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# Analysis of worker posture of Make-Up Artist by Standard Nordic Questionnaire method and Rapid Entire Body Assessment

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**Abstract**

Working posture is one of the factors that can influence work productivity because working with an abnormal posture can cause ergonomic problems, especially muscle injuries in workers. This research aims to analyze the worker posture of Make-up Artists (MUA) in Meukek District, South Aceh Regency. The analysis was carried out using the Standard Nordic Questionnaire (SNQ) method to identify musculoskeletal complaints and Rapid Entire Body Assessment (REBA) with the help of Ergo fellow software to assess worker posture. The research results showed that as many as 80% of MUA workers experienced complaints of musculoskeletal, with the most frequent complaints in the waist, shoulders, and neck. The work posture score of MUA workers is categorized as high risk (REBA score > 11) in several activities, such as when cleaning the face and applying eyelashes. Risk factors that cause unergonomic work postures include long work duration (2-3 hours per client), with dynamic body positions. Lack of ergonomic work facilities. Based on the research results, several solutions are recommended to improve MUA work posture, including providing solutions for good body posture when working and designing ergonomic work chairs so that they can help MUA maintain optimal body posture while working and reduce risk musculoskeletal. Having work chairs that suit the design, is hoped to it can improve the comfort and health of MUA workers and reduce the complaints they have been experiencing.

**Keywords:**
Work posture, Ergonomics, SNQ, REBA, Ergofellow.

## 1. Introduction

Human resources are the main component that needs special attention because of their limited capabilities. Human ability to carry out various kinds of physical activities is usually influenced by less ergonomic working postures [1]. One type of ergonomics issue that's frequently experienced within the working environment, particularly those related to inner human quality and continuance more than once in one cycle is exceptionally helpless to disturbance musculoskeletal. Complaint musculoskeletal.

Is a complaint in parts of the skeletal muscles that's felt by an individual extending from exceptionally gentle complaints to exceptionally difficult ones. On the off chance that muscles get inactive loads. Doing the work is debilitating and musculoskeletal. Laborers who do activity over and over for a long time can cause complaints within the shape of harm to joints, and tendons ligaments [2],[3]. Complaints around harm are ordinarily named complaints of musculoskeletal disarranges (MSDs) or damage to the musculoskeletal framework [4].

Work that is carried out manually and repeatedly with unnatural work postures can give rise to complaints. This can be seen from the activities carried out by Make-up Artists (MUA) bridal make-up workers, the activities carried out are in a squatting standing position in front of the client, so MUA workers experience fatigue due to the wrong work posture. Lack of ergonomics such as complaints in the hands, arms, shoulders, and waist, these activities are carried out continuously repeatedly for approximately 2-3 hours per day, Complaints in the skeletal muscles with an unnatural working attitude when carrying out the make-up process can result in workers facing discomfort and injuries to the body in the waist, left shoulder, and left wrist [5],[6],[7]. After a generic product design produces an ergonomic chair with the implementation of the Rapid Entire Body Assessment (REBA) score dropping two levels to low risk, body complaints can be eliminated and work methods can be improved, so that work productivity increases [8].

MUA bridal makeup which exists in Meukek District, South Aceh Regency consists of sixteen workers. MUA bridal make-up is a business that sells services, more precisely beauty services. Where is the work process or stages make-up took two or three hours of work, from the private lessons I took, the stages of the make-up process consisted of approximately twenty process stages. the first, starting with a facial wash or cleaning of your face for 25 minutes, until the finishing stage of using lipstick and setting spray gradually so that the make-up holds perfectly. The twenty processes can be summarized in three stages, the first stage is skin preparation, this stage takes around 53 minutes. The second stage is called the foundation, just like building a house, making a foundation so that the house stands strong, the same goes for make-up it lasts all day, you have to use foundation, from framing your eyebrows to applying pressed powder takes approximately 36 minutes. And stages starting from eye makeup, and applying lipstick setting spray took approximately 56 minutes. In the twenty stages of the makeup work process, the worker's working attitude is unnatural, such as the back is too bent, the head is raised and the legs are bent, this work position is carried out by workers repeatedly during working hours so there is a risk of experiencing complaints. Musculoskeletal which can cause injury to muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs, apart from this, the pressing element also shows that the work posture shown by the worker is less ergonomic, where the body posture in carrying out work activities is in a bent standing position which will have an impact. Lumbar lordosis or resistance to a body moment load which can cause the spinal skeletal muscles to experience excessive contraction for a long time, this condition is known as fatigue (fatigue).

