The Effects of 11+ Dance in Reducing the Risk of Lateral Ankle Sprain for Collegiate Contemporary Dancers

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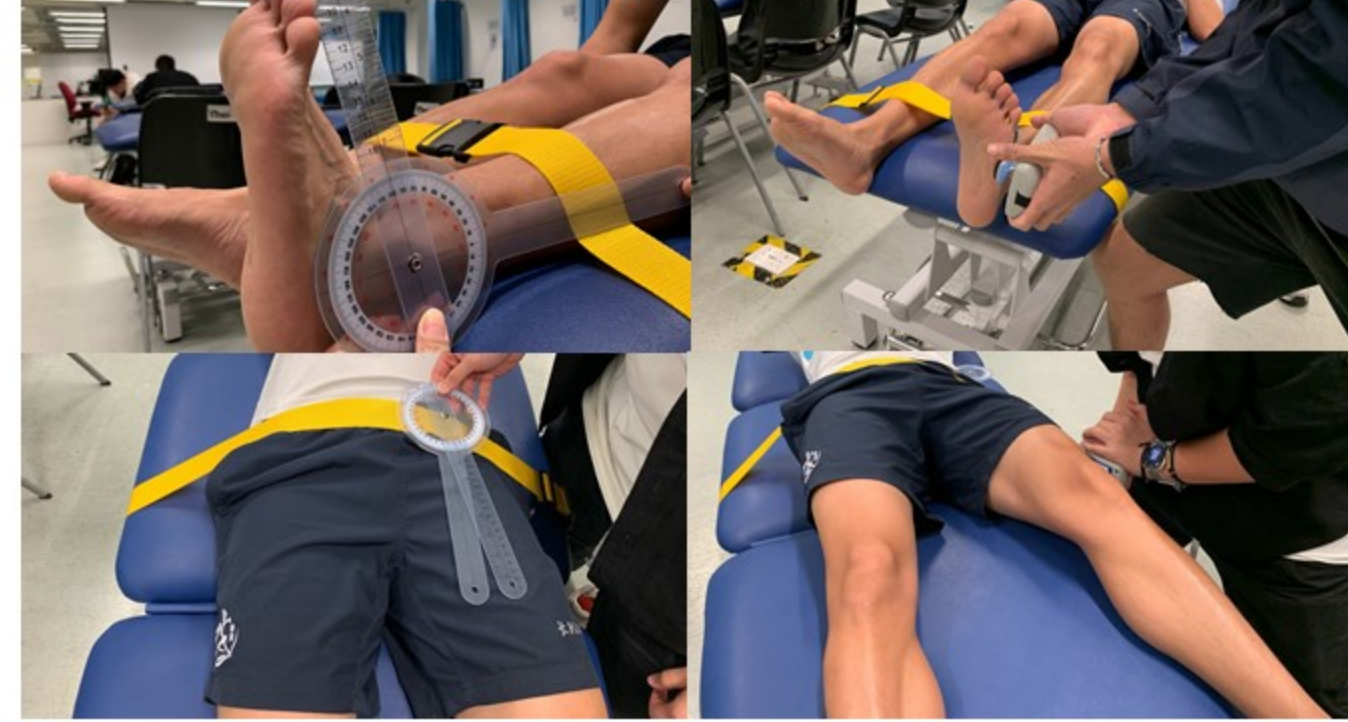
Research Method

Subject

- Aged 18–40 years / Simple random sample
- Selected from a group (N=10) of well-trained contemporary dancers trained for at least 2 years or above professional training from the Hong Kong Academy for Performing Arts (HKAPA)
- Intervention (N1 = 6) / Control (N2 = 4) groups

Testing Set up

A – Single-Leg Hop
B – Handheld Dynamometry – Hip ABD & Ankle EV
D – Single-Leg Side Hop
C – Modified Balance Error Scoring System

Each group moves to the next area along the designated route every 20 minutes

Intervention: 11+ Dance

- Intervention Volume = 5 weeks x 1 day x 25–30 mins (2–3 Sets)
- 15–16 exercises divided into 3 parts
  - Part 1 -> 8 exercises -> Strengthen the core and activate muscles
  - Part 2 -> 3 to 4 exercises -> Enhance balance, stability, and coordination
  - Part 3 -> 4 jump exercises -> Takeoff and landing techniques

