

Designing for Pregnant Women

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Abstract

“It’s positive!” Few words such as these have the power to change a woman's life forever. One may think her life will actually change nine months from them, but even during these nine months of pregnancy her whole body will go through a transformation. According to medical literature, women go through three trimesters, phases during which her body will change to accommodate the baby-to-be. Because women have had pregnancies for the whole span of human history, one would think the apparel industry would have acknowledged this and would have always been designing for them.

Our research shows that this is not the case, though, and so much could be done. When reviewing the literature, we learned that in the past pregnant women would wear their usual clothes until they no longer fit. From there they would wear oversize garments until they gave birth. Indeed, very little has been done in regards to pregnant women and the apparel industry and most of it has been done only in the last few decades. Moreover, it seems that many people think that the changes are only in her torso.

After we surveyed a group of pregnant women and young mothers, our results showed that contrary to what we read in the literature, they perceive their metabolic changes from the very first trimester. In addition, changes appeared not only on their upper part of their body but from head to toe. Moreover, surprisingly, this sample we surveyed seems to be “satisfied” with the clothing currently offered, just as people tend to be in a push marketing system. If designers and marketers are looking to focus on one specific target market, one where there is room for improvement when it comes to size, fit, and styles, maternity wear is definitely the one where it is time to shift from a push marketing strategy and move on to a pull marketing strategy with a consumer-driven concept. Pregnant women represent an undeserved market from this perspective. Thus, if manufacturers and retailers recognize the benefit of focusing on specific target markets and the importance of working with accurate body measurements in variety of styles related to a target market, pregnant women offer an appealing and dynamic target market. Imagine designing appealing garments that could be suitable for all three trimesters! It would be a breakthrough, innovative and sustainable way of designing and satisfying mothers-to-be.

Keywords: designing for pregnancy, maternity wear, fit, apparel

1. Introduction

The apparel industry recognize the fact that height and weight as well as women’s body morphology vary widely between individuals and standards sizes is a real challenge. Since the legendary William Herbert Sheldon (1898-1977)[1] grouped individuals into three major somatotypes, many acknowledged that “It doesn’t take that much ‘people watching’ to discover that figures are different from one another” [2]. Nowadays, women are grouped to visualize this with a front-facing silhouette, such as hourglass shapes, pear shapes, tubular shapes, etc. which helps brands produce apparel for a specific body shape [3]. For their own part, women consciously or unconsciously identify brands that fit their body shape and size [4]. The question then is how apparel brands define sizing for the mothers-to-be and how women manage to find garments that suit their bodies when they begin to change so radically during pregnancy. The literature review first presents a brief history of maternity wear. Next it presents typical body transformation during pregnancy, trimester after trimester as viewed through medical eyes. This view, although very interesting, seems to differ from the answers we gathered when we asked our group of 200 pregnant women and young mothers about their perceptions regarding their body sizes and shapes during their pregnancy. We also investigated their garment tastes, styles references, and garment needs, which are all critical issues for designing maternity wear in the apparel industry in order to satisfy women in this target market. In addition, although subjective, fit is an important aspect to keep in mind during our study of maternity wear.

Although our research is at the embryo stage, this dynamic market and our insights into body changes during the three trimesters of pregnancy should be beneficial to designers, manufacturers, retailers and consumers. Because this research focuses on the body's physical transformation, we believe it would be beneficial to measure women with a 3D body scanner in order to obtain precise, consistent results. Unfortunately, we didn't success obtaining volunteers for this process, so far. Timing wasn't *au rendez-vous*.

2. Literature review

2.1. Maternity wear: a brief history

It wasn't until after the beginning of the last century that research was undertaken to determine what garments would be functional and comfortable for pregnant women [5]. Because women have had pregnancies for the whole span of human history, one would think the apparel industry would have acknowledged this and would have always been designing for them. On contrary, it seems that until recently mothers-to-be often ended up wearing clothes that were not suitable for their needs. The first dress made specifically for maternity was a cheap cotton wrap-around housedress created in the early 1900's [6]. Moreover, according to Peteu and Gray (2009)[7] it is only after 1890 that garments begin to meet special feminine needs. These authors examined 1,126 patents from the U.S. Patent and Trademark Office to determine the primary purpose of garments (fashion, wearability, use and manufacturing) and how garments evolved to accommodate women's unique physiology, paying attention to maternity and sanitary protection. Peteu and Gray (2009)[7], state that it was in 1907 that the first maternity skirt was patented in the United States of America (classified in Class 211). The waistband of that skirt was adjustable to accommodate growth.

