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From Structure to Flow Sensorial Comfort: A Comparative Study of Origami, Kirigami, and Fifi Techniques in Textile and Fashion Design

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ABSTRACT

This research explores how Origami, Kirigami, and Fifi folding methods like these, as creative processes, can contribute to the development of contemporary women's fashion design. This research argues that these folding techniques allow designers to convert a flat surface into a sculptural form and, although folded, still achieve stylish clothing that is comfortable and multi-dimensional, fitting multiple body shapes. Origami allows for highly specialist folds and creates a more precise and architectural style; Kirigami uses controlled cuts, so that it naturally moves more and has better ventilation, while Fifi folding focuses more specifically on volume with layered folds. When used together, these methods and the tactile nature of construction, offer designer's the opportunity to satisfy the desires and needs of the visual appeal of garments and the sensorial comfort of wearing them. By using digital prototyping and appropriate design experimentation, a series of garment based concepts can be created, facilitated by visual interrogation to explore the potential for folding and body inclusivity through potential garment outcomes, measured for fit in specific body type ranges. The results indicate that folding-based construction can bring together aesthetics and the potential for wearability for modern women's garments and reflects a body-focussed and trend-based approach for modern women's wardrobes.

Keywords: *Origami fashion, Kirigami, folding, women's wear, body-inclusive fashion, sensorial comfort, modern fashions, trendy clothing, structural aesthetics, model prototyping, fashion prototyping, textile innovation.*

INTRODUCTION

Fashion has always been a domain for the intersection of art/culture and technology, producing garments that are ultimately functional, but also representative of an identity/creativity. In recent years, women's fashion has leaned even more towards inclusivity and individuality, and away from a standardized silhouette. Constructed garments, such as those that employ modern techniques like Origami, Kirigami, or Fifi folding, have an exciting role to play in enhancing garments structurally and aesthetically. Origami, simply put, is a Japanese practice of folding flat paper into three-dimensional forms which has enabled designers to view fabric as a material they can sculpt, not simply cut and sew. The related fold techniques to Origami produce geometric patterns that certainly add dimensionality to garments without sacrificing grace or accuracy, at least in its concept as applied to fashionKirigami expands on this aspect while integrating positioned cuts with folds. The final result is fabric that provides visual interest while being flexible and breathable and comfortable for daily wear. Fifi folding, on the other hand, is about layered softness and volume. By arranging fabric in layers of cascading folds, it gives garments a fluidity and femininity offering motion and grace for the wearer. Comfortably, beyond just their visual contributing to comfort, these techniques in providing comfort are palpable to the body. Modern definitions of comfort encompass a range, moving beyond thermal balance to include sense and tactile sensation, body movement, and psychological confirmation. Origami folds provide tactile variation; Kirigami cut-outs allow ventilation and air-flow; and Fifi layering creates softness and drape thus enhancing sensorial comfort. Psychological merit is just as important; wearing garments that are contemporary and unique and fit you specifically provides confidence and self-expression; qualities that women value in today's world. Another strength of designing and folding is that it embraces variability on different body types. Commercial clothing patterns often use inflexible sizing systems that are dubious representations of the body. Folds, pleats, and layered constructs are characterized by folds that expand, contract, and reshape to accommodate different silhouettes. The idea of accommodating silhouettes contributes to a growing movement to create inclusive fashion; no longer are designs to fit within prescriptive limitations of body proportions. The focus of this research is to investigate the innovative and practical potential of Origami, Kirigami, and Fifi folding methods in women's wear. A collection of garment prototypes was generated through fabric manipulation and digital visualization, to see how garment prototypes deployed the folding methods in order to achieve fashionable, trendy, and comfortable looks that would be acceptable for multiple body types and shapes. Through the study's consideration of sensorial comfort, inclusivity, and the immediate success of the garments, this evidence aimed to show how the methods of folding could provide valuable innovation for women's fashion without sacrificing wearability or cultural relevance.

LITERATURE REVIEW

In recent years, the potential of structure and surface manipulation in clothing design as fashion designers continue to work toward an equilibrium of aestheticism, functional wearability, and inclusivity has gained increased focus. Origami folding, Kirigami cutting, and Fifi layering, for example, have become legitimate strategies to transform flat fabrics into three-dimensional forms, and not only do these strategies open possibilities for visually compelling garments, but also deeply discomforted garments without compromising style and contemporary relevance in women's fashion.

Origami and Its Application in Fashion

Origami, through the paper folding traditions originating in Japan, has emerged as a unique design method in textiles and garment design. Origami, even in the context of fashion allows designers to manipulate flat textiles into complex three-dimensional constructions without supplementary structures [1]. Designers have drawn liberally from origami for their example of origami-like creations which serves to reinforce either architectural silhouettes, geometric constructions or fold-based embellishments that effectively will beautify the quality design of any garment [2]. Initial explorations into origami in collections were primarily endemic to high fashion where forms were sufficiently exaggerated to enhance forms of drama through a gargantuan floor-length to serve as a framework for

visually stimulating a series folded structures [3]. In stark contrast, contemporary studies have demonstrated origami techniques applied to a series of ready-to-wear collections, where origami enables the designer to adapt garments that accommodate various sizes and body types while also being relaxed and comfortable [4]. The process manipulation of folding fabric assists in hang and drape, which enables a garment to accommodate bust, waist and hip differences [5]. This flexibility also accommodates the rising demand for inclusive fashion. In addition, origami techniques have made their way into digital design programs like CLO3D and 3ds Max, allowing designers to visualize and simulate folds before assembling garments [6]. This helps minimize material waste and improve accuracy during the prototype phase. Research has also shown that origami-like folds improve garment durability, as they help distribute stress across seams and folds evenly [7]. In this way, origami adds both aesthetic and structural value to fashion design.

