

穿戴式裝置與行為改變技術 對增加高齡女性身體活動及減少靜態行為之影響： 隨機對照研究

A randomized controlled trial of wearable accelerometer-based feedback and behavior change techniques to increase physical activity and reduce sedentary behavior in older women

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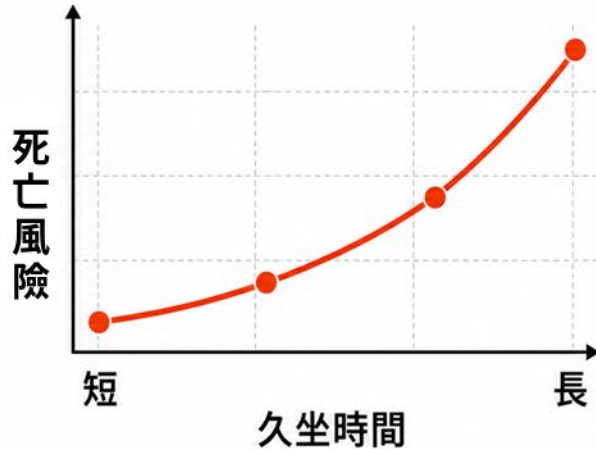
研究背景與動機

- 高齡女性在晚年普遍面臨失能與多重慢性病。
 - 80歲以上的女性中，將近60%至少一項失能，且身體功能明顯率退。
- 因此身體活動 (PA) 及可改變的行為是重要的介入目標 (Rillamas-Sun et al., 2018) 。

