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Industrial sewing as a creative resource in the clothing Surface Design project

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ABSTRACT

The production of clothing has several operational steps, such as industrial sewing, which is used on textile surfaces as a materialization resource, that is, the union of two or more layers of fabrics by sewing points that makes the object tridimensional. In this context, the research seeks to explore the possibilities of industrial sewing to be considered as a creative resource to generate innovative surfaces in clothing, anchored on three pillars: in the design approaches of Surface Design, in the technical aspects of industrial sewing and in characteristics of materials textiles. For this, an exploratory investigation was carried out, with application of experiments using four straight industrial sewing techniques in three grammages of fabrics. The results were categorized through the effects obtained on the surfaces as graphic, structural and graphic structural function, demonstrating to be a creative resource that can be explored at the beginning of the design of clothing products.

Keywords: Surface design. Industrial sewing. Textile materials.

A costura industrial como recurso criativo no projeto de Design de Superfícies do vestuário

RESUMO
A produção dos produtos do vestuário conta com várias etapas operacionais como por exemplo a costura industrial que é emprega nas superfícies têxteis como recurso de materialização, ou seja, a união de duas ou mais camadas de tecidos por meio de pontos de costura que tridimensionalizam o objeto. Neste contexto, a pesquisa busca explorar as possibilidades da costura industrial para ser considerada como um recurso criativo para gerar superfícies inovadoras em vestuário, ancoradas em três pilares: nas abordagens projetuais do Design de Superfícies, nos aspectos técnicos da costura industrial e nas características dos materiais têxteis. Para isso, foi realizada uma investigação exploratória, com aplicações de experimentos por meio de quatro técnicas de costura industrial reta em três gramaturas de tecidos. Os resultados foram categorizados por meio dos efeitos obtidos nas superfícies como gráfica, estrutural e gráfica estrutural, demonstrando ser um recurso criativo que pode ser explorado no início do projeto de produtos do vestuário.

Palavras-chave: *Design de superfícies. Costura industrial. Materiais têxteis.*

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La costura industrial como recurso creativo en el Diseño de Superficies de prendas de vestir.

RESUMEN

La producción de prendas de vestir tiene varias etapas operativas, como la costura industrial, que se utiliza en superficies textiles como recurso de materialización, es decir, la unión de dos o más capas de tejidos mediante puntos de costura que tridimensionalizan el objeto. En este contexto, la investigación busca explorar las posibilidades de la costura industrial para ser considerada como un recurso creativo para generar superficies innovadoras en la confección, anclado en tres pilares: en los enfoques de diseño de Surface, en los aspectos técnicos de la costura industrial y en las características de los materiales textiles. Para ello, se llevó a cabo una investigación exploratoria, con aplicaciones de experimentos utilizando cuatro técnicas de costura industrial recta sobre tres gramajes de tejidos. Los resultados se categorizaron a través de los efectos obtenidos en las superficies como función gráfico, estructural y gráfico estructural, demostrando ser un recurso creativo que se puede explorar al inicio del diseño de productos de confección.

Palabras clave: *Diseño de superficies. Costura industrial. Materiales textiles.*

1. INTRODUCTION

The clothing product development process is divided into two major groups: the project, in which several creative steps are carried out that result in the generation of alternatives, and production, which consists of operations that materialize the best solutions. All stages have their particularities, but the operational ones are not explored from another perspective as the creative ones, often due to lack of labor or interest of professionals.

In this context, it is possible to emphasize sewing as an operational step that aims to unite all parts of two-dimensional textile molds and transform them into three-dimensional ones, through the introduction of the needle with thread in a textile material (MT), forming stitches of sewing.

By changing the position of industrial sewing in the garment manufacturing process, to identify its particularities and be considered as a creative resource to generate innovative surfaces in clothing projects, the research correlated the design approaches of Surface Design (SD). This specialty of Design has strong connections with Textile Design - fabrics are the basis for the configuration of clothing - and from the moment these issues were added to the technical aspects involving the industrial sewing process (needles, lines, stitches, and machinery) will be understood and will allow for graphic and structural innovation by expanding their functions on clothing surfaces.

Finally, this work is part of a dissertation and seeks to contribute to the expansion of Surface Design theories and processes, as this study is the first that integrates industrial sewing as a creative alternative in clothing surface projects.

2. LITERATURE REVIEW

2.1 Design Approaches to Surface Design

The surface in Design projects is characterized as the outside of products that attract users' attention through features such as length, width, shapes, colors, and textures. When these elements are manipulated, they become a communication support and are projected into an autonomous project (RUBIM, 2013; RINALDI, 2013; RUTHSCHILLING, 2008).

Schwartz (2008) states that to enhance the perceptions and performance of these elements, the design functions mentioned by Lobach (2001) as practices (technical aspects), aesthetics (sensory elements) and symbolic (user interaction with the object) can contribute to highlight the attributes on the surfaces.

