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A Study on the Ergonomic Assessment in the Workplace

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Abstract: Ergonomics has gained attention and take into consideration by the workers in the different fields of works recently. It has given a huge impact on the workers comfort which directly affects the work efficiency and productivity. The workers have claimed to suffer from the painful postures and injuries in their workplace. Musculoskeletal disorders (MSDs) is the most common problem frequently reported by the workers. This problem occurs due to the lack of knowledge and alertness from the workers to the ergonomic in their surroundings. This paper intends to review the approaches and instruments used by the previous works of the researchers in the evaluation of the ergonomics. The two main assessment methods often used for ergonomic evaluation are Rapid Upper Limb Assessment (RULA) and Rapid Entire Body Assessment (REBA). Popular devices are Inertial Measurement Units (IMU) and Microsoft Kinect.

INTRODUCTION

Ergonomics is the study of the relationship between the workers and the working environment. It is vital for the workers to concern and realizes the potential ergonomics risk factors around their workplace as the consequences are fatal like death and disability. The examples of the potential ergonomics risk factors include repetitive motion, static posture, heavy lifting, forceful exertion, expose to excessive vibration and etc. [1]. The lack of alertness by the workers on the existence of the potential ergonomics risk factors at their surroundings might endanger their safety and health.

In Malaysia, Department of Occupational Safety and Health (DOSH) is established to protect the safety, health, and welfare of the person in the workplace from any occupational hazard [2]. Investigation on the occupational accidents by sectors has been done by DOSH annually for data analysis [3]. Fig. 1 has summarized the findings of DOSH from year 2014-2016 which distributed into three level of severity like death (D), Non-Permanent Disability (NPD) and Permanent Disability (PD). At the year 2014, there is a total number of 2805 occupational accidents being reported by DOSH. The total number of occupational accidents has shot up to 3345 cases at the year 2015 which is an increment of 19.25% or 540 cases as compared to the year 2014. At the year 2016, the total number of occupational accidents continues to give a rise of 12.11% or 405 cases up until a total number of 3750 cases. As the summarization to occupational accidents reported by DOSH, it appears that the condition is not optimistic since the cases are in upward trend in these few years.

Several studies have been done and reported regarding the work-related health issues from different work fields like health care professions, agriculture, industries and etc. [4-13]. According to the studies, most of the employees claim to have painful posture experience from neck, shoulder, lower back, upper limb, leg and etc. due to lack of

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knowledge and awareness on the ergonomics in the workplace. These issues pose the workers the risk of Musculoskeletal Disorders (MSDs). MSDs are the soft tissues injuries which include, muscles, tendons, ligaments, joints, blood vessel, nerves and etc. [1] . The victims who were suffered by MSDs should receive treatment as early as possible. The severity of MSDs will be deadly as it may lead to conditions like numbness, tingling, stiff joints, moving disability, muscle loss and paralysis [1].

As the solution to the raised issues, it is important to have ergonomics assessments on the workers at different work fields. The potential risk of ergonomics can be determined by going through appropriate ergonomics assessments with different kinds of approaches and devices. This paper presents a review on the studies on the ergonomic assessment which could be used as a reference for other researchers from the same field of study. Several types of ergonomics assessment methods and devices are reviewed and compared to reveal their strengths and weaknesses.

