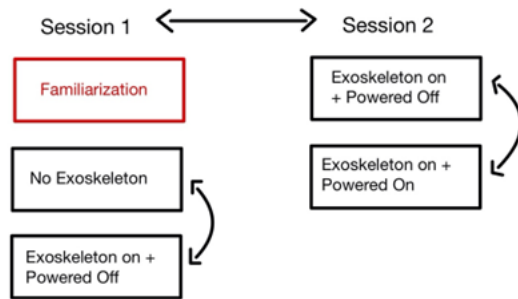


Subjects 1-5: 2 testing days



No exoskeleton = NOEXO

Exoskeleton on + powered off = EXOOFF

Exoskeleton on + powered on = EXOON

Familiarization will always be in Session 1

The task is to perform a reaching and grasping movement by having the participant begin in a starting location. They will reach out to a designated target, grasp a can at the target, and bring the can back to the beginning position. For each condition, there will be patterns to perform the task. Each condition will have the participant reach out and grasp the can 10 times at the target in front of them, 30 times randomly placed between the three targets, 10 times in front, 30 times randomly, and 10 times in front of them (Fig. 1). Combined, this means each condition will have 90 reach and grasp tasks. For the no exoskeleton condition, the participant will complete all the reaching and grasping tasks with no exoskeleton on. For the exoskeleton on but turned off condition, the participants will perform the reach and grasp tasks with the exoskeleton on, but the power will be turned off and there will be no assistance from the exoskeleton. For the exoskeleton on and turned-on condition, the participants will have the exoskeleton on and turned on so the exoskeleton will be assisting them in the reach and grasp tasks. The participants will come in for two sessions and the conditions performed in those sessions will be randomized (Fig. 2). A familiarization condition will always come at the beginning of their first session. The purpose of the familiarization session is to allow the participant to become more familiar with the use of the exoskeleton and allow us to find the best sensor location and parameter for this specific participant. The data that will be collected includes muscle activation by electromyography (EMG), time to complete each phase of the task (Fig. 3) through the use of a motion capture system (Mocap), time to maximal hand aperture with Mocap, and trajectory of movement with Mocap.



Subjects 6-10: 2 testing days

Session 1 \leftrightarrow Session 2

Familiarization

EXOFF	NOEXO
EXON	EXOFF

Same idea of randomization as before just different pairings.

For the tasks, They reached forward 10 times, randomized 50, forward 10, randomized 50, forward 10, randomized 50, forward 10. There was also 2 added locations to the right and left of the home x. They were just as far as the other locations but the degrees went 0, 45, 90, 135, 180.