After the Second World War, styles evolved to emphasize women's procreative role. These new garments called attention to the abdomen and accentuated the hips and breasts [8]. Even then, maternity wear itself was discreet. It all started to change with Princess Grace (Grace Kelly), a fashion icon who was known for classic simplicity. In 1956, the Princess captured the public eye by wearing a Christian Dior tailored suit with a gently flared jacket which showed, rather than hiding, her pregnancy [9]. Although it continued to be conservative and discreet on the whole for few decades, recently maternity fashion has gained prominence, not only amongst today's celebrities but also for other mothers-to-be. Moreover, a style emerged, called the 'pregnant look' [8]. The days when new mothers had to feel like they were running around in their nightgowns are in the past, but nevertheless very little has been published regarding the size and fit of maternity wear.

2.2. Body shape before pregnancy

Legendary William Herbert Sheldon (1898-1977)[1] looked at thousands of photographs and studied physical traits and builds, then grouped individuals into three major *somatotypes*: (1) *endomorph*, (2) *mesomorph*, and (3) *ectomorph* (Sheldon 1941).

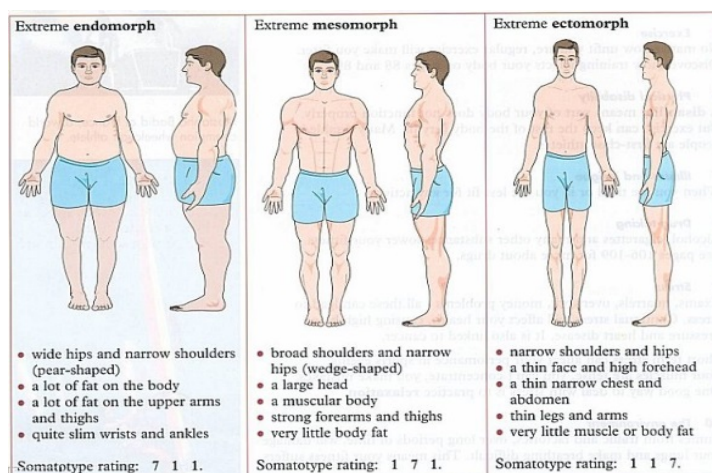


Fig. 1. Endomorphy, mesomorphy, and ectomorphy body shapes, Sheldon, 1938-41[1]

Since that time, many authors have grouped individuals' body types to better serve the apparel industry. Rasband and Lietchy (2006)[2] stated that it is obvious that women's figures are different from one another and easy to see that height and weight as well as women's body morphology vary widely between individuals. Over the last two decades, there has been increased effort in the apparel industry to appeal to different target markets, such as people from different origins, older, plus sized, petites, tall, etc. [10, 11, 12, 13, 14, 15].



Fig. 2. Dove Beauty Campaign <http://thesituationist.files.wordpress.com/2007/10/dove-models-real-beauty.jpg> [16]

Indeed, anthropometric data analysis of women has established that origin, race, age group, the geographic area, etc. can make a difference in body shapes [17, 18]. For instance: although similar in height, Chinese women differ in girth from their Westerners counterparts (Alvanon, a Hong Kong based company) (figure below). The apparel industry recognizes this phenomenon and consequently brands produce for specific body shapes. Consumers then come to recognize brands that fit their body shape and size.



Fig.3. Business wire, August 12, 2008, Alvanon Chinese body measurement study [19]

As a result of recognizing customers' needs, manufacturers and retailers have become more effective, improving consumer satisfaction. Because of the benefit of focusing on specific target markets, working with the right information and using accurate body measurements has become a must, as is proper garment selection for target markets.

