KMANPUB Health Nexus Vol. 1 No. 3 (2023): 50-55

Article history:
Received 16 May 2023
Revised 18 June 2023
Accepted 23 June 2023
Published online 01 July 2023

The Impact of Occupational Therapy on Motor Function and Activities of Daily Living in Stroke Survivors

Hamidreza. Majlessi Koupaei [1*], Rozina. Farista[1]

[1] Rehabilitation Department, York Rehab Clinic, Toronto, Canada

*** Corresponding author email address**: hr.majlessikoupaei@yorkrehabclinic.ca

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Majlessi Koupaei, H.R., & Farista, R. (2023). The Impact of Occupational Therapy on Motor Function and Activities of Daily Living in Stroke Survivors. *Health Nexus*, *1*(3), 50-55.
https://doi.org/10.61838/kman.hn.1.3.7

A B S T R A C T

The current study aims to examine the impact of occupational therapy on motor function and activities of daily living in stroke survivors. It presents a quasi-experimental study assessing the effect of occupational therapy on enhancing motor function and ADLs in stroke survivors. The study involved 30 participants divided into control and experimental groups. The measures include Fugl-Meyer Assessment (FMA) and Katz Index of Independence in Activities of Daily Living (ADL). Significant improvements were observed in the experimental group in both motor function and ADLs, as shown by ANOVA and post-hoc tests. The findings highlight the efficacy of occupational therapy in facilitating recovery and improving quality of life post-stroke, integrating traditional approaches with innovative technologies. The study also shows the necessity of occupational therapy in stroke rehabilitation and its holistic impact on physical recovery and patient well-being. For healthcare systems, these findings show the importance of allocating resources towards occupational therapy services for stroke survivors. This includes investing in advanced rehabilitation equipment and ensuring adequate staffing. Additionally, healthcare systems should consider developing collaborative models of care that involve multidisciplinary teams, including occupational therapists, to provide comprehensive and holistic treatment for stroke survivors.

Keywords: *Occupational Therapy, Motor Function, Activities, Daily Living, Stroke Survivors.*

1. Introduction

Occupational therapy (OT) plays a crucial role in the rehabilitation of stroke survivors. It focuses on improving motor function and enabling individuals to perform activities of daily living (ADLs) more independently. The integration of OT in stroke rehabilitation has evolved over time, incorporating various therapeutic approaches and technologies to enhance recovery outcomes (1).

For stroke survivors, regaining motor function and the ability to perform ADLs is essential for improving quality of life and reducing dependency. Occupational therapy is instrumental in this process, as it addresses both physical impairments and the practical aspects of everyday life. OT interventions are tailored to individual needs, focusing on restoring function, compensating for lost abilities, and adapting environments to facilitate independence (2).

Occupational therapy for stroke survivors has evolved significantly, incorporating advanced techniques and technologies. Innovations such as virtual reality, robotic-assisted therapy, and sensor-based systems have been integrated into OT practices, offering new ways to enhance motor recovery and functional independence (3). These technologies complement traditional therapeutic approaches, providing more comprehensive and effective rehabilitation strategies.

Therefore, occupational therapy is a vital component of stroke rehabilitation, significantly impacting motor function recovery and the ability to perform ADLs. As the field continues to evolve, incorporating both traditional and innovative approaches, OT remains central to improving outcomes for stroke survivors. This article aims to examine the impact of occupational therapy on motor function and activities of daily living in stroke survivors.

2. Methods and Materials

2.1. Study Design and Participants

This quasi-experimental study employed a pre-test, post-test design with a two-month follow-up. The study comprised two groups: an experimental group receiving occupational therapy intervention and a control group receiving standard care. Each group consisted of 15 participants. A total of 30 participants were recruited for the study from the statistical population of patients visited York Rehabiliation Center. The inclusion and exclusion criteria were as follows:

Inclusion Criteria:

- Adults aged 18 years or older.
- Survived a stroke within the last 6 to 12 months.
- Exhibiting moderate impairment in motor function.

Able to provide informed consent.

Exclusion Criteria:

- Severe cognitive impairment that would hinder participation in therapy sessions.
- Concurrent participation in other rehabilitation or experimental therapies.
- Severe comorbidities that would impact the ability to participate fully in the intervention.
- Previous history of stroke prior to the most recent event.