In this context, Rinaldi (2013) considers the surface as a configurative element that seeks use improvements when related to materials and manufacturing processes and highlights that it allied with Design to have project relevance. Thus, Rubim (2013) considers Surface Design as a design specialty that seeks to develop surface projects highlighting the context of use.

Since then, several investigations have emerged in the area and for this research the analytical approaches for designers to design surfaces by Schwartz (2008) and the surface design proposal developed by Rinaldi (2013) will be emphasized.

Schwartz (2008) establishes three approaches named as: representational (graphic representation), constitutional (material, techniques, and manufacturing processes) and relational (semantics). Finally, it highlights that the three interrelate and interfere with different intensities in the configuration of the final appearance of the surface.

Schwartz (2008) directs the focus to representational and demonstrates how to organize information on the surface of an object in an organized way. For this, it relates the message to be built with graphic resources and considers that its ordering is part of a module, which, when repeated, forms a pattern that will cover or constitute a surface.

Still, Schwartz (2008) expands the view of these principles and mentions that the modules can be applied to surfaces with or without repetition, that is, when repeated and fitted together, they generate a partial or total area coverage. Those without repetition will constitute a local or global area.

When advancing in research on SD, Rinaldi (2013) comments that this specialty establishes a relationship at different levels between user and product and because of this, design decisions must be taken from a project planning, based on design concepts and practices and other specialties. Thus, it proposes the surface design divided into Creative Process (CP) and Executive Process (EP).

In the CP, Rinaldi (2013) mentions that the concepts and design goals that are in charge of the surface approaches of Schwartz (2008) are generated. In addition, it counts on the contribution of knowledge from other specialties such as Graphic Design, Fashion, Product, among others. Therefore, the intersections performed at this stage demonstrate that SD is a hybrid field to develop surfaces/products.

The EP seeks to configure the shape of surfaces through materials, manufacturing processes and knowledge of other areas that may or may not be design.

Rinaldi (2013) highlights that the manufacturing processes must be considered in the CP phase, so that technical specifications of the raw material, machinery, finishes and other tools are elaborated. Furthermore, it shows that surface finishes are related to the execution and completion process. Thus, the designer must know the characteristics of the material and the forming techniques.

So then, the two surface processes, Creative and Executive, generate a multifaceted surface with particular characteristics, as they are part of a hybrid project where they are configured based on the knowledge of specialties in the design and non-correlated areas.

In the clothing industry, this process occurs, for example, when the contribution of Fashion Design in the research of trends, fabrics and accessories occurs on the CP, Graphic Design with the creation of the print that will cover a textile surface, Textile Design in the structure design and fabric composition and Ergonomic Design, while providing usability and user comfort. Regarding the Executive stage, the engineering area contributes with knowledge about materials, machinery, and production processes, such as configuring textile materials in wearable products.

Through this example Menegucci (2018), Silva (2017), Pereira (2016), Freitas (2011) and Shaeffer (2008) point out that TM can be a support resource to create visual and tactile effects in products. Thus, it is concluded that the knowledge about its particularities and its possibilities of manipulation and application, contribute to the creative process of clothing surface projects.

2.2 Textile Materials and the Technical Aspects of Industrial Sewing

Currently, it is possible to find on the market several TM options originated from natural, artificial, or synthetic fibers. However, as the experiments in this research will be based on the most used fabrics in the clothing industry, which are plain cotton, technical issues related to this type of TM will be addressed.

Plain fabrics have different characteristics and, according to Vicentini (2010), it is possible to obtain various textures and finishes due to the physical-mechanical characteristics of the fibers such as weight, thickness, elasticity, flexibility, and surface (rough, smooth, among others). These particularities are decisive in the type of trim and in the possibilities of handling each MT.

In addition, Senai (2014) mentions that fibers have linear density, which determines the titles of the threads represent their thickness. This nomenclature is used in threads for sewing lines, string, and other applications.

In this context, Freitas (2011) mentions that TM have different attributes and can be a creative tool in SD projects. However, the designer must have ample technical background to handle them.

In the development of fashion products, fabrics can be a support to create visual and tactile effects such as textures through modeling, among others (PEREIRA, 2016). Prendergast (2015), considers sewing as a creative resource and highlights that when used on TM surfaces, they influence the design process. Antunes, Souza and Souza (2015) complement by stating that the way in which sewing are applied to TM can generate a structural change in configuration or interfere with the aesthetic aspect of the product.

In this way, fashion designers can use sewing techniques on product surfaces to de-characterize TM and incorporate new functions. But to carry out the industrial sewing process it is necessary to understand its technical resources such as needles, threads, lines, stitches and machinery so that, when selected, they reach the project requirements.

The needle is an accessory that, when inserted into the machine, guides the line so that it crosses the textile surface, forming the stitch. They are usually produced in tempered or chromed steel and have cylindrical characteristics with different thicknesses in its extension to suit different types of fabrics, lines, stitches, and machines. (NÓBREGA and OLIVEIRA, 2015; SENAI, 2014; ARAÚJO, 1987).