Statistical Analysis

- SPSS (IBM Corp., Armonk, NY)
  - Kolmogorov-Smirnov and Shapiro-Wilk tests -> Normality
  - Parametric -> One way ANCOVA
  - Non-Parametric -> Quade's ANCOVA
- P-value <0.05 = statistically significant differences

Discussion

- The main results do not support the study's hypotheses
  - No significant difference in the total scores of the four tests
  - but significant differences were shown in the SLS condition of m-BESS.
- 5 weeks of 11+ dance application may not reduce the risk of ankle sprains in terms of strength, balance, and stability.
- Current evidence is insufficient to compare the effectiveness of injury prevention programs for dancers.
  - Various studies have shown significant improvements in Strength and tests like m-BESS, SLH, and SLSH (Sannicandro et al., 2023; Senger et al., 2024).
  - Reduced the risk of ankle injuries by 40% (Doherty et al., 2016; Stephenson et al., 2021).
- It is believed that the optimal training volume is 20–60 times (6 to 8 weeks) x 2–3 times per week × 30–60 minutes, which would have the most significant effect on lower limb injury prevention for young athletes (Steib et al., 2017; Kolokythas et al., 2021).
 - Including increased balance, lower body strength and power.

Background

- Dancers require complex physical abilities to achieve high levels of performance, subjecting them to extensive and intense training, such as challenging usual anatomical limitations (Kenny et al., 2019; Van Winden et al., 2019).
- 11+ Dance is an injury prevention program for dancers, based on existing evidence of sports injury prevention and adapted from similar training interventions such as FIFA 11+.

Emphasis on…
- Strength
- Balance
- Jumping/landing technique
  - with special attention to ankle, knee, and hip alignment

to reduce acute and overuse injuries (Kolokythas et al., 2021; Sudds et al., 2023).

Overuse
↓ 86.2% Cause
Chronic Ankle Injuries
Cause ↑ ↓ 70% RR
Acute Ankle Sprain
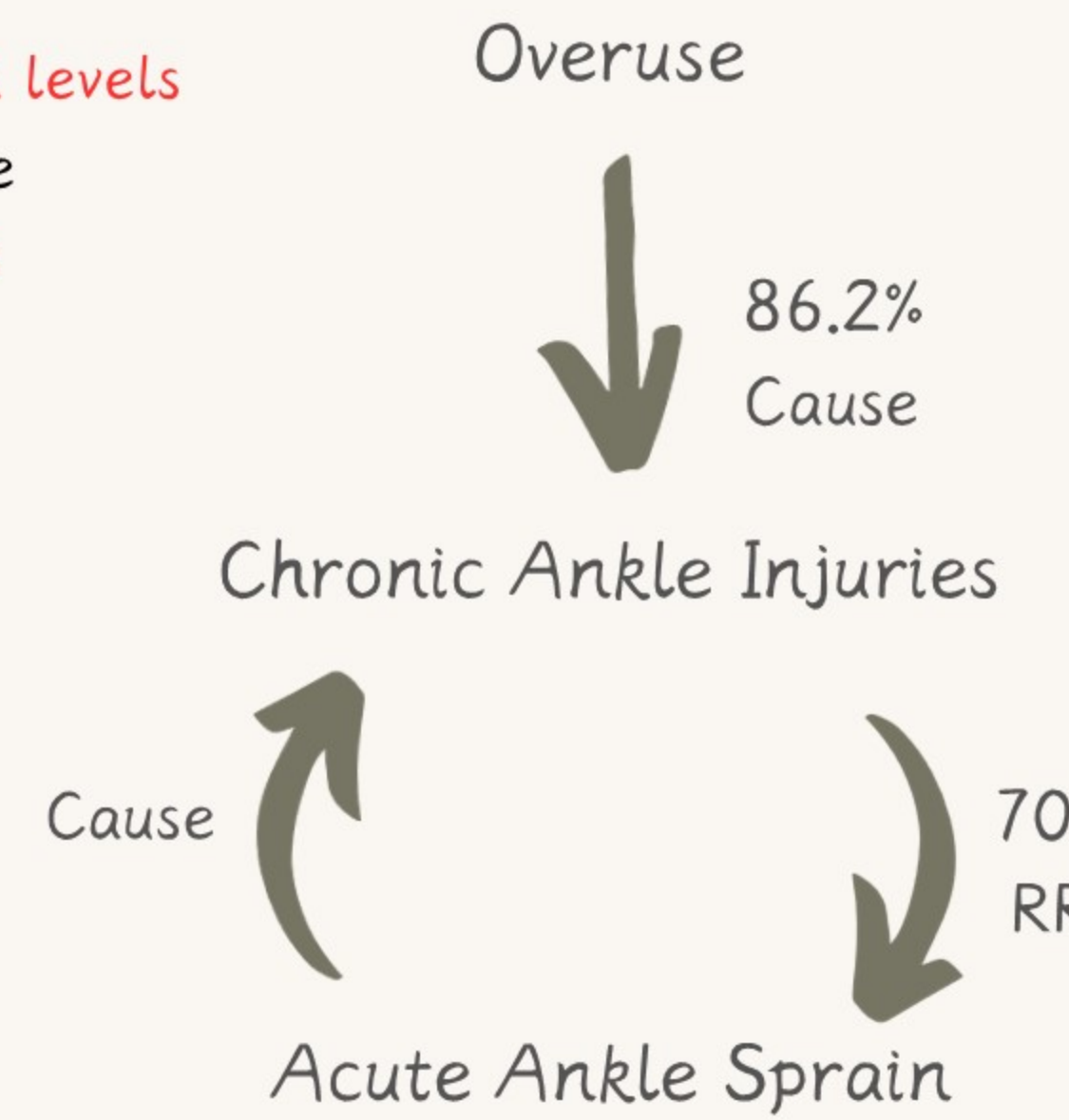
Purpose

