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Ergonomics in Education: A Multiparametric Analysis of Seating Workstation

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ABSTRACT

Prolonged sedentary behavior, particularly in tertiary education settings, can lead to significant musculoskeletal discomfort and potential health issues, negatively impacting students' learning experience and academic performance. This study employed the Rapid Upper Limb Assessment (RULA) method to analyze the ergonomic efficiency of seating workstations in a tertiary institution by methodologically estimating the range of human sitting postures, the creation and use of a manikin model in CATIA for simulation, and the calculation of RULA score to assess the ergonomic efficiency in seated workstations. The findings show significant ergonomic concerns in neck and trunk posture which emphasizes the need for ergonomic adaptation. By improving the ergonomic design of workstations, we aim to enhance student comfort, reduce musculoskeletal disorders, and ultimately improve overall academic performance and well-being. This research provides valuable insights for tertiary institutions to create more ergonomic learning environments, fostering a healthier and more productive student body.

1. Introduction

Ergonomics is a multidisciplinary field combining understanding from human anatomy, engineering, statistics, and physiology to understand more deeply on human capabilities and limitations. The ergonomics' goal is to increase human performance in many different types of tasks by exploiting this knowledge. Since the industrial era has progressed, sitting has been a common posture in workplace and surely in the educational environment. This can lead to risks if joint positions are not naturally aligned. Even while seated, students perform movements like pushing, pulling, and rotating, which impact joint positions and can cause strain. Chairs and seats are designed to reduce physical strain during work. Although sitting can provide relief after extended periods of standing or walking, its comfort and effectiveness depend on proper alignment. Prolonged poor posture while seating can pose some issues related to backbone such as lower back pain and will

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result in Work-Related Musculoskeletal Disorders (WMSD) [1]. Posture-related discomfort is caused by a variety of circumstances and frequently results in weariness or injuries. While bad posture is frequently linked to lumbar spine ailments, other body parts, such as the hands, neck, and legs, can also become fatigued when not enough support is given during extended activity. Resources like those offered by the Department of Safety and Health Malaysia contain guidelines for suggested seated postures and chair measurements. Maintaining proper posture helps reduce the hazards connected with it and provide a more relaxed and encouraging work or studying atmosphere [2].

The modern educational landscape has undergone significant transformation, with increased reliance on digital technologies and prolonged sedentary behaviors. This shift has raised concerns about the potential negative impact on students' physical and cognitive well-being. Poor ergonomic design of seating workstations can lead to musculoskeletal disorders, reduced concentration, and decreased academic performance. In conventional studying environments, students' physical comfort is not given top priority.

The ergonomic design of chairs and other workstation furnishings is very important for ensuring students' comfort in classrooms [3] when studying or working on assignments for extended periods of time while sitting. In the current era of remote education, many students were subjected to studying from home. Unfortunately, when they do not have suitable workstation arrangements at their home, they occasionally turn to utilizing common furniture that is not meant for prolonged sitting as a workstation. The majority of home furnishings are made with temporary use in mind which prioritizes beauty over ergonomics. The lack of appropriate ergonomic support in their temporary workstations that are not suitable for them will increases the risk of musculoskeletal diseases (MSD) amongst users [4]. Numerous suggestions have been made regarding the proper height for dining table and chairs based on research. According to Mandal (1982), the chair should be at least one-third the height of the person and the table should be at least half that of the person. So far, there has not been a successful study to prove that the height of the dining table and chair is suitable for prolonged sitting, but studies have proven that dining tables are not concerned about ergonomics. Jung [20] designs a prototype of an adjustable table and chair that stress the requirement for furniture design flexibility due to variations in human anthropometric dimensions. Meanwhile, according to Sydor [15], chair dimensions can be created by considering the users' height range.

Research proves that extended sitting and poor posture while sitting are main contributors to lower back pain and WMSDs [5]. Sitting posture is basically considered as the most unfriendly body posture because it tends to force the spine into an unnatural alignment [6] if not done correctly. This condition will lead to negative impact on the body. In this case, proper ergonomic desk design plays an important role in maintaining proper posture and also help in reducing the risk of musculoskeletal or other issues related to the back bones. Much research has explored how different aspects of workstations like chair design, table height, monitor position, and the placement of the keyboard and mouse, will impact human posture while working. As stated by W. Marras in the Occupational Ergonomics Handbook, typical activities such as sitting in office chairs, focusing intently on computer screens, and prolonged sitting can contribute to poor posture [7]. Over time, having uncomfortable posture all the time can develop into a habit and this habit will increase back pain and the likelihood of spinal injuries [8].

The Rapid Upper Limb Assessment (RULA) method, a widely recognized ergonomic assessment tool, was employed to assess the risk of work-related musculoskeletal disorders associated with different workstation configurations. It allows a swift evaluation of neck, trunk, and upper limb postures, as well as muscle function and external loads on the body. The method uses three scoring tables and body position representations to assess exposure to risk variables [9]. RULA is a popular evaluation technique that helps users become more productive and efficient. Joint positions and body parts were taken into consideration individually. According to M.F. Ghazali, the posture of the subject was assessed before a final score was resolved [10]. RULA also has accurately predicted employment with a high risk of musculoskeletal diseases [11]. Pertaining to this, anthropometric, biomechanical, and hygienic considerations should be made when constructing any type of equipment [12].

