International Journal of Heritage, Art and Multimedia
IJHAM
EISSN: 2600-8262
Volume 6 Issue 19 (September 2023) PP. 01-12
DOI 10.35631/IJHAM.51001

INTERNATIONAL JOURNAL OF HERITAGE, ART AND MULTIMEDIA (IJHAM)
www.ijham.com

RESEARCH ON DESIGN ELEMENTS OF MATERNITY WEAR BASED ON THE PHYSIOLOGICAL AND PSYCHOLOGICAL NEEDS OF PREGNANT WOMEN: A NARRATIVE REVIEW

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Article Info:

Article history:
Received date:28.07.2023
Revised date: 15.08. 2022
Accepted date: 20.09.2023
Published date: 27.09.2023

To cite this document:

Sun, Y., & Md Nor, Z. D. (2023). Research On Design Elements of Maternity Wear Based on The Physiological and Psychological Needs of Pregnant Women: A Narrative Review. *International Journal of Heritage, Art and Multimedia, 6* (19), 01-12.

DOI: 10.35631/IJHAM.619001.

Abstract:

Pregnancy is a special stage in a woman's life, during which significant changes occur in her physical, physiological, psychological, and emotional aspects. The purpose of this study is to summarize the application of clothing design elements in maternity wear design based on the psychological and physiological needs of pregnant women, to meet their needs for exterior silhouette, internal structure, color, and fabric. The research findings will provide valuable information for maternity wear designers and researchers, and promote further development and innovation in the field of maternity wear design.

Keywords:

Physiological Change, Psychological Change, Maternity Wear, Design Elements

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Introduction

Maternity wear is a functional garment designed to accommodate the anatomical growth of a woman's body during pregnancy(Anand, 2017). The unique physiological and psychological changes that occur during pregnancy necessitate the need for specialized clothing that offers both functionality and style (Weigle, Elizabeth Anne ;McAndrews, 2022). As a result, it is expected that these changes during pregnancy would impact women's clothing preferences and behaviors (Simone Ho Sin man, 2008).

Maternity wear design has gained significant importance in the fashion industry as more women seek comfortable and stylish clothing during pregnancy. This article aims to combine the physiological and psychological needs of pregnant women to carry on a review of the research status of maternity wear design. Through the analysis of the existing maternity wear design literature.

Method

To conduct a comprehensive literature analysis on the topic of maternity clothing, a search strategy was employed to collect and analyze all relevant English original and review articles, books, and papers published between 2000 and 2022. The PubMed and Google Scholar databases were searched using a set of keywords including "pregnancy", "maternity clothing design", "design methods", "fashion", "body image", "pregnancy", "postpartum", and "color". Inclusion criteria were studies that examined the needs, behaviors, and design methods of maternity wear. The screening process was conducted using software and the Rayyan platform was utilized for article review and selection. Ultimately, 37 articles were selected from 121 articles and were reviewed comprehensively.

Findings

The author starts by exploring pregnant women’s physical and psychological needs, conducts a narrative review, and explains the current design elements of maternity wear.

Research on the Needs of Pregnant Women

People expect clothing to meet personal needs during specific stages of the human lifecycle (Miller-Spillman, K.A., Reilly, A. and Hunt-Hurst, 2012). For pregnant women, pregnancy requires special maternity wear to meet personal needs. Pregnancy is an important period for women to experience physiological and psychological changes and wearing maternity wear can help or hinder the process that affects women's health(Ogle, J.P., Tyner, K.E. and Schofield-Tomschin, 2013). Maternity wear should be attractive, comfortable, practical, low electrostatic level, easy to put on and take off, not hinder personal mobility, and not cause pain or discomfort(Sara Bragança & Ignacio Castellucci & etc, 2018). While also meeting the aesthetic standards of normal clothing. Due to the physiological and bodily changes of pregnant women, to better meet the needs of pregnant women for clothing, it is necessary to first understand the changes in their bodies and their needs for clothing.