- A limited literature on 11+ dance and programs
  - Particularly on specific combinations of neuromuscular training
1) Are there any significant differences between the intervention and control groups in strength, balance, and stability after intervention?

H1: 11+ Dance program can significantly increase the dancer's ankle strength, balance, and stability; therefore, the risk of ankle sprains can be effectively reduced.

Results

A – Single-Leg Hop

The post test statistical analy of SLSH (second)

Test	Group	Adjusted Mean (IG)(SEM)(n=6)	Adjusted Mean (CG)(SEM)(n=4)	Adjusted Mean Difference IG-CG (95%CI)	Sig. (p)	η2	ICC(95%CI)
SLSH	D	9.030(0.771)	10.700(0.970)	-1.670 (1.441,-4.782)	3.680	0.103	0.600 (-0.001-0.880)
	ND	9.510(0.258)	9.940(0.361)	-0.429 (0.738,-1.597)	0.756	0.413	0.850 (0.520-0.960)

Note. Abbreviations: SEM - Standard Error of Mean; N-number; IG - Intervention Group; CG - Control Group; ICC - Intraclass Correlation Coefficient; Sig. - P value; η2 - Partial Eta Squared ;CI - Confidence interval ; SLSH - Single Leg Side Hop test; ND – Non-Dominant leg; D - Dominant leg
Note. Means were adjusted by Ancova test (pre-test as covariate)

B – Handheld Dynamometry – Hip ABD & Ankle EV

The post test statistical analy of HHD Hip ABD and Ankle EV (kilogram)

Test	Group	Adjusted Mean (IG)(SEM)(n=6)	Adjusted Mean (CG)(SEM)(n=4)	Adjusted Mean Difference IG-CG (95%CI)	Sig. (p)	η2	ICC(95%CI)
Hip ABD	D	20.339(1.978)	16.384(2.423)	-3.955 (-3.445,11.354)	1.597	0.247	0.970 (0.910-0.990)
	ND	19.670(2.111)	17.554(2.568)	2.116 (10.015,-5.783)	0.401	0.547	0.910 (0.760-0.970)
Ankle EV	D	12.589(1.818)	14.700(2.245)	1.013 (8.712,-6.686)	0.097	0.765	0.950 (0.380-0.990)
	ND	14.352(2.021)	13.339(2.491)	-2.111 (4.851,-9.074)	0.514	0.497	0.910 (0.770-0.980)

