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結合在地化意象與遊戲化設計之高齡者肌少症篩檢系統：

數位設計優化與開發歷程

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摘要

本研究旨在開發一套結合肌少症風險評估問卷(SARC-F)與互動投影技術的科技篩檢系統，用以提升社區高齡者參與肌少症篩檢的動機與精準度。SARC-F為國際公認之篩檢工具，但傳統紙本問卷易受回憶偏誤影響；本研究透過 Unity 開發平台搭配 Kinect 感測技術，將問卷中的肌力、步態、起身、爬梯、跌倒及手握力測試六項指標，轉化為具備在地化意象（三芝梯田等）的互動關卡。設計核心在於將感測器捕捉之物理動作映射至虛擬場景，並透過視覺化參數呈現受試者的體能表現。

開發過程採設計研究法(Design Research)，分為初步設計與系統優化兩階段。在優化階段，本研究依據專家建議調整測試標準，例如增設客觀的「手握力測試」關卡，最終形成六項互動關卡。專家評估結果顯示，系統在「跌倒風險」的動作導向作答設計上具備高度可行性與直觀性，但在「肌力」與「爬梯」測試的標準化上仍有優化空間。整體而言，本系統透過遊戲化體驗與正向回饋設計（如花苞綻放視覺），預期降低高齡者對於篩檢的心理門檻，並提升其參與健康促進活動的意願。

關鍵字：高齡福祉科技、肌少症篩檢、互動投影、在地化意象、數位設計

Sarcopenia Screening System for Older Adults Integrating Localized Imagery and Gamified Design: Digital Design Optimization and Development Process

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Abstract

This study aimed to develop a technology-assisted screening system that integrates the Sarcopenia Risk Assessment Questionnaire (SARC-F) with interactive projection technology to enhance community-dwelling older adults' motivation and accuracy in sarcopenia screening. Although SARC-F is an internationally recognized screening tool, traditional paper-based questionnaires may be affected by recall bias. Therefore, this study used Unity and Kinect sensing technology to transform six SARC-F-related indicators—muscle strength, gait, chair stand, stair climbing, fall risk, and handgrip strength—into interactive tasks featuring localized imagery, such as the terraced fields of Sanzhi. The system maps participants' physical movements onto virtual scenarios and presents their physical performance through visualized parameters.

The development process adopted Design Research and consisted of two stages: preliminary design and system optimization. Based on expert suggestions, the system was refined by adjusting testing criteria and adding an objective handgrip strength test, resulting in six final interactive tasks. Expert evaluation showed that the movement-based design for fall risk assessment was highly feasible and intuitive, while the standardization of muscle strength and stair climbing tasks still requires further improvement. Overall, through gamified interaction and positive visual feedback, such as blooming flower buds, the system is expected to reduce older adults' psychological barriers to screening and increase their willingness to participate in health promotion activities.

Keywords: gerontechnology; sarcopenia screening; interactive projection; localized imagery; digital design

