

The Effectiveness of Accelerated Skill Acquisition Program for Upper Extremity Motor Training in Bilateral Stroke

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ABSTRACT

The bilateral stroke is an added challenge for functional recovery. The evidence of effective therapy intervention for bilateral stroke is rare. A protocol of 30 hours (5 hours/week for 6 weeks) of accelerated skill acquisition program (ASAP) has been administered to a patient with bilateral ischemic middle cerebral artery syndrome at sub-acute stage. Two sessions per day (separately for right and left) were administered. Nepali Wolf Motor Function Test (WMFT) was used to evaluate performance time before and after the treatment. The performance time on Wolf Motor Function Test got largely and consistently reduced on all items of both extremities. There was improvement in grip strength and weight lifting items. Bilateral hand items and turn key in lock were successfully completed after the treatment. Thus, the accelerated skill acquisition program yielded large reduction in performance time, improved hand skills and demonstrated functional improvement of both upper extremities in individual with bilateral stroke.

KEY WORDS

Accelerated skill acquisition program, Bilateral Stroke, Motor training

INTRODUCTION

Stroke is one of the leading causes of disability globally.¹ It is a huge public health burden in developing countries like Nepal.² Bilateral stroke is an added challenge for functional recovery. The literature evidence regarding physiotherapy intervention for motor training in bilateral stroke is very rare. Therefore, it is crucial to find optimal therapy intervention to enhance the functional ability in individuals with bilateral stroke. A patient centered, integrated intervention called accelerated skill acquisition program (ASAP) is feasible and has shown good effect in motor training in stroke.²⁻⁵ Since, the ASAP has been established based on high level of evidence and principles of neuroscience as well as motor control and learning theories, it could improve motor function in patients even with bilateral stroke who meets all criteria for ASAP.^{3,6} The patient met all criteria for the ASAP, and therefore a case study on this patient was of important.

CASE REPORT

A 63-year female admitted in a medical ward of one of tertiary hospital in Kathmandu in 2017 with the diagnosis of bilateral ischemic middle cerebral artery syndrome was referred to Physiotherapy treatment. The infarction was in frontal and parietal lobes bilaterally as per computerized tomography scan report. She was medically and surgically stable. She was a known case of hypertension with diabetes mellitus and had deep vein thrombosis in her lower limbs, which all were under control with the medication. The duration of the stroke since onset was two months when we assessed her before the treatment. She was obese. The motor impairments on upper extremities were more severe than lower extremities. So, our physiotherapy intervention was focused to upper extremities. The findings on Fugl-Meyer assessment of upper extremity (FMA-UE) on initial examination are shown in table 1.

Table 1. Score of different components of FMA-UE on initial assessment (before treatment)

Components	Left UE	Right UE	Remarks
Reflex activity and volitional movement	17/36	15/36	Different scores between two extremities (on 3 domains)
Wrist	4/10	3/10	
Hand	8/14	7/14	
Coordination / speed	2/6	2/6	Same score between two extremities (on 4 domains)
Sensation	6/12	6/12	
Passive joint motion	10/24	10/24	
Joint pain	20/24	20/24	
Total score	67/126	63/126	Difference in total score between left and right extremities

On the table: UE- upper extremity, FMA: Fugl Meyer Assessment scale

The cognitive function was preserved (the mini mental state examination – Bangala version was 27/30). The wrist flexion/extension and finger mass flexion/extension were partial (1/2) on bilateral UE. The stroke severity level was mild to moderate (the motor and coordination score on FMA-UE for left = 31/66 and for right = 27/66). The light touch and position senses were partially preserved (1/2 on FMA). She had no visual loss and no neglect. She met all the criteria for ASAP and therefore this was her treatment of choice.²⁻⁴ Written consent was taken from the patient, care giver and the hospital administrator before beginning of the treatment.

