

The transformative cuts: new foundations in pattern cutting and approximations of the body

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Abstract

Fashion designers are presented with a range of different principles for pattern cutting, and interest in this area has grown rapidly over the past few years, due to both the publication of a number of works dealing with the subject in different ways, and the fact that a growing number of designers emphasize experimental pattern cutting in their practices. Although a range of principles and concepts for pattern cutting are presented from different perspectives, the main body of these systems, traditional as well as contemporary, is predominantly based on a quantified approximation of the body. As a consequence, the connection between existing theories for pattern construction and the dynamic expression and biomechanical function of the body are problematic.

This work explores and proposes an alternative theory for pattern cutting, which unlike existing models, takes as its point of origin the actual, variable body. As such, the research presented here is basic research. Instead of a static matrix of a non-moving body, the proposed model for cutting garments is based on a qualitative approximation of the body, visualized through balance lines and key biomechanical points. Based on some key principles found in works by Geneviève Sevin-Doering, the proposed model for cutting is developed through concrete experiments by cutting and draping fabrics on live models. The proposed theory is an alternative principle for dressmaking, which challenges the fundamental relationship between dress, pattern making, and the body, opening up for new expressions in dress and functional possibilities for wearing.

Keywords: qualitative approximation, pattern cutting, draping, fashion design, logic, design model

Motive

Putting the body at the centre of attention may sound obvious when talking about and working with the creation of garments. However, most of the methods and techniques related to pattern cutting presented in the educational literature merely deal with the shapes of patterns, how to alter them in order to achieve a certain familiar garment, (Aldrich, 1997; Aldrich, 2004; MacDonald, 2010; Öberg, 1999), or how various two-dimensional shapes can be turned into three-dimensional ones, which may then be used to create garments (Roberts, 2008; Nakamichi, 2005). Others clarify methods for draping garments on tailors' dummies, or turning these creations into reproducible patterns (Amaden-Crawford, 2012; Duburg, 2008; Di Marco, 2010; Mee, 1987). This is essential knowledge for anyone who aims to use cutting as a method for fashion design, but the story neither starts nor ends with the pattern; instead, it both commences and concludes with the body that is being dressed.

Origins of pattern cutting

Pattern making per se originated in the medieval period, when tailors began cutting pieces of fabric, shaped for the anatomical contours of the body. Up until then, most garments consisted of either long rectangular pieces of fabric, which were either wrapped around the body in various ways or assembled as smaller rectangular pieces with a minimum of cuts in, and hence waste of, valuable hand-woven fabric (Broby-Johansen, 1953; Tilke, 1990).

The tailoring method of cutting garments, i.e., starting from flat, shaped pieces, has been developed in Europe over the last five hundred years. Tailoring and fit as we know it today developed gradually. Different systems and theories of how to reproduce known styles to fit different body types were developed and, parallel to the shift towards mass production, mathematical systems for size grading were introduced (Rasmussen, 2010; Waugh, 1964). Western tailoring has had a huge impact on dressmaking worldwide, and the near universally dominant flat pattern cutting methods taught today derive from it. The pattern of a tailored sleeve tells us about the shape of an arm, and a front body piece about the shape of a chest.

Consequently, the introduction of the pattern established a form of notation which allowed ways of cutting to be documented, in turn making it possible for knowledge to be shared and spread in trade journals, for example. Craftsmen learned to envision the body when shaping the pattern pieces they worked with. It became possible to work with an abstraction of the body, a template, and by altering the pattern, new types of garment could be created. Instead of working with the fabric and the body, the cutter primarily worked with the pattern. This opened up new possibilities and refinements in cutting, but also introduced an aspect of alienation to the work, a risk that the awareness of the body became lost in the act of cutting, since there was less need for the body to be present.

The prevalent approximation of the body

Drafting a flat pattern in the absence of the body of the intended wearer demands high accuracy in terms of drafting methods. There exist numerous mathematical systems based on vertical and horizontal measurements of the body, which assist in drafting a foundational pattern that may then be transformed into any kind of garment. These measurements of the body abstract the spatially moving body into a series of numbers; from these, a diagram of guidelines is drawn on to a flat surface, and pattern pieces are drafted within this matrix. Some systems generate a basic block following the shape of the body, i.e., a representation of the body, which is to be altered into specific styles (Aldrich, 1997,2004; MacDonald, 2010; Öberg, 1999), while other systems are designed for the drafting of patterns of predefined garments (Doyle, 2005; Friendship, 2008).

