INNOVATION OF MATERNITY PILLOW DESIGN WITH LAVENDER AROMATHERAPY ON SLEEP QUALITY OF PREGNANT WOMEN IN THIRD TRIMESTER

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ABSTRACT

Background: Good sleep quality plays an important role in maintaining maternal health during pregnancy and providing sufficient energy for labor. However, physiological changes such as increased uterine size, physical discomfort, and elevated progesterone levels often lead to sleep disturbances in pregnant women, particularly in the third trimester. One effort to improve maternal sleep quality is by increasing comfort through an innovative maternity pillow design equipped with lavender aromatherapy.

Purpose: This study aimed to develop a maternity pillow design integrated with lavender aromatherapy as a supportive intervention to improve sleep quality among pregnant women.

Methods: This study employed a pre-experimental method using a one-group pre–post test design and a research and development (R&D) approach. The R&D stages included literature review, system and product design, product development and manufacturing, expert validation, system testing, and analysis. Sleep quality was assessed using a structured questionnaire. The research was conducted over a one-year period.

Results: The findings showed that maternal self-efficacy increased from 41 before the intervention to 59.8 after the intervention, with a p-value of 0.000 ($p \leq 0.05$), indicating a significant influence of the Android-based application intervention "cakoASI.id" on the self-efficacy of breastfeeding mothers.

Conclusion: The evaluation results indicated that the Maternity Pillow Design was categorized as very high, effectively improved sleep quality among third-trimester pregnant women, and was feasible and successfully tested in the field.

Keywords: Design, Lavender Aromatherapy, Maternity Pillow, Sleep Quality, Third-Trimester Pregnant Women.

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BACKGROUND

Pregnancy is a physiological process that begins from conception to birth. Pregnancy involves rapid physical and psychological changes in pregnant women, requiring a long adaptation period, especially in the third trimester. A mother experiences anxiety related to the labor process, uncomfortable sleeping positions, active fetal movements at night, fear of pain and physical dangers that will arise during labor, worry about the mother and baby being born abnormally, and dreams that reflect her concerns and worries. This can disrupt the mother's sleep quantity (Ayudia et al, 2022). Ideally, pregnant women should get at least 7.5 hours of sleep (Lestari & Maisaro, 2019).

Various studies report that the prevalence of sleep disorders varies widely, ranging from 30 to 78% of all pregnancies (Phan, 2022). Specifically, studies report that 68% of women experience serious sleep disturbances, including frequency, decreased sleep hours (8.1 to 7.5 hours), and poor sleep quality, especially during the third trimester (Beebe, 2017). A survey of 2,427 pregnant women found poor sleep quality (76%), insomnia (57%), nighttime awakenings (100%), and sleep-disordered breathing (19%) from early to late pregnancy (Mindell & Nikolovski, 2015).

During pregnancy, changes in normal sleep waves and fragmentation occur (Silva-Perez, 2019; Bazalakova, 2017). However, changes in sleep can lead to significant health and cardiovascular problems such as hypertension, an increased risk of preeclampsia, and fetal developmental delays (Hasan Zaky, 2015). Disturbed sleep patterns caused by poor sleep quality also have long-term consequences, such as insomnia, nighttime awakenings, parasomnias, vertigo, and even psychological disorders such as emotional distress, anxiety, fatigue, and depression (Christian, 2019). Good sleep quality will maintain maternal health during pregnancy and provide sufficient energy for labor. This impacts normal physiological changes during pregnancy, such as increased uterine size, physical discomfort, and increased progesterone levels.

Sedative-hypnotic and antidepressant medications, which are widely used in clinical interventions for sleep disorders, are certainly not suitable for pregnant women due to various side effects on pregnancy and the fetus, drug tolerance, dependence, abuse, and decreased cognitive function (Her & Cho, 2021). Therefore, non-pharmacological treatments are the main alternative. One widely recommended therapy is aromatherapy. Aromatherapy is a complementary alternative therapy that can be self-administered due to its simplicity, low cost compared to visiting a professional, and proven to provide rapid effects (Meihartati & Iswara, 2021). The recommended aromatherapy is lavender. Lavender has been shown to contain neurochemicals. Lavender flowers contain linalool, which has sedative and calming properties. It stimulates cilia receptors in the olfactory nerve, transmitting a pleasant aroma to the olfactory bulb via the olfactory bulb (Jafari-Koulaee, 2020).