This research is focused on studying the multiparametric effects on the anthropometry of the upper human body of students [13] when they use a seated workstation which is the most common workstation [14] used in the entire tertiary education be it at the tertiary institutions or their homes. A multiparametric study of the various upper limb body parts and cross interaction with the workstation height parameters has not been studied before to assess the effect on users in particular the Asian tertiary students' demography. By systematically evaluating factors such as seat and table height, and upper limb body parameters [15,16], this study aims to identify critical ergonomic stature and workstation parameters that contribute to student discomfort and fatigue. Understanding the relationship between ergonomic design and student health is crucial for creating optimal learning environments. By optimizing workstation design, educational institutions can enhance student comfort, reduce musculoskeletal complaints, and improve overall academic performance. This research provides valuable insights for educators, policymakers, and furniture manufacturers to promote healthier and more productive learning spaces.

2. Methodology

Essentially, the intention of this study is to model and assess the students' posture at a working table while seated. Through an emphasis on ergonomics and comfort, the study investigates how students interact with the table and arrange themselves throughout various tasks. As a way to improve user experience and health, the simulation aims to evaluate and analyse various postures and different height of table and chair in order to provide insights into how best to build and operate tables and sitting layouts.

2.1 Data Collection

The project requires a range of data for modelling, simulation, and analysis which are obtained from a combination of physical measurements and literature reading. The selected workstation for analysis is based upon a standard tertiary education set up. The sample parameters comprised the sizes of the tables and the configuration of seats. The dimensions of the table and chair as illustrated in Figure 1 was taken by using a measuring tape and the figure below show the recorded parameters values. The original height of the table and the chair is also recorded but for the simulation, the heights will change for each experiment according to the appropriate range of table and chair height for dining table, based on the literature review.

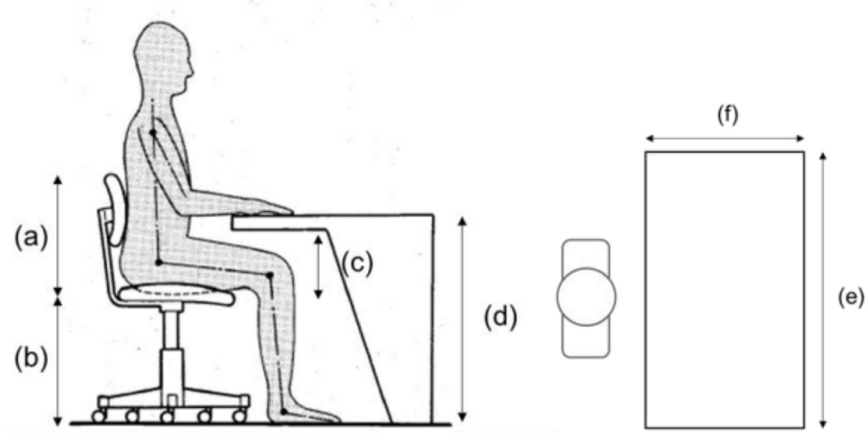


Fig. 1. Measurement parameter for the workstation

Table 1
Parameters of the workstation measured in milimetre

No.	Dimension	Workstation
(a)	Back Support Height	400
(b)	Chair Height	450
(c)	Leg Clearance	300
(d)	Table Height	710
(e)	Table Length	1400
(f)	Table Width	900

2.2 Redesign Workstation 3D Model

Using CATIA V5, the 3D model of the seated workstation was recreated using the dimensional parameters from Table 1. Predetermined parameters were observed while integrating a manikin with an initial sitting posture into the digital world.

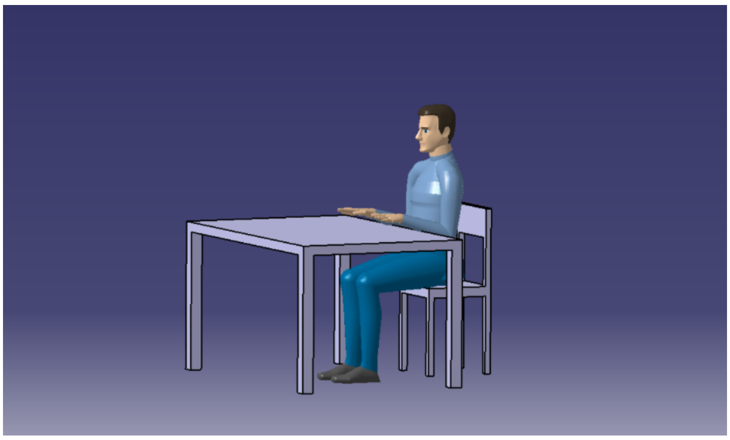


Fig. 2. Seated workstation model

The sitting posture of a person is not static. It varies minute by minute when performing any given activity. Moreover, the anthropometry of the human model must be ascertained as it may affect the ergonomic study. The software has a human builder function that helps to create the digital-human model. Anthropometric variables from the literature review are used for changing the anthropometry of the current model used in the software to ensure a proper fit. Thus, a review of journal literature has been done to ascertain the anthropometry of the human figure in particular the stature that represents a standard Asian student. The anthropometry measurements that were extracted from the journals are shown in the Figure 3 below [17] and the corresponding measurements are given in Table 2. This anthropometric stature fits the size of a standard Asian student in a typical tertiary education environment.