Drafting systems which use vertical and horizontal lines connected in right angles in this way imply a certain approximation of the body, which has little to do with how the body interacts with the fabric, but is easy to reproduce and thus widely spread due to practical reasons. The working order often follows that in which measurements are taken; for example, the centre back neck is a common starting point in both measuring the body and drafting patterns. This is logical, as it is the initial point of balance for garments resting on the shoulders. It is common to measure chest width, waist width, seat width, shoulder width, length of the front and back, and the width

and the length of the arms. These measurements are used as a basis for the diagram that is drawn up, within which the block pattern is shaped (Figure 1).

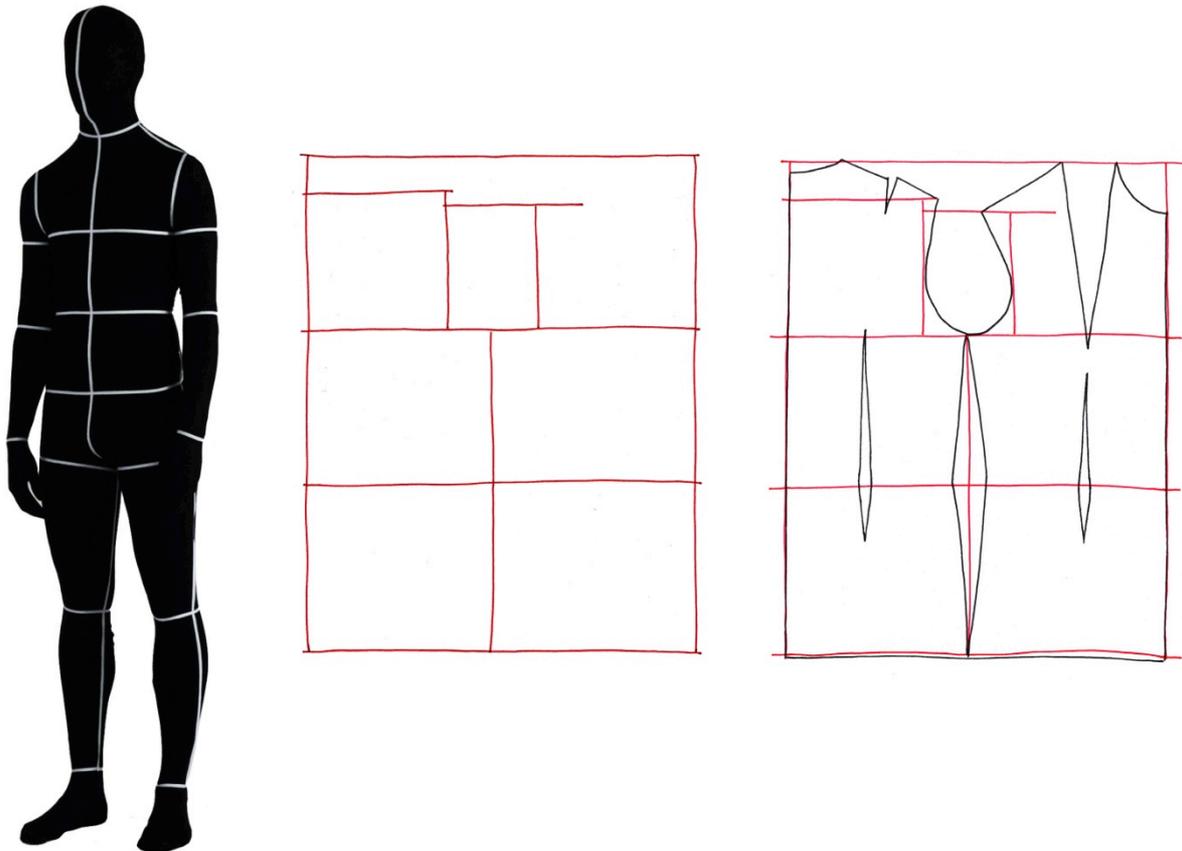


Figure 1. Traditional quantified approximation of the body and block pattern, used as foundation for cutting.

