, and performance of ADL (Activities of Daily Living) [7,8].

Neuroimaging studies have identified the cortical association of the areas related to cognitive dysfunction such as aphasia [9] and spatial neglect [10]. Additionally, many neuroimaging studies have shown the relationship between the lesion side and the prognosis of ADL: patients with the right hemisphere damage are more difficult to recover than those with the left damage [11], however, there are other studies which show the lesion side is unrelated [12].

Evaluation of cognitive function after stroke is recommended by international guidelines [13]. Neuropsychological examinations are widely accepted as including the assessment of cognitive dysfunction in various areas [14]. They are used as the primary outcome in clinical trials [15] and can predict the prognosis [16]. They are useful for evaluating the type and extent of disability of the body structure and function [17].

However, there is a possibility that the factors other than those observed from neuroimaging studies also have influence on the ADL [18]. Most of the neuropsychological studies could not sufficiently evaluate the influence of cognitive dysfunction on ADL and social participation of the stroke patients [19]. ADL and social participation require the coordinated operation of motor, multiple sensory and cognitive systems, and in real-world tasks [20]. The present study will focus on those aspects of post-stroke patients with cognitive dysfunction (SPCD).

As well as the neuropsychological tests, International Guidelines recommends for caregivers to observe and to evaluate ADL and social participation of SPCD [21]. There are several tests that can evaluate the influence of cognitive dysfunctions in the patients' daily lives, such as the Rating Scale of Attentional behavior [22] and the Moss Attention Rating Scale [23] for attention, Questionnaires [24,25] on executive function and Spontaneity Score [26] for spontaneity. However, these kinds of tests are few [21] and most questionnaires and behavioral assessment tools measure only one or restricted aspect of functions such as attention and memory etc.

Purpose of the Study

The purpose of this study is to construct a behavioral assessment list (BAL) that is useful especially for non-professional caregivers and also for medical staffs in order to effectively assess the performance of ADL and other behaviors of SPCD. BAL should consist of the statements of everyday behaviors of SPCD that are easily observable by anyone who takes care of the patient and the range of the behaviors to be observed must include as many relevant cognitive functions as possible.

The benefits of BAL are straightforward and will be useful for rehabilitation planning and a more appropriate caretaking during the entire period of the patients' recovery. The present study is the first step towards this purpose and the proposal of the very first version of the BAL.

Materials and Methods

Preparation of items for BAL

Items relevantly descriptive of SPCD's performance in ADL were selected as follows.

Thirty OTRs (registered occupational therapists) having more than 3 years of experience were asked to write down characteristic behaviors that they had always observed in SPCD based on each of the 20 categories of FIM (Functional Independence Measure). This gave 245 sentence items. Among those, 45 sentences were selected by the judges (the author, two OTRs and a clinical psychologist) as expressing similar behavior and were thus discarded.

The remaining 200 sentences were classified according to the similarity of the presumable causes of the behavior specified by each sentence into 10 arbitrary categories by 22 of the OTRs. From the resulting categorization 108 items were judged as inadequate and discarded because of several reasons such as difficulty in categorization or too many or too little number of items in the given category, and so on by the judges. Inter-item coincidence ratios of each two of the remaining 92 items were calculated from the frequency of which any two items were classified into the same category by the 22 OTRs.

The distance matrix calculated from the above ratio data was analyzed by MDS (PROXSCAL method of multidimensional scaling). The results were further analyzed by hierarchical cluster analysis. The MDS and the cluster analysis were repeated until a reasonable grouping of items was obtained by cluster analysis, judging from the purpose of this study. In the final process of the repeated calculations, we adopted a two-dimensional solution in MDS (raw stress 0,170, s-stress 0.36 Dispersion Accounted For D.A.F 0.829) and then six groups of items in the final cluster analysis. SPSS Statistics ver. 20 IBM was used for those analyses.

In this way we had 6 relevant groups of 92 items, but the number of each group was rather varied (ranged 6 to 26). So, 34 items were discarded to balance the number in each cluster as far as possible by the criteria of clearness of meaning, plausibility of the behavior, and others by the judges mentioned above.

Finally, 66 items in 6 groups were obtained as the preliminary BAL for SPCD [27].

Method

Sample: People selected as the sample of this study were 90 SPCD who were admitted to recovery wards in rehabilitation hospitals at 4 different medical hospitals. Of who, 45 were male and 45 were female.