身體活動量 vs 心血管疾病



靜態行為 vs 全死因死亡率

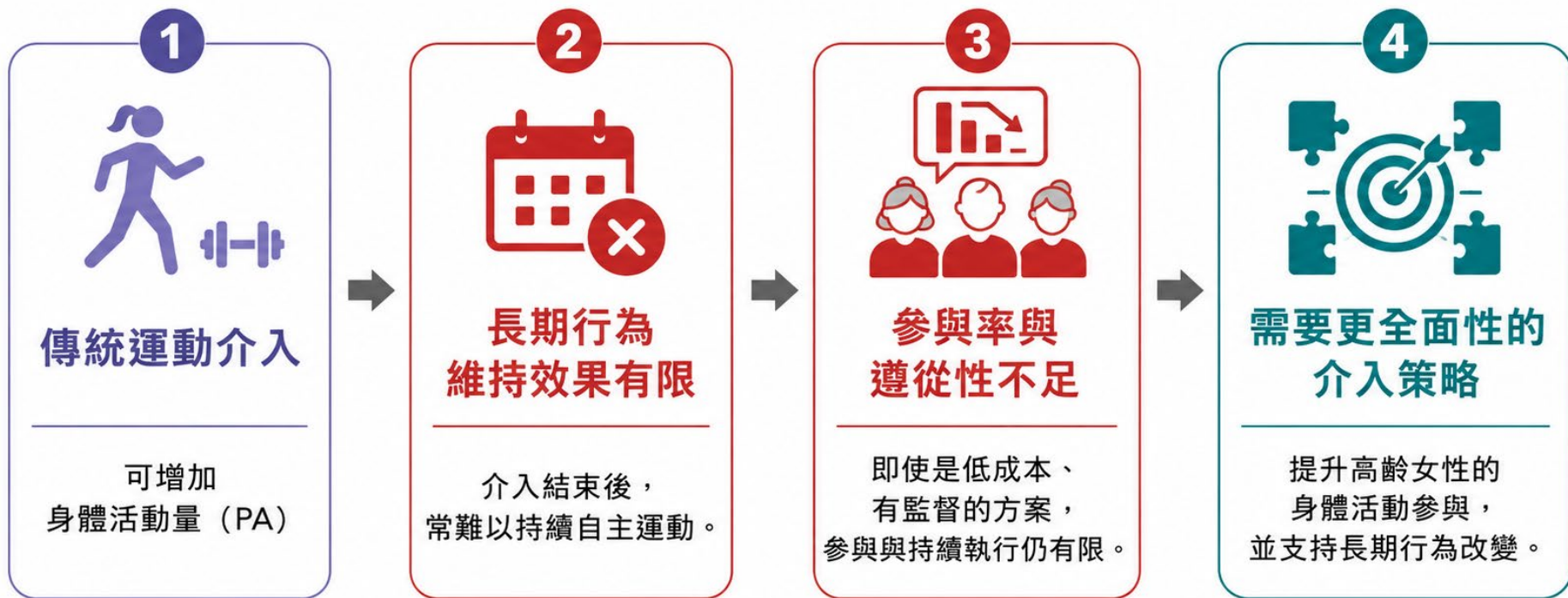


高齡女性挑戰



(Nguyen et al., 2024) 。

研究背景與動機



(Room et al., 2021; Neil-Sztramko et al., 2022; Meredith et al., 2023; Lenouvel et al., 2023)

研究背景與動機

1 穿戴式科技的潛力



促進身體活動 (PA)



減少久坐行為 (SB)



客觀監測活動量



追蹤日常行為

2 相較傳統運動方案的優勢



穿戴式科技
持續監測與數據



提升動機



自我監測



有助長期
遵從性

3 關鍵不只是裝置本身



穿戴式裝置

+



行為改變技巧
(BCTs)

→



更佳介入效果

BCTs 範例



目標設定



回饋與
自我監控



提醒與
行動計畫



僅使用裝置

<



+



裝置 + BCTs

穿戴式裝置需結合行為改變技巧，才能更有效促進身體活動並減少久坐行為。



文獻探討

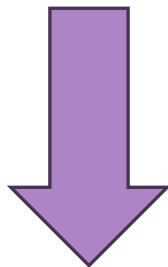
作者 (年份)	研究對象	介入內容	身體活動結果	靜態行為結果
Barwais (2013)	成人	穿戴裝置 + 行為改變	輕度身體活動 ↑ 中高強度身體活動 ↑	靜態行為 ↓
Schuna (2014)	成人	穿戴裝置+行為改變	身體活動 ↑	靜態行為 ↓
Ashe (2015)	高齡者	穿戴式裝置 + 行為介入	身體活動 ↔	靜態行為 ↔
Lyons (2017)	高齡者	穿戴式裝置+行為介入	身體活動 ↔	靜態行為 ↔

過去同時探討身體活動與靜態行為的介入研究結果**不一致**
→成人研究：發現輕度身體活動、中高強度身體活動改善且減少靜態行為
→高齡者研究：發現總身體活動量或靜態行為無顯著改變

研究缺口

多數研究來自西方，亞洲研究較少

高齡女性相關研究不足



研究目的：
透過12周健康信念模式課程+穿戴式裝置回饋提升高齡女性身體活動量減少靜態行為

名詞操作性定義

一、高齡女性

年滿65歲及以上之成年人 (全國法規資料庫, 2019)。

二、身體活動

人們清醒時由骨骼肌肉產生的需要消耗能量的任何身體動作(Caspersen et al., 1985)。按照Troiano (2008) 等，以ActiGraph wGT3X-BT三軸加速規(Pensacola, FL, USA)測量輕度身體活動(100-2019 CPM)及中高強度身體活動(2020-5999 CPM) 時間。

三、靜態行為

久坐行為型態是以每日 ≥ 30 分鐘連續久坐段落的次數與總持續時間，以及每日 1 分鐘久坐中斷次數來表示 (Troiano et al., 2008)。

研究方法-研究對象及研究流程

- ✓ 研究參與者均已簽訂知情同意書
- ✓ 並經臺北市立大學研究倫理委員會審查通過

納入標準

年齡 ≥ 65 歲，居住於社區、願意配穿戴式裝置、可獨立行走、視力正常、近三個月未達每週 150 分鐘中等強度 PA，且未從事阻力訓練

N=74
2023/01-02月於里民活動中心招募參與者



- (1) 過去一年曾骨折者 (n = 3)
- (2) MMSE分數低於 24 分者 (n = 2)
- (3) 可能影響研究之疾病者，如心血管或神經系統相關疾病 (n = 2)

Mini-Mental State Examination (MMSE) (Gou et al., 1988)

N=48
進行隨機分組



因資料不完整、對研究無興趣、拒絕後側、受傷 (n=6)

N=42
最後納入樣本 (實驗組n=22, 控制組n=20)