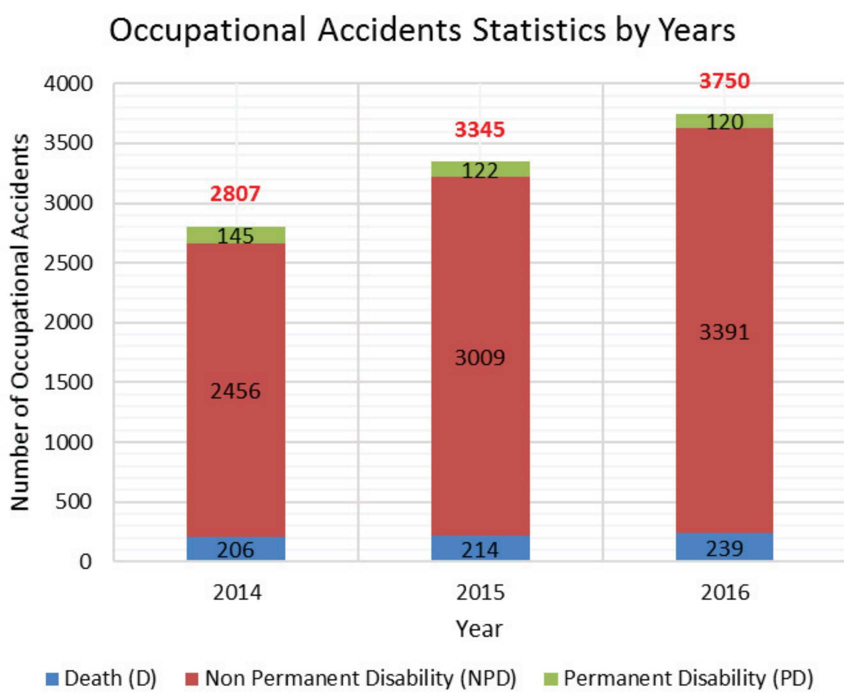

FIGURE 1. Occupational Accidents Statistics by Years

ERGONOMIC ASSESSMENT METHODS

Ergonomic assessment methods are vital to determine the risk factors and evaluate the risk level of ergonomics exist in the working environment. In this section, two types of ergonomic assessment methods have been chosen to be reviewed. The methods chosen are Rapid Upper Limb Assessment (RULA) and Rapid Entire Body Assessment (REBA). These two methods are the popular methods which are often referred by the researchers in the study of ergonomics.

Rapid Upper Limb Assessment (RULA)

McAtamney et al. [14] have introduced rapid upper limb assessment (RULA) at the year 1993. This tool is a survey-based method which evaluates the risk of ergonomics affiliate with work-related musculoskeletal disorders (WMSDs) at different workplaces. It does not require any instrumentation for ergonomics assessment which makes it simple, quick and observational. RULA evaluates the risk factors like movement, posture, exertion force, repetition, and work duration of several body parts which include upper arms, lower arms, wrist, neck, trunk, and legs by using the RULA employee assessment worksheet [14]. The important steps of the RULA assessment are listed in Table 1. The final score of the assessment is distributed into 4 degrees of severity of the risk of ergonomics such as score 1-2 represents acceptable posture; score 3-4 represents further investigation, change may be needed; score 5-6 represents further investigation, change soon and score 7 represents investigation and implement change [14-16].

TABLE 1. Steps of RULA assessment

Analysis	Step	Description
Arm and Wrist Analysis	1.	Locate Upper Arm Position
	2.	Locate Lower Arm Position
	3.	Locate Wrist Position
	4.	Locate Wrist Twist Position
	5.	Determine Posture Score A
	6.	Add Muscle Use Score
	7.	Add Force/Load Score
	8.	Find Row in Posture Score C
Neck, Trunk and Leg Analysis	9.	Locate Neck Position
	10.	Locate Trunk Position
	11.	Determine Legs Condition
	12.	Determine Posture Score B
	13.	Add Muscle Use Score
	14.	Add Force/Load Score
	15.	Find Colum in Posture Score C
	16.	Determine Final Score (1-7)

Gandavadi et al. [17] have assessed the working posture of dental students during the teeth operation in two seating condition by using RULA assessment. 60 dental students are randomly selected and evenly divided into two groups of different seats which are Bambach Saddle Seat (BBS) and conventional seat (CS). According to the results of RULA assessment, the students with BBS during teeth operation has a lower score as compare to CS. It shows that BBS has lower posture risk and shows improvement in the ergonomic of dental students.

Singh et al. [18] have done a study on the Musculoskeletal Disorder (MSDs) risk assessment of workers in small scale forging industry with RULA method. A total number of 102 workers with different work processes has participated in the study of MSDs risk assessment. The work processes are such as shearing, furnace unloading, forging, grinding and picking and placing. From the results obtained, 45.4% workers score 3-4 which have lower risk level; around 34.33% workers score 5-6 which have medium risk level and around 20.33% workers score 7 which have high risk level. The assessment indicates that there is room for improvement on the risk of ergonomics of the workers in the small scale forging industry.