Its tip can be round (conical) for plain fabrics and ball (spherical) for fabrics with spandex. In addition, they are classified by metric numbers (Mn) that indicate a match between the thickness of the fabric and the line or thread that will be used for sewing. The best-known system is the Singer or American system, which consists of measuring the diameter of the shank (the other end of the tip) multiplied by 100. (NÓBREGA and OLIVEIRA, 2015; SENAI, 2014).

In the industrial sewing process, the lines are used in the needles and the threads in the loopers (a hook that serves to take the lines to the loop of the needle thread to form the stitch), located below the needle plate. Lines and threads are obtained through textile fibers (natural, chemical or synthetic) and generally the lines are composed of polyester, cotton, mixed with polyester and cotton, or just polyester or polyamide. While the threads are of chemical origin such as polyester or polyamide (SENAI, 2014).

Senai (2014) and Afonso (2007) point out that the grammage of the TM used in the sewing process influences the selection of technical sewing resources. Thus, they classify the fabrics according to their grammage measured in grams per square meters (g/m²) between: light, light/medium, medium/heavy and heavy. Table 1 shows the relationship between the grammage, fabrics, needles and lines.

Table 1: Adequacy between fabric, needle and line grammage

Fabrics	Needles		Lines			
			Needle Lines		Bottom Line	
	Metric	Singer	Mixed	100% POL	Mixed	100% POL
Heavy – over 440 g/m²	130 to 160 or 120 to 140	21 to 23	24 or 35	25 or 30	28/35 or 45	30/36 or 50
Medium/Heavy – between 340 and 500 g/m²	120 to 140	18 to 22	35	30	45	36
Light/Medium – between 170 and 340 g/m²	100 to 120 or 90 to 100	10 to 14	120/140	120	120/140	120
Light – until 200 g/m²	70 to 90	10 to 14	120/140	120	120/140	120

Source: Adapted from Senai (2014) e Afonso (2007)

Sewing stitches are another variable and according to ABNT (The Brazilian Technical Standard Association) BRN (Brazilian Norm) 13483:1995, it brings a classification to differentiate the types of stitches used for sewing made by hand and machine into six classes (100 to 600) and within each class, the types of stitch are subdivided into tens and ones digits.

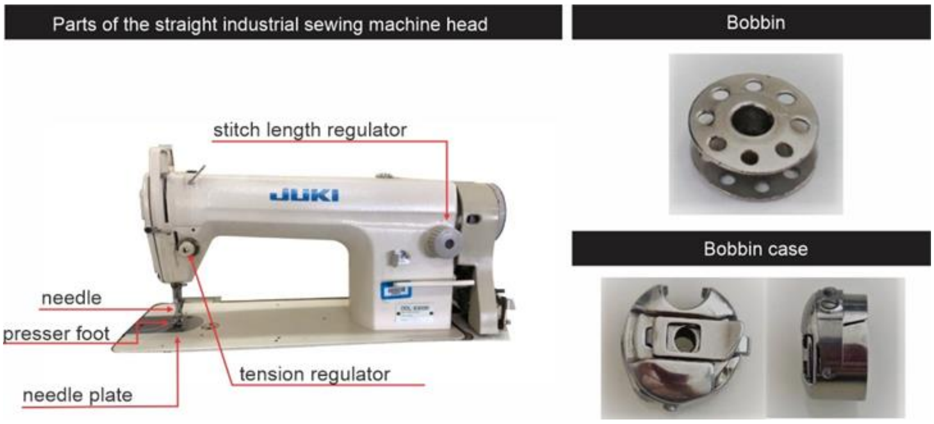
One of the most used classes in clothing companies is 300, made on straight sewing machines (SENAI, 2014), as it is the main tool used in plain fabrics, due to the variety of applications combined with the 301 stitch. This, characterized continuous dots of equal size on both sides of the material (right and wrong).

The industrial straight sewing machine has several components and for the present study, the presser feet, the line tension regulator, the stitch length regulator, the bobbin and the bobbin case are highlighted. Senai (2014) mentions presser feet as an accessory that holds the TM while a needle crosses the surface to form the stitch. In addition to this function, there are special presser feet (adaptable) that help the operator perform some types of sewing, such as: presser foot to apply zippers, gather, among others.

The line tension regulator is composed of two discs and a spring that provides adjustable pressure to the line, preventing an excessive amount of line from being pulled during the formation of the stitch (ARAÚJO, 1987). The stitch length regulator is another mechanism, which allows you to increase or decrease the size of stitches per centimeter (SENAI, 2014).

The bobbin and bobbin case are located at the bottom of the needle plate and are responsible for the second line to form the stitch on the bottom of the textile surface. The line is inserted into the bobbin and the bobbin case wraps around the bobbin, and its function is to allow the bobbin to unwind an adequate amount of line. Figure 1.

