

The Effect of 11+ Dance Protocol to Reduce the Risk of Ankle Injuries in Collegiate Contemporary Dancers

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BACKGROUND

Dancers are used to train related artistic skills and techniques rather than muscle strengthening. The practice increases the susceptibility to musculoskeletal injury due to overuse and performance exceeds joint limitation. Lead to reduced ankle stability (Tekin et al., 2018). Physical fitness training has beneficial effects on injury prevention (Dang et al., 2022). 11+ Dance (Kolokythas et al., 2022), a neuromuscular program set for dancers to strengthen lower extremity stability; muscle endurance; and jump and load control to prevent injuries.

PURPOSE

To investigate the effect of the 11+ Dance program in improving muscle strength, balance, and stability, resulting in a reduction in ankle injuries for collegiate contemporary dancers.

METHODOLOGY

- 10 Contemporary dancers from HKAPA
- CG (4): pre & post test
- IG (6): pre & post test & 11+ Dance
- Tests: 1) Single Leg Side Hop, 2) Single Leg Hop, 3) Modified Balance Error Scoring System, 4) Handheld Dynamometer on ankle eversion & hip abduction
- 11+ Dance program: 5-week, once a week



RESULTS

The post test statistical analysis 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)	η ²	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 (3.420,-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. Means were adjusted 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 analysis 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)	η ²	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 (0.310-0.940)
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 by Ancova test (pre-test as covariate)

The post test statistical analysis 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)	η ²	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 (0.850-0.990)
	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)

The post test statistical analysis 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)	η ²	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)

DISCUSSION

- No significant difference observed between groups in this study
- Several studies & similar program 11+ FIFA shows a significant improvement in lower extremity muscle and balance (Watson et al., 2017; Steffen et al., 2013), positively reduced injury rates as a injury prevention protocol (Moita et al., 2017; Russell, 2013; Misegades et al., 2020).
- Limitation: sample size, duration & frequency of program
- Further study: recruit more subjects, increase training volume and duration to maximize the training acquisition with the limited time

PRACTICAL APPLICATIONS

Neuromuscular-based, additional training and conditioning training revealed an effective strategy for enhancing the balance ability and muscle strength of dancers. It is the beneficial in reducing the injury chance.

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