Table 2
Anthropometric measurement applied in Manikin design (in milimitres)

No.	Anthropometric Dimension	Mean	Standard Deviation	95th Percentile
1	Stature	1565.00	59.57	1663.31
2	Eyes Height	1451.15	100.52	1617.01
3	Sitting Height	792.86	76.52	918.59
4	Hand Length	173.37	15.24	198.52
5	Sitting Eyes Height	679.08	72.69	799.01

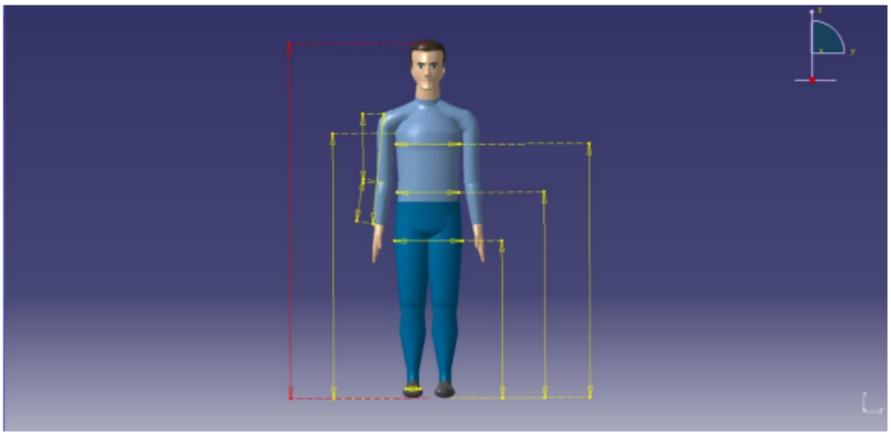


Fig. 3. Anthropometric manikin editor

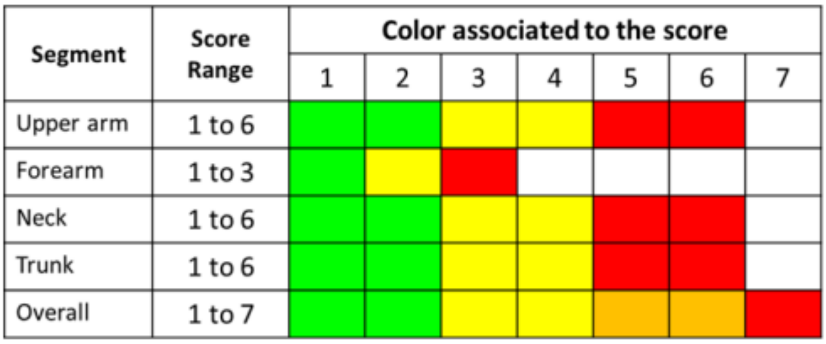
2.3 Parameter Selection and Generation through Latin Hypercube Sampling

With a focus on ergonomics factors involving seating design and postural range, the review aims to clarify the connection between posture and student fatigue in sitting workstations. A detailed review of the literature is important to identify human parametric stature impact on exhaustion in seated workstations. A thorough search was performed to identify key parameters that contribute to fatigue and injury whilst using seated workstations. The key parameters identified are lumbar flexion, lumbar twist, head flexion, head rotation, clavicular flexion/extension, arm abduction and forearm pronation [22-24]. Additionally, the height adjustments to the table and chair [20] is also taken in as parameters to provide a comprehensive analysis. A specific set of maximum allowable range is assigned to each of these parameters and these range values are adapted from various literature [1,20,23-24].

Students will gradually develop a variety of position angle combinations involving different joints as a result of their constantly changing posture. To analyse this random combination, Latin Hypercube Sampling will be used, which can generate near-random sample collections of parameter values across small to large design regions. A single sample can only be stored in each axis-aligned hyperplane within the Latin hypercube [18].

2.4 RULA Analysis

The RULA tool is a very efficient method to perform ergonomic assessments. This tool provides a rapid analysis of the way the human body reacts to different body postures. Using a grading system, this diagnostic tool analyses a person's posture within a suitable range. The score will be depending on the angle of each limb which will be assigned after the assessment. As limbs or body regions deviate from the optimal natural posture, the scores will range from 1 which indicates minimal to no risk to a maximum score of 7 which indicates that severity in fatigue and sure need for interventional measures. Figure 4 shows the range of scores for each limb. With the aid of this evaluation tool, the computational experiment samples generated using Latin Hypercube Sampling in CATIA V5 will be simulated and examined. By using the manikin features in CATIA and sample values generated by LHS, a human's body posture will be reproduced. An analysis of the human response will be conducted, and the RULA score table will be generated by the simulation [19].



Segment	Score Range	Color associated to the score						
		1	2	3	4	5	6	7
Upper arm	1 to 6							
Forearm	1 to 3							
Neck	1 to 6							
Trunk	1 to 6							
Overall	1 to 7							

Fig. 4. Color-coded score range list of RULA

3. Results and Discussion

3.1 Parameter Sample Generation

In the context of ergonomics within tertiary education settings, the computational experimental samples were generated using Mathlab software through the Latin Hypercube Sampling method. A total of 27 samples were generated. This sampling methods is known for it's robust space filling samples which does fair and justified coverage on the design space and allows a comprehensive exploration of the potential ergonomic scenarios. The nine parameters selected are expected to reflect common classroom and study environments amongst tertiary students.