Kirigami and Fashion Adaptability

Kirigami fuses fold with cut singularly offering even more versatility in fabric manipulation. Unlike origami which uses folds exclusively, kirigami experimentation includes cut-outs that provide additional stretch, ventilation, and sometimes dynamic texture [8]. Kirigami is easier to imagine for fashion design (as compared to architecture and product design) in relation to warmer climates where air flow (rather than insulation) is most desirable and/or breathability, ventilation and comfort is important [9]. While kirigami textiles have been studied and used in architecture and product design, its possibilities in garments are just being conceptualized and explored [10]. Researchers in fashion have pointed out that kirigami methods allow for an expansion and contraction of the garment through bodily movement, making clothing more adjustable (to accommodate varying body sizes and shapes) [11]. Adaptive clothing makes the clothing item more comfortable on the body and can encourage sustainability. This is achieved through size flexibility, and the reduction of production in each size [12]. Moreover, kirigami provides alternate methods of sensorial comfort, in that cut-out shapes can sufficiently remove weight from the fabric itself and also offer soft surface relief and tactile variety that can enhance the wearer experience [13]. Digital simulations of kirigami garments have also been used to assess air permeability and thermoregulation, showing advantages compared to regular woven textiles [14]. Thus, kirigami in fashion provides a route to both functional and aesthetic innovation.

Fifi Folding and Feminine Volume

While origami and kirigami explore geometric precision, Fifi folding emphasizes layered softness and volume using cascading folds to create draped silhouettes with feminine and flowing characteristics, originating from fabric manipulation in haute couture [15]. Because of its emphasis on elegance and body movement, Fifi is especially well suited for women's wear [16]. Research on layered fabric structures indicates that Fifi-like folds create garments that are visually pleasing and sensorially comfortable due to the silhouette feeling soft on and around the skin with beautiful movement [17]. Rather than a strict geometry such as origami, Fifi folding brings a certain fluidity that can make garments seem more original, natural and body-inclusive [18] and is often permissive of a variety of figures. Fifi folds have been used by designers in dresses, blouses and skirts to introduce volume without adding a stiffened understructure [19]. Recent trends in fashion indicate the desire of consumers for clothing that considers comfort with style, and Fifi techniques respond to this emerging contradiction by converging tactile comfort with visual refinement [20]. Digital design on platforms now allow the simulation of folds layered on top of each other, so designers can experiment with volume and drape without fabric waste [21]. And the Fifi fold is at least as widespread as other folds for this reason, with its integration into high fashion and popular contemporary collections accelerating.

Sensorial Comfort in Fashion Design

Sensorial comfort, as a multilayered concept, encapsulates tactile, thermal, and psychological dimensions [22]. Scholars in fashion suggest that garments must provide style, and comfort that builds confidence and usability [23]. Origami, kirigami, and Fifi make up sensorial comfort in various ways.

Origami folds modify texture in the fabric to create tactile changes within a garment, furthering the garment experience [24]. Kirigami cut-outs provide air flow and thereby, thermal/physiological comfort [25]. The cascading soft folds of Fifi make garments feel soft against the skin, and also provides psychological comfort in terms of femininity and swishness [26]. In surveys of women's preferred aspects of fashion, comfort consistently ranks next to style and affordability as an influencer in purchasing decisions [27]. In comparison, sensorial comfort is relatively under researched in fashion, possibly to a lesser extent than technical parameters of a breathable fabric, durability, and/or elasticity [28]. With figures such as these, there is room to develop folding methods to improve not only the formal and aesthetic aspects of clothes, but also the sensory aspects of wearing them.

Digital Prototyping and Fashion Technology

Digitally-prototyping tooling has enabled the design and prototyping of folding-based clothing to be altered forever. Software programs like CLO3D, Optitex, and 3ds Max enable designers to simulate folds, cuts, and even layers digitally, freeing up time in the development process while minimizing material waste [29]. Digital simulations can test garments of all body shapes and positioning, imparting knowledge of fit and drape that cannot easily be achieved with traditional methods [30]. Much of the research into digital fashion prototyping seeks to explain how this method aids inclusivity, as we can virtually test garments on different sized avatars [31]. This is especially pertinent with the trend towards body-positive fashion, since clthing is now created not for a standardized torso, but instead for real women with a variety of shapes [32]. Digital tools with folding-based designs increase this accessibility by incorporating the ability for adjustable fits and customisation [33].