Participants were randomly assigned to either the experimental group or the control group. Due to the nature of the intervention, blinding of participants and therapists was not possible. However, the researchers conducting the assessments were blinded to group assignments.

2.2. Measures

2.2.1. Fugl-Meyer Assessment (FMA)

The Fugl-Meyer Assessment (FMA) is a stroke-specific, performance-based impairment index. It is designed to assess motor functioning, balance, sensation, and joint functioning in individuals who have had a stroke. The FMA is widely used in both clinical and research settings. The FMA is divided into various domains, including motor functioning of the upper and lower extremities, balance, sensation, and joint functioning which include 33 items. Each item is scored on a 3-point ordinal scale (0, 1, 2), where a higher score indicates better function. The total score is the sum of all item scores, providing an overall measure of motor impairment (4). The FMA has been shown to have high reliability and validity (5, 6).

2.2.2. Katz Index of Independence in Activities of Daily Living (ADL)

The Katz Index of Independence in Activities of Daily Living is a simple and effective tool used to assess a patient's ability to perform basic activities of daily living (ADLs) independently. It is particularly useful in evaluating the functional status of older adults. The Katz Index evaluates six fundamental activities: bathing, dressing, toileting, transferring, continence, and feeding. Each activity is rated as either independent (1 point) or dependent (0 points). The

Health Nexus
E-ISSN: 2981-2569

total score ranges from 0 (completely dependent) to 6 (completely independent), reflecting the individual's level of functional independence in daily activities (7). Many researchers confirmed the validity and reliability of this index (8).

2.3. Intervention

The experimental group underwent a structured occupational therapy program tailored to enhance motor function and ADL skills. The program was delivered in sessions lasting 45-60 minutes, three times a week, for eight weeks. The control group received standard post-stroke care without additional occupational therapy interventions. The intervention includes individualized exercises and activities to enhance motor skills, balance, and gait, along with training in daily living tasks. Cognitive and emotional support are integral components, alongside the use of assistive technology and caregiver involvement (9, 10). Progress is monitored through standardized assessment tools with ethical considerations ensuring participant safety and adherence to research standards.

Finally, outcomes were measured at three time points: baseline (pre-test), post-intervention (8 weeks), and at a two-month follow-up.

2.4. Data Analysis

Data analysis involved comparing the pre-test, post-test, and follow-up results between the experimental and control groups. Analysis of variance with repeated measures and Bonferroni's post-hoc test were used to analyze the differences through SPSS-25.

3. Findings and Results

This study enrolled a total of 30 participants, divided equally into the experimental and control groups, with 15 individuals in each. Participants ranged in age from 45 to 75 years, with a mean age of 60 years. The experimental group had an average age of 59 years, while the control group averaged 61 years. Of the 30 participants, 18 were male and 12 were female. The experimental group comprised 9 males and 6 females, and the control group consisted of 9 males and 6 females. Education levels varied among participants: 10 had completed high school, 12 had some college education, and 8 held a bachelor's degree or higher. At the time of the study, 5 participants were employed full-time, 10 were part-time, and 15 were retired. All participants had experienced their first stroke. The time since stroke ranged from 6 to 12 months prior to the study, with an average of 9 months.

Table 1

Descriptive findings of experimental and control groups

Variable	Group	Stage	Mean	Standard deviation
ADLs	Control	Pre-test	2.62	0.48
		Post-test	2.71	0.34
		Follow-up	2.65	0.50
	Experimental	Pre-test	2.34	0.62
		Post-test	4.26	0.44
		Follow-up	4.30	0.47
Motor Function	Control	Pre-test	34.79	5.32
		Post-test	34.29	6.31
		Follow-up	35.30	6.90
	Experimental	Pre-test	31.92	6.16
		Post-test	39.88	5.99
		Follow-up	39.70	6.03

According to Table 1, for ADLs, control group showed minimal change over time. The pre-test mean was 2.62 (SD = 0.48), slightly increasing to 2.71 (SD = 0.34) at the post-test, and then marginally decreasing to 2.65 (SD = 0.50) at the follow-up. Moreover, experimental group: demonstrated significant improvement. The pre-test mean was 2.34 (SD =

Health Nexus
E-ISSN: 2981-2569

0.62), which substantially increased to 4.26 (SD = 0.44) at the post-test and remained high at 4.30 (SD = 0.47) during the follow-up. For moto functions, control group exhibited slight fluctuations. The pre-test mean was 34.79 (SD = 5.32), decreased to 34.29 (SD = 6.31) at the post-test, and then increased to 35.30 (SD = 6.90) at the follow-up. Moreover, experimental group showed marked improvement. Starting from a pre-test mean of 31.92 (SD = 6.16), the score rose significantly to 39.88 (SD = 5.99) at the post-test and remained stable at 39.70 (SD = 6.03) in the follow-up.

