Smocking Hot

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ABSTRACT

Our project is about using a combination of smocking and dissolvable thread to create a wearable garment that is instantly personal to its wearer through fit, feel, and material qualities, while also being easily customizable by dissolving the individual smocking knot points. In tandem with qualitative user involvement sessions about one's relationship with one's body and clothing, we also aim for the garment to fit and accentuate different body types. The garment reconciles that relationship by proposing a method of dressing that lets the wearer adjust it to and change it for their body. The garment evokes a physical first-person exploration of one's body, inviting the wearer to both actively shape and tactilely explore the 3D qualities of the smocking, as well as their body underneath. Furthermore, we computationally explore the pattern-making process in an effort to calculate the amount of flat garment needed for a specifically-sized smocking pattern. This project then acts as a mold for various potential applications.

Authors Keywords

pattern; body positivity; polyvinyl alcohol; garment; mental therapy, body image

INTRODUCTION

Smocking Hot is an exploratory project that proposes a more conscious approach to dressing oneself.

By combining innovative fabric, body positivity, deep user involvement sessions, and a computational framework, we have created a customizable garment that adds a whole new dimension to how personal a piece of clothing can get, and how it feels to be in one's 'second skin', i.e. wearing clothes. Our garment acts not only as a traditional piece of clothing which provides us with protection from the elements, self-expression, and a 'home for the body', but it also acts as a consoling mediator for the wearer's personal relationship with their own body.

How one feels and lives their own embodied experience is completely different from how an external observer might view it. We use this observation to create a dichotomy in the garment that embodies different values for both its wearer and outward observer. Towards its wearer, the garment adopts the role of a gentle listener, adapting itself to the body completely, and allowing its wearer to make changes. Outwardly, the garment provides an aesthetic visual ambiguity through a 3D pattern. This dichotomy aims to let the wearer prioritize their own embodied experience in this garment, before turning their attention to their external viewers. The pattern, with its tactile richness, invites the wearer to explore it with their hands while worn, and in turn becomes an interface to also explore one's own body underneath. We hope that this dichotomy and interaction allow the wearer to feel consoled and protected by this personal garment, while at the same time reflect an elegant aesthetic to outside observers.

These effects of the dichotomy manifest themselves physically in a snug fit, a patterning process called smocking, and a specific type of thread. The second prototype is made almost entirely out of intricate patterning, held together by water-soluble thread made from polyvinyl alcohol (henceforth referred to as PVA). The wearer can dissolve individual knots in this pattern with water to adjust the fit exactly where the garment might be too tight. The second prototype, meanwhile, is made from various specialized stitches that, when dissolved, expand according to the location on the body and the direction needed.

We use the preceding phenomenological approach not only for the creation of our final two prototypes (see Prototype/Method) below, but also in our highly iterative, sample-oriented explorations that led to their creation. We used our own bodies and implicit understanding of embodied experience to make, measure, wear, and interact with our samples. The synthesis of the smocking pattern and PVA thread was conceptualized through extensive material exploration of PVA in its various forms, such as glue, 3D printing filament, mesh, and thread, as well as combinations of those. Furthermore, we extensively explored both physically and computationally, various smocking patterns and documented their qualities, which allowed us to specialize them to various body parts and desired stretch after dissolving.

In short, Smocking Hot is a project promoting conscious dressing, body positivity (reconciliation of body and image), exploration of one's body and experiences, and personalization. The method of the project has its roots in phenomenology and deep material exploration of PVA.

PROTOTYPES

Prototype 1

The first prototype was made with only one pattern, which we define as the "Lightning" pattern (see Figure 3). This pattern consists of three stitches, where the first and last one have a 45 degrees angle to the left and the middle one a 45 degrees angle to the right. Integrating this pattern then gives a parallelogram with a 45 degree angle to the left. This deformation was not expected before making it. While making the garment we still tried to make the fabric straight at first, since this feels logical considering normal cloth making. However then the fit of the garment was wrong, since we worked against the pattern instead of with it. Therefore we used draping techniques to immediately see how it will fit the body. Eventually this created the garment where the separate pieces were used with its own qualities giving the fabric flaps at the bottom of the body and arm.

The used fabric is a maroon colored combination of polyester and elastane, which was chosen through our explorations with various fabrics. Polyester is a fabric that is strong and can easily be washed. This makes it easy to work with, which is useful, since the PVA thread already limits the use of the garment due to the fact that it dissolves in water [13]. Moreover, polyester does not wrinkle easily compared to other materials, which makes the gathered fabric fall equally, and lets the pattern come out like it was intended. Elastane gives the fabric stretch, which allows the garment to fit tightly and adjust to the body type of the person wearing the garment.
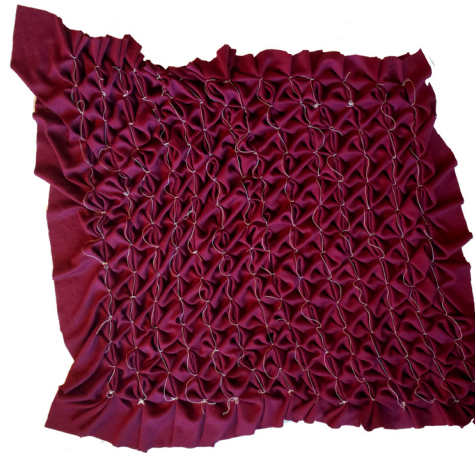

Figure 1: Fabric for Prototype 1 (back)
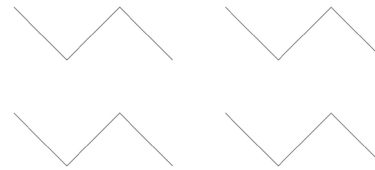

Figure 2: Fabric for Prototype 1 (front)

Figure 3: Pattern for Prototype 1

Figure 4: Prototype 1 being worn.

Prototype 2

The second prototype is based on the findings that were concluded by the group from the first prototype, as well as by users through user involvement sessions (see *User Involvement Session*), and using the program (see *Program*). The garment integrates five different patterns (Fig. 5).

Both the prototypes are made of the same material, namely polyester and elastane. Similar to the first prototype, this prototype is hand-stitched with the use of the patterns that were explored previously. It consists of 4 parts that were later sewn together; front, sleeves, and back. The sleeves are identical, so are the front and back. Moreover, many different patterns are positioned over the garment in various dimensions (see Program for reasoning).

Three different smocking techniques are integrated on the sleeves;

The inverted horizontal stitch: makes the widening of the circumference of the sleeve possible if the knots are dissolved.

The honeycomb stitch: allows the person to lengthen the sleeve as much as they like, by dissolving the knots. This particular stitch ruffles in the vertical direction therefore being great for lengthening the sleeve.

The angled stitch: which only ruffles a little bit of fabric on top of the shoulder, allowing for more room for the shoulder and around the armpit.

For the front and back of the garment two different patterns are used;

V pattern: placed on the sides of the body. Gives equal horizontal and vertical ruffling, meaning that when the pattern is dissolved it gives an equal amount of fabric back in both these directions.

V pattern plus horizontal pattern: placed on the middle columns of the body. The combination of the two patterns creates more horizontal ruffling. The horizontal stitch can be dissolved separately from the V pattern meaning that if the person wearing it would like more room in the horizontal direction of the garment this can be done without touching the V pattern.

Since there are many stitches per row and column, it is possible to make both large and small adjustments, according to the wearer's preference or need. make both large and small adjustments, according to the wearer's preference or need.
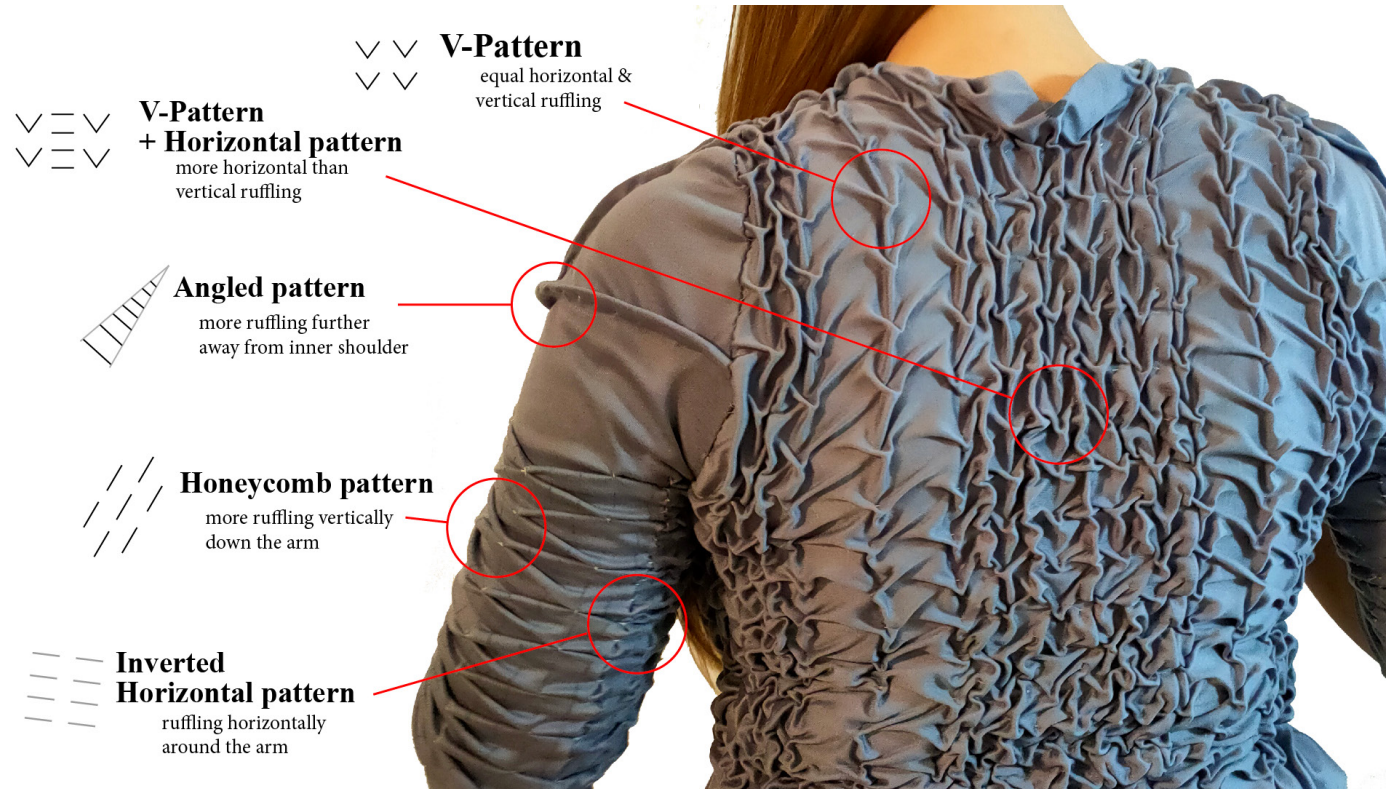

Figure 5: Patterns and stitch types used in the second prototype

MATERIAL EXPLORATION AND EXPERIMENTS

Inspired by a 3D printing workshop given within the Crafting Everyday Soft Things squad, we decided to further explore PVA through its various mediums (thread, mesh, 3D printing filament, and glue). Therefore it was decided to experiment with PVA to see the qualities and properties that this material has and to see what it could be used for.