Procedure: Ninety patients (SPCD) were assessed according to a 5-point scale (0; nothing admitted, 1; rarely admitted, 2; sometimes admitted, 3; frequently admitted, 4; always admitted) for each item of the BAL by an OTR at the hospital to which each of the patients belonged. The number of the patients assessed by an OTR was different and ranged from 6 to 9. In addition to BAL, the Rating Scale of Attentional Behavior that consists of 14 items of Ponsford [22] was also used. Patient's information of awareness stage (Japan Coma Scale: JCS) and FIM as ADL independence measure were obtained from the medical chart of each hospital.

Statistical analysis

An Inter item Pearson's product moment correlation coefficients matrix was calculated and factor analyzed (maximum likelihood method, Promax rotation). To assess the internal consistency, Spearman-Brown correction, Cronbach'α coefficient and Item-Total correlation were calculated. In case of validity, the correlation coefficient among the subscale values of BAL and the Rating Scale of Attentional Behavior, Arousal Scale (JCS), Days from onset, FIM score were also calculated. SPSS Statistics ver. 20 IBM was used for all the above analyses. As the subscale values of BAL for each patient, the averages of assessed scores (0 to 4) of the items for each factor were calculated.

This study was performed in accordance to the Ethics Committee of Bunkyo Gakuin University and informed consents were obtained from all patients.

Results and Discussion

Missing values and remaining samples: Among the 90 patients (SPCD), 9 people were excluded because of more than 6 (10%) missing values. The basic attributes of the remaining 81 patients were 43 males, 38 females, and the average age ± standard error was 63.9 ± 10.29 years. The values of the total score of FIM and the number of days since the onset were 83.29 ± 3.37 and 118.09 ± 13.83 days, respectively (Table 1). The range of the scores for the 66 items was from 4 to 0 and the average value was 1.55 (SD, 1.02).

Factor analysis

Factor analysis mentioned in the procedure was repeated and in each analysis factors with more than 1.0 eigenvalue were selected. Also, items with factor loading > 0.45 and those not belonging to plural factors were selected. Finally, the number of the items was reduced from 66 to 30 items and the 5-factor solution was adopted. The cumulative contribution of five factors before the final promax rotation was 73.1%.

		Numbers and Averages (± standard error)	Range
Sex	Men	43	
	Women	38	
Age		63.98 ± 10.29	21 - 92
Days from onset		118.09 ± 13.83	5 - 763
Side of lesion	Right hemisphere	24	
	Left hemisphere	51	
	Both hemisphere	4	
	Other	2	
FIM	Total score	83.29 ± 3.37	18 - 128
	Motor score	71.85 ± 3.07	25 - 99
	Cognitive score	28.71 ± 1.14	15 - 35
Rating Scale of Attentional behavior		21.81 ± 1.68	0 - 56

Table 1: *Attributes of the samples (SPCDs).*

Note: FIM: Functional Independence Measure.

Table 2 shows the result of the final analysis. There was a positive correlation between the five factors (r = 0.195~0.452) as shown in the table.