The influence of various parametric variations as shown in Table 3 and 4, on the posture of a digital Manikin was a focal point, simulating real-world interactions between students and their workstations. Latin Hypercube Sampling systematically generated a diverse range of values within the specified parameter ranges, enabling the study to account for variability in user dimensions and behaviors. This method enriched the computational experiments, providing nuanced insights into how table and chair heights and upper limb physical parameters impact comfort, posture, and overall ergonomic effectiveness in educational spaces. This consistency ensured the replicability and robustness of the simulations, offering a well-rounded evaluation of the ergonomic interplay among multiple design factors in fostering conducive learning environments for tertiary-level students.

Table 3
Table of seven upper limb physical parameters generated with LHS and its corresponding actual range values

No	Lumbar Flexion (0° to 20°)		Lumbar Twist (-10° to 10°)		Head Flexion (7° to 23°)		Head Rotation (-43° to 41°)	
	LHS	Angle	LHS	Angle	LHS	Angle	LHS	Angle
1	0.1265	2.530	0.7643	5.286	0.2150	10.440	0.6648	12.843
2	0.4464	8.928	0.8321	6.642	0.6136	16.8176	0.6924	15.162
3	0.1829	3.658	0.4181	-1.638	0.0463	7.7408	0.6081	8.0804
4	0.5339	10.678	0.1529	-6.942	0.4430	14.088	0.4989	-1.0924
5	0.0265	0.530	0.8026	6.052	0.0020	7.032	0.1148	-33.3568
6	0.7471	14.942	0.9759	9.518	0.3791	13.0656	0.7578	20.6552
7	0.8448	16.896	0.5565	1.130	0.2756	11.4096	0.1692	28.7872
8	0.8725	17.45	0.0713	-8.574	0.5487	15.7792	0.3503	-13.575
9	0.9854	19.708	0.6820	3.640	0.3519	12.6304	0.8625	26.426
10	0.3398	6.7960	0.3550	-2.900	0.2401	10.8416	0.8512	28.5008
11	0.2342	4.684	0.5071	0.142	0.7780	19.448	0.3777	-11.273
12	0.1034	2.068	0.9532	9.064	0.8572	20.7152	0.2169	-24.780
13	0.3956	7.912	0.5275	0.550	0.8903	21.2448	0.5749	5.29160
14	0.5876	11.752	0.4446	-1.108	0.4563	14.301	0.9905	40.2020
15	0.7159	14.318	0.4005	-1.990	0.7258	18.6128	0.9493	36.741
16	0.0529	1.058	0.1192	-7.616	0.5580	15.928	0.5310	1.6040
17	0.6974	13.948	0.2890	-4.220	0.7600	19.16	0.2900	-18.64
18	0.4390	8.78	0.0003	-9.994	0.5099	15.1584	0.8045	24.578
19	0.2046	4.092	0.6370	2.74	0.1705	9.728	0.4371	-6.2836
20	0.8923	17.846	0.2435	-5.130	0.6776	17.8416	0.9187	34.1708
21	0.6092	12.184	0.3063	-3.874	0.3126	12.0016	0.0249	-40.9084
22	0.2951	5.9029	0.6112	2.224	0.1201	8.9216	0.4489	-5.2924
23	0.9610	19.22	0.0811	-8.378	0.9261	21.8176	0.7233	17.757
24	0.6368	12.736	0.7275	4.550	0.6310	17.096	0.0591	-38.0356
25	0.3166	6.332	0.8862	7.724	0.9802	22.6832	0.3267	-15.557
26	0.8006	16.014	0.2003	-5.994	0.8162	20.0592	0.0752	-36.6832
27	0.4893	9.786	0.8922	7.844	0.1068	8.7088	0.2442	-22.4872

No	Clavicular Flexion/Extension (-8° to 23°)		Arm Abduction (0° to 20°)		Forearm Pronation (140° to 160°)	
	LHS	Angle	LHS	Angle	LHS	Angle
1	0.4132	4.8092	0.6285	12.56	0.8459	156.918
2	0.5698	9.6638	0.1775	3.55	0.4550	149.100
3	0.0601	-6.1369	0.5017	10.03	0.7193	154.386
4	0.5971	10.5101	0.3657	7.31	0.1321	142.642
5	0.2672	0.2832	0.1478	2.96	0.0413	140.826
6	0.2050	-1.6450	0.1953	3.906	0.9854	159.708
7	0.2291	-0.8979	0.2461	4.922	0.4008	148.016
8	0.0778	-5.5882	0.7118	14.236	0.7543	155.086
9	0.9841	22.5071	0.4283	8.566	0.9399	158.798
10	0.9506	21.4686	0.7986	15.69	0.2471	144.942

