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ENHANCE BODY CONTOURED WOVEN OCCASIONAL WEAR, INSPIRING FROM PERFORMANCE WEAR PRODUCTION

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ABSTRACT

Studies have confirmed, most of the women face many difficulties when choosing stylish occasional wear, because of they could not wear them with an appropriate bra. Visibility of bra straps and discomfort when wearing stylish occasional wear become main problem when selecting perfect stunning occasional wear. Performance wear techniques ensure good upward support, limited breast motion and comfortability. There are precise pattern cutting and garment construction techniques are used in performance wear manufacturing. Bras are in-built in most of the performance wear products. This research focuses on identify woven body contouring fashion market in Sri Lanka, identify customer need of alleviating wearing a separate bra with occasional wear, examines performance wear pattern cutting and construction techniques and check the possibility of applying them to woven body contour occasional wear manufacturing. The aim of this research is to introduce woven body contouring wear bodice alleviating the need of wearing a separate bra inspired from performance wear techniques. This research discusses the analysis of data that gathered using questionnaire survey, performance wear and occasional wear product survey and experiments based on various experiments. The proposed woven body contouring experiments developed by exploring performance wear techniques and applied them to woven fabric flat pattern cutting and conducted a fit evaluation to identify upward support, comfortability and aesthetic values. All results indicated woven body contoured wear with in-built breast support can be achieved from performance wear pattern cutting and construction methods and elasticated adjustable back methods without fastenings.

Keywords - Sports performance wear, woven fabrication, Body contoured wear, Inbuilt support

INTRODUCTION

Creating a perfect, sensuous and stunning silhouette become more prominent among working women in Sri Lanka. Most of the women looking for a perfect blend of fashion, comfort, and function (Lawrence, 2011). Although many difficulties appear when choosing stylish occasional wear styles, because of difficulty in choosing appropriate bra. Visibility of bra straps and discomfort in wearing stylish occasional wear become main problem when selecting perfect stunning occasional wear.When considering the fabric preference in Sri Lankan customer there is huge market to woven fabrics.

Functionality, fashion, and style are key contributors in performance apparel (Watkins & Dunne, 2015). Performance wear techniques ensure good upward support, limited breast motion and comfortability. There are precise pattern cutting and garment construction techniques are used in performance wear manufacturing. Since performance wear

are in-built with breast support, it minimized the wearing of separate bra.

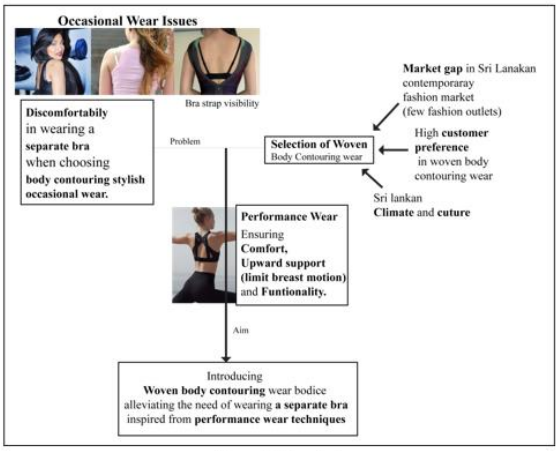


Figure 1 Flow chart

This study examined those performance wear pattern cutting and construction techniques and check the possibility of applying them to woven body contour occasional wear manufacturing. Enhancing body contouring effect for woven garments, alleviate the need of wearing a separate bra. As the result of multiple experiments with feasibility tests, this study presented the best methods to enhance body contouring of woven based garments. Finally this study confirmed the in-built breast support with elasticated adjustable back (back or wings – use most appropriate word) methods without fastenings will show better results.

Problem Identification

Discomfortably in wearing a separate bra when choosing body contouring stylish occasional wear

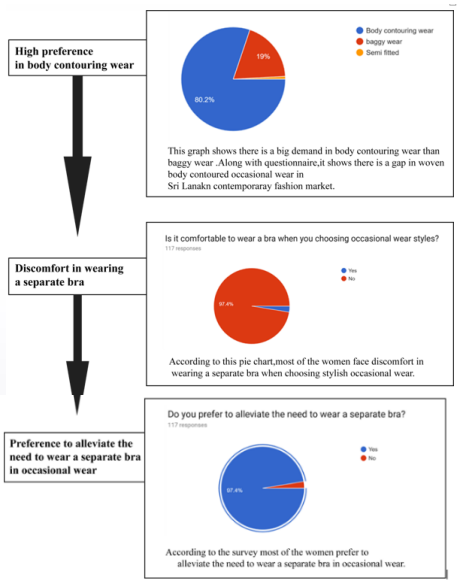


Figure 2 Problem identification

Aim of the study

-Introducing Woven body contouring wear bodice alleviating the need of wearing a separate bra inspired from performance wear techniques

Objectives

1. Identify woven body contouring fashion market in Sri Lanka and identify need of alleviating wearing a separate bra with occasional wear.
2. 2. Examine those performance wear pattern cutting and construction techniques and check the possibility of applying them to woven body contour occasional wear manufacturing.
3. 3. Introduce Woven body contouring wear bodice alleviating the need of wearing a separate bra inspired from performance wear techniques

Significance of the study

-Visibility of bra straps and discomfort when wearing stylish occasional wear become main problem when selecting perfect stunning occasional wear.

-Introducing Woven body contouring wear bodice alleviating the need of wearing a separate bra inspired from performance wear techniques

LITERATURE REVIEW

Performance Wear

Performance apparel is defined as garments that perform or function for some purpose such as to help athletes and active people keep cool, comfortable and dry using moisture management and other techniques (Davis, 2016).

Sports Bra

Sports bras, available in encapsulation and compression forms, are designed to control, support, and contain breast tissue during strenuous exercise while many are purported to facilitate moisture as well(Krenzer, Starr, & Branson, 2005).

An improved sports brassiere possesses multiple enhancements comprising adjustable wider straps for increased comfort, high quality stretch material, and two adjustment points on either side thus ensuring a perfect fit, is herein disclosed. The brassiere is also provided with underwire Supports and a large quantity of lace material across the upper portion of each cup for enhanced aesthetic quality (Johnston, 2011)

Figure 3 Technical drawing of back adjustment of the sports bra(Johnston, 2011).

