

Validation of a Standardized Assessment of Postural Control in Stroke Patients

The Postural Assessment Scale for Stroke Patients (PASS)

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Background and Purpose—Few clinical tools available for assessment of postural abilities are specifically designed for stroke patients. Most have major floor or ceiling effects, and their metrological properties are not always completely known.

Methods—The Postural Assessment Scale for Stroke patients (PASS), adapted from the BL Motor Assessment, was elaborated in concordance with 3 main ideas: (1) the ability to maintain a given posture and to ensure equilibrium in changing position both must be assessed; (2) the scale should be applicable for all patients, even those with very poor postural performance; and (3) it should contain items with increasing difficulty. This new scale has been validated in 70 patients tested on the 30th and 90th days after stroke onset.

Results—Normative data obtained in 30 age-matched healthy subjects are presented. The PASS meets the following requirements: (1) good construct validity: high correlation with concomitant Functional Independence Measure (FIM) scores ($r=0.73$, $P=10^{-6}$), with lower-limb motricity scores ($r=0.78$, $P<10^{-6}$), and with an instrumental measure of postural stabilization ($r=0.48$, $P<10^{-2}$); (2) excellent predictive validity: high correlation between PASS scores on the 30th day and FIM scores on the 90th day ($r=0.75$, $P<10^{-6}$); (3) high internal consistency (Cronbach α -coefficient=0.95); and (4) high interrater and test-retest reliabilities (average $\kappa=0.88$ and 0.72).

Conclusions—Our results confirm that the PASS is one of the most valid and reliable clinical assessments of postural control in stroke patients during the first 3 months after stroke. (*Stroke*. 1999;30:1862-1868.)

Key Words: reproducibility of results ■ prognosis ■ posture ■ stroke ■ hemiplegia

After a stroke, the ability to control balance in the sitting and standing positions is a fundamental skill of motor behavior for achieving autonomy in everyday activities. The postural performance of patients soon after a stroke has been found to be closely correlated with long-term functional improvement.¹⁻³ Because it may help in establishing the severity and prognosis of a stroke, the early assessment of balance in stroke survivors is an important part of the clinical examination.

Analysis of balance relies either on clinical scales or on instrumentation. The advantage of the former is mainly related to the need to assess balance in each patient with a stroke, irrespective of the severity of impairment. The advantage of the latter is mainly related to the fact that in some conditions, the use of new biotechnology is helpful for understanding the diseases. Although the present report is focused on the clinical approach, the comparative value of these 2 ways of assessing posture will be presented.

Among the clinical measurements available for assessing postural abilities, only a few are specifically dedicated to

hemiplegic patients (Table 1). Some are included in global neurological or functional assessment.⁴⁻¹¹ More recently, clinical scales have been proposed that are specifically designed to assess posture in hemiplegic patients.^{1,12-16} Most of these scales are constructed with ordinal items or are time related, providing helpful data for clinical practice or research.^{1,4-10,12-16}

Postural tasks vary from test to test. Sitting posture is one of the first postures to be restored after stroke, presumably due to the bilateral innervation of the trunk and girdle muscles.^{17,18} This posture can thus be assessed early, and the evaluation of the patients' ability to remain seated independently is very often a key point in the assessment of postural control after stroke. For instance, Feigin et al¹ and Sandin and Smith¹⁵ evaluated static and dynamic balance in patients who were sitting on the side of a hospital bed. The time between stroke onset and evaluation in these 2 studies was quite short, <1 week and ≈ 3 weeks, respectively. However, a major ceiling effect was observed in both studies, because maximal

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TABLE 1. Clinical Scales Available in Stroke Patients and Containing Postural Items

