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Anthropometry-Based Work Facility Design for the Paperbag Folding and Gluing Process (Case Study: UD XYZ)

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ABSTRACT

The folding and gluing process of *paperbag* production at UD XYZ is still carried out manually, with workers sitting on the floor without work facilities such as tables and chairs. This condition requires workers to adjust their body posture to the work object positioned at a low level, which may cause discomfort during work. This study aims to design ergonomic work facilities in the form of a work table and chair for the folding and gluing process using an anthropometric approach. Anthropometric data were collected from 31 workers in the folding and gluing section, including knee height, buttock-popliteal length, hip breadth, sitting elbow height, sitting shoulder height, shoulder breadth, and forward arm reach. The data were processed through mean calculation, standard deviation calculation, data adequacy test, data uniformity test, and percentile calculation. The results showed that the proposed work chair dimensions consisted of a chair height of 41 cm, seat depth of 46 cm, seat width of 38 cm, backrest height of 51 cm, and backrest width of 42 cm. The proposed work table was designed with a height of 65 cm, depth of 60 cm, and length of 120 cm. The proposed workstation is expected to improve posture suitability and reduce the potential risk of musculoskeletal discomfort during repetitive folding and gluing activities. The study contributes to ergonomic workstation design for labor-intensive SMEs through task-specific anthropometric adaptation.

1. Introduction

UD XYZ is a business engaged in paperbag production located in East Java. The company produces several types of paperbags, such as plain paperbags, patterned paperbags, and colored paperbags, which are used as product packaging, souvenirs, and store packaging. The increasing demand for environmentally friendly packaging products has encouraged small and medium-sized enterprises (SMEs) in the packaging industry to improve both product quality and production efficiency [1], [2]. Paperbags are widely used as an alternative to plastic packaging because they are considered more environmentally sustainable and commercially attractive. Consequently, production activities in paperbag manufacturing require work systems that are able to maintain product consistency while supporting workers' performance and comfort during the production process.

The paperbag production process consists of several stages, including material cutting, pattern forming, printing for certain product types, drying, punching, rope installation, folding and gluing, and packaging [3]. The folding and gluing process is the focus of this study because this stage plays an important role in forming the final structure of the paperbag and determining the conformity of the product shape before packaging. Errors at this stage may result in irregular folds, weak adhesive joints, and reduced visual quality of the product. Therefore, this process requires working conditions that support accuracy, work position stability, and worker comfort during the activity. In addition, folding and gluing activities are categorized as repetitive manual work that highly depends on workers' physical endurance and body posture consistency. If these activities are carried out in inappropriate working conditions, the risk of fatigue and work-related injuries may increase over time.

Based on initial observations, the folding and gluing process at UD XYZ is still carried out manually, with workers sitting on the floor without work facilities such as tables and chairs. This condition causes the work object to be positioned at a low level, requiring workers to adjust their body posture to

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the work material throughout the process. Workers tend to perform the activity with a bent posture, folded legs, and repetitive hand movements. When performed for a long duration, this condition may lead to physical discomfort and fatigue. Work-related musculoskeletal disorders are among the health problems that frequently occur in the workplace and require attention because they may affect workers' physical condition, work productivity, quality of life, healthcare costs, and absenteeism [5]. These disorders generally do not appear immediately but develop gradually due to unnatural working postures and work methods that are not suitable for workers' conditions [6]. Poor workstation design may also contribute to decreased productivity because workers are required to spend additional physical effort to maintain balance and perform repetitive movements during work activities. Therefore, ergonomic improvement in manual workstations becomes important not only to reduce discomfort but also to support sustainable work performance in small-scale industries.

Ergonomics is an approach used to adjust work, equipment, and the work environment to human abilities and limitations. The application of ergonomics aims to create safe, comfortable, healthy, and efficient working conditions [7], [8]. In the context of work facility design, ergonomics is an important basis so that workers are not forced to adjust their bodies to the job; instead, the work facilities should be adapted to the workers' abilities and characteristics. In addition, ergonomic intervention in the design process is not only related to occupational health problems but can also support improvements in worker productivity [9]. Ergonomic principles are widely implemented in workstation and facility design because inappropriate work posture has been identified as one of the main causes of musculoskeletal complaints in manual work systems. Through ergonomic intervention, companies can improve the compatibility between workers and work facilities, thereby reducing physical strain and increasing work efficiency.