Physiological Changes in Pregnant Women

A woman's physiological state experiences multiple body changes during pregnancy(Kohlhepp LM ; Hollerich G, 2018). In(Üstün, G., Ağaç, S., & Çeğindir, 2006) study to determine pregnant women's expectations of clothing products, the "body parts where women's weight gain occurs" were mainly investigated. The results showed that 21.3% of women had weight gain in both hips and bust, 18% had the most weight gain in hips, and 16% had the most weight

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IJHAM
EISSN: 2600-8262
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gain in the bust. Therefore, the structure of maternity wear needs to be adjusted according to the changes in pregnant women's body shape and the relationship between clothing and body shape needs to be handled well. Women's hormones undergo drastic changes during pregnancy(Md. Shamsuzzaman Rasel, 2017), resulting in continuous and prominent changes in their body shape, especially during mid-to-late pregnancy(D.V.Hankins, 2013; Luis D.Pacheco; Maged M.;Costantine, 2013). Among them, the changes in the bust and abdomen are particularly prominent. Compared to pre-pregnancy weight, pregnancy weight increases by about 25%, which is about 15 to 20 kilograms (R.Jain;T.Nirosa, 2018). The main features of body shape changes are the increase in bust and abdomen size (Georgeta et al., 2015). Therefore, it is crucial to understand and summarize the regularities and characteristics of physiological changes during pregnancy for the design of maternity wear (see Figure 1)

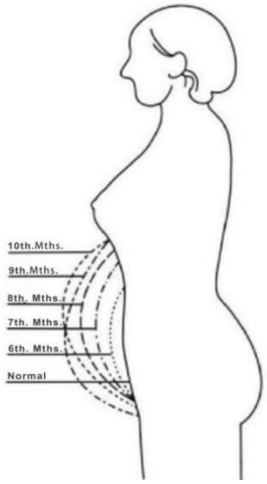

Figure 1: Changes in the abdominal circumference of pregnant women at different stages of pregnancy (Author drawing)

Source: (Author's Drawing)

The Characteristics of Body Shape Change in Each Stage of Pregnancy

Pregnancy generally lasts for 40 weeks and can be divided into three stages (Nirosa, 2018). (The first 12 weeks are the early stage of pregnancy, during which the physical changes in the pregnant woman's body are not significant, and the belly slightly protrudes while the breasts show no noticeable change. Loose-fitting or stretchy regular-sized clothing can still be worn, and there is no need to wear specific maternity wear. However, weeks 4 to 12 are a critical period for the formation of the fetus's organs (see Figures 2 and 3). Weeks 13 to 27 are the mid-pregnancy stage, during which there is a significant change in the pregnant woman's body shape, particularly with the noticeable growth of the belly and breasts(Georgeta et al., 2015). In the early stage of pregnancy, the location of the protruding belly is not yet clear. As the pregnancy progresses from the early stage to the mid-stage, the protrusion of the belly becomes more prominent and continues to rise above the chest point (Joy Sarkar & Md. Shamsuzzaman Rase, 2017). According to statistics, during this stage, the pregnant woman's bust, waist, and hip circumference increase by 15.5%, 30.3%, and 11%, respectively(Md. Shamsuzzaman Rasel, 2017). At this time, loose-fitting regular-sized clothing is no longer able to accommodate the pregnant woman's body shape, and it is recommended to choose suitable maternity wear. (See Figure 4)

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Figure 2. Pre-pregnancy Shape

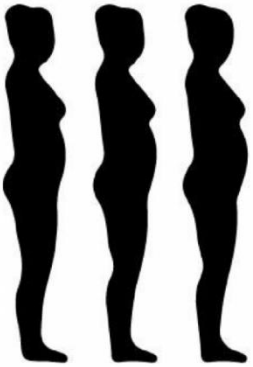

Figure 3. 1-12 Weeks

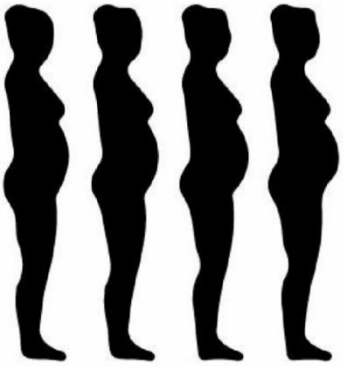

Figure 4. 13-27 Weeks

Source: (Author's Drawing)

