

## A Quantitative Assessment on Perceived Physiological Comfort of Clothing during Lactation

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### ABSTRACT

**Background:** Physiological comfort refers to sensorial comfort including temperature, fit and fabric weight. Because pregnant and lactating women undergo various physiological changes, it is important to identify optimal comfort features regarding clothing. This will promote and increase breastfeeding duration. The purpose of this research is to compare physiological comfort of two types of clothing. They include designed clothing (DC), such as side flaps to access breasts and a strap which gets unhooked, and conventional clothing (CC), like center front button closure, center front zipper, knitted V-neck shirt, and a t-shirt.

**Methods:** This was a quantitative research study conducted to examine perceived physiological comfort of clothing during lactation (IRB# 1-1056432-1). Data were collected from 217 lactating women who were on lactated related social media sites (e.g., BabyCenter blog). A validated and reliable survey was developed by interviewers. It was a series of questions including demographic ones and assessed seven physiological features. Data were analyzed using descriptive statistics, frequencies (number and percent), and a sample t-test.

**Results:** After comparing DC with CC, authors found that DC provided greater physiological comfort. Statistically significant differences ( $p \leq .05$ ) were found between garment coverage in reference to temperature (i.e. warmth) and satisfaction with the length of the garment.

**Conclusion:** The results have practical implications for a variety of professions including apparel designers and lactation health care providers. Currently, there is little to no research which investigated physiological comfort of outerwear clothing for lactating mothers.

**Keywords:** Breastfeeding, Clothing, Physiological Comfort

## Introduction

As reported by the World Health Organization (2015), breastfeeding meets the nutritional needs of infants necessary for immune protection, optimal growth and development. Some of the benefits for breastfed infants include a decrease in respiratory infections, sudden infant death syndrome, and diseases in later adult life. They might include obesity, diabetes, and gastroenteritis (e.g., Sankar *et al.*, 2015; Anadolitou, 2012). Similarly, benefits for the mother constitute return to pre-pregnancy weight, and lower risk of ovarian and breast cancer (e.g. Dieterich *et al.*, 2014). Newborn infants who have experienced short and long term skin-to-skin contact with mothers (Kangaroo care) have demonstrated improvements in successful and longer duration of breastfeeding (Association of Women's Health, 2019).

Physiological comfort or “sensorial and thermal comfort, fit and fabric weight” (Cho, 2006, p. 340) are affected by physiological changes of the body while breastfeeding. Breastfeeding changes the physiology of a women's body; causing pain, changes in milk flow, and body temperature. Clothing can influence physiological comfort of a breastfeeding woman by keeping her warm, and providing a light covering and soft surface to hold a child (Gordon, 2015). Understanding the design of clothing which enhances physiological comfort would be extremely paramount to breastfeeding mothers in selecting the most ideal clothing. This promotes and increases breastfeeding duration (Gordon, 2015)

Clothing comfort is a component of quality or the “degree of excellence” to which a “garment meets expectations” (Brown and Rice, 2014, p. 68). It is a functioning property defined as “a condition of ease or well-being ... affected by many factors” (Collier and Epps, 1999, p. 292), including physical properties (e.g. designing materials, construction, and finishes). These physical features contribute to the garment's aesthetics (e.g. design, color, etc.) and women's functioning (e.g. use-ability) (Brown and Rice, 2014, p. 68). Within this framework, Cho (2006)

identified physiological comfort or the sensory aspects of clothing, including fit, touch, weight, suitability of temperature, etc.

Physiologically, lactating women may experience breast engorgement and breast infections causing fever and flu-like symptoms (Prachniak, 2002). Pain experienced in breasts and nipples are primary reasons for mothers to cease breastfeeding (Pollard, 2011). Some factors associated with painful breasts include weight of the breast and ill-fitting bras which restrict blood flow causing pulsing pain (Prachniak, 2002). Restriction of milk flow may cause redness of the breasts and conceivably a discernable irregularity of available milk (Prachniak, 2002). Problems with milk flow could be avoided with proper fit of the clothing (Gordon, 2015; Prachniak, 2002) while respecting and concealing mother's privacy during lactation (Brent *et al.*, 1998).

Additionally, candidiasis, a parasitic contaminant, causes sore and inflamed nipples resulting in excruciating pain under arms (Riordan and Wambach, 2010). Milk seepage contributes to this problem. It produces a wet breast pad; a conducive environment for development of contagious painful diseases (Riordan and Wambach). According to Gordon (2015) Apparel designers and researchers should consider prevention of infections related to lactation when “choosing fabrics for breastfeeding products” (p. 21). Furthermore, variation in hormonal changes during lactation could affect thermal balance contributing to hot flashes and discomfort (Gjerdingen *et al.* 1993). Physiological clothing features that might remedy the abovementioned breastfeeding issues include thermal properties of the fabric, style of the garment, fabric's sensation on the body, and garment-fit. These characteristics are specifically affected by fiber and types of fabric which might influence air permeability, tensile, thermal insulation, water-vapor permeability, and pore size (Tarafdar, 1995). The literature on this topic reveals that clothing during lactation must be light and comfortable against the

skin for proper air circulation (The Healthy Mummy, 2017).

