Ergonomic Workstation Design for Online Shop Live Streamers: Reducing Musculoskeletal Disorders (Pt. Xyz Case Study)

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ABSTRACT: This study was conducted at PT. XYZ to evaluate and reduce the risk of musculoskeletal disorders among host streamers through the design of ergonomic workstations. The research method used was a quantitative case study approach, with the population consisting of employees at PT. XYZ who worked as host streamers. Purposive sampling was employed to select 10 respondents who frequently experienced fatigue and complaints in specific body areas. Primary data were collected through observation, questionnaires, guidelines, and interviews. Posture measurements were taken using the REBA (Rapid Entire Body Assessment) and RULA (Rapid Upper Limb Assessment) methods. The results indicated that prior to the intervention, host streamers had REBA and RULA scores that signified a high risk of musculoskeletal disorders, particularly in the neck, shoulders, back, and legs. After implementing an adjustable live streaming workstation design, along with adjustments to lighting and microphone positions, there was a significant decrease in the REBA and RULA scores. The REBA score decreased from 10 to 1, and the average RULA score dropped from 7 to 3. This indicated a significant reduction in the risk of musculoskeletal disorders. The conclusion of the study was that the design of an adjustable ergonomic workstation significantly reduced the risk of musculoskeletal disorders among host streamers at PT. XYZ, thereby enhancing worker comfort and health during live streaming.

KEYWORDS: Ergonomic workstation; Live streaming; Musculoskeletal disorders; Nordic body maps; Rapid upper limb assessment

1. INTRODUCTION

The advancement of the digital era and online commerce has driven businesses to use live streaming as a primary means of interacting with customers. However, live streaming without ergonomic support can become exhausting. An ergonomic workstation designed specifically for live streaming is necessary to ensure comfort during long streaming sessions, taking into account factors such as desk height, lighting, and space for technical equipment. PT. XYZ is a company focused on digital marketing and social media management strategies.

PT. XYZ specializes in digital marketing and social media management with the goal of helping companies achieve their maximum potential in the digital realm. The company offers digital creative products and social media management services, employing host streamers who act as hosts for clients using their services to market products. Host streamers work approximately 8 hours daily, with two 30-minute breaks. During work, host streamers are provided with live streaming workstations. However, a study at PT. XYZ revealed that these workstations are not suitable for the body dimensions of the users, as the company has not yet implemented ergonomic approaches, leading to fatigue and musculoskeletal complaints among the host streamers.

Ergonomics is the science that studies the relationship between humans and their environment, allowing tools and work systems to be tailored for user comfort (Balaputra and Sutomo, 2017). One impact of a non-ergonomic work environment and tools is the occurrence of Occupational Diseases (OD) related to Musculoskeletal Disorders (MSDs). This can result in decreased productivity, lost work time, reduced alertness, and increased risk of workplace accidents (Gunawan, 2021).

The research involved a Nordic Body Map survey to identify the muscle complaints of host streamers. The survey results indicated dominant complaints in the leg and neck muscles during live streaming. The analysis also revealed that prolonged standing, lasting around 1-4 hours, caused discomfort in the legs, eyes, waist, back, and neck. Based on the above, the researcher conducted this study with the aim of designing an ergonomic live streaming workstation and setting up live streaming equipment to minimize the complaints experienced by employees at PT. XYZ.

2. RESEARCH METHODS

This study was conducted at PT. XYZ from October to November 2023. The method used in this research is a quantitative case study approach, selected for its ability to provide numerical data that can clearly measure research needs and deliver results that can be statistically analyzed. This approach is particularly useful for understanding the issues and solutions related to the work

system of host streamers, which cause musculoskeletal disorders among PT. XYZ employees. The proposed improvement is an ergonomic live streaming workstation design that is adjustable and includes customizable lighting and microphone positioning, aimed at making work more comfortable, safe, effective, and efficient.

The population for this study consists of employees at PT. XYZ who work as host streamers. The sampling technique used is purposive sampling (Sugiyono, 2019), with 10 respondents selected from PT. XYZ employees who frequently experience fatigue and complain about discomfort in the neck, shoulders, waist, and legs. Primary data for this research were collected through observation, questionnaires, guidelines, and interviews. Posture measurements were then taken using the REBA (Rapid Entire Body Assessment) method. Data collected from REBA were analyzed to identify high-risk work postures and to formulate recommendations for designing an ergonomic live streaming workstation in the workplace.

