

## 中文摘要

退化好發於高齡族群，在 65 歲以上的高齡人口中約 10% 至 25% 具退化現象，85 歲以上的高齡人口中幾乎一半以上符合退化定義，退化可能造成體能下降、日常生活功能障礙、跌倒、失能、住院甚至死亡，可見退化是生活品質的一大威脅。

我們的願景是希望建置銀髮族專屬健身中心，藉由退化評估與健身運動延緩老年退化。可歸納本研究四的項主要目標：(1)透過個案資料建立指標參考標準，並依據各退化指標與運動的對應關係，推演運動處方演算法；(2)依照退化評估及健身運動兩項服務需求，規劃銀髮族健身中心資訊系統，設計具娛樂性的多媒體互動退化偵測遊戲軟體，增加老人的使用意願；(3)進行硬體設備研發，開發互動式四合一退化偵測椅，並改善舊有之健身器材，使健身器材自動化控制(4)設想各項老人們於銀髮族健身中心所需之服務內容，規劃銀髮族健身中心創新的服務模式。

本研究之成果目前已實際導入照護機構，為測試系統效能並了解使用者於此創新服務的滿意度，我們設計了一銀髮族進身中心體驗流程，並招募自願者進行(1)電子與傳統工具信效度實驗，(2)健身中心滿意度調查實驗兩項實驗。於照護機構中共招募了 20 位實驗個案，

在電子與傳統工具的信效度實驗中，我們藉由比較電子與傳統工具的相關性來驗證新型電子式退化偵測設備的信效度，六項指標之實驗結果分別為：反應力相關係數 0.155、手握力相關係數 0.563、肌耐力相關係數 0.462、行動力相關係數 0.308、平衡感相關係數 0.694，以及功能性前伸相關係數 0.679，其中有三項指標達中度相關性。針對效能不足三項指標反應力、肌耐力、行動力及其量測工具電子握力計和電子坐墊作探討後，提出測試流程與加入除錯機制的改良方案，利用模擬實驗可使三項指標之相關性上升至：反應力相關係數 0.427、肌耐力相關係數 0.542、行動力相關係數 0.885。在滿意度調查方面，針對使用意願、認知有用性、認知易用性、產出品質，以及效果論證五大類問題，於 7 級評鑑之中都得到 5 級以上的分數，獲得良好等級的評價，可以得知受試者對於銀髮族健身中心滿意度很高。

關鍵字- 退化，銀髮族健身中心，無線感測技術，多媒體互動遊戲。

## 英文摘要

Frailty is one of the greatest gerontological challenges faced by modern societies with ageing populations. Compared with their age-matched non-frail counterparts, frail elderly people have a much higher risk of falling related injuries, which could result in disability, hospitalization, institutionalization or even death. Frailty increases the risk of adverse health outcomes, including mortality, institutionalization, falls and hospitalization. In the United States and Europe, approximately 10-25% of the elderly population over the age of 65 and almost 50% of population over the age of 85 meet the definition of frailty [10]. Frailty is one of the greatest gerontological challenges faced by societies with ageing populations in the next 10 years.

Our vision is to build an elder's fitness center to delay the degradation. The study can be summarized as four major objectives: (1) Establish the standard of frailty indicators and derive the exercise prescription algorithm based on the relationship between the frailty indicators and exercise. (2) Develop the information system of elder's fitness center and design interesting multimedia interactive games to

detect the frailty indicators automatically. (3) Develop four in one frailty detection chair, and modified of existing fitness equipment. (4) Planning elder's fitness center service model.

We designed two experiments to test the overall measurement instruments performance and survey the degree of user satisfaction: (1) Pearson's correlation analysis comparing traditional instruments and electronic instruments. There were 20 subjects in this experiment and we used Pearson's correlation analysis to interpret the data. The results shown most correlation coefficients for the frailty indicator measurements are highly positive, indicating strong correlations between our system and traditional measurement methods. (2) Elder's fitness center satisfaction survey experiment. The 20 cases of previous experiment also involved in the satisfaction survey. All the questions of satisfaction survey obtain more than 5 points in 7 points question. The results shown the subjects have a high degree of satisfaction and the subjects can accept the innovative concept of elder's fitness center.

Keywords- Frailty; Elder's Fitness Center; Wireless Sensor Technologies; Multimedia Interactive Games.