Figure 1: Parts of the industrial straight sewing machine



Source: Created by Ana Cláudia de Abreu e Marizilda dos Santos Menezes

Finally, Jana (2015) and Nóbrega and Oliveira (2015) mention that the proper selection of fabrics, needles, lines, threads, stitches and machinery ensure the final quality of the products, avoiding possible defects such as tears, holes and fraying in the fabrics. Thus, when considered in a SD project, it is possible to correlate them with the approaches of Schwartz (2008) and the multifaceted process of Rinaldi (2013).

3. MATERIAL AND METHODS

The study consists of an inductive reasoning research, as the results were obtained from the observations of the experiments. Qualitative approach of applied nature, because the investigation deals with practical purposes and solutions to concrete problems. Exploratory character because the proposed approach is new in scientific data.

To achieve the proposed objective, the experimental method was used with the intention of directly manipulating the independent variables (fabrics and sewing techniques) and dependent variables (needles, lines and machinery) that are related to the object of study through controlled situations.

In the experimental stage, a strategy consisting of 6 phases was carried out: 1) Selection of TM; 2) Test to identify TM grammage; 3) Selection of industrial sewing techniques, needle, lines, stitch, and machinery; 4) Preparation of fabric for the experiments; 5) Preparation of samples; 6) Analysis of samples according to the protocol developed by Abreu (2020) which are described below.

3.1 Experimental phase

The experimental stage began with the selection of three 100% cotton plain fabrics in their raw form (without chemical additive) with different grammage to compose the body of the tests. The choice was made due to the ease of finding them on the market and their constant use in clothing production.

The intention of working with different grammage came from the literature review when it was observed that for a given grammage of fabric there is an adequate number of needle and sewing line. Therefore, the technical aspects of sewing interfere with the textile grammage.

As the materials were purchased in commercial establishments and not all of them had information about their grammage, a grammage test was carried out following BRN 10591 - Textile Materials - Determination of the grammage of textile surfaces, in partnership with the Textile Engineering course at the Federal Technological University from Paraná, Apucarana campus, to supervise the procedure with the necessary equipment.

The test started with the separation of the three fabrics into three groups regarding the tactile aspect: fabric A, B and C. Then, five specimens (15 x 15cm) were cut on the surface of each group of fabrics, with spacing of 10 centimeters (cm) from the selvedges, respecting the warp direction (length), forming a diagonal.

Soon after removing the specimens, all were directed to the sample cutter and redefined by 10 x 10 cm and then were weighed separately on an analytical balance to verify the mass in grams. To make the measurements more accurate, each specimen was placed in a 100 ml glass beaker.

The values found in grams were separated into groups and the arithmetic mean between them was calculated. By multiplying by 100, it was possible to find the grammage per square centimeter of each category. Finally, the grammage were related to Table 1, which indicates that fabrics up to 200 g/m² are considered light. However, based on the results of the experiments, the fabric with the highest grammage has 142.27 g/m². When adapting the result of the experiment in the context of the research, the fabric of group A with 94.65 g/m² will be considered light: B with 121.32 g/m² as light/medium and C with 142.47 g/m2 as medium/heavy.

The third phase of the experimental stage was the selection of technical aspects of sewing and started from the selection of four industrial sewing techniques, identified through a visual survey carried out on the Fashion Forward portal, where the most used techniques in garments from various collections of fashion brands. With that, the techniques visualized were, matelassé, tuck, gather with and without elastic line.

By crossing the information in Table 1 and the grammage with the technical aspects of sewing, the following sewing resources were defined: round tip needle No. 14

(recommended for plain fabrics). Lines with 100% polyester composition and n° 120 (needle and bobbin). Elastic line (58% elastane and 42% polyester) on the bobbin of the gather technique with elastic line.

It is noteworthy that Table 1 indicates the use of needles No. 10 to 14 for fabrics weighing up to 200 g/m². Before this selection, a pre-test was performed on the three groups of fabrics with needles n° 10, 11, 12, 13 and 14 in an industrial straight sewing machine and line n°120. From this, it was observed that the sewing with the number 14 needle showed similarity in the three groups in relation to the resistance of the stitches.

An industrial straight sewing machine was regulated and used to make the samples, as well as stitch N°301 and class 300, as they are the structural basis for the manufacture of clothing products with plain fabrics.

In the fourth phase of the experimental stage "preparation of fabrics for the experiments", 5 sheets (20 cm x 20 cm) of each grammage of fabric were cut for the use of sewing techniques (one sheet for each, except for the matelassé technique which requires two sheets). To complement this, 3 sheets (20 x 20 cm) of acrylic blanket, 1 cm thick, were cut to place between the TM sheets using the matelassé technique.

In addition, templates were developed for the matelassé and tuck techniques, in order to build a graphic effect with sewing stitches, from which the markings were made on the specimens.

To perform the gather technique, the pressing foot gathering was inserted into the sewing machine, so that the result of the effect was even along the entire edge.