Weeks 28 to 40 is the last trimester of pregnancy. During this period, the embryo in the abdomen is in a period of rapid growth, so the abdomen of the pregnant woman becomes more prominent and heavier, making it more inconvenient to move. According to data, the bust will increase by 25%, about two cups, the waist will increase by 49%, and the hips will increase by 18%(Joy Sarkar & Md. Shamsuzzaman Rase, 2017). In the design of maternity wear, the structure and style design of clothing are closely related to the changes in the body shape of pregnant women during pregnancy, especially the four parts of the bust, waist, middle hip, and hip(Anand, 2017). In the design of maternity wear the structure and style design of clothing are closely related to the changes in the body shape of pregnant women during pregnancy, especially the bust, waist, middle hip, and hip circumference. The circumference data of these four parts are important references for women's bodies during pregnancy data. (See Figure 5)

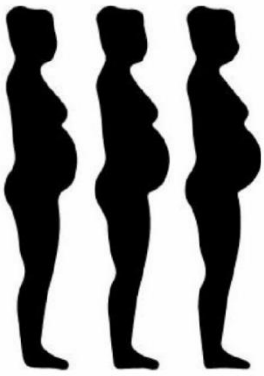

Figure 5. 28-40 Weeks

Source: (Author's Drawing)

The Characteristics of Body Function Change During Pregnancy

- Fat accumulation leads to decreased body flexibility, and physiological changes in pregnant women also cause changes in body functions (Colman, 2007). Under the influence of hormonal changes, a large amount of fat accumulates in the hips, pelvic joints, and pubic symphysis, making the relationship between them unstable. The weight of the fetus affects the pubic symphysis, causing the gap to widen, resulting in a wider and thicker hip area. (森 由紀;木岡 悦子, 1994) To provide nutrition to the fetus, the mother's body stores necessary milk and fat, causing the woman's body to develop horizontally, such as an increase in the dimensions of the arms and legs, and a thicker back(Arzu Şen Kılıç, Derya Tama, 2014). In the middle and later stages of pregnancy, due to the heavy abdomen,

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pregnant women need to lean their body backward to maintain balance, causing the neck to lean forward, the abdomen to protrude, and the hips to be tucked inward, making walking difficult(Sohn, M., & Bye, 2012).

- The body also produces adverse physiological reactions, which constantly appear with the physiological changes in pregnant women during pregnancy. The breasts of pregnant women swell and undergo secondary development. The blood volume in a pregnant woman's body exceeds normal, and the storage of water and sodium elements also increases, with some pregnant women experiencing varying degrees of edema in the later stages of pregnancy. The weight of the abdomen and the need to tilt the waist and drag the abdomen in the middle and later stages of pregnancy can lead to back pain. Pregnant women are more prone to feeling hot and sweating due to accelerated blood circulation and fat accumulation in the body. Muscle spasms in the legs, as well as constipation, urgency, frequency of urination, and vaginal infections, may also occur. The skin becomes dull and yellowish because of pregnancy hormones(Nirosa, 2018).
- Psychological pressure increases over time, and pregnant women tend to be emotionally unstable, become more sensitive than before, and worry about things will also increase. Part of the reason for women's psychological changes during pregnancy is the chain reaction of physiological changes that affect the way expectant mothers choose maternity wear (Longhurst, 2005).
- Among the psychological-related stressors of pregnant women, pregnant women in the first trimester are most concerned about the healthy development of their babies, as well as worries about diet and activities that do not meet the standards, worries about their own health, and worries about mood swings(Artur， Bjelica. et., 2018).
- Among the psychological changes in life, the most prominent is the conflict between pregnancy and work. The huge psychological and physical pressure brought about by pregnancy will directly lead to a decline in work performance and pregnancy complications, directly threatening the health of the mother and fetus(Yasuka, 2022).
- Psychological changes caused by major events: Before the COVID-19 pandemic, about 10% of pregnant women experienced mental disorders, mainly depression, and this figure was even higher (about 16%) in developing countries (World Organization Health, 2020). During COVID-19, pregnant women are postponing or canceling prenatal visits due to fear of getting infected in the hospital(Güner, 2022).
- The influencing factors of psychological stress during pregnancy include the mother's role, pregnancy motivation, personality traits, and social support (S.M.Woods, 2010).
- Maternity wear can bring a sense of security to pregnant women. Some pregnant women mentioned that the design of overalls can be associated with "kangaroo mothers" and bring a sense of security psychologically. It is believed that maternity wear should be comfortable, and safe, and should have a psychological "trust" for maternity wear. See table 1.

