LOWER EXTREMITY FLEXIBILITY PATTERNS IN JAPANESE CLASSICAL BALLET DANCERS AND THEIR CORRELATION TO INJURY

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Many athletes who perform artistic movements such as synchronized swimming, rhythmic sports gymnastics, and figure skating commonly perform dance training to improve their performance level. Physical characteristics of ballet dancers would contain useful information for considering the training for those athletes. The purpose of this study was to investigate the physical characteristics of Japanese female ballet dancers especially for lower extremity flexibility patterns and their correlation to injury. From the results of this study, dancers with more than one injury showed higher flexibility in hip flexion and external rotation. It is suggested that higher flexibility by dance training would be one of the risk factors for injury as well as the important factors to improve performance level.

KEY WORDS: dancer, artistic sports, flexibility,

INTRODUCTION:

Dancers and other athletes who have to perform artistic movements such as synchronized swimming, rhythmic sports gymnastics, and figure skating should have higher flexibility to improve their performance level. Those athletes commonly perform dance training on regular basis. Dance training emphasizes to increase range of motion in hip external rotation, which is called "turn-out" in classical ballet. Physical characteristics related to flexibility especially for the range of joint motion had not been well elucidated for both dancers and artistic athletes. Reid et al., (1987) have reported that an unbalanced routine that emphasized hip abduction and external rotation to the exclusion of adduction work would be reflected in the significantly lower range of passive hip adduction and internal rotation in dancers compared to the controls. They suggested that this unbalanced flexibility would induce hip/knee injury. So the purpose of this study was to investigate the range of joint motion of professional Japanese ballet dancers to gain basic information of persons with higher flexibility for improving their performance level and to investigate the relations between flexibility and injury for Japanese ballet dancers.

METHOD:

Data Collection: Twenty-nine dancers (28 female), aged 18 to 43 years, were recruited from a professional classical ballet company in Tokyo. Mal-alignments of the lower extremity, such as increased Q angle and genu varum or valgum, were evaluated. Measurements were taken of passive hip external rotation, hip internal rotation, hip flexion, hip extension, hip abduction, hip adduction, ankle pronation, and ankle supination for both legs. The functional turnout angles in standing and joint laxity were also determined. All subjects answered a questionnaire about injury history and present and past exercise experience. Three turnout variables were derived: active ER lag, compensated turnout, and static-dynamic turnout disparity (Gilber et al.1998).
Data Analysis: Comparisons among groups were made using ANOVA. A significance level of $p<0.05$ was set.

RESULTS:

In this study, 80.8% of the dancers reported a history of injury, with 59.6% reporting a history of nontraumatic injuries versus 19.1% traumatic injuries. A medical doctor diagnosed 80.0% of all injury. A strong majority of the subjects, 61.7%, did no exercise except dance.
Subjects were divided into three groups: those with only one injury (Group 1; n=9), more than one injury (Group 2; n=13), and no injuries (Group 3; n=5), The dancers in Group 2

showed significant senior age, although there was no significant difference in the years of dance experience. For Group2, significantly greater Q angle of both legs and lower joint laxity were observed when compared to the other groups (Fig.1.). Group 2 also showed significantly greater ROM in left hip flexion and external rotation for both sides, while ROM of hip internal rotation for both sides, right ankle pronation, and right ankle supination were significantly smaller for Group 2 (Fig. 2 & Fig. 3). For group 2, natural turnout and maximal turnout in 1st position were also significantly greater compared to the other groups (Fig.4). No correlation was found between hip ER ROM and functional turnout.

Table 1. Profiles of subjects.