When it comes to maternity clothes, not only does body shape and size differ initially, but body sizes and shapes differ between groups and over time, so It is important to look at the characteristics and perceived physical changes of mothers-to-be.

2.3. Key stages in pregnancy

Pregnancy usually occurs between a woman's twenties and late thirties (though it is possible to range from 10 and 60 years old) [20]. During this period of pregnancy, the body changes its physiological and homeostatic mechanisms to ensure the development of the foetus. Weight gain results from increased appetite, fat deposition, and growth of the reproductive organs and foetus, as well as increased blood volume and water retention.

Women gain anywhere between 2.5kg to over 45.3kg during pregnancy [21]. Doctors' recommendations concerning maternal weight gain have shifted during the last century, when women were encouraged to gain only a few pounds (between the 1940's and 1960's) to encouraging women to eat according to their appetite (during the 1970's), to encouraging them to gain between 11kg to 15.8kg - less if the woman is overweight and more, up to 18kg, if the woman is underweight [22]. Although these recommendations were provided, the reality may differ. Jimenez and Bacallao (1995)[21] who looked at the weight gained and compared it to studies of previous decades, stated that their study, done between 1980 and 1983, showed an average weight gain of 28kg with a standard deviation of 4.5kg. When compared with Hanes' study of the 1970s, where the average weight gain was 29kg with a SD of 7kg, and HES' study of the early 1960s with this time an average weight gain of 28.8kg and a SD of 6.25kg, we can conclude that variation in terms of weight gain is remarkably similar over the past last few decades despite the change in health cares' recommendations [23].

Women duration of a pregnancy is typically 38 weeks after conception (9 months and 2 weeks), or approximately 40 weeks from the last normal menstrual period [20]. Pregnancy is arbitrarily divided into three unequal trimesters, which refer to the different stages of prenatal development. Each trimester has its own predictable developments for both the foetus and the mother-to-be. In their recent studies Rutter *et al.*, (1984) illustrate a series of highly predictable growth patterns for pregnant women. Their pilot study included eight subjects: four endomorphic, two mesomorphic, and two ectomorphic. The pilot study's objective was to evaluate the ease with which anatomical landmarks could be identified on subjects at term and to assess measurement session protocol, measuring instruments, and the survey recording form. Their final sample was done on one hundred and five subjects randomly selected from a specific maternity clinic, and each subject was measured twice. The first time they were measured was during the first trimester i.e., at the time of their first visit between week 4 and 16, when there had been no physical development, and at term during pre-labor, at the end of the third trimester.

2.3.1. First trimester

The first trimester runs from the first week to week twelve. It is a period during which the outer layers of the embryo grow and form a placenta for the delivering of essential nutrients through the uterine wall, or endometrium. During this period not only are the muscular fibers of the uterus getting thicker and longer but the uterus itself is increasing, putting pressure on the mother's bladder. At this point not much change can be visually perceived in the belly, but changes in the upper part of the female body are more visible (see figure below). Since the cardio rhythm is increasing, the "galactophores canals" are multiplying and the size and weight of the breasts can increase considerably [20]. Some women become minutely conscious of any changes, and the baby may not yet seem real, so women may focus on themselves [24]. A high percentage of pregnant women seem not to gain any weight due to morning sickness. This is also the trimester where most miscarriages occur.

2.3.2. Second trimester

During the second trimester (week 13 to week 28), the development of the foetus can be more easily monitored. It is during the second trimester that women begin to put on weight, especially if it is their second pregnancy [24]. The uterus expands in order to adapt itself to the size of the foetus [20]; and the belly enlarges. At the beginning of the second trimester, even if there is little evidence of pregnancy it is not unusual for an enthusiastic mother-to-be to wear maternity clothes as a "validation" of her pregnant state [25].