Fashionability and Cultural Relevance

The cultural significance of origami, kirigami, and Fifi folding is much broader than just a technical performance. These constructs are appealing to those consumers who are interested in innovation, artistry, and individuality when purchasing fashion (Ref 34). Origami garments are meant to reference modernity and sophistication, while design that uses kirigami principles shows boldness and creativity. The Fifi folds speak to softness and femininity, in alignment with traditional ideas of elegance, while simultaneously providing the flexibility for modern contexts (Ref 35). Adding further to the overall fashionability of folding constructions is their symbolic value, for which they are both functional and attractive. In an era of fashion that exists as a mode of self-expression and cultural communication; garments that make use of folds and related methods offer a clothing item that allows a user to stand out whilst enjoying the comfort and versatility this type of construction better affords. [36].

Table 1: Summary of Literature on Folding-Based Fashion Techniques

Technique	Key Features	Comfort Contribution	Fashion Relevance	References
Origami	Geometric folds, structured forms	Tactile variety, improved durability	Modern, architectural appeal	[1]–[7], [24]
Kirigami	Folds + cuts, ventilation, elasticity	Thermo comfort, reduced weight	Bold, experimental fashion	[8]–[14], [25]
Fifi	Layered folds, cascading volume	Softness, flowing comfort	Feminine elegance	[15]–[21], [26]

Sensorial Comfort	Tactile, thermal, psychological	Enhanced wearability and confidence	Body-inclusive fashion	[22]–[28]
Digital Tools	CLO3D, 3ds Max, Optitex simulations	Virtual testing for fit	Inclusive, sustainable design	[29]–[33]
Cultural Value	Symbolism of folds in identity	Psychological comfort	Trendy, expressive styles	[34]–[36]

METHODOLOGY

The cultural significance of origami, kirigami, and Fifi folding is much wider than just a technical performance. These constructs are attractive to those consumers who are buying fashion with innovation, art-matter and individuality in mind (Ref 34). Origami garments attempt to signify modernity and sophistication, whilst design that employs kirigami principles embodies audacity and creativity. The Fifi folds depict softness and femininity, concerning traditional notions of elegance, while allowing room for modern contexts (Ref 35). Adding to the overall fashionability of folding constructions is their culturally symbolic meaning, and both functional and aesthetic appeal. In a time of fashion that exists as a type of self-expression and cultural discourse; garments that utilise folds and related methods offer a garment that allows a user to display difference, while also benefitting from the comfort and flexibility that this construction allows.Thirty women aged between twenty and forty years participated in the research. They were selected to represent a range of body types including slim, petite, curvy, and plus-size. Each participant tested garments constructed using Origami, Kirigami, and Fifi techniques and provided structured feedback. In addition, five professional fashion designers were included in the evaluation process to provide expert insights into technical accuracy and design quality.

Fabric Manipulation

In the design process fabric was the key variable offering unlimited options in terms of color texture pattern weight and variety. The manipulation of fabric was used to create innovation in design. The fabric manipulation technique aims to innovate new cutline and by applying the technique on simple fabrics to convert them into 3D design pieces, it uses to develop 3D structure by using 2D laid fabric by which designer can add up some other additional properties to the new fabric. Origami, Kirigami, and Fifi style techniques are used to manipulate the fabrics to convert them into new innovative fabrics with qualities of size variation flexibility and better fit. These techniques are of different styles like overlapped shaped by multiplying texture back upon itself and getting it set up. Creases are ordered as squeezed that is, pressed, or in any case heat set into a sharp wrinkle, or undressed falling in delicate folds. The comfort is of the tactile surface feel of fabric gives relaxation and mold the itchiness feel into comfort.

Psychological comfort is the state of the wearer about the wearing style and proportions and the final looks. The design techniques used for maternity wear give very graceful looks through which subjects feel confident and psychologically strong with comfort.

