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MODERN METHODS OF EVALUATION WORKPLACE FACTORS IN ERGONOMY

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Keywords: musculoskeletal diseases, RULA, REBA, evaluation of ergonomic risks
Abstract: Modern methods of assessment the ergonomic risk serve for early identification and enable complex risk assessment of damage to the musculoskeletal system. These advanced methods include RULA ("Rapid Upper Limb Assessment") and Reba ("Rapid Entire Body Assessment"). The above mentioned methods could serve as prevention of musculoskeletal diseases and could be used in assessing of ergonomic risks in company. Musculoskeletal diseases (MSDs) are the most common diseases in Europe related to work. The implementation of ergonomic principles, i.e. ergonomic risk identification, analysis, proposal, implementation of solutions and evaluation of the effectiveness of measures can significantly reduce the number of MSDs.

1 Introduction

Musculoskeletal diseases (MSDs) are the most common diseases in Europe related to work. The implementation of ergonomic principles, i.e. ergonomic risk identification, analysis, proposal, implementation of solutions and evaluation of the effectiveness of measures can significantly reduce the number of MSDs.

Nowadays, the most used methods enabling the complex ergonomic analysis are methods RULA and REBA.

RULA method ("Rapid Upper Limb Assessment") was developed in University of Nottingham and is used for fast and systematic assessment of the risk in the process of damage the musculoskeletal system with regard to the upper limbs [1]. This method has been used abroad for evaluation disorders of the upper limbs resulting in the evaluation of working positions [3], [4]. REBA method ("Rapid Entire Body Assessment"), systematically evaluate the musculoskeletal apparatus and is based on the methodology RULA [1], [2]. Article deals with the REBA method because the method RULA is freely available on the Internet at: www.rula.co.uk

2 REBA method

The Rapid Entire Body Assessment (REBA) method was developed by Dr. Sue Hignett and Dr. Lynn McAtamney, ergonomists from University of Nottingham in England (Dr. McAtamney is now at Telstra, Australia). REBA is a postural targeting method for estimating the risks of work-related entire body disorders. A REBA assessment gives a quick and systematic assessment of the complete body postural risks to a worker. The analysis can be conducted before and after an intervention to demonstrate that the intervention has worked to lower the risk of injury [5].

The REBA worksheet is divided into two body segment sections on the labelled A and B. Section A (left side) covers the neck, trunk, and leg. Section B (right side) covers the arm and wrist. This segmenting of the worksheet ensures that any awkward or constrained postures of the neck, trunk or legs which might influence the postures of the arms and wrist are included in the assessment [5].

Score Group A. (Trunk, Neck and Legs) postures first, and then score Group B. (Upper Arms, Lower Arms, and Wrists) postures for left and right. For each region, there is a posture scoring scale and additional adjustments which need to be considered and accounted for in the score [1].

2.1 Evaluation of work posture by REBA

Reba assessment is performed in 13 steps. Steps 1-5 value the load of neck, trunk and legs in light of manipulation with loads (group A, score A). Steps 6-10 value the load of upper limbs. Arms, forearms, wrist and graph technique is taken into account (score B). Steps 11-12 determine the final outcome of Reba. It is evaluated according to the table where the values A and B are compared. The score C is assigned in this way and the score activity is added towards it (score C) [1].

Step 13 is an interpretation of the final result Reba.

2.1.1 REBA analysis

REBA analysis A:

Step 1: Locate Neck position:

Choose the picture that matches position of neck at work.

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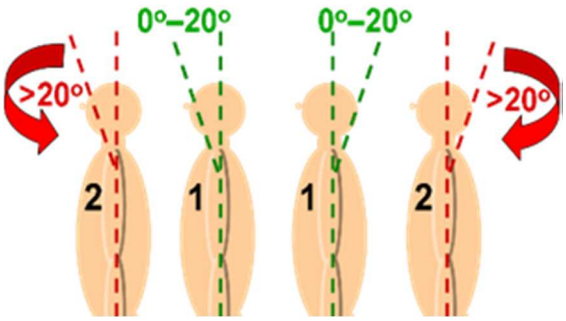

Figure 1 Neck position

If the head is tilted to the side:

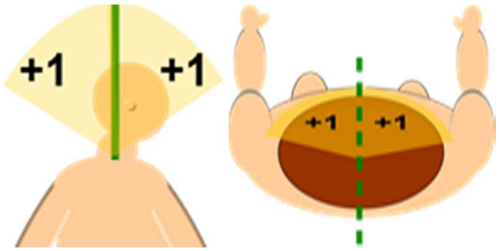

Figure 2 Head position

Enter result to the scheme in item: *neck*:

