

EFFECTS OF VING TSUN MARTIAL ART TRAINING ON STANDING BALANCE PERFORMANCE, LEG MUSCLE STRENGTH, KNEE JOINT PROPRIOCEPTION AND REACTION TIME IN COMMUNITY-DWELLING MIDDLE-AGED AND OLDER ADULTS

Shirley S.M. Fong^{a,b*}, Timothy T.T. Yam^a, Yvonne T.C. Chak^c, Joyce C.Y. Leung^{d,e}, William W.N. Tsang^d

^a *School of Public Health, University of Hong Kong, Hong Kong*

^b *Hong Kong Martial Arts Institute, Hong Kong*

^c *Hong Kong Christian Service, Hong Kong*

^d *School of Nursing and Health Studies, Open University of Hong Kong, Hong Kong*

^e *Department of Social Work and Social Administration, University of Hong Kong, Hong Kong*

BACKGROUND

- **Ving Tsun (VT) = Wing Chun**
 - A popular Chinese martial art among the middle-aged and older adults.
 - Rapid striking techniques and agile footwork → may strengthen the sensorimotor and body balance systems?



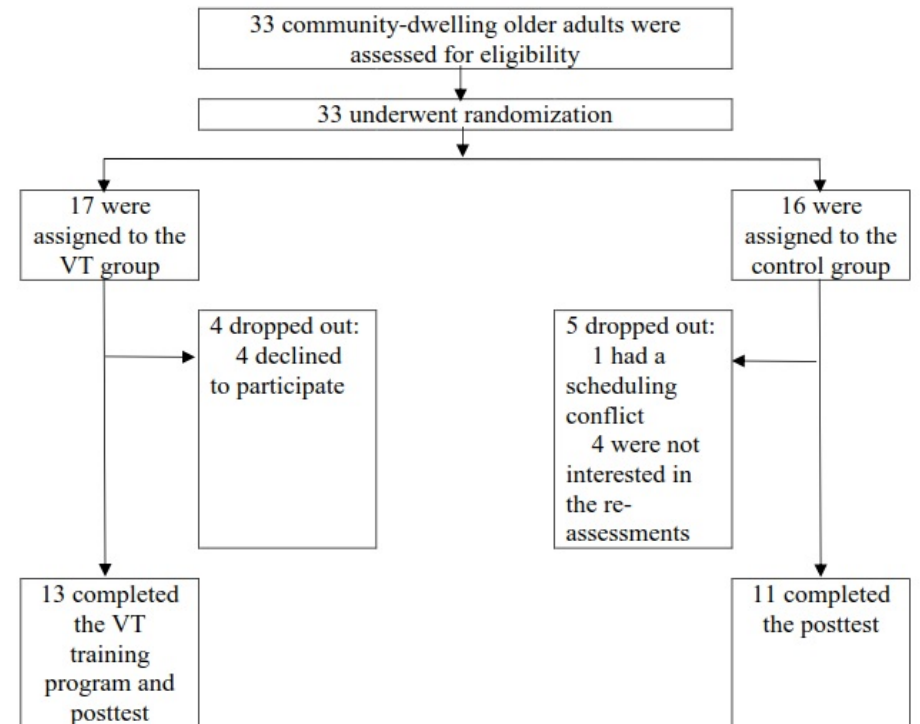
AIM OF STUDY

- To evaluate the effects of **VT martial art training** on **standing balance performance**, **lower limb muscle strength**, **knee joint proprioception** and **simple reaction time** in **community-dwelling middle-aged and older adults**.



METHODS

- A randomized, parallel group controlled trial.
- **Thirty-three adults** were recruited from the Un Chau Neighborhood Elderly Center of the Hong Kong Christian Service.
- They were randomly allocated to either a **VT group** (n = 17, mean age = 67.5 years) or a **control group** (n = 16, mean age = 72.1 years).



METHODS

- The **VT group** received VT sticking-hand training (<https://youtu.be/ssaYXNGm7hM>) twice per week for 3 months.