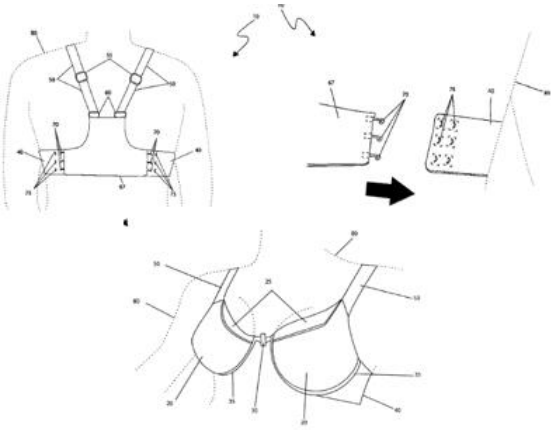


Figure 4 Technical drawing of front adjustment of sports bra (Johnston, 2011).

A method for installing and utilizing the adjustable sports bra may be achieved by performing the following steps: unlatching the front closure; applying the adjustable sports bra to one's torso by looping the straps over one's arms in a normal manner, adjusting in turn each strap using the adjustable fasteners to obtain a correct shoulder height; adjusting the side panel length as required using the hooks and loops; latching the front closure; flexing one's torso in such away as to test for a comfortable secure fit of the adjustable sports bra(Johnston, 2011).

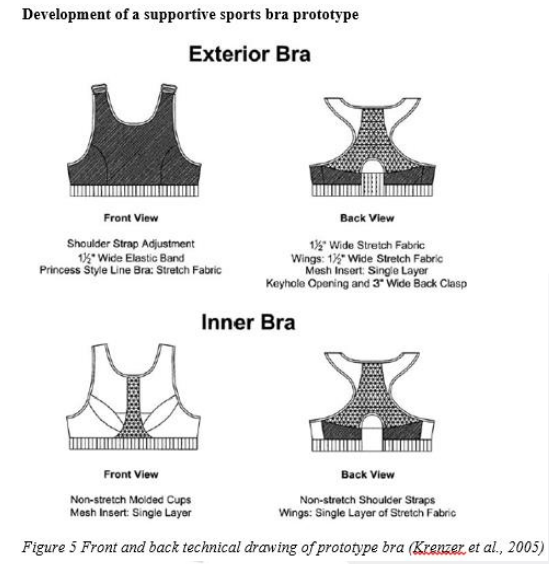


Figure 5 Front and back technical drawing of prototype bra (Krenzer et al., 2005)

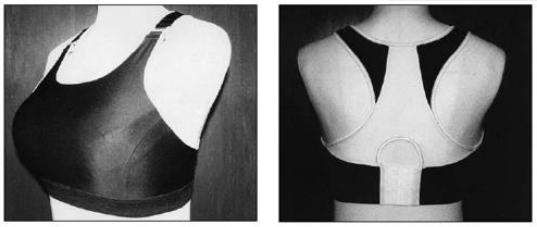


Figure 6 Prototype sports bra(Krenzer et al., 2005.)

The prototype sports bra was designed to address the following needs: support breast tissue, minimize breast motion, provide a flattering look, facilitate thermal comfort, provide coverage, and offer ease in donning and doffing. To support breast tissue and minimize breast motion, the prototype combined an encapsulating inner bra with a compression- style outer bra: the inner bra separates and contains each breast and the outer bra compresses the breasts to the chest cavity by means of a high modulus knit fabric. Motion was also minimized through the presence of wide, non-adjustable shoulder straps. A high neckline and wide side bands offered greater coverage than in typical sports bras. An adjustable back closure and a wide under bust band made it easy to don and doff the bra, as well as providing support, comfort, and good fit(Krenzer et al., 2005).

Adhesive interlining

Interlining is a layer of fabric inserted between the face and the lining of a garment to give clothing a suitable appearance and stability. Interlining which uses a thermoplastic resin for attaching the face fabric is known as an adhesive or fusible interlining and it is usually used nowadays because of its convenience. Adhesive interlining generally gives a higher level of quality in a garment(Kim, Inui, & Takatera, 2011).

Bonded Seams

Table 1. Possibility of constructing different seam types.

Seam category	Seam type	Possibility of bonding	Possibility of needle stitching
Super-imposed seam	Plain seam–SSa	Possible	Possible
	French seam–SSe	Possible (more thicker)	Possible
Lap seam	Lap seam–LSc	Possible	Possible

Table 2. Seam strength behavior of plain seam (test reports).

Seam type	Composition	Fabric IM	Bonded (adhesive) strength KGF 2.5	Sewing strength KGF 2.5
Plain seam	100% Cotton	363255 6F ANTHRA	25.68	9.69
	100% Poly	441223 DGHTR	46.72	1.96
	12% Spandex 88% Poly	309377 BLUE/421976 BLACK	32.85	2.54
	12% Spandex 88% Poly	470426 BLACK	52.19	1.94

Table 3. Seam strength behavior of French seam (test reports).

Seam type	Composition	Fabric IM	Bonded (adhesive) strength KEF 2.5	Sewing strength KEF 2.5
French seam	100% Cotton	363255 6f ANTHRA	41.77	5.07
	100% Poly	441223 DGHTR	52.05	3.08
	12% Spandex 88% Poly	309377 BLUE/421976 BLACK	52.05	34.53
	12% Spandex 88% Poly	470426 BLACK	52.05	3.42

Figure 7 Bonded seams strength (Seram & Nandasiri, 2015)

In terms of the strength of the seams, the result shows that the bonded seam is the most reliable technique for constructing seams (Seram & Nandasiri, 2015).