Facilities are available in the gallery only for clients, the lack of work facilities that support carrying out work activities can trigger complaints of musculoskeletal caused by unsupportive work facilities and unergonomic work postures, so it is necessary to design work facilities and repair or eliminate activity elements that cause these complaints.

These actual activities show that it is necessary to increase the work chair facilities for MUA workers themselves so that they are more ergonomic by the worker's anthropometry. By redesigning the work facilities, the work posture of workers during work can be improved to reduce complaints of pain in several parts of the worker's body.

To decrease complaints experienced by MUA specialists, the strategy utilized is The Standard Nordic Questionnaire (SNQ) strategy, where this strategy is utilized to recognize the source of muscle weariness amid work, whereas the REBA strategy is utilized to decide hazard components related to general body pose when working with assistive gadgets Ergofellow program where the instrument points to analyze rapidly and effortlessly in terms of postural exercises experienced by a person's body conjointly give a esteem of a few levels of hazard when working [[9],[10].

Working posture is one of them as a determinant in assessing the effectiveness of the work activities being carried out. A working posture that is considered good and ergonomic ensures the ultimate comes about gotten from the specialist will be good, be that as it may, if the worker's pose isn't ergonomic, the ultimate result of the working pose will diminish which is considered incapable. According [11], [12]. Unnatural working postures cause muscle movements that should not occur and waste energy, thereby creating a risk of fatigue and muscle injury.

Ergonomic posture analysis of MUA workers is important to ensure that their activities can be carried out comfortably and without risk of injury. Factors such as work duration require high precision and long processing time. Unergonomic body positions during make-up application can cause fatigue, muscle tension, and even injury musculoskeletal.

## 2. Method

### 2.1 Standard Nordic Questionnaire

The SNQ is one of the measuring tools commonly used to identify the source of complaints of muscle fatigue. Through SNQ You can find out which muscle parts are experiencing complaints by looking at and analyzing the body map as in attachment one SNQ, then estimate the type and level of skeletal muscle complaints felt by workers [13]. This method is quite simple and contains a high value of subjectivity. To emphasize the bias that occurs, it is best to take measurements before and after carrying out work activities. This method is done so that the differences between before and after work can be identified so that the comparison can be seen.

### 2.2 Rapid Entire Body Assessment

REBA is an ergonomics study carried out to determine risk factors related to posture while working. REBA was developed to assess work posture (static or dynamic posture) in the healthcare industry.

REBA is a method in the field of ergonomics that is used to quickly assess the posture of a worker's neck, back, arms, wrists, and legs. REBA has similarities that are close to the RULA method, but the REBA method is not as good as the RULA method which shows in the analysis the advantages that are needed and for the movement of repetitive work created, REBA is more general, in the sum of one of the new systems in the analysis which includes dynamic and static factors in the form of loading 19 individual weight interactions, and a new concept related to considerations called "The Gravity Attended" to prioritize the position of the most superior [14].

The REBA method has the following characteristics, which have been developed to provide an answer to the need to obtain equipment that can be used to measure aspects of the physical load of workers. Analysis can be made before or after an interference to demonstrate the eliminated risk of an injury occurring. This provides a speedy systematic assessment of the risks to body postures that workers can expect from their work.

### 2.3 Software Ergofellow in deciding worker posture

REBA can be defined as a postural analysis tool that is sensitive to musculoskeletal risks in carrying out various tasks and a worker posture assessment scale found in the world of work and industry.