- The **control group** received **no training** but continued their usual daily activities and medical care.

| Ving Tsun (VT) drill | Description | Exercise frequency | Exercise intensity | Exercise duration |
|---|---|--------------------------------------|--------------------|-------------------|
| Warm-up | Jogging and static stretch of large muscle groups. | VT class: three times per week | | 5-10 min |
| 1. Single sticking-hand exercise in static stance | Both partners face each other in a fixed stance, maintaining a semi-squatting posture with feet shoulder width apart. One person executes an arm attack while the other person responds to the movements of his/her partner, trying to defend using one arm. Upper body perturbation forces are induced. | | 20 repetitions | 5 min |
| 2. Double sticking-hand exercise in static stance | Both partners face each other in a fixed stance, maintaining a semi-squatting posture with feet shoulder width apart. One person executes arm attacks using both arms while the other person responds to the movements of his/her partner, trying to defend using both arms. Partners may attack and defend simultaneously using both arms. Larger upper body perturbation forces are induced because both arms are used. | | 20 repetitions | 5 min |
| 3. Advancing footwork with Taan Sau and retreating footwork with Fook Sau | The attacker takes a step forward and applies a Taan Sau technique (pushing forward) while the defender takes a step backward and applies a Fook Sau technique to oppose the attacker's Taan Sau technique. The two partners are connected via the upper extremities, and they move together. | | 20 repetitions | 5 min |
| 4. Advancing and retreating footwork with vertical punches | The attacker shuffles forward and punches continuously with alternating hands, while the defender shuffles backward and keeps a safe distance from the attacker to avoid being hit. The two practitioners are not connected (no external support). | | 20 repetitions | 5 min |
| 5. Pivoting footwork with Taan Sau and vertical punch in response to an incoming punch (a pushing force) | As the attacker punches, the defender shifts his/her body weight to one leg, pivots on the heels and uses the Taan Sau technique to redirect the punch from the line of attack. The defender may also counter attack with a punch. Both partners must maintain postural stability during the maneuver. | | 20 repetitions | 5 min |
| 6. Pivoting footwork with Gang Sau/down block to deflect an incoming punch (a pushing force) | As the attacker punches, the defender shifts his/her body weight to one leg while applying a down block to deflect the incoming punch. The defender may also counterattack with a punch. Both partners must maintain postural stability during the maneuver. | | 20 repetitions | 5 min |
| 7. Advancing footwork with palm strikes in response to an incoming punch (a pushing force) | As the attacker punches, the defender defends by stepping in and applying palm strikes to deflect and control the attacker's punching arm and counterattacks at the same time. Both partners must maintain postural stability during the maneuver. | | 20 repetitions | 5 min |
| 8. Advancing footwork with shoulder strike in response to a Lap Sau (a pulling force) | While being pulled, the defender steps in and lightly applies a shoulder strike to the chest of his/her opponent. Both partners must maintain postural stability during the maneuver. | | 20 repetitions | 5 min |
| 9. Advancing footwork with Bong Sau in response to a Lap Sau (a pulling force) | While being pulled, the defender steps in and applies a Bong Sau to control his/her opponent's arms. Both partners must maintain postural stability during the maneuver. | | 20 repetitions | 5 min |
| Cool down | Static stretch of large muscle groups and jogging. | | | 5-10 min |