Table 1: Psychological/Physiological Changes During Pregnancy

Pregnancy stage	Psychological characteristics	Physical characteristics
Early pregnancy （1-12week）	1 Anxiety 2 Irritable 3 Mood swings 4 Worries about fetal development	1 Little change in body shape 2Early symptoms are not obvious 3 Easily flustered and short of breath

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		4 Vomiting
Mid pregnancy（13-27week）	1 The mood tends to be stable 2 working pressure 3 Established an emotional connection with the child 4 Worried about losing shape 5 Worry about fetal health	1Significant change in body shape 2Chest and abdomen size increased significantly 3 Accelerated blood circulation, afraid of heat, easy to sweat 4 Grow stretch marks
Late pregnancy（28-40week）	1 Eager to care 2 Worry about the production failure	1Large abdomen and inconvenient movement 2 Increased breast weight 3 Urgent and frequent urination
Lactation period	1 Desire for approval	1 Nipple cracking or fissures 2 Breast engorgement 3 Breastfeeding

Source: Author's drawing

Maternity Wear Design

Exterior Silhouette Design

The silhouette is an important element of fashion design. The designer's sensibility is expressed by the design changes in silhouette lines (NISHIMURA, 2021).

(Sun Xilu, 2021a)summarized the suitable clothing silhouettes for pregnant women and suggested choosing **A-line, H-line**, and **O-line** silhouettes, which can partially adjust the body shape. From the characteristics of pregnant women's body changes, the changes in the front waist, and abdomen are the most prominent. Therefore, A-line, H-line, and O-line silhouettes are recommended for overall clothing, which can have a certain corrective effect on the body shape of pregnant women. To avoid inconvenience to pregnant women's movements, the overall length of the clothing should not be too long. A-line clothing is narrow at the top and gradually widens downwards, with an overall loose fit and increased looseness at the hem, which can modify the protruding abdominal shape of pregnant women and reduce the visual sense of expansion.

When designing **A-line** maternity wear, attention should be paid to controlling the added volume value and setting the internal segmentation line to avoid making the clothes look more bloated after wearing them, exposing the pregnant woman's body shape. H-line clothing has the same length as the shoulders and hem, without a clear waistline, which is suitable for early pregnancy but not suitable for wearing in the middle and late stages of pregnancy, as it can make the waist and abdomen feel uncomfortable. **H-line** clothing can provide reliable and stable emotional value to pregnant women (Sun Xilu, 2021b). **O-line** clothing is round and plump, with a wide and long waist that exceeds the shoulders and hem, which is very suitable for wearing in the middle and late stages of pregnancy. It can perfectly wrap around the high and bulging belly of pregnant women in the middle and late stages of pregnancy, providing more space for the belly, and making it more comfortable to wear. (See Figure 6) However, X-line, T-line, and V-line silhouettes are not suitable for the design of maternity clothes. X-line is characterized by a narrow waist and wide shoulders and hem, which is exactly opposite to the body changes of pregnant women. T-line emphasizes wide shoulders, so an exaggerated

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shoulder silhouette will cause inconvenience to pregnant women's movements. Therefore, the above-mentioned clothing silhouettes are not suitable for the design of maternity wear.

