



# Exploring Natural Fitness Instincts:

## Motion Capture, dumbbells and biceps curls

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### INTRODUCTION

While other research focuses on muscle growth in certain areas, grip, tries to understand the muscles' response to different amounts of load or detects anomalies the main research question is:

*How does the natural use of dumbbells, especially in relation to the form and technique during biceps curls, vary among individuals?*

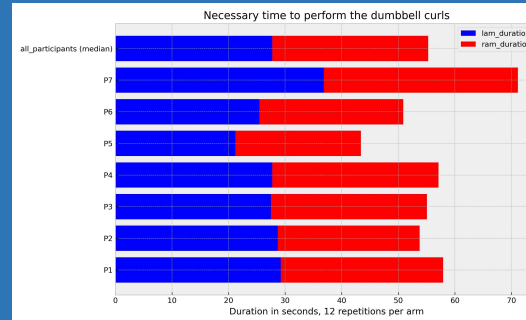
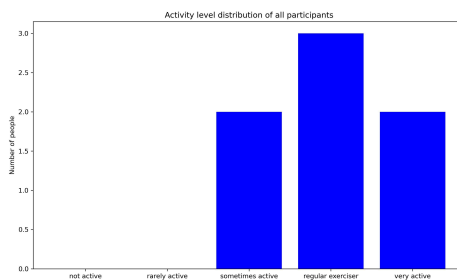
Until now researchers did not try to analyze the intuitive use of dumbbells in weight training.

### METHOD

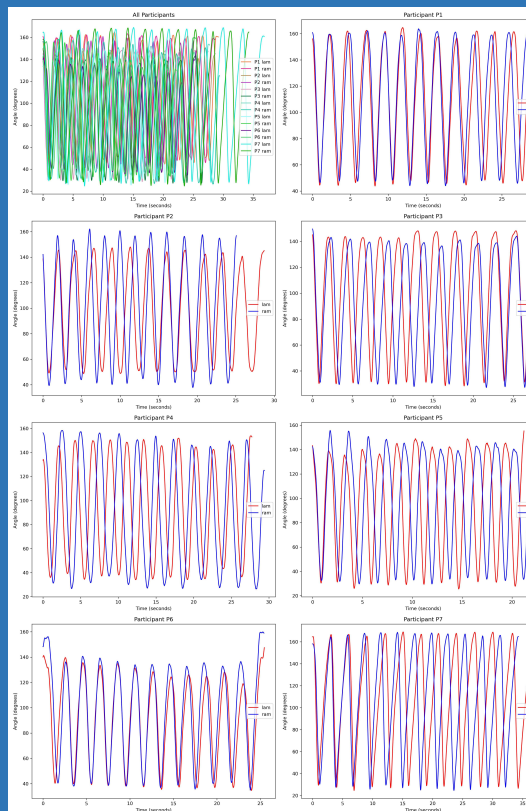
During the experiment 7 participants were asked to perform 12 repetitions of biceps curls with each arm. A 5kg dumbbell was used for this task.

The exercises were recorded with a Qualisys motion capture system (100 fps) and a total of 8 markers per person. 3 markers were placed on each arm (shoulder, elbow, wrist) and 2 more markers on the dumbbell.

In order to be able to better assess the group of participants, they completed a questionnaire on the topics of weight training, sporting activity and previous experience.



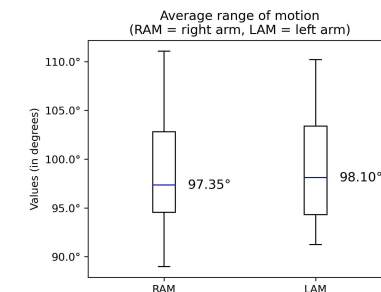
Variation in range of motion and duration.



### RESULTS

„Variation (in various forms)“ can be identified as the main finding of the experiment, although a self-described "active" group with prior knowledge was studied.

The median of the average range of motion is approx. 98 degrees, although it should be noted that participants who described themselves as „very active“ tended to have a greater average range of motion (approx. 105 to 110 degrees). These two participants are also the slowest.



### DISCUSSION

The results of this experiment raise numerous questions. Further research should aim to define the „perfect“ technique/form to be able to analyze the „correctness“ of fitness exercises. Parameters like skewness of movements, ideal starting points and a measurement scale for "wrongness" of execution should be considered.

Do more experienced participants train the initial range of motion more (to have "better" results)? Do participants who have less experience with weight training prefer the final range of motion because it is less exhausting?