Based on experiments on performance wear pattern cutting and construction techniques which check the possibility of applying them to woven body contour occasional wear manufacturing, below findings are gathered

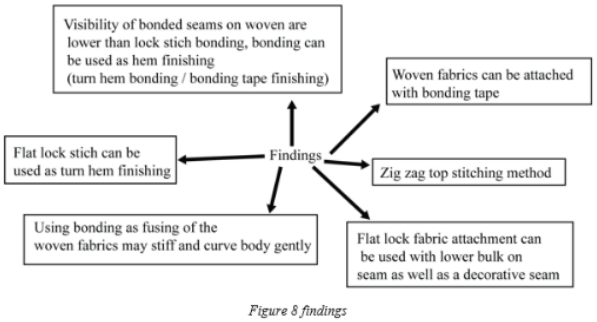


Figure 8 findings

Body contouring wear

Body contouring wear holds or molds a body to a certain shape. During the past decade or so, greater emphasis has been observed in the desire to have clothing aid the wearer in appearing to have a desired typically sexy torso (Russo & St, n.d.).

Achieving body contouring techniques

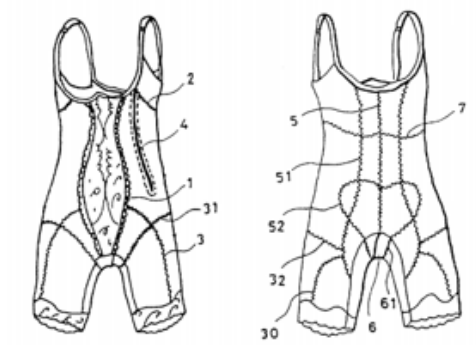


Figure 9 Drawing of Front and back style lines (Huang, 2000)

The front vertical torso seams 1 are closer together to each other at the breast position and are further apart at the abdominal position. The seams 1 are formed into two curved lines. two bodice side seams 2 are extended from the lower position of the shoulder to the back section and are then formed together to form a front horizontal bodice seam 7 the two lateral sides of the center vertical back seam 5 is provided with a left vertical back seam 51 and the two left vertical back seams(Huang, , 2000).

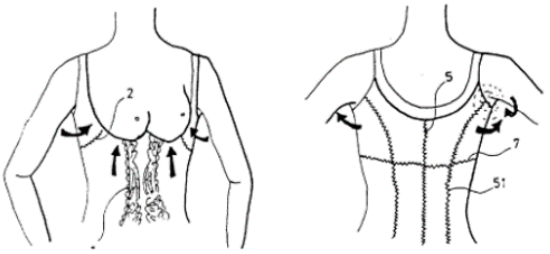


Figure 10 Drawing of muscle compression (Huang, 2000)

in view of the above structure, when a lady wears the undergarment of the present invention, the bodice side seam 2 and the front vertical torso seam 1 push the body fat at the waist upward to the direction of the breast Accordingly, the breast of the wearer is stiffer(Huang, , 2000).

Garment with Integral Brassiere

A woman's garment includes a tubular garment body and an inner support unit .The preferred inner support unit comprises a liner secured to the garment body along an upper edge portion of the garment body a pair of underwire members. the wearer's torso to provide a comfortable fit and support without detach able fasteners (not shown) which complicate the garment and show through to the exterior creating unsightly bulges(Katze, O'Donnell, & Meehan,2001).

Returning exclusively the preferred underwire members each comprise a U-shaped, rigid metallic or polymeric underwire encapsulated in soft fabric material to provide Support for, and contouring of, the breasts (not shown) of the wearer(Katze et al., 2011).

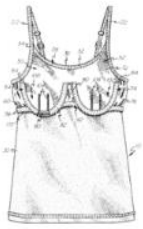


Figure 11 Inner front

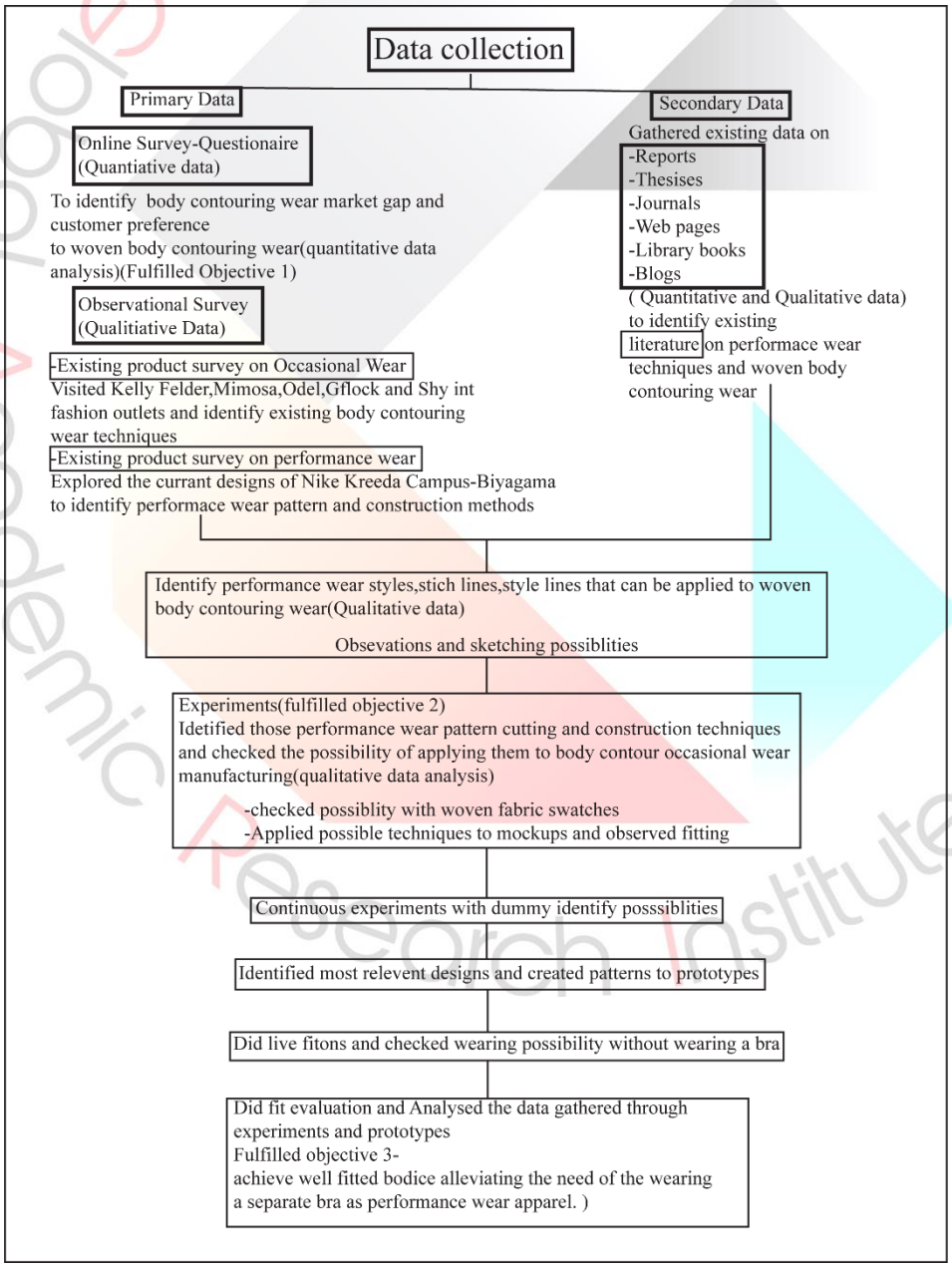
Figure 12 Outer front (Ize et al., 2011).

