

## EVALUATING A STANDARD REHAB THROWING PROGRAM

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### OVERVIEW:

This report outlines workload analysis of a standard rehab throwing program. The sample program was converted into workload units and ultimately acute and chronic workload measures for analysis. Overall, the program was too aggressive early in the rehab, and too conservative late in the rehab.

### PROGRAM:

Day of Rehab	Throws	Distance (feet)	Day of Rehab	Throws	Distance (feet)	Day of Rehab	Throws	Distance (feet)
1	25	45	26	-	-	51	50	105
2	-	-	27	75	75	52	-	-
3	40	45	28	-	-	53	-	-
4	-	-	29	75	75	54	75	105
5	50	45	30	-	-	55	-	-
6	-	-	31	25	90	56	-	-
7	25	60	32	-	-	57	75	105
8	-	-	33	25	90	58	-	-
9	25	60	34	-	-	59	-	-
10	-	-	35	50	90	60	25	120
11	50	60	36	-	-	61	-	-
12	-	-	37	50	90	62	50	120
13	50	60	38	-	-	63	-	-
14	-	-	39	75	90	64	-	-
15	75	60	40	-	-	65	75	120
16	-	-	41	-	-	66	-	-
17	75	60	42	75	90	67	-	-
18	-	-	43	-	-	68	25	120
19	25	75	44	25	105	69	-	-
20	-	-	45	-	-	70	-	-
21	25	75	46	25	105	71	25	120
22	-	-	47	-	-	72	-	-
23	50	75	48	50	105	73	50	120
24	-	-	49	-	-	74	-	-
25	50	75	50	-	-	75	75	120

**Table 1** Sample rehab throwing program of throw counts prescribed at various long toss distances over seventy five days.

### CODING INTO WORKLOAD:

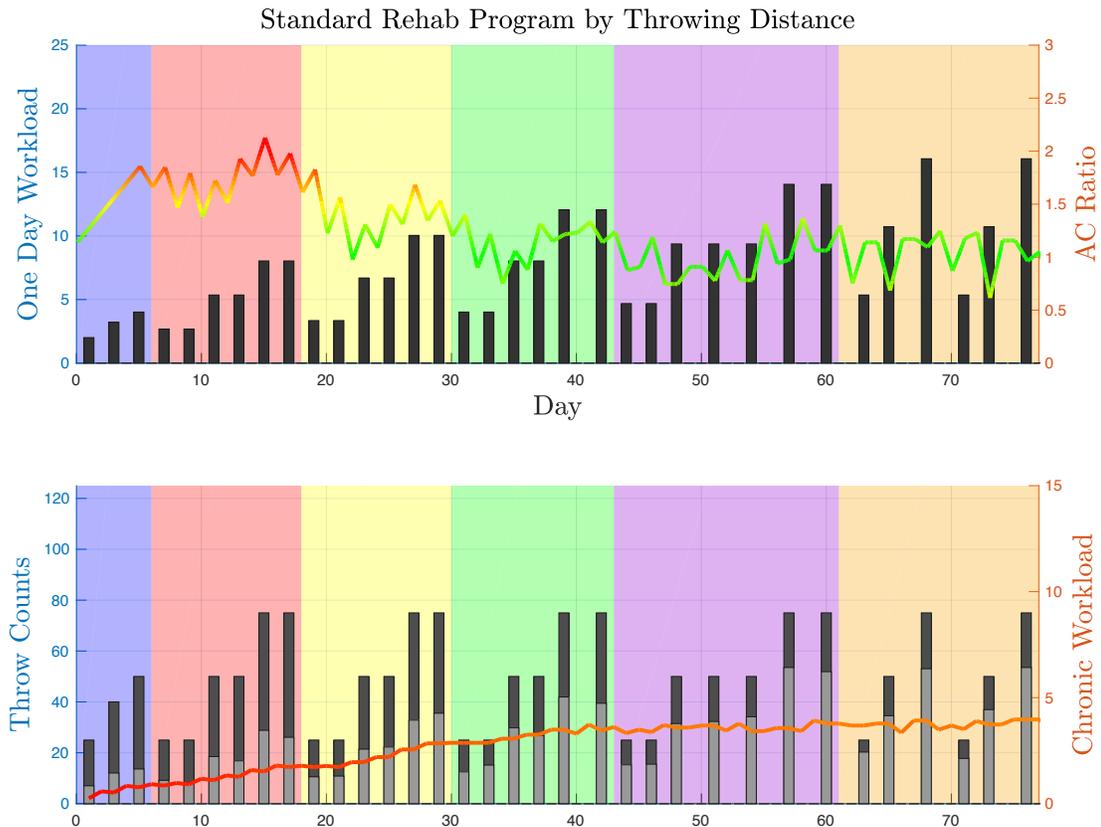
To analyze the rehab program above with acute:chronic ratios, a daily workload was computed with the following equation (1) containing throw count and throwing distance:

$$Daily\ Workload = throw\ count * distance * \frac{1}{140' * 4} \quad (1)$$

Additional workloads were computed from this daily workload, including acute workload (seven day rolling average), chronic workload (28 day rolling average) and acute:chronic ratio (acute workload divided by chronic workload).

## RESULTS:

The sample rehab program was fed through Motus Global's workload algorithms to produce one day, acute, chronic, and acute:chronic workload ratios for the duration of the throwing program. Each phase of the throwing program was broken down by distance prescribed. Seen below in Figure 1, there are six (6) phases of the rehab throwing program: 45 feet, 60 feet, 75 feet, 90 feet, 105 feet, and 120 feet.



**Figure 1** workloads throughout various phases of a standard rehab throwing program. Blue = 45', Red = 60', Yellow = 75', Green = 90', Purple = 105', and Orange = 120'

## RECOMMENDATIONS:

Overall, this rehab program appears to be conservative and does a good job at slowly introducing workload to the thrower's arm. However, there are three areas of concern.

First, in the 60' throwing phase (red), there is a severely elevated acute:chronic ratio (>2.0). This period of elevated fatigue could be minimized by more conservative work in day's 13-19. The pitcher's arm is likely not ready to tolerate one day workloads of ~8.0 only 13 days into a throwing program.

The second area of concern is in the 75' (yellow) throwing phase, where slightly elevated acute:chronic ratios persist. The workloads on day 27 appear to have caused this spike.

Lastly, it appears that the regression in throwing volume in the 105' (purple) and 120' (orange) phases have a detrimental effect to the chronic workload. There is roughly negligible chronic workload

progression over the last 25 days of the rehab program. This suggests there is room for more aggressive workload progression in these later phases of rehab.

**FUTURE WORK:**

The major limitation to this work is that workload is heavily defined by distance thrown. In reality, an athlete may throw with high intensity at either short or long distances. Therefore using distance as a proxy for effort is flawed. This program should be tailored with percent-effort alongside each throwing distance. Additionally, percent-effort should be determined by actual versus max-effort elbow valgus torque levels. Given that max-effort elbow valgus torque levels may not have been recorded prior to the injury, an estimation method will be needed using an interpolation method.

Secondarily, these throwing prescriptions do not include any warmup phases. It has been observed (through use of the motusTHROW device during this example of rehab) that as many as 25-40 additional warmup throws may be needed in order to work up toward throwing at the prescribed daily distance. Rather than assume a warmup profile for each distance, the prescription should include a variety of distances, throws, and perfect efforts on each day of rehab.