It is noteworthy that the steps of preparation, execution and evaluation of the tests took place in the UTFPR

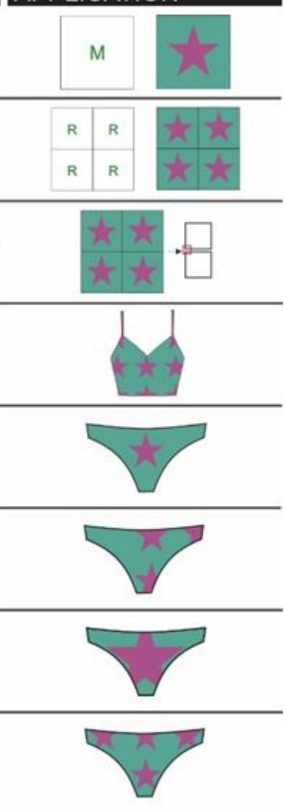
Industrial Sewing Laboratory, with 12 samples as a result, which were later analyzed among themselves based on the parameters of the Protocol developed by Abreu (2020) for addressing the knowledge about SD mentioned in the literature review of this research.

3.2 Protocol for analysis of experiments

Following the protocol, the representational aspects were first analyzed in two groups: the SD principles composed of module, repetition, fit, pattern and type of surface application (local, partial, total or global), exemplified in Figure 2.

Figure 2: SD Principles

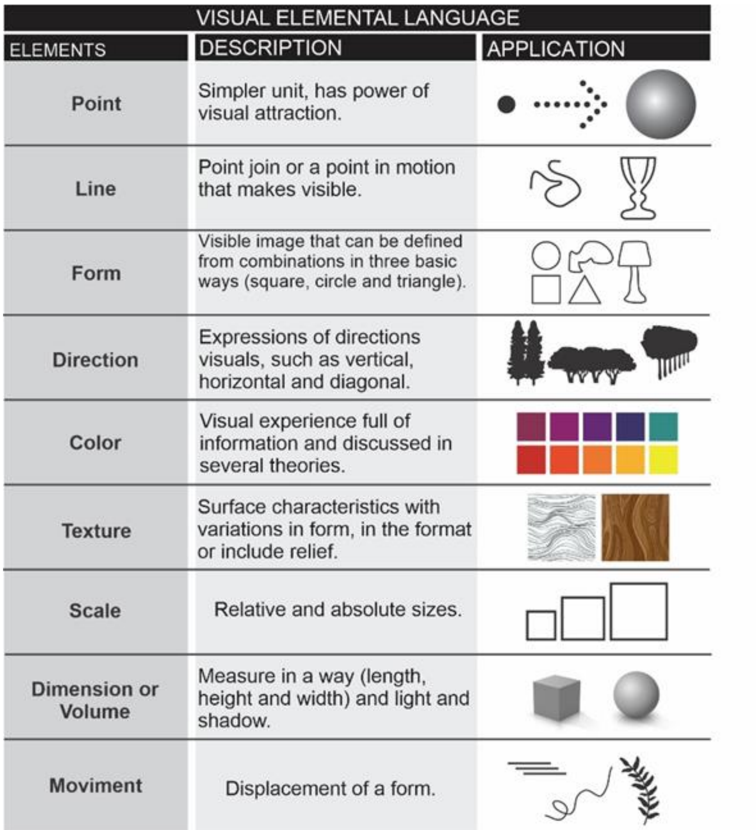
SD PRINCIPLES		
ASPECTS	DESCRIPTION	APPLICATION
Module	Limited area where all visual elements are organized.	M
Repetition	Repetition of modules in the length direction and in width.	R R R R
Fit	It is the meeting point between the modules.	
Pattern	The pattern will overlay or will constitute the surface.	
Local Application	Module local application on a surface.	
Parcial Application	Module local application on a surface.	
Global Application	Module global application on a surface.	
Total Application	Full application of the module in a surface.	



Source: Created by Ana Cláudia de Abreu e Marizilda dos Santos Menezes

To complement the representational aspects, the visual language elements (VEL) were considered: point, line, shape, direction, color, texture, dimension, scale, and movement, shown in Figure 3.

Figure 3: Visual Elemental Language



Source: Adapted from Pereira (2016, p.31)

In the second moment, the constitutional aspects, named as projectual, were analyzed. This category includes the sewing machine used, the presser foot, sewing stitch (number and size), needle (number and type of tip), needle line and bobbin (color, number and composition), if there was a change in size initial sample and volume addition (right and/or wrong).