研究工具-身體活動與靜態行為測量

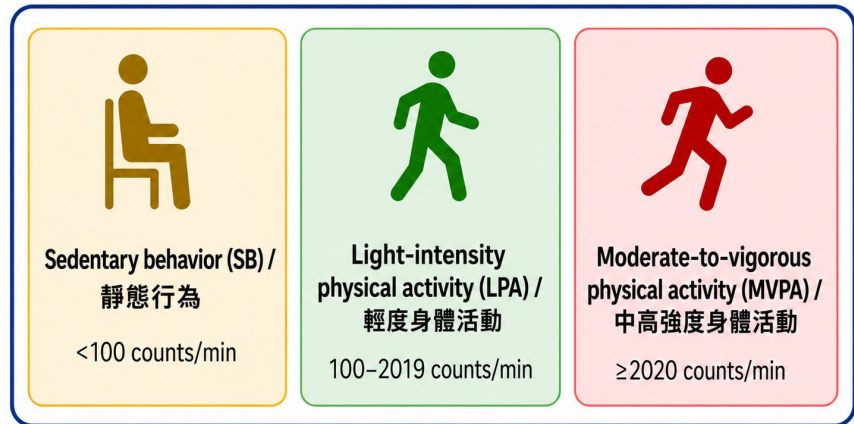
三軸加速規



於腰部連續配戴七天
至少 ≥ 4 有效日
(三個平日+一個週末)
除水中活動，睡眠時間也須配戴

(GT3X+ ActiGraph, Pensacola, Florida)

三軸加速規切點



(Troiano et al., 2008)

研究工具-身體功能測量

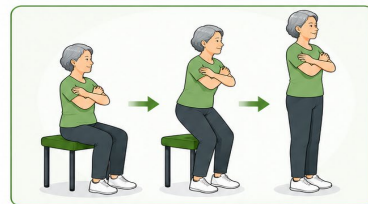
握力 (Handgrip Strength)

儀器垂直於身體，用慣用手測量兩次取最佳成績
(Taekema et al., 2010 ; Abizanda et al., 2012)



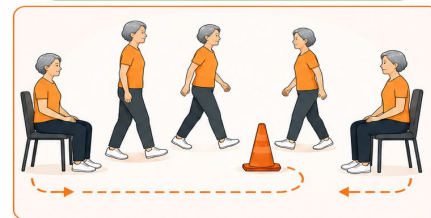
5 次坐站 (5-Times Sit-to-Stand)

雙手交叉胸前，以最快速度完成 5 次坐站。評估下肢肌耐力。
(Buatois et al., 2008)



3公尺走路速度 (3-m Timed Up and Go)

公尺標誌物再繞回坐下。評估動態平衡與靈敏度。
(Bischoff et al., 2003; Hubbard et al., 2009; Buta et al., 2016)