One ergonomic approach that can be used in work facility design is anthropometry. Anthropometry is a field related to the measurement of human body dimensions as a basis for determining the size of a product, tool, or work facility [10]. Anthropometric measurement is needed in work furniture design to obtain accurate body dimension data, so that the resulting design can better suit user needs [9]. In a seated workstation, the design of work facilities must consider the suitability between facility dimensions and users' anthropometric dimensions. A proper sitting posture is indicated by the knees forming an angle of approximately 90° and the feet resting on the floor or footrest. In addition, the height of the work table must be adjusted so that the arms remain in a relaxed position and do not cause workers to bend forward or raise their shoulders excessively [8]. The use of anthropometric data allows ergonomic facilities to accommodate variations in workers' body dimensions, thereby minimizing the mismatch between the worker and the workstation. As a result, anthropometry is commonly applied in the design of chairs, tables, workstations, and production tools that require direct interaction with workers.

Several previous studies have shown that the anthropometric approach can be used as a basis for ergonomic work facility design. Ardiansyah and Satoto [6] redesigned an anthropometry-based work chair by considering workers' body dimensions and percentile values as the basis for determining chair dimensions. Ramadhan and Satoto [12] applied an anthropometric approach in designing a work tool so that the resulting design could better suit user needs. Another study also showed that anthropometric data can be used in designing ergonomic work facilities in the form of a work table to reduce workers' physiological load [13]. Previous studies generally focused on ergonomic chairs, work tools, or general workstation improvements in manufacturing activities. However, studies discussing ergonomic work facility design specifically for manual folding and gluing activities in paperbag production are still limited. In particular, there is still a lack of studies that integrate anthropometric considerations with the specific characteristics of repetitive folding activities, precision work, and reachable work areas in small-scale paperbag industries.

Although anthropometric workstation studies have been widely conducted, limited studies specifically address repetitive folding and gluing activities in paperbag SMEs, where workstation design should simultaneously consider posture stability, precision work, and reach area requirements. However, work facility design for the folding and gluing process of paperbag production still needs to be examined because this activity requires accuracy, seated posture stability, and compatibility between the work surface and workers' hand reach. Unlike previous studies, this research focuses on designing work facilities in the form of a table and chair that are specifically adjusted to the characteristics of folding and gluing activities in a small-scale industry. This study also emphasizes the importance of designing an integrated workstation consisting of both a work chair and a work table, rather than focusing on a single facility component only. The integration between chair dimensions, table height, and work reach area is expected to create a more ergonomic and functional workstation configuration for manual production activities.

Unlike previous studies that focused primarily on general furniture redesign, this study proposes an integrated workstation design combining chair dimensions, worktable configuration, and work reach area specifically for repetitive folding and gluing activities in paperbag SMEs. This contribution emphasizes task-specific ergonomic adaptation rather than solely anthropometric dimension adjustment.

The novelty of this study lies in the design of work facilities in the form of a table and chair that are adjusted to the characteristics of the folding and gluing process of paperbag production using an anthropometric approach. The proposed design does not only focus on providing seating facilities but also considers the suitability between sitting posture, work surface, and workers' reach area. Based on these problems, this study aims to design ergonomic work facilities in the form of a table and chair for the folding and gluing process of paperbag production at UD XYZ using an anthropometric approach. The results of this study are expected to provide a proposed work facility design that suits workers' body characteristics, supports comfort during work, and serves as a reference for the application of anthropometry in work facility design for small-scale industries. Furthermore, the findings of this study are expected to contribute to the implementation of ergonomics in labor-intensive SMEs that still rely heavily on manual production systems and have limited ergonomic facilities.

2. Research methods

This study applied an anthropometric approach to design ergonomic work facilities for the folding and gluing process of paperbag production at UD XYZ. The research object was focused on workers in the folding and gluing section, while the proposed work facilities consisted of a work table and a work chair. The research flowchart is presented in Figure 1.

