Rapid Entire Body Postural Analysis (REBA) with Alert in Android for Computer Operators

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Abstract: **In India the common occupational problem among the workers are musculoskeletal disorders. Musculoskeletal disorders (MSDs) are injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal disks. The aim of this review is to provide a summary of one of the observational postural analysis ergonomic assessment tools; Rapid Entire Body Assessment (REBA) in terms of its development, applications, validity and limitations. Research showed REBA's convenience for postural assessment of jobs in numerous professional settings, including industrial and health care jobs, construction, sawmill tasks, supermarket industry, food industry, computer based jobs, packaging, school workshop, odontological services and for firefighters and emergency medical technicians. Face validity is established in two stages. In terms of concurrent validity, several studies used REBA to compare the results with other observational and direct methods so that the level of conformity between the two is determined. The limitations discussed in this review did not hold the method's implementation back, on the contrary, it is currently used and remains a rapid to use tool with computerized checklist and tables available in public domain.**

Key words: Ergonomic Assessment, REBA, Musculoskeletal Disorders

I. INTRODUCTION

Ergonomic assessment of Work-Related Musculoskeletal Disorders (WMSDs) involves the evaluation of risk of developing a range of disorders to muscles, nerves and joints, primarily to the upper limb and low back, associated with occupational tasks. Musculoskeletal disorders are among the most widely spread occupational problems for both developed and developing countries, in industries and services, with increasing expenses of salary compensation and health costs, declining productivity and lower quality of life. These disorders are caused by different risk factors' interactions resulting from several factors, which can be categorized into individual, psychosocial and physical factors. Physical load of work is usually evaluated by analyzing body posture, movement; recurring and forceful activities and maximum force, or increasing muscle load over time. Observational and instrument based techniques are proposed in research to provide a quantitative measure for the degree of discomfort and postural strain caused by different body positions. The angular departure of a body segment from the neutral posture in the observational technique is acquired through visual perception, whereas recordings of the body positions done continuously in the instrument-based techniques are taken using a device attached to a person.

In a developing country like India, Work Related Musculoskeletal Disorders (WMSD) has become a major problem and is widespread in many countries. Several international studies have also shown that there is a high incidence of Musculoskeletal Disorders and work related physical problems in the textile and garment manufacturing industries. WMSDs affect one million people each year and the most common problems are back pain, work related neck and upper limb disorders, repetitive strain injuries and lower limb disorders.These disorders are preventable or at least can be delayed. The risk of WMSDs can increase with an increase in workloads, low work satisfaction, high work demands and work related stress. Therefore immediate attention must be provided to those individuals. Any delay in such cases might result in very lengthy treatment with a long rest period and also results in other sufferings with financial losses to the individual, his / her family and surroundings.

The main aim of our study is to minimize injuries that are self-inflicted by workers due to their poor working style in garment industries. Workers in these units work in designing, cutting, fusing, sewing etc. where prevalence of work related musculoskeletal disorders is very high. Therefore an attempt has been made in this study to assess the musculoskeletal disorders on workers performing various tasks in leather garment industry using REBA tool. Ergonomic interventions and solutions have been developed on the basis of acquired assessment results.

II. LITERATURE REVIEW

David, G[3] provided an overview of the range of methods that have been developed for the assessment of exposure to risk factors for work-related musculoskeletal disorders.

P.N.Kale and R. T. Vyavahare presented the review on the studies carried out so far to analyse the various tools used for ergonomic analysis. Review shows that the many of the researchers are focussed on study of a single tool and its use in particular industry for analysing the problem.

Andrzej M. Lasota assessed the workload and risk of musculoskeletal discomfort (MSD's) in the process of order fulfillment for the position of packer and to conduct an analysis of risk factors.

Chiasson M and D. Imbeau [1] provided postural analysis assessment tool Rapid Entire Body Assessment (REBA) in terms of its development, applications, validity and limitations. Research showed REBA's convenience for postural assessment of jobs in numerous professional settings, including industrial and health care jobs, construction, sawmill tasks, supermarket industry.

Coyle, A.[2] compared the use of two different assessment tools (Rapid Entire Body Assessment versus New Zealand Manual Handling Hazard Control Record) to assess, plan and implement changes in manual handling practices in the supermarket industry.

Dima Al Madani have reviewed, wrote all the paper and contributed to the writing of the manuscript.

Awwad Dababneh have guided and designed the research paper and revised the manuscript.

III. SYSTEM MODEL

Many embedded systems have substantially different designs according to their functions and utilities. The microcontroller located at the centre of the block diagram forms the control unit of the entire project. Embedded within the microcontroller is a program that helps the microcontroller to take action based on the inputs provided by the output of the sensors. This project consists of Renesas microcontroller, Accelerometer, LCD, GSM and an android device.

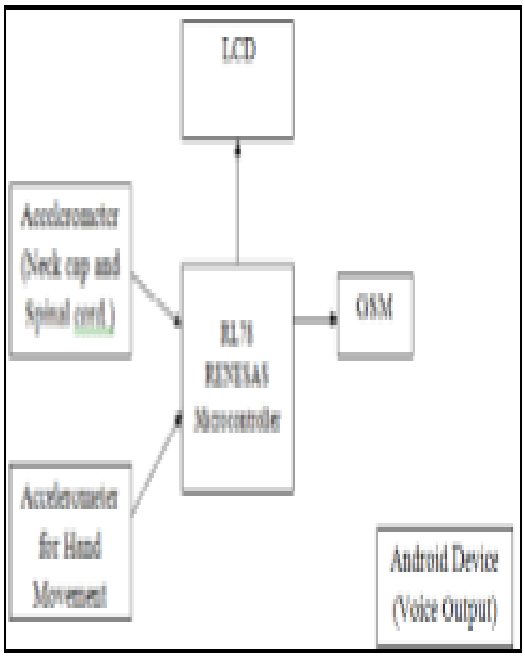

Fig 1:Block Diagram Of Model

If the person wearing these devices is sitting for a long time, also then a voice output will be generated until the person changes from sitting position to standing position or doing some physical activity. Voice output indicating change in position is activated on a periodically basis from time-to-time.