The ASAP treatment procedure and task selection were performed based on the protocol described by Weinstein et al. and Adhikari et al.^{2,3} Parameters selected were as follows: 60 minutes per extremity per setting, different sessions every day for right and left UE, 5 days per week for 6 weeks, total of 30 hours for both right and left UE separately. The change with the intervention was measured before and immediately after the treatment using the Nepali Wolf Motor Function Test (WMFT), the Stroke Impact Scale (SIS) for hand items and global recovery, and the ASAP brief self-efficacy rating scale.⁷ These outcome measures were appropriate tools to use effectiveness of the ASAP intervention and have been already used in stroke.^{2,3}

There was consistent reduction in performance or movement time (measured in seconds) with the treatment on both left and right extremities in all WMFT hand items as shown in figure 1 and table 2 (reduction in performance time: 0.09 to 7.41 seconds on left hand and 0.57 to 11.28 on right hand) in different items that were successfully completed before as well as after treatment. Extending elbow, lifting can, stacking checkers and flipping cards items demonstrated maximum reduction on performance time with the treatment on both extremities. As shown in figure 2 and table 2, some items, which were not completed

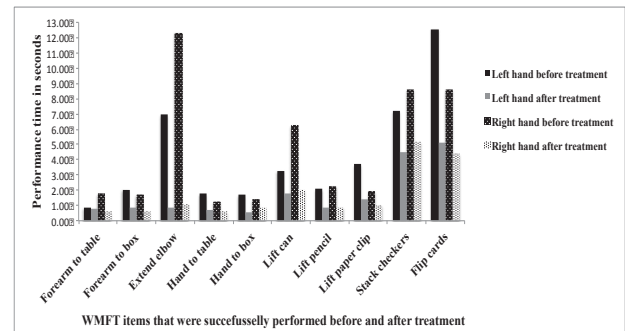


Figure 1. Intervention induced changes on different WMFT (Wolf Motor Function Test) hand items

Table 2. Comparison of performance time (in seconds) of various items before and after the treatment

WMFT Items	Left hand (Performance time in seconds)			Right hand (Performance time in seconds)		
	Before	After	Diff.	Before	After	Diff.
Forearm to table	0.89	0.8	0.09	1.78	0.6	1.18
Forearm to box	2.06	0.9	1.16	1.72	0.65	1.07
Extend elbow	6.95	0.88	6.07	12.34	1.06	11.28
Hand to table	1.78	0.67	1.11	1.27	0.6	0.67
Hand to box	1.72	0.58	1.14	1.4	0.83	0.57
Lift can	3.29	1.78	1.51	6.28	2.05	4.23
Lift pencil	2.09	0.9	1.19	2.28	0.9	1.38
Lift paper clip	3.70	1.44	2.26	1.95	1.03	0.92
Stack checkers	7.18	4.48	2.70	8.6	5.19	3.41
Flip cards	12.53	5.12	7.41	8.61	4.4	4.21
Reach and retrieve	120.00	3.39	116.61	120	0.79	119.21
Turn key in lock	120.00	3.18	116.82	120	2.9	117.1
Fold towel	120.00	5.17	114.83	120	3.06	116.94
Lift basket	120.00	1.56	118.44	120	1.18	118.82

WMFT: The Wolf Motor Function Test, Diff.: Difference between before and after the treatment

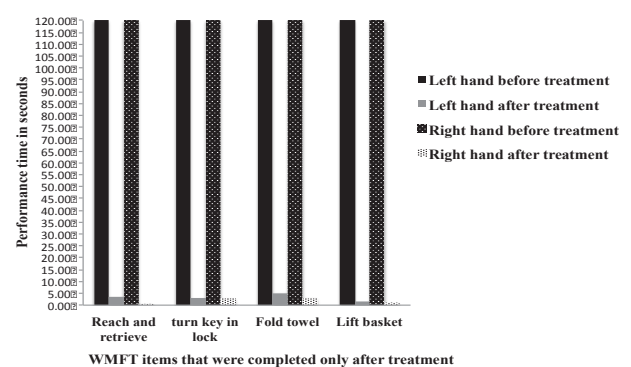


Figure 2. Tasks that were completed only before the treatment

before the treatment (so performance time = 120 seconds), had been successfully completed after the treatment with huge reduction in performance time.

