

KINETIC ANALYSIS OF LOWER LIMBS IN STEP AEROBIC DANCE

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SUMMARY

Study of the kinetics of lower limbs in aerobic dance is helpful to the understanding the mechanism of injuries. The results of this study showed that the loadings in step aerobic dance were 2-10 times of that in stair climbing.

CONCLUSIONS

The results of this study suggested that the aerobic instructors should emphasize the training of hip adductors, quadriceps, hamstring, plantarflexors, dorsiflexors and ankle inversion muscles. The loading in over step movement were highest, the beginner should avoid learning movement of over step at the beginning. The beginners and the person who has musculoskeletal problem should participate in low impact aerobic dance first.

INTRODUCTION

Lower extremity is the most frequent site of injury in aerobic dance. Frequent injury rate of aerobic dance might have close relation to the high joint load and overuse problem. Thus, the purpose of this study is to estimate three dimensional joint kinetics of lower limb in step aerobics.

PATIENTS/MATERIALS and METHODS

Fifteen females were recruited from the step aerobic dance class of Gym or school in this study. VICON612 motion analysis system was used to collect the trajectories of reflective markers to calculate the joint movements of lower limbs. The aerobic step was placed on the top of the force plate. Two AMTI force platforms were used to collect the ground reaction forces and moments to estimate the joint forces and joint moments of the lower limbs. The REEBOK aerobic step (RFE International Ltd., UK), and TOUCH AERO aerobic shoes with difference sizes (Touch Aero Co., Ltd. Taiwan) were prepared for each subject. Each subject was asked to perform the designed step aerobic dances (about 20 minutes, including worm up, aerobic dance, cool down) with 130 beats per minutes. Five useful repetitions of four different basic movements (including knee lift, lunge, turn step and over step) for lower impact and high impact step aerobic dances were collected.

RESULTS

The result in Table 1 is the comparison the maximum hip, knee and ankle joint forces and moments between the step aerobic dance (this study) and the results of stair climbing the study from Costigan in 2002.

DISCUSSION

The joint forces in step aerobic dance were about 2-3 times of that in stair climbing. The joint moments in high impact step aerobic dance reached 10 times of the results in stair climbing. It may be resulted from hopping, skipping, and jumping movements in step aerobic movements. The peak joint forces and moments in high impact step movements were about 2 times of that in low impact movements. It maybe the answer of that injury rate was higher in high impact step aerobics than low impact step aerobics.

REFERENCES

[1] Costigan, PA. et al., Gait and Posture, 2002; 16: 31-37.

Table 1: The maximum joint forces (N/kg) and joint moments (Nm/kg) in step aerobic dance and stair climbing (Costigan study, 2002). H: hip; K: knee; A: ankle; Pos: posterior; Lat: lateral; Com: compression; Add: adduction; FL: flexion; E: extension; ER: external rotation. Inv: inversion; Env: eversion.

	Low impact aerobic ance	High impact aerobic ance	Stair climbing		Low impact aerobic ance	High impact aerobic ance	Stair climbing
H_Pos_F	7.21 ± 1.86	9.47 ± 2.14	4.38 ± 0.74	K_Ant_F	7.09 ± 0.88	12.38 ± 2.63	4.73 ± 0.70
H_Lat_F	2.02 ± 0.52	3.31 ± 0.71	1.29 ± 0.40	K_Lat_F	5.27 ± 1.17	10.60 ± 2.32	1.32 ± 0.48
H_Com_F	13.36 ± 4.37	25.90 ± 2.99	9.05 ± 0.83	K_Com_F	11.82 ± 1.64	25.96 ± 2.86	9.87 ± 0.79
H_Add_M	3.72 ± 0.76	7.68 ± 1.81	0.80 ± 0.12	K_Add_M	3.39 ± 1.00	6.07 ± 1.67	0.42 ± 0.15
H_FL_M	6.46 ± 1.20	12.67 ± 2.55	0.80 ± 0.24	K_FL_M	3.09 ± 0.68	7.25 ± 2.21	1.16 ± 0.24
H_E_M	4.84 ± 1.02	9.10 ± 2.00	-	K_E_M	6.67 ± 1.32	12.16 ± 2.96	-
H_ER_M	2.29 ± 0.58	3.46 ± 0.74	0.32 ± 0.07	K_IR_M	2.61 ± 0.59	5.16 ± 1.37	0.10 ± 0.04
A_PF_M	5.26 ± 0.73	11.20 ± 2.55	-	A_Inv_M	4.03 ± 0.71	8.21 ± 1.70	-
A_DF_M	5.13 ± 1.35	10.20 ± 2.14	-	A_Env_M	2.72 ± 1.24	3.10 ± 1.01	-