Introduction to PVA

Polyvinyl alcohol (PVA or PVOH) is a water soluble synthetic polymer. It is odorless, resistant to grease, oils, and solvents, and not toxic [14]. It is flexible, but strong, and is of effective use as an oxygen and aroma barrier. It is extensively used to strengthen textile yarns and papers and even makes them more oil resistant while PVA is hydrophilic (water dissolvable and repelled to oils). Also due to its non-toxicity PVA is often used as a coating for food supplements.

Polyvinyl alcohol can be easily misunderstood for polyvinyl acetate, since their abbreviation is often both PVA [1]. Chemically, only their side chain differs, but creates a fundamental difference in their properties. Among other things polyvinyl acetate does not dissolve in water and is commonly used as a wood glue. It can therefore not be mistaken for the dissolvable, biodegradable, non-toxic polyvinyl alcohol that was used in this project [5].

Glue Experiments

Due to the lockdown and lack of access of PVA filaments, we firstly started experimenting with glue, since most glue consists partly out of PVA, creating properties similar to pure PVA. Liquid glue and stick glue were used for the experiments. Most of the experiments were done on fabric and the goal was to explore different techniques and usage of the glue, see Figure 6;

Number 1: It shows patterns of the liquid glue on the fabric, this to see how it would deform the fabric when it would dry up. The glue only made the fabric hard on the places that it was put, but did not shrink or deform the fabric. However the glue did give the fabric different ways of restrainment when it was moved, because it could no longer stretch in certain directions.

Result: Glue limits the stretch and movement of a given fabric.

Number 2: The deformation of the fabric was explored by first glueing the fabric with liquid and stick glue and then giving it a certain shape by, for example, putting it over an object so that it would get the form of the object when it was dry. It showed that the fabric would indeed form around the object that it was placed on and would not go back to its original flat form.

Result: It is possible to deform the fabric with PVA.

Number 3: Here we tested the coloring capabilities of the glue. The green and purple on the fabric is glue mixed with watercolor, since PVA is dissolvable in water. The experiment showed how easy it was to color the glue and that it would

Figure 6: PVA glue experiments

stick very well to the fabric. Besides that, on jeans fabric uncolored glue was not visible, because the glue dries into an almost completely see-through mass.

Result: Glue can be mixed with watercolor to create colored glue.

Number 4: These explorations are done with PVA filament. The yarn is dipped in the PVA that was dissolved in water and colored, see Figure 7 for a recipe how this is done. Once dry the string would keep its form that it was put in before drying. This made clear that, just like the glue experiment, the PVA behaved the same. Furthermore, when the PVA filament was dissolved in water it would also be sticky just like glue and have a similar texture, bringing light to the fact that glue and PVA filament indeed have similar characteristics. The yellow piece of fabric was deformed with PVA and also kept its shape when dry, just like glued fabric in above experiments. The translucent circle is dried up PVA filament that was dissolved in water and then placed in a mold to dry. The dried up PVA had the same properties as the PVA filaments.

Result: This indicated that the PVA can be used over and over again. However, the PVA will absorb the moisture in the atmosphere over time, which makes it unusable. Therefore it should be kept in an air-tight container.

According to how much you want to make, put 10 cm PVA with 2 ml of boiling or hot water

Cut the PVA in small pieces and add the water

Occasionally stir the mixture, after about 5-6 hours the PVA should be dissolved

Adding color to the PVA can be done by using water paint

Scrape off the desired amount

Mix it with the PVA

Suggestion for the usage

Cut yarn in pieces of the desired length

Dip the yarn in the mixture

Let it dry, preferable on a plate without anything on it, otherwise it will stick to it (so do not use aluminium foil)

Figure 7: PVA glue recipe

Printing with the PVA filament

Theoretically it would be possible when printing on a polyester fabric that the fabric melts when the filament is placed on top of it, and in this way fusing the two different materials. When attempting the experiment, however, the PVA did not fuse with the fabric. This is most likely due to the fact that PVA filament does not contain plastics but is a polyvinyl alcohol [5]. Therefore the fabric we printed on needed to have holes. We would print one or a couple of layers of the print without the fabric, then pause the print, stretch the fabric over it and continue printing . In this way the PVA would bond and therefore hold its place. A print succeeded easier when the fabric was stretchy, since it was possible to stretch the fabric tightly over the first printed layers when the print was paused. Besides the nozzle would not interfere with the fabric while it was moving to create the next layer, since this did happen when a loose cotton woven mesh was tried out. The layers of filament will keep the fabric between them in the stretched state when it is hardened, but the surrounding fabric will go back to its original state. This can create an interesting play of forces, an example shown in the top-left of Figure 8.

Smocking with PVA thread

For the smocking we used PVA thread, also called water soluble thread. The thread dissolves immediately in water and is relatively fragile. Right now washing the garment is impossible because the smocking knots will

Figure 8: PVA filament explorations

disappear. Therefore in a production process it would be good to make use of pva thread that is strictly soluble with higher temperatures of water. Temperatures up to 90 degrees are already on the market [2], however during their research the specific practical working is not explored. Normal clothes can be washed at a temperature of 30 degrees [11], so that gives a big room for imperfections of the thread.

Originally, we attempted the smocking technique with the soluble thread to see how it would change the shape of the fabric or garment. Later, we also conducted experimentation to see how dissolving the threads again would affect the fabric. Figure 9 shows various fabrics with smocking, as well as the effects of a particular pattern on the shape of the piece. The cotton one, number 1, shows that the pattern does not look consistent everywhere, because of the stiffness of the fabric. However with the other materials, number 5,6,7 like viscose, elastane, and polyester, the patterns look smooth and equal all over, since these materials have more flexibility to them. Number 2 and 4 show two other patterns and this shows that with different patterns and the cotton fabric it can look smooth. We also made two samples, number 3 and 8, that are meant to be worn on the arm and around the waist. For this, we chose a fabric that is soft and gentle.

Historically, smocking was used to transform a big fabric to a fitting garment. Because of that, there was no need to cut into the fabric, making it possible to reuse or deform when needed [7]. When we use PVA thread for the smocking this can be done easier with water. Dissolving one knot only affects a specific piece of the fabric and will not influence the rest of the fabric. Figure 10 shows how smocking around the waist can customize a shirt to fit tighter around the waist. This gave the idea that smocking in different parts of a garment can have different functions that are in accordance with what a specific body part needs. Different patterns could be implemented in the garment so that the garment could be dissolved in different places to fit the body better.

Figure 9: Smocking explorations

Figure 10: Smocked shirt

Figure 11: Pattern samples

Hence, we started our exploration on different patterns, and how these would change the fabric (Fig. 11). We chose six different patterns in two sizes each; one with a bigger stitch length and one with a smaller stitch length. It can be seen that some patterns transform the fabric into a diamond-like shape. The top two patterns on the right only shrink in one direction, while the rest shrinks in both directions. All of the patterns also give a different look to the fabric.

After exploring the PVA through lots of making it was time to get to know the material better by bringing the individually made samples together. One whole day we tactilely explored all the samples. This included testing how it would react with frozen water, room temperature water, boiled water, an acid solution, and a liquor of natriumhydroxide. We have extracted the following findings from this day:

- During the dissolving process, PVA thread has three phases after getting in contact with water; it becomes stretchy at first, after a while it becomes a slimy, glue-like substance, which spreads out over the fabric going along with the water, and eventually becomes solid and loses its initial soft properties.

- When too little water is used while dissolving a smocking knot, it will become a hard part in the fabric which can irritate the skin. This can be overcome by using enough water.

- PVA filament will take a long time to dissolve, but goes through a similar kind of process and the PVA thread. Only the filament does not have a stretchy face, however, before it is totally dissolved the exterior becomes smooth in feel and look.

Figure 12: Exploring all samples made

Figure 13: Exploring PVA dissolution on skin

PROGRAM

Hand smocking a garment is a time consuming and planning-intensive crafting process, which makes a fully smocked final garment a precious object. While making such a fabric there is little space for quick-iterative exploration, which limited us with a lack of freedom for large-scale smocking experimentation. The above exploration with the six different patterns showed us how the pattern reacts when smocked, aside from their aesthetic properties. To make up for the lack of exploratory freedom in this process, we have created a computer program that lets us experiment quickly with different dimensions and calculations of patterns.

The program should have the possibility to adjust all dimensions of a pattern. Every pattern has a unique set of variables which will create a specific result when combined differently. Figure 14 shows that a pattern is subdivided into segments (the four rectangles shown with a dashed line). A segment is one whole stitch including the white space before a new stitch is started. The pattern shown in the figure has five different variables; the width of the stitch line, the height of the stitch line, the width of the segment, the height of the segment, and the angle of the corner. Changing one of the variables will influence the eventual look after being stitched together. The variables for the white space have an influence on the eventual size of the fabric when smocked. The variables for the stitch line have an impact on the amount of fabric that is ruffled together, which can be released when a smocking knot is dissolved. Therefore it impacts the ratio of the smocked fabric and the amount of fabric that is needed to get the desired smocking in the garment.

The different codes (see appendix programs) provide ways to variate the dimensions by pressing different keys without influencing the other dimensions. Making the stitch line smaller will not influence the height and width of the segment, and will therefore increase the amount of white space in between the stitches. Other keys can then make it possible to change the size of the segment separately. The code also calculates the ratio

of the pattern, which is important because different body parts have a different variety in measurements. Differences in the measurement of arm widths are a lot smaller than differences in waist measurements. Therefore the ratio will be smaller for a pattern on the arms than around the waste.

With the freedom of exploration, the program created, and our findings from the user involvement session we were able to create the second prototype.