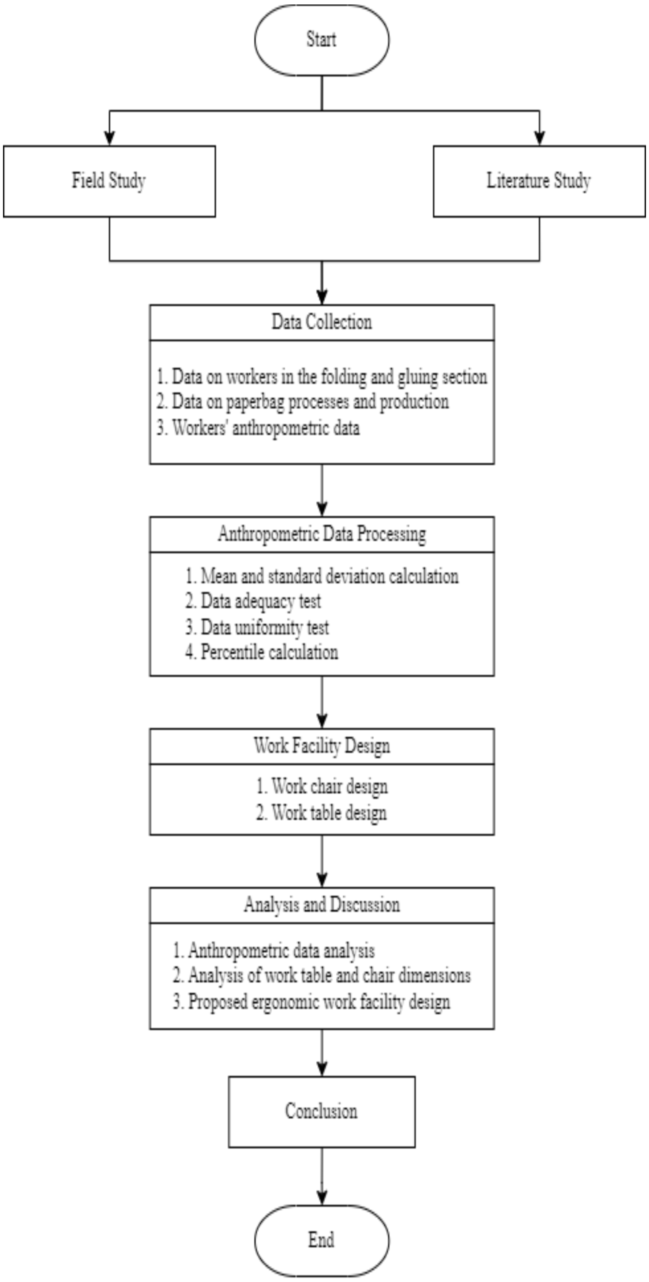

Figure 1 Flowchart

2.1 Field study

The field study was conducted to identify the actual working conditions in the folding and gluing section at UD XYZ. Direct observations were carried out to examine the workers' activities, working posture, production flow, and existing work facilities. The results of this stage were used to understand the problems that occurred in the work process and to determine the requirements for designing work facilities that suit the workers' activities.

2.2 Literature Study

The literature study was carried out to obtain theoretical references related to the research topic. The references used in this study included ergonomics, anthropometry, workstation design, sitting work posture, and ergonomic work facility design. This stage was also used as a basis for determining the anthropometric data processing steps and selecting the appropriate percentile values for designing the work table and chair.

2.3 Data Collection

Data collection was conducted to obtain the information required for the work facility design. The data collected in this study included data on workers in the folding and gluing section, data on paperbag processes and production, and workers' anthropometric data.

Data on workers in the folding and gluing section were used to identify the number of workers involved as research respondents. Data on paperbag processes and production were used to describe the production flow and the characteristics of the folding and gluing activities. Meanwhile, workers' anthropometric data served as the main basis for determining the dimensions of the proposed work table and chair.