To date, limited research has focused on physiological comfort of lactating mother's clothes. The purpose of this research is to compare physiological comfort of two types of clothing worn during breastfeeding: Designed clothing (DC) and conventional clothing (CC).

### Methods

Data were collected from lactating women through Reddit and BabyCenter blogs along with members of the Home4Birth Club on Facebook. After approval from the institution's IRB (#1-1056432), authors posted a quantitative survey on these social media sites. The survey was a series of questions including demographics, general lactating behaviors, breastfeeding clothing/devices, and physiological comfort. The items on seven features of physiological comfort were adopted from Cho's (2006) study regarding the comfort of hospital gowns. Prior to the start of the research, five experts (fashion merchandising, apparel designers, lactation consultant, and survey designer) tested the survey's validity. They also conducted convenience sampling on four women who had previously breastfed. The authors decided to use this population. This is because newly lactating mothers have sufficient understanding about the scope of the research. To ensure reliability, a test-retest was performed within one week apart with a different sample of 40 women who had experience with breastfeeding. Unlike the final sample, the pilot sample was not limited to women who were currently breastfeeding or breastfed within the last two years. It included anyone who breastfed in the past. Physiological features were reliable (seven physiological features,  $\alpha \leq .920$ ). This-pilot sample was not part of the final analysis.

Women residing in the United States who had breastfed within the last two years and were invited to participate.

The survey was completed by 217 mothers, either currently lactating, or who had lactated in

the past two years. Mothers under 18 were excluded

### Measurement

There were three parts to the *survey* instrument. Part A consisted of questions on demographics, lactating behaviors, and apparel (DC or CC) typically worn during breastfeeding. Part B had graphical images of DC and CC commonly worn during lactation. Based on their typical apparel worn (DC and/or CC) during breastfeeding, participants completed the survey items. In part C, participants rated seven physiological comfort features of DC and/or CC on a 5-point Likert scale. They included (1=strongly agree, most comfortable; 2=somewhat agree, moderately comfortable; 3=neutral, no preference; 4=somewhat disagree, moderately uncomfortable; and 5=strongly disagree, least comfortable. These features were: 1) The garment did not seem bulky when I was standing; 2) The garment covered my body well to keep me warm while breastfeeding; 3) The seams of the garment did not irritate my skin; 4) The length of garment was appropriate for breastfeeding; 5) The garment was a size that fit me well; 6) The garment kept me warm enough; 7) I was comfortable because the garment seemed to be light.

### Data collection

After exempt approval was obtained from the University's Institutional Review Board (#1056432-1), a recruitment letter with the survey link was posted for one month on Reddit, BabyCenter, and Home4Birth Club. Moreover, a reminder was posted fortnightly requesting participation.

### Data analysis

Data were downloaded into SPSS v.23 for Windows (SPSS, 2016) for analysis. Descriptive statistics and frequency were run on all variables. Frequencies (number and percent) were used to determine the overall prevalence of specific survey questions and to identify the type of clothing attributes desired by breastfeeding women. Interval and ratio data were analyzed using appropriate

parametric statistics (e.g., one sample t-test). Statistical significance was set at  $p \leq 0.05$ .

## Results

There were 217 women between 20-40 who met the criteria and successfully completed the study. Most of them identified themselves as Caucasian ( $n=101$ ; 83.5%), were employed full time ( $n = 55$ ; 45.5%), or housewives ( $n = 38$ ; 31.4%). 51 participants (33.8%) resided in the Midwest. From 217 participants, the commonly reported clothes worn during lactation were as follows: CC ( $n = 124$ ), DC ( $n=93$ ), both CC and DC ( $n=82$ ). Since more than one-third ( $n=82$ ) of the participants reported wearing both types of clothes during lactation, and to avoid biasness, the researchers made comparisons with this sample.

Physiological comfort mean score for CC was 13.17. Items were on a scale of 1 to 5 where 1 was (strongly agree) and 5 was (strongly disagree). Generally, a lower mean score meant the garment was comfortable. Average mean for all the seven comfort features was 1.88 ( $n=124$ ). As demonstrated in Table 1, Variables with the highest mean score were warmth, "The garment covered my body well to keep me warm while breastfeeding" ( $m = 2.39$ ;  $SD = 1.280$ ) and length, "The length of garment was appropriate for breastfeeding" ( $m = 2.00$ ;  $SD = 1.020$ ). The most comfortable feature for CC was in reference to touch: "The seams of the garment did not irritate my skin." ( $m = 1.61$ ;  $SD = .917$ ). The next most comfortable features were related to fit and bulkiness "The garment was a size that fit me well" ( $m=1.68$ ;  $SD = 0.942$ ) and "The garment did

not seem bulky when I was standing" ( $m=1.69$ ;  $SD = .991$ ).