Right now, you can change the dimensions of the segment, angle or line by pressing the assigned keys, but there is no function to hold a certain ratio or amount of white space. Sometimes it is desired to only vary the ratio or to experiment with the same amount of white space remaining. For example when you know a desired ratio for a specific body part but the pattern is displayed too small, it would be nice if you can instantly change the size of the total pattern. Also, when you know how much fabric is needed for a specific body part after smocking, it would be nice to keep the amount of white space and only vary the line. So, right now the program calculates the ratio and the amount of white space, so this could be set accordingly, however, it can still be improved by adding a function that locks either the ratio or the white space of the pattern, which makes it possible to play around with the pattern in a different way. This would increase the precision of the eventual pattern.
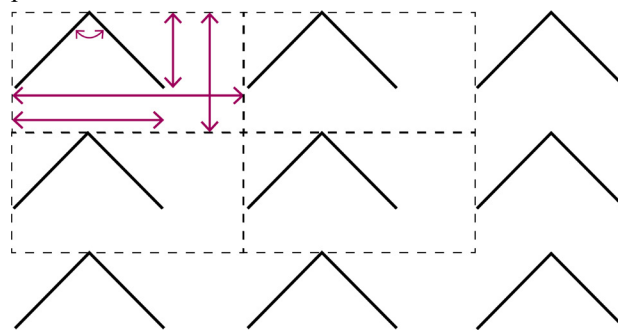

Figure 14: Pattern programming diagram

USER INVOLVEMENT SESSION

We performed eight qualitative user involvement sessions that consisted of a user test with the first prototype, a one-on-one interview of the user's adolescent past and their experience with clothing, as well as their opinion on others wearing the same garment. The goal of the user involvement session was to get a better view on people's opinion about dressing, as well as their thoughts on the first prototype and improve this in our second prototype.

Setup: The full detailed setup with exact questions, and the worked out interviews can be found in the appendix.

Orientation: Before beginning with the user involvement session, we shortly introduced the users to our overall project, as well as the structure and content of the imminent session. We handed them the consent form (see appendix), and gave the users the opportunity to ask questions. We then mutually signed the consent form and began with the session.

Part I: In this part we introduced the user to the garment itself. We let them wear the garment, and express any free thoughts about it. We then asked a variety of questions relating to how the user felt in the garment, what they liked about it, whether they would wear this in public, and how it compares to their current wardrobe. We also asked them what specifically they would change about the garment, and where. One of our users was able to dissolve the PVA knots to their liking. We asked this user more specific questions regarding the logistics of the dissolving and their happiness with the result.

Part II: In the second part we took a step back from the garment and asked the users about the relation with their own body during adolescence by comparing it to their present relation with their body and the garment. This part was more about the user's general emotion towards dressing and body changes (during adolescence) rather than their opinion on the garment, which is tested in the other two parts.

Part III: In the third part of the user involvement session, we focused on their external perception of the garment.

We showed them pictures of other people wearing it and asked for comments or remarks. We further inquired about what they would think if this garment was worn by someone in public.

General Results

While all users liked the pattern, the majority of male users found the garment itself too feminine. Moreover, all users preferred to have a symmetrical format for the garment, where both sleeves are the same length and cut straight. When conducting the interviews, almost all users said that they avoided standing out too much during their adolescence, and feel that now the societal norms shifted to favor individuals standing out.

Notable Individual Results

Almost none of the users experienced body image issues. However, one female user stated that she had it a bit easier because her body was the "accepted norm".

Another female user stated that she would only wear the garment in a fancier setting. If she would wear it casually, she would prefer it to be more discreet, perhaps by making it black, straight cutted, and with less patterning.

She also stated that during adolescence, she felt like being in a race against her peers in terms of body development. This made her compare her own body to others, and made her feel more insecure when others were ahead of her, which made her link social status to body growth.

Discussion of Results

Our user involvement session setup, like any user test, carried certain implications, biases, and limitations. We interviewed fewer than 10 users, and we used a convenience sampling method due to circumstances caused by the pandemic. And although the sessions were qualitative and helped us develop a further prototype and gather attitudes towards our project, it is difficult to draw general conclusions to a broader group of people, and preconceptions we thought were true were not confirmed during these interviews. One such example is that despite a growing discourse in body positivity online, as well as our group members' negative experiences with body image issues in their adolescence, very few of our users actually reported having had body image issues. Furthermore, certain circumstances such as the user involvement session being performed in a small space, being forced to wear masks, being recorded, or being uncomfortable talking about these personal topics might have influenced the answers and attitudes given by our users in a multitude of ways.

Conclusion

These user involvement sessions paved the way for our next prototype, as well as the framing of our project. For our second prototype we incorporated the feedback

Figure 15: Takeaways from User Involvement Sessions

and experiences of our users to create a symmetrical garment with more specialized patterning. This one shows less skin, fits better and can be adjusted more specifically. In order to create this, we decided to explore six different patterns (see *Material Exploration and Experiments*) by making samples of them and creating a program that gives us the ability to explore all of these patterns without making them in real life, due to the time consuming nature of smocking. (see *Program*).

BODY POSITIVITY

The specific final implementation of our garment is still unknown, and also not the purpose of our project. However during the user involvement sessions and the discussions in our group a possible path was explored. We believe that the garment could improve someone's body image. Multiple characteristics of the garment propose this. In the following section, we evaluate findings from the therapist, psychologist and literature. Also, we will evaluate how the garments can be used as a statement piece for body positivity.

The expanding qualities of the garment are possible because of the water soluble characteristics of the PVA thread. On itself the garment challenges the wearer to think about clothes through feeling before considering the looks of it. This encourages a closer relationship with the body. This can highlight what somebody likes about fit and feel, and this closer look can also highlight body parts that are pleasing or not. This in itself does not create more body positivity but does make the relationship somebody has with their body more honest and open. Overall the garment has an interesting implication for body positivity, namely the depth of the texture. There seems to exist two layers: the tight garment against the skin and a thicker, imaginary layer on the outside created by the pattern. Therefore the eye can choose which curves they want to follow. Parts that are liked by the wearer to be bigger can be seen through the 'outer' layer and parts that one likes to be thinner will also look thinner because of that visual ambiguity. Even when the requirements of the wearer changes over time they can choose how they see themselves.

Secondly the garment has the warmth of a sweater but the movement flexibility of a shirt. This is logical when you consider that a lot of fabric is tucked into one garment which gives the heaviness of a sweater but also keeps the warmth inside. But the fabric that is used is still thin and stretchy so will move closely with your body. Research from Kelsey Vitullo and Margarita Benitez [6] has shown that the feeling of a hug reduces anxiety. Some participants said that the garment felt like a hug onto their skin which therefore can create a calming feeling. Other research performed by Hannah Frith and Kate Gleeson [4] shows indeed that clothing behaviours have an impact on our experience of the body. 'Body image' is not a static product but an "active process with the individual engages in to modify, ameliorate and come to terms with their body in specific temporal and cultural locations." And their data shows that "...clothing practices form part of the everyday social practices by which we make sense of and negotiate our experience of the body". This has far reaching implications for our garment, which tries to enhance one's own body image. It means that both makers and wearers of clothing can influence their own body image through their clothes. The unique construction and feel of our piece then indeed can have the power to also determine a specific body image for its wearer; hopefully a positive one.

As a group we have talked extensively about body image issues and on the impact that the garment could have on people who are struggling with these issues. However, these were all assumptions based on our own experiences, so we talked with a psychologist, Peter Verberne [11], to get a better view from an expert about possible implementations of the garment in mental therapy. After showing and explaining our project, we talked about his views on the implementation in mental therapy. He was very positive and could already see the garment being implemented into therapy for people suffering from Anorexia Nervosa. Anorexia Nervosa is an eating disorder characterised by a person's extreme fear of gaining weight, no matter how much weight is lost [8]. Peter said that patients suffering from this

often have a very compulsive character that maintains themselves from short-term satisfaction and creates a disturbed body perception. Therefore, through therapy the goal is to let the patient relinquish control in a rewarding manner. He saw our garment as a soft way to get in touch with your body again, because of the wavy look and soft material. This could be by touching yourself when wearing it, dissolving the knots so that the material goes from a safe 3D 'landscape' to a flat representation of how the body really looks, or even by creating a garment yourself in creative therapy.

People with other eating disorders like Bulimia Nervosa (trying to lose calories in an unhealthy way after not being able to stay in control over eating [9]) and Obesity (having a disproportionate amount of body fat [10]), often have different characteristics. Where people with Anorexia Nervosa have trouble in letting go of compulsive control of their food intake, people with Bulimia Nervosa and Obesity struggle to limit their eating habits. Hence, our approach might not be as applicable. Peter could not picture how the garment could help with Bulimia Nervosa or Obesity right away. However, he mentioned that with some changes that could be turned around like using a stiffer material.

DISCUSSION

Our group made very effective use of the exploratory and sample-based approach to design. Each member branched out into their own PVA experiments in a respective medium, which is how we gathered the large amount of tacit knowledge of the material as a group. We also brought it all together and explored each other's samples. This process allowed our group to get to know the qualities of the material in an efficient and effective manner.

Furthermore the subdivision of work on the prototype was a large success, especially considering the circumstances caused by the pandemic and the work-intensive technique. Our prototype assembly was modular: each member applied the selected smocking pattern to one of the four pieces of fabric, and in the

end it was all assembled together quickly. This means that the entirety of the group was fully focused on making the prototype and nobody was forced to wait for anybody else's part to be finished.

While the concept of the project and the philosophy behind it was extensively thought out by the group, it seemed difficult to frame and convey this to both our users in the user involvement sessions, as well as people that are not in the field of design. There was a certain disconnect between users' current understanding of clothes and the concept of a somewhat therapeutic and protective garment with a rich tactile experience. Most users regarded it as a personalizable piece of clothing, and the pattern as pure visual aesthetics, not noting any particular tactile experiences. Perhaps the pattern and the feel of the garment had a subtle, subconscious effect on our users, or more emphasis needed to be made on the pattern's tactile qualities. Moreover, some users had trouble figuring out how to dissolve certain parts of the prototype. They needed close guidance and instruction, as many of them had no clue what to dissolve, and some expressed their displeasure at "breaking" the prototype. This could be addressed by providing users with detailed instructions, as well as a variety of examples where someone else dissolved parts of the garment. Another potential approach would be to nudge wearers to determine where and how much to dissolve through a short meditative session focusing their attention to their body, or any other kind of guided session. Overall, the garment might find success as a specialized piece of clothing with therapeutic, meditative purposes, or higher-end fashion, as opposed to an everyday wardrobe piece.