Anthropometric measurements were taken directly from workers in the folding and gluing section. The measured body dimensions were selected based on the requirements of seated work facility design, including popliteal height, buttock-popliteal length, sitting hip breadth, sitting elbow height, sitting shoulder height, shoulder breadth, and forward arm reach. These measurements were used to determine the dimensions of the work facilities according to the workers' body characteristics.

2.4 Anthropometric Data Processing

The collected anthropometric data were processed statistically to determine the dimensions of the proposed work facilities. The data processing stages included mean calculation, standard deviation calculation, data adequacy test, data uniformity test, and percentile calculation. The mean was used to determine the central value of each anthropometric dimension, while the standard deviation was used to identify the variation of the data. The data adequacy test was conducted to ensure that the number of collected data was sufficient, whereas the data uniformity test was performed to determine whether the data were within the upper and lower control limits [9]. After the data were declared sufficient and uniform, percentile values were calculated as the basis for determining the dimensions of the work chair and work table.

The mean value was calculated using Equation (1)

$$\bar{\mathrm{x}} = \frac{\sum \mathrm{xi}}{\mathrm{N}} \tag{1}$$

Where $\bar{x}$ is the mean value, x_i is the observed data, and n is the number of observations.

$$\sigma = \sqrt{\frac{\sum (xi - \bar{x})^2}{N-1}} \tag{2}$$

where σ is the standard deviation, x_i is the observed data, $\bar{x}$ is the mean value, and nnn is the number of observations. The data adequacy test was used to determine whether the collected data were sufficient for the design process. The data adequacy test was calculated using Equation (3).

$$N' = \left[\frac{\frac{k}{s}\sqrt{N \sum xi^2 - (\sum x_i)^2}}{\sum x}\right]^2 \tag{3}$$

where N is the required number of observations, n is the number of collected data, k is the confidence level constant, s is the degree of accuracy, and x_i is the observed data. The data were considered sufficient when the value of N' was smaller than n. If N' was greater than n, additional data collection was required.

The data uniformity test was conducted to determine whether the anthropometric data were within the control limits. The upper control limit and lower control limit were calculated using Equations (4) and (5).

$$BKA = \bar{x} + k\sigma \tag{4}$$

$$P50 = \bar{x} \tag{7}$$

$$P95 = \bar{x} + 1{,}645\ (\sigma) \tag{8}$$

The percentile values were selected according to the function of each design dimension. The use of percentiles aims to accommodate variations in workers' body dimensions, allowing the proposed work facilities to be used comfortably by most workers.

2.5 Work Facility Design

The design of the work facilities was developed based on the results of anthropometric data processing. The proposed facilities include a work chair and a work table to support the folding and gluing activities in paperbag production. The dimensions of each facility component were determined by considering the relevant body dimensions of the workers and the functional requirements of the work activity. Anthropometric data are used as a basis for designing work facilities that correspond to users' physical characteristics (see Figure 2), so the facilities can support comfort and ease of use during work [10].

The work chair was designed by referring to anthropometric dimensions related to seated posture, including popliteal height, buttock-popliteal length, sitting hip breadth, sitting shoulder height, and shoulder breadth. These measurements were used to determine the chair dimensions, such as seat height, seat depth, seat width, backrest height, and backrest width. Meanwhile, the work table was designed by considering sitting elbow height and forward arm reach to obtain a table height and working area that are appropriate for the folding and gluing process [10], [11].

The percentile selection was adjusted according to the function of each design dimension. Dimensions related to reach were determined using lower percentile values so that workers with smaller body dimensions could still access the work area comfortably. In contrast, dimensions related to clearance and space were determined using higher percentile values to ensure that workers with larger body dimensions could use the facilities properly. Therefore, the proposed work chair and work table are expected to accommodate variations in workers' body dimensions and support a more ergonomic working posture [10], [11].