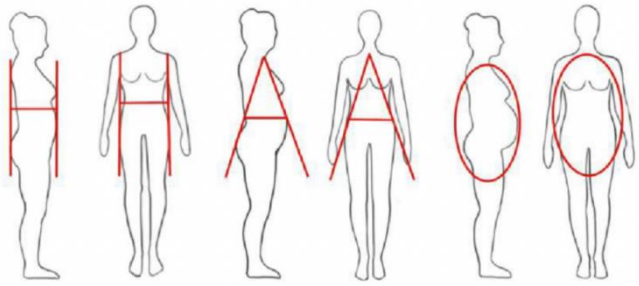

Figure 6: Clothing Silhouettes Suitable For Pregnant Women During Pregnancy

Source: Author's Drawing

Internal Structure Design

Before designing the structure of maternity wear, it is necessary to fully understand the characteristics of the pregnant body and combine them with the actual situation of pregnant women, to make the clothing comfortable, structurally reasonable, and easy for pregnant women to move.

During pregnancy, women's body shape undergoes significant changes, mainly manifested in an increase in the bust and hip circumference, and a rapid increase in abdominal circumference. Unlike traditional clothing design, in maternity wear design, in addition to considering the shape of the chest, the shape of the abdomen must also be considered. Based on the characteristics of a pregnant woman's body shape, the indentation between the chest and abdomen can be used as a breakthrough point in structural design.

In the mid-to-late stages of pregnancy, the circumference between the waist and hips gradually crosses the hip line (as shown in Table 2). Therefore, the structure of the waist and hips in maternity wear should also change accordingly. These changes are mainly reflected in the structure of the front piece. More importantly, to accommodate the continuous increase in abdominal circumference, not only should the waist size of the front piece increase, but the hip size should also increase.

Table 2: Body Size Statistics Of Pregnant Women (Author Drawing)

Circumference	Max	Min	Average
Bust circumference(B)	108	90	94.14
Waist circumference(W)	116	73	90.78
Middle hips circumferences (MH)	126	84	103.86
Hips circumferences(H)	119	89	102.2

Source: Author's drawing

(Sohn, 2009) used 3D technology to evaluate the fit of maternity wear. They studied the changes in body measurements and shapes during pregnancy and analyzed the relationship between changes in measurement and shape. A single case study was used to observe the body measurement results of a participant, the changes in body shape during pregnancy, and the relationship between the two. Based on the changes, the relationship between body size, body shape, and body changes was analyzed, and the pattern of change was identified.

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(Komarkova & Glombikova, 2013) determined the type of pregnant woman (body weight gain of 12 kg or more) based on statistical analysis and applied the results to the design of two models of maternity wear (shirt for the upper body and pants for the lower body). The results are applicable not only to determine the type of pregnant woman but also to designing input mode parameters that respect the body proportions of pregnant women in different types of maternity wear.

(SJ Cha, 2020) provided basic data for designing the pattern of maternity leggings. SPSS 24.0 statistical software was used for analysis. Based on the results of the appearance evaluation, the main pattern changes were concentrated in the thighs, calves, and upper body. In addition, wrinkles appeared on the upper body and knee areas.

(Sun Xilu, 2021a) summarized the design method for adding allowances in pattern making for maternity wear, including the upper body (bust, front center line, side swing, and drape) and lower body (waist, hip, abdomen, straight crotch, rise, and fall).

Color

Color plays a crucial role in the design of maternity wear, as its unique symbolic meaning and psychological associations provide a reference for the design of maternity wear. Colors are emotional, and to make maternity wear suitable for the needs of pregnancy, the use of color is also functional (KomarkovaP, 2013). Recognizing the impact of color on individuals' mental and emotional states can guide fashion designers to design maternity wear based on the best emotional state.

In Abd's study, red was believed to increase sexual attractiveness by affecting the sympathetic nervous system and increasing blood pressure, respiration, and heart rate(Farahat Mohammed Abd El Sabour, 2015). Yellow also increases blood pressure, respiration, and heart rate(WenF, ZuoB, WuY, SunS, 2014). and this color can activate nerve cells. Orange is a symbol of energy, increases appetite, and reduces depression and drowsiness. Pregnant women may experience some discomfort, especially in the middle and later stages of pregnancy. Pregnant women may sweat more, feel hot, and experience symptoms such as lower back pain and muscle cramps in the lower limbs. Women with pregnancy-induced hypertension should choose colors that can relieve their pain. Blue can relieve pain and the use of blue and green can bring happiness, calm nerves, relieve mental fatigue, and help pregnant women alleviate lower back pain. Purple not only can alleviate muscle spasms but also has the effect of reducing blood pressure in colors and can also have a calming effect on the mind, making people feel relaxed and sleepy. It can also lower body temperature and reduce sensitivity to pain(Tina M.Sutton & Jeanette Altarriba, 2016).