As mentioned in the programming section of the report, the inclusion of data and computing allowed us to quickly explore patterns and their effects on the garment. In the future, this program could be developed further to apply to specific clothing templates and their pieces. Then, for example, we could calculate the amount of fabric and spacing of the pattern needed for a t-shirt and its specific parts. The program would then distribute the pattern over these pieces and allow to fully visualize the templates with the pattern drawn over it.

Through the user involvement sessions, the research, a talk with a therapist, and our own experiences we can see that our garment could have a future potential in the mental health sector. We believe that our garment could help its wearer to explore their own body in a positive way and thus help them to accept their body the way it is. In agreement with the therapist, we believe that it could be used in therapy sessions to get in touch with one's body, because the garment can be formed and changed to the body of the user or to their own liking. The material is soft and the garment feels very comforting because of the weight and tight fit.

Another future application can be the usage of our garment in design. The technique of using different patterns with soluble thread to enable the user to make the garment instantly personal can be used for multiple applications. One example could be to use it in uniforms in certain workforces like healthcare, military, police, or supermarkets for example. Workers in these sectors have to wear the same outfit, so instead of manufacturing different sizes of clothing, our technique would be used to allow manufacturers to produce only one size. This way, employees can customize their uniform completely to their own body and liking.

In line with the above application, this technique can also be spread through the fashion and clothing industry. Our combination of smocking and PVA thread can make it possible for everybody to have a piece of clothing that can be customized to their body. The standard sizes that are now used in stores will not be needed anymore and everybody will have a unique piece, since everybody has a different body and each dissolved knot gives the garment a different look. The use of a similar aesthetic and technique of gathering fabric can be found in work of fashion designers such as Eunjeong Jeon [3], which shows that there could indeed be potential for fashion design from smocking.

CONCLUSION

Applying concepts from phenomenology and body positivity, Smocking Hot is a project that aims to create a garment with unprecedented personalization, both in terms of physical customizability and the tactile experience it provides to its wearer. It aims to be a mediator between a person and their body image by providing visual ambiguity and tactile interaction with one's own body.

Built upon extensive material exploration, user involvement sessions, and computational pattern exploration, we deliver two prototypes for the concept. One maroon garment with a diagonal shape and unequal sleeves containing a single type of smocking stitch throughout, and a light blue garment with specialized smocking stitches in a more standard t-shirt format.

Deep user involvement sessions made it apparent that the first or maroon garment would unlikely fit a given person's everyday wardrobe, and users acted uncertain when given freedom to adjust the garment. Therefore, the second, light blue garment was created, which implemented the participants' wishes more but was also more precise because of the uses of the computational pattern exploration. This garment might find success in a specialized, guided use case such as therapy (specifically for Anorexia Nervosa) This does not, however, exclude other possibilities such as one-size manufacturing for working attire (uniforms), or pieces for fashion.

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Appendix

- participant concent form
- set-up interview
- the interviews
- programs

PARTICIPANT CONSENT FORM

Retelling personal experiences through interaction with a personally customizable garment

This research is about reconciling ones view of their own body and past experiences related to finding fitting clothing through an interactive, experiential, and personally customizable soft prototype. You (the participant) will be asked to wear and interact with an experimental garment while also participating in an open discussion about your current/past views of your own body, as well as finding fitting clothing throughout your adolescence. The data recorded will be qualitative, and might include any observations made by the researcher using notes, video-recording, voice-recording, and images.

- I have read the above information. I was also able to ask questions. My questions have been answered to my satisfaction. I had enough time to decide whether to participate. - I know that participation is voluntary. I know that I may decide at any time not to participate after all or to withdraw from the study. I do not need to give a reason for this.
- I give permission for the collection and use of my data to answer the research question in this study.
- I know that some people may have access to all my data to verify the study. These people are listed in this information sheet. I consent to the inspection by them.
- I do / do not consent to being recorded (images, voice recording and video)
- I want to participate in this study.

Name of study subject:
Signature:

Date: __ / __ / __

I hereby declare that I have fully informed this study subject about this study.
If information comes to light during the course of the study that could affect the study subject's consent, I will inform him/her of this in a timely fashion.

Name of investigator (or his/her representative):
Signature:

Date:__ / __ / __
The study subject will receive the full information sheet, together with an original of the signed consent form.

SET-UP INTERVIEW

First part (trying garment)
Participant will putt on the garment. Then, the following questions will be asked.
1. How do you feel in the garment? ask further
2. What do you like about the garment?
3. Would you wear this in public?
4. How do you compare this garment to the clothes that you currently own?
5. What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up? Show the example garment and explain how dissolving is possible
     - Some participants are able to dissolve the PVA. Let those participants change what they would like and/or let them play around with the dissolving of the PVA. Then, the following question will be asked.
1. What do you think about practically dissolving it? (easy, sticky, hard to find dots, etc.)

Before starting the second part, make pictures of the participant with the garment on

Second part (adolescence)
1. Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
2. What is you experience buying clothes during adolescence? E.g. did you have any difficulties buying clothes that fit during adolescence?
3. Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?
4. How would you have felt in the garment when you would have tried it on during adolescence? Combining first question with adolescence (experience)

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.
1. How do you think it looks on someone else?
2. If someone would wear this in public, what would you think about it?

User Involvement Session, participant 1

Image 1: partipant 1 wearing prototype 1

First part (trying garment)
The Participant will put on the garment. Then, the following questions will be asked.Confusion about how to put it on, which side is the front where the arms should go.

How do you feel in the garment?
The fact that the side is so open is not comfortable, a little short (see image 1). It is a little bit special that it is asymmetrical.

What do you like about the garment?
I like it, the pattern I am not sure, I would have to see it. (walking to mirror) The pattern is a little much, it does not give me a lot of form/shape, but it does have something. Now it is a little more formless.

Would you wear this in public?
No, for sure not. Not like it is right now.

How do you compare this garment to the clothes that you currently own?

If it is the same? The shape is different, I usually have shirts straight at the bottom. The pattern I am not sure if I have. The color I do have. I also feel something at the side of the sleeve when I put my arm up, which I do not feel on the other side. It is a little thicker there.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
The open part. I would make it a bit longer. (I could not understand all of it 22 min. and before) I would maybe put the longer side in my pants if I would wear it. The pattern is also a little much.

Explaining how the PVA works, and how the garment could be adjusted by dissolving the PVA yarn with water. How would you customize it if you could dissolve it yourself?
Tighter under the bra to accentuate it more.

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
There is a difference, I try to follow the fashion. (jokingly) I had jackets and skinny jeans now I have more of those mom jeans. Patterns on my shirts, bright colors and scarfs were what I wore and do not have now anymore.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes that fit during adolescence?
I do not remember. I liked it, I do not have bad or good memories from it.

Is it the same as shopping now?
I did follow the fashion of that time, however also made it my own (style-wise). I do wear more dresses, usually longer dresses. I did not do that before because I did not like it then and short dresses were more the trend. Now it is more vintage. You create more your own style now and things that fit for you.
Were you more searching for your own style then?
Then I was more influenced by the environment.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?

No not really, because I fell into the "accepted" norm. I did get curves, but not a lot. I was relatively thin, in high-school I was thinner than my friends which I was aware of. I was content with myself.

How would you have felt in the garment when you would have tried it on during adolescence?
Combining first question with adolescence (experience) I would feel different. Now it is more fashion to wear something that stands out while that used not to be the case. This does stand out, but not in Amsterdam for example.

What if the sleeves would be short and it would be symmetrical at the bottom?
A little bit, the pattern is more of before. And the shape is more fashionable now.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.
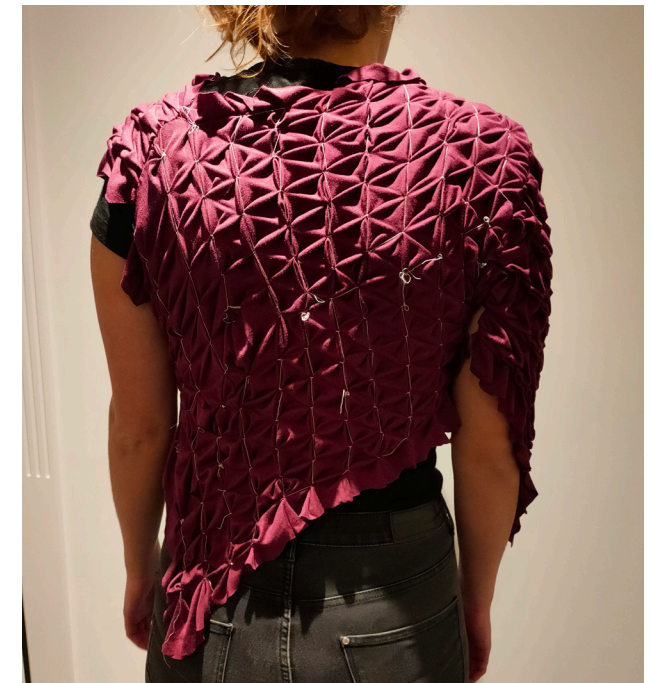*How do you think it looks on someone else?*

Image 2: participant 1 wearing prototype 1

(Jasmijn Vugts) It looks nicer on her than on me. What she wears already stands out a little. It looks longer on her and she is thinner than I am. That is maybe why it looks a little longer.

(Jasmijn Braakhuis) On her I find it less beautiful, here it is a little broader which accentuates that it looks a little weird and with the other girl that is not the case.

(Rodion) Is it a boy? Yes, I would look a little longer when I would see him in public. It looks more like a feminine pattern. It looks broken, because of the "friemeltjes", (loose ends)

(Karlijn) With you that also looks the same (same as on the person themselves, same as on Jasmijn B). It sits higher, because of your bigger breasts. The "punt" becomes less because of that. Oh from the back it looks better.

If someone would wear this in public, what would you think about it?
Not a lot actually, only the sleeves stand out.

User Involvement Session, participant 2

Image 3: participant 2 wearing prototype 1

First part (trying garment)
The Participant will put on the garment. Then, the following questions will be asked. Scared to break the garment by putting it on

How do you feel in the garment?
Warm and comfortable, but not very pretty. I find it a bit feminine, because if I would not be wearing anything underneath the garment, you would see a lot of skin.
The sleeve is very open. I would only see that on someone who is very muscular. And the folded pattern is something I would only see on female clothing.

What do you like about the garment?
The pattern is really pretty. I just would not wear it myself. I also like the sleeve. It reminds me a bit of a bird, while it ends in the point and that reminds me a bit of a big feather. More like a wing, and the folds look like feathers.

Would you wear this in public?
No, because it looks feminine.