The Ving Tsun Chinese martial art training protocol

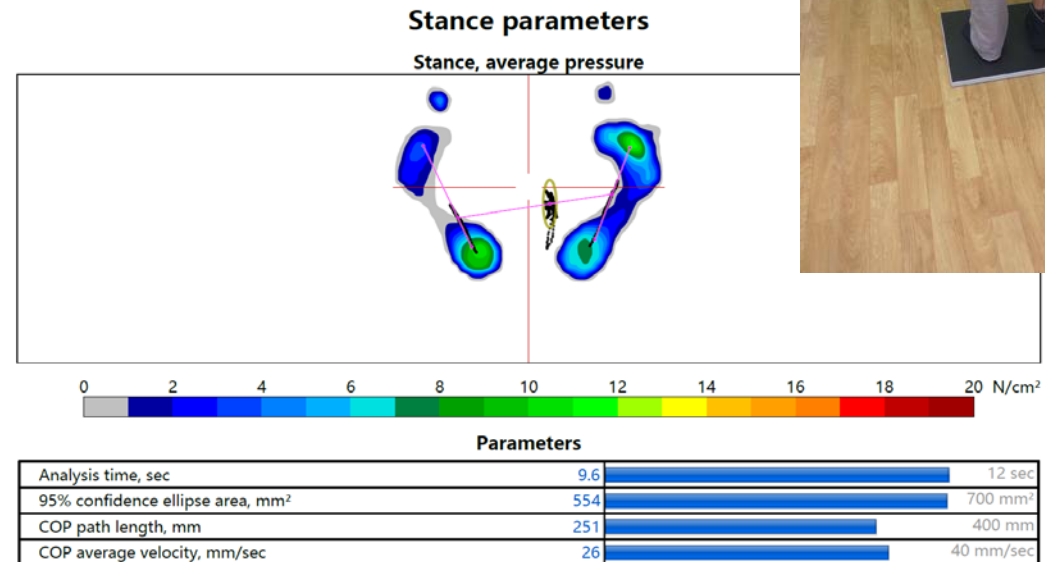
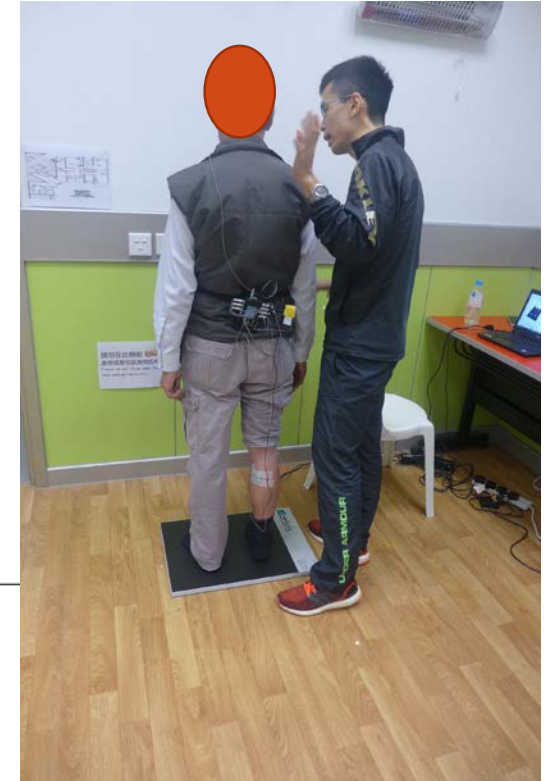
(<https://youtu.be/ssaYXNGm7hM>)

Note:

- To progress, all sticking-hand techniques are practiced with a partner from anticipated to unexpected movements, from static to dynamic movements and from slow to fast movement speed.
- Appropriate feedback and practice are given to the participants to help them progress through the 3 stages of motor learning: cognitive, associate and autonomous [10].
- The two partners alternate between the roles of attacker and defender. The participants practice the VT techniques under supervision to ensure safety.

METHODS

- Measurements were taken **before and after** the intervention period by blinded assessors.
- **Primary outcome:**
 - Static standing balance performance
 - Sway area in standing
 - A force platform



METHODS

- Secondary outcomes:
 - Lower-limb antigravity muscles' peak force
 - A hand-held dynamometer
 - Knee-joint repositioning error
 - A knee-joint passive positioning and active repositioning test
 - A universal goniometer
 - Simple reaction time
 - A ruler drop test



STATISTICAL ANALYSIS

- **Intention-to-treat principle** was used to handle the missing data due to attrition.
- **Changes** in the primary and secondary outcomes following the intervention were quantified by subtracting the baseline scores from the posttest scores.
- The **differences in change scores** between groups were analyzed with independent t test.
- Alpha = 0.05.

RESULTS

| | VT group (n = 17) | Control group (n = 16) | p value |
|--|------------------------------|-----------------------------------|----------------|
| Age (years) | 67.5 ± 6.3 | 72.1 ± 10.3 | 0.129 |
| Age range (years) | (56–78) | (55–94) | |
| Sex | | | 0.576 |
| Male (n, %) | 2 (11.8%) | 3 (18.8%) | |
| Female (n, %) | 15 (88.2%) | 13 (81.2%) | |
| Body weight (kg) | 55.5 ± 8.9 | 55.2 ± 7.8 | 0.908 |
| Height (cm) | 154.6 ± 7.6 | 153.5 ± 6.5 | 0.670 |
| Body mass index (kg/m²) | 23.3 ± 3.5 | 23.4 ± 3.0 | 0.889 |
| Physical activity level (metabolic equivalent hours/week) | 14.4 ± 19.0 | 14.2 ± 13.0 | 0.976 |

Means ± standard deviations are presented unless otherwise specified.

VT = Ving Tsun martial art.

