

# 2002 Fiscal Year Final Research Report Summary

## Individual variation of postural control during bilateral- arm-movement in standing and relationship between initial posture and the variation

Research Project

### Project/Area Number

11680019

### Research Category

Grant-in-Aid for Scientific Research (C)

### Allocation Type

Single-year Grants

### Section

一般

### Research Field

体育学

### Research Institution

Kanazawa University

### Principal Investigator

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### Project Period (FY)

1999 - 2002

### Keywords

standing posture / arm flexion movement / anticipatory postural control / hip movement / preparatory posture / muscle action order / tennis stroke / postural movement

### Research Abstract

Many previous studies have shown that the action onset in the postural muscles of the leg and trunk that control standing postures precedes that in the focal muscles that rapidly move the arm. Researchers have reasoned that the preceding actions of postural muscles modulate the effects of any disturbance caused by rapid arm movement. In these studies and our preliminary studies, factors thought to exert influence upon postural adjustment were considered. In these factors, we noticed particularly the postural movement, and the posture maintained before the onset of arm movement. We get the following results. 1) The correlation coefficient in the movement angle between foot-leg and leg-trunk across all subjects was very high ( $r=0.870$ ). With regard to individual variation in postural movement, it was noteworthy that the movement angle of the hip joint was almost twice as large as those of the ankle and knee joints. The action of postural muscles occurred after focal muscle action in many subjects showing the hip flexion pattern. 2) The subjects were divided into 3 groups depending on the standing position during quiet standing, namely backward, middle and forward. Subjects maintained standing postures at various CFP (center of foot pressure) positions in the auteroposterior direction, and the started bilateral arm movement at their own pace. In only the biceps femoris, the preceding action to the anterior deltoid was clearly observed at more forward CFP positions in the order of the forward, middle and backward groups. 3) At the initial hip joint angles of flexion, the erector spinae and biceps femoris begun to contract before the deltoid. At the

extension and 0 °, they began to contract after the deltoid in half of subjects when the hip joint between the flexion position. 4) The movement angle of the hip joint in the left side during tennis stroke showed a high correlation efficiency ( $r=0.785$ ) to that during bilateral arm movement in quiet standing.

## Research Products (12 results)

All Other  
All Publications

- [Publications] Fujiwara K., Toyama H., Asai H., Kunita K.: "Postural movement pattern and muscle action sequence associated with rapid bilateral-arm-raise in standing"Outlines of Biomechanics Research, Editorial Board of The 14th Japanese Society of Biomechanics Conference. 138-142 (1999) ▼
- [Publications] Fujiwara K., Toyama H., Kunita K., Asai H., Miyaguchi A.: "Individual differences of postural movement pattern and muscle action sequence associated with rapid bilateral-arm-flexion in standing"Jacques Duysens, Bouwien C.M.Smits-Engelsman and Herman Kingma(eds.), Control of Posture and Gait 2001. 271-274 (2001) ▼
- [Publications] Fujiwara K., Toyama H., Kunita K., Asai H., Miyaguchi A.: "Modality of postural movement in men and women with both arms flexed during standing"Perceptual and Motor Skills. 93. 611-625 (2001) ▼
- [Publications] Fujiwara K., Toyama H., Miyaguchi A., Shigeiwa M.: "Anticipatory action of postural muscle while arm flexion in subject with different standing position"Kollmitzer.J. and Bijak M.(eds.), Proceeding of XIVth Congress of the Inter. Society of Electrophysiol. and Kinesiol.. 368-369 (2002) ▼
- [Publications] 藤原勝夫, 茂岩路恵, 外山寛: "両側上肢屈曲運動時の姿勢変換と筋活動に対する初期股関節角度の影響"Health and Behavior Sciences. 1. 1-8 (2002) ▼
- [Publications] Fujiwara K., Toyama H., Kunita K.: "Anticipatory activation of postural muscles associated with bilateral arm flexion in subjects with different quiet standing positions"Gait and Posture. 17. 254-263 (2003) ▼
- [Publications] Fujiwara K., Toyama H., Asai H. and Kunita K.: "Postural movement pattern and muscle action sequence associated with rapid bilateral-arm-raise in standing."Outlines of Biomechanics Research, Editorial Board of The 14th Japanese Society of Biomechanics Conference. 138-142 (1999) ▼
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- [Publications] Fujiwara K., Shigeiwa M. and Toyama H.: "Influences of initial hip joint angles on postural change and muscle action associated with bilateral arm flexion."Health and Behavior Sciences. 1. 1-8 (2002) ▼
- [Publications] Fujiwara K., Toyama H. and Kunita K.: "Anticipatory activation of postural muscles associated with bilateral arm flexion in subjects with different quiet standing positions."Gait and Posture. 17. 254-263 (2003) ▼

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