11	0.9038	20.0178	0.2945	5.89	0.2666	145.532
12	0.7444	15.0764	0.0352	0.704	0.4074	148.342
13	0.1221	-4.2149	0.5522	11.04	0.8896	157.180
14	0.3934	4.1954	0.3113	6.23	0.5509	151.792
15	0.1580	-3.102	0.9540	19.08	0.3618	147.648
16	0.0017	-7.9473	0.8948	17.90	0.2213	145.078
17	0.3503	2.8593	0.3757	7.514	0.5701	150.896
18	0.7207	14.3417	0.0384	0.768	0.5144	150.070
19	0.6922	13.458	0.6856	13.71	0.1701	142.014
20	0.5529	9.1399	0.8807	17.61	0.5969	151.262
21	0.4747	6.7157	0.9916	19.83	0.0908	141.494
22	0.3299	2.2269	0.0912	1.824	0.8011	156.374
23	0.5014	7.5434	0.4533	9.07	0.0293	141.036
24	0.8515	18.397	0.5797	11.61	0.6874	153.248
25	0.8550	18.505	0.7607	15.214	0.8535	157.946
26	0.6429	11.9299	0.8282	16.564	0.3287	146.674
27	0.8148	17.2588	0.6327	12.654	0.6492	153.012

Table 4
Two workstation parameters generated with LHS and its corresponding actual range values

No	Table Height (710mm to 760mm)		Chair Height (450mm to 500mm)	
	LHS	Height	LHS	Height
1	0.4127	730.635	0.0882	454.41
2	0.0354	711.77	0.3729	468.645
3	0.3448	726.24	0.4506	470.28
4	0.5563	742.815	0.0039	450.196
5	0.1377	717.385	0.6821	486.105
6	0.7728	753.92	0.5710	481.05
7	0.9376	760	0.5239	477.065
8	0.7811	755.055	0.8135	494.905
9	0.3848	723.24	0.8931	494.655
10	0.2630	715.3	0.7627	491.45
11	0.6965	748.225	0.3690	468.45
12	0.1943	714.365	0.4168	471.73
13	0.9131	759.49	0.7350	490.25
14	0.5401	739.505	0.1799	458.995
15	0.5128	738.4	0.1257	456.285
16	0.0808	713.04	0.2498	462.39
17	0.0509	711.545	0.5065	476.325
18	0.2319	718.395	0.9851	499.255
19	0.8220	756.1	0.6516	482.58
20	0.8864	758.32	0.3190	465.95
21	0.5944	743.22	0.2737	463.085
22	0.6482	746.46	0.8827	497.585
23	0.1572	715.86	0.9560	498.88

24	0.4540	735.4	0.6261	481.305
25	0.7100	754.5	0.2103	460.365
26	0.3275	722.625	0.0456	452.28
27	0.9831	760	0.8432	492.160

3.2 RULA Analysis

According to experimental data from Table 3 and Table 4, the Manikin's posture angles are adjusted for each computational simulation and followingly the RULA score is computed. All the values of parameters and workstation information are used to control the posture angles of the upper arm, forearm, and head. To start the RULA analysis, a command needs to be entered into the CATIA command box after each posture is entered. A sample set up of computational experiment one is shown in Figure 6. The results of the RULA analysis scores for individual organ regions and the overall upper limb is tabulated in Table 5.

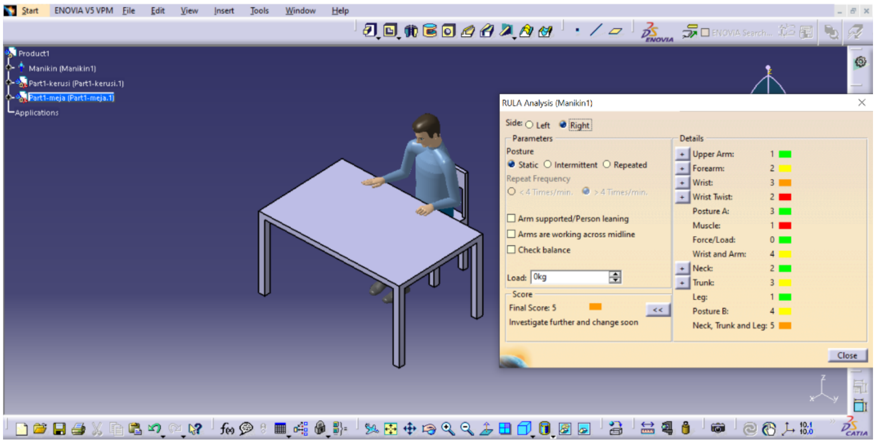


Fig. 6. RULA analysis sample for experiment 1 parameters

Table 5
RULA score for all experiments

No	Neck	Trunk	Left Upper Arm	Right Upper Arm	Left Forearm	Right Forearm	Overall
1	2	3	1	1	2	2	5
2	2	3	1	1	2	2	5
3	1	3	1	1	1	1	4
4	2	3	1	1	2	2	5
5	1	3	1	1	1	1	4
6	2	3	1	1	2	2	5
7	2	4	1	1	2	2	6
8	2	4	1	1	2	2	5
9	2	4	1	1	2	2	5
10	2	3	1	1	1	1	4
11	2	2	1	1	2	2	3
12	3	3	1	1	1	1	4
13	3	2	1	1	2	2	4
14	3	3	1	1	2	2	4
15	2	3	2	2	2	2	5
16	2	3	1	1	1	1	4

17	2	3	1	1	2	2	4
18	2	3	1	1	1	1	4
19	1	3	1	1	2	2	4
20	2	4	1	1	2	2	5
21	3	3	2	2	2	2	5
22	1	3	1	1	1	1	4
23	3	4	1	1	2	2	5
24	2	3	1	1	2	2	4
25	3	3	1	1	2	2	4
26	3	4	1	1	2	2	5
27	1	3	1	1	2	2	4