2.3.3. Third trimester

Lastly is third trimester, from the beginning of the 29th week on, which approximates the point of viability, when the foetus is capable of survival, with or without medical help, outside of the uterus. The foetus begins to move regularly and can become quite strong. This period of a woman's pregnancy can be uncomfortable, with symptoms like weak bladder control and back-ache [24]. The woman can feel the foetus moving and it may cause pain or discomfort when it is near the woman's ribs and spine. It is during this third trimester that the foetus will be growing the most rapidly, gaining up to 28 grams per day. The growing foetus pushes on the digestive organs and compresses the stomach and the bladder [20]. Final weight gain takes place, which is the most weight gain throughout the pregnancy. Breasts become full and sensitive. At this point, the woman's belly may change shape

as the belly drops due to the foetus turning in a downward position in preparation for birth. Moreover the woman's navel will sometimes become convex due to her expanding abdomen.

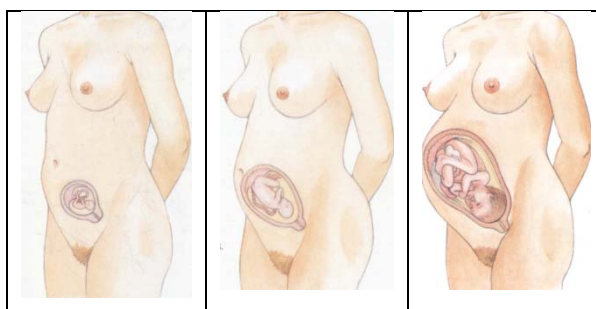


Fig. 4. Body profile for the three trimesters of pregnancy, Stoppard and Younger-Lewis, 1995, p. 170 [20]

Interestingly, results may vary depending of the number of pregnancies. According to Rutter *et al.* (1984) [24] whose sampled women around 26 years old who had been pregnant twice and who had successful births, showed that during their second pregnancy women gained 10.5 kg (17% increase over pre-pregnant weight).

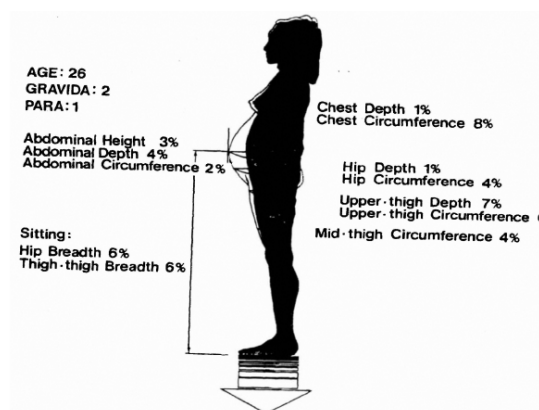


Fig. 5. Rutter *et al.* (1984) 26 years old pregnant women

In addition, the authors state, they had increases of 2.8 cm in abdominal circumference and 8.2 cm in abdominal depth. Bottom line not only the body size changes but the posture changes as well and the back curves [25].

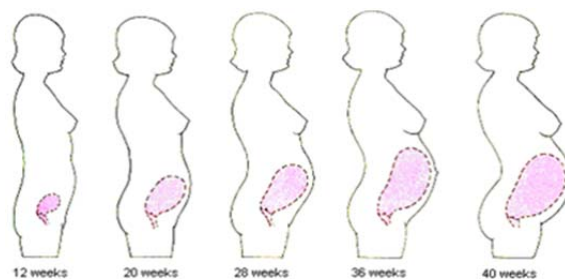


Fig. 6. Olds *et al.*, 1984, *Maternal-newborn Nursing: A Family-centered Approach*, p. 295 [25]

The question is then when and how body changes are perceived by mothers-to-be and, how do they manage the acquisition of garments when their body shape and garment needs change radically during pregnancy?

3. Research methodology and results

This research focuses on women's perceptions of their bodies' transformation during the three trimesters of their pregnancy and their need for new apparel and ...shoes to accommodate these changes. We investigate pregnant women's satisfaction with the sizes of clothes available to them on the market for each of the three trimesters. Lastly, we investigate whether women would like to serve for a 3D body measurement study to collect data.

3.1. Sample

The sample size of this study that was conducted in Asia few years ago was just over two hundred women. Of these women, 26% were pregnant during the study and the rest had been pregnant within the last few years. For a majority of them, over 60%, it was their first pregnancy. Of the women, 90% were either married or were with a significant other. As stated in the literature, the age distribution was close to 70% between 20 to 35 years old; and of these, 14% were in the age range of 20 and 25 years old, 26% were between 26 and 30 years old, and close to 30% were between 31 and 35 years old.