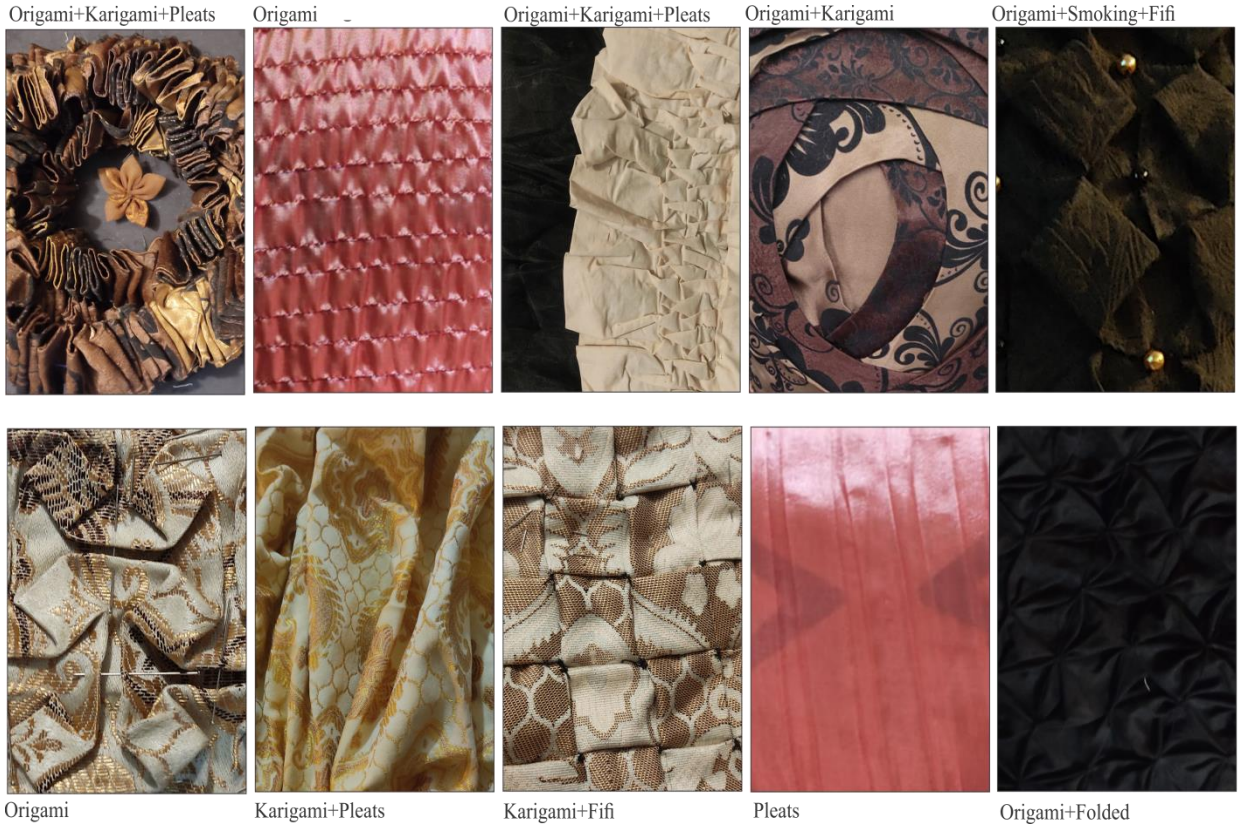

Fig1: fabric manipulation techniques applied onto fabrics

Material selection played a significant role in determining garment performance. For Origami garments, medium-weight cotton sateen, twill, and polyester-blend poplin were chosen to retain sharp folds while remaining flexible and breathable. Kirigami garments were made from lightweight viscose blends, cotton jersey, and stretch polyester to enable elasticity around cut-out sections without fabric damage. For Fifi garments, chiffon, crepe, georgette, and viscose-rayon blends were selected because of their fluid drape and ability to create cascading folds. Elastic belts and light buckles were added with care to reinforce structure and retain comfort.

Material Selection

The choice of fabric was critical to the success of fold-based construction. Unlike rigid materials, such as leather, this study used textiles which are recognized for comfort, flexibility and the ability to preserve folds. Three categories of fabric were decided upon:

1. **For Origami folds:** Medium-weight cotton sateen, twill and polyester-blend poplin. Provided the structural stability required to achieve clean folds while retaining breathability.

2. **For Kirigami cut-outs: Lightweight viscose blends, cotton jersey, and stretch polyester**. Its elasticity allowed for cut-outs to be supported without compromising the integrity of the fabric.

3. **For Fifi cascading folds**: **Chiffon, georgette, crepe, and viscose-rayon blends** were employed. Their fluid drape and soft hand-feel made them ideal for layered folds that emphasize femininity and movement.

Accessories such as elastic belts, lightweight buckles, and trims were added selectively to reinforce design features without compromising comfort.

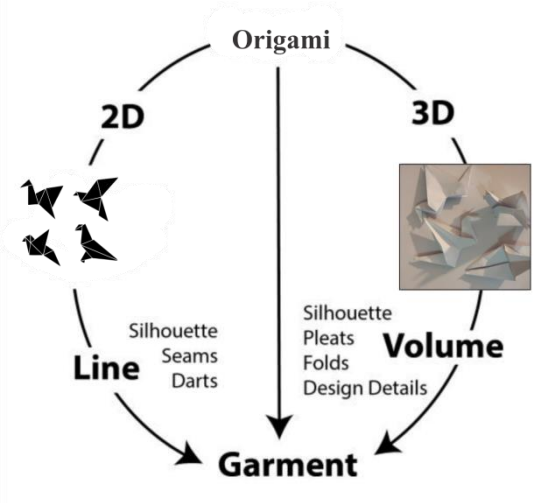

Figure 2: Origami technique pattern

Kirigami technique involves cutting and building 3D structures which were practiced before moving to the final garments in CLO. This step is indeed to truly understand the basic cuts and built shapes of the structural garment. Small papers are cut and pasted into shapes and to build different types of patterns of the basic bodice with this technique and the 3D approach to the Kirigami technique. As you can see in the fig the new design of the pattern is developed by constructing the 2D paper into the 3D structure as shown in Figure 2

Figure 3: Origami and Kirigami physical development

After getting through the physical experimental process to approach the Kirigami cuts and folds than these Kirigami techniques were applied to the VMs on CLO in 3D to look and create garments. The Kirigami technique is used in different percentages for different dresses.