3.2.1 RULA scores by specific organ regions and overall upper limb

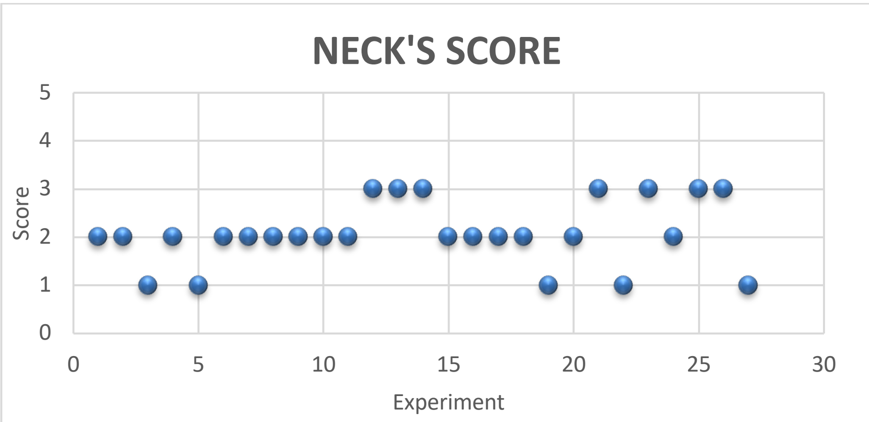


Fig. 7. Graph of RULA score for the neck region

The graph plot in Figure 7 illustrates the RULA score for the neck posture amongst the students. The minimum score rated is 1 with a frequency of 5 and the most frequent score is 2 with a frequency of 15 experiments. The highest score recorded is 3 with 7 experiments potentially indicating slight forward or backward neck tilt. This may lead to discomfort over extended periods, impacting focus and productivity. The neck postures scores do not show any criticality based on the simulation set ups.

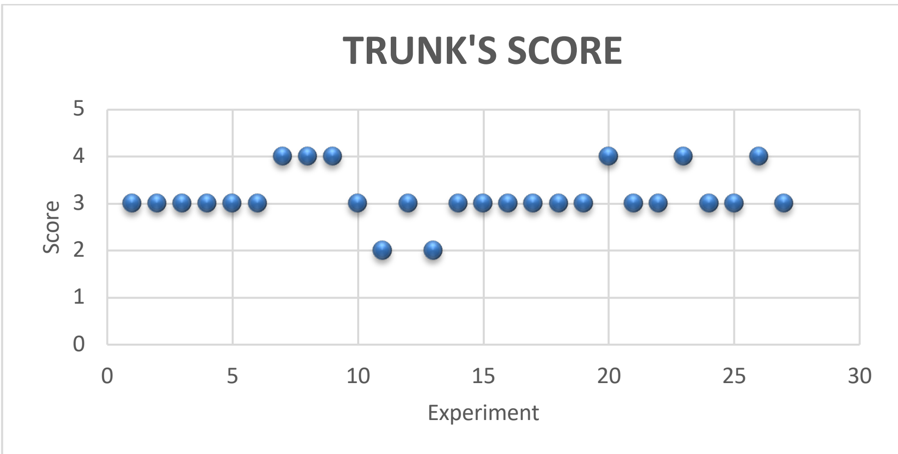


Fig. 8. Graph of RULA score for the trunk region

The trunk region is a crucial area assessed in RULA as it plays a significant role in maintaining balance and posture during work activities. The scores in the plot fall between 2 and 4. This suggests that the trunk posture in the experiments was generally in the category of low to medium risk according to the RULA scale. The scores are clustered around the 3-point mark with a frequency of 19, indicating that the trunk posture was mostly in the medium risk category. The score of 4 appeared only 6 times, but this indicates exposure to a greater risk where the study posture or the height of the desk and chair might need to be changed because they are not appropriate. Overall, the posture of the trunk that falls into the moderate to higher risk category will reflect ergonomic concerns that would benefit from interventions in order to improve the workstation and promote better posture as well as reduce any kind of tension.

