

Neuromarketing-Based Gamification for User Experience and Cognitive Load Management in Physical Therapy

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1 ABSTRACT

Gamification techniques are widely used in physiotherapy and rehabilitation processes to maintain patient motivation and ensure the continuity of treatment. Current studies in this field (Huber et al., 2021; Krepkovich et al., 2022; Arbuckle et al., 2025) show that game-based applications not only increase user satisfaction but also improve patient participation and the overall usability of applications. However, the balancing of cognitive load in gamification strategies and the neurophysiological foundations of this process are not yet clear. Inappropriate levels of cognitive engagement can negatively affect the learning process and application success (Müller et al., 2025; Ayoob et al., 2020).

This study presents the NEURO-GAMER PT approach, which approaches gamification applications within the physiotherapy discipline from a neuromarketing perspective and integrates multisensory feedback with neurophysiological data, to the academic literature. This research is based on a randomized controlled experimental design to deeply examine changes in user experience and cognitive load in gamified rehabilitation processes.

Keywords: Neuromarketing, Gamification, User Experience, Cognitive Load Management, Physical Therapy

2 NEUROMARKETING-BASED GAMEFICATION FOR USER EXPERIENCE AND COGNITIVE LOAD MANAGEMENT IN PHYSICAL THERAPY

2.1 Introduction

The use of virtual reality (VR) and gamification elements in physical therapy and rehabilitation processes yields superior results in terms of patient motivation and adherence to treatment compared to traditional treatment methods. Studies focusing on stroke, Parkinson's disease, and musculoskeletal disorders show that gamified rehabilitation approaches improve balance control, motor skills, and functional independence in daily life for patients (Syed et al., 2019; Cameirão et al., 2010; Arbuckle et al., 2025).

While users' general attitudes towards gamified physiotherapy systems are mostly satisfaction-oriented (Huber et al., 2021), the underlying cognitive load dynamics of this experience have generally been limited to survey-based measurements.

These findings suggest that gamification strategies in physiotherapy should be considered not only as a motivator but also as a strategic improvement motivation tool that manages cognitive load and attention mechanisms. Evidence from the neuromarketing literature reveals that individuals' decision-making, reward perception, and attention processes are largely shaped by unconscious (latent) mechanisms. This indicates that user experience cannot be fully explained by self-report (subjective) questionnaires alone; it needs to be supported by sensitive neurophysiological tools such as EEG (Ahmed et al., 2025). However, neuromarketing-focused approaches allow for the unraveling of the incomprehensible dynamics behind superficial responses by examining the decisive role of emotional and cognitive arousal on user behavior (Robaina-Calderín, 2021; Ouzir, 2023; Yadete & Kant, 2023).

This study, stemming from this need, aims to experimentally investigate the effects of multisensory feedback on user experience and cognitive load in gamified physiotherapy applications.

2.2 Methods

The study group consisted of individuals aged 18 and over who experienced mobility limitations due to trauma, surgery, or chronic illnesses and required rehabilitation.

A total of 40 volunteers were randomly assigned to experimental and control groups, and all participants were selected to complete at least 6 weeks of rehabilitation after treatment.

To ensure methodological reliability, cognitive ability will be assessed using the Mini Mental State Assessment (MMSE > 20); medical contraindications that could compromise the safety of haptic feedback VR systems, such as epilepsy and the presence of implants, will be excluded from the study. To minimize bias in the assessment process, a single-blind sampling strategy will be applied, preventing researchers from accessing group distributions

2.2.1 Critical Game Design Elements to be Examined from a Neuromarketing Perspective

In this study, neuromarketing dynamics will be observed and measured through unconscious processes such as attention management, cognitive load balance, reward expectation, sensory feedback, flow state, and emotional arousal, thus influencing user experience and treatment adherence.

2.2.2 Overall Assessment and Research Expectations

This study provides a significant analytical framework for evaluating the generalizability of observations to different rehabilitation scenarios, including individuals experiencing functional loss due to stroke, trauma, surgery, or illness. Accordingly, the research aims to establish a theoretical and methodological reference point on the applicability of neuromarketing-based game design in the field of health and rehabilitation.

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