Sharan et al. [19] have done a study on the relationship between the ergonomic risk and the RULA assessment in computer professions. A total number of 620 IT workers with the average age of 28.45±10.4 years, average height of 163.45±9.35 cm and average weight of 61.45±7.44 kg have participated in the case study. The postures of the IT workers are assessed during the use of the computer in their workplace. From the results obtained, 65% of workers are at low risk level, 30% of workers are at medium risk level and 15% of workers are at high risk level. It shows that improvement on the ergonomics of the IT workers is needed in terms of the working environment, working hours and sitting posture.

Mohamad et al. [20] have analyzed the WMSDs of the worker in packaging industry by using RULA method and Digital Human Modelling (DHM) The interested posture of the worker is the repetition on the load lifting of the 39.4kg weighted product. The whole process of load lifting is recorded and divided into 5 different postures. All the postures are reconstructed using DHM which implement the posture of the worker in 3D graphical interface. The CATIA P3 V5R14 software is selected for RULA assessment on DHM of the worker in all different postures. The outcome of the study shows that the worker is suffering from heavy load lifting and compensated posture.

Norhidayah et al. [21] have done the evaluation on the MSDs risk among mining industry workers by using RULA method. 18 workers which concern with the age group from 19-36 years and the working experience from <1 year to 5 years are randomly selected for the assessment. The posture studied is the scenario of wet screening the raw mining material with manual handling water hose. The whole study is distributed into 3 assessment like morning, noon and afternoon. According to the results, the mean scores for every assessment get score 7 which is the highest in RULA assessment. This shows that immediate action is need to be taken on the posture of the workers in mining industry as they are exposed to high MSDs risk.

Rapid Entire Body Assessment (REBA)

Hignett et al. [22] have developed Rapid Entire Body Assessment (REBA) at the year 2000. REBA shares the same principle as RULA with regard to the procedure on the evaluation of risk factors and designated body parts for assessment. The main difference between both methods is the assessment on the field of professions. REBA shows better results in the ergonomics evaluation of health care and service industries professions but not in production line work profession. REBA is a better tool for whole body assessment as compare to RULA which more focus on the upper body assessment. Table 2 shows the important steps of REBA assessment by referring REBA employee assessment worksheet [22]. The final score of the REBA assessment is different with RULA assessment which divided into 5 degrees of severity of the risk of ergonomics such as score 1 represents negligible risk; score 2-3 represents low risk, change may be needed; score 4-7 represents medium risk, change soon; score 8-10 represents high risk, investigation and implement change and score 11 represents very high risk, implement change [16, 22, 23].

TABLE 2. Steps of REBA assessment

Analysis	Step	Description
Neck, Trunk and Leg Analysis	1.	Locate Neck Position
	2.	Locate Trunk Position
	3.	Locate Legs Position
	4.	Determine Posture Score A
	5.	Add Force/Load Score
	6.	Find Row in Posture Score C
Arm and Wrist Analysis	7.	Locate Upper Arm Position
	8.	Locate Lower Arm Position
	9.	Locate Wrist Position
	10.	Determine Posture Score B
	11.	Add Coupling Score
	12.	Find Colum in Posture Score C
	13.	Add Activity Score
	14.	Determine Final Score (1-11)

Singh et al. [13] have assessed the working postures and the risk of WMSDs of the workers in Indian Electronics Industries with RULA and REBA methods. The workers have reported having MSDs due to the improper working postures and handling techniques during manual lifting. Delmia software is used for both RULA and REBA assessment. From the final results obtained, RULA assessment has scored 6 which is medium risk level while REBA has scored 11 which is high risk level. The results revealed that the workers are exposed to high risk of ergonomics which may endanger ensure the safety of workers.

