Machine-led 'Taichi Pushing Hand' Program for Fall Prevention: A Pilot Study

Poster Code: P30

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Background

Fall prevention is one of key aspects of primary health care. Tai Chi, originating from China, has shown efficacy in enhancing muscle strength, fitness, and quality of life while reducing fall risks and alleviating pain. While previous studies have predominantly focused on human-led Tai Chi exercises, this research introduces an approach by utilizing a specially designed robot for Tai Chi Push-Hands exercises to implement a fall prevention program.

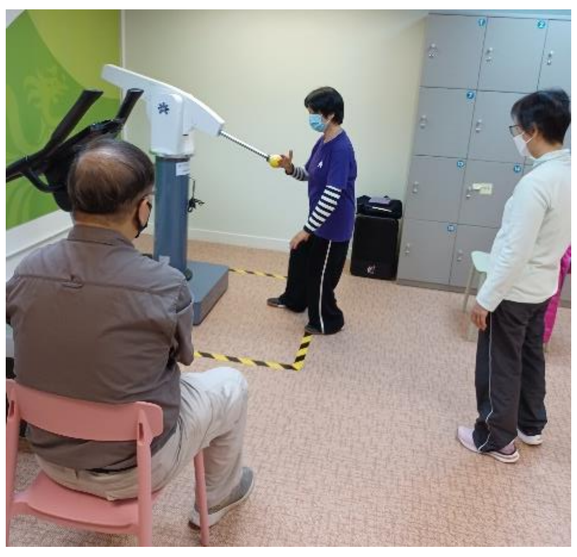
Objectives

This study aimed to

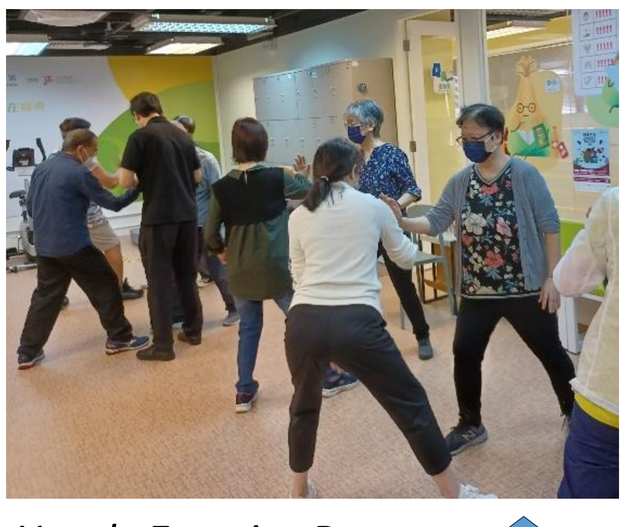
- explore the initial effectiveness of the machine-led 'Taichi Pushing Hand' program for fall prevention and examine its equivalence with human-led programs.

Methodology

- A quasi-experimental design with repeated measures was adopted in this study.
  - Baseline (0th week), 1st Follow Up (12th week), 2nd Follow Up (25th week)
- Inclusion criteria:
  - Aged 50 and above, cognitively sound, independently mobile in the community, and at moderate or higher risk of falls were recruited from primary healthcare centers.
- Participants were allocated to either the machine-led or human-led programs, comprising
  - 4-week teaching sessions (2-hour x 4 weeks)
  - 20-week self-practice period (2 to 3 sessions per week, 1 hour per session)
- Outcome measures
  - Balance Outcome Measure for Elder Rehabilitation (BOOMER)
    - i) Step Test,
    - ii) Timed Up and Go,
    - iii) Functional Reach,
    - iv) Timed Static Stance



Machine-led Tai Chi Push-Hands Exercise Program



Human-led Tai Chi Push-Hands Exercise Program

Results

Thirty participants engaged in the machine-led program, with an equal number in the human-led program.

Table: Change of Outcome Scores of Machine-led Program

Mean (SD)	Baseline	Change ^ @ 1st FU	Change ^ @ 2nd FU
BOOMER (0 - 16)	12.80 (1.90)	1.20 (2.04)*	4.90 (3.97)**
• Step test (0 - 4)	3.07 (0.59)	0.60 (0.74)**	1.62 (1.36)**
• Timed up and go (0-4)	3.27 (0.46)	<0.1 (0.93)	0.14 (0.57)
• Functional Reach (0 – 4)	2.29 (0.80)	0.27 (0.88)	1.38 (1.53)**
• Timed static stance (0 – 4)	3.53 (0.92)	0.33 (0.82)	1.76 (1.48)**

N=30, *: p<0.05, **: p<0.01, ***: p<0.001

Table: Change of Outcome Scores of Human-led Program

Mean (SD)	Baseline	Change ^ @ 1st FU	Change ^ @ 2nd FU
BOOMER (0 - 16)	12.38 (1.96)	1.44 (1.97)*	2.79 (3.48)***
• Step test (0 - 4)	3.06 (0.93)	0.44 (0.73)*	0.88 (1.26)**
• Timed up and go (0-4)	3.06 (0.44)	0.44 (0.63)*	0.42 (0.88)*
• Functional Reach (0 – 4)	2.44 (0.89)	0.38 (1.03)	0.75 (1.29)**
• Timed static stance (0 – 4)	3.81 (0.54)	0.19 (0.54)	0.75 (1.26)**

N=30, *: p<0.05, **: p<0.01, ***: p<0.001

Table: Effect size of the change between baseline and 2nd FU

Effect size (Cohen's d)	Machine-led program	Human-led Program
BOOMER (0 - 16)	1.23 (large)	0.73 (medium)
• Step test	1.19 (large)	0.6 0(medium)
• Timed up and go	0.25 (small)	0.70 (medium)
• Functional Reach	0.90 (large)	0.37 (small)
• Timed static stance	1.19 (large)	0.34 (small)

Implications & Conclusions

This study confirmed the preliminary effectiveness of the machine-led 'Taichi Pushing Hand' program in fall prevention, showcasing comparable effectiveness to human-led counterparts. The machine-led approach offers advantages in service delivery, such as reduced manpower and increased flexibility. Further investigation in larger-scale studies is warranted to fully explore the potential of this program.

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