

The Effects of Generalized Joint Laxity and Shoulder Joint Laxity on Shoulder Joint ROM in Swimmers

Beth Baril, SPT, Brenda Bivens, SPT, Lindsay Brown, SPT, *Janette Travis, SPT

Department of Physical Therapy, College of Health Professions

Abstract. There has been considerable research on the overhead athlete concerning shoulder biomechanics and the resulting pain and injuries that develop, however, there have been limited studies specific to swimmers. Swimmers were of interest because they appear to require greater shoulder mobility for efficiency in competitive swimming techniques. This study focused on uninjured, young competitive swimmers and the biomechanics of the uninjured shoulder. This study examined the relationship between the inferior sulcus test (shoulder joint laxity) and the Beighton Mobility Scale (generalized joint laxity); and between laxity, as measured by these scales, and shoulder range of motion. The subjects were adolescent volunteers from a local swim club with a variety of years of swimming experience. The Beighton Mobility Scale, bubble inclinometer, and inferior sulcus test were utilized to measure generalized joint laxity, shoulder range of motion and shoulder joint laxity respectively. Results revealed no correlation between the Beighton Mobility Scale and the inferior sulcus test or between generalized and shoulder joint laxity and shoulder range of motion.

1. Introduction

There has been considerable research on the overhead athlete concerning shoulder biomechanics and the resulting pain and injuries that develop, however, there have been limited studies specific to swimmers [1]. Swimmers were of interest because they appear to require greater shoulder mobility for efficiency in competitive swimming techniques [1]. Studies related to swimmers dealt primarily with pain and injuries [1]. This study focused on uninjured, young competitive swimmers and the biomechanics of the uninjured shoulder. Little is known about the normal physiological laxity in asymptomatic shoulders of swimmers [1]. There is also limited knowledge available concerning the physiological effects of shoulder joint laxity and generalized joint laxity [2,3].

Hypermobility, an excessive motion compared with normal range of motion (ROM), [1] whether it be generalized or in specific joints, and/or altered ROM are discussed as potential risk factors for injuries during sporting activities [1]. At this point there is no consensus supporting a causal relationship [1]. If a strong correlation were to be established, it may have significant implications for sport screening and injury prevention strategies [2]. If a relationship between two testing methods for detecting excessive joint mobility was discovered, this would enable clinicians to use time more efficiently during the evaluation process.

The purpose of this study was threefold: 1) examination of the relationship between excessive mobility in the shoulder joint and generalized joint laxity, 2) examination of the relationship between shoulder joint laxity and changes in shoulder internal rotation (IR), external rotation (ER), and extension (ext) ROM, and 3) examination of the relationship between excessive mobility in joints throughout the body and changes in shoulder ROM.

2. Experiment, Results, Discussion, and Significance

A convenience sample of 43 adolescent male (17) and female (26) swimmer volunteers was studied. Written consent from legal guardians and assent from each individual were obtained. All participants had no previous history of shoulder surgery, no injuries within the last year which restricted participation in practice or competition for at least one week's time, and no present complaints of shoulder pain. Each participant was tested at their respective facility, using the same equipment. For increased reliability, examiner 1 (intrarater reliability 0.896) was responsible for conducting the Beighton mobility test, examiner 2 positioned the participant at end ROM while examiner 3 (intrarater reliability IR=0.899, ER=0.978, ext=0.969) measured the participant's ROM, and examiner 4 (intrarater reliability 0.917) performed the sulcus test for every participant.

To measure generalized joint laxity, the Beighton Mobility Scale was utilized. For this procedure, the participants were responsible for completing the following movements upon instruction and demonstration from the researcher: 1) Pull the thumb down to touch the forearm, 2) Pull the little finger back > 90 degrees, 3) Hyperextend the elbow > 10 degrees. 4) Hyperextend the knee > 10 degrees, and 5) Bend to place palms on the floor while keeping knees straight. The participant received one point per side per action that they were able to successfully complete. Points were added up and scored over the total number of points available (9). The participant was considered hypermobile if the score was greater than or equal to 5/9 [4]. To measure shoulder ROM a bubble inclinometer was used. Rotational ROM was measured with participant lying on his/her back, while extension ROM was measured with participant prone with head turned away from test side. To measure shoulder joint laxity, an experienced examiner performed the sulcus test. For this procedure, the participant sat with the arm by the side and the shoulder muscles relaxed. The researcher grasped the participant's forearm below the elbow and pulled the arm downward. Grades of 0-3 were assigned based on the amount of downward movement [5].

Results revealed no significant difference (NSD) between sulcus grades and each ROM measurement, NSD between Beighton scores and each ROM measurement, and no association (NA) between sulcus grades and Beighton scores. The NSD hypotheses were analyzed using the One-Way ANOVA while the NA hypothesis was analyzed using a Chi-Square test.

Table 1. Characteristics of subjects (n=43)

	Age in years	Height in cm	Weight in kg	ER in degrees	IR in degrees	Ext in degrees
Mean	13.93	162.51	53.68	120.53	73.77	74.91
Std Dev	2.9	11.2	12.0	16.2	17.6	11.6

Table 2. Percent of subjects scored on Beighton and sulcus tests

	0	1	2	3	4	5	6	7	8	9
Beighton [#]	14.0	9.3	30.2	18.6	18.6	7.0	0.0	2.3	0.0	0.0
Sulcus*	20.9	39.5	32.6	7.0						

[#]= Represents scores 0-9

*= Represents grades 0-3

Based on these results, the sulcus (shoulder laxity) cannot be substituted for the Beighton scale (generalized laxity) as a clinical measurement for generalized joint laxity. This supports findings in previous research that general joint laxity was not a feature of those found to have shoulder laxity [2, 6]. In swimmers used in this study, the degree of shoulder laxity (sulcus) or generalized joint laxity (Beighton) does not appear to influence any changes in shoulder joint ROM. This supports a previous study in which no correlations were found between these variables [2].

3. Conclusions

The results of this study conclude that generalized joint laxity cannot be inferred from shoulder joint laxity, nor can these variables infer shoulder joint ROM measurements.

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