Items	Factor					Communality	Item-Total Correlation
	1	2	3	4	5		
Begin something without deciding the order of doing it beforehand.	0.938	0.062	-0.010	-0.013	0.033	0.826	.814**
Difficult to decide what to do first (e.g. in clearing a room or changing clothes)	0.878	0.058	-0.005	0.071	0.069	0.898	.830**
Cannot make a schedule to do a task	0.832	0.192	0.050	0.022	0.026	0.416	.868**
Cannot decide the priority of the tasks to be done	0.785	0.197	0.058	0.020	0.079	0.645	.879**
Difficult to estimate the time needed to finish a task (e.g. changing clothes or using the toilet)	0.726	0.235	0.075	0.045	0.079	0.804	.885**
Mistake the order of the motions of doing something (e.g. changing clothes or using the toilet)	0.645	0.084	0.261	-0.050	0.130	0.410	.803**
Difficult to follow the advices given about the order of motions in changing clothes etc.	0.567	0.210	0.196	0.024	0.197	0.691	.851**
Cannot realize one's own mistakes while doing something (e.g. changing clothes or using the toilet)	0.559	0.094	0.361	-0.050	0.197	0.855	.828**
Tend to forget the place where an important thing was placed	0.270	0.649	0.157	-0.044	0.093	0.706	.805**
Tend to forget where everyday things like books or newspapers were placed by oneself	0.245	0.623	0.192	-0.082	0.204	0.430	.829**
Repeat the same story many times	0.138	0.594	0.063	0.171	0.116	0.665	.750**
Tend to slip mind and cannot find what to speak next	0.275	0.538	-0.161	0.061	-0.138	0.815	.468**
Tend to remember wrongly what was told to do	0.217	0.534	-0.017	0.294	0.123	0.819	.746**
Repeat asking the same questions	0.076	0.528	0.044	0.171	-0.024	0.795	.578**
Often forget promises	0.273	0.528	0.042	0.204	0.093	0.683	.761**
Tend to move or behave hastily	0.044	0.023	0.888	0.091	-0.136	0.908	.563**
Behaviors are rough in general	0.142	-0.151	0.838	0.187	-0.037	0.954	.595**
Use everyday things or tools roughly	0.244	0.029	0.666	0.094	0.005	0.939	.673**
Talkative	-0.156	0.265	0.528	0.331	0.029	0.876	.618**
Difficult to take notice the body balance while changing clothes etc.	0.292	-0.053	0.501	-0.020	0.396	0.745	.720**
Try to do next motion before finishing present one	0.106	0.271	0.494	-0.106	0.325	0.912	.716**
Repeat the same mistakes because of too much self confidence	0.190	0.239	0.461	0.166	0.095	0.788	.758**
Speak loudly without minding the people around	-0.151	0.046	0.237	0.705	-0.069	0.592	.364**
Speak inappropriately to the context or the circumstance	0.162	0.210	-0.036	0.648	0.221	0.609	.726**
Difficult to understand other's intention or thought	0.423	0.190	0.005	0.630	-0.025	0.842	.776**
Has little intention to speak clearly to be understood easily by others	-0.032	-0.081	0.365	0.576	0.245	0.745	.564**
Talk is sluggish and difficult to understand	0.168	0.299	0.140	0.545	-0.005	0.662	.767**
Unable to stop movement of eating or wearing	0.167	-0.035	-0.092	0.145	0.835	0.565	.597**
Keep washing the same place only while cleansing or bathing	0.224	0.032	0.035	-0.044	0.811	0.604	.640**
Move around restlessly in the hospital	0.018	0.198	-0.021	0.268	0.446	0.731	.528**
Factor correlation							
Factor 1	1.000						
Factor 2	0.452	1.000					
Factor 3	0.303	0.236	1.000				
Factor 4	0.200	0.258	0.195	1.000			
Factor 5	0.425	0.315	0.239	0.076	1.000		

Table 2: *Factor pattern coefficients of 30 items of BAL after Promax rotation.*

Factor structure of BAL: The 5 factors of BAL were labeled and interpreted as follows:

- **Factor 1:** Executive Function, this factor consisted of 8 items, like "Begin something without deciding the order of doing it beforehand", "Difficult to decide what to do first (e.g. in clearing a room or changing clothes)", and "Cannot make a schedule to do a task," had high factor loadings. This is related to planning, effective performance and temporal sequencing deficits [24,28,29] and may reflect the prefrontal cortex damage [30,31].
- **Factor 2:** Memory, this factor included 7 items related to memory function such as encoding, storage, reproduction, etc. [32,33]; "Tend to forget the place where an important thing was placed", "Repeat the same story many times" and "Tend to remember wrongly what was told to do".
- **Factor 3:** Behavioral Regulation, including 7 items, this factor seemed to reflect hasty and careless behavior. This indicates an impairment in pacing [34] and attentional control [31], which may be related to the right hemispheric symptoms [34,35]; "Tend to move or behave hastily", "Behaviors are rough in general" and "Talkative".
- **Factor 4:** Communication ability, this consisted of 5 items associated with nonverbal language impairment [36] and hyperlalia [37] rather than aphasia; "Speak inappropriately to the context or the circumstance", "Difficult to understand other's intention or thought" and "Has little intention to speak clearly so as to be easily understood by others". These items represent and may be related to the right hemisphere and thalamic damage [37].
- **Factor 5:** Preservation, this included 3 items, i.e., "Unable to stop movement of eating or wearing", "Keep washing the same place only while cleansing or bathing" and "Move around restlessly in the hospital". These items seemed to be related to preservation [38], i.e. tendency of not being able to inhibit the once activated behavior. It appears to reflect the control of attention [39], which makes it difficult to switch attention. There are many opinions that this symptom is due to the left hemispheric symptom [40], although there is some assertion that the right hemisphere is also responsible for this symptom [41,42].