Note. Abbreviations: SEM - Standard Error of Mean; N-number; IG - Intervention Group; CG - Control Group; ICC - Intraclass Correlation Coefficient; Sig. - P value; η2 - Partial Eta Squared ;CI - Confidence interval ; HHD - Handheld Dynamometry; Hip ABD - Hip Abduction; Ankle EV - Ankle Eversion; ND – Non-Dominant leg; D - Dominant leg
Note. Means were adjusted by Ancova test (pre-test as covariate)

C – Modified Balance Error Scoring System

The post test statistical analy of m-Bess SLS and TLS (errors score)

Test	Adjusted Mean (IG)(SEM)(n=6)	Adjusted Mean (CG)(SEM)(n=4)	Adjusted Mean Difference IG-CG (95%CI)	Sig. (p)	η2	ICC(95%CI)
SLS	-1.417(0.888)	2.125(1.063)	-3.542 (-0.376,-6.708)	0.033	0.454	0.380(-0.280-0.800)
TLS	4.329(0.540)	3.756(0.672)	1.181 (3.426,-1.059)	0.259	0.156	0.800(0.380-0.940)

Note. Abbreviations: SEM - Standard Error of Mean; N-number; IG - Intervention Group; CG - Control Group; ICC - Intraclass Correlation Coefficient; Sig. - P value; η2 - Partial Eta Squared ;CI - Confidence interval ; m-BESS – Modified Balance Error Scoring System; SLS - Single Leg Stand; TLS - Tandem Leg Stand;

Note. Abbreviations: Analysed by Quade's Ancova; Negative adjusted means indicate that, after accounting for covariates and rank transformation, the group's mean is lower than expected based on the overall distribution of the data

The post test statistical analy of m-Bess SLSF and TLSF (errors score)

Test	Adjusted Mean (IG)(SEM)(n=6)	Adjusted Mean (CG)(SEM)(n=4)	Adjusted Mean Difference IG-CG (95%CI)	Sig. (p)	η2	ICC(95%CI)
Over ALL	6.037(0.621)	6.570(0.787)	-0.533 (2.025,-3.091)	0.637	0.034	0.600 (0.002-0.884)
SLSF	4.329(0.540)	3.756(0.672)	0.573 (2.684,-1.538)	0.541	0.056	0.380 (0.314-0.940)
TLSF	1.138(0.653)	2.293(0.823)	-1.155 (1.496,-3.806)	0.337	0.132	0.490 (-0.160-0.840)

Note. Abbreviations: SEM - Standard Error of Mean; N-number; IG - Intervention Group; CG - Control Group; ICC - Intraclass Correlation Coefficient; Sig. - P value; η2 - Partial Eta Squared ;CI - Confidence interval ; m-BESS – Modified Balance Error Scoring System; SLSF – Single Leg Stand on Foam; TLSF - Tandem Leg Stand on Foam; Over ALL;Sum of SLS TLS SLSF TLSF
Note. Means were adjusted byAncova test (pre-test as covariate)

D – Single-Leg Side Hop

The post test statistical analy of SLH (centimeter)

Test	Group	Adjusted Mean (IG)(SEM)(n=6)	Adjusted Mean (CG)(SEM)(n=4)	Adjusted Mean Difference IG-CG (95%CI)	Sig. (p)	η2	ICC(95%CI)
SLH	D	118.882(3,706)	105.010(4.633)	13.872 (28.570,-0.826)	0.468	0.516	0.800 (0.530-0.940)
	ND	117.674(5.202)	111.439(6.608)	6.253 (27.780.-15.311)	4.981	0.061	0.880 (0.700-0.970)

Note. Abbreviations: SEM - Standard Error of Mean; N-number; IG - Intervention Group; CG - Control Group; ICC - Intraclass Correlation Coefficient; Sig. - P value; η2 - Partial Eta Squared ;CI - Confidence interval ; SLH - Single Leg Hop test; ND – Non-Dominant leg; D - Dominant leg
Note. Means were adjusted by Ancova test (pre-test as covariate)

Limitations

- Small sample size -> limit statistical power to detect significant differences
- The intervention volume were little
- Differences between the study research in terms of sport type, gender, and the competitive level of the participants
  - the results only attempted to demonstrate a dose-response relationship for 11+ dancing

Practical Implications

- Dance instructors can try introducing 11+ Dance to young or professional dancers
- The assessments were moderate to highly reliable in assessing dancers' performance
  - Dancers or coaches can evaluate their performance in the SLSH, SLH, and HHD assessments

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