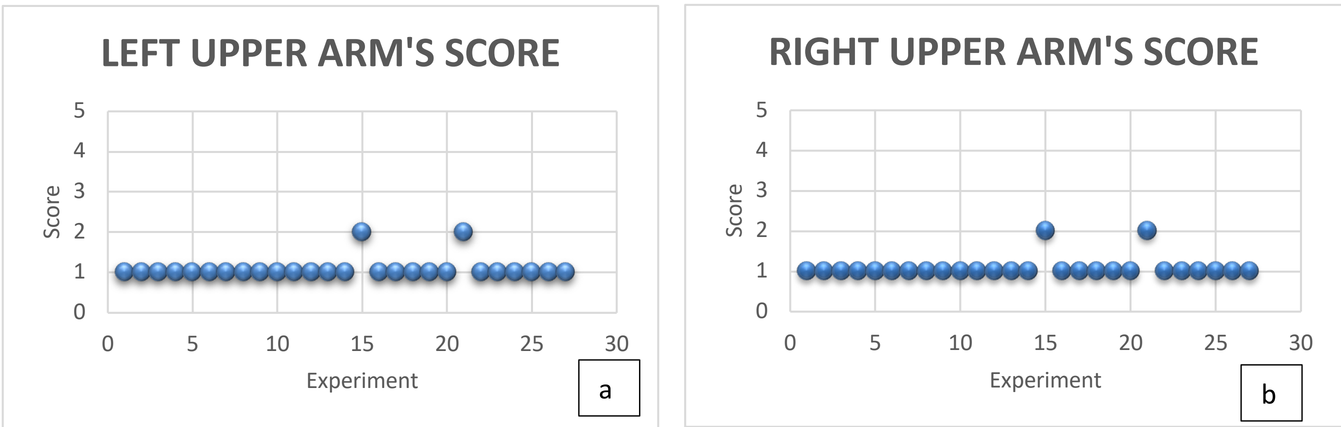


Fig. 9(a) Graph of RULA score for left upper arm, **9(b)** RULA score for right upper arm

The RULA scores for the left upper arm and right upper arm posture are similar as displayed in Figure 9a and 9b. 92.6% of the scores are rated 1. This shows that the posture adopted for the left and right upper arm is mostly in an ideal state, indicating a very low risk of the musculoskeletal. This particular region of the body appears to suffer the least impact in the sitting position based on the table and chair height range studied. Furthermore, this study does not consider thoracic twist and flexion thus creating a more symmetrical positioning of the manikin.

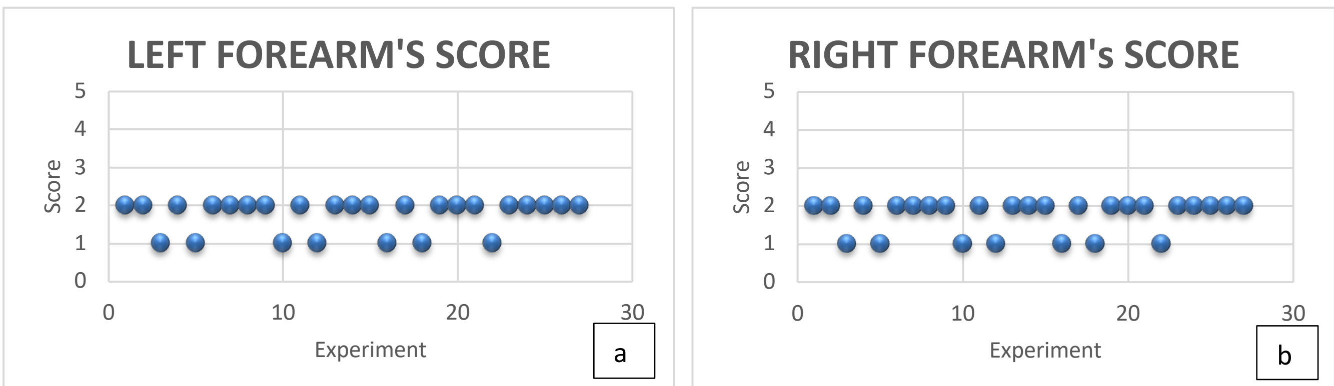


Fig. 10(a). Graph of RULA score for left forearm, **10(b)** RULA score for right forearm

The scores for RULA on the left and right forearm in Figure 10a and 10b display a consistent score of 2 with the frequency of 20 in the experiments. This shows that the postures are uniform with a low risk of any issue related to the musculoskeletal but still have slight deviation from the ideal posture. The ideal posture score is 1, which indicates a neutral position with the lowest risk of strain which only appeared 7 times on the experiments. Overall, the graph shows that 20 experiments will experience low-risk posture and 7 of the experiments indicates the possible need of an ergonomic workstation with more support for students arm placement.

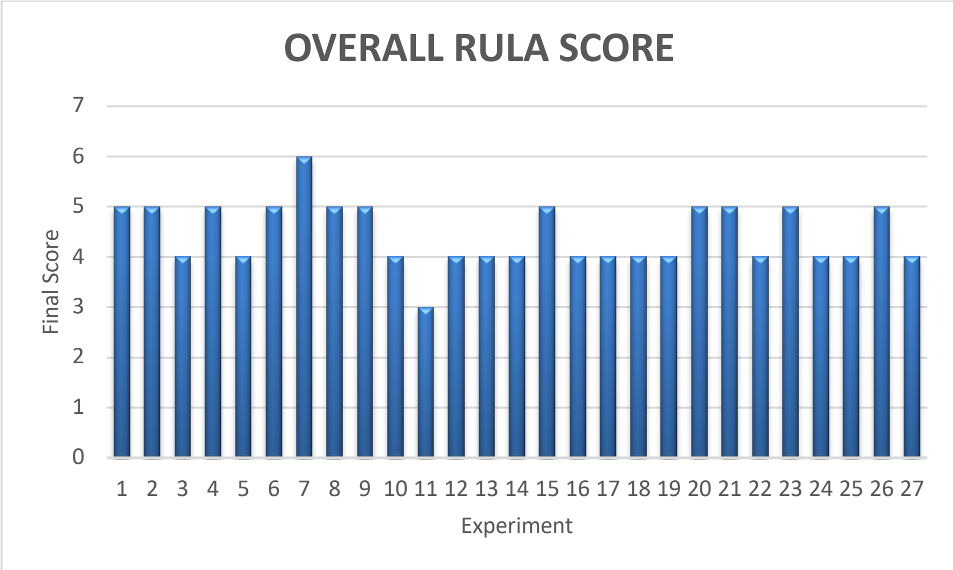


Fig. 11. Graph for the overall RULA score

Figure 11 illustrates the overall scores of RULA analysis across 27 experiments reflecting the cumulative ergonomic risk associated with posture, particularly for tertiary students in learning environments. The scores range from 3 to 6, with higher values indicating a greater need for ergonomic intervention. Most experiments show scores between 3 and 5, suggesting a moderate level of ergonomic risk. These scenarios indicate that posture adjustments are advisable but not immediately critical. At one instance in experiment 7 a score of 6 is obtained representing high risk, necessitating immediate intervention to prevent discomfort or musculoskeletal issues. No scores drop below 3, meaning most scenarios pose at least some level of ergonomic risk.

