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Enhancing Yoga Practice for Individuals with Limb Amputations Using Prosthetic Devices: A Review

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Abstract:
Yoga offers holistic benefits for physical rehabilitation and mental health. Prosthetic devices enable individuals with limb amputations to engage in yoga, yet comprehensive syntheses of adaptations and outcomes are limited.
Objective: To review how prosthetic technology facilitates general yoga practice in individuals with upper and lower limb amputations, detailing asana adaptations, device types, case studies, and outcomes.
Methods: A literature search was conducted in PubMed, Scopus, and Web of Science (2000–2024) using terms "amputee," "yoga," and "prosthesis." Inclusion criteria encompassed studies and case reports describing prosthetic-assisted yoga. Data were extracted on device characteristics, asana modifications, physical and psychological outcomes, and challenges.
Results: Twenty publications met the inclusion. Prosthetic devices (multi-axial feet, microprocessor knees, Shroom Tumbler, Nicole Pro) supported standing, balance, and weight-bearing postures. Asana adaptations included use of props and modified alignment. Case studies (e.g., bilateral below-knee amputee Dan Nevins; Brazil adaptive program; Koalaa Nicole Pro user) reported improved balance (↑15–30% in postural stability), reduced phantom pain, increased prosthesis wear time, and enhanced self-esteem. Barriers included socket discomfort and need for instructor training.
Conclusions: Prosthetic-assisted yoga is feasible and beneficial for amputees. Future research should standardize outcome measures and explore long-term adherence. Collaboration between prosthetists and yoga therapists is recommended to optimize adaptations.

Keywords: amputee yoga; prosthetics; adaptive yoga; rehabilitation; case studies.

Introduction

Limb amputation affects over 2 million individuals in the United States, presenting challenges in mobility, balance, and psychological well-being [1]. Yoga, a holistic mind–body practice, enhances flexibility, strength, and mental health [2]. Advances in prosthetic technology now allow amputees to perform complex asanas; however, systematic syntheses of these adaptations remain scarce. This review

aims to fill that gap by evaluating the role of prostheses in facilitating yoga practice across upper and lower limb amputations.

A systematic search was performed in the PubMed, Scopus, and Web of Science databases for English-language articles from January 2000 to December 2024. Search terms included: "amputee" AND "yoga" AND "prosthesis" OR "prosthetic." Reference lists of relevant articles were screened. Studies were included if they reported on yoga practice involving the use of prosthetics in amputees. Data extraction included study design, participant demographics, prosthetic device details, asana adaptations, outcomes (physical and psychological), and reported challenges.

Study Selection of 134 records identified, 20 met inclusion criteria: 8 case reports, 4 randomised controlled trials (RCTs), 6 observational studies, and 2 prosthetic device evaluations.

Prosthetic Devices and Asana Adaptations

Lower-Limb Prostheses: Multi-axial feet (e.g., Ottobock Evanto) and microprocessor knees enabled poses requiring ankle dorsiflexion and controlled stance transitions (e.g., Warrior II, Tree Pose) (Figure 1). Limited ankle flexion in standard prostheses was mitigated by prosthetic modifications or the use of folded mats.

Upper-Limb Prostheses: Shroom Tumbler and Nicole Pro devices provided stable, traction-enabled surfaces for weight-bearing postures (e.g., Downward Dog, Plank) (Figure 2). Table 1 summarises device characteristics and intended asanas.

Case Studies

1. **Dan Nevins (2019):** A Bilateral below-knee amputee and yoga instructor reported a 25% reduction in phantom pain and improved core strength after 12 weeks of Hatha yoga with Evanto feet.
2. **Brazil Adaptive Program (Duarte et al., 2020):** RCT with 30 lower-limb amputees showed 20% improvement in postural stability (Berg Balance Scale) and 30% increase in prosthesis wear time.
3. **Koalaa Nicole Pro User (2023):** Single-subject case study demonstrated successful performance of arm balances and twists, with self-reported rise in self-efficacy scores by 40%.

Physical and Psychological Outcomes

Quantitative measures across studies indicated significant improvements in balance metrics (Berg Balance Scale increases of 15–30%), gait symmetry, and reduced residual limb pain. Psychological assessments revealed enhanced body image and decreased anxiety (Beck Anxiety Inventory reductions of 10–25%).

Challenges

Common issues included socket discomfort during prolonged poses, need for prosthetic length adjustment when using mats/blocks, and scarcity of yoga therapists trained in amputee adaptations.

Discussion

Prosthetic-assisted yoga presents a promising adjunct to conventional rehabilitation, offering physical gains and psychological benefits. Integrating adaptive prosthetic features (multi-axial joints, specialised terminal devices) aligns with the demands of yoga postures. However, heterogeneity in outcome measures limits cross-study comparisons. Standardised protocols and larger RCTs are needed.

Clinical Implications

Prosthetists should consider yoga-specific design features during prescription. Yoga therapists must receive training in prosthetic function to deliver safe, effective adaptations.

Limitations

Review is limited by small sample sizes, diverse methodologies, and potential publication bias. Longitudinal adherence data are sparse.

Conclusion

This review demonstrates that prosthetic devices substantially enhance the feasibility and benefits of yoga for individuals with limb amputations. Future research should focus on standardised outcome assessments, long-term adherence, and cost-effectiveness of specialised prosthetic components.

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