3. RESULT AND DISCUSSION

The level of complaints from employees during live streaming using ergonomically inadequate workstations can be assessed based on the results from the Nordic Body Maps (NBM) shown in Figure 1.
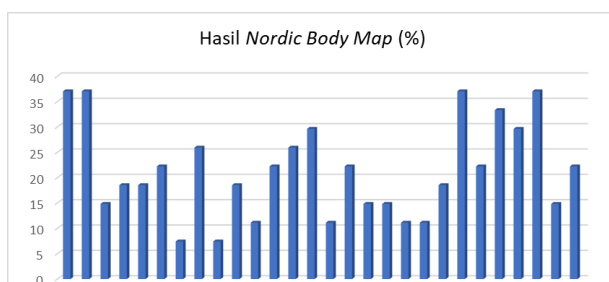

Figure 1. Nordic Body Map Questionnaire Result
Source: Primary data processed, 2023

Based on observations using the Nordic Body Map to assess musculoskeletal disorder complaints among 10 workers, it can be concluded that, in general, workers experience complaints in various body parts such as the neck, shoulders, back, and legs. These pains are linked to the work positions adopted by the workers, including a neck angle of approximately 20°, a body angle of 45°, and legs supporting the body for relatively long periods. The average score obtained from the 10 samples was 7, indicating a high-risk level. Therefore, corrective actions need to be promptly implemented to reduce these risks.

REBA (Rapid Entire Body Assessment)
Group A Scores
Group A in the REBA method involves scoring the neck, body, and legs. The neck received a score of 2 due to the neck forming an angle of 20°. The body was scored 3 because it formed an angle of 20° to 60°, and the legs received a score of 1 for having a balanced position. The total score for Group A, based on the REBA guidelines, is shown in Table 1. The result indicates that Group A (neck, body, and legs) has a total score of 5.

Table 1. Reba Group A Analysis

Neck Posture Score	Badan (Trunk)											
	1		**2**		**3**		**4**		**5**		**6**	
	Kaki		kaki		kaki		kaki		kaki		kaki	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
1	1	3	2	3	3	4	5	5	6	6	7	7
2	2	3	2	3	4	5	5	5	6	7	7	7
3	3	3	3	4	4	5	5	6	6	7	7	7
4	5	5	5	6	6	7	7	7	7	7	8	8
5	7	7	7	7	7	8	8	8	8	8	8	8
6	8	8	8	8	8	8	8	9	9	9	9	9

Source: A Step-by-Step Guide to the REBA Assessment Tool, 2013

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Group B Scores

Group B in the REBA method involves scoring the upper arms, lower arms, and wrists. The upper arms received a score of 3 due to forming an angle of 45°-90°. The lower arms scored 2 for forming an angle of 100° with arms crossing. The wrists scored 2 for being in a neutral position (not bent). Wrist rotation received a score of 1 as the wrists rotated within the middle range. The total score for Group B, according to the REBA guidelines, is shown in Table 2. The result shows that Group B (upper arms, lower arms, and wrists) has a total score of 6.

Table 2. REBA Group B Analysis

Tabel B		Lower Arm					
		1			2		
	Wrist	1	2	3	1	2	3
Upper arm	1	1	2	2	1	2	3
	2	1	2	3	2	3	4
	3	3	4	5	4	5	5
	4	4	5	5	5	6	7
	5	6	7	8	7	8	8
	6	7	8	8	8	9	9

Source: A Step-by-Step Guide to the REBA Assessment Tool, 2013

Final REBA Score

The next step is to enter the final scores from Table A and B into Table C. The final REBA score indicates the results of the work posture.

1. Score A of 5, plus a load of <5 kg and repetitive activity, gives a total score of Table A = 5+0+1 = 6. Therefore, the score of 6 is circled on Table A.
2. Score B of 6, plus a load of <5 kg and repetitive activity, gives a total score of Table B = 6+0+1 = 7. Therefore, the score of 7 is circled on Table B.

The final REBA score can be seen in Table 3, where it was found that the REBA score for workers before implementing improvements was 9. This score indicates that the workers' postures before improvement had a high ergonomic risk level and required immediate corrections to reduce the risk of injuries or discomfort during work.