Even sitting posture is corrected using this equipment. Say the person wearing this device is bending more rather than sitting upright, then also a voice output will be generated insisting him to sit upright.

Accelerometer is placed on the back of the palm. When the palm is twisted more towards the right or left side the accelerometer generates an output voltage. This output voltage is fed to the microcontroller. From the microcontroller the processed information is sent to android device via GSM.

In android devices an application is created. On receiving information sent by GSM module, a voice output is generated from the android device using the application created.
For demo purpose LCD is used to display the changes in output voltages of accelerometer and any event occurring.

IV. METHODOLOGY

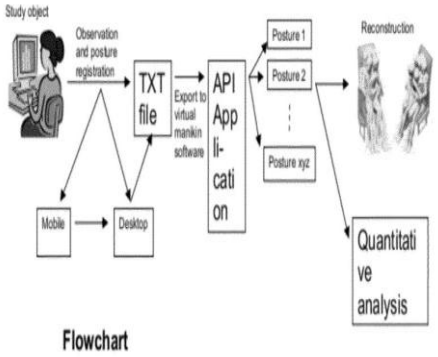

Fig 2:Flowchart Of REBA

A system and method for analysis of steps of action of a person in activity in an environment with potential occlusion and without the need to use of invasive equipment. Non-limiting implementations use posture registration and postural analysis based on an observation protocol that allows reconstruction, in a digital human simulation environment, of the adopted postures observed in a real time situation or by video.

The technology herein relates to system and method for observation, postural analysis and reconstruction, and more particularly to a noninvasive system and method for ergonomics and behavioral analysis in different environments, for example means of transportation including but not limited to aircraft.

V. OUTCOMES

Using the REBA , the evaluator will assign a score for each of the following body regions: neck, eyes and legs. After the data for each region is collected and scored, tables on the form are then used to compile the risk factor variables, generating a single score that represents the level of MSD risk.

Table 1.Level Of Msd Risk

Score	Level of MSD Risk
1	negligible risk, no action required
2-3	low risk, change may be needed
4-7	medium risk, further investigation, change soon
8-10	high risk, investigate and implement change
11+	very high risk, implement change

Table 1: Level Of MSD Risk

REBA assessment tool uses a systematic process to evaluate whole body postural MSD and risks associated with job tasks. A single page worksheet is used to evaluate required or selected body posture, forceful exertions, type of movement or action, repetition, and coupling. REBA is a postural targeting method for estimating the risk of work related entire body disorders. A REBA assessment gives a quick and systematic assessment of the complete body postural risk to a worker.

VI. CONCLUSION

The project is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications. REBA is one of the most popular and widely used observational ergonomic assessment tools in various industries and services. Several studies were reviewed in order to provide an overview of this method's development, applications, validation and limitations so far.

REFERENCES

[1] De Sa, F., M. De Nascimento, A. De Melo, J. Santos and P. Adissi, "Comparison of methods RULA and REBA for evaluation of postural stress in odontological services". Proceedings of the 3rd Conference on Production Research-Americas' Region (ICPR-AM' 06), 2006

[2] Hignett, S. and L. McAtamney, "Rapid Entire Body Assessment (REBA)". Applied Ergonom.,2010.

[3] Joseph, C., D. Imbeau and L. Nastasia, "Measurement consistency among observational job analysis methods during an intervention study. Int. J. Occupat". Safety Ergonom., 2011.

[4] Kee, D. and W. Karwowski,, ".A comparison of three observational techniques for assessing postural loads in industry",2007

[5] Lasota, A., "A REBA-based analysis of packers workload",2014.

[6] Pillastrini, P., R. Mungnai, C. Farneti, L. Bertozzi and R.Bonfiglioli et al., Evaluation of two preventive interventions for reducing musculoskeletal complaints in operators of video display terminals.,2007.

[7] Shanahan, C., P. Vi, E. Salas, V. Reider and L. Hochman et al., "A comparison of RULA, REBA and Strain Index to four psychophysical scales in the assessment of non-fixed work",2013.

[8] Chiasson, M., D. Imbeau, K. Aubry and A. Delisle,, "Comparing the results of eight methods used to evaluate risk factors associated with musculoskeletal disorders". Int. J. Indust. Ergonom., 2012..

[9] Coyle, A., "Comparison of the rapid entire body assessment and the New Zealand manual handling 'hazard control record', for assessment of manual handling hazards in the supermarket industry. Work", 2005.

[10] David, G., "Ergonomic methods for assessing exposure to risk factors for work-related musculoskeletal disorders". 2005

[11] Gentzler, M. and S. Stader, "Posture stress on firefighters and Emergency Medical Technicians (EMTs) associated with repetitive reaching, bending, lifting and pulling tasks. Work",2010

[12] Hashim, A., S. Dawal and N. Yusoff, "Ergonomic evaluation of postural stress in school workshop".2012.