3.2. Results of physical changes perceived

Consistent with the literature, during the first trimester, 46% of our sample reported changes in their bust. Yet contrary to the literature, 40% also stated that their waistline also increased. Moreover, 22% mentioned that their face changed, 23% noted changes to their hips, 11% stated that their legs changed, and 3% stated that their feet changed.

As expected, it was during the second trimester that most respondents perceived physical changes. Indeed, during the 2nd trimester, except for the bust, which lagged at 38%, all of the percentages increased. The waistline changed in 48%; the face changed for 42%; the hip changed for 53%; the legs changed for 43%; and the feet changed for 26%.

During the last trimester, while the percentage of respondents reporting physical changes declined, more than 30% of our sample still identified changes in their leg and feet sizes. A total of 64% of our sample perceived differences in their foot size during their pregnancy (For the third trimester percentages were: bust 6%; waist line 6%, face, 15%; hip, 18%; legs, 31% and feet, 35%).

The bar chart in the figure below indicates the second trimester as being the one with the most perceived changes with the exception again of the bust and waist line which also occur during the first trimester.

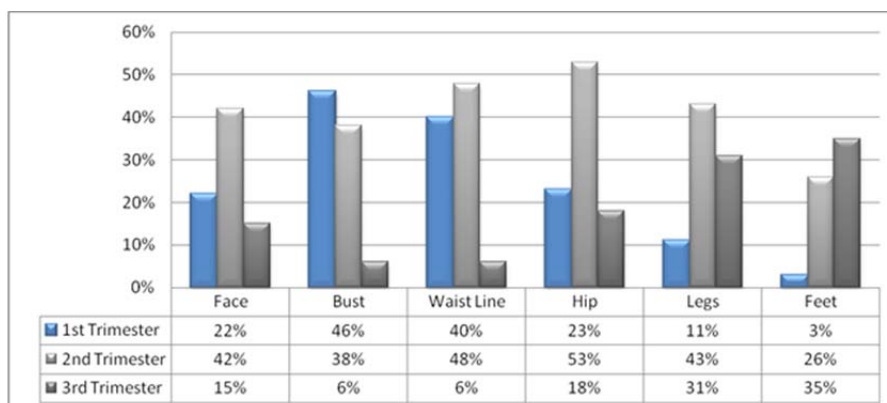


Fig. 7. Perceived physical changes for different body parts per trimester

3.2. Results of garments and ...shoes needed

Because of these transformations, and depending on when these occur, women needed new garments throughout their pregnancies. According to our results, the need for new clothes is most pronounced during the second trimester with the exception of the need for a new bra, which appeared earlier, and also coincides with our first results and the literature. Surprisingly, a high percentage mentioned they needed new panties (40%) and pants (42%) during their first trimester. Although this correlates with our finding that 40% of our sample stated that they perceived a change in their waistline as early as the first trimester, it is again contrary to the literature, though as Rubin [24] mentioned, women become minutely conscious of any changes in their bodies. Another very interesting result is that close to 60% felt they needed to change their shoe size during pregnancy.

The percentage of women that stated they needed different garments, per trimester, is as follows. During the first trimester: pants 42%; bras and panties 40%, skirts 26%, blouses 18%. The other garments such as sleepwear, sportswear, bathing suit, socks, tummy belt and shoes each account respectively for less than 10%. During the second trimester: dresses counted for 62% and blouses 61%. These are closely followed by skirts (57%), pants (48%), bras and panties again were the same at 46%. Differing from the first trimester, during the second trimester, women also perceived a need

for other garments such as sleepwear (50%), sportswear (36%), bathing suits (20%), socks (27%), tummy belts (48%) and shoes (26%). Lastly, during the third trimester, most of the women seem to have had less need for new clothes. All of the above items counted for less than 20% with the exception of shoes, which counted for 26%.