How do you compare this garment to the clothes that you currently own?
Much tighter, and it shows much more skin, while it is so open. Also, my own clothes are much more minimal, so not that many special, weird things.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
I would loosen it up. I think the pattern is nice, but then I would make it a bit more oversized. The sleeves I would then make longer until the palm of my hand, and I would want to make that there is no skin shown at the bottom

Explaining how the PVA works, and how the garment could be adjusted by dissolving the PVA yarn with water. How would you customize it if you could dissolve it yourself?
I would have less pattern on the neck and have more towards the bottom like a fade. Which would be a choice of style and aesthetic.

Tries dissolving on the sample
Very surprised about how quickly it dissolves.

Image 4: participant 2 wearing prototype 1

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
Yes. It changed a lot over those years. Before, I did not mind clothes at all. My parents just decided what I would wear, because I did not really care. Like normal, basic T-shirt, jeans. Now I wear more oversized clothes, mostly with a cool pattern or vintage. I like minimalistic clothes like not that many busy patterns or colours in one garment. When I was in my fourth year of high school, I got a mixed group of friends with boys and girls, and the girls were just more into fashion already. Then they asked if they could style me just for fun, and after they styled me I realized that I really liked to get new clothes, and fashion. They acknowledged that I did not have that many clothes, and it just interested me to try out something else.

So it was more influenced by your surroundings?
Yes, well that moment made me start to care about fashion, and evolved more later.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes that fit during adolescence?

That came more from others. First I always went shopping with my mom, but during my adolescence I always went with friends. Then I went to the city a lot, and now I do that too still, but also sometimes online.

And how was your experience with buying clothes considering your emotions?
Well first of all, I always find it 'gezellig'. And it is always nice to have people/ friends with you that will be honest with you if something looks good or not.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?
Not really because something changed, but I have always been very thin. Not that there were a lot of comments, but sometimes people would just say that I am very thin and not muscular, but that's it.

But did your feeling or experience change about that during your adolescence?
In the beginning, when I was 15 or 16, I got a bit more conscious about the fact that I am really thin, but after that I also realized that others have it the other way around, like having problems with losing weight. So then I thought: "I have it quite well actually. I can eat what I want and I am not that skinny that I look like a walking skeleton." I like clothes even better on my body type.
I think I just accepted that I am like this and I am actually glad about it now.
So, are the clothes that you wear also more made for thin people?
No, the opposite actually. I get bigger clothes than I would need, and maybe that is to cover it up, but I also just like bigger clothes. It is my style, but I do not wear it because I want to cover up my body type.
But for your body type, you find that style a nice style?
Yes, exactly

How would you have felt in the garment when you would have tried it on during adolescence?
Combining first question with adolescence (experience)
I used to care less and was less aware about the things that I would wear.
If I would have to wear this to school during my adolescence I would find it worse than now. Right now, I still would not like to wear this in public, but it would have

been a bigger step for me during my adolescence than now. Mainly because I feel more confident now to express myself in the way I want.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else?
Showing a picture with a male wearing the garment (Rodion)
Very feminine

If someone would wear this in public, what would you think about it?
Well in my opinion it does not look like a very noticeable color, so I probably would not look up immediately, but that could also be because I am color blind. Though, if a male friend of mine would wear this, then I would be quite surprised.It looks more like a gown.

Showing a video of a female (Jasmijn V) with the garment. "So, do you think this looks different?"
Yes, this looks much prettier. I just find it a very feminine garment, and with her I would actually think that it looks very neat.

Showing a picture of another female (Jasmijn B) "Does this look different?"
No, not really. Here it just looks more as something comfy, and with the other girl it looks more as a fashion item. Still, I would not be looking weird seeing her like this at all.

User Involvement Session participant 3
The Participant will put on the garment. Then, the following questions will be asked. Trying to put on garment
Does not feel very comfortable at the moment. I don't dare to pull it down, because I am scared that I am ripping all those threads. Has the garment on, and is surprised that the garment is diagonal.

Image 5: participant 2 wearing prototype 1

What is with this sleeve (long sleeve)? I find it very peculiar. It is longer than my sleeve (of the shirt underneath) and hangs on the inside of my arm. Like on the inside of my elbow, I don't find that comfortable.

Helping the participant by moving the shoulder a bit up, so that the sleeve hangs a bit more towards the back of the arm. "How is this?"
It is better, but I just have to get used to it.

How do you feel in the garment?
Walking around a bit, and looking at his reflection
A-symmetry is always nice, but it just feels a bit weird here. Points at the sides of the waist. It fits quite nice, though. This long sleeve, I can not really get use to it.
You think it is too long?
Well, it is also that it "walks towards a point", and it is a bit heavy.
So, you don't like it that the sleeve is heavy?
It is morw that my arm is not sure if it is a normal t-shirt or a sweater. It is just neither.
And if the sleeve was the same length on the other side?
Then I still would find it very annoying. But, I am also just not used to it. Clothing for men is mostly not that adven-

turous. It is either a short or long sleeve, not in between, and women sometimes have like a bat sleeve.
Participant keeps moving right arm to move the point of the sleeve away from the inside of the elbow.

What do you like about the garment?
I like the thickness of the garment. It feels kind of thick and warm, while it is actually just a t-shirt fabric, I think. And also, I just think it looks nice
Touches the front of the garment
And you also like to touch it?
Yes, I would find it very nice if this would be like a nice sweater, but for now I am just not sure what to do with it. It goes a bit there, and then there.
It goes towards a side and you do not know what you should do with it?
I don't get the design choices right now.

Would you wear this in public?
Well, at the moment I just find the sleeve weird, and furter I just have to get used to all the sloping sides.
And if it would be straight? If it would have more a shape of a normal t-shirt?
Yes then I would wear it. Because it is not about the fabric, but more the adventurous shapes that sets me off a bit. The fabric is nice in my opinion. It could be as a t-shirt, but as a sweater I would think it would be very nice. Then you would just have a not very thick sweater.
And about the tightness?
I don't really notice it that much actually, because it already stops at the waist. Also with the arm not really. I am also not the widest person, so it does not stand out for me.

Image 6 and 7: participant 2 wearing prototype 1

How do you compare this garment to the clothes that you currently own?
In anyway it is quite special
Or you could also mention or have similarities?
Yes that was actually where I wanted to go. I used to have a vest and it was quite similar as this. I also had this dark red color, but it was more that there was foam in it.
It was quite the same fabric, but it was a bit stiffer, because it was ironed or printed. However you would do that mechanically. So it was a bit stiffer, but for the rest it fitted quite similar. And further. Compared to my t-shirts the fabric is quite similar. It fits a bit tighter. I think I can compare it best with my t-shirts. At least for how it is designed right now.
What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
Explaining how dissolving of PVA works
Well, I find it quite hard, but the sleeve I would just remove right now. Any moment that you would think that it begins to be a normal garment, it stops. Points to the waist and shoulder/sleeve where it is tight and suddenly stops and is open. Well I the pattern can have an added value when you would get bigger or talles suddenly.
And I also think that you could make a cool pattern in it by dissolving it. But for the size I think it could be quite handy.

So would this be the size you would buy it in?
I think it is comparable to the size that I would buy it in. I just cannot judge it well right now, because it stops so high. The neck is also very wide

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
Considering style I think a bit, but I think that is just because you change as a person. And now I invest more in a piece of clothing that I know that I won't wear that often, because now I know that I won't grow out of it anymore. Before that I just bought my clothes of personal usefulness. Like there was a time that I would just grow out of shirts and pants after 2 or 3 months. So now I am in the phase that I am grown out, so I can invest in clothes for parties for example.
What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes

Image 8: participant 2 wearing prototype 1

that fit during adolescence?
Well, it depends on the clothing item. Shirts were never that big of a problem. Sweaters already became a bit harder, just because of the fit. Pants too actually.

What didn't fit then?
Because at a given moment you get really tall and not that wide, which I still have by the way. Now I do not have that problem as much actually, but they did not used to have that much clothing for tall people. Taller is also a more square fitt, so taller would mean more mass so a bigger fitt.
So, you get too short or too wide clothing?
Exactly, especially that square fit. And some look very good in that fitt, but with me that was not the case at all. While I actually just wanted the same fit but with longer sleeves. And the same was for pants. I had to look for clothes that would distinguish length and wideness in the size.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?
In the sense of being conscious about my changing body, yes. But not in a way that I got insecure about it. You just get to a point that you realize that childhood is over, and that is more of a mental step, but I did not have anything that I was embarrassed about considering my body.
That your childhood is over?
It is more that you are entering a different phase of your life, and then you just have to make that switch. So that

would be more where I would have difficulty with. The only body change that would be a bit annoying was my voice change. With the voice cracks, when you wanted to make a point in a conversation. But my length or weight does not really bother me.

How would you have felt in the garment when you would have tried it on during adolescence? Combining first question with adolescence (experience)
Yes, I would have liked to participate, but I do not think I would have worn this in daily life. Especially not in this shape. Not per se because I was ashamed of my body that I would not wear it, but more because of the people I met.

So more considering how your environment would react to it?
Yes, I think that too. Not because I was afraid to be laughed at, but that people appreciate it now more if I would wear something more adventurous. So now it gets appreciated when I take a risk, and in the past it did not really matter if I wore something basic or adventurous.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else?
Showing a picture with a male wearing the garment (Rodion)
I think it looks nice on him. Now I also think it looks better on him than me. Well, with him the sleeve falls nicely, first of all. And with him the neck is not that wide, so maybe he has a better body shape than me. A bit more muscular.
I can also show you a picture of yourself in the garment.
It looks nicer than I thought actually. The shape is still not how I would choose it, but it actually looks quite nice.

Showing a video of a female wearing the garment (Jasmijn V)
I think it is different because I am not used to it. It is different from a normal garment, but because women already wear weirder clothing, with different shapes and fabric. And you see that less with men.

And why do you think that is?
Now I think we get more into a social debate, but I think that it has a lot to do with what is socially accepted and not. The stores also don't really help, because I can not buy much more than a shirt or a sweater. Depends on supply and demand I guess.
But would you like to see that change?
Right now I am not feeling limited as an individual, but I can imagine it would be nice to have a bit more variation and that it would be profitable for others. So for this (the garment) it would be less of a risk for a man than a woman, so I think it looks more normal on a woman. If a man would walk in this in public, then it would stand out more.

If someone would wear this in public, what would you think about it?
And we are quite open-minded at Industrial Design, but if I would go outside wearing this, and I am also wearing a pink T-shirt, that people already would think that they know my orientation.
Oh okay, so you think it would be associated with that?
Yes, I think it will
But would you think that too? If you would see the guy that you just saw in the picture?
Depends a bit on the person. I can act like I do not have prejudices, but unconsciously I think I still do that, yes.
Unconsciously you would think, he is into men?
Yes, but that would also be because of the fact that right now this kind of clothing would be associated with a woman. And generally, if a man dresses more feminine, it is associated with that he would be gay. However, if a lot more men would wear it, the association would probably be different.

