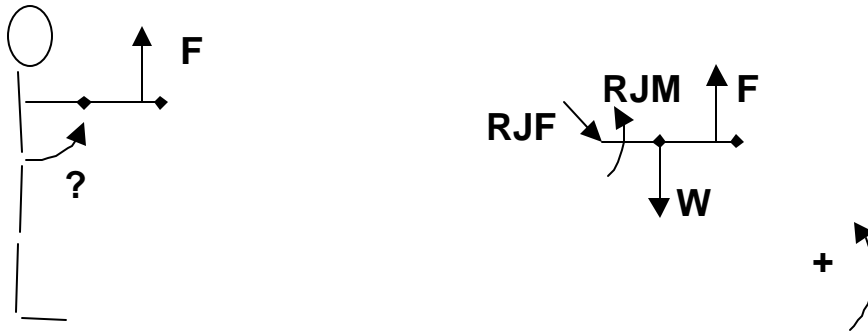


PT 617 KINESIOLOGY

Homework Assignment  
Dynamic Movement Analysis

You are about to perform a movement analysis with your patient, who is using a theraband to strengthen her shoulder muscles during a bout of extension-flexion cycles starting from 90 deg as shown below.

1. Draw the FBD of the upper extremity, including the perpendicular component of the contact force from the theraband F.



2. The weight of the arm  $W = 150$  N, with moment arm  $d_w = .25$  m from the shoulder. The applied contact force  $F = 200$  N at 90 deg shoulder flexion with moment arm  $d_f = 0.5$  m from the shoulder. At 0 deg, F increases to 300 N due to the stretch of the theraband. Compute the resultant external load  $SM_L$  at 90 deg and 0 deg, respectively.

a) at 90 deg:

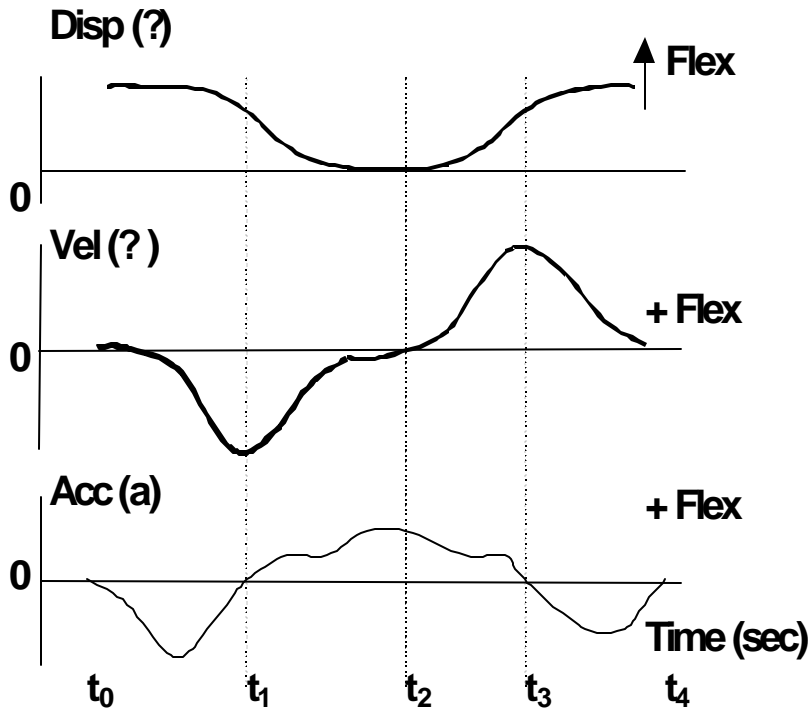
$$SM_L = F \times d_f - W \times d_w = 200 \times .5 - 150 \times .25 = 62.5 \text{ Nm}$$

b) at 0 deg:

$$SM_L = F \times d_f - W \times d_w = 300 \times .5 - 150 \times 0 = 150 \text{ Nm}$$

Note, the  $SM_L$  will vary between - 62.5 Nm and - 150 Nm within the range of motion from 0 to 90 deg.

3. Draw displacement, velocity and acceleration-time history for the movement cycle from 90 to 0 deg, and without stopping return back to 90 deg.



4. complete the analysis for the movement.

Phase of movement	$t_0 \rightarrow t_1$	$t_1 \rightarrow t_2$	$t_2 \rightarrow t_3$	$t_3 \rightarrow t_4$
Direction of $S M_L$	CCW	CCW	CCW	CCW
Direction of ?	CW	CW	CCW	CCW
and $\alpha$	CW	CCW	CCW	CW
Propulsion/braking (P/B)	P	B	P	B
Direction of RJM	CW ? EXT	CCW ? FLX fast 0 CW ? EXT slow	CCW ? FLX fast 0 CW ? EXT slow	CW ? EXT
Type of muscle contraction (c/e)	C	E QUIET C	E QUIET C	E