Fabric

Fabric is the material basis of clothing, and the color and style are directly realized by the material of the fabric. Designers will design corresponding styles of different styles according to the softness, stiffness, drape, and other characteristics of the fabric. The performance of fabrics is an element that affects the comfort of clothing(Chen Lili, 2019).

Pregnant women have lower immunity and lower skin barriers, so their skin is more sensitive. Therefore, maternity wear should meet the following requirements: comfort, warmth, and coolness, which are of great significance. Because pregnant women have the physiological

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characteristics of sweating, the inner fabric of maternity wear should have good moisture absorption and air permeability, to maintain the heat of pregnant women and balance metabolism. In summer, sun protection and heat insulation are the main functions of maternity wear. The selection of materials that are conducive to reducing radiation and heat dissipation is conducive to regulating the surface temperature.

(D.A.N. Mentone, R.H. Osava, S.H.A. Gomes, R.A. Sanches, 2018) Using a "design thinking" approach, starting from understanding user needs, based on interviews with thirty pregnant women. Based on the material gathered, the need for breast-friendly clothing was identified as a common problem. A prototype shirt was developed in a synthetic jersey fabric containing elastane.

(ShaguftaRiaz， et., 2022) fabricated flexible conductive textiles using different deposition techniques for the development of comfortable maternity wear to protect the fetus and mother from catastrophic radiation. The developed fabric is a new type of shielding material for maternity wear, which has the characteristics of low cost, lightweight, durability, comfort, and comprehensive performance.

(Borradale D, Isenring E, 2014) Harmful UV rays reduce the effectiveness of folic acid supplementation in pregnant women by 20%.

(P Sasikala, 2017) For UV protection, the characteristics of bamboo blended with cotton, polyester, and modal were studied at three fiber ratio levels. The test results show that the performance of bamboo/modal blends is better than that of bamboo/cotton and bamboo/polyester fabrics, and it is more suitable for maternity wear fabric design.

Conclusion

The research meets the physiological and psychological needs of pregnant women from the four aspects of clothing external profile, internal structure, color, and fabric. In terms of the external shape of the clothing, it is necessary to meet the psychology of pregnant women who want to cover up their posture, and to choose a clothing silhouette that can correct the shape of pregnant women and at the same time bring a sense of visual and psychological security and stability to pregnant women; in terms of internal structure, it is necessary to meet the needs of pregnant women. The structural design should handle the relationship between the fabric and the pregnant woman’s body so that the clothing fits well and avoid defects; in terms of color, color psychology is used to help pregnant women relieve their anxiety and anxiety during pregnancy. The feeling of adverse reactions to the body of pregnant women, using color relationships to brighten the dull complexion during pregnancy. In the fabric, we should pay attention to comfort and breathability, choose materials with good moisture absorption and breathability, and consider the characteristics of sun protection and UV resistance.

Acknowledgments

Thanks to Dr. Zainudin Bin Md Nor for guidance and assistance in the research direction of this research.

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DOI 10.35631/IJHAM.51001

References

Anand, N. (2017). *Smart Maternity-wear* (Lambert publication Germany (ed.)). Lambert publication Germany.

Artur , Bjelica. et. (2018). The phenomenon of pregnancy — a psychological view. *Ginekologia Polska*, *89*(2), 102–106. https://doi.org/10.5603/GP.a2018.0017

Arzu Şen Kılıç, Derya Tama, Z. Ö. (2014). CLOTHING PROBLEMS WITH MATERNITY GARMENTS. *International Izmir Textile and Apparel Symposium*, 63–67.