	Group1 (n=8)			Group2 (n=13)			Group3 (n=5)		
Age (yrs)	24	±	5.6	27.4	±	6.5$	18.6	±	0.9
Height (cm)	162.3	±	4.3	163	±	2.9	160.2	±	3.4
Body mass (kg)	46.4	±	3.5*	45.7	±	1.8$	43.1	±	3.1
BMI	17.6	±	0.7*	17.2	±	0.7$	16.8	±	0.6
Dance Experience (yrs)	19.1	±	4.4	20.1	±	6.5	15.4	±	1.7

$: p<0.05 between Group 2 and Group3; * p<0.05 between Group1 and Group3

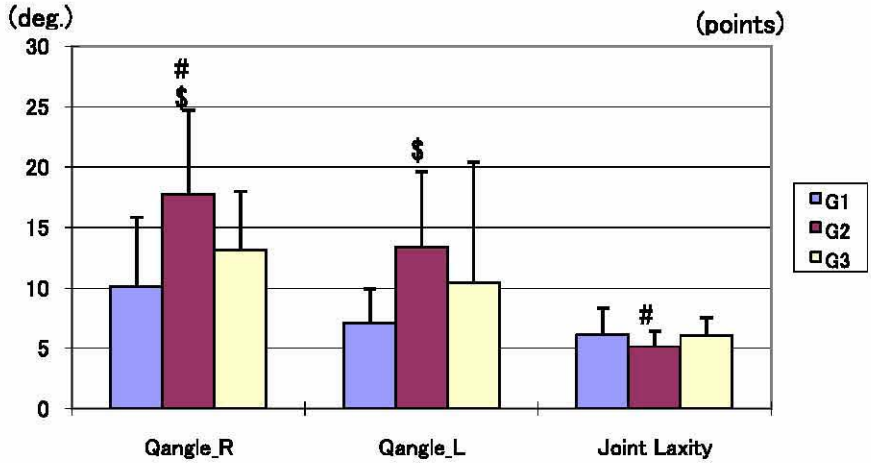

Fig.1 Q angle and joint laxity of three groups (#: p<0.05 between Group 1 and Group2, $: p<0.05 between Group 2 and Group3)

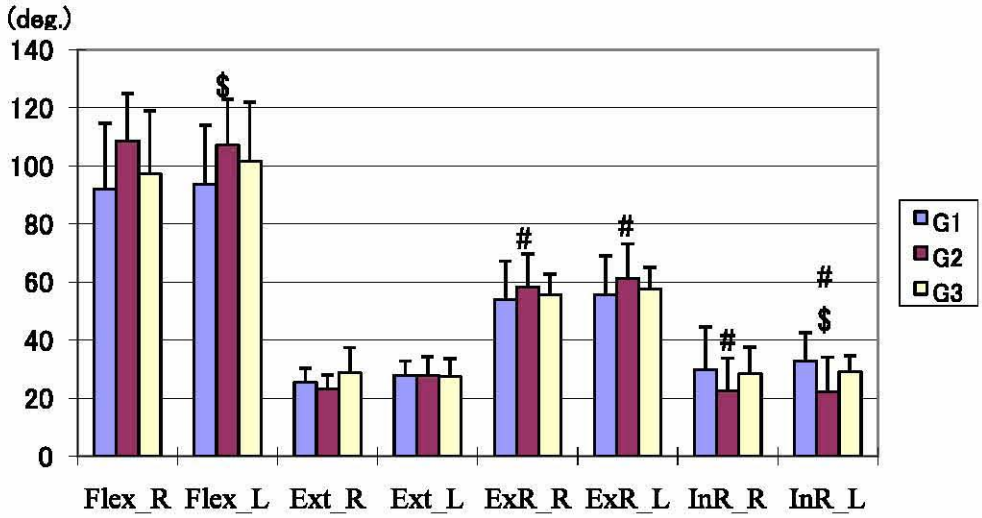

Fig.2 ROM of hip joint for three groups (#: p<0.05 between Group 1 and Group2, $: p<0.05 between Group 2 and Group3)