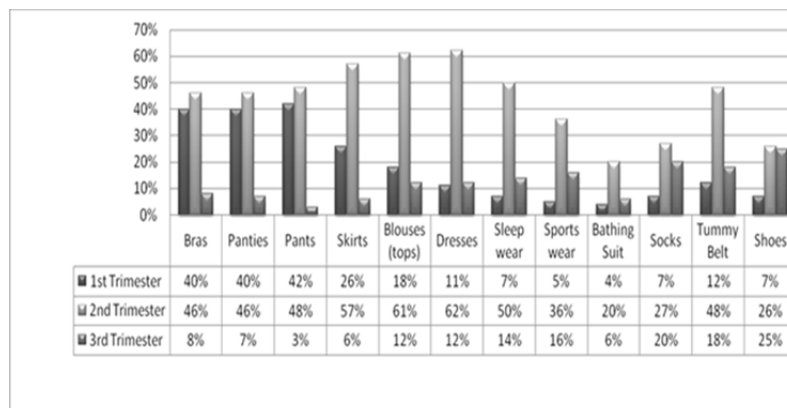


Fig. 8. Percentage of respondents with specific clothing need by trimester

3.3. Results of the most important criteria when it selecting maternity wear

To identify the importance of various criteria in the selection of maternity wear for our target market, women in our sample were asked to rank each of the following: price, brand, size and fit, quality, fashionable styles and the salesperson’s opinion. On this Likert scale, (1) denotes not important at all while (5) indicates being extremely important criteria in the decision to purchase maternity clothes. The most important criterion was the size and fit (55% women stated that it was an extremely important criterion and 35% stated that it was an important criterion, for a totals of 90%). Contrary to our expectations, though, a high percentage of our sample were “neutral” (a 3 on a Likert scale of 1 to 5) or satisfied (4) with the sizes and fit offered for maternity clothes. One could expect such results for sizes and fit of socks for which 49% wrote 3 on a Likert scale of 1 to 5. But to our surprise as much 47% wrote they were satisfied with maternity bras, while 40% were neutral and 37% were satisfied with maternity jeans. As for the type of garment preferred, a high percentage stated that they prefer a one-piece dress (69%). Surprisingly, this garment was the one that received the lowest score for satisfaction. As much as 44% of our sample answered that they were either not satisfied at all or were dissatisfied with the fit of this type of garment.

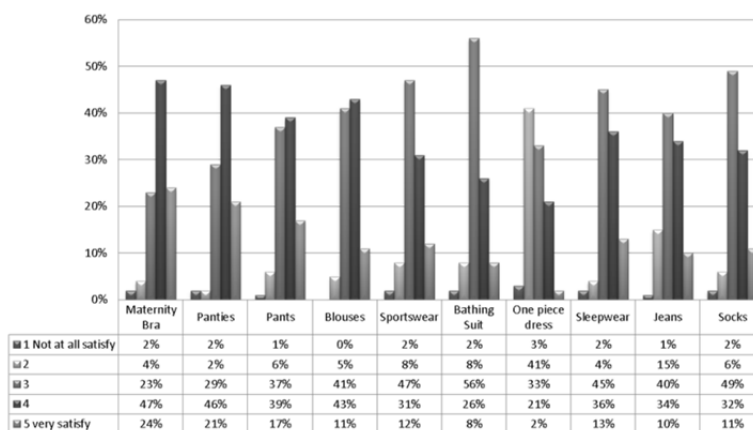


Fig. 9. Percentage of respondents according to their satisfaction

This was followed by criteria such as quality and price. According to our results, women of our sample are either neutral or pay little attention to the criteria such as the brand, fashion trends, and the salesperson’s opinion.