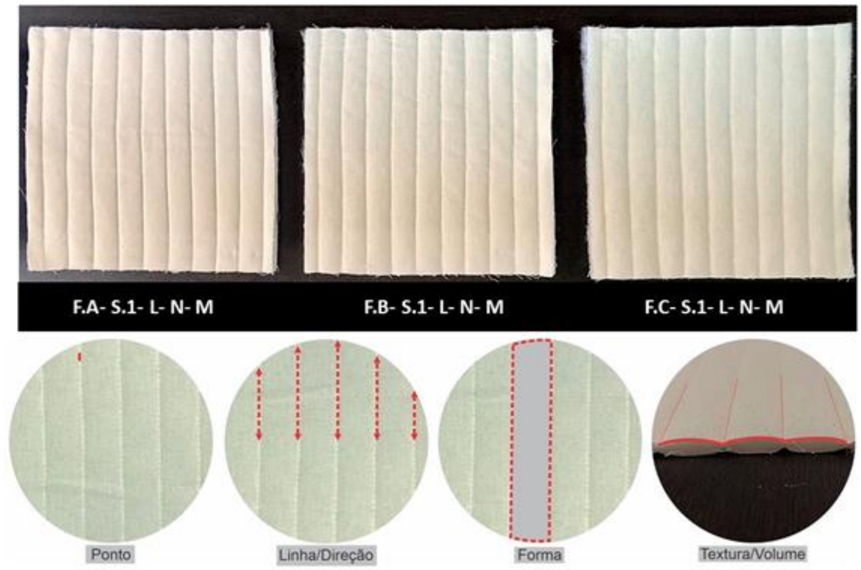
Finally, the relational aspects concern the standards used, the contribution of other areas of knowledge and the place of execution of the experiments.

4. RESULTADOS E DISCUSSÃO

For each sewing technique, a reference was assigned as a way to facilitate the analysis between the samples. These are based on the abbreviation of the following words: fabric A (FA), fabric B (FB), fabric C (FC), sewing 1- matelassé technique (S.1), sewing 2- tuck technique (S.2), sewing 3 - gather technique (S.3), sewing 4- gather technique with elastic thread (S.4), line n°120 (L), elastic line (EL), needle (N), industrial straight sewing machine (M).

The first technique observed is the matelassé and following the representational aspects of the protocol taken as the basis for the analysis, the use of industrial sewing in the three samples generated some VEL such as: the point through the length of the sewing stitch, with its repetition, make up lines. The shape was formed by repeating the directions of vertically parallel lines, forming a rectangle. The nude color, as it is the same as the textile surface. The texture and volume are noticeable on the fabric's right and wrong, through the sewing stitches that joined the acrylic blanket and the fabrics, providing a more rigid structure when compared to a sheet of raw cotton, Figure 4.

Figure 4: Samples and Visual Elemental Language of in the matelassé technique



Source: Abreu (2020, p.92-93)

In addition to these characteristics, the surfaces are composed of a module formed by the length of the sewing stitch and its repetition in the width of the fabric, resulting in a pattern with full application. Finally, the three samples have a structural graphic effect.

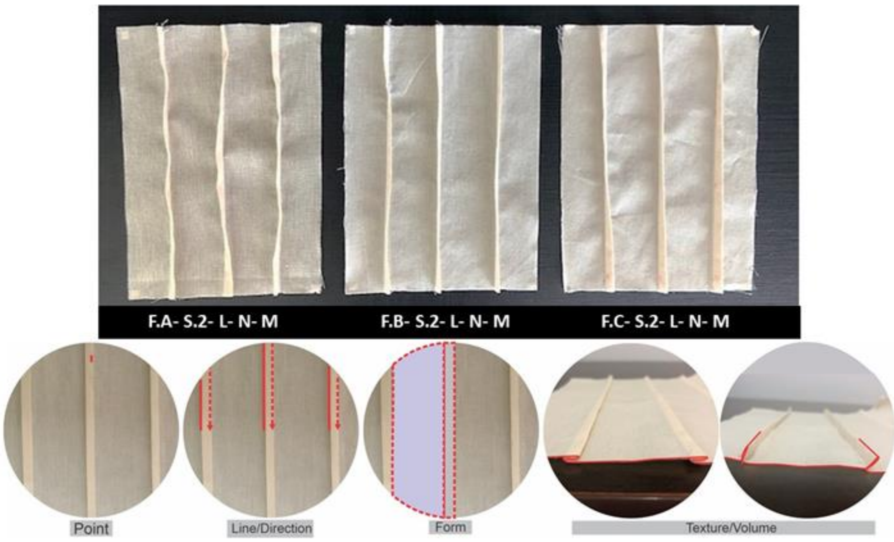
The projectual and relational aspects of the samples referring to the matelassé and tuck technique are similar, as they concern the selection of the technical aspects of industrial sewing and the contribution of textile engineering to help identify the use of BRN 10591 to define the grammge of fabrics, mentioned in topic 3.1.

Finally, the three samples of the matelassé technique have similarity in the addition of volume on both sides of the fabrics. However, samples F.A-S.1-L-N-M and F.B-S.1-L-N-M have a lesser visual effect when compared to F.C-S.1-L-N-M. This was due to the lighter grammage. Therefore, the greater the textile grammage combined with an acrylic blanket, the greater the visual, tactile and structural effect.

It is noteworthy that there was no variation in the length and initial width of the sample.