Borradale D, Isenring E, H. E. and K. M. (2014). "Exposure to solar ultraviolet radiation is associated with a decreased status in women of childbearing age",. *J Photochem Photobiol B*, *131*, 90–95.

Chen Lili, L. C. (2019). Relationship between fabric performance and the dressing convenience of lower limb disabled persons. *Wool Textile Journal*, *47*(12), 54–58.

Colman, C. K. S. ;Jack M. (2007). Physiological changes in Pregnancy. In *Heart Disease in Pregnancy*.

D.A.N. Mentone, R.H. Osava, S.H.A. Gomes, R.A. Sanches, A. Y. S. D. (2018). A proposed procedure to develop clothing for pregnant women. In *Reverse Design* (p. 8). CRC Press.

D.V.Hankins, L. D. P. M. M. C. (2013). Physiologic Changes During Pregnancy. In *Clinical Pharmacology During Pregnancy* (pp. 5–20).

Farahat Mohammed Abd El Sabour, H. (2015). Color selection and the promotion of health and healing by means of clothing design. *International Design Journal*, *5*(3), 1371–1379.

Georgeta, P., Alexandra, M., & Sabina, O. (2015). INNOVATIVE CLOTHING DESIGN FOR WOMEN DURING PREGNANCY. *Annals of the University of Oradea Fascicle of Textiles, Leatherwork*, 67–72.

Güner, O. (2022). Psychological and social impact and lifestyle changes among pregnant women of COVID-19 pandemic: A qualitative study. *Archives of Psychiatric Nursing*, *36*, 70–77.

Joy Sarkar & Md. Shamsuzzaman Rase. (2017). Maternity Clothing- A Comprehensive Review. *Textile Foucus*.

Kohlhepp LM ; Hollerich G. (2018). Physiological changes during pregnancy. *Search Life-Science Literature*, *67*(5), 383–396. https://doi.org/10.1007/s00101-018-0437-2

Komarkova, P., & Glombikova, V. (2013). THE EFFECT OF ANATOMICAL CHANGES IN THE FEMALE BODY DURING PREGNANCY ON PATTERN DESIGNS FOR MATERNITY WEAR. *Technical University of Liberec, Faculty of Textile Engineering, Department of Clothing Technology, Liberec, Czech Republic* , *23*(4).

KomarkovaP, G. (2013). Theeffectofanatomicalchangesin the female body during pregnancy on pattern designs formaternitywear. *PLoS One*, *23*, 409–415.

Longhurst, R. (2005). Dressing Pregnant Bodies in New Zealand: Clothing, Fashion, Subjectivities and Spatialities, Gender, Place and Culture. *Journal of Feminist Geography*, 433–435.

Luis D.Pacheco; Maged M.;Costantine, G. D. V. H. (2013). Physiologic Changes During Pregnancy. In *Clinical Pharmacology During Pregnancy* (pp. 5–20).

Md. Shamsuzzaman Rasel. (2017). Maternity Clothing; A comprehensive Review. *Textile Focus.Com*. https://doi.org/http://textilefocus.com/maternity-clothing-comprehensive-review/

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Volume 6 Issue 19 (September 2023) PP. 01-12
DOI 10.35631/IJHAM.51001

Miller-Spillman, K.A., Reilly, A. and Hunt-Hurst, P. (2012). The Meanings of Dress. In *Bloomsbury Publishing*.

Nirosa, J. A. S. M. D. R. J. T. (2018). Physiological changes in pregnancy. *Drug Invention Today*, *10*(8).

NISHIMURA, T. T. S. (2021). Silhouette Classification of Designer's Collections in Luxury Fashion Brands. *International Journal of Affective Engineering*, *20*(1), 33–40. https://doi.org/https://doi.org/10.5057/ijae.IJAE-D-20-00002

Ogle, J.P., Tyner, K.E. and Schofield-Tomschin, S. (2013). "The role of maternity dress consumption inshaping the self and identity during the liminal transition of pregnancy." *Consumer Culture*, 119–139.