### 2.4 Anthropometry

Anthropometry could be a collection of numerical information related to the physical characteristics of the human body, measure, shape, and quality as well as the application of this information for taking care of plan issues. The plan to prepare or plan unused items must be in agreement with human needs. This can be related to the thought that when planning an item it must be arranged towards generation neighborly, conveyance inviting, establishment inviting, operation neighborly, And support neighborly.

Anthropometrics is studies of measurements of the human body which are valuable in planning an item to find agreement between the item and the people Who wear it. The usage of data Anthropometrics endeavorall tool adapted to human abilities, not humans adapted to tools. the design that has high compatibility with the humans who use it is very important to reduce the emergence of danger due to work errors due to design errors [15].

### 2.5 Layout

A planning facility can be stated as an office arranging preparing, counting investigation, arranging, planning, and course of action of offices, physical hardware, and individuals which is planning to extend the productivity of generation and benefit frameworks [16].

Within the mechanical world, office arranging is aimed as an implies for enhancement formats offices, utilized in fabric taking care of (fabric dealing with) and to decide gear within the generation prepare, moreover utilized in by and large office arranging. There are two fundamental things in the office arranging, to be specific those related to manufacturing plant area arranging (plant area) and generation office plan which incorporates plant structure plan, office format plan, and fabric dealing with framework plan.

Arranging the framework area Office is a vital office since the production line or industry will work for a long time, subsequently, mistakes in examination and arranging formats will cause generation exercises to be incapable and wasteful [17],[18].

## 3. Calculation of Anthropometric dimensions of workers

Before designing work facilities that will make workers' work easier, it is necessary to process human body anthropometric data related to the facilities to be designed. Based on the anthropometric data in Table. 1 dimensional measurement results.

### 3.1 Data adequacy test

Calculation to test adequacy data Anthropometric data is used with a confidence level of 95% and an accuracy level of 5%, in calculating the adequacy test. An example of a data adequacy test for the Popliteal Height (TP) dimension is:

$N = 16$

$\sum X = 887,88$

$\sum X^2 = 49359,23$

$(\sum X)^2 = 788330,89$

$\sum X = 56,70 + 51,20 + 57,13 + 52,10 + 58,24 + \ldots\ldots\ldots + 55,52 = 887,88$

$\sum X^2 = 56,70^2 + 51,20^2 + 57,13^2 + 52,10^2 + \ldots\ldots\ldots + 55,52^2 = 49359,23$

$(\sum X)^2 = (56,70+51,20+57,13+52,10+58,24+\ldots\ldots\ldots+55,52)^2 = 788330,89$

$$= \left[\frac{40\sqrt{1416,74}}{887,88}\right]^2 = \left[\frac{40.37,63}{887,88}\right]^2 = \left[\frac{1505,5}{887,88}\right]^2 = [1,6957]^2 = 2,87$$

$$N' = \left[\frac{40\sqrt{16\,(49359,23) - (887,88)^2}}{887,88}\right]^2$$

$$= \left[\frac{40\sqrt{789747,632 - 788330,89}}{887,88}\right]^2$$

$N' = 2,87$

Conclusion that N'2.87 < data = 16 So the data from the measurements carried out have met the requirements for conducting research, in the same way as above, then the recapitulation of the data adequacy test results for the overall body dimensions of bridal make-up artist workers can be seen in Table 1. Based on Table 1. above, the data from the measurements carried out have met the requirements for conducting research.

Table 1. Recapitulation of Data Adequacy Tests

| No | Dimension | $\Sigma X_i$ | $\Sigma Xi^2$ | N | N' | Information |
|---|---|---|---|---|---|---|
| 1 | Tall popliteal (TP) | 887,88 | 49359,23 | 16 | 2,88 | Is Sufficient |
| 2 | Long popliteal (LP) | 925,3 | 53547,73 | 16 | 1,09 | Is Sufficient |
| 3 | Hip width (HW) | 1683,26 | 177123,6 | 16 | 0,35 | Is Sufficient |
| 4 | Sitting Shoulder Height | 908,72 | 51632,29 | 16 | 0,67 | Is Sufficient |
| 5 | Shoulder Width (SW) | 749,21 | 35103,99 | 16 | 0,99 | Is Sufficient |
| 6 | Sitting Elbow High (SEH) | 430,86 | 11623,17 | 16 | 2,85 | Is Sufficient |