Figure 2 Work Facility Design

2.6 Analysis and Discussion

The analysis and discussion stage was conducted to evaluate the results of anthropometric data processing and the proposed work facility design. The analysis focused on the anthropometric data used as the basis for determining the dimensions of the work chair and work table. The calculated mean, standard deviation, data adequacy, data uniformity, and percentile values were analyzed to ensure that the proposed dimensions were appropriate for the workers' body characteristics. The analysis of the work chair design included the suitability of seat height, seat depth, seat width, backrest height, and backrest width with the selected anthropometric dimensions. Meanwhile, the work table design was analyzed based on the suitability of table height and working area with sitting elbow height and forward arm reach. This analysis was carried out to ensure that the proposed facilities could support the folding and gluing activities with a more suitable sitting posture and a comfortable working reach area.

The results of the analysis were then used to describe the proposed ergonomic work facility design for the folding and gluing process of paperbag production. The final design is expected to provide a more appropriate work surface, improve sitting posture, and support workers' comfort during the work process. Therefore, the proposed work chair and table can be considered as an ergonomic facility recommendation based on workers' anthropometric characteristics.

3. Results and Discussion

3.1 Workers' Anthropometric Data

Anthropometric data were collected from workers in the folding and gluing section of paperbag production at UD XYZ. The measurements were conducted directly on 31 workers involved in the process. The measured body dimensions included knee height (Tld), buttock-popliteal length (PPD), hip breadth (Lp), sitting elbow height (Tsd), sitting shoulder height (Tbd), shoulder breadth (Lb), and forward arm reach (Jtd). These dimensions were selected because they are related to the design requirements of the proposed work table and work chair.

Knee height was used as a consideration in determining the chair height and leg clearance. Buttock-popliteal length was used to determine the seat depth, while hip breadth was used to determine the seat width. Sitting elbow height was used as the basis for determining the work table height so that workers could perform folding and gluing activities with a more comfortable arm position. Sitting shoulder height and shoulder breadth were used to determine the backrest dimensions, while forward arm reach was used to determine the working area that could be reached comfortably by workers.The anthropometric data of workers in the folding and gluing section are presented in Table 1.

Table 1.
Workers' Anthropometric Data

	Respondent	Age	Tld	PPD	Lp	Tsd	Tbd	Lb	Jtd
1	R1	37	47	47	36	24	53	41	70
2	R2	34	46	47	35	24	52	41	69
3	R3	51	46	46	36	24	52	40	69
4	R4	53	49	48	38	25	55	42	72
5	R5	55	48	47	38	25	54	42	71
6	R6	32	46	46	34	24	52	40	69
7	R7	43	48	47	37	25	54	42	71
8	R8	37	48	48	34	25	54	41	72
9	R9	29	47	46	34	24	53	40	70
10	R10	48	47	47	37	24	52	41	70
11	R11	47	43	47	34	22	50	35	64
12	R12	42	45	49	38	23	52	37	67
13	R13	38	42	46	33	22	48	34	63
14	R14	45	45	49	36	23	51	36	67
15	R15	52	44	46	35	22	49	35	66
16	R16	47	42	47	33	22	48	35	63
17	R17	36	44	48	38	23	50	36	65
18	R18	50	43	48	37	22	49	35	64
19	R19	55	43	46	33	21	48	34	64
20	R20	62	43	46	33	22	47	34	65
21	R21	40	44	48	37	23	50	36	65
22	R22	53	42	47	34	22	48	35	63
23	R23	50	44	47	37	22	50	35	66
24	R24	42	45	48	36	22	51	36	67
25	R25	44	46	49	38	23	52	37	68
26	R26	60	43	47	34	22	50	35	64
27	R27	35	48	47	34	24	53	41	70
28	R28	46	43	46	35	22	49	35	63
29	R29	34	44	47	36	22	50	36	65
30	R30	50	42	47	36	22	48	35	63
31	R31	28	47	48	34	24	53	41	70
	Total		**1394**	**1462**	**1100**	**714**	**1577**	**1163**	**2075**
	Average		**44.968**	**47.161**	**35.484**	**23.032**	**50.871**	**37.516**	**66.935**

Notes: Tld = knee height; PPD = buttock-popliteal length; Lp = hip breadth; Tsd = sitting elbow height; Tbd = sitting shoulder height; Lb = shoulder breadth; Jtd = forward arm reach.