This study uses maternity pillow media because pillows are media that are often used when someone sleeps, where the pillow will be closer to the human sense of smell so that the aromatherapy pillow media someone will automatically inhale the aromatherapy and also aromatherapy pillows are very effective as a therapy media to deal with sleep quality disorders because someone who will sleep will definitely use a pillow. Maternity pillows have a special design to support the stomach and support the back. The recommended position for pregnant

women in the third trimester is the left side sleeping position, right side, and using a pillow support pillow under the waist which can provide comfort to the mother, and provide optimal benefits to the fetus that obtains maximum blood flow and nutrition through the placenta (Ratnasari & Karina, 2019).

Riswanto et al.'s 2021 study, entitled "Lavender therapy pillows affect sleep quality in the elderly." The results showed a P-value of 0.000 (P-value <0.005), indicating a significant effect of lavender aromatherapy pillows on sleep quality in the elderly in Kragilan, RT 03/RW 13, Banjarsari Village, Surakarta City (Riswanto et al., 2021). In this study, the pillows designed were regular pillows equipped with lavender aromatherapy. Ratnasari's 2019 study, entitled "Pillow support on the right side of pregnant women on the incidence of supine hypotension in pregnant women in the third trimester," showed a p-value of 0.005, indicating a significant relationship between pillow support and supine hypotension in pregnant women. This study concluded that the use of special pillows for pregnant women can reduce maternal disorders in the form of supine hypertension (Riswanto et al., 2021). Based on previous research on aromatherapy pillows, researchers concluded that there are no pillows specifically designed for pregnant women designed with the addition of complementary aromatherapy. While existing maternity pillows still need further development to further improve maternal sleep quality, current maternity pillows tend to be monotonous in shape and design.

Based on basic data from the Padang City Health Office in 2022, there were 17,376 pregnant women in Padang City Community Health Centers, including Nanggalo Community Health Center and Andalas Community Health Center. The number of pregnant women at Andalas Community Health Center was 1,486 (Health Office, 2022). The number of pregnant women at Andalas Community Health Center in 2023 was 171.

OBJECTIVE

This study aims to design an innovative lavender aromatherapy maternity pillow that implements complementary therapy to increase maternal relaxation.

METHODS

Study Design

This research uses a research and development (R&D) approach, namely building and designing a system that is applied in the health sector.

Setting

This research was conducted in the on Juni-November 2024.

Research Subject

This research focuses on maternity pillow product design activities, the activities are described as follows:

1. Literature Study
   The initial stage of developing a project-based science learning model began with a needs analysis. This analysis was conducted through literature review and interviews with pregnant women. These interviews were conducted to obtain information about the Lavender Aromatherapy Maternity Pillow Design, the challenges encountered, and the potential benefits of supporting the Lavender Aromatherapy Maternity Pillow Design for pregnant women.
2. Designing a maternity pillow

The design process began with research into pillowcase materials, color, shape, thickness, weight, and aromatherapy. The design was crafted with meticulous and precise attention to ergonomic principles, allowing for further manufacturing, such as using a 3D printer.

3. Implementation of maternity pillow manufacturing
   The design will be made by a tailor, with aromatherapy innovations added.
4. Product Trial and Evaluation
   The maternity pillows that have been created will be tested for their suitability by experts in the field. Validation is carried out by administering a questionnaire to the experts. Based on the questionnaire, suggestions, comments, and constructive feedback are obtained, which are used to improve the maternity pillow model.
5. Analysis
   The tested products are then analyzed and subjected to small-scale product trials on pregnant women.