### 3.2 Average calculation, standard deviation, maximum and minimum values

Anthropometric data that has been obtained from all workers will then determine the average value, standard deviation, and maximum and minimum values for each measurement item. The equation used to calculate the average value, standard deviation, minimum, and maximum values for each measurement is:

1. The average value is calculated for TH data, exp: is:

$$\overline{X} = \frac{56,70 + 51,20 + 57,13 + .....+ 52,10}{16} = \frac{887,88}{16} = 55,493$$

2. Value Minimum and Maximum

The minimum and maximum values are the smallest and largest values in the measurement data. Examples of minimum and maximum values for TH data are Minimum Value = 51.2 and Maximum Value = 58.54

3. Value Standard Deviation

Value calculation standard deviation for each measurement can be determined. The example of value calculation standard deviation the TP data is:

$$\sigma = \sqrt{\frac{((56,70 - 55,49)^2 + (51,20 - 55,49)^2 + ….. + (55,52 - 55,49)^2}{16 - 1}} = 2,43$$

Based on these calculations, more details can be seen in the calculation results the average value, standard deviation, and maximum and minimum values for the overall tensions are summarized in Table 2.

Table 2. Recapitulation of Calculation Results of Average Value, Standard Deviation, and Maximum Value and Minimum for Overall Dimensions.

| No | Dimension Measurements | $\overline{X}$ | $\sigma$ | $X_{min}$ | $X_{max}$ |
|---|---|---|---|---|---|
| 1 | TP | 55,49 | 2,43 | 58,54 | 60,35 |
| 2 | LP | 57,83 | 1,56 | 59,78 | 60,95 |
| 3 | HW | 105,2 | 1,6 | 107,5 | 108,4 |
| 4 | SSH | 56,8 | 1,2 | 58,76 | 59,2 |
| 5 | SW | 46,83 | 1,2 | 48,78 | 49,23 |
| 6 | SEH | 26,93 | 1,17 | 29,92 | 29,27 |

### 3.3 Data uniformity test

The data uniformity test is used to control the process of data parts that are rejected or non- uniform because they do not meet specifications. If in one dimensional measurement there is one or more data that is not uniform or in other words is not within the control limits, it will be immediately rejected and the data will be revised by removing the data that is outside the control limits and recalculating.

## 4. Research methodology

### 4.1 Research location and time

This research was conducted in Meukek sub-district, South Aceh district. Starting from December 2023 to March 2024.

### 4.2 Research object

Object: The research subject observed was the body gestures of workers or workers' make-up artist bridal make-up in Meukek sub-district, South Aceh Regency. This research focused on the body posture of make-up artist workers and then provided ergonomic solutions and designed chairs according to MUA needs so that workers can work safely and comfortably.

### 4.3 Research population and sample

The population of this study was all MUA in the Meukek sub-district, South Aceh district.

## 5. Result discussion

### 5.1 Complaint level analysis based on SNQ

Analysis of the complaint level assessment with SNQ indicates that the worker make-up artist For bridal make-up, it was found that on average workers experienced the biggest complaints in parts of the body, including pain in the right shoulder with a percentage of 76.56%, pain in the back with a percentage of 89.06%, pain in the waist with a percentage of 87.50%, pain in the right wrist with a percentage of 79.69%, pain in the right hand, namely amounting to 87.50%, pain in the right thigh with a percentage of 75.00%, pain in the right knee with a percentage of 78.13%, pain in the right calf with a percentage of 75.00%, pain in the right ankle amounting to 84.38% and pain in the right foot amounting to 89.06%.

Meanwhile, complaints were experienced by each worker make-up artist Based on the SNQ questionnaire, it shows that the highest complaints are at the eyebrow framing stage and facial wash or cleaning the face of the stage with a percentage of 75.00%, and 74.11%, the lowest percentage is at the primary use station with a percentage of 59.82%. Based on the results of the data on complaints of pain, this is due to the lack of work facilities that support carrying out work which is not in accordance with anthropometric body dimensions so that the two work postures are not ergonomic due to differences in work posture positions which result in workers having to bend, squat, bend their legs and standing and bending repeatedly for more than 2-3 hours per day, to overcome this it is necessary to design work chairs that are in accordance with the anthropometry of workers to reduce the risk musculoskeletal that happened.