User Involvement Session participant 4
First part (trying garment)
The Participant will put on the garment. Then, the following questions will be asked. She says wow when she sees it. Confusion about what the front is.

How do you feel in the garment?
Mm difficult, it feels soft. It also feels colder on the side where there is no sleeve. It feels nice, for the summer I would wear it. I really like the fabric and the color, it does

Image 9: participant 3 wearing prototype 1

not really look nice on me, but I usually have more with a taille. It now looks rather straight, but that is the case with my body type. It looks like a lot especially because I have broad shoulders. It accentuates my shoulders.

What do you like about the garment?
The fabric and that it fits nicely at the top. The neck is nicely done, same goes for the shoulder. And you cannot see the wrinkles because of the structure.

Would you wear this in public?
No, it is not really my style. Then I would have to walk around with an exposed stomach and I would not do that, that would maybe look weird. If my stomach was not exposed I would do it I think. Then I would feel more comfortable.

Would you make the bottom straight if you were to make it longer? How would you make it longer?
I would put the "punt" in my pants. I mostly wear high waisted pants and I think I am not an alternative enough

person to wear it like this.

How do you compare this garment to the clothes that you currently own?
You can see that this is an expensive technique to make and my clothes do not have that, so if you would see this then it looks unique. There are only a few pieces of it. And in comparison to my clothes it is way more chique, if it were longer you could almost wear it to a gala.
What makes it chique?
The color and the pattern, which reminds me of a bit of a gala dress with a nice pattern in it.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
Depends on what I would want to do with it, what it is for. For everyday life I would want to even sleeves, even though this also has something, it is less boring. The "punt" can stay the same because it can be worn in or out of the pants. But I want the bottom of the shirt to come up to my pants.

Explaining how the PVA works, and how the garment could be adjusted by dissolving the PVA yarn with water. How would you customize it if you could dissolve it yourself?
I think under the taille making it a little bit looser, my body is pretty straight so maybe the fact that it would be looser at the bottom would create more taille.
Places where you would want it to be tighter?
It already fits nicely around my taille. It fits everywhere nicely.

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
Yes of course the overall fashion is different, but considering what I dare to wear it is very different. The difference is that now it deviates from what the rest wears. And that I sometimes try to differ from the current fashion, because friends of mine usually buy clothes from the same store and I try to avoid that. I do not want to wear what everybody wears while in my adolescence that was totally switched. I wanted to have things because everybody had that.

Image 10: participant 3 wearing prototype 1

Why do you think that is?
In highschool you are more aware of others and you are also going through puberty and I think that changed when I went to university, because everybody is new and you just see that things are more easily accepted here. And especially because you do not know everybody you will do that more easily, because people do not have an opinion easily then. You also see more people that are alternative and therefore it is not weird if you wear something more alternative for once.
So that is especially about your environment then?
Yes, I care about what people think. It did become less and I think this has to do with the clothes that you wear and just care less and at my home my farmers home they will also think that it looks weird but now I don't really care about that anymore.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes

that fit during adolescence?
I always liked it, but at my home the money we got for clothes was very strict. So I wanted to buy more, but couldn't.

Was it difficult finding clothes that fitted when you went shopping?
Yes, I always find finding pants difficult, especially the pockets on the butt. Which if they are placed wrong will give you a weird figure. And shoes, but I have size 40, so then your feed will very quickly look very big.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?
Yes I think so, that did circle through my mind. But back then you were also more insecure and everything needed to be tight. I did not like to gain weight. But now I think a bit of curves is more okay. In highschool I lost some weight, so then I did go and buy some things that were a bit shorter for summer for example. Wait, this is anonymous right? But for example people always told me that I had a fat ass, but I did not like that because then I always looked out for the pants I bought so that it would not accentuate it.

How would you have felt in the garment when you would have tried it on during adolescence? Combining first question with adolescence (experience)
Then I would not have worn it because I would have been too insecure. I would definitely not have worn it to high school, but in private I would.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else?
(Jasmijn Vugts) On her I think it looks good, the only thing is that it looks a little like well not avatar, but a little futuristic. Especially the punt. Yes futuristic/jungle, the back looks very pretty. When she puts her arms up it looks very pretty. However I do need to get used to the punt. When you saw the punt on yourself you did not have that. A bit less, but for me it is placed higher. With her if you

were to look quickly you would think it is a body.
And when a boy wears it?
With the boy you see that he gets an extra small taille, because boys normally wear bigger shirts and now it is tighter. And for him it is also higher and the punt also looks less weird. If I were to see it in public I think I would find it a bit special to see.

If someone would wear this in public, what would you think about it? If you were to see this outside you would look twice?
If I were to see this outside I would look two times to see it.

And for the girl if you would see it in public?
Depending on who is wearing it, like I see it on her I also think I would look but then think Ooh nothing weird about it.

Image 11: participant 4 wearing prototype 1

User Involvement Session Participant 5
First part (trying garment)
The Participant will put on the garment. Then, the following questions will be asked.A bit uncomfortable with putting it on. Laughing a lot

How do you feel in the garment?
Feels a bit tight. A bit compressed.
Is that too much?
No, it is not that I can't breathe, but I feel the pressure. Maybe you could get used to it, but it feels like it is a bit too tight. I would wear it looser, but I never wear tight shirts, so I am not used to the tightness.
And how do you feel about it?
It is not my style. Al those loose pleats, I just want a plain T-shirt.
What do you like about the garment?
I like the color. I am not really a fan that it goes diagonal (see image 1). Just because it isn't a complete shirt. I would just like it to have a t-shirt shape and normal sleeves. Just a short sleeve t-shirt shape.

Image 12 and 13: participant 4 wearing prototype 1

Would you wear this in public?
No

And can you elaborate on that?
No offense, but you have people that you see on the street with some vague clothes on, and that is okay, but I just prefer basic clothes. This (the garment) is more alternative.

How do you compare this garment to the clothes that you currently own?
My clothes are just straight and plain clothes. Nothing like weird shapes, pleats, or even diagonal sleeves. I have clothes with prints on them, but not like pleats.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
Just underneath my chest it is a bit tight. Above at the chest it sits fine, but it is just underneath it that feels too tight. If I could dissolve it I would dissolve 'these' (see image 2) two points.
Moreover, I find it annoying that the sleeve falls on my arm (see image 3) . If it would be longer and the other sleeve would be the same, then I would not mind it. Though, I find the softness and the feel of the fabric pleasant.

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
I don't think it changed a lot. Maybe now I wear a bit more shirts (overhemden), because when I was younger I saw it probably more as something older people would wear. But for the rest there are not big differences between then and now.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes that fit during adolescence?
The same as now, online. I always order clothes online. In a store it always looks like you have a lot of choices, but it is always a bit disappointing. Maybe they don't have your size or you have to go to all those different stores to search for the right thing, and I also don't really like employees asking me all their questions.
If I want to buy something a bit different, then I prefer to try it on before I buy because I am not sure if it looks nice or what size I have. But normally I know what sizes I need, so then it's not a problem to order it online.
And did you ever have difficulty with shopping?
This can be practically but also emotionally.
No, I just buy a bigger size when I grow. I never had the trouble that I was this big or tall that I couldn't wear something I wanted. I had no troubles with that.

Image 14: participant 4 wearing prototype 1

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?

No, in that sense I didn't really have a hard time during puberty. Reason for that could be that I did not worry about too much if someone would say something about me, but my surroundings were also quite calm in that sense. I went to a gymnasium school, where there was not a lot of bullying or fights, so I also never experienced it like that. I can not say if it was because of me being a strong person or because of my surroundings that it did not really bother me that I was a little smaller than the others for example.

How would you have felt in the garment when you would have tried it on during adolescence? Combining first question with adolescence (experience)

Then I wouldn't have put it on. That was indeed something that was different during that time, that you were scared to be made fun of. I am also not trying to give others some-thing to let them make fun of me (="ik zoek het ook niet op"). That sounds a bit weird because I just said that it didn't bother me what others thought, and then I say that I do not want to give them something. Maybe it's both not my style, and because of the fact that others could make fun of me.

Could it also be possible that it is your style, because it is accepted?

Yeah that is an interesting topic. That could be it of course. Having an alternative is a bigger risk because you stand out. So it could be that I chose this style because I didn't want to take that risk indeed.

And would you take that risk now sooner?

I think I would wear something more risky now sooner than in my puberty, yes. Now if I like something that stands out a bit more, I just don't care and wear it. But I also think that everyone has that in their puberty. Everyone is insecure so if someone would wear something that you didn't dare to wear you would make fun of them. Now those comments are not made as much, so you get to a point where you just wear what you like.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else? Showing a picture with a male wearing the garment
Okay. I think it looks very feminine. At first if you didn't say that it was a guy, I would have thought that it was a girl. I think that is because men mostly wear more basic clothes, and this is with a lot of fringes and waves that it looks more feminine. Maybe also because I thought that I saw longer hair, but it could also be a guy with longer hair of course.

If someone would wear this in public, what would you think about it?
Than I would think that he would be gay to be honest. I have to be honest, those prejudices are just there. If you dress more feminine it gets mostly associated with that.

Showing a video of a female with the garment. "So, do you think this looks different?"

It just feels like it makes more sense when a girl wears it. Because you tend to think that girls have a bit more of an outspoken style. I would still think that it looks a bit odd, but more in a sense that you see that more often that they wear a bit different clothes. A bit alternative but I would not look back a few times whereas with that guy I would.

User Involvement Session participant 6
First part (trying garment)
The Participant will put on the garment. Then, the following questions will be asked.

How do you feel in the garment?
Feels special. It feels quite heavy to be, there is a lot of weight. That point is quite weird, but I don't know if that is supposed to be like that. I also find it a hard pattern to look at. I don't know if that is because I just woke up, but it makes me feel a bit dizzy if I look long at it.I feel that the sleeve is a bit too long for me, and that point too. I would prefer that shorter.

What do you like about the garment?
"Is discussed in the first question"
Would you wear this in public?
No. One side has a sleeve and the other doesn't, so I don't like that.
And if the side where there is no sleeve was the same as the other side?
No, I don't know, I don't think so. Probably because of the pattern, I find it too intense. I like more basic clothes. I don't really like patterns, I would like stripes more for example. That it would be vertical or horizontal not diagonal. Just a bit more straight.