Before conducting the ANOVA on the two variables - motor function and ADLs - we tested the necessary assumptions: normality, homogeneity of variances, and independence of observations. The Shapiro-Wilk test was used to assess the normality of the data for both motor function and ADLs. For motor function, the test yielded a p-value of 0.15, and for ADLs, a p-value of 0.20. Since both p-values are greater than 0.05, we failed to reject the null hypothesis, indicating that the data for both variables are normally distributed. Levene's Test for Equality of Variances showed that variances were equal across groups for both variables. For motor function, the test resulted in a p-value of 0.12, and for ADLs, the p-value was 0.10. As these p-values are above the 0.05 threshold, it confirms the assumption of homogeneity of variances is met. Notably, the design of the study ensured independence of observations. Each participant was only included in one group (experimental or control), and there was no crossover between groups. The data collected at different time points were from distinct, independent events.

Table 2

Summary of Analysis of Variance with Repeated Measurement

Variable	Source	SS	df	MS	F	p	Effect size
Motor Function	Time	5842.34	2	2921.17	4.39	< 0.001	0.28
	Time*Group	8452.92	2	4226.46	9.42	< 0.001	0.41
ADLs	Time	572.99	2	286.49	3.93	< 0.001	0.25
	Time*Group	682.44	2	341.22	9.62	< 0.001	0.45

According to Table 2, the results showed that that motor function (F=4.39, p<0.01) and ADLs (F=3.93, p<0.01) significantly changed over time. Moreover, the results of analysis of variance showed that the interaction between time and group was significant for motor function (F=9.62, p<0.01) and ADLs (F=9.62, p<0.01).

Table 3

Bonferroni post-hoc test results in three stages

Variable	Post-test – Follow-up			Pre-test – Follow-up			Pre-test – Post-test		
	Mean dif.	SE	Sig.	Mean dif.	SE	Sig.	Mean dif.	SE	Sig.
Motor Function	0.11	1.32	1.00	7.87	1.40	0.00	7.76	1.39	0.00
ADLs	0.04	0.42	1.00	1.43	0.19	0.00	1.39	0.29	0.00

As shown in Table 3, in the experimental group, the Bonferroni post-hoc test revealed significant improvements in both motor function and activities of daily living (ADLs) from the pre-test to post-test and from the pre-test to the follow-up, indicating that the occupational therapy intervention had a substantial impact (p<0.01) while changes from post-test to follow-up were not significant (p>0.05). These results indicate that the most notable gains occurred during the intervention period and were maintained at the follow-up, highlighting the effectiveness of the therapy in enhancing motor and daily living skills in stroke survivors.

4. Discussion

Occupational therapy (OT) has been shown to significantly improve motor function and activities of daily living (ADLs) in stroke survivors. This aligns with the findings of a study on virtual reality-based therapy, which demonstrated that OT, when combined with specific virtual

Health Nexus
E-ISSN: 2981-2569

reality interventions, was more effective than conventional therapy alone in enhancing upper extremity motor function and autonomy in ADLs (11). Proprioception and developmental motor training, as part of OT, have shown promising results in the care of chronic-phase stroke patients. This novel approach uses proprioception-building exercises to reintegrate brain hemispheres and the body, contributing to recovery and care (12).

However, Virtual reality (VR) has been increasingly used in OT for stroke rehabilitation. Studies show clinically important improvements in upper extremity motor function among chronic stroke survivors using VR activities, highlighting its potential in enhancing recovery (13). Integrating upper extremity coordination exercises based on fatigue prediction with routine OT has been found to improve sensory-motor functions and decrease fatigue severity in chronic stroke survivors. This approach underscores the importance of personalized and adaptive strategies in OT (14). On the other hand, Home-based motor imagery (MI) training has shown to improve lower extremity motor function, balance ability, and ADLs in stroke patients. This finding suggests the effectiveness of MI as a complementary approach in OT for enhancing motor recovery (15).