Aldrich (2004) claims that the body remains constant, and therefore argues that the pattern blocks representing the body are a good starting point for cutting garments.

Pattern cutting by this method is a means of achieving a shape around the body so that, although the body and therefore the body blocks remain constant, there is no limit to the ideas that can be followed through into workable designs.

The problem with this argument is that the body does not remain constant; rather, it is changeable, varying, and by all means inconstant. The body is a moving variable (Burnham, 1997), which constantly shifts its physical appearance. Although most practitioners are fully aware that the body and also the fabric are “moving variables” (Burnham, 1997), fashion designers seldom, for practical reasons, work directly with

a human body when cutting a garment. Pattern cutting methods are hence based on approximations of the body, models that do not represent the body exactly but are close enough to be useful for cutting work. These approximations are intended to simplify the cutting and design process, and are used to make predictions of the result easier.

The described quantitative take on cutting, i.e., using a matrix drawn after the horizontal and vertical measurements of the body, illustrates the prevalent approximation of the human form. The same kind of matrix is commonly applied to the dress stand to be used as foundation while draping, which arguably indicates that contemporary draping as described by Mee (1987) and Duburg (2008) is based on the same theoretical framework as is used in flat construction. Draping (*moulage* in French) reintroduces a three-dimensional awareness into the practice of cutting, as well as a partial awareness of the body. However, due to the fact that draping primarily involves a fixed dress stand, and that it uses the same perspective on the body as flat construction, it has the tendency to create the same rigidity as cutting from block patterns sometimes has. This quantitative approximation has come to define the cutting of a modern dress with its darts, shoulder, and side seams, and has further affected the view on the use of grain direction and the development of grading principles.

Several recent research works have proposed developments to the prevalent theory of pattern making. For example, McKinney (2012) argues that “theory can ground the practice and lead to a better understanding of body-pattern relationships”, and aims to develop a theoretical understanding of the body and fitting issues within existing theories of flat pattern cutting. The tailoring matrix and the practice of cutting from block patterns based on a static upright positioning of the body is, however, disputed and several improvements have been suggested. Wang (2011) and Simoes (2013) both present alternative ways of constructing foundational patterns based on different studies of bodies in motion; Wang, by altering tightly fitted blocks after a study of runners in motion, and Simoes by tracing the distorted forms of tightly fitted costumes with plastic qualities worn by six different women. Both methods intended to support the biomechanical functions of the body better and, while questioning the

dominant discourse, both constitute developments *within* the prevalent theory of pattern cutting.

Patterns as tool or notation?

When dealing with cutting garments for a body, the question of how to view the pattern is of significance. Is it to be seen as a representation of the body (Aldrich, 2004), a tool or starting point for designing (Roberts, 2008), a catalyst between fabric and garment (Debo, 2003), or a notation of a shape?

When a two-dimensional pattern is the starting point for creation, and lines and shapes are joined together into three-dimensional garments, the pattern may become an effective tool for creating new shapes (Aldrich, 2004). Cutting from blocks and designing with the pattern has been promoted as a design method in a number of published titles. These methods have been given different names, such as *Metric Pattern Cutting* (Aldrich, 2004), *Pattern Magic* (Nakamichi, 2010), *Subtraction Cutting* (Roberts, 2008), and *Transformational Reconstruction* (Sato, 2011); crucially, what they all have in common is that they start from two-dimensional blocks or shapes and use a “jigsaw puzzle” approach to designing. However, Roberts states that the pattern has been his main interest, and that his designs are frequently dominated by his interest in the pattern itself. Arguably, pattern cutting ought to be concerned first and foremost with the body, secondly the dress, and finally the pattern. The block pattern is merely an abstraction of the body and, when using it as the foundation for cutting, the work is grounded in a widespread but questionable approximation of the body that, in fact, has little to do with either the biodynamic functions of the body or how the body interacts with the fabric.

Looking at the above systems of pattern cutting, I would argue that the dynamics of the body are easily lost when working within the tailoring matrix; hence, the pattern is viewed as a tool for designing. In order to rid us of this static approach to the body, there is a need to develop a new, more dynamic model of the body as a basis for pattern cutting. Such an approach may be based on how the moving body interacts with fabric while being dressed in it. This calls for a new approximation of the body derived from qualitative, rather than quantitative, measures of it, in order to open up for new aesthetic values that are functional as well as expressional.