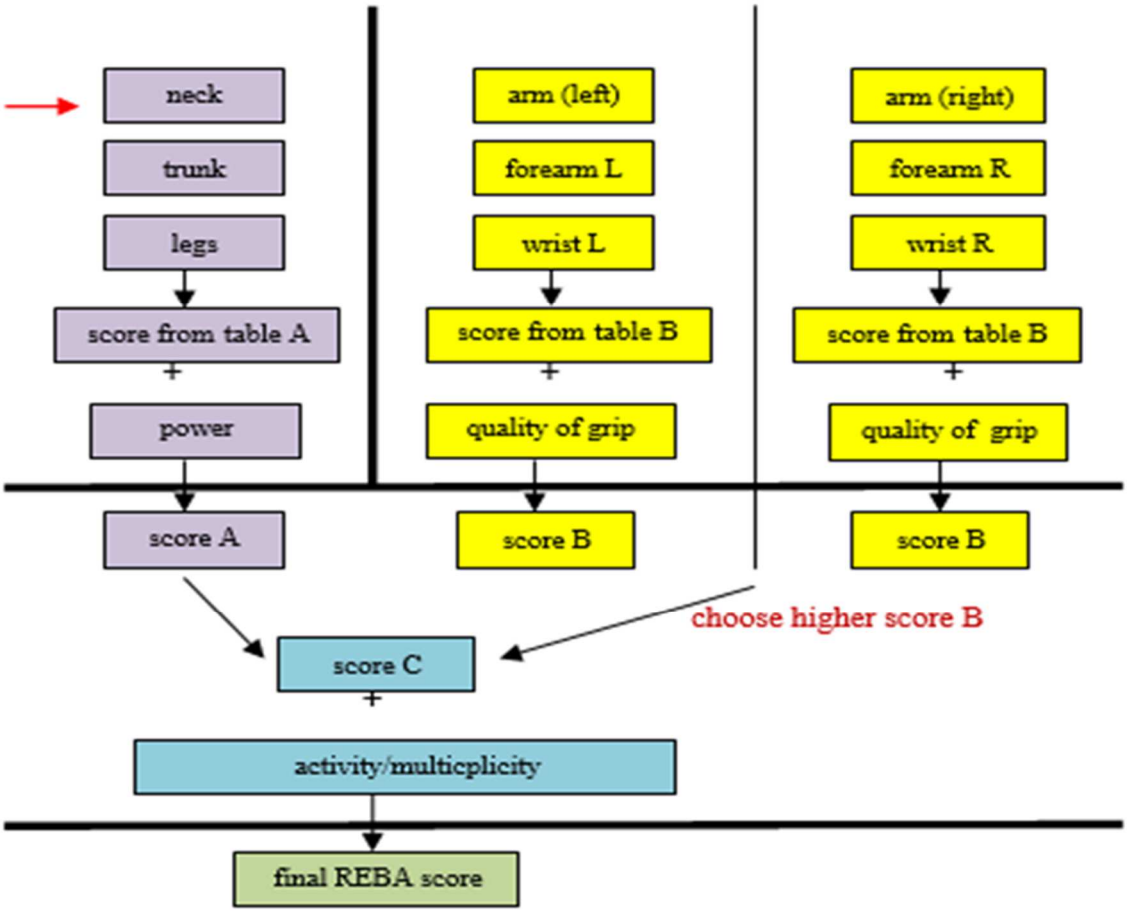

Figure 3 The scheme of REBA results

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Step 2: Locate Trunk position (Figure 4):
Choose the picture that matches position of working posture.

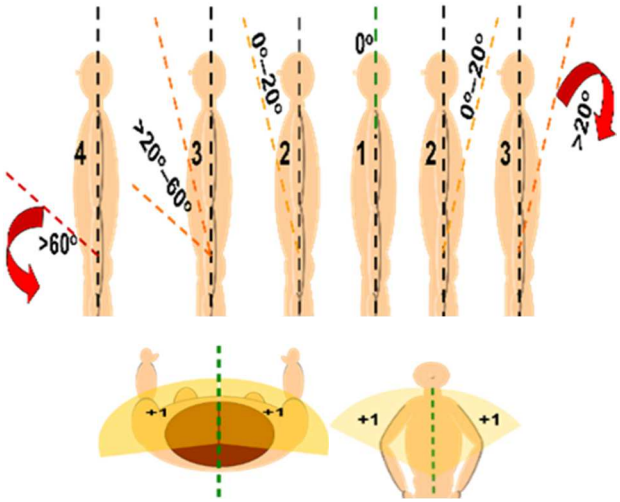

Figure 4 Trunk position

If trunk is twisted: +1
If trunk is side bending: +1
Enter result to the scheme (Figure 3) in item*: trunk*.