Applying different techniques on the garments in different ratios to achieve better fits and visual appearance. The First Origami technique applied to the seven dresses with 10% to 70% design technique to understand the visual looks (as shown in Figure 3).

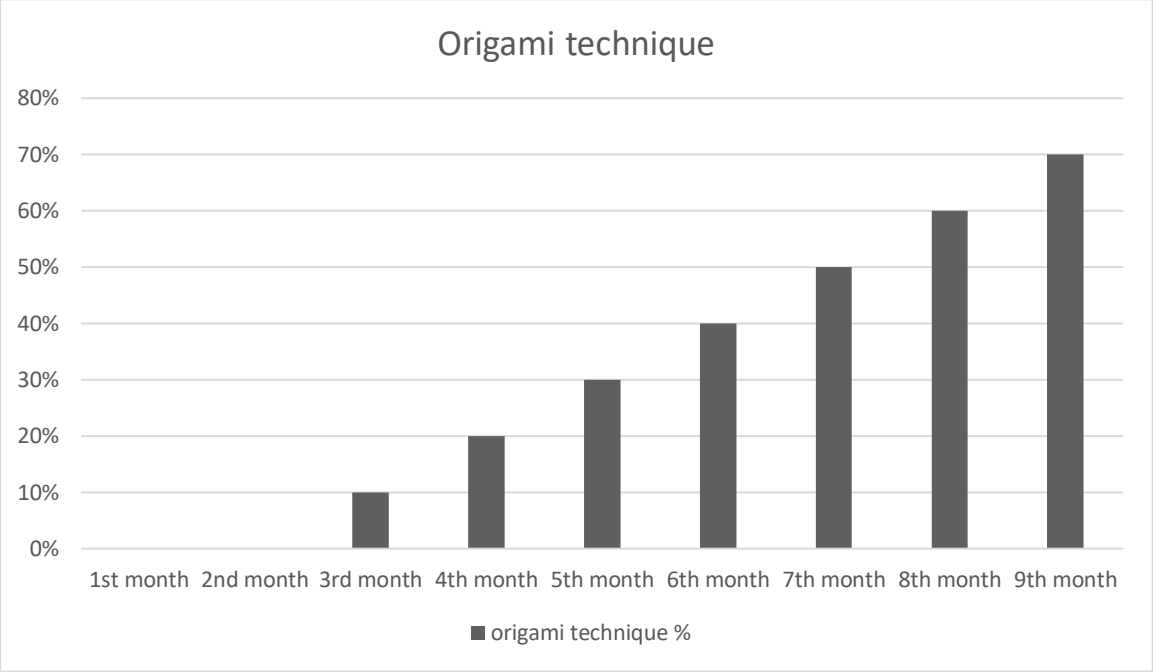

Figure 3: Origami technique percentage

Kirigami techniques were developed from 10% to 70% on the garments and folding and cutting methods to achieve a better fit and visual appearance. Seven garments were developed and compared with each other to visualize the best one

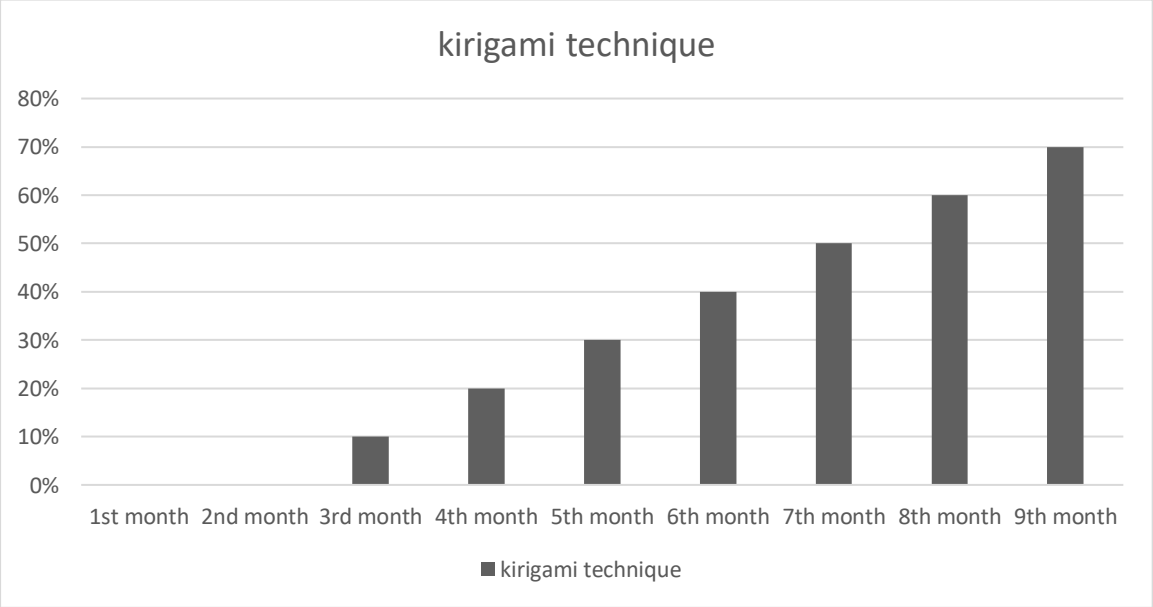

Figure 4: Kirigami technique percentage

Fifi style/dart manipulation techniques were applied to the garments according to visualize the better fits and visual appearances and developed on CLO with Fifi style technique applied 10% to 70%

