



Research Article

CORRELATION BETWEEN 6-MINUTE PUSH TEST AND 4-FUNCTIONAL TASKS IN INDIVIDUALS WITH SPINAL CORD INJURY

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ABSTRACT

Purpose: To find the correlation between 6-Minute Push Test and 4-Functional Tasks who self-propel manual wheelchair for measuring the functional capacity in spinal cord injury patients who use manual wheelchair for propulsion. These 2 outcome measures are used to assess and monitor physical therapy problems for wheelchair bound patients with Spinal Cord Injury.

Methods: 50 spinal cord injury patients aged with of 18-65 years and both gender who self-propel a manual wheelchair were included in the study. Distance in meters or centimeters of 6-minute push test, one stroke push test and forward vertical reach test and time in seconds of forward wheeling, ramp ascending tasks were assessed.

Results: Data analysis revealed a moderate Negative Correlation Between distance (meters) of 6-Minute Push Test with time (seconds) of Forward Wheeling and Ramp Ascending tasks ($r=-0.71$, $r=-0.69$), positive correlation with Distance of One Stroke Push test ($r = 0.607$) and the result is Highly Significant but significant weak positive correlation with Distance of Forward Vertical Raising($r = 0.318$)

Conclusion: This Study concludes that There is a Highly Significant Correlation Between 6-Minute Push Test and 4-Functional Tasks.

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INTRODUCTION

Spinal cord injury (SCI) is a traumatic and life changing event, which leads to neurological deficits and disabilities, because of the loss of mobility and sensation. The mobility associated with SCI is a major contributing factor influencing inactivity in people with SCI.¹The majority of SCIs are due to trauma; the most common causes of traumatic SCIs are motor vehicle accidents or motor-bike accidents, followed by falls, violence, and sports accidents.¹

The majority of people with a spinal cord injury (approximately 80%) are dependent on a wheelchair for their mobility for the rest of their lives.²

6-Minute push test (6 - MPT) is used to measure the functional capacity in patients with SCI.³

The 4 functional tasks are timed forward wheeling, ramp ascent, one stroke push and forward vertical reach distance which quantifies functional ability for manual wheelchair users.⁴

These 2 outcome measures are used to assess and monitor physical therapy problems and measure the functional capacity for wheelchair bound patients with SCI.

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Need of the Study

No relationship between the 6-Minute Push Test and 4-Functional Tasks in individuals with SCI has been established yet to enhance the physical functioning of the patients.

Thus, need arises to find the Correlation Between 6-Minute Push Test (6-MPT) and 4-Functional Tasks (4-FTs) for Measuring the Functional Capacity in Spinal Cord Injury (SCI) Patients.

Aim and Objectives

To find the correlation between 6-minute push test (6-MPT) 4-Functional Tasks (4-FTs) forward wheeling, ramp ascent, one stroke push test and forward vertical reach task in individuals with spinal cord injury(SCI) patients.

Null Hypothesis and Alternative Hypothesis

There may be or may not be correlation between 6-minute push test (6-MPT) and four functional tasks (FW, RA, OSP, FVR) in individual with cord injury (SCI).

MATERIALS AND METHODS

50 spinal cord injury Patients from spine institute were included as per inclusion criteria which based on convenient sampling method and it is a cross-sectional study.

Inclusion Criteria: Patients who are willing to participated aged with 18-70 years of age.

Both Genders, traumatic or non-traumatic cases, in traumatic cases the level of Lesion must be Dorsal six vertebrae or below this level with classification of extent of injury (complete versus incomplete) according to the American Spinal Injury Association Impairment Scale (ASIA impairment scale)A and B. Also Individuals must be able to self-propel a manual wheelchair were included.

Exclusion Criteria: patients with upper limb and cervical spine fracture and injuries, participants with psychosomatic disorders and any serious co-morbidity were excluded from the study.

Ethical approval was received from the institution ethical committee. After taking written informed consent, all the patients were asked to performed 6-minute push test and 4-functional tasks by using Manual Wheelchair, Measure Tape, Stick, Stop-watch, Performa, Consent Form, Documentation forms, 2 Cones, Sphygmomanometer, Pulse oximeter, Borg Scale, Ramp, Carpet. Then total distance travelled in 6 Minutes, distance in centimeters for Forward Vertical Reach, One Stroke Push tasks and also time in seconds for 23 meters Forward Wheeling, Ramp Ascending tasks. The data was recorded and documented for analysis. All testing was completed without any incident and there were no complaints of fatigue during testing.