P Sasikala, P. T. (2017). A Study on the Effectiveness of Bamboo Blended Fabrics on UV Protection for Maternity Wear. *International Journal of Latest Technology in Engineering ,Management & Applied Science*, *VI*(VI), 54–57.

R.Jain;T.Nirosa, J. A. S. D. (2018). Physiological changes in pregnancy. *Drug Invention Today*, *10*(8).

S.M.Woods, J. L. M. (2010). Psychosocial Stress During Pregnancy. *Obstetric Anesthesia Digest*, *30*(4), 61.e1-61.e7.

Sara Bragança & Ignacio Castellucci & etc. (2018). Insights on the apparel needs and limitations for athletes with disabilities: The design of wheelchair rugby sports-wear. *Applied Ergonomics*, *67*, 9–25. https://doi.org/https://doi.org/10.1016/j.apergo.2017.09.005

ShaguftaRiaz， et. (2022). Layer by layer deposition of PEDOT, silver and copper to develop durable, flexible, and EMI shielding and antibacterial textiles. *Colloids and Surfaces A:Physicochemical and Engineering Aspects*, *650*(5). https://doi.org/https://doi.org/10.1016/j.colsurfa.2022.129486

Simone Ho Sin man. (2008). *Maternity garment treatment for the relife of low back pain*. The HONG KONG Polytechnic University.

SJ Cha. (2020). Pattern Development of Maternity Leggings. *Journal of the Korean Society of Clothing and Textiles*.

Sohn, M., & Bye, E. (2012). Visual analysis of body shape changes during pregnancy. *International Journal of Fashion Design, Technology and Education Design*, *5*, 117–128.

Sohn, M. (2009). *A Pattern Adaptation for Body Changes during Pregnancy:A Single Case Study*. University of Minnesota.

Sun Xilu. (2021a). *Design practice of modern maternity dress in workplace environment*.

Sun Xilu. (2021b). Research on the Design and Color Matching of Maternity Wear Based on the Physiological and Psychological Needs of Pregnant Women. *China Academic Journal Electronic Publishing Houseca*, *12*, 123–126.

Tina M.Sutton & Jeanette Altarriba. (2016). Color associations to emotion and emotion-laden words: A collection of norms for stimulus construction and selection. *Behavior Research Methods*, *48*, 686–728. https://doi.org/10.3758/s13428-015-0598-8

Üstün, G., Ağaç, S., & Çeğindir, N. Y. (2006). Hamile kadınların giyim ürünlerinden beklentileri. Gazi Üniversitesi 12. Ulusal Ergonomi Kongresi. *Ergonomi'de Yeni Gelişen Stratejiler Teknolojiler ve Sektörel Uygulamalar Bidiriler. Ankara: Kardelen Ofset Ltd. Şti.*

International Journal of Heritage, Art and Multimedia
IJHAM
EISSN: 2600-8262
Volume 6 Issue 19 (September 2023) PP. 01-12
DOI 10.35631/IJHAM.51001

Weigle, Elizabeth Anne ;McAndrews, L. (2022). The future of maternity wear: Generation Z's expectations of dressing for pregnancy. *Fashion Marketing and Management*, *26*(3), 534–549. https://doi.org/10.1108/JFMM-11-2020-0244

WenF, ZuoB, WuY, SunS, L. (2014). Red is romantic ,but only for feminine females:Sexual dimorphism moderates red effect on sexual attraction. *Evol Psychol.*, *12*, 719–735.

World Organization Health. (2020). Org. *Maternal Health*, https://www.who.int/teams/mental-health-and-substa. https://doi.org/https://www.who.int/teams/mental-health-and-substance-use/maternal-mental-health

Yasuka, N. & Y. S. T. & et. (2022). Occupational stress is associated with job performance among pregnant women in Japan: comparison with similar age group of women. *BMC Pregnancy and Childbirth*, *22*, 749. https://doi.org/https://doi.org/10.1186/s12884-022-05082-3

森 由紀;木岡 悦子. (1994). 妊娠後期の衣服設計に関する基礎的研究. 日本家政学会誌, *45*(2), 137–146. https://doi.org/https://doi.org/10.11428/jhej1987.45.137