Based on Table 1, each worker had different body dimensions for each anthropometric variable. This variation indicates that the proposed work facilities should not be designed based on a single worker's body size. Therefore, the data were further processed through mean calculation, standard deviation calculation, data adequacy test, data uniformity test, and percentile calculation to determine the ergonomic dimensions of the proposed work table and chair.

3.2 Anthropometric Data Processing

After the anthropometric data were collected, the next stage was data processing. This stage was conducted to determine whether the collected data were sufficient and uniform before being used for percentile calculation. The anthropometric data were processed by calculating the mean, standard deviation, data adequacy test, and data uniformity test.

The mean was used to identify the central value of each body dimension, while the standard deviation was used to determine the variation of the data. The data adequacy test was conducted to ensure that the number of collected data was sufficient for the design process. In this study, the data were considered sufficient if the value of N\prime was smaller than the actual number of observations, which was 31 respondents. Meanwhile, the data uniformity test was conducted to ensure that all data were within the upper control limit and lower control limit. The summary of anthropometric data processing is presented in Table 2.

Table 2.
Summary of Anthropometric Data Processing

No.	Body Dimension	Average	Stdev	N'	BKA	BKB	Data Adequacy	Data Uniformity
1	Tld	44,968	2,137	3,496	49,241	40,694	Sufficient	Uniform
2	PPD	47,161	0,934	0,608	49,030	45,292	Sufficient	Uniform
3	Lp	35,484	1,710	3,596	38,904	32,064	Sufficient	Uniform
4	Tsd	23,032	1,169	3,986	25,369	20,695	Sufficient	Uniform
5	Tbd	50,871	2,156	10,338	55,183	46,559	Sufficient	Uniform
6	Lb	37,516	2,645	9,447	42,809	32,226	Sufficient	Uniform
7	Jtd	66,935	2,730	3,154	72,395	61,475	Sufficient	Uniform

Based on Table 2, all anthropometric dimensions had N^\prime values smaller than the actual number of observations. This indicates that the collected data were sufficient for further analysis. In addition, all measurement data were within the upper control limit and lower control limit, which means that the data were uniform. Therefore, the anthropometric data of workers in the folding and gluing section could be used as the basis for percentile calculation.

3.3 Percentile Calculation

After the anthropometric data were declared sufficient and uniform, percentile calculation was carried out to determine the distribution of workers' body dimensions. The percentiles used in this study were the 5th percentile (P5), 50th percentile (P50), and 95th percentile (P95). These percentile values were used as the basis for determining the dimensions of the proposed work table and work chair so that the design could accommodate the body dimensions of most workers.

The selection of percentile values was adjusted to the function of each design component. The 5th percentile was used for dimensions related to reach or minimum body dimensions, while the 95th percentile was used for dimensions related to clearance or space. Meanwhile, the 50th percentile was used to represent the average body dimension of workers. The results of the percentile calculation and the proposed dimensions of the work facilities are shown in Table 4.

Table 3.
Anthropometric Dimension

No	Component	Anthropometric Dimension	Percentile	Description
1	Chair height	Knee height (Tld)	P5	To allow workers with shorter body dimensions to sit with their feet resting comfortably
2	Seat depth	Buttock-popliteal length (PPD	P5	To prevent pressure behind the knees of workers with shorter thighs
3	Seat width	Hip breadth (Lp)	P95	To provide sufficient sitting space for workers with wider hips
4	Backrest height	Sitting shoulder height (Tbd)	P50	To provide a middle value suitable for most workers
5	Backrest width	Shoulder breadth (Lb)	P95	To accommodate workers with wider shoulders
6	Table height	Sitting elbow height (Tsd)	P50	To obtain a table height that supports a comfortable arm position during work
7	Table reach	Forward arm reach (Jtd)	P5	To ensure that workers with shorter arm reach can still access the work area