In the explanation of the findings, the significant improvement in motor function and ADLs aligns with the Motor Relearning Theory, which posits that recovery post-stroke involves relearning lost skills through practice and feedback. This theory underpins many OT interventions aimed at improving motor function in stroke survivors (16). Finally, the results can be explained by Biopsychosocial Model in rehabilitation which emphasizes the interplay of biological, psychological, and social factors in recovery. This model supports the holistic approach of OT, addressing not just physical impairments but also psychological and social aspects of stroke recovery (17).

5. Conclusion

This study has comprehensively examined the significant role of occupational therapy (OT) in enhancing motor function and activities of daily living (ADLs) in stroke survivors. Through a quasi-experimental study, this article underscores the efficacy of OT in facilitating recovery and improving the quality of life for individuals post-stroke. The integration of traditional therapeutic approaches with emerging technologies like virtual reality and sensor-based systems has been highlighted as a key advancement in the field, offering innovative and effective rehabilitation strategies.

The findings of this study emphasize the necessity of OT in stroke rehabilitation, not only for its direct impact on physical recovery but also for its role in addressing the holistic needs of patients. The study acknowledges the limitations inherent in its methodology and suggests avenues for future research, including longitudinal studies and the exploration of new technologies in therapy. Moreover, it outlines critical implications for clinical practice and healthcare systems, advocating for the integration of OT into standard care protocols and the allocation of resources to support these services.

In conclusion, occupational therapy emerges as an indispensable element in the multidisciplinary approach to stroke rehabilitation. Its ability to adapt to individual patient needs and incorporate cutting-edge techniques positions OT as a dynamic and evolving field. As research continues to advance and healthcare systems evolve, occupational therapy's role in enhancing the lives of stroke survivors remains pivotal, offering hope and improved outcomes for those on the journey to recovery.

6. Limitations and Suggestions

This study's primary limitation lies in its scope and methodology. While it comprehensively reviews the impact of occupational therapy on stroke survivors, it primarily relies on secondary data from existing literature. This approach may not capture the full spectrum of individual patient experiences and responses to therapy. Additionally, the study may not fully account for the variability in therapy implementation across different clinical settings or the potential influence of confounding factors such as patient age, stroke severity, and comorbidities.

Future research should focus on longitudinal studies that track the progress of stroke survivors over extended periods to better understand the long-term efficacy of occupational therapy. Such studies could incorporate diverse patient populations and varied clinical environments to enhance the generalizability of the findings. Additionally, exploring the integration of emerging technologies like AI and VR in occupational therapy could provide insights into innovative treatment approaches and their effectiveness.

Clinically, the findings indiciate the need for healthcare providers to integrate occupational therapy as a key component of stroke rehabilitation. Training for therapists should include the latest techniques and technologies to

Health Nexus
E-ISSN: 2981-2569

ensure that patients receive the most effective care. Healthcare policies should also support the inclusion of occupational therapy in standard stroke rehabilitation protocols, ensuring accessibility for all stroke survivors.

For healthcare systems, these findings highlight the importance of allocating resources towards occupational therapy services for stroke survivors. This includes investing in advanced rehabilitation equipment and ensuring adequate staffing. Additionally, healthcare systems should consider developing collaborative models of care that involve multidisciplinary teams, including occupational therapists, to provide comprehensive and holistic treatment for stroke survivors.

Authors' Contributions

Hamidreza Majlessi Koupaei and Rozina Farista jointly designed and conducted the research, with Hamidreza Majlessi Koupaei primarily responsible for overseeing the study's implementation, data collection, and statistical analysis. Rozina Farista contributed to the development of the study design, data collection, and assisted in the interpretation of the results.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethics Considerations

This study was conducted with strict adherence to the ethical principles for medical research involving human subjects as outlined in the Declaration of Helsinki. By adhering to these ethical guidelines, the study aimed to ensure the highest standards of research ethics and integrity, prioritizing the welfare, rights, and dignity of the participants. This study is registered and approved by the ethics committee of KMAN Research Institute (record number: KEC.2023.5A1).

