

# A Comparative Study on Activity Levels and Functional Outcomes in Early and Delayed Prosthetic Fitting among Trans radial Amputees: A Pilot Case Study

Tanu Singh Yadav<sup>1</sup>, Amritanshu Dwivedi<sup>2</sup>, Gargi Khare<sup>3</sup>

<sup>1,2</sup>M.P.O. Students, <sup>3</sup>Assistant Professor,  
Department of Prosthetics and Orthotics, Dr. Shakuntala Misra National Rehabilitation University,  
Lucknow-226017 U.P., India

Corresponding Author: Tanu Singh Yadav

DOI: <https://doi.org/10.52403/ijrr.20260335>

## ABSTRACT

Early prosthetic fitting is widely recognized as a critical factor influencing functional recovery, prosthetic acceptance, and long-term rehabilitation outcomes in individuals with upper limb amputation. Despite this, many transradial amputees receive prosthetic devices several months or years after surgery due to socioeconomic and healthcare related barriers. This pilot case study aims to compare activity levels functional performance and prosthetic usage patterns between early prosthetic users (fitted within 3 to 4 months post-surgery) and (fitted 1 to 3 years post-surgery) delayed prosthetic users. A small sample of four transradial amputees was evaluated using a structured questionnaire and functional assessment parameters, including prosthesis usage duration, independence in activities of daily living (ADLs), comfort, satisfaction, phantom limb pain, and psychosocial adaptation. The findings suggest that early prosthetic fitting is associated with improved activity participation, higher prosthesis acceptance, and better functional outcomes. This study highlights the clinical importance of timely prosthetic rehabilitation in transradial amputees.

**Keywords:** Trans radial amputation, Early prosthetic fitting, Delayed prosthetic fitting, Activity level, Functional outcomes, Rehabilitation.

## INTRODUCTION

Transradial amputation leads to significant loss of hand function, affecting an individual's ability to perform daily activities, vocational tasks, and social roles. The hand plays a vital role in fine motor control, bimanual coordination, and object manipulation, and its loss often results in functional dependency and psychological distress.[3] Prosthetic rehabilitation aims to restore partial hand function, promote independence, and enhance quality of life for upper limb amputees.[3] Several factors influence the success of prosthetic rehabilitation, including the level of amputation, type of prosthesis, quality of rehabilitation training, patient motivation, and timing of prosthetic fitting.[2,4,9] Existing literature emphasizes that early prosthetic fitting facilitates neuromuscular adaptation, reduces phantom limb pain, and encourages consistent prosthesis use.[3,6] In contrast, delayed prosthetic fitting may result in learned non-use, increased reliance on the intact limb, and reduced functional performance. [1,7] Although the benefits of early prosthetic fitting are well acknowledged, limited small-scale comparative studies focus specifically on trans radial amputees in routine clinical settings.[1] This pilot case study aims to

compare functional outcomes and activity levels between early and delayed prosthetic users, thereby providing clinical evidence to support early prosthetic intervention.

### **Aim**

To compare activity levels and functional outcomes between early and delayed prosthetic users among trans radial amputees.

### **Objectives**

- To evaluate daily prosthetic usage time in early and delayed prosthetic users.
- To assess independence in activities of daily living (ADLs).
- To compare comfort, satisfaction, and acceptance of the prosthesis.
- To analyze dependence on the intact limb and psychosocial adaptation.



- To identify functional advantages associated with early prosthetic fitting.

### **METHODOLOGY**

This study adopted a comparative pilot case study design to evaluate functional outcomes in trans radial prosthetic users based on the timing of prosthetic fitting.

### **Study Sample**

A total of four unilateral trans radial amputees participated in the study. Participants were divided into two groups: early prosthetic users (fitted within 3–4 months post-amputation) and delayed prosthetic users (fitted between 1–3 years post-amputation).



