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Risk factors and lower limb injuries of dancers: an explorative pilot study

Background

Dance as an intense kind of performance is associated with **high loads** on the **musculoskeletal system**. In particular, the lower limb is exposed to these high loads, which is reported by a high prevalence. Most dancers are affected by injuries during their careers, most in the lower limb. Typical **risk factors** for dancers include the **compensatory turnout**, **hypermobility**, and **core stability**. The correlation between these factors and lower limb injuries is not fully understood.

Aim

The aim of this study was to evaluate the **correlation** between **lower limb injuries** and different **risk factors** such as compensated turnout, hypermobility and core stability. Based on these results, hypotheses can be generated for further studies.

Methods

This explorative pilot study was located at Osnabrück University of Applied Sciences. All 16 female participants with different levels of dance experience (mean 11.3 years) and dance lessons per week (mean 17.6 hours) were scheduled for a single appointment and followed the same test protocol: (1) completing a dance specific questionnaire (modified MPIIQM), (2) testing compensated turnout, (3) testing hypermobility (Beighton score), (4) testing core stability (motor control test battery[1]).

Parameters for the correlation analysis with the numbers of lower limb injuries were:

- Core stability
- Compensated turnout
- Dance experience in years
- Dance style
- Hypermobility
- Professional dance experience in years
- Dance hours per week

Significance level for the statistical analysis was set at 90% because of the explorative character of this study with the purpose to generate hypotheses.

Results

Significant correlations with the **numbers of lower limb injuries** were found at **core stability** (r_s=.489, p=.034), **dance hours per week** (r_s=.459, p=.048) and **professional dance experience in years** (r_s=.396, p=.093). Two dance styles (modern dance: r_s=.388, p=.101 and contemporary dance: r_s=.385, p=.104) were close to the significance level (tab.1, fig. 1-3).

Additionally, **significant correlations** with diffent **locations of lower limb injuries** were found at **core stability** (*right hip*: r_s=.399, p=.09; *left hip*: r_s=.419, p=.07), **dance hours per week** (*left hip*: r_s=.428, p=.07; *left foot*: r_s=.428, p=.07) and **professional dance experience in years** (*left foot*: r_s=.410, p=.08).

Discussion & Conclusions

Neurophysiological changes due to decreased trunk stability can lead to **biomechanical modifications** at different levels of the **sensorimotor system**, thereby increasing the susceptibility to injury[2]. The results show that in dancers decreased core stability may play an important role in the occurrence of lower limb injuries. This corresponds to different research results in athletes[3,4] and underlines the **importance** of **core stability** and **motor control** for preventive and rehabilitative management strategies among dancers.
Further research projects with a larger sample size could confirm the results of this explorative pilot study.

References

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3. Zazulak B, Hewett T, Reeves N, Goldberg B, Cholewicki J. The effects of core proprioception on knee injury - a prospective biomechanical-epidemiological study. *Am J Sports Med* 2007;35(3):368-73. doi: 10.1177/0363546506297909.
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Correlation		Number of lower limb injuries	
		r_s	p-value
Core stability (positive MC tests)		**.489**	**.034***
Dance hours per week		**.459**	**.048***
Professional dance experience in years		**.396**	**.093***
Dance experience in years		.337	.158
Compensated turnout		-.286	.235
Hypermobility		.158	.518
Dance style	Contemporary	.385	.104
	Modern dance	.388	.101
	Ballet	.212	.384

Tab. 1: Correlations between the number of lower limb injuries and different risk factors (r_s=Spearman´s rho; .00-.19: "very weak"; .20-.39: "weak"; .40-.59: "medium"; .60-.79: "strong"; .80-1.0: "very strong"; MC=motor control; p<.1).

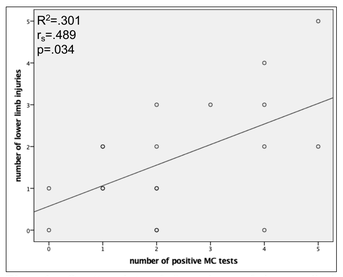

Fig. 1: Scatterplot of "number of lower limb injuries" and "core stability" (MC=motor control; r²=coefficient of determination; r_s=correlation; p<.1).

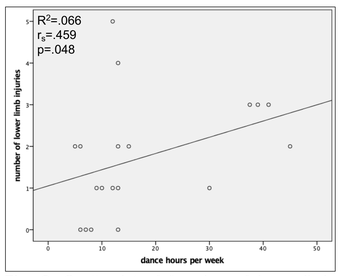

Fig. 2: Scatterplot of "number of lower limb injuries" and "dance hours per week" (r²=coefficient of determination; r_s=correlation; p<.1).

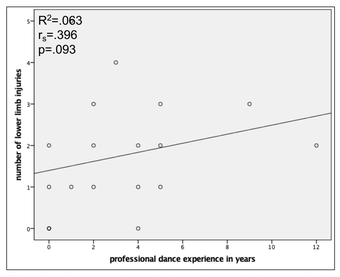

Fig. 3: Scatterplot of "number of lower limb injuries" and "professional dance experience in years" (r²=coefficient of determination; r_s=correlation; p<.1).

Correlation		Core stability (positive MC tests)		Dance hours per week		Professional dance experience in years	
		r_s	p-value	r_s	p-value	r_s	p-value
Location of lower limb injuries	Right hip	**.399**	**.09***	-.071	.77	-.036	.09
	Left hip	**.419**	**.07***	**.428**	**.07***	.197	.42
	Right knee	.042	.86	.218	.37	.241	.32
	Left knee	.134	.58	.219	.37	-.011	.96
	Right foot	.242	.32	.178	.47	-.024	.92
	Left foot	-.325	.17	**.428**	**.07***	**.410**	**.08***
Core stability (positive MC tests)		1.000	.00	.078	.752	.019	.94
Dance hours per week		.078	.75	1.000	.00	**.716**	**.01****
Professional dance experience in years		.019	.94	**.716**	**.01****	1.000	.00

Tab. 2: Correlations between significant risk factors of tab. 1 and the locations of lower limb injuries (r_s=Spearman´s rho; .00-.19: "very weak"; .20-.39: "weak"; .40-.59: "medium"; .60-.79: "strong"; .80-1.0: "very strong"; p<.1).

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