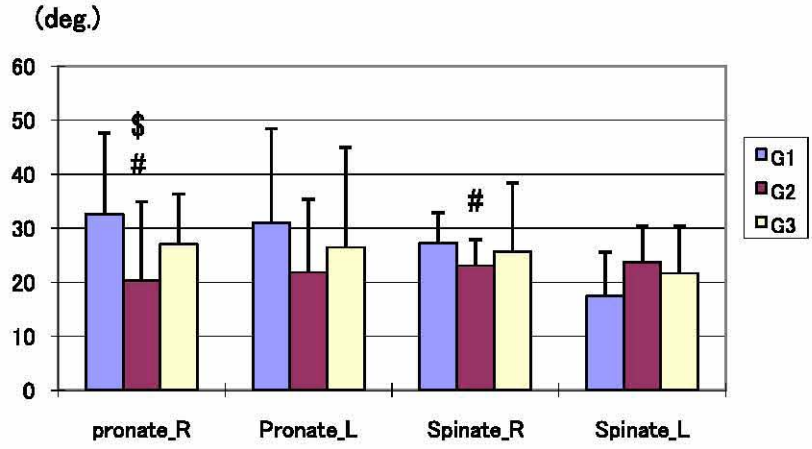

Fig.3 ROM of ankle joint for three groups (#: p<0.05 between Group 1 and Group2, $: p<0.05 between Group 2 and Group3)

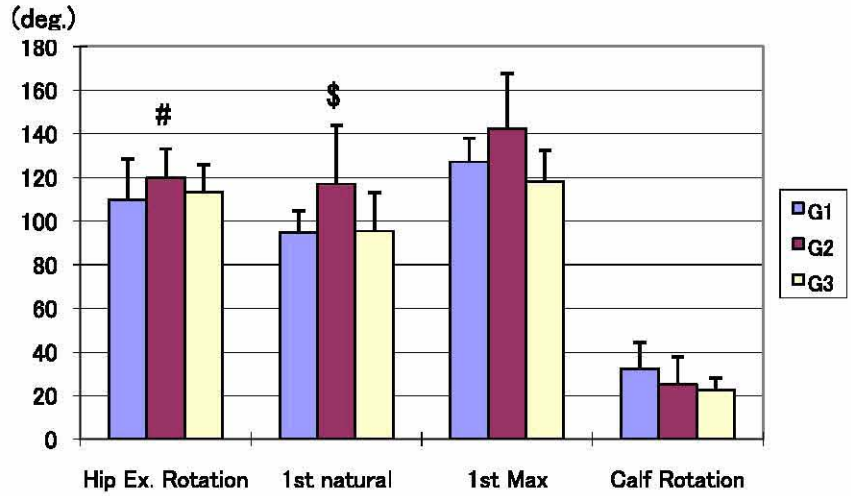

Fig. 4 Functional ROM in standing for three groups (#: p<0.05 between Group 1 and Group2, $: p<0.05 between Group 2 and Group3)

DISCUSSION:

Previous studies have reported that overuse or nontraumatic dance injuries are often attributed to faults in technique, with poor turnout and inappropriate compensatory strategies consistently cited as the main cause (Negus et al., 2005). However, this study implicates a different cause: The dancers who had been injured more than twice showed significantly higher flexibility in both hip flexion and external rotation and lower flexibility in ankle joints, and greater Q angle. These results suggest that the main cause of dance injury may be related to hyper-mobility of the lower leg joints, which could easily cause greater movement of the joints during dancing. From the results of this study, there was significant difference in the mean age among three groups. It is also suggested that the more injured group would be also more experienced/high-qualified, so therefore they showed significant higher flexibility.

CONCLUSION:

The results of this study indicate that dancers with higher flexibility in hip flexion and external rotation, and lower flexibility in hip internal rotation and ankle pronation and supination, might be at higher risk for injury. Athletes with higher flexibility in lower extremity might have similar risk factors to injury. It is necessary for further study to investigate the lower extremity

flexibility in the athletes who are evaluated from the artistic point of view and their correlation to injury.

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