How do you compare this garment to the clothes that you currently own?
Those patterns are quite different. I don't have anything that ruffles, mostly just tight. I would wear the color, though.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
I don't know if I would want to change anything, because

Image 15: participant 6 wearing prototype 1

you would create a gap. And I don't find it too tight or too loose somewhere so I wouldn't change that either I think.

So looking at the tightness would be comparable to what you would normally wear?
Yes
And considering style would you change anything?
Yes, definitely. I would just change it to a normal cut for a straight t-shirt.

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
I think it is fairly similar. Well, no it is a bit less basic. First I just had black and white clothes, and now also clothes with prints or wide pants.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes that fit during adolescence?

If I am in a 'shop mood' I buy a lot of clothes, but if not I don't buy anything at all.
I always went shopping with my mom, or sent her a picture of what I wanted to buy. I always wanted her approval. Now that is less than during my puberty.
I barely grew since I was 11, so I still fit clothes I wore back then. Sometimes I hoped that I would grow so that I have an excuse to buy new clothes. I don't mind that I still can wear those clothes.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?
No, really not. Sometimes I have that things don't fit. Even xs doesn't fit sometimes.

How would you have felt in the garment when you would have tried it on during adolescence? Combining first question with adolescence (experience)
Now, I have a bit more of the attitude that I don't care what people think. I just wear the things that I like, and I barely let it affect what others think. Though, in high school I wouldn't wear something like this because I didn't like it myself, but also because others didn't like it.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else?
Showing a video of a female wearing the garment
I think that it looks very nice on her. A bit alternative. I think that is because of the person wearing it. The way she acts.

Showing a picture of another female
I don't know. Now it looks a bit more like an old lady. It looks quite good on her, but it makes her look older, whereas the other one looked younger.

If someone would wear this in public, what would you think about it?
I would find it a bit weird, also because of that point. For the first girl I would find less weird. Maybe the difference

in color of their pants makes it look different.
I think I would appreciate it that she dares to wear something like this.

Showing a picture of a guy
Yeah, I think this looks very weird. Looks like a flopped crop top. That is just because you have a different idea from guys, than girls. With guys it looks quickly like a rockstar or emo, but that is generalizing it. Maybe I am not supposed to do that, but I think I would still do that. I think I would think that he would be in a rock band.

Showing another picture of a girl
Yeah this I like too, looks a bit like a knight.
It really looks different on girls than guys.

User Involvement Session participant 7
First part (trying garment)
The Participant will put on the garment. Then, the following questions will be asked.
Over my T-shirt? Yes.

Image 16: participant 7 wearing prototype 1

How do you feel in the garment?
It's pretty. It's also really soft.Points out the gaps on the sidesThere's a bit of a weight to it, but it's also really comfortable and soft.
You like the weight, or?
Maybe i would prefer it if it was lighter. It looks cool.
What do you define as cool?
The pattern is unusual, you don't see this often in clothing. It's unique in a way. I'm not a big fan of having one side longer than the other [referring to sleeves]. The sleeve is loose, a half-sleeve. Maybe if the collar was a bit more faded, not instantly starting with the pattern. ...But I like it a lot. I'm just being critical.

What do you like about the garment? [question skipped due to above response flowing into this question]

Would you wear this in public?
Yeah the only thing is the sleeve, i don't know. I would make both sleeves short. Yeah I think i would wear this in public for like a special thing, not a daily piece of clothing
What makes it that?
I think it's special and not discreet at all, a very outspoken piece. I would wear this in a palace where other people also have outspoken pieces, where I wouldn't stand out so much. If i wear the same black t-shirt then it's just a black t-shirt, but if i wear THIS everyday people will notice. Though I wouldn't wear this nowadays because it's cold.

How do you compare this garment to the clothes that you currently own?
This would be fancy for me. My usual style is more casual; for comfort. This [the prototype] is more how it looks, than for comfort itself. This would be like a special event kind of piece of clothing.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
To fit my style, I would probably make it black or a darker color. I would cut the sleeve. I would connect the front and the back. I would make it more t-shirt standard. More boring basically [laughs]

You may now change or dissolve whatever you would like.
Am I supposed to mess up your prototype?
Well no, like adjust it

Image 17: participant 7 adjusting prototype 1
How am I supposed to make it tighter? [Points at the gap at the sides between the front and back]We have pins

Can I dissolve the seam?
The seam is not dissolvable
[dissolves certain knots, and asks for pins]

Isn't it also kinda reversible because you can wear it the other way around? Because you can't see the knots that well from this side.

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
What ages does that mean?
At 14-15, middle of your puberty
In a sense. I still wear hoodies and stuff, that hasn't changed. But I would say while the themes are the same i dress more 'adult'

Adult in what way?
I can match colors way better now and make better outfits. When i was 14 or 15 nobody told me i had a good style, but now I get compliments.

Would that be because it stands out more right now?
It was the same style but now i wear more what i want, now i'm more myself. At the time I tried to fit a trend. The other thing is that now I got more interested in fashion over time. Now I have inspirations I look at that make my style better. And when you're 14 your parents buy your clothes and you don't have full power over the clothes you buy.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes that fit during adolescence?
I remember i was into clothes but it was more a social statement because i was at a private school and clothes

defined you. Abercrombie and Fitch was very popular at my school and I tried to wear that as well.

Was it an international school?
No, it was a private school in Portugal. The kids were all rich and it was a social status thing. Since there was no Abercrombie and Fitch store in Portugal, it meant that they must've gotten the clothes internationally. I am not proud that I was proud of this and supported this, but I wanted to be part of it. My fashion was set by other people basically, so I didn't stand out and no one gave me compliments. Now I just wear more of what I want.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type?
Could you elaborate?
Yes I think definitely. At that age you also start comparing yourself more to your friends, who might be at different stages or are "ahead"; so more specifically have bigger boobs for example, and you're like "why am i not like this, is something wrong with me?". This is also the age where you have love, or crushes and stuff, and you start thinking that if boys chose your friends instead of you, that it was because of her body instead of yours. It's really dumb. But the judgement of other people and what you see on TV and media and you start to analyze your own self.

Would you compare yourself more during that time because your body is changing?
I don't know. Now it might not be changing anymore, but i still compare myself. Hopefully on a less superficial level. Before puberty girls couldn't really be compared by bodies because there wasn't anything going on. People expect everyone to be the same basically, and start comparing if they're not. It used to be easier to compare during puberty because everyone went through it at the same time, we were in the same 'race'.

How would you have felt in the garment when you would have tried it on during adolescence?
I don't think I would dare to wear it.
Would you feel different wearing it if you were 14 now during a user test?
Yeah I probably would have reflected on what I was wearing and why. I would realize how stupid the conforming mindset is, i hope i wouldve realized that I was a slave to the trend. Then I would have thought that this is something you only see in fashion shows.

Image 18: participant 7 adjusting prototype 1

Do you think the clothing trend is sent harder in private schools?
Yeah I think so. It probably has something to do with culture. In Portugal people like to spend money on things they can show off instead of vacations and travel. I've had a friend ask why I don't have an iphone or a good car, to which i said that I went to america and it was really fun. But she didn't understand. I was like PEOPLE SPEND MONEY ON DIFFERENT THINGS. It really is about materialism. There were some girls that I didn't understand why they were popular since they were mean. So I asked one of my friends and she said "yeah because she is fashionable and has really good style, that's why everyone's friends with her". I didn't even know that was a criterium

Is it different now?
Yeah definitely I dont give a shit about brands. There is definitely still a culture of comparing brands and stuff, but I hope some of my old schoolmates realized it's not that important. I think when you're younger you wanna be like everyone else, but now it seems like everyone wants to stand out. I think it's good.

And you think that comes with age?
I think age and maturity. Though I still have conversations with friends where they compare phones like android and iphone. It's already a thing if you have different phones, like having an android shows that you are less wealthy or something.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else?
I think it looks better on her. If i would see someone at the uni with this, i would be like "cool t-shirt", but i wouldn't think that someone bought this at the store, more like that this was a DIY or project thing. This isn't your average piece of clothing, but that also makes it special.
It's funny because it actually suits everyone.

Do you think it looks different on others?
Yeah also depends on their outfit.
Do you think it is gender related?
Yeah it's also because they [male participants] are taller, for them it becomes more like a top. With guys I think it's a summer garment, but with girls I think it's more of a winter outfit.

If someone would wear this in public, what would you think about it?
I have stupid association that tight is more female clothing, since its tight around the waist, but i think it suits the guys well too.

Would you look twice?
Yeah definitely

Would it change if it was a girl or a guy?
No, I would still be interested. I think if i knew the story behind the material, that
dissolves in water, i would definitely be more interested. This reminds me a lot of those half-summer half-winter pieces of clothing, like split.

User Involvement Sessions participant 8

The Participant will put on the garment. Then, the following questions will be asked.

How do you feel in the garment?
Feels special. A bit loose, and open. Especially because this side is so open. It would be something that I have to wear over something else.

What do you like about the garment?
I like those ruffles. I would like it better when both sides would have a sleeve. Quite special (positively) that is diagonal. I am not sure if that is my style, though.

Would you wear this in public?
Because it is not my style I think no. But if I see someone wearing this in public I wouldn't find it weird. I like it, but I wouldn't buy it in the store myself. Maybe for a special occasion.

How do you compare this garment to the clothes that you currently own?
A lot different. I like the ruffles, but the shape is really different from the clothes that I have in my closet.

What would you change about the garment? E.g. Are there parts that you want to tighten or loosen up?
Like I said, I would do the sleeves on both sides, and I am quite like that it goes diagonal, but I think I would want to make it longer. I find the pattern a bit too much, maybe I would only want it on the sleeve.
So that is because of your style rather than how it fits?
Yes. It actually fits very nice, very comfortable.
Before starting the second part, make pictures of the participant with the garment on

Second part (adolescence)
Do the clothes that you own at this moment differ a lot from the clothes that you bought during adolescence?
At the start of my puberty the Cool Cat was very trendy, so I wore a lot of very bright colors. That is something I really wouldn't wear nowadays. Now I wear a bit more basic clothes, compared to what I wore back then.

What is your experience with buying clothes during adolescence? E.g. did you have any difficulties buying clothes

Image 19: participant 8 wearing prototype 1

that fit during adolescence?
Mostly I would go shopping with my mom. And I would go to the standard stores, like the H&M and Cool Cat. I liked shopping.

Growing up did you have any body image issues or were you self-conscious about your (changing) body type? Could you elaborate?
I did not have trouble with it per se. I did not like my clothes from a year ago. Probably because my style changed.