Lasota [24] has conducted a research on a company that sells books to analyse the ergonomics of the workers by using REBA assessment. The tasks of the case studied are order picking, carton sealing and sorting parcels. All the tasks studied are allocated along the conveyer belt. The outcome of the assessment shows that 5 postures are at medium risk level, 7 postures are at high risk level and 1 posture is at very high risk level. This concludes that the overall score of the workers postures is not acceptable. The main risk factor determined is the awkward posture of the worker's.

Ansari et al. [25] have done a case study on the posture analysis of the workers in small scale factory by using both RULA and REBA assessments. A total number of 15 workers with average height 168.34±2.69cm, average age 35.8±3.02 years, average weight 63.6±6.66kg and average experience 11.2 years are involved in the assessments. The RULA and REBA assessments on the posture of workers are calculated using Ergointelligence™ software. From the results obtained, RULA assessment shows that 13% workers are at low risk level, 47% workers are at medium risk level and 40% percent workers are at high risk level. REBA assessment shows that 13% workers are at low risk level, 33% workers are at medium risk level and 53% percent workers are at high risk level. Results from both RULA and REBA assessments indicates that most of workers are exposed to medium to high risk level at their workplace.

Hembecker et al. [12] have conducted ergonomics evaluation on a packaging workstation in an electrical supplies industry using REBA assessment since the workers often complaint to have upper-limb musculoskeletal discomfort during work. 14 women workers with at least a year experience are selected for the posture investigation on the electric supplies packaging process. The processes are assessed by dividing into 5 different sessions which include manual product feeding, product packaging, hot glue sealing, box weighing and labelling and lifting boxes. The result shows that both the sessions on hot glue sealing and lifting boxes have score 10 in RUBA assessment. It also means that the workers are at high risk level. The workstation need to be modified to improve the ergonomics of workers.

Fazi et al. [11] have analysed the ergonomic of the workers at food production industry using both RULA and REBA assessment. 3 workers with different gender and height range from 150-180cm are selected for the case study which are worker A, B and C. The posture studied are divided into posture 1 and posture 2. Posture 1 is products lifting from one place to another while posture 2 is arranging products. According to the assessment, worker A scores the highest in both RULA and REBA assessment with different postures as compare to worker B and C. The result shows that worker A need to be transferred to the different workstation as the height of worker A is not suitable for the study area.

Discussion on Ergonomic Assessment Methods

RULA and REBA are well known as survey-based methods. Both methods share the same scoring techniques which categorized the postures and exertion force of the subject with different risk levels by considering the parameters like gender, age, height, weight, working experience and etc. Both methods are made to be simple which is easy for the workers to learn and master without using any difficult skills; and quick which no special instrumentation is needed for any measurement on the movements, angles and postures. The factors that distinguish both methods are the field of profession and the type of postures assessed. REBA shows better results in the ergonomics evaluation on the professions which include dynamic and unpredictable postures like health care and service industries. RULA is more suitable to measure static postures with repetition of the same action like production line work profession. Furthermore, RULA is a better tool for upper body assessment while REBA is a suitable tool for entire body assessment. The comparison on the suitability of the ergonomics assessment methods to the subject studied is shown as Table 3.

TABLE 3. Comparison on the suitability of the assessment method to the subject studied

Authors	Assessment Methods	Work Field	Parameters	Postures	Suitability
Gandavadi et al. [17]	RULA	Dental student	-	Teeth operation	Suitable
Singh et al. [18]	RULA	Small scale forging industry	-	Shearing Furnace unloading Forging Grinding Pick and place	Less Suitable
Sharan et al. [19]	RULA	IT	Age Height Weight	Sitting	Suitable
Mohamad et al. [20]	RULA DHM	Packaging industry	-	Load lifting	Suitable
Norhidayah et al. [21]	RULA	Mining industry	Age Experience	Wet screening	Suitable
Singh et al. [13]	RULA REBA	Electronics Industry	-	Manual lifting	Suitable
Lasota [24]	REBA	Books company	-	Order picking Carton Sealing Sorting parcels	Less Suitable
Ansari et al. [25]	RULA REBA	Small scale factory	Age Height Weight Experience	Not specified	Suitable
Hembecker et al. [12]	REBA	Electrical supplies industry	Gender Experience	Product feeding Product packaging Hot glue sealing Lifting boxes Label and lift	Less Suitable
Fazi et al. [11]	RULA REBA	Food production industry	Gender Height	Product lifting Product arranging	Suitable