Step 3: Location of legs (Figure 5):
Choose the picture that matches position of legs during working process.

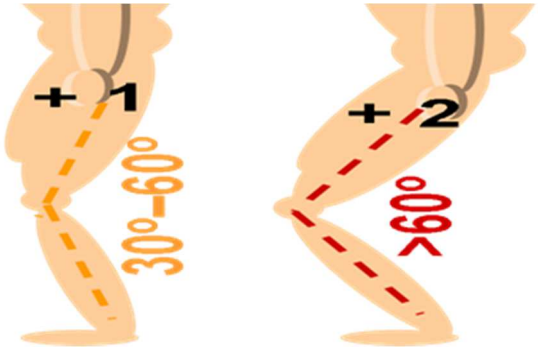

Figure 5 Position of legs

When the knees are bent from 30 ° to 60 °: +1
When the knees are bent more than 60 °: +2
Enter result to the scheme (Figure 3) in item: *legs*.

Step 4: ***REBA analysis A***
Using values from steps 1-3 above, locate posture score in table A (Table 1): According to the table, the posture score is 5.

Table 1 REBA analysis A

tab. A		**trunk**				
		1	2	3	4	5
neck = 1	legs					
	1	1	2	2	3	4
	2	2	3	4	5	6
	3	3	4	5	6	7
	4	4	5	6	7	8
neck =2	legs					
	1	1	3	4	5	6
	2	2	4	**5**	6	7
	3	3	5	6	7	8
	4	4	6	7	8	9
neck =3	legs					
	1	3	4	5	6	7
	2	3	5	6	7	8
	3	5	6	7	8	9
	4	6	7	8	9	9

Enter result to the scheme (Figure 3) in item: *score from table A* (Table 1).

Step 5: Add force / Load score
If load is < 5 kgs: +0
If load is 5 to 10kgs: +1
If load is > 22 kgs: +2
Enter result to the scheme (Figure 4) in items: *power and score A.*

REBA analysis B:
Step 6: Location of upper arms (Figure 6):
Choose the picture that matches the best position of location the upper arms.

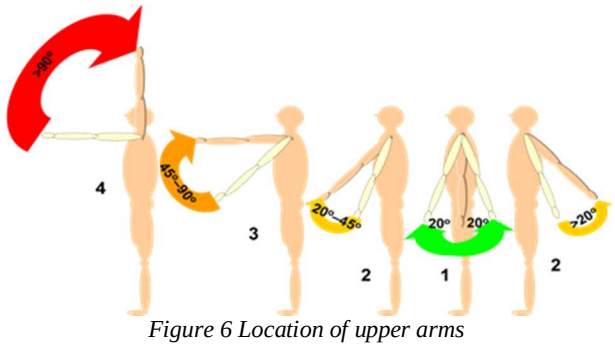

Figure 6 Location of upper arms

If shoulder is raised: +1
If upper arm is abducted: +1

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If arm is supported or leaning: -1
Enter result to the scheme (Figure 3) in items: *left and right arm.*

Step 7: Location of forearms (Figure 7):
Choose the picture that matches the best position of location the forearms.

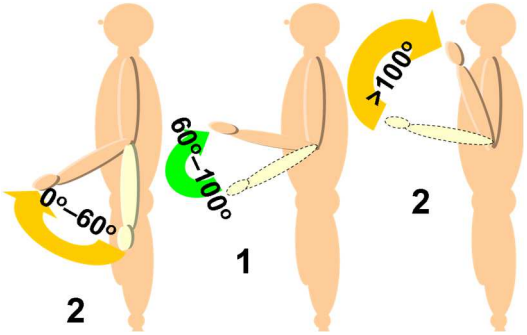

Figure 7 Location of forearms

Enter result to the scheme (Figure 3) in items*: left and right forearm.*

Step 8: Locate wrist position (Figure 8):
Choose the picture that matches the best position of wrist location.