Design of experiments – analysis of experiments

Through multiple reconstructive studies of the pattern works by the costume designer Geneviève Sevin-Doering, a hypothesis for an alternative model for pattern construction took shape. Considering the ways in which the fabric in different constructions interacted with the human body while they were being created, put on, and worn, an alternative relationship between body and dress appeared. The aim of my research endeavour was to develop new models for garment construction that enabled innovative artistic expressions and design functions for dress (Koskinen, 2011, p. 51).

The first part of the work, to understand the problem of research and to form a hypothesis for an alternative pattern cutting system, was framed through reverse engineering and design recovery of Geneviève Sevin-Doering's work and methods. As Chikofsky and Cross (1990) explain, reverse engineering is a process of analyzing a system so as to create representations of the system at a higher level of abstraction, with the purpose of bringing about new development. Design recovery may be understood to be a subset of reverse engineering, in which "recovery" refers to the reproduction of all of the information necessary for a person to fully understand what a system (or design programme) does, how and why it does this, and so on (Biggerstaff, 1989). By quoting the principle parts of Sevin-Doering's work, different representative types of dress were recreated on a live body, using the same working method she had utilized. In this way, I managed to abstract and understand the key principles of her work, forming my initial hypothesis.

Once this had been accomplished, the second part of the work was conducted through concrete physical experimentation, i.e., draping with fabric on a live model. As opposed to tendencies to follow preconceived ideas about the order of things, and dogmatic principles such as professional fashion design trends concerning pattern construction or academic teachings in pattern making, the fundamental form – the theory – was arrived at as the result of a series of experiments performed through observations, in a similar way to that proposed by Sir Francis Bacon (1620/1990) in his "new method".

From this perspective, experimentation and the analysis of experiments is also a fundamental tool in practice-based design research, with the aim of suggesting change and development through new foundational definitions and theoretical propositions within the field of art itself (Hallnäs, 2010). Firstly, the experiments arbitrated between competing theories, while simultaneously functioning as the tools necessary to develop and validate new methods and models for innovative expressions and functions. Secondly, they formed a foundation of accumulated data with which to generalize and abstract the theoretical principles through inductive reasoning.

The design of the experiments was based on three variables; body, material, and form. The first two were independent, selected, or manipulated by myself. The body was exchanged between different experiments, and the material was manipulated in different ways through cutting. The third variable, form, was the dependent variable, and was affected by the changes in and manipulations of the first two variables (Koskinen, 2011, p. 55).

Defining a qualitative approximation of the body

Rather than taking the lexicon of modern dress, with its standard block patterns drawn from the tailoring matrix, as reference points for shape creation, let us look to the body itself. How does fabric behave on the body? Where does it want to go? How does it fall? What happens to the fabric when the body moves? According to Sevin-Doering (2007), there is no clear logic, if one starts from the actual body, to split pieces at, for example, the top of the shoulder or along the sides. Quite the opposite, in fact; the shoulders are one of the natural points where garments rest on the body, and from where they are pulled downwards by gravity.

In 2011, I visited Geneviève Sevin-Doering in her atelier in Marseille, and was shown her archive of garments and patterns made of a single piece of fabric. That Geneviève's work was based on another approximation of the body than the traditional tailoring matrix was clear; here, then, the starting points were the fabric and the body, and traditional block patterns or dress stands marked with straight

lines were nowhere to be seen. The garments were sculpted on the person they were intended for while they moved around in the atelier, and a few cuts transformed the single piece of fabric into a complete garment. How this approximation differed from the traditional tailoring matrix was, however, neither verbalized nor visualized, other than through the garments and the patterns, which bore the marks of another view on dressmaking.

By looking at the body in this way, and through draping experiments with a single piece of fabric, guidelines, in the form of points and directions, have been defined. The directions suggest where on the body the fabric “wants” to fall and may be draped in order to neither fall off the body nor restrain its movements. These lines are not suggestions for where to place seams, nor are they guides for where to measure the body, but proposals for how the fabric may be draped around the body. The way in which the fabric falls, and where it “breaks” or folds, also highlight certain points toward which the cuts into the piece of fabric are supposed to be directed; the *transformative cuts*. The principal difference between conventional draping and this model of working is that the “break-lines” that occur in traditional draping are, in this approach, not simply beautiful lines which exist because of how a fabric hangs when it is draped. Instead, these marginalized, “beautiful” break-lines are in themselves a part of defining the fundamental structure – grid – of this dynamic approximation of the body (Figure 2).