According to the findings from Table 3, it shows that the ergonomic assessment methods must be applied accordingly to the profession and posture in order to get more accurate result. There are exceptional cases in which the ergonomics assessment methods are not applied accordingly to the profession but the results acquired are correct and vice versa. This indicates that the applied ergonomics assessment methods must not consider professions as the only factor. Postures is the most important factor as compared to profession. For the case studies which applied both RULA and REBA method, it shows the better results because the final score from both assessments is referred to obtain the best within them.

ERGONOMIC ASSESSMENT DEVICES

Ergonomic assessment devices are crucial as the support instrument for the ergonomic assessment methods. Most of the ergonomic assessment methods are the observational or survey-based methods which evaluate the risk of ergonomics without proper measurement. The aid from the device may increase the accuracy of the ergonomics assessment. In this section, the Inertial Measurement Unit (IMU) and Kinect (imaging) are chosen as the devices to be reviewed due to some reasons. For IMU, it is the most popular and traditional sensor used by the researchers for ergonomics assessment. For Kinect, the device shows an upward trend on the applications of ergonomics assessment and other fields of studies using imaging techniques.

Inertial Measurement Units (IMU)

Inertial Measurement Units (IMU) is a device which measures static angular displacement with respect to g-line, linear accelerations and angular velocities of an object in orthogonal directions. It is built with the combinations of accelerometer and gyroscope or sometimes with a magnetometer in addition of obtaining an additional directional reference beside g-line. Accelerometer is a device that measures the physical accelerations of the object in translational movements like sway, surge and heave. Gyroscope is a device that measures the orientations of the object which consists of row, yaw and pitch. Magnetometer is a device that measures the directions of the magnetic field.

Vignais et al. [26] have developed an innovative system for real-time ergonomic assessment in industrial manufacturing. The assessment is done by referring RULA scoring sheet. The joint angles and orientations are calculated by using IMU units. The IMU units are placed at the different landmarks of the worker which include upper arm, forearm, head, trunk and pelvis. Goniometer is used to synchronize the networking of the IMU units. The upper body of the worker is then interpreted in biomechanical model which provides 20 degrees of freedom (DoF). From the findings from the experiment, the system has advantages on the freedom of the movement and in-field application. The main disadvantage of the assessment is the magnetic disturbance from the IMU units.

Li et al. [27] have presented a Smart Safety Helmet (SSH) to detect the risk of ergonomics of the workers in the industries. SSH consists of IMU units and EEG sensors. The IMU units are used to measure the head gestures of the users. The EEG sensors are used to determine the brain activities or the mind state of the users. The overall system is controlled by the artificial intelligence module which interprets and evaluate the risk factors of the workers according to the raw data received from the sensors. The risk factors considered are the probability of occurrence, the severity of mishap, and exposure. The results reveals that SSH is able to identify the relationship between the motions of head and the mind state of the workers. The main disadvantage is that the device unable to provide the information on the body movement and posture.

Chen et al. [28] have proposed a coupled system which consists of the Kinect and IMU unit which cover up each other's limitations and provides a more flawless system. It is able to detect the occupational hazards of manual lifting in construction companies. Kinect is used to synchronize the motion of the subject to the skeletal tracking system with its 3D-mapping function. It also can measure the physical feature of the subject like height and body shape which is not able to be done with IMUs However, the performance of the application is limited with several factors like light conditions, joint occlusion and misrepresentations. IMUs are used to make up the shortcomings of the Kinect. IMUs are able work independently and collect the data of motion without being affected by the light condition. The overall performance of the coupled system indicates that the accuracy of posture measurement has increased as compare to the separate system of Kinect and IMUs.