Table 4.
Percentile Calculation

No.	Design Component	Anthropometric Basis	Percentile	Calculation Result	Proposed Dimension
1.	Chair height	Knee height (Tld)	P5	41.453 cm	41 cm
2.	Seat depth	Buttock-popliteal length (PPD)	P5	45.625 cm	46 cm
3.	Seat width	Hip breadth (Lp)	P95	38.297 cm	38 cm
4.	Backrest height	Sitting shoulder height (Tbd)	P50	50.871 cm	51 cm
5.	Backrest width	Shoulder breadth (Lb)	P95	41.866 cm	42 cm
6.	Table height	Chair height + sitting elbow height	P5 + P50	64.485 cm	65 cm
7.	Table reach	Forward arm reach (Jtd)	P5	62.444 cm	60 cm
8.	Table Length	Work area requirement			120 cm

Based on Table 4, the chair height was determined from the 5th percentile of knee height, while the seat depth was determined from the 5th percentile of buttock-popliteal length. These values were selected to accommodate workers with smaller body dimensions. The seat width and backrest width were determined using the 95th percentile to provide sufficient space for workers with larger body dimensions. Meanwhile, the backrest height used the 50th percentile of sitting shoulder height to represent the average worker.

The table height was obtained by adding the chair height and sitting elbow height, resulting in a proposed table height of 65 cm. The table depth was determined by considering the 5th percentile of forward arm reach. Although the calculated reach value was 62.444 cm, the proposed table depth was set at 60 cm so that the entire work area remained within a comfortable reach. In addition, the table length was designed at 120 cm by considering the space required for the folding and gluing process of paperbag production. Therefore, the proposed dimensions were expected to support a more ergonomic working posture and provide a more suitable work facility for the workers.

3.4 Work Facility Design

The work facility design was developed based on the results of anthropometric data processing and percentile calculation. The proposed facilities consisted of a work chair and a work table designed to support the folding and gluing process of paperbag production. The dimensions of the work chair included a chair height of 41 cm, seat depth of 46 cm, seat width of 38 cm, backrest height of 51 cm, and backrest width of 42 cm. Meanwhile, the work table was designed with a height of 65 cm, depth of 60 cm, and length of 120 cm.

The proposed dimensions were determined by taking into account the workers' anthropometric characteristics as well as the functional requirements for folding and gluing tasks. The chair is designed to promote better sitting posture, while the table is designed to provide a stable work surface and an easily accessible work area. The proposed workstation design is shown in the following figure 3 and Figure 4.