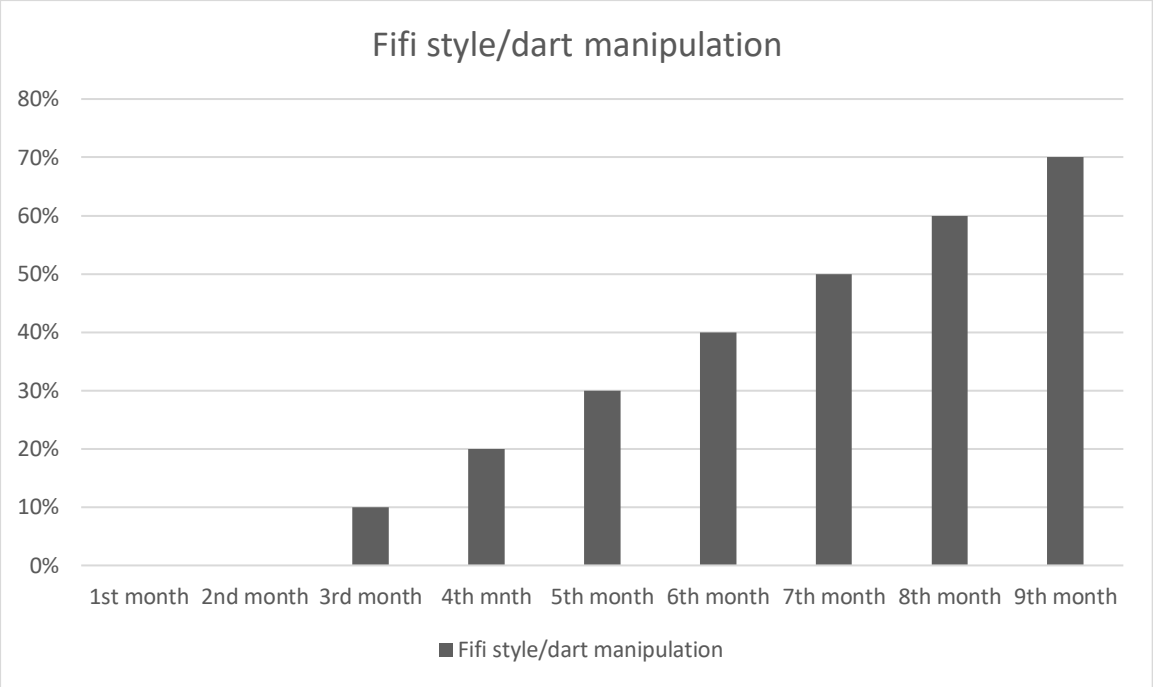

Figure 5: Fifi style/dart manipulation technique percentage

To support material choices, digital prototyping was carried out using CLO 3D and 3ds Max software. Virtual mannequins representing different body types were used to test fold placement and garment balance. Stress maps indicated areas where folds placed strain on the garment. Origami designs concentrated stress at angular folds, Kirigami distributed stress more evenly but required stability around cut-outs, and Fifi showed smooth stress distribution because of its flowing layers. The simulations allowed adjustments to be made before physical construction, minimizing waste and improving design accuracy.

Table 1 presents the distribution of experimental factors across the three folding techniques.

Technique	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Origami	10%	20%	30%	40%	50%	60%	70%
Kirigami	10%	20%	30%	40%	50%	60%	70%
Fifi	10%	20%	30%	40%	50%	60%	70%

Following digital testing, nine garments were constructed, three for each folding technique. For origami garments the geometric drafting had to be precise, and reinforced through topstitch on the garment seams; while kirigami garments utilized slits that were measured, and stabilized through stitching on surrounding edges; and Fifi garments were draped by hand on a mannequin, and folding occurred that followed the pattern - clothing can only fold naturally on a body. The garments had trims and other special items that finished the design, added fashion identity, and still allowed for movement when worn. Wear trials with thirty subjects evaluated the documentation for each garment on three criteria - 'feel' of comfort, adaptability to body type, and visual appeal. A five-point Likert scale elicited participant number ratings from one (lowest) to five (highest), which forced the participants' evaluations in terms of the samples' particulars, allowing participants to also describe their feelings about their bodies as well as their impressions about the garment's fit and appearance. The original wear trials included input from other professional designers who focused qualitative feedback on the

garments based on their originality, construction quality, and relevance to contemporary fashion markets. Data were collected, verified, and analyzed with SPSS software, which calculated descriptive statistics for each garment category for each wear trial, including mean and standard deviation.. Table 2 summarizes the mean comfort and visual appeal scores across the three folding methods.