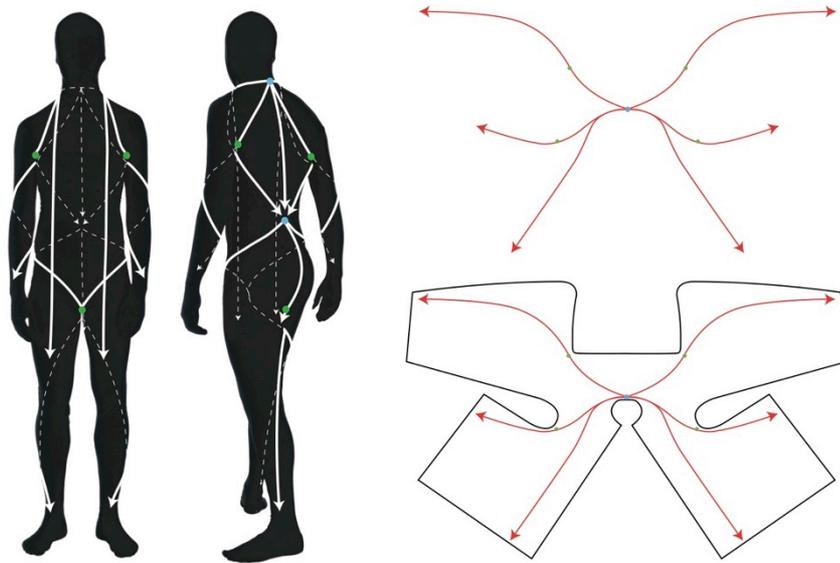


Figure 2. Proposed qualitative approximation of the body, visualised through direction lines and foundational points.

There are two categories of points within this theory. The first, the foundational (structural) points, coincide with the direction indicators at the start of the lines (centre back neck and centre back waist), or at the “bodily break point” at the front and back of the armpit, and at the front and back of the crotch. These points relate to the structure and biodynamic function of the body, and are as fundamental a part of the proposed theory as the direction lines. The points at the start of the lines serve to direct the first cuts into the fabric so as to let it hang undisturbed from the shoulders or from the waist, while the armpit and crotch points are crucial when directing cuts in order to create garments with functional arms and legs.

The secondary category of points, the derived (form) points, relate to the form of the body and the desired form of the garment. They are derived from where the fabric “breaks” or creases when draped upon the body; this appearance may differ between different body and fabric types, as well as depending on how the grain line of the fabric is placed. By either cutting through such a point or leaving it uncut, one can thus eliminate this crease or keep it. For example, on top of the shoulder are three break points; if one leaves all three of them, and only cuts aiming at the

fundamental armpit points, one obtains a sleeve shape, similar to that of a square cut chemise, while if one places a cut going through all three of these break points, one creates a sleeve shape similar to that of a tailored jacket. In the same manner, the points at the elbows and knees serve to direct the cuts when cutting a bend sleeve or leg. The direction lines and fundamental points are intended to be valid for all body types and both sexes, while a greater number of derived points might be added on a more curved body. Hence, the number of derived points is the only principal difference between a male and a female body within the theory. Typically, additional derived points may then be added on the bust and at the hips (Figure 3). As already discussed, the points function to direct the cuts into the fabric; hence, the cuts can, but do not necessarily need to, pass through the points.