Fig 1 Forward Wheeling



Fig 2 Ramp Ascending

6-Minute Push Test

There was 30-m loop which marked by two cones spaced 15 m apart (30-m loop) with 2.8 m on either end for turning. At rest, Blood Pressure, Pulse Rate, Borg Scale and SpO₂ are measured and documented. Patient was instructed to propel

wheelchair at comfortable sub maximal speed around the two cones allowed to take rests in between the test as required. The total distance (meter) travelled in 6 min including time of rest and reason for rest was documented.

4-Functional Tasks

23 meter forward wheeling

Patient with standardized stationary position. Patient was instructed to self-propel a manual wheelchair forward at 23-meter distance and Timing began from the first movement of the casters at starting of this distance and ceased when the most posterior aspect of the rear wheels crossed the finish line. The time taken to complete the 23-m distance was measured using a stop watch.

Ramp Ascending

The patient was allowed a moving start of 4.5m on a level surface. The timing began when the front casters crossed the start line at the beginning of the incline and continued until the most posterior aspect of the rear wheels crossed the finish line at the top of the ramp (10.3m, 1:13 grade). The time taken to ascend the ramp was measured using a stop watch.

One stroke push task

Patient seated in wheelchair with all 4 wheels positioned on the carpeted surface or garden surface (1.5-cm pile), the participant propelled the wheelchair forward by pushing once with maximal effort. The most posterior point of the rear wheels was marked as the starting point. Once the wheelchair rolled to a stop, the most posterior point of the rear wheels was marked to indicate the completed distance pushed. If the push was asymmetrical, the mark was recorded for the most posterior wheel. The distance (cm) between the 2 marked points was recorded.

Forward vertical reach

The wheelchair was positioned parallel to the marking board, and participants held the stick, independently (palms down). Participants began with forearms parallel to their thighs and raised the stick upward. Participants were instructed to keep the stick level and to avoid excessive backward arching. The distance in centimeters from the floor to the mark was measured.

RESULTS

The Statistical Analysis of the present correlation study was done using SPSS version 16.0.

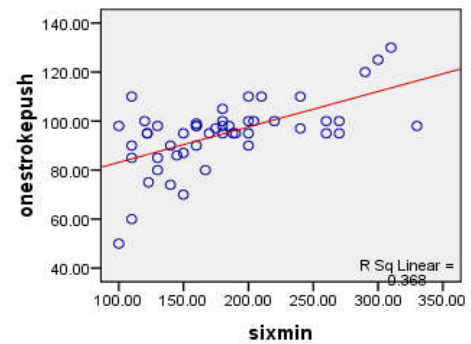
Confidence Interval was set at 95%. One sample ks test were used to find the data were normally distributed or not. Data were normally distributed. So, Pearson test was used to find the correlation between distance of 6-minute push test with time taken in forward wheeling, ramp ascending task and distance covered in one stroke push test, forward vertical reach tasks.

Table 1 Mean and Standard Deviation of 6-Minute Push Test and 4-Functional Tasks (Forward Wheeling, Ramp Ascending, One Stroke Push Task, Forward Vertical Reach)

Outcomes	Mean	Standard Deviation
6-Minute Push Test (meters)	180.62	58.81
4-Functional Tasks:		
Forward Wheeling (seconds)	20.32	6.23
Ramp Ascending (seconds)	17.84	9.8
One Stroke Push (centimeters)	94.82	14.01
Forward Vertical Reach (centimeters)	154.22	8.55

Table 2 Correlation between 6-minute push test (6-MPT) distance with time forward wheeling, ramp ascending time, distance of one stroke push and forward vertical reach

Sr. no.	Parameter	Pearson's correlation coefficient (r)	P value
1	6-MPT (meters)-Forward Wheeling (seconds)	-0.71	P<0.00001
2	6-MPT- Ramp Ascend(seconds)	-0.69	P< 0.00001
3	6-MPT- One Stroke Push (centimeters)	0.607	P<0.00001
4	6-MPT-Forward Vertical Reach (centimeters)	0.318	P<0.0284