The surfaces of the samples of the tuck technique are composed of a point represented in the length of the sewing stitch, however, unlike the matelassé technique, it has the function of joining two parts of the same fabric. The shape is represented by the rectangle formed by folding the fabric vertically (direction) and between the tucks. The color represents the white of the line with the fabric. The texture and tactile volume appear regular on the tucks (right side) due to the pre-defined distances and marked by the template, Figure 5.

Figure 5: Samples of Visual Elemental Language in the tuck technique



Source: Abreu (2020, p.95-96)

The tuck volume represents a modulus that was repeated in the fabric width, thus forming a graphic pattern. In addition, the regions where the sewing are formed as tucks, generated structure to the fabric, similar to a cutout. Therefore, as in matelassé, this technique allows free graphic creation and structural.

Still in the three samples, there was a change in the size of the initial width of the textile surface, due to the union of some parts to form the effect. In addition, the tucks of sample F.C-S.2-L-N-M are more structured when compared to others. Concluding that, as in the matelassé technique, the medium/heavy gramage of the fabric generated a greater volume.

The third technique is the gather, and regarding representational aspects, the point corresponds to the intersection of the lines that arise through the sewing. These cause a curved and vertical direction effect. There is presence of texture in irregular gather (scale), located from the top to the base of the sample, promoting a sensation of movement. Finally, there are core volumes. (Figure 6).

Figure 6: Samples of Visual Elemental Language in the crimping technique

Fonte: Abreu (2020, p.97-98)

The first gather created by industrial sewing is represented by the module, which, when repeated along the width of the fabric, forms a structural pattern due to the volume acquired.

The difference between the projectual aspects of this technique for the matelassé and the tuck is the replacement of the simple presser foot with the gathering foot and the loosening of the line tension.

From this, the samples showed deformation on their sides after the application of industrial sewing. The experiment F.A-S.3-L-N-M (fabric with light grammage) obtained greater change in the gather region when compared to the others. In addition, in all three there was volume addition, with emphasis on the sample F.3-S.3-L-N-M (medium/heavy fabric). Thus, it is concluded that the higher the fabric grammage, the greater the volume acquired. However, the lightweight F.A-S.3-L-N-M sample has more gather and less volume.

The fourth technique corresponds to the gather with elastic line and, according to the others, there is also the presence of repetition of visual and tactile effects, in this one, in particular, due to the elastic line used in the bobbin.

In relation to VEL, the point is present in the length of the industrial sewing stitches that form the lines in different directions (movement). The color is the same as the textile base with dark nuances between the gather. There is irregular texture and volume with variations in relief and size (Figure 7).

Figure 7: Samples of Visual Elemental Language in the gather technique with elastic line

Source: Abreu (2020, p.100-101)

On the surfaces of the samples there is a three-dimensional module represented by the volume of the first gather in the corner of the fabric, which, when repeated in width and length, form a partial application and a structural graphic pattern with visual similarities on the fabric's right and wrong. In addition, sample F.A-S.4-E.L-N-M (light grammage) has regular gather when compared from the other samples. This observation was also obtained in technique 3 with the sample with light grammage fabric.

Regarding the projectual aspects, the gather foot with the elastic line on the bobbin was used. For the machine to work properly, it was necessary to loosen the screw of the bobbin case, to facilitate the transport of the line upwards.

When relating the results with the literature consulted, Rinaldi (2013) considers that in a SD project, the manufacturing processes such as the technical specifications of the raw material, machinery and finishes must be considered in the creative phase. For this, the designer must know the characteristics of the material and the configuration techniques. Therefore, based on this, all aspects involving the production of samples from experiments such as TM, industrial sewing resources and the preparation of specimens, such as templates, were planned and organized in stages and this was only possible after understanding the characteristics of the resources used in the process through the literature review.

Regarding TM, Menegucci (2018), Silva (2017), Pereira (2016), Freitas (2011) and Shaeffer (2008) mention that they can be a support resource to create visual and tactile effects in products. Still Freitas (2011), considers that the designer must have a technical background to handle them. Through experiments it was proven that when applying industrial sewing stitches on textile surfaces, they generate graphic and structural elements, such as in the matelassé technique, the greater the grammage combined with acrylic blanket, the greater the tactile and visual effect. However, it was only possible to reach this result after performing the procedure to understand the grammage of each textile material.

Finally, Prendergast (2015) mentions that sewing is a creative resource and when used in TM, it influences the design process. It can be said that through the tests, it was proven that industrial sewing is a creative resource when applied to TM, as it allows graphic and structural creation when selecting the correct features, and can even change the TM characteristic, as in the gather technique with elastic line, industrial sewing provided elasticity to a 100% cotton flat fabric.

In this way, industrial sewing is no longer just an element of materialization and becomes a graphic and structural resource in SD projects.

5. CONCLUSION

This work presented an exploratory research, with experiments carried out in laboratories, in which it was found that industrial sewing can be considered a creative resource to develop surface projects, since through the experiments it was proven that graphic and structural changes occur.