研究方法-介入方法-行為改變技術

實驗組



加速規成績單

讓參與者了解自己的身體活動數據

12周團體課程

進行身體活動、靜態行為、睡眠等健康相關課程

訊息提醒

課後進行重點整理，提醒高齡者中斷靜態行為進行身體活動等資訊

目標設定

為參與者客製個人目標:如>7000步/天

個別化諮詢

擬定個別化行動計畫

控制組

會接受健康老化相關議題的課程，目的在維持參與者的研究參與動機，但沒有提供改善身體活動或改變靜態行為的認知教育及行為策略

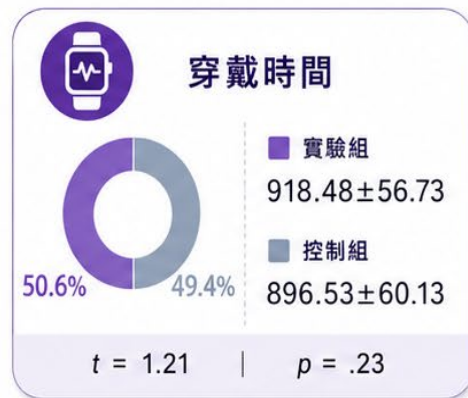
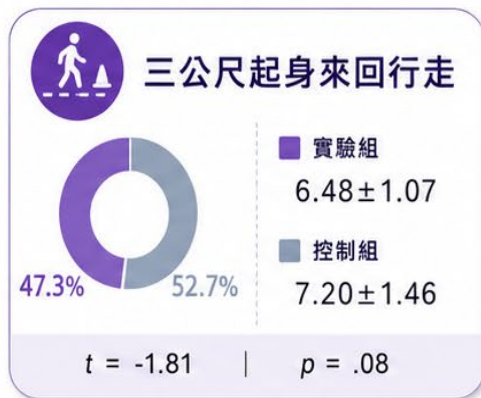
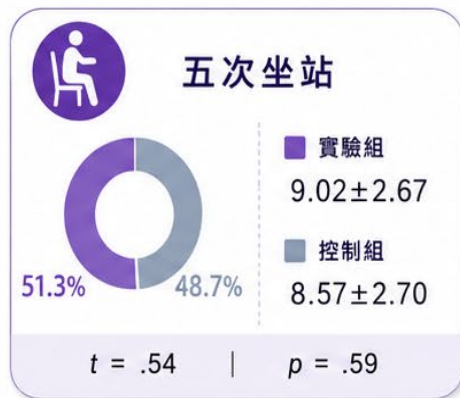
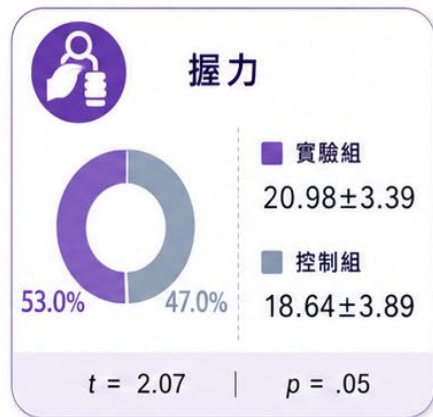
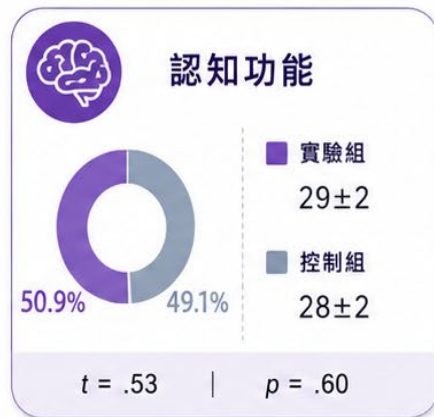
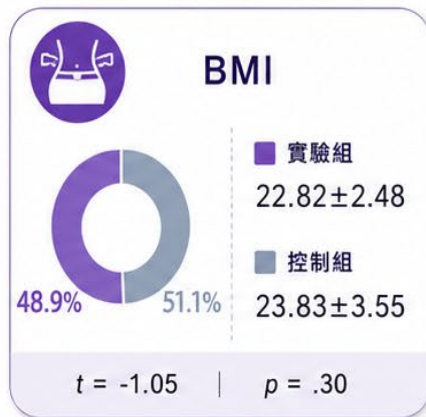
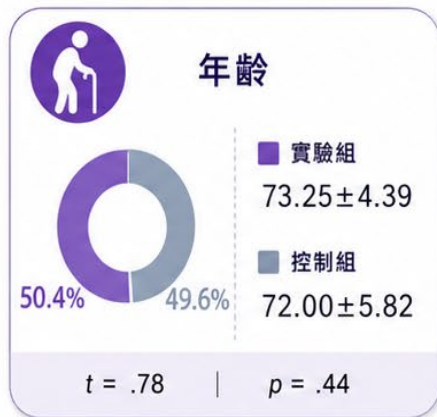
研究方法-資料處理與分析

描述性統計	平均數 標準差	<ul style="list-style-type: none">• 年齡、BMI• MMSE分數• 身體活動量(LPA/MVPA)• 身體功能
獨立樣本t檢定	檢視兩組差異	
共變數分析	檢視兩組身體活動、每日步數、靜態行為差異	
使用 IBM SPSS 22 統計軟體 統計顯著水準設定為 $p < .05$ ActiLife軟體6.0處理三軸加速規數據		

研究結果-參與者基本資料

■ 實驗組

■ 控制組



研究結果-實驗組與控制組12周身體活動與靜態行為結果

■ ANCOVA 結果顯示，介入組在 12 週後的總身體活動量與每日步數顯著高於控制組；
 平均每日連續30分鐘坐著不動的行為次數與時間顯著低於控制組；LPA、MVPA、靜態行為總時間，
 以及平均每日至少1分鐘中斷久坐的次數則無顯著差異。