Figure 13 Outer back (Katze et al., 2011).

Figure 14 Inner back (Katze et al., 2011).

RESEARCH METHODOLOGY

This chapter consists of the methods that the researcher used to achieve the objectives of the study. Researcher explains how the research designed based on the objectives, data and data collection methods used in this study.



Secondary Research

Secondary research methods were used to find the background data and identify the research problem. Literature related to the study such as research papers, thesis, Industrial web sites, books and blogs were used to find the initial data for the study.

Primary Research

Primary research is carried out in three ways

1. Questionnaire survey
2. Product Survey (performance wear and occasional wear)
3. Experiments

Questionnaire survey

Questionnaire survey has been carried out as the primary data collection method and it was distributed via internet. Random Sample of 110 people in 20-30 age gap, used as sample for the questionnaire.

This is conducted to identify woven body contouring fashion market in Sri Lanka and identify need of alleviating wearing a separate bra with occasional wear.

Product Survey

-Occasional wear product survey

-Performance wear product survey

Occasional wear product survey

Occasional wear product survey is conducted to identify occasional wear designs, pattern cutting and construction methods (when achieving body contours) ,finishing methods ,fabrics used ,customer preference ,colour combinations.

Fashion outlets- ODEL,Cotton Collection,Kelly Felder,Gflock,Mimosa, and Shy int

Performance wear product survey

- Performance wear product survey is conducted to identify, stich types, pattern cutting techniques, fabric selection, construction methods and fastening methods. Current designs of Nike Kreeda Campus-Biyagama are explored.

Experiments

1. Experimenting swatches- to identify performance wear construction methods on woven fabric
2. Mockups- to identify performance wear pattern cutting methods on woven fabric
3. Prototypes- to introduce woven body contouring wear bodice techniques alleviating the need of wearing a separate bra

Data Collection

This chapter discusses the analysis of data that gathered using

-Research Method 1 - Questionnaire survey

-Research Method 2 - Performance wear and Occasional wear product survey

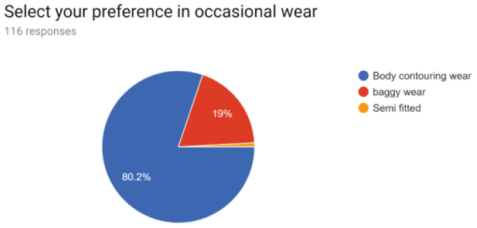
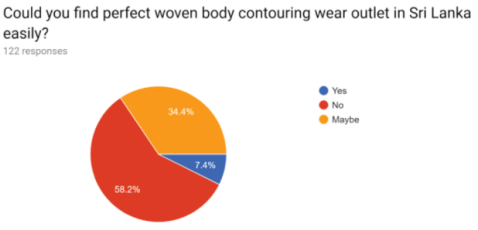
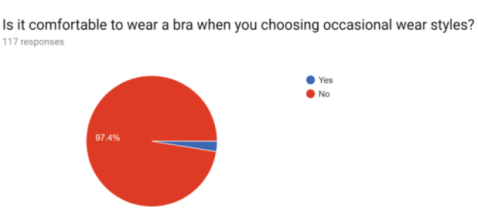
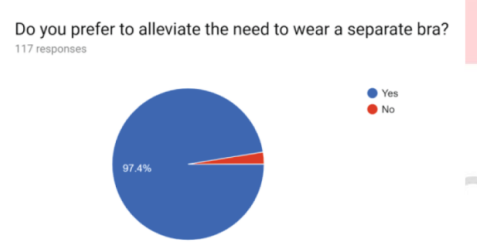
-Research Method 3 - Prototype experiments.

The gathered data has been analyzed and discussed under main objectives of the research by using relevant analyzing methods.

Research Method 1 - Questionnaire survey –

To identify woven body contouring fashion market in Sri Lanka and identify need of alleviating wearing a separate bra with occasional wear (Objective 1)

Table 1 Questionnaire results

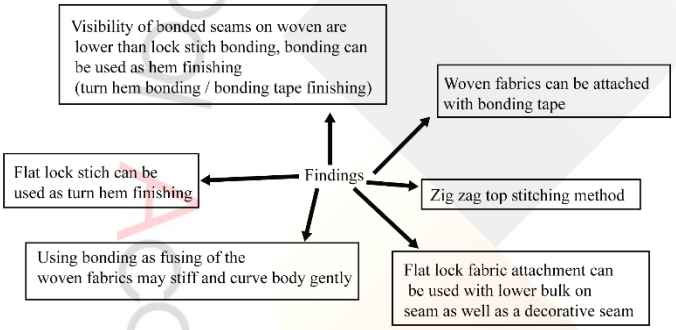
	Result	Description
High preference in body contouring wear		This graph shows there is a big demand in body contouring wear than baggy wear .Along with questionnaire, it shows there is a gap in woven body contoured occasional wear in Sri Lankan contemporary fashion market.
Fewer capabilities in Sri Lankan fashion market		-According to the questionnaire, there is a gap in woven body contouring outlets in Sri Lanka. -There are fewer capabilities in Sri Lankan fashion market when finding the body-contoured occasional wear.
Discomfort in wearing a separate bra		According to this pie chart, most of the women face discomfort in wearing a separate bra when choosing stylish occasional wear.
Preference to alleviate the need to wear a separate bra in occasional wear		According to the survey most of the women prefer to alleviate the need to wear a separate bra in occasional wear.