### 5.2 Analysis posture worker with using apps Ergofellow

Based on the REBA score calculation in the previous chapter using the application Ergo fellow then the highest REBA score was obtained in the activity of framing the eyebrows and the process of applying lipstick or finishing, with a score of 12 and 12 is categorized into action level required immediately, based on these two work postures which result in the worker having to bend, legs bent and standing with the neck and body having to bend repeatedly, this will impact the risk of complaints musculoskeletal, To reduce and overcome this, it is necessary to design work chairs that suit the anthropometry of workers to reduce risks musculoskeletal that happened.

### 5.3 Size analysis for work chair design based on Anthropometry

The analysis of the size of the work chair design based on anthropometry is in accordance with the results of measuring anthropometric data on the worker's body. Based on the Popliteal Height (TP) dimension, the average worker is 55.49 cm, the worker's popliteal length is 57.83 cm, and the hip width (LP) dimension is 105.2 cm. Furthermore, the sitting shoulder height dimension is 56.8 cm, while the shoulder width dimension is 46.83 cm, and the sitting elbow height dimension is 29.39 cm, where the percentile used is the 50th percentile (average). The following is a chair design work for MUA see in Fig. 1,2,3 and 4.

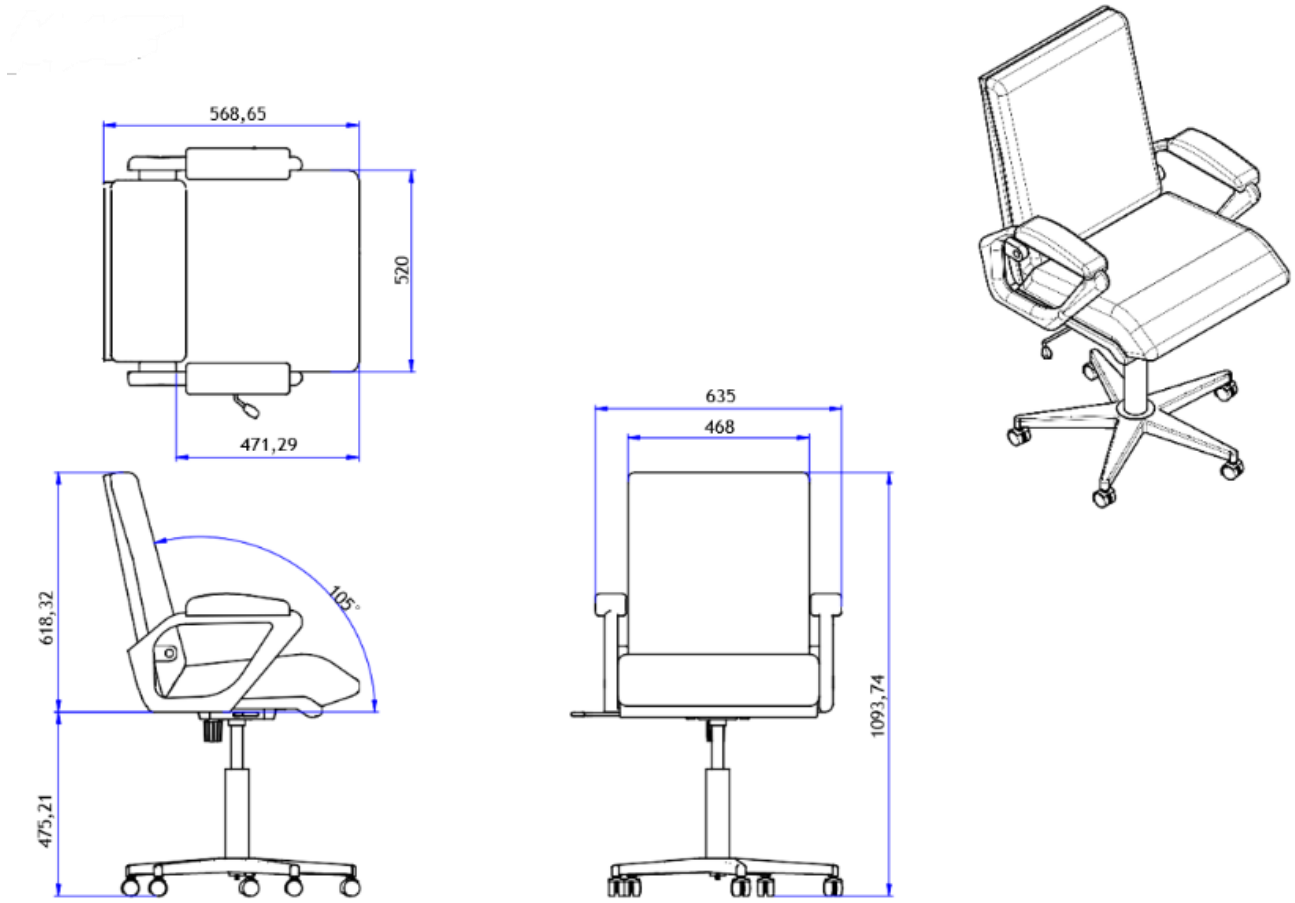
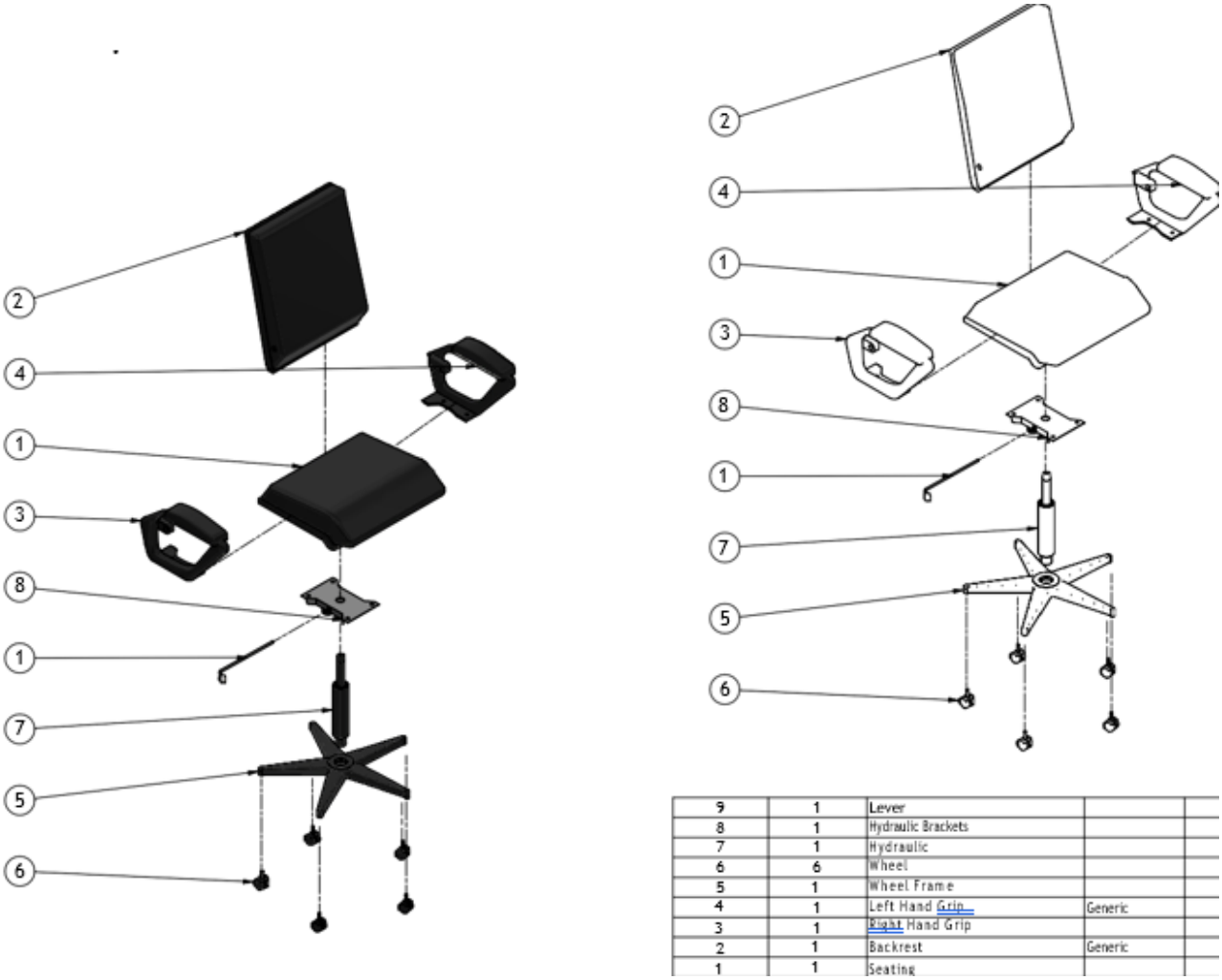