Author (Year); Name of Assessment (If Available)	Type of Scoring	Examination Positions	Postural Tasks	Validation
Fugl-Meyer (1975); FM Motor Assessment	Sum of ordinal items	Lying/sitting/standing	Maintain and change position	Valid reliability
Feigeson (1979); Burke Stroke Time-Oriented Profile (BUSTOP)	Sum of ordinal items	Lying/sitting/standing	Maintain and change position	...
Ashburn (1982)	Sum of ordinal items	Lying/sitting/standing	Maintain and change position	Reliability
Carr (1985); Motor Assessment Scale (MAS)	Sum of ordinal items	Lying/sitting/standing	Maintain and change position	Reliability
*Shumway-Cook (1986); Sensory Organisation Balance Test	Timed items	Standing	Maintain position	...
Lindmark (1988); BL Motor Assessment	Sum of ordinal items	Lying/sitting/standing	Maintain and change position	Valid reliability
*Partridge (1988)	"does/does not" items	Lying/sitting/standing	Maintain and change position	Valid
*Collin (1989); Trunk Control Test (TCT)	Sum of numerical items	Lying/sitting	Maintain and change position	Valid reliability
*Sandin (1989)	Ordinal item	Sitting	Maintain position	...
*Brun (1993); Bourges indexes	2 Ordinal items	Sitting/standing	Maintain position	Valid reliability
*Bohannon (1993); Single Limb Stance Timed Test	Ordinal item	Standing	Maintain position	Valid reliability
Gowland (1993); Chedoke-McMaster Stroke Assessment	Sum of ordinal items	Lying/sitting/standing	Maintain and change position	Valid reliability
*Hill (1996); Step Test	Timed task	Standing	Change position	Valid reliability
*Feigin (1996)	Ordinal item	Sitting	Maintain and change position	...

Items with an asterisk concern only postural abilities. Validation includes validity and/or reliability.

scores were observed in 66% and 65% of patients only 1 week after the first evaluation. Some studies used a timed task for the standing position, either in static¹² or dynamic¹⁴ conditions. As a result, these studies only concerned those patients able to stand with¹² or without¹⁴ support, which consequently increased the delay in assessing patient postural skill (54.4 days for patients who could stand independently without support). This illustrates the difficulties of evaluating equilibrium in poststroke patients by use of a single clinical scale, particularly in the first weeks after the incident.

One way to avoid floor or ceiling effects is to include items of varying difficulty in the same clinical scale. Such a scale was composed by Fugl-Meyer et al⁸ as early as 1975. On many occasions, this scale has proved to be a valid and reliable tool, both as a whole and particularly with regard to the mobility and balance sections that assess postural abilities.^{19,20} The major drawback of the Fugl-Meyer scale is that most items (including mobility and balance items) have only 3 levels of assessment, so that many hemiplegic patients score the intermediate level and remain at this stage for quite a long time. For this reason, Lindmark and colleagues proposed a revised version of the Fugl-Meyer assessment. On this scale (the BL Motor Assessment), all items had at least 4 levels, to obtain a more sensitive scale¹⁰; 15 of 98 items were dedicated to mobility (7 items, plus 1 for gait) and balance (7 items).

The present study aimed at validating a specific postural assessment scale specifically designed to assess and monitor postural control after stroke. The Postural Assessment Scale for Stroke patients (PASS) was elaborated in concordance with 3 main ideas: (1) basically, postural control relies on 2 domains, which must both be assessed: the ability to maintain a given posture and to ensure equilibrium in changes of position; (2) a useful scale should be applicable for all patients, even those with very poor postural performance; and (3) a sensible scale should contain items with increasing

levels of difficulty. On this basis, we have adapted items from the Fugl-Meyer assessment. The new scale contains 12 four-level items of varying difficulty for assessing ability to maintain or change a given lying, sitting, or standing posture (see Appendix).

Subjects and Methods

One hundred subjects participated in the study: 30 healthy subjects and 70 patients. Age-matched controls were analyzed to obtain normative data. Fifty-eight patients were prospectively included in our neurological rehabilitation unit within the first month after a first unilateral hemispheric acute stroke. CT scan or MRI confirmed the diagnosis. Patients were included over an 18-month period only if they had suffered a unique supratentorial cerebrovascular accident, showed no psychiatric disorders or dementia, and had no previous sensory or orthopedic disease that could affect body balance. Twelve other patients have been included to test reliability properties. Equilibrium was measured with the PASS on day 30 (D30) and day 90 (D90) after stroke onset.