Table 6
Parameters value for experiment 11

No	Lumbar Flexion (0° to 20°)		Lumbar Twist (-10° to 10°)		Head Flexion (7° to 23°)		Head Rotation (-43° to 41°)	
	LHS	Angle	LHS	Angle	LHS	Angle	LHS	Angle
11	0.2342	4.684	0.5071	0.142	0.7780	19.448	0.3777	-11.273

Clavicular Flexion/Extension (-8° to 23°)		Arm Abduction (0° to 20°)		Forearm Pronation (140° to 160°)	
LHS	Angle	LHS	Angle	LHS	Angle
0.9038	20.0178	0.2945	5.89	0.2666	145.532

Table Height (710mm to 760mm)		Chair Height (450mm to 500mm)	
LHS	Height	LHS	Height
0.6965	748.225	0.3690	468.45

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Experiment 11 has the lowest overall RULA score of 3. This shows that the combination of physical parameters and workstation height with the values generated offer the most comfortable sitting posture for the user. Figure 12 illustrates the workstation and manikin set up for experiment 11. Table 6 displays the parametric values for all 9 parameters studied. Prolonged exposure to scores in the moderate-to-high range (4-7) may lead to musculoskeletal strain, particularly in the neck, shoulders, or back, commonly reported by students during extended study periods. It is to be noted that no safe score was achieved in this study.

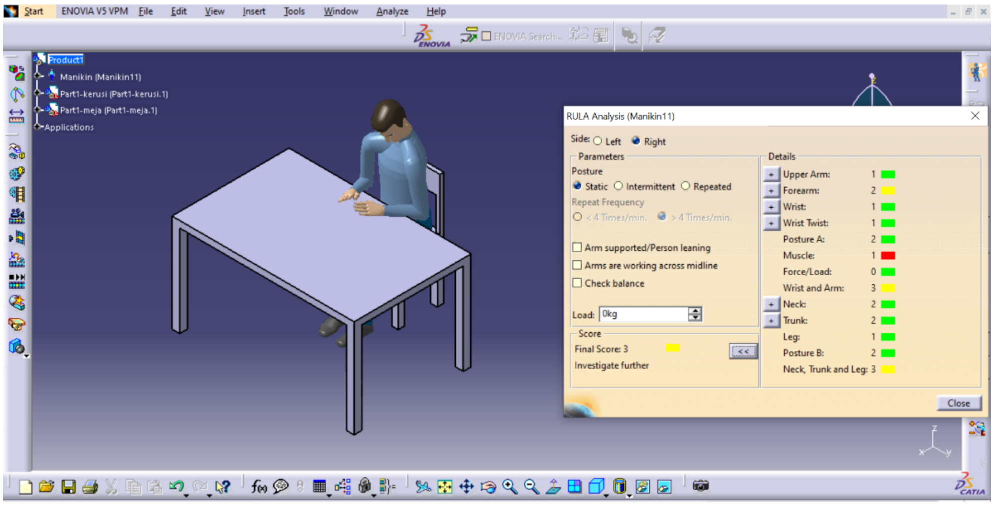

Fig. 12. RULA analysis on Experiment 11

4. Conclusions

This study has provided a thorough analysis on the lack of ergonomics in seating workstations such tertiary institution seating set ups and home environment seating set ups. The set up in this environment do not generally use adjustable chairs and tables hence subjecting students or users to the dangers of acute or physical fatigue and injury either in a prolonged or temporary use. By using Rapid Upper Limb Assessment (RULA), this study was able to assess ergonomic efficiency and highlight various concern that have been raised such as neck and trunk posture. This is very important because a less ergonomic design can lead to the risk of musculoskeletal if sitting for a long period of time. These findings emphasize the urgent need for ergonomic improvements in education set up design to ensure comfort can be improved and health risks can also be mitigated. Discomfort and fatigue caused by poor ergonomics can disrupt concentration and learning efficiency, ultimately impacting academic performance.

The results emphasize the necessity for adjustable furniture in tertiary education environments to accommodate various body dimensions and postural needs. The overall RULA scores highlight a consistent need for ergonomic improvements in tertiary education settings. It would be highly beneficial that tertiary institutions mandate ergonomic standards for all furniture purchases. Awareness should also be given to the students on the correct sitting body posture by posting posters in classrooms. By addressing these risks through better workstation design and awareness, institutions can foster a healthier, more productive learning environment, ultimately supporting student well-being and academic success. To further expand the knowledge, future work can look into studying a wider demographic range of students to provide a more specific guideline for each regions and their users.

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