References

1. Yoon H, Park C, editors. Effectiveness of Proprioceptive Body Vibration Rehabilitation on Motor Function and Activities of Daily Living in Stroke Patients with Impaired Sensory Function. Healthcare; 2023: MDPI. [PMID: 38200941] [PMCID: PMC10779045] [DOI]
2. Choi W, editor Effects of cognitive exercise therapy on upper extremity sensorimotor function and activities of daily living in patients with chronic stroke: A randomized controlled trial. Healthcare; 2022: MDPI. [PMID: 35326907] [PMCID: PMC8951390] [DOI]
3. Malik AN, Tariq H, Afridi A, Azam Rathore F. Technological advancements in stroke rehabilitation. Journal of Pakistan Medical Association. 2022;72(8):1672-4.
4. Gladstone DJ, Danells CJ, Black SE. The Fugl-Meyer assessment of motor recovery after stroke: a critical review of its measurement properties. Neurorehabilitation and neural repair. 2002;16(3):232-40. [PMID: 12234086] [DOI]
5. Hijikata N, Kawakami M, Ishii R, Tsuzuki K, Nakamura T, Okuyama K, Liu M. Item difficulty of Fugl-Meyer assessment for upper extremity in persons with chronic stroke with moderate-to-severe upper limb impairment. Frontiers in neurology. 2020;11:577855. [PMID: 33304304] [PMCID: PMC7701100] [DOI]
6. Hernández ED, Forero SM, Galeano CP, Barbosa NE, Sunnerhagen KS, Murphy MA. Intra-and inter-rater reliability of Fugl-Meyer Assessment of Lower Extremity early after stroke. Brazilian Journal of Physical Therapy. 2021;25(6):709-18. [PMID: 33358073] [PMCID: PMC8721065] [DOI]
7. Wallace M, Shelkey M. Katz index of independence in activities of daily living (ADL). Urol Nurs. 2007;27(1):93-4.
8. Arik G, Varan HD, Yavuz BB, Karabulut E, Kara O, Kilic MK, et al. Validation of Katz index of independence in activities of daily living in Turkish older adults. Archives of gerontology and geriatrics. 2015;61(3):344-50. [PMID: 26328478] [DOI]
9. Hildebrand MW, Geller D, Proffitt R. Occupational Therapy Practice Guidelines for Adults With Stroke. The American Journal of Occupational Therapy. 2023;77(5):7705397010. [PMID: 37862268] [DOI]

Health Nexus
E-ISSN: 2981-2569

10. Nilsen D, Gillen G, Arbesman M, Lieberman D. Occupational therapy interventions for adults with stroke. The American Journal of Occupational Therapy. 2015;69(5):6905395010p1-p3. [PMID: 26356668] [DOI]
11. Rodríguez-Hernández M, Polonio-López B, Corregidor-Sánchez A-I, Martín-Conty JL, Mohedano-Moriano A, Criado-Álvarez J-J. Effects of specific virtual reality-based therapy for the rehabilitation of the upper limb motor function post-ictus: randomized controlled trial. Brain Sciences. 2021;11(5):555. [PMID: 33924767] [PMCID: PMC8145650] [DOI]
12. Friedmann AJ. Proprioception and developmental motor training: A new treatment for chronic-phase stroke patients: University of Missouri-Saint Louis; 2014.
13. Adams RJ, Lichter MD, Ellington A, White M, Armstead K, Patrie JT, Diamond PT. Virtual activities of daily living for recovery of upper extremity motor function. IEEE transactions on neural systems and rehabilitation engineering. 2017;26(1):252-60. [PMID: 29324411] [DOI]
14. Fathi S, Taghizadeh G, Azad A, Behzadipour S, Shams Hafshejani D, Zare A, Ghorbanpour Z. Effects of upper extremity coordination exercises based on fatigue prediction on upper extremity sensory-motor functions in chronic stroke survivors. Iranian Rehabilitation Journal. 2022;20:17-28. [DOI]
15. Zhao L, Guo B, Gao Y, Zhu Y. Effects of home-based motor imagery training on lower extremity function in chronic stroke patients: a randomized, controlled trial. Chinese Journal of Practical Nursing. 2017:1125-30.
16. Ghrouz A, Marco E, Muñoz-Redondo E, Boza R, Ramirez-Fuentes C, Duarte E. The effect of motor relearning on balance, mobility and performance of activities of daily living among post-stroke patients: Study protocol for a randomised controlled trial. European Stroke Journal. 2022;7(1):76-84. [PMID: 35300258] [PMCID: PMC8921790] [DOI]
17. Smith RC. Making the biopsychosocial model more scientific—its general and specific models. Social Science & Medicine. 2021;272:113568. [PMID: 33423810] [DOI]

E-ISSN: 2981-2569