Fig. 1. Initial design of the chair




| | | | | |
|---|---|---|---|---|
| 9 | 1 | Lever | | |
| 8 | 1 | Hydraulic Brackets | | |
| 7 | 1 | Hydraulic | | |
| 6 | 6 | Wheel | | |
| 5 | 1 | Wheel Frame | | |
| 4 | 1 | Left Hand Grip | Generic | |
| 3 | 1 | Right Hand Grip | | |
| 2 | 1 | Backrest | Generic | |
| 1 | 1 | Seating | | |

Fig. 2. Chair components

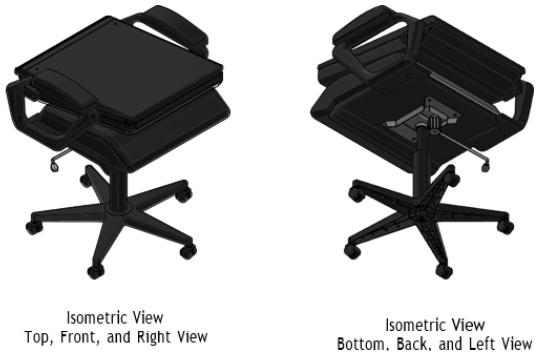



Fig. 3. Seat when folded


Fig 4. Work chair design

## 6. Conclusion

The results of data processing on the level of complaints experienced by workers during the bridal make-up process based on distributing the SNQ questionnaire, it can be seen that the largest percentage of body level is on the back at 89.06% and the right leg at 89.06%. This is caused by the position of the body resting on the right leg so that the back muscles become tense, resulting in soreness.

Assessment of work posture using the REBA application with the help of Ergo Fellow software makes it easier to determine the highest Reba score in work positions 2 and 5, namely in eyebrow framing activities and the process of applying lipstick or finishing, with a score of 12 and 12 categorized as the action level required at that time. Also, the lowest REBA score is in the third position in foundation use activities with a REBA score of 10 and is categorized into action levels needed immediately.

The analysis of the proposed design of work facilities proposed by the MUA is by the results of measuring anthropometric data on workers' bodies and the TP dimension of workers is 55.49 cm, the worker's popliteal length is 57.83 cm, for the LP namely 105.2 cm. Furthermore, the sitting shoulder height dimension is 56.8 cm, while the shoulder width dimension is 46.83 cm, and the sitting elbow height dimension is 29.39 cm, where the percentile used is the 50th percentile (average). With the suggestion that working using a chair can make it easier for MUA workers to do their work, MUA workers often do their work standing up, causing MUA workers to experience pain in certain parts of the body. Having a work chair can make it easier for workers to do their work, such as in the facial wash position. The long duration of work while standing and bending causes soreness in the legs and waist. With the MUA chair, workers can do their work by sitting in a chair, thereby reducing pain in certain parts of the body.

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