Research Method 2 - Performance wear and Occasional wear product survey

This study examines those performance wear pattern cutting and construction techniques and check the possibility of applying them to woven body contour occasional wear manufacturing.(Objective 2)

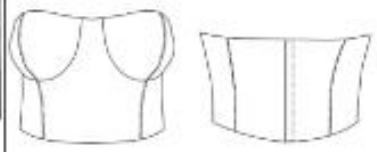
Experimenting performance wear construction techniques

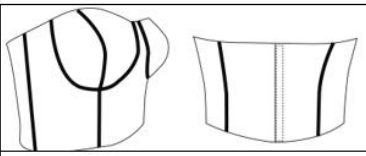
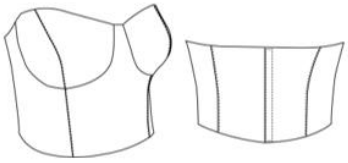
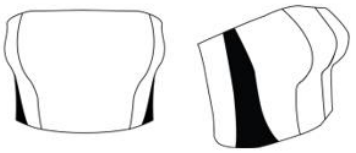
According to the product survey results, experiments are conducted to realize feasibility.



Experimenting performance wear pattern cutting techniques

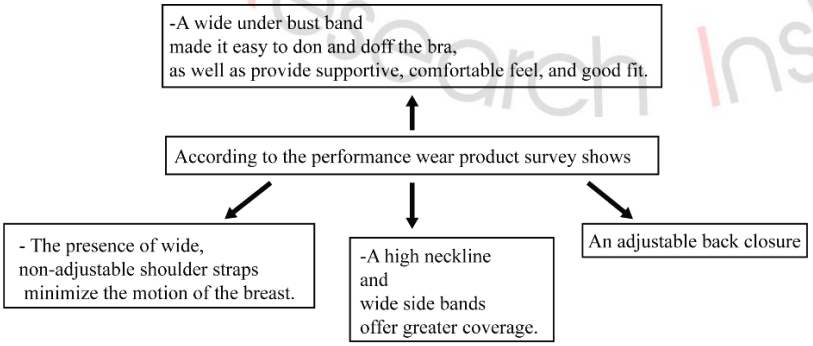
Table 2 Performance wear pattern cutting techniques experiment

	Experiment	Technical drawing	Description	Outcome
1			-Initial stage-finalizing fitting with woven fabrics -experimenting possibility of achieving perfect fit from woven fabric	-Woven body contouring can be achieved from precious pattern cutting methods of performance wear
2			Finalizing fitting and style lines with woven satin fabric –experimenting possibility of achieving perfect fit from satin woven fabric	Woven body contouring can be achieved from precious pattern cutting methods of performance wear

3			-Experimenting body fitting by applying flat seam for style lines.	-Flat seam attachment on seams may add more strength and decrease the seam bulk as well as performing as a decorative stich
4			-Experimenting French seam with cotton fabric	-Attaching cotton fabric with French seam adds more strength and create body curves in more body hugging way
5			-Parallel style lines fitting with flat seam	-Attaching bodice with parallel flat lock stich lines cut down body muscles and create body curve
6			-Inserting stretch panel to side seam	-Adding side seam panel with stretch fabric adjust body curve

Research Method 3 - Prototype experiments.

Introducing Woven body contouring wear bodice alleviating the need of wearing a separate bra inspired from performance wear techniques (objective 3)



The prototype woven body contouring bodice styles were designed to address the following needs inspired from performance wear: minimize breast motion, support breast tissue, facilitate comfort and offer ease in donning and doffing (no fastening)

DATA ANALYSIS

In this phase of the study, The prototype woven body contouring bodice styles were designed to address the following needs inspired from performance wear: minimize breast motion, support breast tissue, facilitate comfort and offer ease in donning and doffing (no fastening).