Construct validity, ie, the extent to which the PASS can be related to other constructs, was assessed by an examination of how it correlated with clinical indexes (motricity, somatosensory threshold, spatial inattention, spasticity, and functional status) and with instrumental measures of sitting balance, when available. A clinical examination was made on D30 and D90 for 58 patients. The severity of weakness was assessed on a scale ranging from 0 to 40 by a standard examination of muscle strength derived from that proposed by Held et al²¹ in patients with central neurological disorders. As already proposed,²² the somatosensory threshold was assessed by an investigation of pressure sensitivity at the pulp of the big toe with a set of 20 calibrated nylon filaments by use of a Semmes-Weinstein esthesiometer.²³ The spasticity of 5 muscle groups was assessed with the Ashworth scale,²⁴ which gives a total score ranging from 0 (no spasticity) to 20 (severe and diffused spasticity). Assessment of spatial inattention was based on the number of targets omitted in the star cancellation test.²⁵ Functional status was measured with the Functional Independence Measure (FIM).²⁶

Patients' equilibrium was also measured instrumentally (D30 and D90) with a rocking platform, described in detail by Pérennou et al.^{22,27} Briefly, a rigid plane support was mounted on a seesaw with a horizontal rotation axis parallel to the subject's sagittal plane.

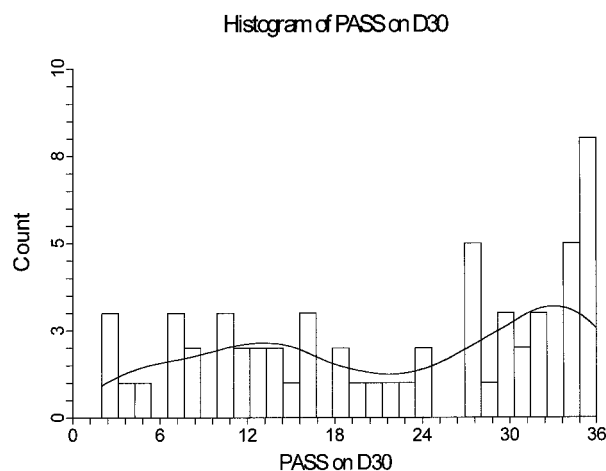


Figure 1. Frequency distribution and density trace of PASS scores on D30.

Patients sat centrally on the rocking platform, laterally unstable. They were asked to actively maintain an upright sitting posture as still as possible for 8 seconds while looking straight ahead at a target centrally positioned at eye level. During the trials, their hands were crossed, resting on the thighs. The height of the sitting support was adjustable so that the subjects' legs were freely hanging. The kinematics of the support orientation and stabilization were analyzed by means of an accelerometer fixed under the platform and used as an inclinometer. Only those patients able to maintain an erect sitting posture on this laterally unstable support were evaluated.

Predictive validity was assessed by an examination of how PASS score, measured on D30, could be correlated to the functional status (FIM level) at the end of the third month. Internal consistency, ie, the extent to which items on the PASS are correlated with each other, was assessed with the Cronbach α -coefficient in patients. A high inter-item correlation indicates a good homogeneity of the entire scale.

Reliability properties were assessed in a separate sample of 12 patients. Interrater reliability, ie, the consistency of measurements between raters, was measured with the κ -coefficient (for every item) and Pearson product moment correlation (for the total score) between two raters' scorings. Intrarater reliability, ie, the consistency of results from 1 administration of the test to another, was assessed with the κ -coefficient and Pearson product moment correlation between 2 consecutive scorings from a unique rater.

Results

Normative Data

Among the 30 age-matched (63.3 ± 1.5 years) healthy subjects, only 3 did not attain the maximal score because of their inability to stand on 1 leg, either right or left, more than 10 seconds. The mean PASS score was then 35.7 (range 32 to 36).

Descriptive Statistics of Patients

The frequency distribution and density trace of PASS scores in 58 patients on D30 and D90 are displayed in Figures 1 and 2. On D30, a uniform distribution of scores was noted (Figure 1), whereas on D90, a pronounced peak was noted around the highest values (Figure 2), suggesting the existence of a moderate ceiling effect on D90. Thus, the PASS is less suitable after this date, because many patients (38%) have already reached the maximum score.

The frequency distribution of the 12 items on D30 is represented in Table 2. The great variability in the distributions indicates the large range of difficulty between items. As

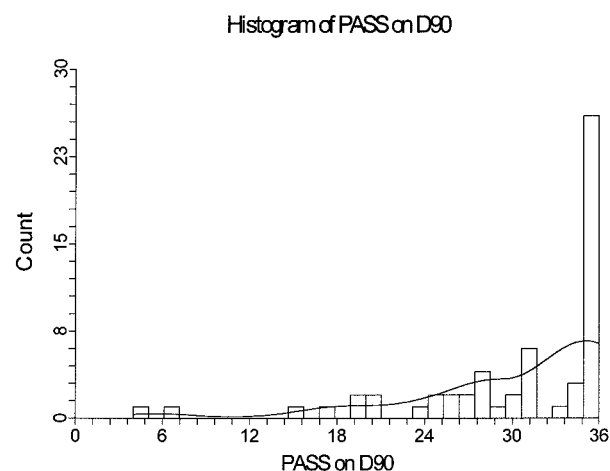


Figure 2. Frequency distribution and density trace of PASS scores on D90.