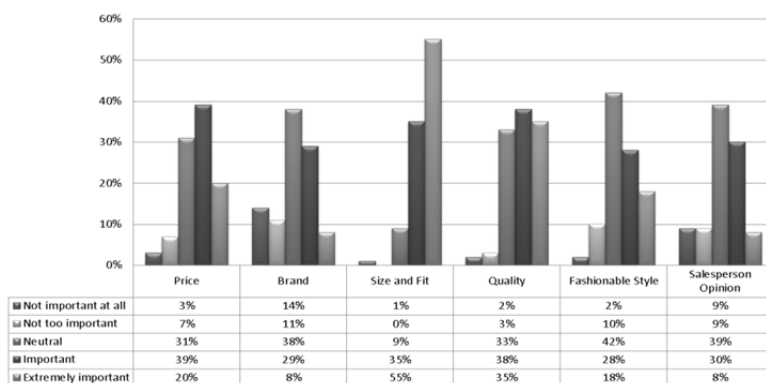


Fig. 10. Importance of various criteria for purchase of maternity wear

Further statistical details can be found in “An Expanding Market: Asian Mothers-to-be” by Faust *et al.* (2011)[27].

3.5. Results to serve as a model to be measured

Size in the apparel industry has always been challenging for manufacturers and retailers and a decisive factor for consumers’ clothing selection. As our results show, size and fit seems to be a critical issue for mothers-to-be. In order to improve the maternity wear size system and garment fit, pregnant women need to be measured systematically. We therefore asked women of our study if they would serve as models to be measured during their pregnancy with a 3D body scanner.

The majority, 73%, answered they would not want to be measured. 67% added that if they “had” to be measured they would prefer to be manually measured. A total of 45% state they would need to discuss with their husband first, whereas 27% state they would need to discuss with their doctor first. Less than 15% were comfortable to take this decision on their own and none of them entered the 3D body scanner at this point. No incentives were offered for participation. This validates the fact that there are still a number of difficulties specific to the adoption of such technology in the industry and yet adoption remains slow [26].

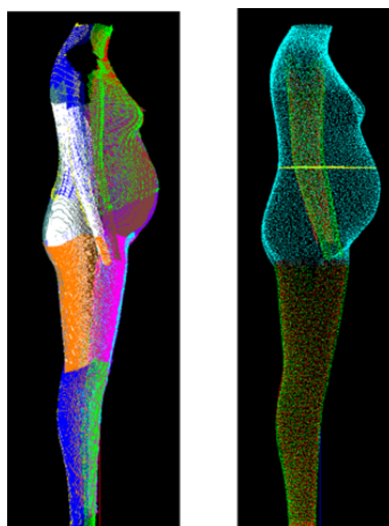


Fig. 11. Model scanned

3.6. Maternity wear choice

In regards to maternity wear the challenge is still present for manufacturers and retailers. Very little has been published at this point and since meeting the needs of a target market also means offering satisfactory fit (criteria number one of our sample surveyed), a lot of work could be done.

Now that we know that during pregnancy, mothers-to-be need new clothes and shoes according to each trimester; that the foetus obliges the future mother to curve her back in order to counterbalance the increases weight of the abdomen; that this poor posture may put pressure on the vertebrae,

especially during the second part of the pregnancy [20]; that physiological changes appear, such as slightly higher body temperature, it seems obvious that all of the above contribute to alter women's purchasing patterns for clothes and ...shoes. While some may choose natural fibers such as cotton and wool blends and others may go for more elastane, size, fit and comfort are still number one criteria. And as of today only fourteen maternity patents were approved in U.S.A. specifically for skirts for pregnant women (patents are registered and classified in Classes 219 and 221 of the Patent and Trademark Office). Indeed, most brands on the market such as Motherhood Maternity®, A Pea in the Pod®, and Destination Maternity®, all come from one of the largest manufacturer of maternity clothes; Destination Maternity Corporation. Although they are doing amazing work, it seems we are at the embryo stage of what could be done for maternity wear and more research needs to be done, and he results will be beneficial to manufacturers, retailers and consumers.

4. Conclusion

This research serves as a starting point to investigate women's perceptions of their body shape during pregnancy and their appreciation for maternity wear currently on the market. Although results are somewhat limited (a sample of just over 200 Asian women who were pregnant at the time or had recently been pregnant), it (1) does serve to show the lack of literature and (2) surely showed that size, shape and fit are important criteria in maternity wear. This survey is starting to be replicated in America and definitely should be replicated on a larger scale in other geographic areas. Yet, this study investigated a new area for research; maternity clothes for different geographic markets and ethnicities, and thereby informs designers, manufacturers and retailers with the objective of satisfying this specific target market.

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