Reliability and internal consistency: As to the reliability of each item, the Item-Total correlation was computed and ranged from 0.364 to 0.879 (significance level $p < 0.01$) (Table 2). The correlation coefficient using split-half method ranged from 0.538 to 0.955, and as shown in table 4 the reliability by Spearman-Brown correction formula ranged from 0.700 to 0.977 and Cronbach's α coefficients ranged from α=0.825 to 0.977 with all factors.

		α confidence coefficient	Spearman-Brown correction	Rage of Item- Remainder correlation
Factor 1	Executive Function	0.977	0.977	0.852 - 0.943
Factor 2	Memory	0.931	0.921	0.390 - 0.796
Factor 3	Behavioral regulation	0.892	0.893	0.454 - 0.780
Factor 4	Communication ability	0.881	0.888	0.489 - 0.805
Factor 5	Perseveration	0.825	0.700	0.538 - 0.767

Table 3: *Internal consistency (coefficient of α confidence, Spearman-Brown and Item- Remainder correlation).*

The correlation coefficient using split half method and the Cronbach's α coefficient indicated high internal consistency in all 5 factors. Since the alpha value of Cronbach showed a high value as 0.8 or more, it can be considered that BAL was verified as having good reliability and internal consistency [43].

Validity of BAL: Pearson's correlations among the individual average score of each factor and the scores of other 5 assessments i.e. The Rating Scale of Attentional behavior, Arousal Scale (JCS), number of days from onset, and FIM were shown in table 4. Factors 1 to 5 were strongly correlated with FIM (cognitive score), Arousal Scale (JCS) and Days ($r=0.283 \sim 0.880$, $p < 0.001$). Factor1 to 3 showed significant correlations with Arousal Scale and Factor1 and 2 showed significant correlations with the Rating Scale of Attentional behavior ($p < 0.05$) (Table 4).

		FIM (Total score)	FIM (Motor score)	FIM (Cognitive score)	Arousal Scale (JSC)	Attention Scale	Days from on set
Factor 1	Pearson's r	.462**	0.272	.680**	.360**	.431**	.880**
	n	74	40	40	77	77	77
Factor 2	Pearson's r	.249*	0.063	.670**	.307**	.274*	.736**
	n	77	41	41	80	80	80
Factor 3	Pearson's r	.335**	0.209	.535**	.344**	0.117	.659**
	n	77	41	41	80	80	80
Factor 4	Pearson's r	0.189	-0.082	.651**	.346**	0.090	.555**
	n	78	41	41	81	81	81
Factor 5	Pearson's r	.415**	0.271	.433**	.283*	0.204	.808**
	n	78	41	41	81	81	81

Table 4: *Pearson's correlation coefficient: among the subscale score for each factor and scores of other.*

***p < 0.001, *p < 0.05.*

Note. FIM: Functional Independence Measure; JCS: Japan Coma Scale; Attention Scale: Rating Scale of Attentional behavior.

The results from the present study indicated that BAL could evaluate cognitive functions such as executive functions, nonverbal communication, pacing, and perseveration in SPCD, and it can be said that those aspects in SPCD have not been sufficiently evaluated by the existing neuropsychological tests. In rehabilitation, the WHO ICF model is often referred, but usually 'body structure and function' in the model are considered separate from 'activity and participation. There are tools to measure the type and degree of disability in the body structure and functions of the ICF, while there are few tools to measure activity and participation. Adequate tools to get information about activities and participation of the patients from caregivers are needed. Therefore, BAL can serve as an adequate tool that can assess activities and participation. Above all non-professional caregivers can also possibly evaluate SPCD with BAL and share the information with professionals.

Study Limitation

The present study aimed to develop a scale to measure the difficulty in performance of ADL after stroke, and therefore, constructed BAL. Although the internal consistency of it was established to be sufficiently good, the inter-rater reliability has not been examined at this stage of the study. It would be useful to verify the reliability of the test-retest method also. But it was impossible to use it because the patients of this study were in the periods of acute to recovery period and had shown significant symptomatic changes during this period. Like the present study, this is one of the inherent limitations of these studies.

As for the validity, high correlation between BAL and FIM was found in the present study but it is desirable to compare the score of BAL with proper neuropsychological examinations.

BAL of the present study had 30 items. Among them there still are several sentences resembling with each other in the meaning. Further refinement and reduction of the number of items is possible and also preferable.