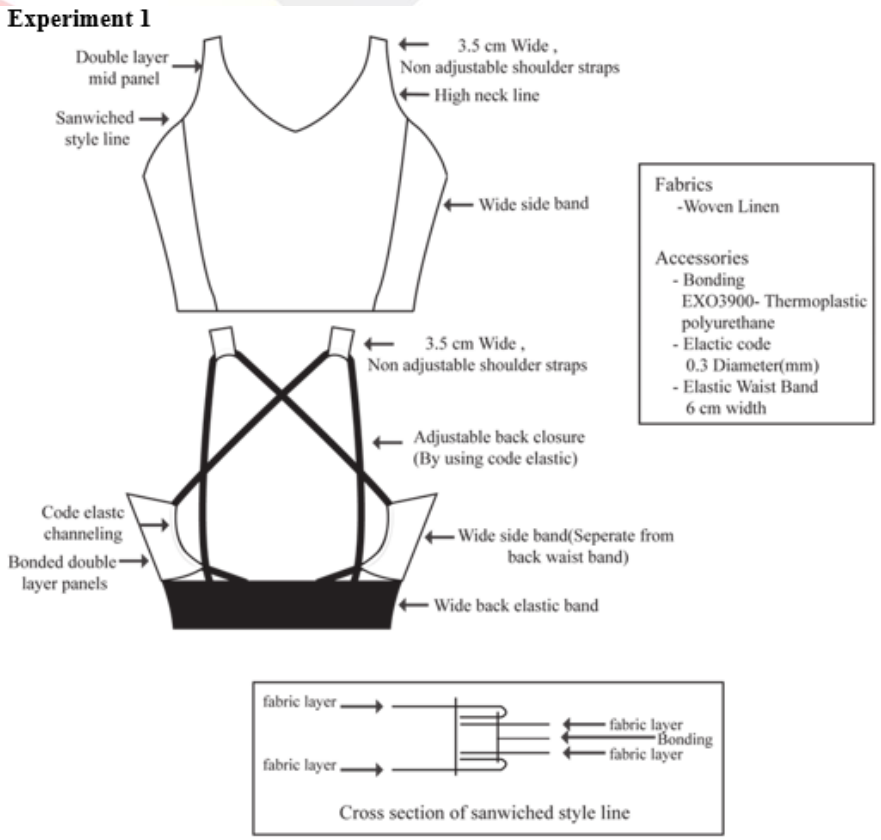


Figure 15 Experiment 1

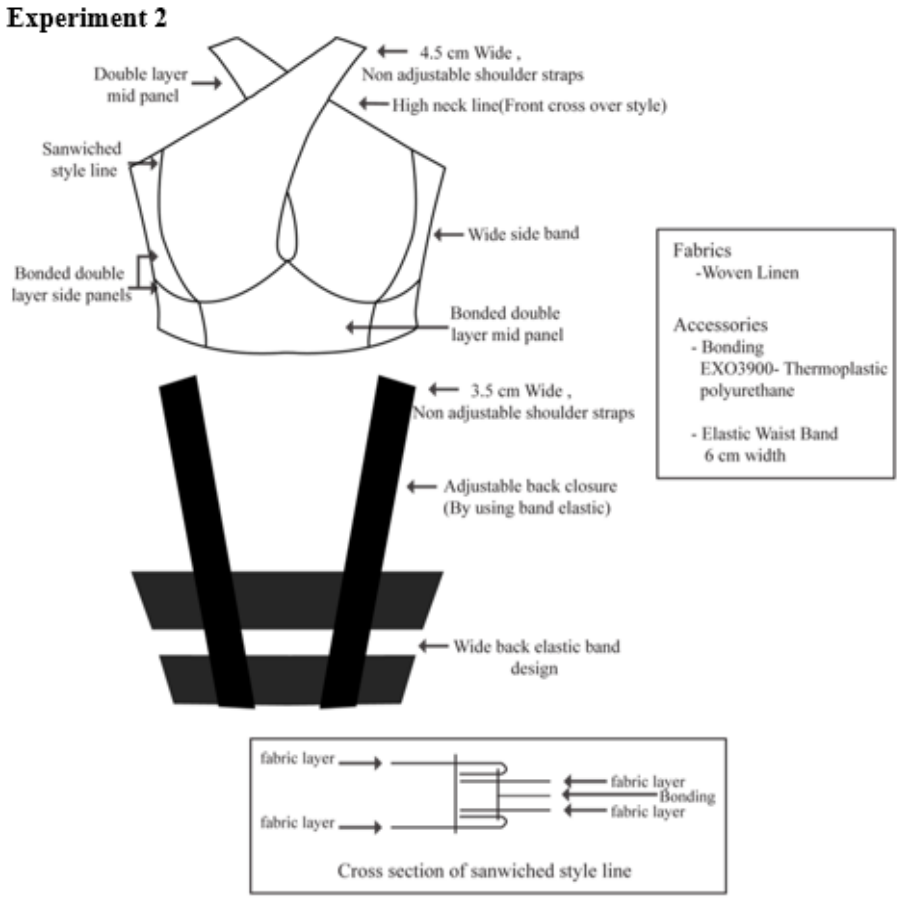


Figure 16 Experiment 2

Experiment 3

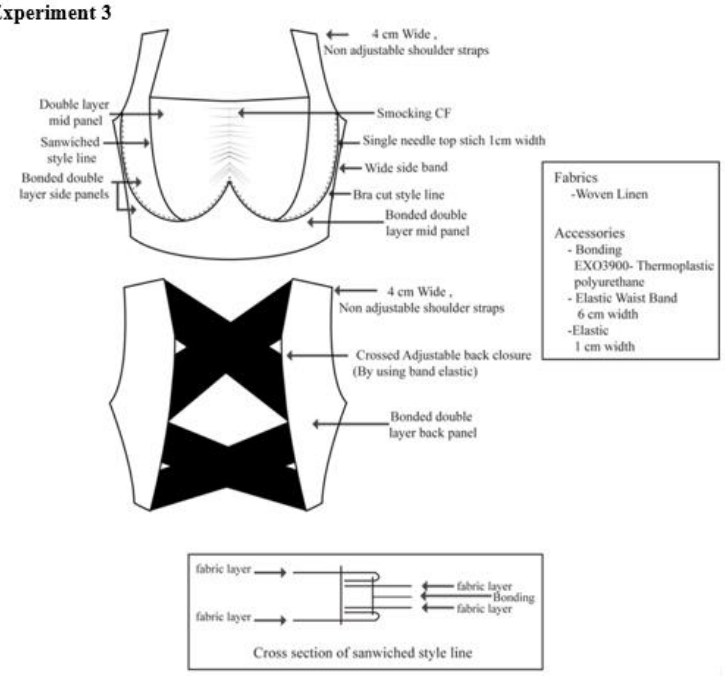


Figure 17 Experiment 3

Experiment4

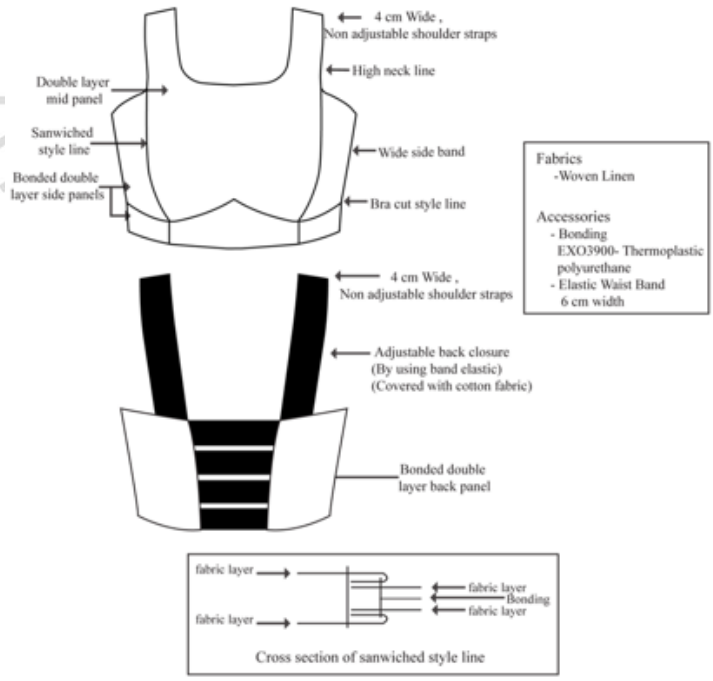


Figure 18 experiment 4

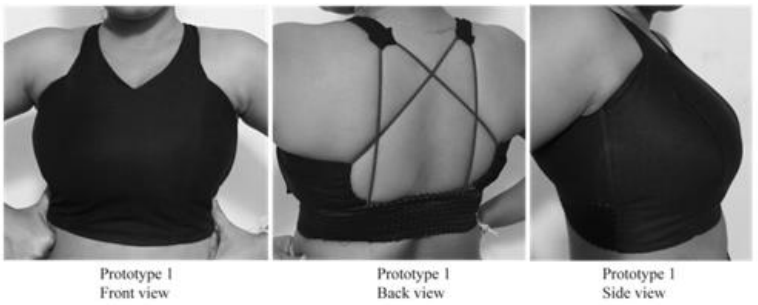
Table 1 Performance wear techniques experimenting with woven fabric

	Experiment	Fabrics	Accessories	Experimented key features
1		- Woven Linen	- Bonding EXO3900-Thermoplastic Polyurethane - Elactic code 0.3 Diameter(mm) - Elastic Waist Band 6 cm width	-Double layer mid panel -Sanwiched style line -3.5 cm Wide , Non adjustable shoulder straps -High neck line -Wide side band -Code elastc Channeling -Bonded double layer panels -Adjustable back closure(By using code elastic) -Wide side band(Seperate from back waist band) -Wide back elastic band
2		- Woven Linen	- Bonding EXO3900-Thermoplastic polyurethane - Elastic Waist Band 6 cm width	-Double layer mid panel -Sanwiched style line -Bonded doublelayer side panels -4.5 cm Wide , Non adjustable shoulder straps -Wide side band -Bonded doublelayer mid panel -Adjustable back closure(By using band elastic) -Wide back elastic band design
3		- Woven Linen	- Bonding EXO3900-Thermoplastic polyurethane - Elastic Waist Band 6 cm width -Elastic 1 cm width	-4 cm Wide , Non adjustable shoulder straps -Smocking CF -Wide side band -Bra cut style line -Bonded double layer mid panel -Bonded double layer side panels -Sanwiched style line -Bonded double layer side panels - Crossed Adjustable back closure(By using band elastic) -Bonded doublelayer back panel
4		- Woven Linen	- Bonding EXO3900-Thermoplastic polyurethane - Elastic Waist Band 6 cm width	-4 cm Wide , Non adjustable shoulder straps -High neck line -Wide side band -Bra cut style line -Double layer mid panel -Sanwiched style line -Bonded double layer side panels - Adjustable back closure(By using band elastic) (Covered with cotton fabric) -Bonded double layer back panel

Experiments based on performance wear pattern cutting and construction methods prove the presence of wide, non-adjustable shoulder straps minimize the motion of the breast, a high neckline and wide side bands offer greater coverage, Front bonded panels, an elasticated adjustable back closure and a wide under bust band made it easy to don and doff the bra, as well as provide supportive, comfortable feel, and good fit.