expected, the easiest item was "sitting without support," with 81% of patients scoring at the highest level. The most difficult was "standing on paretic leg," with 67% of patients scoring at the lowest level. As expected, D90 mean score was significantly higher than D30 score (30 ± 7 and 22 ± 9 , respectively; $P < 10^{-6}$).

Construct Validity

Table 3 summarizes the results of Pearson correlation coefficients between PASS scores on D30 and other clinical scales. Strong correlations were found with the transferring and locomotion sections of the FIM, as well as with motricity, sensibility, and spatial neglect scores. The more severe these clinical deficits were, the lower the PASS score and postural performance. Spasticity was the only clinical variable that was not correlated to the PASS. With regard to instrumental measurement of the equilibrium with the rocking-platform paradigm, fewer than 15 patients were able to perform the task successfully on D30 and 31 on D90. The correlation between the clinical and instrumental indexes of equilibrium has thus been tested from these latter data. The PASS was negatively correlated with both measurement of postural stabilization ($r=0.48$; $P < 10^{-2}$) and postural orientation with respect to gravity ($r=0.36$; $P=0.05$). These results clearly demonstrated the construct validity of the PASS.

Predictive Validity

The PASS on D30 was strongly correlated with the total FIM score ($r=0.75$; $P < 10^{-6}$), the transfer FIM items ($r=0.74$; $P < 10^{-6}$), and the locomotion FIM items ($r=0.71$; $P < 10^{-6}$) on D90. This indicates that it is possible to predict functional prognosis from the PASS on D30.

Internal Consistency

The Cronbach α -coefficient was very high (0.95), indicating that the PASS is homogeneous and is likely to produce consistent responses. Furthermore, the sums of maintaining-position items and of changing-position items were strongly correlated ($r=0.86$, $P < 10^{-6}$).

TABLE 2. Frequency Tables of PASS Items on D30

Item Description	Level 0, % (Worst)	Level 1, %	Level 2, %	Level 3, % (Best)
Lying and sitting items				
Supine to affected side lateral	8.7	8.7	10.3	72.4
Supine to nonaffected side lateral	12.1	12.1	12.1	63.8
Supine to sitting up on edge of table	13.8	17.2	13.8	55.2
Sitting without support	3.5	6.9	8.6	81.0
Sitting on edge of table to supine	12.1	12.1	20.7	55.2
Mixed items				
Sitting down to standing up	25.9	19.0	8.6	46.6
Standing up to sitting down	24.1	13.8	6.9	55.2
Standing items				
Standing with support	15.5	17.2	10.3	56.9
Standing without support	44.8	6.9	6.9	41.4
Standing, picking up a pencil from the floor	56.9	3.5	8.6	31.0
Standing on nonparetic leg	43.1	22.4	6.9	27.6
Standing on paretic leg	67.2	19.0	1.7	12.1

Lying and sitting items are easier. The most difficult items are those assessing postural performance in a standing position.

Reliability

First, 2 raters assessed the postural abilities of 12 patients with the PASS (on the same day). One rater was a physiotherapist (rater A) and the other a physiatrist (rater B, session B1). Second, rater B assessed the patients again 3 days later (session B2). Table 4 summarizes the association between each measurement made by rater A and rater B (A versus B1) and between both measurements of each item made by rater B (B1 versus B2). The average κ -coefficient over the 12 items was 0.88 (range 0.64 to 1) for interrater agreement and 0.72 (range 0.45 to 1) for intrarater agreement. The Pearson correlation coefficients between measurements of the global score were 0.99 ($P < 10^{-6}$) and 0.98 ($P < 10^{-6}$), respectively, for interrater and intrarater reliability. These results show the high reliability of the PASS measurement in stroke patients despite daily fluctuation in postural performance. As an illustration of the good interrater and intrarater reliabilities, differences between rating scores versus mean rating scores for each value of the PASS are displayed in Figures 3 and 4.