變項	實驗組 0 週	實驗組 12 週	控制組 0 週	控制組 12 週	<i>p</i>	η^2
 Total PA	333.70 ± 15.36	339.28 ± 17.17	340.51 ± 16.00	318.02 ± 12.06	0.000*	0.45
LPA	312.41 ± 15.30	316.56 ± 17.09	318.00 ± 14.29	301.19 ± 10.65	0.360	0.02
 MVPA	21.28 ± 2.72	22.72 ± 4.15	22.51 ± 3.97	16.83 ± 2.85	0.079	0.08
 每日步數	7463.27 ± 460.80	8198.12 ± 606.98	7846.46 ± 670.38	6758.07 ± 564.40	0.011*	0.16
 靜態行為總時間	562.82 ± 16.05	538.98 ± 18.32	577.96 ± 14.33	580.54 ± 15.70	0.063	0.09
 平均每日連續30分鐘 坐著不動的行為次數	2.05 ± 0.284	2.01 ± 0.227	1.84 ± 0.204	4.21 ± 0.286	0.000*	0.52
 平均每日連續30分鐘 坐著不動的時間	81.65 ± 11.83	80.95 ± 9.34	76.32 ± 8.80	183.95 ± 14.56	0.000*	0.51
 平均每日至少1分鐘 中斷久坐的次數	72.47 ± 2.24	70.94 ± 2.72	65.28 ± 2.07	72.74 ± 1.71	0.054	0.09

顯著
差異

註：採共變數分析 (ANCOVA) 比較兩組差異；**p* < .05。Total PA = 總身體活動量；LPA = 輕度身體活動；MVPA = 中高強度身體活動。

討論

v 本研究主要發現

- **活動量提升**：實驗組每日總身體活動量與步數顯著高於控制組。
- **久坐型態改善**：減少了長時間久坐的頻率與總時間，成功打破久坐慣性。

v 與過去研究一致性

- **結果一致**：本研究證實「行為反饋」結合「行為改變技術」能效促進高齡者身體活動，強調行為改變介入對行為維持的重要性。

每日步數與總身體活動量的提升，與較佳的身體功能表現及較低的慢性疾病風險相關。

(Michie et al., 2009; Paterson & Warburton, 2010; Cadmus-Bertram et al., 2015; Liu et al., 2020)

討論

→ 為什麼步數增加但 LPA/MVPA 不顯著：

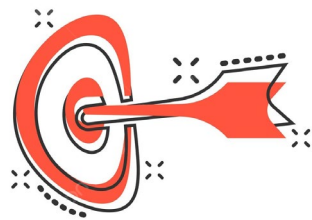
主要增加日常生活中的零散走動，足以反映在步數與總量，但強度尚未達到連續且穩定的LPA或MVPA分鐘數。

→ 為什麼久坐型態會改變：

加速規成績單與文字訊息提醒能讓實驗組對「久坐」產生警覺，從而增加起身頻率，這對降低心血管風險與死亡率具重要價值。

結論

穿戴式裝置與行為改變技術，可提升每日總身體活動量與步數，並改善久坐行為型態，特別是減少長時間未中斷的久坐行為。



未來研究方向與研究限制

- **未來研究建議**

進行較長期追蹤、納入更大且更多樣化的樣本，並採用適合高齡者的相對強度評估方式，以更準確反映身體活動改變

- **研究限制**

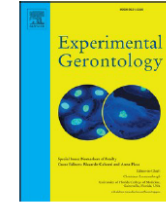
1. 對於體能與步態較特殊的高齡者，可能產生誤判，低估 SB、LPA 與 MVPA 之間的差異。
2. 三軸加速規無法測量水中活動，故有可能低估參與者身體活動。
3. 本研究招募對象為具高度參與意願的社區女性，其健康狀況或運動習慣可能優於一般高齡族群，限制了結果的推論性。



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A randomized controlled trial of wearable accelerometer-based feedback and behavior change techniques to increase physical activity and reduce sedentary behavior in older women[☆]

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報告結束，請多多指教

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