Table 2. Mean participant scores for comfort and visual appeal

Technique	Comfort mean	Comfort SD	Visual mean	Visual SD
Origami	4.2	0.6	4.5	0.5
Kirigami	4.0	0.5	4.3	0.6
Fifi	4.4	0.7	4.6	0.4

The results indicated that Fifi garments received the highest ratings for both comfort and visual attractiveness, while Origami scored highly for its structured aesthetics and Kirigami was valued for ventilation though rated lower for overall comfort. Further analysis was conducted to evaluate adaptability across body types. Adaptability was calculated as the percentage of participants in each category who rated the garment as suitable for their body shape. The results are summarized in Table 3.

Table 3. Adaptability of garments across different body types

Technique	Slim (%)	Petite (%)	Curvy (%)	Plus-size (%)	Overall (%)
Origami	80	76	86	84	82
Kirigami	82	72	78	80	78
Fifi	86	82	88	84	85

The data demonstrated that Fifi garments achieved the highest adaptability, followed by Origami, while Kirigami scored lowest due to modesty concerns associated with cut-outs. A one-way analysis of variance was used to statistically test the difference among the three folding techniques. The results indicated significant differences in comfort, aesthetic appeal, and adaptability with p-values under 0.05, indicating differences across the three techniques on each dimension. To complement the tables, figures were created. The first figure includes digitally prototyped garments inspired by Origami design principles on slim and curvy avatars to showcase the garment's geometric dimension. The second figure includes Kirigami cut-out prototypes to highlight airflow and dynamic surface textures. The third figure presents Fifi garments where the cascading folds create volume and flow. The final figure showcases a wear trial across four body types slim, petite, curvy and plus-size. Figure 5 is a statistical bar chart comparing measures of comfort and visual appeal by techniques. The approach showed, with combinations of digital simulation, physical garment construction and participant evaluation as part of the combination process tested by statistical analysis, that folding-based fashion techniques can be assessed. The results show that Origami creates the best yet modern structured garments, Kirigami leads to more experimental types, such as more ventilation based types, whilst Fifi creates types based on body diversity and comfort for people of all body types, for all body types, confirming fold-based methods' potential current innovative designers'' possibilities within women's fashion design.

RESULTS AND DISCUSSION

The study reveals valuable insights into how Origami, Kirigami and Fifi folding techniques operate with women's fashion garments. The research shows differences in aspects of comfort, adaptability and aesthetics between the techniques, demonstrating each method has unique advantages and limitations. In the discussion, I relate the insights from the study to the participants' observations, experts' evaluations, and extant knowledge in fashion research. The evaluation of comfort produced the largest differences between the three folding techniques. Origami garments had an average comfort score of 4.2, which indicates they had reasonably high levels of comfort but some concerns about the stiffness around the concentration of folds. Many participants referred to the Origami garments as structured and elegant and some indicated the wide variety of folds produced a feeling of improved posture and support. However, for garments that had a high quantity of folds, some participants said the fabric was less flexible to wear, especially in the shoulder and torso. Kirigami garments, with an average comfort score of 4.0, were praised for their breathability due to the cutouts. This factor allowed airflow to increase thermal comfort during wear. While some participants appreciated elements of comfort discussed above, others reported discomfort related to placement of the cut-outs and added pressure or exposure in unintentional body areas. Overall, of the three geometries in this study, Fifi garments received the most comfortable scores with a 4.4. The cascading folds were described as soft, lightweight, and flowing along with the participant takeaways noting these garments adapted well to different postures and movements of the body. This provided evidence that Fifi layering offered a compromise between tactile comfort and psychological comfort for wearers as they felt both fashionable and comfortable. The visual appeal ratings followed a similar trend, but differences were closer with the three methods. Origami garments scored high visual ratings of 4.5, making them stand out as impactful designs with a modernist or architectural aesthetic. Participants and expert evaluators agreed that Origami offered highly fashion-forward designs that were distinctly different from common apparel. Kirigami garments obtained an average visual score of 4.3. The cut-outs create with Kirigami added visual elements to the garments that were so dramatic that they were praised by experts for their bold/original and experimental nature. Some participants did note that some Kirigami designs might be well suited to fashion force consumers, as opposed to general wearFifi garments received a score of 4.6, just higher than Origami, and were recognized for their classic elegance. With a soft drape and layered style, experts believed that both luxury and commercial markets would be attracted to its style, confirming its wider fashion relevance. The ability to adapt the three folding techniques across body type were noted on its own. Origami was noted to have an overall adaptability of 82 percent, with curvy and plus-size participants indicating the structured folds suited their Figure well because they created contouring around the torso and waist.Petite participants, however, sometimes found the folds visually overwhelming. Kirigami garments received an adaptability score of 78 percent, the lowest among the three techniques. While slim participants found the cut-outs flattering, plus-size participants expressed concerns about modesty, as some cut-out placements did not provide adequate coverage. Fifi garments achieved the highest adaptability at 85 percent. The flowing folds were described as universally flattering, complementing both smaller and larger body frames. Participants appreciated that the cascading design disguised areas of concern while still highlighting body movement. The findings confirmed that Fifi garments provided the most inclusive solutions, aligning with the growing demand for body-positive and adaptable fashion. Statistical analysis reinforced these differences. One-way ANOVA confirmed significant variation among Origami, Kirigami, and Fifi garments in comfort, visual appeal, and adaptability, with all p-values below the 0.05 threshold. These findings have confirmed that folding methods are not interchangeable but yield meaningful differences in garment performance. Regression analysis showed that comfort level tended to be higher as folding intensity increased to some point around 40 percent. Beyond that point, Origami and Kirigami comfort level ratings were plateaued or fell, while Fifi maintained consistent comfort ratings at all degrees of folding. This suggests that Fifi garments offer greater latency in heavy folding use, while Origami and Kirigami garments are more reach structured or open-ended to a point, it renders the garment over-structured or over-exposed. These findings have practical design ramifications. First, Origami provides designers a way to create architectural silhouettes without distorting the shapes of these types of garments. Of the