TABLE 3. Correlations Between D30 PASS Scores and Other Clinical Measures

Clinical Measures	Pearson Correlation Coefficients
FIM, transfer	0.82; $P < 10^{-6}$
FIM, locomotion	0.73; $P < 10^{-6}$
FIM, total	0.73; $P < 10^{-6}$
Motricity, upper limb	0.63; $P = 10^{-6}$
Motricity, lower limb	0.78; $P = 10^{-6}$
Sensitivity, upper limb	-0.42; $P = 0.002$
Sensitivity, lower limb	-0.45; $P < 10^{-3}$
Spasticity, upper limb	-0.14; $P = 0.31$
Spasticity, lower limb	-0.14; $P = 0.30$
Spatial neglect (omissions)	-0.53; $P < 10^{-4}$

In both cases, differences between PASS scorings are weak (-0.5) and homogeneous.

Discussion

Postural assessment is a key point of the rehabilitation program in stroke patients. There are 2 ways to assess postural ability after stroke. The first relies on the use of instrumental techniques, which may provide valuable information about impairment, not only with respect to postural performance but also with respect to postural strategies.²⁸ Unfortunately, only patients who can successfully perform the given task can be analyzed. This limits the relevance of these methods for population studies. The second method relies on clinical scales that have the advantage of being easily applied to all patients, even those with the most severe postural impairment. There is thus an increasing need for

TABLE 4. κ -Coefficients for the 12 Items of the PASS

Item	κ -Coefficients, A vs B1	κ -Coefficients, B1 vs B2
Sitting without support	0.84	0.45
Standing with support	0.88	0.63
Standing without support	0.86	0.76
Standing on nonparetic leg	1	0.82
Standing on paretic leg	1	1
Supine to affected side lateral	0.64	0.64
Supine to nonaffected side lateral	1	0.76
Supine to sitting up on edge of table	1	1
Sitting on edge of table to supine	0.83	0.67
Sitting to standing up	0.76	0.53
Sitting down from standing up	0.76	0.53
Standing, picking up a pencil from the floor	1	0.87

A vs B1 indicates interrater reliability; B1 vs B2, intrarater reliability.

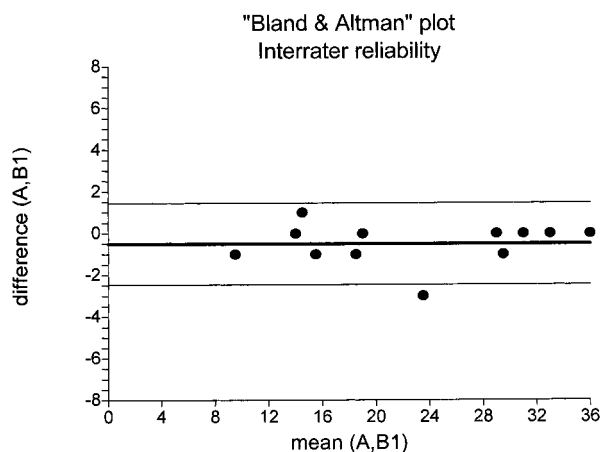


Figure 3. Bland and Altman plot for interrater reliability. The differences between scorings by rater A and first scorings by rater B are weak (0.5) and homogeneous (differences A-B1 are within or very near the 95% confidence limits of the mean).

valid tools that meet both practical and metric properties. By practical properties, we mean good feasibility and concrete significance for the clinical team. Metric properties include validity, reliability, internal consistency, lack of ceiling or floor effects inside the target population, and ability to discriminate different populations.²⁹

Postural performance during the first weeks after stroke has been found to be an important indicator for the long-term prognosis of gait ability.¹ Indeed, for all patients, it is particularly important to accurately assess their postural abilities early after stroke. In view of the goal of postural control, such assessment should concern ability in both maintaining a given posture and ensuring equilibrium in position change. With this aim, the PASS scans 3 fundamental postures: lying, sitting, and standing. At present, one of the most frequently used clinical scales for assessing balance after stroke is the Berg Balance Scale.³⁰ This scale had originally been developed to measure balance in the elderly and is not specifically dedicated to stroke patients. Ability to roll in a lying position is not assessed by the Berg Balance