Peppoloni et al. [29] have developed an upper limb wearable device to assess and measure the force exerted by the muscle and the postures of the upper limb of the subject for ULMSDs assessment. IMU and EMG sensors are applied to the device on ergonomics assessment. IMU is used to measure the motion and posture of the subject. EMG is used to assess the force exerted by the muscle. The output signals from both sensors are referred to study the relationship between the force exerted by the muscle and the posture of the upper limb during a task has been done by the subject. The result of the device is then compared with traditional RULA assessment to determine its reliability and performance. The result indicates that the device has the capability to determine the risk of ULMSDs. The only disadvantage of the application is the assessment only limited to upper limb.

Yan et al. [30] have proposed a wearable IMU-based real-time motion warning system to raise the awareness of the construction workers to prevent MSDs. This device connects with smartphone application which warns the workers directly when discomfort posture is detected. The smartphone application is provided with real-time data process algorithm and warning thresholds algorithm. The real-time data process algorithm collects and process the raw posture data from the subject. The warning threshold algorithm sends a warning signal to the subject if the analyzed data go beyond the threshold. According to the evaluation of the performance, this device works well with the construction workers. The weakness of the device is the energy efficiency that the device can only operate for a short while.

Kinect

Kinect is a motion sensing input device that is developed by Microsoft at year 2009. The device was first introduced at E3 2009 as a game console. Recently, the researchers realize that the device has a great potential in other fields of studies like robotics, imaging, sports science and healthcare [31-34]. The device consists RGB camera, depth sensor and multi-array microphone in it which has a number of functions like facial recognition, motion recognition, 3D mapping and voice recognition. A number of previous works done by the researchers have been reviewed on the evaluation of the performance of Kinect in ergonomics assessment.

Dutta [35] has evaluated the performance of the Kinect sensor in assessing the risk MSDs in the workplace. The Kinect sensor is selected as it is a compact, portable and low-cost equipment with the functionality of 3-D motion capture which enables the user to conduct ergonomics assessment in more simple and convenient way. Several actions have been done to obtain the configuration of the Kinect such as the calibration of depth camera using checkerboard and pilot testing to determine the distance of detection. The system is evaluated in terms of software requirements, hardware requirements, accuracy, the effective field of view, object detection and usability as a 3-D motion capture. From the evaluation, the author concludes that there still limitation exist in the software of the current system used and further development may enable the device to be used for ergonomics assessment.

Diego et al. [36] have investigated the possibility of using a Kinect sensor as the device for ergonomics assessment. The performance of the device is evaluated by comparing the results obtained from a posture assessment with OWAS. OWAS is an observational method for posture analysis. The assessment is done by using Kinect joint tracking algorithm to detect the movement of the 20 coordinates on the human body. Delphi XE is selected as the software for data retrieval and data processing. According to the findings, Kinect has shown similarity in the result as compare to the OWAS assessment from the expertise. Besides that, the orientation of the camera is found out as the main factor that affects the results of assessment.

Haggag et al. [37] have done research on the application of Kinect to assist the real time RULA assessment for assembly operation in industrial. Microsoft software development kit (SDK) is selected as the software to operate the Kinect. SDK has provided with the skeletal tracking function which enables the Kinect to be activated without calibration done. The RULA is then assessed by using voxel-based estimation method to calculate the joint angles of the postures. From the assessment, three challenges have been realized which may give impacts to the results obtained. The three challenges are the determination of voxel size, joint occlusion and hand tracking. The strength of the device are simple to use, portable and small in size.

Paliyawan et al. [38] have done a study on the sitting behavior of the office workers by using data mining classification on a posture monitoring system. The system capture and record the real-time data from the Kinect and calculate the ergonomic health level of the studied subject through the classification model built from the data set training. The performance of the classification model is evaluated by comparing with others classification methods like decision tree, neural network, naive Bayes and k-Nearest Neighbors. According to the results obtained, the proposed system is able to assess the ergonomics of the office workers with 98% accuracy and classify the ergonomic health level of the workers into 3 states like healthy, caution and unhealthy. The disadvantage of the device is lack of information on body posture.