Introduced woven body contoured wear bodice, alleviating the need of wearing a separate bra inspired from performance wear techniques, is appointed woven body contoured wear with in-built breast support with elasticated adjustable back methods without fastenings.

Fit Evaluation



Prototype 1 Front view | Prototype 1 Back view | Prototype 1 Side view

Prototype 3 Front view | Prototype 3 Side view | Prototype 3 Back view

Prototype 2 Front view | Prototype 2 Side view | Prototype 2 Back view

Prototype 4 Front view | Prototype 4 Side view | Prototype 4 Back view

The wearers' perceived fit responses to seven questions on each sample were analyzed to compare the wearers' responses for each sample.

Table 3 Fit evaluation question table

Question 1	Physiological Fit (Physical comfort)
Question 2	Psychological Fit (Wearer's Satisfaction)
Question 3	Upward support (Limit Breast Motion)
Question 4	Comfortability
Question 5	Provide Coverage
Question 6	Offer Ease in Donning and Doffing
Question 7	Aesthetic Value (front and back styling)

Subjects were asked to express their agreement or disagreement on a five point response scale from 1 (strongly disagree) to 5 (strongly agree).

1-5 Scale

Table 4 1-5

1	Very Dissatisfied
2	Dissatisfied
3	OK
4	Satisfied
5	Very Satisfied

Analyzing wearer perception

The wearers' perceived fit responses to seven questions on each sample were analyzed to compare the wearers' responses for each sample.

Table 5 Wearer perception of fit evaluation

Prototype	Wearer Perception of Fit Evaluation						
	Physiological Fit (Physical comfort)	Psychological Fit (Wearer's Satisfaction)	Upward support (Limit Breast Motion)	Comfortability	Provide Coverage	Offer Ease in Donning and Doffing	Aesthetic Value (front and back styling)
Prototype 01	3	4	5	4	3	4	5
Prototype 02	5	5	4	5	4	5	5
Prototype 03	4	4	5	4	5	4	4
Prototype 04	5	3	5	4	4	4	4

Based on wearer comments overall result is shown in this bar chart. All requirements that need to complete when developing woven body contouring wear alleviating the need of the wearing a separate bra are fulfilled.

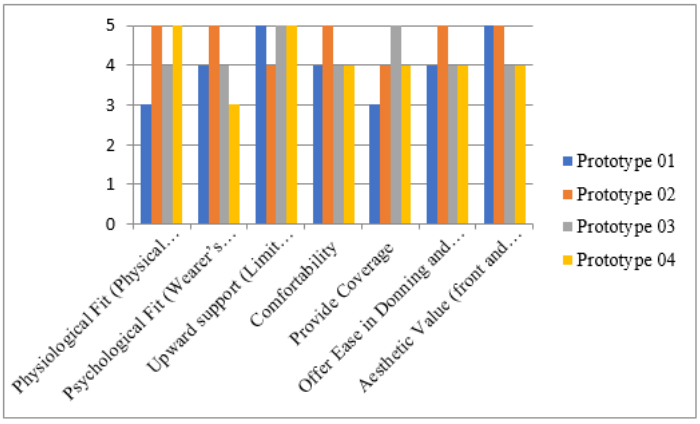


Figure 19 Comparing wearer satisfication

Analyzing upward support

Motion was also minimized through the combining sports bra techniques such as presence of wide nonadjustable shoulder straps, high neck line and wide side bands. This line chart shows these all designs can be wear without a bra in occasional wear with good support.