Figure 3 demonstrated motor improvement in functional level (1 = could not do at all to 5 = not difficult at all). All hand items of SIS scale showed marked increased in the score after the treatment. The global recovery item of SIS,

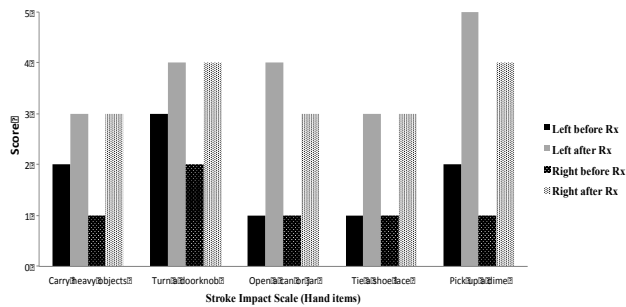


Figure 3. Functional improvement demonstrated on stroke impact scale with Rx, Rx- treatment

which was measured out of 0 (no recovery) to 100 (full recovery) also showed marked recovery with the treatment on both extremities (figure 4 A). The motivation level and efficacy level were found high as ASAP brief-self efficacy scale showed higher values when measured in the form of visual analogue scale (0 = no efficacy, 10 = maximum efficacy) as shown in figure 4 B.

DISCUSSION

The reduction of movement time of WMFT with improvement in functional level indicated motor improvement in this patient with bilateral stroke. Task specificity was seen on bilateral items. The larger improvement was found in dexterity than strength gain. The performance time and functional improvement were supported by improvement in global recovery.

The result of this study is consistent with the findings of a study by Tretriluxana et al. which demonstrated improvement on reach to grasp actions and WMFT items following ASAP administration.⁴ Similarly, faster and improved quality of movement in ASAP group over usual care was another supportive evidence for the findings of this case study.⁸ Another study by Adhikari et al.

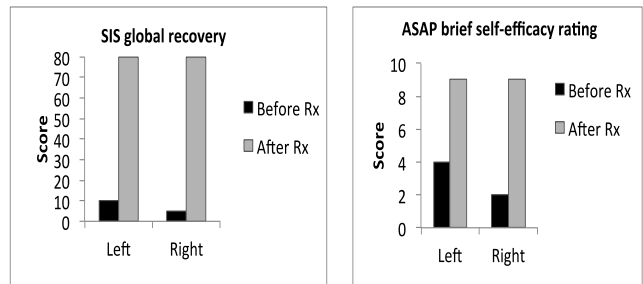


Figure 4. Changes in A) Global recovery, and B) ASAP brief self-efficacy rating scales for right and left hands, Rx- treatment, SIS: Stroke Impact Scale, ASAP: Accelerated Skill Acquisition Program Tasks that were completed only before the treatment

demonstrated immediate beneficial effect with ASAP and showed task specificity as well as strength gain.² These findings are in line with the findings of present case study that showed beneficial effect on both extremities with respect to performance time as well as strength gain. The gain in strength was supported with the findings of a study by Winstein et al. who demonstrated improved strength with the functional training similar to resistance training in short term but better than the resistant training in long term outcome.⁹

We can argue that the improvement was due to the intervention induced effect rather than spontaneous recovery, which might have limited contribution at two months post stroke.^{10,11} This was also because there was neither any physiotherapy intervention in parallel nor patient was exposed to any enriched environment during the ASAP treatment. In conclusion, the ASAP intervention was feasible to administer to a patient with bilateral stroke and can induce improvement in motor and functional level. However, the findings from a case study might have limited clinical implication and therefore, further clinical trials are recommended.

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