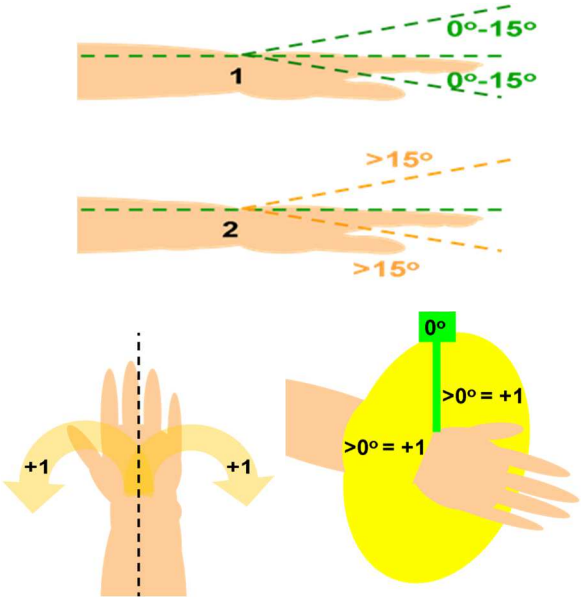

Figure 8 Wrist position

Enter result to the scheme (Figure 3) in items: *left and right wrist.*

Step 9: ***REBA analysis B***
Using values from steps above, locate posture score in table B. According to the table, the posture score is 6.

Table 2 REBA analysis B

tab. B	arm					
	1	2	3	4	5	6
forearm = 1	**wrist**					
	1	1	1	3	4	6	7
	2	2	2	4	5	7	8
	3	2	3	5	5	8	8
forearm = 2	**wrist**					
	1	1	2	4	5	7	8
	2	2	3	5	**6**	8	9
	3	3	4	5	7	8	9

Enter result to the scheme (Figure 3) in item: *score from table B (left and right) (Table 2).*

Step 10: Addition of coupling score:
Well fitted handles and mid-range power grip: good: +0
Acceptable but not ideal hold or coupling, acceptable with another body part: fair: +1
Hand hold not acceptable, but possible: poor: +2
No handles, awkward: unacceptable: +3
The higher score is taken into account in final evaluation.

Enter result to the scheme (Figure 3) in items*: quality of grip and score B.*

Step 11: ***REBA analysis C***
Find column in table C.

Table 3 REBA analysis C

tab. C		final score A											
		1	2	3	4	5	6	7	8	9	10	11	12
Final score B	1	1	1	2	3	4	6	7	8	9	10	11	12
	2	1	2	3	4	4	6	7	8	9	10	11	12
	3	1	2	3	4	4	6	7	8	9	10	11	12
	4	2	3	3	4	5	7	8	9	10	11	11	12
	5	3	4	4	5	6	8	8	10	10	11	12	12
	6	3	4	5	6	7	8	9	10	10	11	12	12
	7	4	5	6	7	8	**9**	9	10	11	11	12	12
	8	5	6	7	8	8	9	10	10	11	12	12	12
	9	6	6	7	8	9	10	10	10	11	12	12	12
	10	7	7	8	9	9	10	11	11	12	12	12	12
	11	7	7	8	9	9	10	11	11	12	12	12	12
	12	7	8	8	9	9	10	11	11	12	12	12	12

Enter result to the scheme (Figure 3) in item: *score C (Table 3)*

Step 12: Activity score:
If 1 or more body parts are held longer than a minute (static): +1

Repeated small range actions (more than 4× per minute): +1
Action causes rapid large range change in postures or unstable base: +1

Enter result to the scheme (Figure 3) in items: *activity/ multiplicity and final Reba score.*

Step 13: Interpretation of Reba result (Table 3):

Table 3 Final REBA result

score	level of risk
1	negligible risk, no action required
2-3	low risk, change may be neede
4-7	medium risk, further investigation, change soon
8-10	high risk, investigate and implemeted change
11+	very high risk, implement change

Conclusion

The aim of the article was to summarize basic knowledge of ergonomic method REBA. Of course there are more methods, approaches and philosophies dealing with ergonomics in workplace. There is developed special software that takes into account the stress of human body during the working process. After these analyses, changes in workplace and working positions are recommended. This software is used in the process of design the workplace. The main goal is to prevent occupational diseases. Each company should focus on its ergonomic side in company. It does not refer to only production workers but also workers who work in offices and spend all day computing, which negatively affects motor system and sight.

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Review process
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