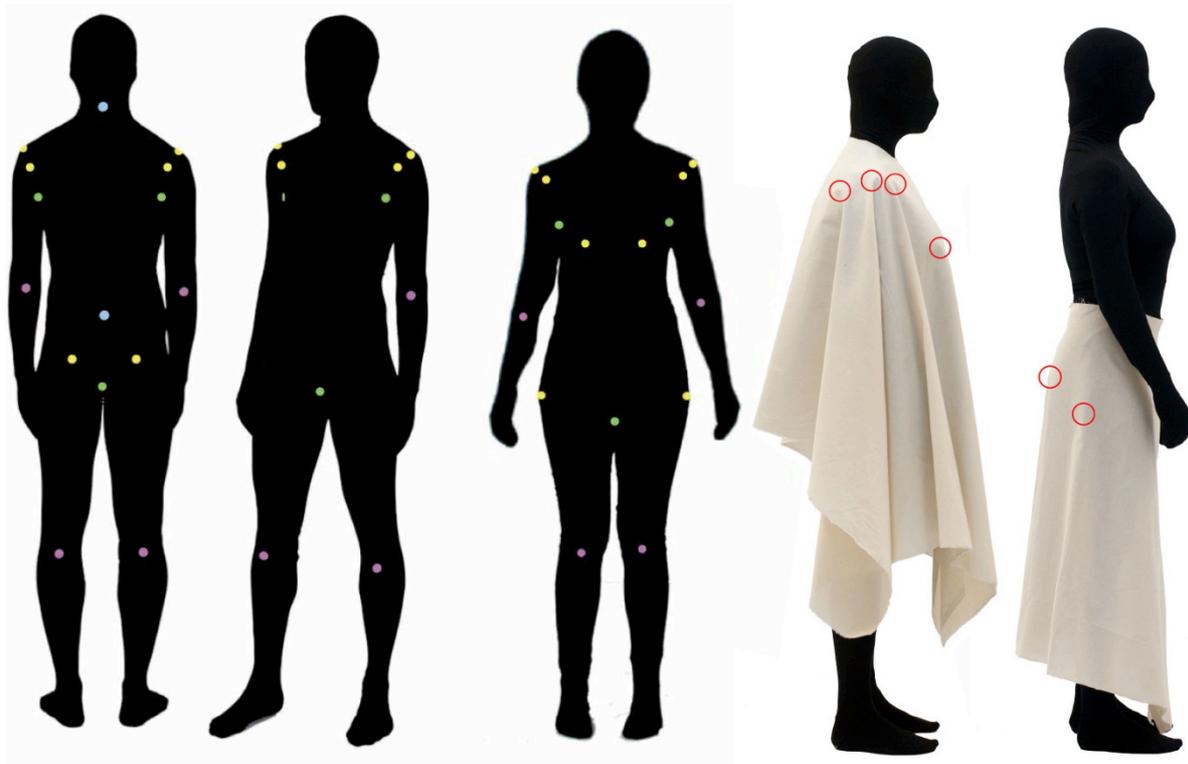


Figure 3. Foundational points (in blue and green) and derived points (in yellow and lilac) on a male and a female body, together with example of breaking points (figures draped in calico).

The transformative cuts

The draping method utilized while developing the proposed quantitative approximation of the body is here termed “the Transformative Cuts”. A few initial cuts

transform a piece of fabric that hangs either from the shoulders or from the waist into a shaped garment. These cuts, aimed towards various described points, are directed by the drape of the fabric (gravity) in relation to the biomechanical functions of the body (balance and movement); as such, the act of cutting becomes a search for new expressions of the body. These three parameters are commonly taken into consideration during the fitting of a garment or a toile. "How does it fall? Is the balance good? Can we see it from the side? Can you please give us a walk?" Here, however, it is entirely present in the construction, or shape design, of the garment. If the pattern is drawn from ready-made blocks, one has to rely on the balance of the blocks, and mentally visualize the body within the pattern pieces. Gravity and the movement of the body are present merely through the experience of recognizing well-known pattern shapes and what they may or may not do in conjunction with a body. While draping, gravity is a most present axiom; however, the fabric pieces are often pinned in position on the dress stand, partly circumventing the parameters of gravity and balance.

The cuts illustrated here are to be viewed in comparison to conventional draping and flat cutting, in which comparable initial acts would be to measure the body and further shape darts, shoulder seams, and side seams (Figure 4). The transformative cuts are a working method of cutting into a piece of fabric, which was developed and utilized by Genevieve Sevin-Doering. It has been utilized in the experiments conducted while defining this qualitative approximation of the body and while designing the examples presented in this paper. The theory outlined here explains the work of Sevin-Doering; however, it may also work as a foundation for developing further new construction methods.