Martin et al. [39] have developed a real-time ergonomic monitoring system using Kinect. The system is designed to analyse the ergonomics of the prolonged standing employees in the industries. SDK is selected as the software to operate the Kinect because calibration is not needed to ignite the skeletal tracking features. In this project, design iterations method is used to improve the performance of the system gradually. The output of the project shows that the system is able to measure the strain of the workers successfully after several iterations are conducted but with a few existed limitations on the system that need to pay attention to. Besides that, this system is able to export information captured to the database automatically and efficiently. The limitations are such as joint occlusion and smoothness of motion tracking.

Discussion on Ergonomic Assessment Devices

IMU is the most popular method frequently used by the researchers on the ergonomics assessment or posture measurement. IMU is able to measure the linear acceleration and angular velocity in translational and rotational directions of the subject with respect to the line of gravity. IMU is better in terms of reliability and robustness. The only problem exist in IMU is the magnetic disturbance created from the feedback of the magnetometer. As for Kinect, it is a more recent technology applied in wide variety of researches. Kinect is a cheaper and portable device with features like facial recognition, motion recognition, 3D mapping and voice recognition. The skeletal tracking function is often used for posture measurement. The device synchronizes and captures the movement of the subject through its 3D mapping function without adding any extra load on the subject's body. The posture of the subject is measured with the aid of other extra software. Kinect shows different experience in ergonomic assessment but the device is still under construction before it is ready to be commercialize. Kinect has the limitations on light condition, voxel size, joint occlusion, hand tracking and smoothness of the motion tracking. Table 4 shows the comparison on the features of different assessment devices used in ergonomic assessments.

TABLE 4. Comparison on the features of different assessment devices used in ergonomic assessment

Authors	Assessment Devices	Materials	Cost	Reliability	Accuracy
Vignais et al. [26]	Innovative System	IMU Goniometer	High	High	High
Li et al. [27]	Smart Safety Helmet (SSH)	IMU EEG	High	Medium	Medium
Chen et al. [28]	Coupled System	IMU Kinect	Medium	High	High
Peppoloni et al. [29]	Upper Limb Wearable Device	IMU EMG	Low	High	High
Yan et al. [30]	IMU-based Real-time Motion Warning System	IMU Smartphone	Medium	Medium	Medium
Dutta [35]	Kinect	Kinect	Low	Medium	Medium
Diego et al. [36]	Kinect	Kinect Delphi XE	Low	Medium	Low
Haggag et al. [37]	Kinect	Kinect SDK	Low	Medium	Medium
Paliyawan et al. [38]	Posture Monitoring System	Kinect	Low	Medium	High
Martin et al. [39]	Real-time Ergonomic Monitoring System	Kinect SDK	Low	Medium	Low

According to findings in Table 4, the features of the ergonomics assessment methods are compared in terms of cost, reliability and accuracy. In terms of cost, the Kinect based devices shows lower cost as compare to the IMU based devices. Kinect based devices come in complete unit with built in software itself in which no extra expenses are paid for other parts. For IMU based devices, extra cost will be charged for every hardware parts. In terms of reliability, the IMU based devices is more reliable than the Kinect based device since IMU based devices are more established. In terms of accuracy, the results might be vary in which it is dependent on the performance of the ergonomic assessment devices developed by the researchers.

SUMMARY

This paper has presented a review of the different types of methods and devices used in ergonomics assessment but it is not only limited to the approaches as stated in this paper. The strength and weakness of the methods and devices are highlighted in this paper which will be useful as a reference for future works. For ergonomics assessment methods, RULA and REBA are evaluated and compared by referring the parameters, professions and postures of the case of studies from different researchers. Both survey based methods show their importance to assess the risk of ergonomics of the workers at their working environment with the condition on applying them relative to the professions and postures. For ergonomics assessment devices, IMU and Kinect on different applications are compared to determine their performance, reliability and features. According to the findings, IMU based devices show more promising result while Kinect based devices still have room for improvement in the future works. In conclusion, it is vital for the workers to realize the importance of the ergonomics to assess potential ergonomics risk factors existed around their work place. The raise of awareness of the workers towards these matters may save their life from any hazardous activities or places.

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