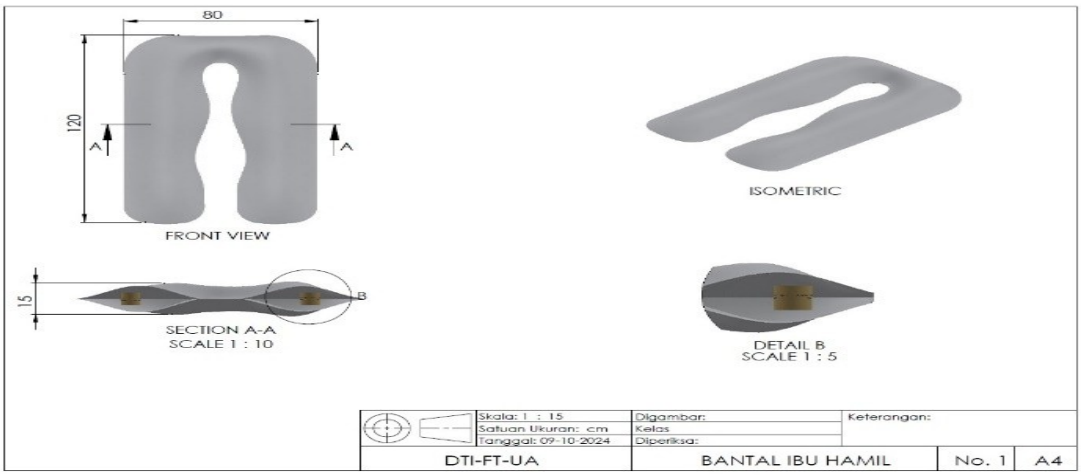
RESULTS

1. Results of Needs Analysis (Analyze)
   The initial stage of developing a project-based science learning model begins with a needs analysis. The needs analysis conducted in this study aims to obtain information from experts and pregnant women regarding the Innovation of Maternity Pillow Design with Lavender Aromatherapy on Sleep Quality of Pregnant Women in the Third Trimester. The needs analysis was conducted through literature studies and interview techniques given to pregnant women. These interviews were conducted to obtain information about the Maternity Pillow Design with Lavender Aromatherapy, the obstacles faced and the potential to support the Maternity Pillow Design with Lavender Aromatherapy for pregnant women.
   a. Pillow and Pillowcase Material
      Pillow material was chosen because, based on discussions with pillow makers and users, and based on research conducted by Jeon et al. (2014), it was found that different pillow materials impact sleep quality differently. Pillow material factors were then divided into outer pillow material and pillow filling material.
   b. Product Color
      Color is known to influence the psyche. Therefore, colored paintings or objects can have an emotional impact. One study found that certain colors can affect a person's sleep quality. Therefore, it is crucial to choose a pillowcase color that can ensure a good night's sleep.
   c. Product Shape and Thickness
      Pillow shape was chosen because, based on research conducted by Liu et al. (2011), it showed that pillow shape affects sleep quality. Pillow thickness was also chosen because, based on research conducted by Ren et al. (2016), it showed that different pillow thicknesses provide different sleep quality.
   d. Product Weight
      Pillow weight was not chosen because pillow weight does not affect sleep quality. In research conducted by Sinaga et al. (2014), it was found that pillow weight plays a role

when used in specific situations. The pillow used in this study weighed 2 kilograms, so pillow weight was used as a signal factor in determining sleep quality.

2. Results of the Maternity Pillow Design Concept Design

The Maternity Pillow has original dimensions of 120 cm x 80 cm x 15 cm (Length x Width x Height). This design was created with careful and precise attention to ergonomic principles so that it could be followed up to the manufacturing stage using 3D images. The steps for implementing the Maternity Pillow design concept model are explained as follows:



3. Data Analysis of Expert Validation Results

Table 1. Expert Validation Result Data

No	Rated aspect	score	Score/Total Score x 10	Mark	Criteria
1.	Product Material and Pillowcase	43	9,0	A	Very good
2.	Product Color	7	7,0	B	good
3.	Product shape and thickness	8	8,0	A	Very good
4.	Product weight	10	7,3	B	good
	All aspects	68	8,0	A	Very good

Based on the table, the value of each aspect is obtained, such as (1) the aspect of material and pillowcase with a score of 9.0 with a value of A with good criteria (2) the

color aspect obtained a score of 7.0 with a value of B with good criteria (3) the aspect of shape and thickness of the product scored 8.0 with a value of A and included in the very good criteria (4) the aspect of product weight obtained a score of 7.3 with a value of B and included in the good criteria. In addition to the value of the results of product validation, suggestions and comments were also obtained to improve the color of the product. The suggestion is to clarify the color of the product, namely the project planning stage, the implementation stage and the presentation stage. Overall, the results of the expert assessment of the product contained in the Maternity Pillow Design received a score of 68 which is included in the very high category. So it can be stated that the product in the Maternity Pillow Design is suitable for use in improving the sleep quality of pregnant women in TM III, so the product is said to be worthy of being tested in the field.