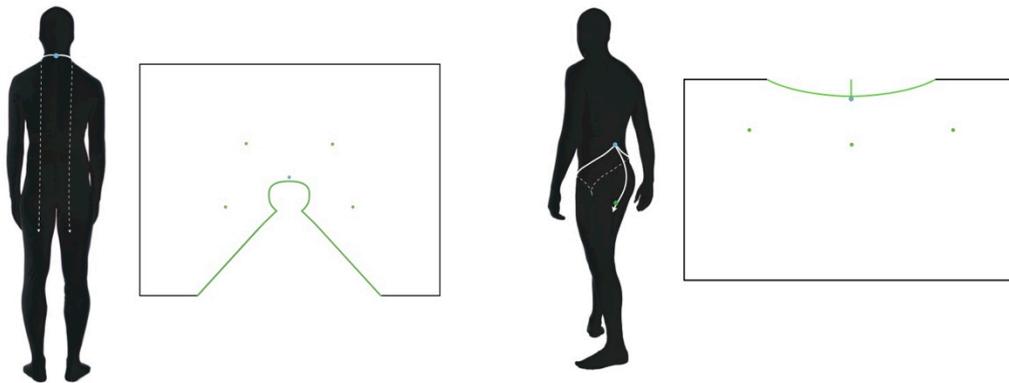


Figure 4. Suggestion for transformative cuts for shoulders (left), and for waist (right).

Design examples

The following examples show two garment prototypes modelled from a single piece of fabric, although the number of pattern pieces that the garments are composed of is of less importance. The one piece principle may be compared to a beautiful proof in mathematics, or the shortest equation with which to explain an experiment. The proof could be written differently, in just one part or in any number of pieces, but doing so would only make the principle less clear.

The principle outlined in this paper radically differs from manipulating block patterns. It shares similarities to draping, and uses the same principles of pinning, cutting, and marking, as described by Duburg (2008). It is, however, based on another logic than draping, another way of understanding the relationship between the body and the fabric, in which the traditional tailoring matrix is left out. As such, this qualitative logic proposes an alternative theory for pattern cutting, a radically different framework for understanding the body in garment making. Thus, it is also a practice that emphasizes the expression and movement of the body, rather than the pattern, which originates from the actual break-lines of the body and the fabric, instead of from the mathematical post-construction of the tailoring matrix. It is a system of qualitative measurements, created in order to explain and achieve what cannot be accessed through quantitative measurements.

The design examples (the tailored jacket and the trousers) included in this paper are made in congruence with the suggested model, in order to illustrate both how the model works and how it has been developed, as well as that the cutting and modelling of the fabric on the body is the experimental foundation for the observation of key points and break-lines, from which the theory is derived (Figures 5 and 6).

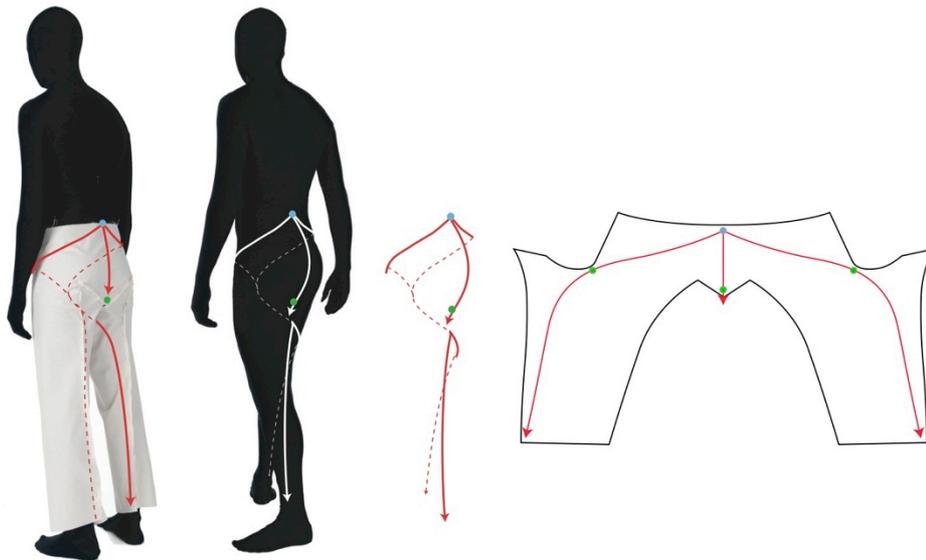


Figure 5. Design example; trouser in calico, together with directions on legs and pattern, marked with direction lines and points.