These aspects occur due to the proper selection of textile materials and technical resources of industrial sewing anchored in the SD approaches and becomes a way to stimulate new alternatives for clothing surface projectual and encourage experiments for the Fashion Designer to create innovative surfaces.

Finally, the results expand the operational field of industrial sewing of the union of fabric parts for a creative and executive process capable of creating visual, tactile, and structural information through the selection of textile materials and technical aspects of industrial sewing.

REFERENCES

ABREU, A. C. **Design de Superfícies**: a costura industrial como recurso criativo em produtos do vestuário. Bauru, 2020. 114f. Dissertação (Mestrado em Design) – Universidade Estadual Paulista. Bauru, SP, 2020.

AFONSO, H. G. **Costura Industrial**. SENAI – Serviço Nacional de Aprendizagem Industrial. Belo Horizonte: MODATEC – Centro de Desenvolvimento Tecnológico do Vestuário, 2007.

ARAÚJO, M. de. **Manual de engenharia têxtil**. Lisboa: Fundação Calouste Gulbenkian, 1987.

ANTUNES, D. C.; SOUZA, A. P. B. de; SOUZA, P. de M. Interferência Têxtil: a costura como recurso estruturante. In: COLÓQUIO DE MODA, 11., 2015, Curitiba. **Anais do Colóquio de Moda**. Disponível em: <http://www.coloquiomoda.com.br/anais/Coloquio%20de%20Moda%20-%202015/POSTER/PO-EIXO6-PROCESSOS-PRODUTIVOS/PO-6-INTERFERENCIA-TEXTIL.pdf>. Acesso em: 10 fev. 2021.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **NBR 10591**: Materiais Têxteis-Determinação da gramatura de superfícies têxteis. Rio de Janeiro: Abnt, 2008.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **NBR 13483**: Materiais Têxteis- Tipos de pontos de costura. Rio de Janeiro: Abnt, 1995.

FREITAS, R. O. T. de. **Design de Superfície**: ações comunicacionais táteis nos processos de criação. São Paulo: Blucher, 2011.

JANA, P. Sewing equipment and work aids. In: NAYAK, Rajkishore; PADHYE, Rajiv (Org.) Garment Manufacturing Technology. Oxford: Elsevier, 2015. Cap.1 p.275-315.

LÖBACH, B. **Design Industrial**: Bases para a Configuração dos Produtos Industriais. São Paulo: Edgard Blucher, 2001.

MENEGUCCI, F. **Design de Superfícies Têxteis**: diretrizes de ensino aprendizagem para a formação em design de moda por meio da abordagem experiencial. Bauru, 2018. 255 f. Tese (Doutorado em Design) – Universidade Estadual Paulista "Júlio de Mesquita Filho". Bauru, SP, 2018.

NÓBREGA, L. C. O.; OLIVEIRA, A. de. **Costura Industrial**: métodos e processos de modelagem para produção de vestuário. São Paulo: Érica, 2015.

PEREIRA, L. M. **Projeto de programação visual no processo de desenvolvimento de produto de moda**: uma proposta didática para o ensino superior. 2016. 242 f. Tese (Doutorado em Design) Universidade Estadual Paulista "Júlio de Mesquita Filho". Bauru, SP, 2016.

PRENDERGAST, J. **Técnicas de costura**: uma introdução às habilidades de confecção no âmbito do processo criativo. São Paulo: Gustavo Gili, 2015

RINALDI, R. M. **A intervenção do design nas superfícies projetadas: processos multifacetados e estudos de caso**. 2013. 190 f. Tese (Doutorado em Design) –Universidade Estadual Paulista "Júlio de Mesquita Filho". Bauru, SP, 2013.

RUBIM, R. **Desenhando a superfície**. 3. ed. São Paulo: Rosari, 2013.

RUTHSCHILLING, E. A. **Design de Superfície**. Porto Alegre: Editora Ufrgs, 2008.

SCHWARTZ, A. R. **Design de superfície**: por uma visão projetual geométrica e tridimensional. 2008. 200 f. Dissertação (Mestrado em Desenho Industrial) - Universidade Estadual Paulista "Júlio de Mesquita Filho". Bauru, SP, 2008.

SHAEFFER, C. B. **Fabric, Sewing, Guide**. Cincinnati: Krause Publications, 2008.

SENAI. Serviço Nacional de Aprendizagem Industrial. **Mecânico de máquinas reta e overloque**. São Paulo: Senai-SP, 2014

SILVA, M. L. F. da. **Design de Superfícies**: por um ensino no Brasil. 2017. 337 f. Tese (Doutorado em Design) - Universidade Estadual Paulista "Júlio de Mesquita Filho". Bauru, SP, 2017.

VICENTINI, C. R. Garcia. **Ferramentas e Metodologia de Projeto aplicados na criação de produtos para a indústria têxtil- confecção**. 2010. 157f. Tese (Doutorado em Engenharia Mecânica) – Faculdade de Engenharia Mecânica, Universidade Estadual de Campinas. Campinas, SP, 2010.