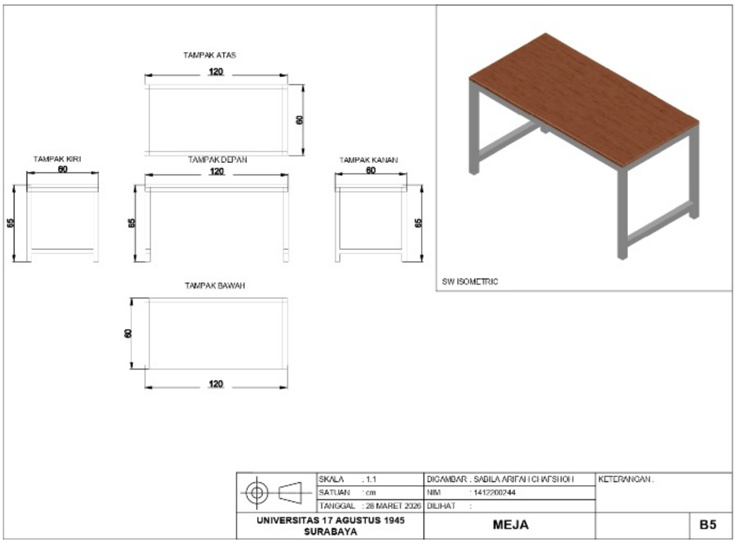

Figure 3 Proposed Table Design

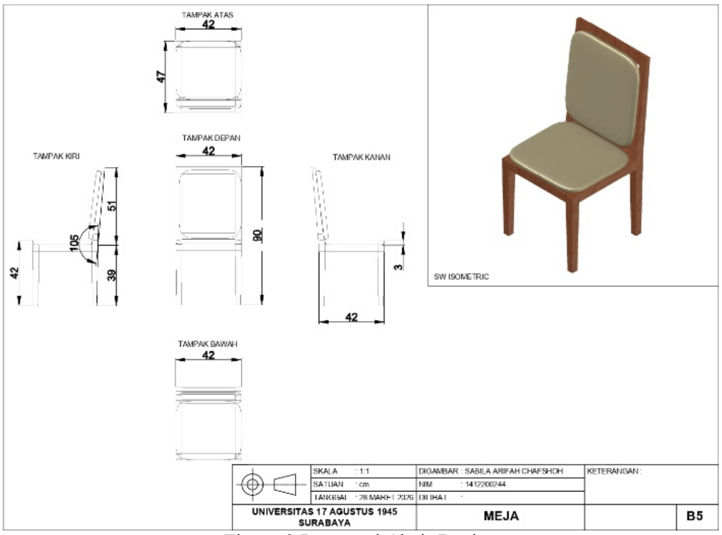

Figure 3 Proposed Chair Design

3.5 Design Analysis

The findings are consistent with previous studies showing that anthropometric workstation redesign contributes to improved posture suitability and reduced physical strain. The proposed work facility design was analyzed based on the suitability between the final design dimensions and the workers' anthropometric characteristics. The chair dimensions were determined to support a more appropriate seated posture during the folding and gluing process. The seat height was adjusted to allow workers to place their feet more comfortably, while the seat depth and seat width were designed to provide adequate support and sitting space. In addition, the backrest dimensions were determined to support the back area and improve comfort during seated work activities.

The work table was designed to provide a more suitable working height and reachable work area. The table height was determined by considering the chair height and sitting elbow height, so that workers could perform folding and gluing activities with a more comfortable arm position. The table depth was designed based on forward arm reach, allowing workers to access materials and tools without excessive arm extension. Meanwhile, the table length was adjusted to the space required for placing materials, glue, and paperbag workpieces during the production process.

Compared with the previous working condition, where workers performed folding and gluing activities while sitting on the floor, the proposed design provides a more structured work arrangement. From an ergonomic perspective, elevating the work object from floor level to table height potentially reduces trunk flexion and excessive upper limb movement. Previous studies reported that workstation adjustments based on anthropometric characteristics may reduce physical strain and improve comfort during repetitive work activities. The proposed design may also support better work stability and potentially reduce musculoskeletal risk factors. The availability of a work chair and table allows the work object to be positioned at a more appropriate height and within a comfortable reach area. Therefore, the proposed work facility is expected to support a more ergonomic working posture and improve comfort during the folding and gluing process.

4. Conclusion

This study proposed an ergonomic work facility design for the folding and gluing process of paperbag production at UD XYZ using an anthropometric approach. The proposed design was developed to address the absence of appropriate work facilities in the folding and gluing section, where workers previously performed the activity while sitting on the floor. The design consisted of a work chair and a work table intended to provide a more suitable seated working posture, a stable work surface, and a comfortable working reach area.

Anthropometric data were collected from 31 workers and processed through mean calculation, standard deviation calculation, data adequacy test, data uniformity test, and percentile calculation. The results showed that all anthropometric data were sufficient and uniform, so they could be used as the basis for determining the proposed work facility dimensions. Based on the percentile calculation, the proposed chair dimensions consisted of a chair height of 41 cm, seat depth of 46 cm, seat width of 38 cm, backrest height of 51 cm, and backrest width of 42 cm. The proposed work table was designed with a height of 65 cm, depth of 60 cm, and length of 120 cm.

The proposed work chair and table were designed by considering the workers' anthropometric characteristics and the functional requirements of the folding and gluing activities. Compared with the previous working condition, the proposed design provides a more structured work arrangement and allows the work object to be positioned at a more appropriate height and reach area. Therefore, the proposed facility is expected to support a more ergonomic working posture and improve workers' comfort during the folding and gluing process.

This study can serve as a reference for applying anthropometric principles in the design of simple ergonomic work facilities, particularly in small-scale manual production processes. This study involved only 31 workers from a single SME; therefore, the findings may not fully represent broader worker populations or industrial sectors. The current study only reached the workstation design stage and did not include implementation or experimental validation. Future studies should evaluate the effectiveness of the proposed design using posture assessment methods such as REBA, RULA, Nordic Body Map, or user comfort analysis.

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