Conclusion

In this study, we could present BAL especially designed to assess the difficulties in ADL of SPCD. The target users of BAL are for both non-professional caregivers and experienced medical stuffs. By using BAL cognitive functions such as executive function, attention function, memory, working memory, communication, and preservation could be easily assessed by observing everyday behaviors of SPCD in any circumstance. Sharing the results of BAL would bring efficient clues to better rehabilitation planning and help to quickly grasp the rough stage of recovering of the patients.

In the next step of the present study, it will be necessary to increase the number of cases to enhance reliability and validity. And it may be said reducing the number of assessment items will be necessary for more practical use.

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Conflict of Interest

None.

Bibliography

1. Strong Kathleen., *et al*. "Preventing Stroke: Saving Lives Around the World". *The Lancet Neurology* 6.2 (2007): 182-187.
2. Kalra Lalit and Peter Langhorne. "Facilitating Recovery: Evidence for Organized Stroke Care". *Journal of Rehabilitation Medicine* 39.2 (2007): 97-102.
3. Tatemichi TK., *et al*. "Cognitive Impairment After Stroke: Frequency, Patterns, and Relationship to Functional Abilities". *Journal of Neurology, Neurosurgery, and Psychiatry* 57.2 (1994): 202-207.
4. Paolucci Stefano, *et al*. "Predicting Stroke Inpatient Rehabilitation Outcome: The Prominent Role of Neuropsychological Disorders". *European Neurology* 36.6 (1996): 385-390.
5. Mysiw WJ., *et al*. "Prospective Cognitive Assessment of Stroke Patients before Inpatient Rehabilitation. the Relationship of the Neurobehavioral Cognitive Status Examination to Functional Improvement". *American Journal of Physical Medicine and Rehabilitation* 68.4 (1989): 168-171.
6. Skidmore Elizabeth R., *et al*. "Cognitive and Affective Predictors of Rehabilitation Participation After Stroke". *Archives of Physical Medicine and Rehabilitation* 91.2 (2010): 203-207.
7. Pohjasvaara T., *et al*. "Correlates of Dependent Living 3 Months After Ischemic Stroke". *Cerebrovascular Diseases* 8.5 (1998): 259-266.
8. Grimby G., *et al*. "Dependence and Perceived Difficulty in Daily Activities in Community-Living Stroke Survivors 2 Years After Stroke: A Study of Instrumental Structures". *Stroke* 29.9 (1998): 1843-1849.
9. Gottesman Rebecca F and Argye E Hillis. "Predictors and Assessment of Cognitive Dysfunction Resulting from Ischaemic Stroke". *The Lancet. Neurology* 9.9 (2010): 895-905.
10. Verdon Vincent., *et al*. "Neuroanatomy of Hemispatial Neglect and its Functional Components: A Study using Voxel-Based Lesion-Symptom Mapping". *Brain* 133.3 (2010): 880-894.
11. Denes G., *et al*. "Unilateral Spatial Neglect and Recovery from Hemiplegia: A Follow-Up Study". *Brain* 105.3 (1982): 543-552.
12. Wade DT., *et al*. "Stroke: Influence of Patient's Sex and Side of Weakness on Outcome". *Archives of Physical Medicine and Rehabilitation* 65.9 (1984): 513-516.
13. Miller Elaine L., *et al*. "Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient: A Scientific Statement from the American Heart Association". *Stroke* 41.10 (2010): 2402-2448.
14. Cumming, Toby B., *et al*. "Stroke, Cognitive Deficits, and Rehabilitation: Still an Incomplete Picture". *International Journal of Stroke* 8.1 (2013): 38-45.

15. Lees Rosalind., *et al*. "Cognitive and Mood Assessment in Stroke Research: Focused Review of Contemporary Studies". *Stroke* 43.6 (2012): 1678-1680.

16. Nys GMS., *et al*. "Cognitive Disorders in Acute Stroke: Prevalence and Clinical Determinants". *Cerebrovascular Diseases* 23.5-6 (2007): 408-416.

17. Mahendra Nidhi. "A Multicultural Perspective on Assessing TW, a Bilingual Client with Aphasia". *Perspectives on Neurophysiology and Neurogenic Speech and Language Disorders* 16.3 (2006): 9-18.

18. Saeki S., *et al*. "Association between Location of the Lesion and Discharge Status of ADL in First Stroke Patients". *Archives of Physical Medicine and Rehabilitation* 75.8 (1994): 858-860.

19. Tompkins CA., *et al*. "Functional Outcome Assessment of Adults with Right Hemisphere Brain Damage". *Seminars in Speech and Language* 19.3 (1998): 303-321.