Physiological comfort features of CD had a mean of 11.59. The mean of all seven comfort features was 1.65 ( $n = 93$ ). On the Likert scale, this reflected the physiological comfort items ranging from moderately comfortable (2) to neutral (3). The item - The garment kept me warm enough - had the highest mean of 2.09 ( $SD = 1.139$ ). Similarly, the item - The garment covered my body well to keep me warm while breastfeeding - had a mean score of 2.10 ( $SD = 1.145$ ). The item with the lowest mean score (most comfortable) was length; "The length of garment was appropriate for breastfeeding" ( $m = 1.47$ ;  $SD = 0.842$ ). As exhibited in Table 2, "The seams of the garment irritated my skin" ( $m=1.59$ ;  $SD= 0.863$ ), and "The garment did not seem bulky when I was standing", also ( $m=1.84$ ;  $SD = 1.145$ ) had the mean score of less than 2.0.

When responses to the physiological comfort items regarding CC and DC were compared, two comfort features were statistically significant ( $p \leq .05$ ). The first one was - "The garment covers my body well to keep me warm while breastfeeding"  $t(82) = 2.304$ ,  $p = .024$ . The average mean of this item for CC and DC were: 2.53 ( $SD = 1.328$ ) and 2.07 ( $SD = 1.187$ ) respectively. The second feature was- "The length of garment is appropriate for breastfeeding"  $t(82) = 5.903$ ,  $p = .000$ . CC for this comfort feature had a mean of 2.07 ( $SD = 1.045$ ), while DC had a mean of 1.48 ( $SD = .861$ ) (see Figure 1).



**Table 1.** Physiological Comfort: Minimum, Maximum, Scale Mean and Standard Deviations of Conventional Clothing (N = 124)

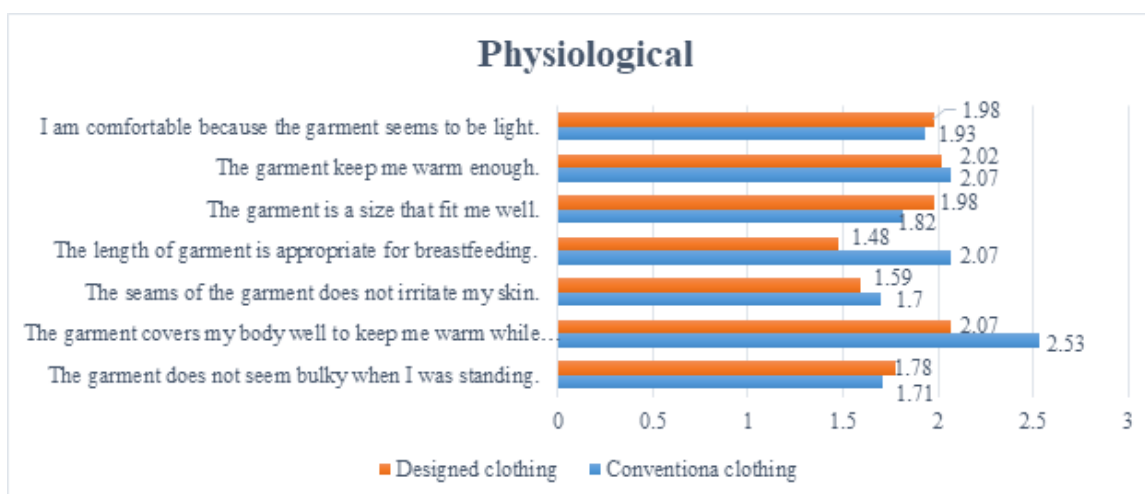
Physiological comfort	Minimum – Highest Level	Maximum- Lowest Level	Mean	Std. Deviation
1. The garment did not seem bulky when I was standing.	1	5	1.69	.991
2. The garment covered my body well to keep me warm while breastfeeding.	1	5	2.39	1.280
3. The seams of the garment did not irritate my skin.	1	5	1.61	0.917
4. The length of garment was appropriate for breastfeeding.	1	5	2.00	1.020
5. The garment was a size that fit me well.	1	5	1.68	0.942
6. The garment kept me warm enough.	1	5	1.94	1.015
7. I was comfortable because the garment seems to be light.	1	4	1.86	0.810

1=strongly agree; 2=somewhat agree; 3=neutral; 4=somewhat disagree; 5=strongly disagree