three folding methods, Origami may be positioned to achieve contemporary fashion dress audiences' desires with new, unique structural forms. The only drawback to Origami is reduced comfort at high density of fold, suggesting it will only work for statement pieces, formal wear, or collections aimed at avant-garde markets. Kirigami proposed creativity through its breathability and experimentation with textures but the finding provide warnings that Kirigami may not be as chameleon to all body types or dolls in varied environments. It can be most effective in informal or climate-responsive tailoring styles where ventilation is preferred. Fifi, conversely presents as the most versatile technique. The cascading folds found in other garments, appropriately manage comfort and malleability while maintaining a fashionable and feminine appearance, allowing it to compete in both commercial collections and higher end markets. Feedback from participants provided additional context regarding the psychological effects of these garments. Some of the participants felt Origami garments increased their confidence due to the structure of the garments making them feel empowered and bringing their posture up. Kirigami garments were described as bold and expressive but a few participants were self-conscious of their exposure through cutouts. Fifi garments consistently were described as graceful and comfortable, wearers described feeling relaxed and confident. Qualitatively, these comments corroborated with the statistical analyses and further suggested that folding techniques influence not only physical comfort but also psychological perception. Reviews from experts in the field further validated this analysis. Origami received high marks from fashion experts for accuracy and innovation assessment, with one expert saying it was a very suitable contender for runway fashion. Kirigami was scored high for creativity, although experts raised questions about durability and commercialization. Fifi was rated high due to a strong balance between finished technical quality and potential for mass appeal. Experts suggested that Fifi would easily fall between "high fashion" and ready to wear. Figures included in this study illustrate these outcomes. The Origami design prototype, showed how the way folds created the contour effects on slim and curvy avatars whilst displaying volume and providing structure (R024). The Kirigami prototype, demonstrated the ventilation effects by cut-outs, again presenting experimental aesthetics (R023). The Fifi prototype demonstrated cascading folds that were able to fluidly respond to body movements, which again supported the adaptability results. The comparative wear trial images across slim, petite, curvy and plus size body types show differences in their suitability and support for the proposition; of the three Fifi was clearly the most adaptable. A statistical bar chart characterization of participants ratings was provided to visually demonstrate that Fifi had higher comfort and visual results than the other methods applied in this study.

In conclusion, the findings and discussion indicate that Origami, Kirigami, and Fifi fold methods each offer unique benefits to women's fashion design. Origami can help achieve structure and modernism, Kirigami facilitates ventilation and experimental experimentalism, and Fifi promotes inclusivity and sensorial comfort. The statistical data also provide evidence for the considerable and significant differences between these three fold methods to engage with design practice. Collectively, they provide fashion designers with a set of folding strategies to choose from depending on their particular market segment, body types, and consumer's expectations. The findings position folding as both a creative and functional means of producing women's fashion and can influence the future of more inclusive and innovative women's fashion.

CONCLUSION AND FUTURE WORK

This research examined the role of Origami, Kirigami and Fifi folding construction methods in women’s clothing, focusing specifically on the constructs of comfort, adaptability and fashion appeal. The findings established that Origami is useful for creating structured and modern silhouettes, Kirigami provides ventilation and striking surface effects, and Fifi maintains superior levels of comfort and inclusivity across a variety of body types. Statistical analyses indicated that there was a statistically significant difference between the three folding construction methods, with Fifi consistently outperforming the other category folding methods in adaptive and sensorial comfort. Overall, these findings indicate that folding methods for construction are not only aesthetically innovative but also practical solutions to inclusive, contemporary clothing designs. Future research pathways could pursue these findings by evaluating folding construction methods with ethical fabrics to investigate their

sustainability impact. Long-term wear trials of the final folded design would allow for reflections on durability and longevity of various sourced materials. Additionally, cross-cultural studies would develop an understanding of how folding construction methods with ordinary consumers differ between fashion markets. Finally, the establishment of online and physical digital prototyping can be further developed through explorative simulation tools, giving designers the opportunity to clarify folding strategies for ready-to-wear or haute-couture applications. Overall, these potential research opportunities suggest that folding methods have significant promise to redefine the future of fashion by incorporating unique forms of creativity, comfort, and inclusivity.

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