

Rodgers Muscle Fatigue Analysis

The Muscle Fatigue Analysis was proposed by Rodgers as a means to assess the amount of fatigue that accumulates in muscles during various work patterns within 5 minutes of work. The hypothesis was that a rapidly fatiguing muscle is more susceptible to injury and inflammation. With this in mind, if fatigue can be minimized, so should injuries and illnesses of the active muscles. This method for job analysis is most appropriate to evaluate the risk for fatigue accumulation in tasks that are performed for an hour or more and where awkward postures or frequent exertions are present. Based on the risk of fatigue, a Priority for Change can be assigned to the task.

First, divide a job into tasks and determine what percent of the shift each task is done. Identify which tasks are perceived as “difficult” by people on the job. Do the analysis on the primary tasks performed (those done for more than 10% of the shift) and on any tasks considered “difficult”, no matter how much of the job they constitute. For each task and for each body region, assess the three job risk factors by assigning each factor a rating by category. The following data sheet provides a format for this process. Descriptions of Effort Levels for the different body regions, Continuous (single) Effort Duration and Effort Frequency are provided on the data collection form. Within a body region, once an Effort Level is chosen to represent the task, the assignment of Continuous Effort Time and Efforts per Minute should be associated with the chosen effort. Notes: If the effort level is high enough that most workers cannot accomplish it, if the continuous effort duration is greater than 30 sec, or if the frequency is greater than 15 / min, then there is sufficient reason to assign a Very High priority for change.

The Priority for Change is found by locating the combination of scores in the various categories in either table on page 3. Note: A combination of 3 and 3 for Duration and Frequency is not possible. The first table on page 3 provides an indication of relative risk for fatigue within a category. The earlier the combination of categories is in the list the lower the fatigue should be (i.e., it is better).

References

Suzanne H. Rodgers, A functional job evaluation technique, in Ergonomics, edited by J. S. Moore and A. Garg, *Occupational Medicine: State of the Art Reviews*. 7(4):679-711, 1992.

Suzanne H. Rodgers, Job evaluation in worker fitness determination; *Occupational Medicine: State of the Art Reviews*. 3(2):219-239, 1988.

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Job		Analyst	
Task	% of Shift Time	Date / /	

Region	Effort Level (If the effort cannot be exerted by most people, enter 4 for Effort and VH for Priority)			Scores			Priority
	Light -- 1	Moderate -- 2	Heavy -- 3	Effort	Dur	Freq	
Neck	Head turned partly to side, back or slightly forward	Head turned to side; head fully back; head forward about 20°	Same as Moderate but with force or weight; head stretched forward				
Shoulders	Arms slightly away from sides; arms extended with some support	Arms away from body, no support; working overhead	Exerting forces or holding weight with arms away from body or overhead	Right			
				Left			
Back	Leaning to side or bending arching back	Bending forward; no load; lifting moderately heavy loads near body; working overhead	Lifting or exerting force while twisting; high force or load while bending				
Arms / Elbow	Arms away from body, no load; light forces lifting near body	Rotating arms while exerting moderate force	High forces exerted with rotation; lifting with arms extended	Right			
				Left			
Wrists / Hands / Fingers	Light forces or weights handled close to body; straight wrists; comfortable power grips	Grips with wide or narrow span; moderate risk angles, especially flexion; use of gloves with moderate forces	Pinch grips; strong wrist angles; slippery surfaces	Right			
				Left			
Legs / Knees	Standing, walking without bending or leaning; weight on both feet	Bending forward, leaning on table; weight on one side; pivoting while exerting force	Exerting high force while pulling or lifting; crouching while exerting force	Right			
				Left			
Ankles / Feet / Toes	Standing, walking without bending or leaning; weight on both feet	Bending forward, leaning on table; weight on one side; pivoting while exerting force	Exerting high force while pulling or lifting; crouching while exerting force	Right			
				Left			
Continuous Effort Duration	< 6 s 1	6 - 20 s 2	20 - 30 s 3	> 30 s 4 (Enter VH for Priority)			
Effort Frequency	< 1 / min 1	1 - 5 / min 2	> 5 - 15 / min 3	> 15 / min 4 (Enter VH for Priority)			

Category Scores Grouped by Priority for Change in the Order of Effort, Continuous Effort Duration and Frequency

The following table ranks the combinations of scores in increasing potential for fatigue, and, thereby, in increasing priority for change. The least fatiguing combinations are at the top left side of the table and the highest are at the end of the list on the right side of the table. When a solution is chosen to improve the work, it is important to rate the new task with the same tool to be sure the fatigue has been dropped to a lower level.

Low (L)	Moderate (M)	High (H)	Very High (VH)
111	123	223	323
112	132	313	331
113	213	321	332
211	222	322	4xx, x4x, xx4*
121	231		
212	232		
311	312		
122			
131			
221			

*A category of 4 for Effort Level, Continuous Effort Duration or Frequency is automatically Very High (VH)

Alternative Look-up Table for Priority for Change Score

Enter with the category scores for Effort Level (top row), Duration and Frequency (columns within the section for Effort Level). A category of 4 for Effort Level, Duration or Frequency is automatically VH (Very High). The Priority for Change from the table is Low (L), Moderate (M), High (H), or Very High (VH). See the preceding table for relative location of a combination with respect to other combinations.

Effort Level = 1			Effort Level = 2			Effort Level = 3		
Durat'n	Freq	Priority	Durat'n	Freq	Priority	Durat'n	Freq	Priority
1	1	L	1	1	L	1	1	L
1	2	L	1	2	L	1	2	M
1	3	L	1	3	M	1	3	H
2	1	L	2	1	L	2	1	H
2	2	L	2	2	M	2	2	H
2	3	M	2	3	H	2	3	VH
3	1	L	3	1	M	3	1	VH
3	2	M	3	2	M	3	2	VH
3	3	**	3	3	**	3	3	**

** This combination of Duration and Frequency is not possible.