20. Keith Cicerone., *et al*. "Cognitive Rehabilitation Interventions for Executive Function: Moving from Bench to Bedside in Patients with Traumatic Brain Injury". *Journal of Cognitive Neuroscience* 18.7 (2006): 1212-1222.

21. Miller Elaine L., *et al*. "Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient: A Scientific Statement from the American Heart Association". *Stroke* 41.10 (2010): 2402-2448.

22. Ponsford Jennie and Glynda Kinsella. "The use of a Rating Scale of Attentional Behaviour". *Neuropsychological Rehabilitation* 1.4 (1991): 241-257.

23. Whyte John., *et al*. "The Moss Attention Rating Scale for Traumatic Brain Injury: Initial Psychometric Assessment". *Archives of Physical Medicine and Rehabilitation* 84.2 (2003): 268-276.

24. Chan Raymond C K., *et al*. "Assessment of Executive Functions: Review of Instruments and Identification of Critical Issues". *Archives of Clinical Neuropsychology* 23.2 (2008): 201-216.

25. Wilson Barbara A., *et al*. "Behavioural Assessment of the Dysexecutive Syndrome". *Journal of Occupational Psychology, Employment and Disability* 5.2 (2003): 33-37.

26. Fumiko Wakui, *et al*. "New Evaluation Method by using Spontaneity Score (S-Score) in Patients with Brain Disorders". *Sogo Rihabiriteshon* 21.6 (1993): 507-510.

27. Yaoko Iwasaki, Toshiaki Muraki, and Ken Goryo. "A Preliminary Study of Characteristics of Performance Difficulties in Daily Life Activities of Patients with Higher Cortical Dysfunction". *Bulletin of Saitama Occupational Therapy* 12 (2013): 11-19.

28. Cicerone K D and J C. Wood. "Planning Disorder After Closed Head Injury: A Case Study". *Archives of Physical Medicine and Rehabilitation* 68.2 (1987): 111-115.

29. Burgess Paul W and Tim Shallice. "Response Suppression, Initiation and Strategy use Following Frontal Lobe Lesions". *Neuropsychologia* 34.4 (1996): 263-272.

30. Lezak Muriel D. "Neuropsychological Assessment, 3rd Edition". (1995): 1026.

31. Antoine Bechara., *et al*. "Failure to Respond Autonomically to Anticipated Future Outcomes Following Damage to Prefrontal Cortex". *Cerebral Cortex* 6.2 (1996): 215-225.

32. Tulving Endel. "Concepts of Memory". The Oxford Handbook of Memory (2000): 33-43.

33. Okuda Jiro., *et al*. "Participation of the Prefrontal Cortices in Prospective Memory: Evidence from a PET Study in Humans". *Neuroscience Letters* 253.2 (1998): 127-130.

34. Takashi Miyamori. "Right Brain Damage and Rehabilitation: On Psychological Problem". *Sogo Rihabiriteshon* 16.11 (1988): 855-862.

35. Hajime Hirabayashi., et al. "Impairment in Pacing in Right-Brain-Damaged Patients". Japanese *Journal of Neuropsychology* 7.2 (1991): 141-148.

36. Joanette Yves., *et al*. "Right Hemisphere and Verbal Communication". New York, NY, US: Springer-Verlag Publishing (1990): 228.

37. Yamadori A., *et al*. "Hyperlalia: A Right Cerebral Hemisphere Syndrome". *Behavioural Neurology* 3.3 (1990): 143-151.

38. Goldenberg Georg. "Apraxia and Beyond: Life and Work of Hugo Liepmann". *Cortex* 39.3 (2003): 509-524.

39. T Shallice. "Specific Impairments of Planning". *Philosophical Transactions of the Royal Society of London B Biological Sciences* 298.1089 (1982): 199-209.

40. Fisher M. "Left Hemiplegia and Motor Impresistence". *The Journal of Nervous and Mental Disease* 123.3 (1956): 201-218.

41. Albert Martin L and Jennifer Sandson. "Perseveration in Aphasia". *Cortex* 22.1 (1986): 103-115.

42. Sandson J and M L Albert. "Perseveration in Behavioral Neurology". *Neurology* 37.11 (1987): 1736-1741.

43. Robert A Peterson. "A Meta-Analysis of Cronbach's Coefficient Alpha". *Journal of Consumer Research* 21.2 (1994): 381-391.

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