4. Product Trial Results

Table 2. Data from the results of the Pregnant Women's Response Questionnaire in a Small-Scale Trial

No	Rated aspect	score	Score/Total Score x 10	Mark	Nilai	Criteria
1.	Product Material and Pillowcase	123	41	8,1	A	Very good
2.	Product Color	22	7,3	7,3	B	good
3.	Product shape and thickness	24	8	8	A	Very good
4.	Product weight	35	11,7	7,8	B	good
	All aspects	204	68	8	A	Very good

Based on the table above, the overall results of the small-scale maternity pillow design questionnaire received a score of 8, with an A rating, which is considered very good. The pregnant women's questionnaire not only provided an assessment but also provided comments and suggestions that were used to improve the developed model. Among the suggestions and comments provided were to make the product color more attractive and vibrant.

DISCUSSION

Testing certainly determines the product's success in addressing sleep disorders and improving maternal comfort and sleep quality. According to the Great Indonesian Dictionary, comfort is a state of ease, freshness, and coolness. Sleep is a process of changing a person's state of consciousness that occurs repeatedly over a period of time (Potter & Perry, 2017).

Meanwhile, according to Chopra (2003), sleep is a state of mutually exclusive relaxation, where the body rests peacefully and metabolic activity decreases, while the brain works harder during dreaming periods compared to daytime activities. Based on these definitions, sleep comfort can be defined as the state of comfort experienced when the body is at rest and consciousness changes. Sleep comfort can be assessed based on thermal comfort and sleeping posture.

Several previous studies have designed pillows for different purposes. This research is supported by research by Cai & Chen (2016), which examined the creation of pillow design concepts using an ergonomic approach. The pillow design concept aims to improve sleep quality. This study presented four studies: investigating the natural sleeping positions of 40 subjects aged 17-36 to obtain key points for pillow design; measuring body dimensions related to pillow design in 40 subjects to determine pillow size; creating pillow designs based on previous studies; and assessing the sleep quality of six subjects using the pillow designs compared to their current pillows. The results of study 1 revealed four natural sleeping positions.

Liu et al. (2011) conducted a study to determine the relationship between pillow design and subjective comfort levels. Four pillow designs were combined into eight configurations, which were then tested for their comfort level. The test was conducted by asking subjects to lie on each of the eight pillow configurations for one minute each. They were then asked to compare the comfort levels of pillows 1 and 2, 1 and 3, and so on. Thirty subjects (16 men and 14 women) participated. Pillow configuration 4 was the most comfortable pillow, with regard to head, neck, and shoulder comfort, height, and overall comfort. The four pillow configurations consisted of a standard pillow, a neck pillow, and a shoulder pillow.

Landry et al. (2015) studied sleep quality measurements in older adults over 55 years of age, comparing subjective and objective methods. The subjective methods used were the Pittsburgh Sleep Quality Index (PSQI) and the Consensus Sleep Diary (CSD). The objective measurements used actigraphy with MotionWatch 8. The results of this study showed that perceived sleep quality (subjective method) differed from the results of the objective method in adults over 55 years of age. This difference was not related to age, gender, education, or cognitive status. The best way to measure sleep quality in older adults is to use both subjective and objective methods.

Munawaroh et al. (2016) studied pillow softness based on physical parameters by determining the kapok filling composition, resulting in soft pillows at low production costs. The physical characteristics of pillow softness were assessed using the pillow force constant. Five pillows of the same size and density with different kapok compositions were tested. The kapok used was high- and medium-quality kapok. The results of this study indicate that to produce a soft pillow at a low production cost, the pillow should be filled with high- and medium-quality kapok in a 50:50 ratio

CONCLUSION

The product's test results on pregnant women yielded a score of 8 with an A, which is considered very good. Therefore, this product can be used to improve sleep quality for pregnant women in the third trimester.

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CONFLICTS OF INTEREST
This research does not involve any conflict of interest.

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