Table 3. Final REBA Score

Skor Tabel A	Tabel C											
	Score tabel B											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12

Source: A Step-by-Step Guide to the REBA Assessment Tool, 2013

Antropometri

Anthropometric data serves as a guide in determining dimensions for designing workstations to improve employee work positions. From the uniformity test results, all measured anthropometric values were within control limits, indicating that the data were homogeneous. The adequacy test results confirm that the entire anthropometric data meets the criteria N>N', emphasizing that the

collected data were more than sufficient. Subsequently, percentile calculations from anthropometric data were used as the basis for workstation design dimensions, as shown in Table 4.

Table 4. Percentile Calculation Recap

| Persentil	Dimensi Tubuh (cm/kg)							
	Tbt	Tmt	Tbb	Tsb	Tpb	Jka	Plb	Tlb
Mean	168,2	154,2	147,2	128,2	113,2	213,2	41,15	51,1
SD	3,259	3,25	3,259	3,259	3,25	3,25	1,66	1,10
P5	163,35	149,35	142,35	123,35	108,35	208,35	39	49,45
P95	172,55	158,55	151,55	132,55	117,55	217,55	43,55	52,55

The process of processing anthropometric data aims to obtain workstation dimensions that conform to ergonomic principles, adjusting work positions and environments to reduce potential musculoskeletal disorder risks among workers. Based on the precise measurements, improvements in workplace ergonomics can be expected, thereby minimizing adverse effects on workers' musculoskeletal health.

Table Design

Considering the initial conditions, it was identified that the standing posture of host streamers during live streaming sessions with uncomfortable workstations lasted around 1-4 hours. The next step is to use anthropometric data to design the workstation.

1. The desk length is based on the TMT (Eye Height) data with a percentile value (95) = 158.55 cm.
2. The desk width is based on the TSB (Standing Elbow Height) data with a percentile value (95) = 132.55 cm.
3. The desk height can be adjusted according to the height of the host streamer, using anthropometric data for Standing Shoulder Height (SSH) with a percentile value (95) = 151.55 cm.

Figure 2 Streamer table improvement
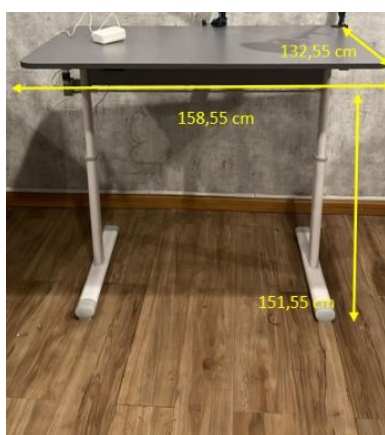
Figure 3. Worker's position after proposed improvement

After improving the work positions, as seen in Figures 1 and 2, the next step involves calculating the workers' body angles to determine the improvement scores. This process aims to measure and evaluate how adjustments affect work posture quantitatively. By obtaining improvement scores, a detailed understanding of the positive impact of work posture changes on ergonomics and potential musculoskeletal disorder risk reduction can be gained. This calculation process is crucial for assessing the effectiveness and efficiency of the implemented improvements in the work environment.

REBA Score Comparison

The REBA score for body posture after improvements showed an actual score of 10. This means the employee was at high risk of musculoskeletal disorders, requiring immediate corrective measures. After improving body posture with the newly designed chair and desk based on anthropometric calculations, the final REBA score was 1. This indicates that the worker is less likely to experience musculoskeletal disorders and other skeletal muscle issues. Table 5 presents the comparison of REBA scores before and after improvements.

Tabel 5. Comparison of Final REBA Scores

Description	Before Improvement	After Improvement
Body Score Table A	6	1
Body Score Table B	5	1
Total Score	9	1
Risk Level	High	Low
Action	Need to be repaired immediately	Can be ignored and does not require repair

Source: Calculation Results, 2023

4. CONCLUSION

The conclusion of this study is that the difference between the initial and final workstation designs significantly impacts reducing health risks for live streaming employees. This is evident from the evaluation results using the REBA methods, which show that the workers' postures before improvements had high-risk levels, with scores of 9. The results indicated a potential for musculoskeletal disorders, highlighting the urgent need for interventions to improve workplace ergonomics. The proposed improvements, especially in designing more ergonomic workstations, provide an effective solution to reduce these risks.

After implementing the workstation improvements, there was a significant decrease in REBA scores, reducing them to 9 and 1. These results indicate that the risk of musculoskeletal disorders and similar conditions among employees has been significantly reduced, achieving a low-risk level. The changes in workstation design have had a positive impact on the workers' posture.

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