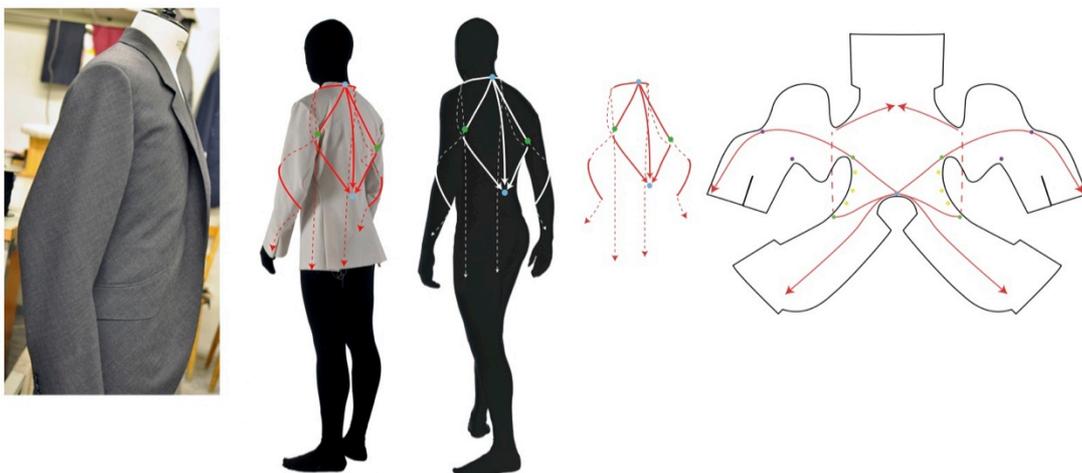


Figure 6. Design example; tailored jacket in wool and pattern, marked with direction lines and points.

Conclusion

This paper introduces and demonstrates an alternative theory of pattern making for new possible expressions of body and dress. The method of transformative cuts is explained and clarified through a new theoretical framework; a qualitative approximation of the body, in contrast to the traditional quantitative theory based on the horizontal and vertical measurement grid, is presented. This new construction theory opens up for innovative expressions in dress, as well as functional possibilities for wearing.

This is to be seen as a general theory and can, just as the traditional tailoring matrix does, form the foundation for any kind of dress, be it wholly standardized or customized to a certain body. Like any other system, this framework is assumed to hold possibilities for creating any kind of garment shape. It is not primarily a system for creating one piece garments. The one piece block may be split and adjusted into different forms, and then consist of any number of pattern pieces. Moreover, the system is not a system of draping in the traditional sense, even though draping may seem to be the starting point for the system. It can be based on any human body, specific or general, and can be adapted to both sizing systems and cultural deviations. However, and more importantly, it is the actual body as such that is the point of departure for the development of the system and its applied construction, which is an essential difference compared to an approach that takes measurements of the body as a point of departure.

The examples in this paper serve to validate this function of the proposed theory of transformative cutting, and each example demonstrates that the theory works; simply put, it is possible to apply the theory to garment making as a whole. Furthermore, the selection of the tailored jacket, as a kind of traditional garment, was made from an epistemological point of view, showing the potential of serving the same dish but with a different taste. However, there is a great need to perform further work so as to demonstrate the potential of the system through more expressive examples, which reach further out from traditional forms, and thus illustrate the potential of this framework for developing along unknown avenues.

In addition to presenting an alternative approximation of the body, this system also questions the conventional utilization of fabric grain in the cutting of garments. When wrapping the fabric around the body, the grain, instead of running vertically or at an angle of 45 degrees, varies across the body, and therefore in the garment, and this affects the expression and function of the garment.

The questions that arise as a consequence of formulating this theory of garment making naturally touch upon its expressive and functional possibilities and limitations. While the examples serve to validate the basic expression and function of the theory of transformative cuts, the question still remains as to what extent this theory is significant; what new expressions may one make with it? What new functions will it offer? Does it mean a refinement of the approximation?

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