Graph 1,2,3,4 Correlation between 6-minute push test and forward wheeling, ramp ascent, forward vertical reach and one stroke push

DISCUSSION

The present study was conducted to find the relationship between 6-Minute Push Test and 4 Functional Tasks in 50 wheelchair user spinal cord injury patients. Moderate negative correlation with forward wheeling task, Ramp Ascending and Moderate positive correlation with One stroke push task, the result is Highly significant at $p < 0.05$. but positive correlation with forward vertical reach task, significant at $p < 0.05$

6-Minute Push Test provides outcome for assessing functional capacity. It is a measure of endurance or cardio-vascular capacity of an individual to achieve more distance in this, one needs to maintain a proper sitting posture in the wheelchair.

Four functional task can provide better idea regarding endurance capacity, upper limb strength, trunk control, balance.

Forward wheeling task (23 meter) is propelling a wheelchair on a smooth linear surface that is very similar to the wheelchair propulsion performed in a 6-minute push test.

The negative moderate correlation is also found between these two. It means if some distance increases in 6-Minute Push Test, the time taken in 23 meter forward wheeling task of 4 Functional Tasks decreases.

Ramp ascending task involves the propulsion of wheelchair on the ramp (against gravity) with maximum work of strength and endurance. The strength of upper limb plays a major role in propelling on a ramp.

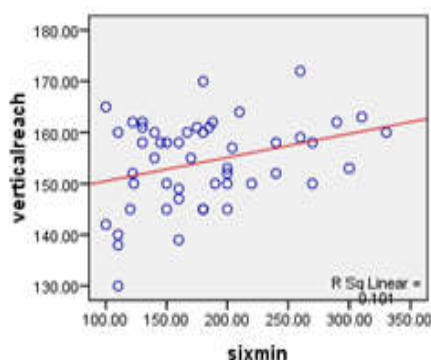
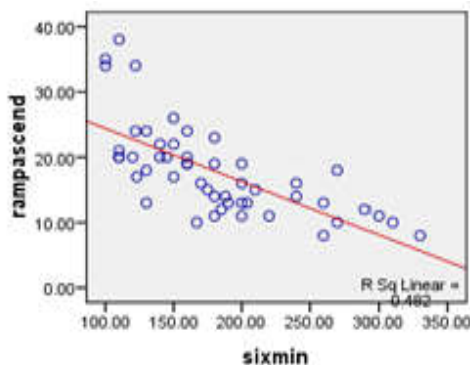
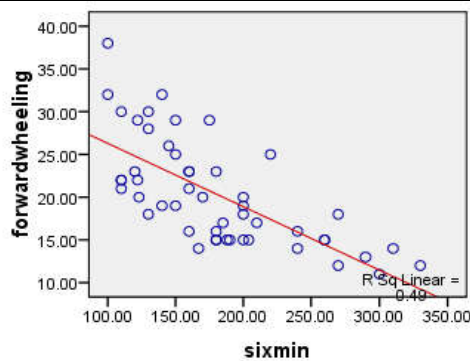
Also, Ramp ascending needs fair to good trunk balance of the patient to control the trunk in proper position in wheelchair sitting.

There is negative moderate correlation found it means if distance covered in 6-minute push test increases, time taken to ascent the ramp decreases.

The one stroke push test has to be performed on rough surface, that is thicker and uneven surface compare to the smooth linear surface. Also, to propel a large distance in a single stroke needs strength and accuracy with good trunk control. Through the one stroke, it gives momentum toward the movement and increasing distance.

Current study shows moderate positive correlation between 6-Minute Push Test and One Stroke Push Task.

Proper trunk control yields a good posture and such individual would score high on the vertical reach tests.



Thus, the result also shows positive correlation between 6-Minute Push Test and vertical reach distance.

Gorgey, Mackie, McCormack and Campbell, Rauch *et al.*, Thompson and Widman *et al.* found that endurance and good upper limb strength are essential for Person with Spinal Cord Injury to improve mobility.

Gorzowski *et al.*, Ulrich *et al.* suggested that it made more likely for the participants to be involved in community activities thus improving their Quality of Life.