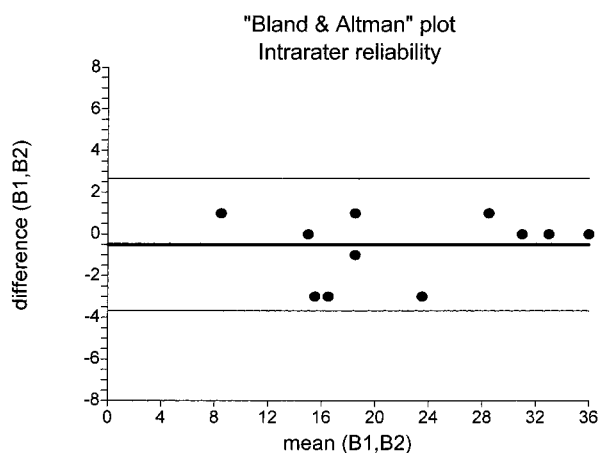


Figure 4. Bland and Altman plot for intrarater reliability. The differences between the first and second scorings by rater B (B1 and B2) are weak (0.5) and homogeneous (differences B1-B2 are within the 95% confidence limits of the mean).

Scale. Because roughly 30% of the patients could not roll to the affected side and roughly 40% could not roll to the nonaffected side on D30, our results demonstrate that these motor activities have to be assessed early after stroke.

The PASS is derived from the Fugl-Meyer assessment⁸ of balance and mobility but differs from it in that 2 protective reaction items,¹ which evaluate the postural response to a noncalibrated perturbation (examiner related), have been removed. The fact that such items are not suitable for an objective standardized assessment is supported by the studies of Maloin et al³¹ and Poole and Whitney.³² These studies emphasized the lack of validity of the Fugl-Meyer sitting balance items owing to the 2 protective reaction items, which greatly differ from other postural tasks.³¹ Moreover, it should also be stated that the objective assessment of protective reaction was revealed to be unreliable in our 5-year experience²; the item "leaning forward and touching the feet" seemed more relevant in the standing than in the sitting position. Thus, we adapted this item, which became "standing, picking up a pencil from the floor." This change has the advantage of increasing the difficulty of the PASS, leading to a scale with the same number of lying/sitting and standing items.

The restoration of an independent gait is one of the major goals of poststroke rehabilitation, and its assessment is important. Gait is a complex activity that relies on navigation and rhythmic motor activity of the 2 lower limbs and requires a good balance. In brain-damaged patients, the level of gait performance can be affected by many factors, such as impaired equilibrium (difficulty in controlling the orientation and/or stabilization of the body with respect to gravity), tone disorders,³³ and strength deficits.³⁴ For this reason, and in agreement with most other authors,^{5-9,13,30,33-35} we chose to separate posture and gait assessments. In the present study, 50% of the patients scored 0/6 on the gait item of the BL motor assessment¹⁰ corresponding to the inability to walk, even with the help of 2 people. This strengthens the idea that early after stroke, it is more relevant to assess balance than gait.

Together with other clinical scales, we have been using the PASS for 5 years in our neuro-rehabilitation unit. Administering the PASS requires no special equipment except a chronometer. It can be easily, rapidly (from 1 to 10 minutes, depending on the severity of deficits), and confidently performed by junior physicians or physiotherapists. For these reasons, our clinical staff has now routinely adopted the PASS. It has ultimately become a very helpful clinical tool for monitoring patients' weekly progress, which is a type of validation by use. Because we expected that this scale had fulfilled all the goals that led to its development, we undertook a statistical validation of the scale.

Healthy subjects scored 3/3 in all items but 1: only 90% could stand on 1 leg for >10 seconds (level 3). This item is of particular interest in hemiplegic patients because the monopodal stance is a fundamental stage for the acquisition of independent walking. It was the most difficult item for patients: only 35% could stand on the nonparetic leg for >5 seconds (levels 2 to 3) and 14% on the paretic one. The other remarkable landmarks were the percentage of patients sitting

without support (>10 seconds: levels 2 to 3) and the percentage of patients standing without support (for 1 minute or more: levels 2 to 3) on D30 (90% and 48%, respectively). These results are comparable with those of Partridge and Edwards (91%/63%)¹¹ and Feigin et al (80% of patients sitting without support by the third week).¹