RESULTS

Group Statistics

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|--|-----------|----|------------|----------------|-----------------|
| Reaction_time_ruler_change_s | Ving Tsun | 13 | -3.1231 | 7.22705 | 2.00442 |
| | Control | 11 | -2.2273 | 8.07887 | 2.43587 |
| Jtproprio_kn_jtrepostangle_change_degree | Ving Tsun | 14 | -26.7857 | 67.26890 | 17.97837 |
| | Control | 11 | -47.1818 | 44.73437 | 13.48792 |
| MMT_Rt_hipE_PeakTor_change_kg | Ving Tsun | 14 | 1.3357 | 4.71864 | 1.26111 |
| | Control | 11 | 2.3455 | 2.28489 | .68892 |
| MMT_Rt_KnE_PeakTor_change_kg | Ving Tsun | 17 | -.1824 | 4.28722 | 1.03980 |
| | Control | 16 | 1.4313 | 2.95719 | .73930 |
| MMT_Rt_AnkPF_Tiptoe_change_reps | Ving Tsun | 13 | 6.0000 | 11.06797 | 3.06970 |
| | Control | 11 | 5.7273 | 16.69186 | 5.03279 |
| COP_PA_confidenceellipsearea_change_mm | Ving Tsun | 13 | -2507.0769 | 8048.64530 | 2232.29256 |
| | Control | 9 | 195.2222 | 1247.40398 | 415.80133 |
| COP_AP_confidenceellipsearea_change_mm | Ving Tsun | 13 | -1780.5385 | 4117.14625 | 1141.89092 |
| | Control | 9 | -65.8889 | 1257.41048 | 419.13683 |



RESULTS

Independent Samples Test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|--|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|------------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Reaction_time_ruler_change_s | Equal variances assumed | .615 | .441 | -.287 | 22 | .777 | -.89580 | 3.12419 | -7.37497 | 5.58336 |
| | Equal variances not assumed | | | -.284 | 20.352 | .779 | -.89580 | 3.15455 | -7.46880 | 5.67719 |
| Jtproprio_kn_jtrepostangle_change_degree | Equal variances assumed | 2.253 | .147 | .865 | 23 | .396 | 20.39610 | 23.58922 | -28.40191 | 69.19412 |
| | Equal variances not assumed | | | .907 | 22.490 | .374 | 20.39610 | 22.47545 | -26.15629 | 66.94850 |
| MMT_Rt_hipE_PeakTor_change_kg | Equal variances assumed | 1.319 | .263 | -.650 | 23 | .522 | -1.00974 | 1.55290 | -4.22215 | 2.20267 |
| | Equal variances not assumed | | | -.703 | 19.643 | .491 | -1.00974 | 1.43701 | -4.01080 | 1.99132 |
| MMT_Rt_KnE_PeakTor_change_kg | Equal variances assumed | 1.362 | .252 | -1.251 | 31 | .220 | -1.61360 | 1.29009 | -4.24475 | 1.01754 |
| | Equal variances not assumed | | | -1.265 | 28.497 | .216 | -1.61360 | 1.27583 | -4.22498 | .99777 |
| MMT_Rt_AnkPF_Tiptoe_change_reps | Equal variances assumed | .091 | .766 | .048 | 22 | .962 | .27273 | 5.69818 | -11.54458 | 12.09003 |
| | Equal variances not assumed | | | .046 | 16.878 | .964 | .27273 | 5.89508 | -12.17167 | 12.71712 |
| COP_PA_confidenceellipsearea_change_mm | Equal variances assumed | 1.997 | .173 | -.992 | 20 | .333 | -2702.2991 | 2724.99992 | -8386.5494 | 2981.95107 |
| | Equal variances not assumed | | | -1.190 | 12.824 | .256 | -2702.2991 | 2270.68731 | -7614.6744 | 2210.07609 |
| COP_AP_confidenceellipsearea_change_mm | Equal variances assumed | 2.592 | .123 | -1.203 | 20 | .243 | -1714.6496 | 1425.24643 | -4687.6615 | 1258.36239 |
| | Equal variances not assumed | | | -1.410 | 15.042 | .179 | -1714.6496 | 1216.38421 | -4306.6842 | 877.38504 |

RESULTS

- No significant between-group differences in the change scores were noted ($p > 0.05$).
- Both VT and control groups demonstrated **similar improvements** in the primary and secondary outcomes from baseline to posttest.



CONCLUSIONS

- *Short-term VT training had no obvious effects on the standing balance performance, leg muscle strength, knee joint proprioception and reaction time in community-dwelling middle-aged and older adults.*



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