**Table 2.** Physiological Comfort: Minimum, Maximum, Scale Mean and Standard Deviations for Designed Clothing (N=93)

Physiological comfort	Minimum	Maximum	Mean	Std. Deviation
1. The garment did not seem bulky when I was standing.	1	5	1.84	1.145
2. The garment covered my body well to keep me warm while breastfeeding.	1	5	2.10	1.225
3. The seams of the garment did not irritate my skin.	1	5	1.59	.863
4. The length of garment was appropriate for breastfeeding.	1	5	1.47	.842
5. The garment's size fit me well.	1	5	2.01	1.247
6. The garment kept me warm enough.	1	5	2.09	1.139
7. I was comfortable because the garment seemed to be light.	1	5	2.04	1.010

1=strongly agree; 2=somewhat agree; 3=neutral; 4=somewhat disagree; 5=strongly disagree



**Figure 1.** Mean of physiological comfort items for conventional clothing and the clothing designed for breastfeeding (n=164).

## Discussion

The purpose of this research was to compare physiological comfort of DC with conventional clothing-CC. The results demonstrated that women who wore CC during lactation thought the garments were comfortable with regard to the touch/feel of the seams, size or fit, and bulkiness. CC was less comfortable regarding warmth while breastfeeding. The garment was rated as moderately appropriate in length. Perhaps these women lived in geographical regions or breastfed during winter. Further study could examine comfort in terms of keeping the temperature appropriate in different climatic conditions. In addition, CC would require the woman to wear a loose shirt and/or to lift her shirt, exposing more of her body during arid warm temperature.

CD was the most comfortable in terms of the length of the garment, texture on the skin (i.e. rough or soft), and bulkiness. However, the garments were moderately comfortable with regard to warmth and body coverage during breastfeeding. These findings help determine where designers can improve CD.

When comparing overall means scores of DC and CC, the authors perceived DC as having greater physiological comfort. Results indicated healthcare professionals could be more proactive in educating lactating women regarding the physiological features of DC. More specifically, when comparing DC to CC, two physiological comfort features showed a statistically significant difference. The first feature was related to body temperature. Respondents were neutral about CC regarding the statement, "The garment covers my body well to keep me warm while breastfeeding." This is while the group wearing DC mildly agreed to the statement. Nursing mother may have hot flashes, infections, and hormonal changes (Gjerdingen et al., 1993; Cho, 2006). Evidence suggests lactating mothers who experience hormonal changes could consider DC to help alleviate discomfort.

The second statistically significant difference was found in the feature, "The length of garment is

appropriate for breastfeeding." Although women in the DC category agreed to this statement, there was discrepancy among the CC group. This indicated their disagreement to the statement. Previous studies supported the idea that designers should choose garments to fit lactating mothers at a time when their bodies are fluctuating in size (Gordon, 2015; Prachniak, 2002). Therefore, DC might be better designed to accommodate this need.

The results of this study may help a wide variety of professionals, from apparel designers, merchandisers, healthcare professionals, to lactating support providers. Apparel designers can utilize these findings to maintain some of the garment features of DC that enhance physiological comfort. Hospitals and other medical professionals could also find the results useful. Development of apparel which would meet psychological comfort could increase duration of bonding between infant and mother, thereby contributing to ease and duration of breastfeeding. The outcome of this would affect the overall health status of infants. Recommendations to wear DC could be made to patients who have problems with hormonal variations. In merchandising, marketers can highlight the benefits of buying and wearing DC during lactation.

The strengths of the research outweigh the limitations in several aspects: a) this was the first study that examined physiological comfort of outerwear clothing during lactation. b) Authors made comparisons related to physiological comfort between DC and CC; c) The instrument to assess physiological comfort of clothing worn during lactation was original and was tested for validity and reliability. d) The participants who were actively engaged in certain types of technology (Reddit, BabyCenter and Facebook) had the opportunity to complete the survey resulting in a broad cohort. Future research should focus on populations outside the United States. Moreover, studying an intergenerational population (e.g. women over 40 lactating more than 24 months) demonstrates how perceptions of clothes worn during lactation have changed over time. There

were a couple of limitations in the current research: a) the sample included only women residing in the United States. b) Only participants who breastfed within the past 24 months were invited.

### Conclusion

Examining the comfort of clothes while breastfeeding has the potential to affect duration and participation rates resulting in health benefits for both mother and infant.

Physiological clothing features are important to consider given the physical changes a mother

Experiences post pregnancy. Results found physiological comfort of CC and DC during lactation was different among mothers preferring the latter. Appropriateness of different temperatures and fit of the clothing are important features to consider for physiological comfort of lactating mother. Further research is needed to understand how perceptions of physiological comfort might vary among different ethnicities, cultures, and age groups.

### Conflict of interest

The authors declared no conflict of interest.

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### Authors' contribution

Wrote the paper, J.K. and D.S.; collected the data and helped write the first draft, F.A.

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