Content validity, ie, the extent to which the sampling of items reflects the aim of the index, had already been widely documented in studies referring to the Fugl-Meyer scale (see Sanford et al²⁰ for a review). As in the study by Dettman et al³⁶ or that by Wood-Dauphinee et al,¹⁹ we noted a strong correlation between PASS score and functional indexes involving equilibrium or motricity, and this is an argument for criterion validity. In the present study, the clinical postural scale (PASS) was also related to plantar foot sensitivity, muscular weakness, and hemispatial neglect, for which the relation with postural abilities is well known.^{37,38} More specific to our study was the demonstration that poor postural performance is related to impairment in body stabilization. This last finding greatly strengthens the content validity of the PASS. In addition, the PASS shows a high predictive validity in the sense that it is an early relevant indicator for long-term functional prognosis; this finding is consistent with that by Feigin et al.¹

In the present study, results regarding reliability were obtained from the examination of a relatively small number of patients (n=12). Previous works have already pointed out the high reliability of very similar or identical items.^{10,20} We then considered that most methodological efforts had to be concentrated on validity. However, to avoid an overestimation of reliability coefficients due to our experience with the PASS, rater B (J. Villy) was selected because she was the most recently recruited physiotherapist in the unit and actually was unfamiliar with the PASS until that point.

Interrater ($r=0.98$) and intrarater agreements ($r=0.99$) were comparable to those of the Motor Assessment Scale⁵ and the Chedoke-McMaster Stroke Assessment.⁹ Interrater/intrarater agreements were $r=0.95/0.98$ and $r=0.97/0.98$, respectively, in these 2 studies. They were higher than those reported by Sanford et al²⁰ for the Fugl-Meyer Stroke Scale and by Collin et al⁶ for the Trunk Control Test (interrater agreement, $r=0.93$ and $r=0.76$, respectively). Lindmark et al¹⁰ found high internal consistency among items from the balance and mobility parts of the BL assessment ($\alpha=0.90$ and 0.98). The gathering of selected items issued from both parts in one unique score, the PASS, has also produced a homogeneous scale ($\alpha=0.95$). Moreover, the 2 subscales of changing and maintaining posture were strongly correlated. Splitting them into 2 different groups is thus not necessary for the early postural assessment of stroke survivors. The frequency distribution of PASS scores suggests that it is more sensitive for the assessment of stroke survivors during the first 3 months. Because nearly 40% of patients score 36/36 on D90, we recommend using more difficult items after this date, eg, the step test.³⁴

The high sensitivity of the PASS during the first months had already been demonstrated by its ability to discriminate between patients with right and left brain damage.³² In the

present study, the postural improvement between D30 and D90 provides evidence of the high sensitivity of the PASS.

To conclude, this study of 30 healthy subjects and 70 patients demonstrates that the PASS is suited to the assessment of postural abilities of stroke patients in the first months after stroke in both a neurological and a rehabilitation context. Among the different postural scales dedicated to stroke patients, the PASS has undergone one of the most complete validation phases.

Appendix

PASS Items and Criteria for Scoring

Maintaining a Posture

1. Sitting without support (sitting on the edge of an 50-cm-high examination table [a Bobath plane, for instance] with the feet touching the floor)

0=cannot sit

1=can sit with slight support, for example, by 1 hand

2=can sit for more than 10 seconds without support

3=can sit for 5 minutes without support

2. Standing with support (feet position free, no other constraints)

0=cannot stand, even with support

1=can stand with strong support of 2 people

2=can stand with moderate support of 1 person

3=can stand with support of only 1 hand

3. Standing without support (feet position free, no other constraints)

0=cannot stand without support

1=can stand without support for 10 seconds or leans heavily on

1 leg

2=can stand without support for 1 minute or stands slightly asymmetrically

3=can stand without support for more than 1 minute and at the same time perform arm movements above the shoulder level

4. Standing on nonparetic leg (no other constraints)

0=cannot stand on nonparetic leg

1=can stand on nonparetic leg for a few seconds

2=can stand on nonparetic leg for more than 5 seconds

3=can stand on nonparetic leg for more than 10 seconds

5. Standing on paretic leg (no other constraints)

Same scoring as item 4

Changing Posture

Scoring of items 6 to 12 is as follows (items 6 to 11 are to be performed with a 50-cm-high examination table, like a Bobath plane; items 10 to 12 are to be performed without any support; no other constraints):

0=cannot perform the activity

1=can perform the activity with much help

2=can perform the activity with little help

3=can perform the activity without help

6. Supine to affected side lateral

7. Supine to nonaffected side lateral

8. Supine to sitting up on the edge of the table

9. Sitting on the edge of the table to supine

10. Sitting to standing up

11. Standing up to sitting down

12. Standing, picking up a pencil from the floor

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