The findings of correlation study between 6-Minute Push Test and 4-function tasks have highlighted the importance of functional abilities of people with spinal cord injury who self-propel manual wheelchair.

Educate the importance of wheelchair training in initial rehabilitation phase. This, in turn, may lead to overcoming obstacles, such as car transfers, uneven terrains and curbs encountered during community mobility with a wheelchair

CONCLUSION

6-Minute Push Test signifies the functional capacity of an individual propelling with wheelchair and the 4-Functional Tasks signifies the functional mobility of an individual on different aspects.

Thus, by finding the relationship between the two, we can clinically yield better outcomes for the physical health of individuals with sci.

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Ethical Clearance: obtained from institutional ethical committee

References

1. Centers for Disease Control and Prevention. Spinal Cord Injury (SCI): Fact Sheet. <http://www.cdc.gov/traumaticbraininjury/scifacts.html>. Updated November 4, 2010. Accessed September 12, 2014.
2. Post MW *et al.*(1997) Services for spinal cord injured: availability and satisfaction. *Spinal Cord* 1997; 35(2): 109–15.
3. Rachel Cowan, *et al.* (2011) “Six Minute Push Test: Association with Injury Level, Mobility Disability and Functional Independence in SCI” *Medicine and science in sports and exercise*.43 (suppl 1):796.

4. Anjali Ravindra Bhise, *et al.* (2015).” Using six-minute-push-test to measure Cardiovascular fitness in Spinal Cord Injury patients in Indian Hospital Setting”; <https://doi.org/10.1016/j.apmr.2015.08.253>.
5. May, L.A., *et al.* (2004).” Wheelchair back support options: functional outcomes for persons with recent spinal cord injury. “*Arch Phys Med Rehabil*85(7):1146-1150.
6. May LA, *et al.* (2003)” Measurement reliability of functional tasks for persons who self-propel a manual wheelchair. *Arch Phys Med Rehabil*; 84:578-83
7. Gorzowski, J., *et al.*, (2011), ‘Obstacles to community participation among youth with spinal cord injury’, *The Journal of Spinal Cord Medicine* 34(6), 576–585.
8. Gorgey, A.S., (2014), ‘Exercise awareness and barriers after spinal cord injury’, *World Journal of Orthopedics* 5(3), 158–162. <https://doi.org/10.5312/wjo.v5.i3.158>
9. Mackie, J.M., *et al.*, (1989), ‘Fitness and spinal cord injury’, *Canadian Family Physician* 35, 1663–1667.
10. Rauch, A., *et al.*, (2013), ‘Participation in physical activity in persons with spinal cord injury: A comprehensive perspective and insights into gender differences’, *Disability and Health Journal* 6, 165–176. <https://doi.org/10.1016/j.dhjo.2013.01.006>
11. Thompson, P.D., *et al.*, (2003), ‘Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease’, *Arteriosclerosis, Thrombosis, and Vascular Biology* 23, 1319–1321. <https://doi.org/10.1161/01.ATV.0000087143.33998.F2>
12. Tomasone, J.R., *et al.*, (2013), ‘Spinal cord injury, physical activity, and quality of life: A systematic review’, *Kinesiology Review* 2, 113–129. <https://doi.org/10.1123/kjrj.2.2.113>
13. Widman, L.M., *et al.*, (2007), ‘Aerobic fitness and upper extremity strength in patients aged 11 to 21 years with spinal cord dysfunction as compared to ideal weight and overweight controls’, *The Journal of Spinal Cord Medicine* 30 (Suppl 1), S88–S96. <https://doi.org/10.1080/10790268.2007.11754611>
14. Ulrich, P.M., *et al.*, (2012), ‘Activity and participation after spinal cord injury: State-of-the-art report’, *Journal of Rehabilitation Research & Development* 49(1), 155–174. <https://doi.org/10.1682/JRRD.2010.06.0108>
15. Wendell, C. *et al.*, (1998), ‘Physical activity interventions in low-income, ethnic minority, and populations with disability’, *American Journal of Preventive Medicine* 15(4), 334–343. [https://doi.org/10.1016/S0749-3797\(98\)00081-6](https://doi.org/10.1016/S0749-3797(98)00081-6)

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