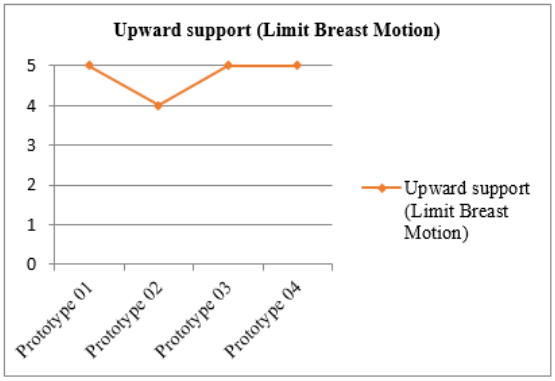
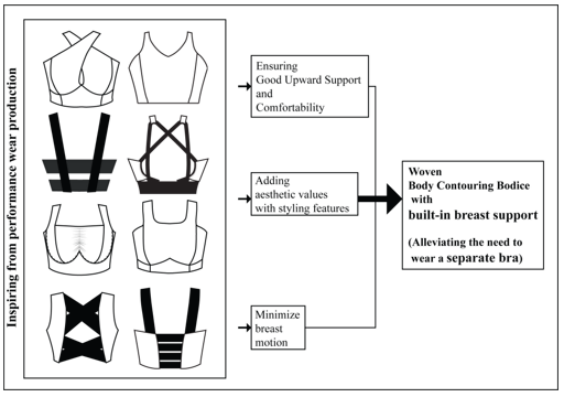


Figure 20 Line chart of upward support according to wearer perception



Analyzing comfortability

Main purpose of alleviating the need of wearing separate bra is increase comfortability .It is evident from below chart.

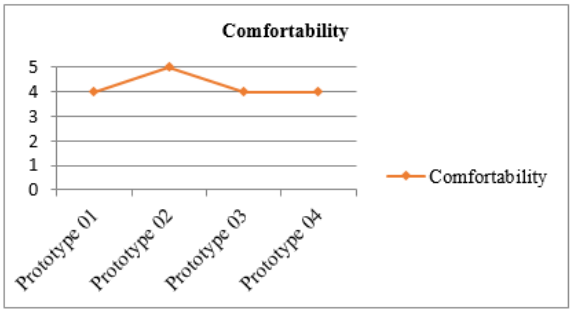


Figure 21 Line chart of comfortability according to wearer perception

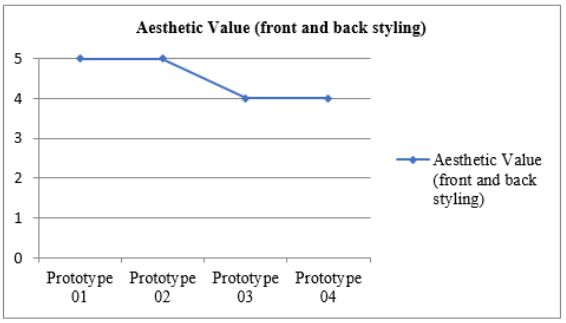


Figure 22 Line chart of aesthetic value according to wearer perception

According to the above charts it ensure the breast motion minimization, comfortably and higher aesthetic value. Based on those key features it was clear the aim of the study. All data prove it is possible to develop a woven body contouring wear bodice alleviating the need of a separate bra.

CONCLUSION

Visibility of bra straps and discomfort when wearing stylish occasional wear become main problem when selecting perfect stunning occasional wear.

Performance wear techniques ensure good upward support, limit breast motion and comfort ability. There is no need to wear a separate bra when wearing performance wear. This research was based on identify these performance wear techniques and check possibility of applying them into woven body contouring wear.

This research was targeted to achieve through three objectives. The first objective was to identify woven body contouring fashion market in Sri Lanka and identify customer need of alleviating wearing a separate bra with occasional wear. The questionnaire results indicate that there is a clear gap in woven body contouring wear in Sri Lanka and most of

the women prefer to alleviate the need of wearing a bra in occasional wear.

The second objective was to examine performance wear pattern cutting and construction techniques and check the possibility of applying them to woven body contour occasional wear manufacturing. The product survey results and performance wear construction experiments on woven fabrics shows woven fabrics can be attached with bonding tape ,visibility of bonded seams on woven are lower than lock stich bonding, bonding can be used as hem finishing(turn hem bonding / bonding tape finishing),Flat lock fabric attachment can be used with lower bulk on seam as well as a decorative seam, flat lock stich can be used as turn hem finishing, zig zag top stitching method and Using bonding as fusing of the woven fabrics may stiff and curve body gently.

Performance wear pattern cutting experiments on woven fabrics shows woven body contouring can be achieved from precious pattern cutting methods of performance wear, Flat seam attachment on seams may add more strength and decrease the seam bulk as well as performing as a decorative stich, Attaching cotton fabric with French seam adds more strength and create body curves in more body hugging way, attaching bodice with parallel flat lock stich lines cut down body muscles and create body curve and Adding side seam panel with stretch fabric adjust body curve.

The third objective was to introduce woven body contouring wear bodice alleviating the need of wearing a separate bra inspired from performance wear techniques. The systematic developments with performance wear pattern cutting and construction experiments ensure it is possible to alleviate the need of wearing bra. Based on fit evaluation, all experiments prove breast motion minimization, comfortably and higher aesthetic value..Further experiments of variety of performance wear styles can be carried out in future. Introduced woven body contoured wear bodice, alleviating the need of wearing a separate bra inspired from performance wear techniques, is appointed woven body contoured wear with in-built breast support with elasticated adjustable back methods without fastenings.

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