### **Inclusion Criteria**

- Unilateral transradial amputees
- Age between 18 and 50 years
- Users of body-powered prostheses
- Minimum of three months of prosthetic usage experience

### **Exclusion Criteria**

- Bilateral upper limb amputees
- Severe residual limb complications
- Neurological or cognitive impairments affecting participation

### **Outcome Measures**

Functional and activity-related parameters were assessed using a structured questionnaire adapted from commonly accepted prosthetic outcome measures. Parameters included daily prosthetic usage

time, ADL performance, comfort, satisfaction dependence on the intact limb, social participation, and phantom limb pain. [5,8]

### **DISCUSSION**

The findings of this pilot study indicate that early prosthetic users demonstrate higher activity levels, better functional performance, and greater prosthesis acceptance compared to delayed users. Early fitting allows timely neuromuscular adaptation and psychological acceptance of the prosthesis, facilitating improved integration into daily life. [3,6] Delayed prosthetic users often develop compensatory one-handed strategies, which may limit later

prosthetic use and reduce functional benefits. [1,7] These observations are consistent with previous studies highlighting higher prosthetic abandonment rates among delayed users. [1,9]

### Clinical Implications

The results emphasize the importance of early prosthetic intervention in transradial amputees. Surgeons, prosthetist, and rehabilitation professionals should work collaboratively to ensure timely referral and early prosthetic fitting, which may significantly improve long-term functional outcomes and patient satisfaction. [2,3]

### Limitations

The study is limited by a small sample size and the pilot nature of the design, which may restrict the generalizability of findings. Subjective self-reported measures may also introduce response bias. Future studies with larger sample sizes and objective outcome measures are recommended.

### CONCLUSION

This pilot case study concludes that early prosthetic fitting plays a crucial role in enhancing functional outcomes, activity participation, and prosthesis satisfaction among transradial amputees. Delayed prosthetic fitting may lead to reduced prosthetic use and limited functional recovery. Early rehabilitation protocols should therefore be strongly encouraged in clinical practice.

### Declaration by Authors

**Source of Funding:** None

**Conflict of Interest:** No conflicts of interest declared.

### REFERENCES

1. Biddiss, E., & Chau, T. (2007). Upper-limb prosthetics: Critical factors in device abandonment. *American Journal of Physical Medicine & Rehabilitation*, 86(12), 977–987.
2. Dudkiewicz, I., Gabrielov, R., Seiv-Ner, I., Zelig, G., & Heim, M. (2004). Evaluation of prosthetic usage in upper limb amputees. *Disability and Rehabilitation*, 26(1), 60–63.
3. Meier, R. H., & Atkins, D. J. (Eds.). (2004). *Functional Restoration of Adults and Children*

- with Upper Extremity Amputation. Demos Medical Publishing.
4. Resnik, L., Klinger, S. L., & Etter, K. (2012). The DEKA arm: Its features, functionality, and evolution during the Veterans Affairs study. *Prosthetics and Orthotics International*, 38(6), 492–504.
5. Resnik L, Adams L, Borgia M, Delikat J, Disla R, Ebner C, Walters LS. Development and evaluation of the activities measure for upper limb amputees. *Arch Phys Med Rehabil*. 2013 Mar;94(3):488-494.e4. doi: 10.1016/j.apmr.2012.10.004. Epub 2012 Oct 17. PMID: 23085376.
6. National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Board on Health Care Services; Committee on the Use of Selected Assistive Products and Technologies in Eliminating or Reducing the Effects of Impairments; Flaubert JL, Spicer CM, Jette AM, editors. *The Promise of Assistive Technology to Enhance Activity and Work Participation*. Washington (DC): National Academies Press (US); 2017 May 9. 4, Upper-Extremity Prostheses. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK453290/>.
7. Kulkarni Tushar, Uddanwadiker Rashmi. Overview: Mechanism and Control of a Prosthetic Arm. *Molecular & Cellular Biomechanics*; Forsyth. 2015, Vol. 12, Iss. 3, 147-195. DOI: 10.3970/mcb.2015.012.147
8. Resnik LJ, Borgia ML, Clark MA, Heinemann AW, Ni P. Measuring Satisfaction With Upper Limb Prostheses: Orthotics and Prosthetics User Survey Revision That Includes Issues of Concern to Women. *Arch Phys Med Rehabil*. 2022 Dec;103(12):2316-2324. doi: 10.1016/j.apmr.2022.05.008.
9. Biddiss EA, Chau TT. Upper limb prosthesis use and abandonment: a survey of the last 25 years. *Prosthet Orthot Int*. 2007 Sep;31(3): 236-57. doi: 10.1080/03093640600994581.

How to cite this article: Tanu Singh Yadav, Amritanshu Dwivedi, Gargi Khare. A comparative study on activity levels and functional outcomes in early and delayed prosthetic fitting among trans radial amputees: a pilot case study. *International Journal of Research and Review*. 2026; 13(3): 307-309. DOI: <https://doi.org/10.52403/ijrr.20260301>

\*\*\*\*\*