

DYNAMIC SHOULDER STRENGTH IN VARIOUS ELEVATION PLANES

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KEY WORDS: shoulder, strength, torque, muscle

INTRODUCTION: The objective assessment of shoulder strength is necessary to adequately predict a return to injury-free sport activities or strenuous activities. During most daily activities, the shoulder performs movements in various elevation planes and different modes of dynamic contraction. However, it appears that there has been no study of elevation plane movements, except for the sagittal plane and coronal plane. The purpose of this study was to establish a database of normal shoulder strength. More specifically, the study was performed to test the hypothesis that the mode of contraction (concentric and eccentric) and the plane of elevation would have significant effects on strength measurements of the shoulder joint.

METHODS: Forty healthy young volunteers (20 men and 20 women) between 19 and 31 years of age with no history of upper extremity symptoms participated in this study. The Kin-Com isokinetic dynamometer (Chattanooga Corp., Chattanooga, TN) was used to measure elevation (abduction) and depression (adduction) strength of the shoulder in the 0° (sagittal plane), 30°, 60°, and 90° (frontal plane) of elevation, throughout the range of motion at eight angular velocities, 30°/sec to 240°/sec with steps of 30°/sec. Both concentric and eccentric tests of the dominant side were performed. The order of testing was random with respect to the elevation plane, velocity, and muscle contraction mode. MANOVA was used to analyze whether the strength ratios of elevation/depression differ with the plane of elevation, contraction mode and velocity.

RESULTS: The strength ratios of elevation/depression depend on the plane of elevation, but not on the contraction mode and angular velocity. These values were greatest in the 60° plane of elevation and lowest in the 30° plane of elevation. In the 60° plane of elevation and frontal plane these strengths were greater in eccentric contraction than in concentric contraction. In contrast, in the sagittal plane and 30° plane of elevation these values were greater in concentric contraction than in eccentric contraction. There were significant differences in the plane of elevation and angular velocity, but no significance in gender and movement type, elevation or depression.

CONCLUSIONS: In this study, the effect of elevation plane on shoulder strength was considered in addition to muscle contraction mode and angular velocity. In summary, this study demonstrated that the mode of contraction and planes of elevation have a significant influence on the strength measurement of the shoulder joint. Such information should be considered in functional evaluation and muscle conditioning in rehabilitation.