How would you have felt in the garment when you would have tried it on during adolescence? Combining first question with adolescence (experience)
I think I would have bought it sooner during my adolescence than now, while I bought more provocative clothes at that time. I am not really sure if I would have worn this in public, because I also went with the style of others.

Third part (evaluate on the garment)
In the end, come back to the garment, and ask questions based on observations (e.g. pulling the garment or padding on it) Let the participant show a video of someone of the same sex wearing the garment.

How do you think it looks on someone else?
Showing a picture of a female (Jasmijn V)
I think it looks good on her. It is always that you think that it looks different on yourself than on others. It also looks a bit more fashionable.

Showing a picture of a guy (Rodion) "Is this different?"
I would have thought that the garment would be more female clothing, but I also don't think it looks bad on him. I don't see men wear things the long sleeve, and the color. But also the ruffles is not something I would see a lot on men's clothes. Mostly they have a bit more basic clothes.

If someone would wear this in public, what would you think about it?
I would not find it weird. It is something that would stand out, so I would notice it, but I wouldn't think weird about it.

And with the guy? Would that be different?
Maybe it would stand out a bit more, but I think it also depends on the person.

Image 20: participant 8 wearing prototype 1

Programs

The first two programs will have extra comments added explaining the calculations and layout.
This is not included in the other coding because those are quite similar.

1. Brick Pattern

```
1  //Jasmijn Braakhuis 01/12/2020 toevoegingen Jasmijn Vugts, last editing 06/01/21
2  //Brick pattern
3
4
5
6  int W = 21;                                              //grid size
7  int H = 21;
8  int G = 21;
9
10
11 void setup(){
12     size(440,440);
13 }
14 void draw(){
15     background(255);
16     for (int j = 0; j*2*H < height - 8*H; j++){          //the amount of rows, so in vertical
17         for (int i = 0; i*W*2 < width - 2*W; i++){       //the amount of column, so in horizontal //G + i*G, the distance between the pattern
18             pleat(2*W*i, j*4*H);                         //the lines that begin immediatly at the left
19             pleat(W + 2*W*i, 2*H + j*4*H);               //the lines that start G from the left
20         }
21     }
22 }
23
24
25
26 void pleat(int x, int y){
27     line(x, y, x + G, y);                                //line
28     line(x, y + H, x + G, y + H);                        //line just under it
29 }
30
31
32
33 void keyPressed(){
34     if (key == 'c')
35         W = W + 1;                                        //width 1 bigger
36     if (key == 'd')
37         W = W - 1;                                        //width 1 smaller
38     if (key == 'e')
39         H = H + 1;                                        //height 1 bigger
40     if (key == 'f')
41         H = H - 1;                                        //height 1 smaller
42     if (key == 'a')
43         G = G + 1;                                        //grid one bigger
44     if (key == 'b')
45         G = G - 1;                                        //grid one smaller
46     println("W = " + str(W));                            //print the width
47     println("H = " + str(H));                            //print the height
48     println("TOP2TOP (horizontal) = " + 2*W + " (pixels)");   //horizontal distance between the tops
49     println("TOP2TOP (vertical  ) = " + 2*H + " (pixels)");   //vertical distance between the tops
50     println("ALPHA = " + str(degrees(ALPHA)));           //print the angle
51     println("RATIO (horizontal) = " + W *(width / (G+W)) + ":" + height);   //prints the horizontal ratio to the height
52     println("RATIO (vertical) = " + height  + ":"+  width);    //prints the vertical ratio to the width
53     println("NEW (horizontal) = " + W * (width / (2*W)));      //prints the new vertical
54     println("NEW (vertical) = " + height);               //prints the new horizontal
55 }
```

```
//Jasmijn Vugts and Jasmijn Braakhuis 2/1/20, last edited 6/01/21
//wave shape



int G = 20;                                              //grid size
int H = 40;
int W = 60;
float ALPHA = radians(45);                               //angle



void setup () {
  size (800,800);
}



void draw (){
  background(255);
    for (int j = 0; j*H < height - H; j++){              //the amount of rows, so in vertical
        for (int i = 0; i*W < width - W; i++){           //the amount of columns, so horizontaly
            pleat (W/2 + i*W, H + j*H);
        }
    }
}



void pleat (int x, int y) {
  line (x,y, x + G*tan(ALPHA), y - G);                   //line, G*tan(ALPHA) comes from tan(ALPHA) = ?/G
}



void keyPressed() {
  if (key == 'a')
     G = G + 1;                                          //grid one bigger
  if (key == 'b')
     G = G - 1;                                          //grid one smaller
  if (key == 'g')
     ALPHA = ALPHA + radians(1);                         //angle one degree bigger
  if (key == 'h')
     ALPHA = ALPHA - radians(1);                         //angle one degree smaller
  if (key == 'c')
     W = W - 1;                                          //width one smaller
  if (key == 'd')
     W = W + 1;                                          //width one bigger
  if (key == 'e')
     H = H - 1;                                          //height one smaller
  if (key == 'f')
     H = H + 1;                                          //height one bigger

    println("ALPHA = " + str(degrees(ALPHA)));                           //prints the alpha
    println("RATIO (horizontal) = " + sqrt(pow(G, 2) + pow(W-G*tan(ALPHA), 2)) * width/ W + ":" + width);    //prints the horizontal ratio to the width of the screen
    println("RATIO (vertical) = " + sqrt(pow(H-G, 2) + pow(G*tan(ALPHA), 2)) * height / H + ":"+  height);    //prints the vertical ratio to the height of the screen
    println("NEW (horizontal) = " + sqrt(pow(G, 2) + pow(W-G*tan(ALPHA), 2)) * width/ W);     //prints the new horizontal
    println("NEW (vertical) = " + sqrt(pow(H-G, 2) + pow(G*tan(ALPHA), 2)) * height / H);     //prints the new vertical
}
```

```
//Jasmijn Vugts
//Steel pattern 2/12/20


int G = 18;
int H = 18;
int W = 18;
float ALPHA = radians (45);

void setup () {
  size (400,400);
}

void draw() {
  background(255);
    for (int j = 0; j*(2*H) < height - (2*G+H) ; j++){
      for (int i = 0; i*(W+(tan(ALPHA)*G)) < width - (W+ 2*(tan(ALPHA)*G)) ; i++){
        pleat (W/2 + i*2*W, H/2 + j*2*H);
      }
    }
}

void pleat (int x, int y) {
  line (x, y + G, x + tan(ALPHA) * G, y);
  line (x + W, y + H, x + W + tan(ALPHA)*G, y + H + G);
}

void keyPressed(){
    if (key == 'a')
      G = G + 1;
    if (key == 'b')
      G = G - 1;
    if (key == 'g')
      ALPHA = ALPHA + radians(1);
    if (key == 'h')
      ALPHA = ALPHA - radians(1);
    if (key == 'c')
      W = W - 1;
    if (key == 'd')
      W = W + 1;
    if (key == 'e')
      H = H - 1;
    if (key == 'f')
      H = H + 1;

    println("ALPHA = " + str(degrees(ALPHA)));
    println("RATIO (horizontal) = " + sqrt(W*W+G*G) + ":" + height);
    println("RATIO (vertical) = " + sqrt(H*H+(tan(ALPHA)*G)*(tan(ALPHA)*G)) + ":"+  width);
    println("NEW (horizontal) = " + sqrt(W*W+G*G) + "pixels");
    println("NEW (vertical) = " + sqrt(H*H+(tan(ALPHA)*G)*(tan(ALPHA)*G)) + "pixels");
    println("W" + str(W));

}
```

```
v_shape_working  ▼
1  // Jasmijn Vugts, 2/12/20
2  // v shape code
3
4
5  int G = 10;
6  int H = 20;
7  int W = 30;
8  float ALPHA = radians( 90 );
9
10 void setup(){
11     size(440,440);
12 }
13
14 void draw(){
15     background(255);
16     for (int j = 0; j*H < height - H; j++){
17         for (int i = 0; i*W < width - W; i++){
18             pleat(W/2 + i*W, H/2 + j*H);
19         }
20     }
21 }
22
23 void pleat(int x, int y){
24     line(x - G*tan(ALPHA/2),y,x,y - G);
25     line(x,y - G,x + G*tan(ALPHA/2),y);
26 }
27
28 void keyPressed(){
29   if (key == 'a')
30     G = G + 1;
31   if (key == 'b')
32     G = G - 1;
33   if (key == 'g')
34     ALPHA = ALPHA + radians(1);
35   if (key == 'h')
36     ALPHA = ALPHA - radians(1);
37   if (key == 'c')
38     W = W - 1;
39   if (key == 'd')
40     W = W + 1;
41   if (key == 'e')
42     H = H - 1;
43   if (key == 'f')
44     H = H + 1;
45
46   println("ALPHA = " + str(degrees(ALPHA)));
47   println("RATIO (horizontal) = " + (W-2*G*tan(ALPHA/2))*(width / W) + ":" + width);
48   println("RATIO (vertical) = " + sqrt(G*G+(tan(ALPHA/2)*(tan(ALPHA/2))) * (height / H)  + ":"+  height));
49   println("NEW (horizontal) = " + (W-2*G*tan(ALPHA/2))*(width / W));
50   println("NEW (vertical) = " + sqrt(G*G+(tan(ALPHA/2)*(tan(ALPHA/2))) * (height / H)));
51 }
```

```
lightning_shape_working  ▼

1  // Jasmijn Vugts 07/01/2021
2  // finished
3
4
5  int G = 18;
6  int H = 18;
7  int W = 18;
8  float ALPHA = radians (90);
9
10 void setup () {
11   size (400,400);
12 }
13
14 void draw() {
15   background(255);
16     for (int j = 0; j*(H+G) < height - (H+G) ; j++){
17       for (int i = 0; i*(3*G+W) < width - (3*G+W) ; i++){
18         pleat (W/2 + i*(3*G+W), H/2+ j*(H+G));
19       }
20     }
21 }
22
23 void pleat (int x, int y) {
24   line (x, y, x + G*(tan(ALPHA/2)), y + G);
25   line (x + G*(tan(ALPHA/2)), y + G, x + 2 * G*(tan(ALPHA/2)), y);
26   line (x + 2 * G*(tan(ALPHA/2)), y, x + 3 * G*tan((ALPHA/2)), y + G);
27 }
28
29 void keyPressed(){
30     if (key == 'a')
31       G = G + 1;
32     if (key == 'b')
33       G = G - 1;
34     if (key == 'g')
35       ALPHA = ALPHA + radians(1);
36     if (key == 'h')
37       ALPHA = ALPHA - radians(1);
38     if (key == 'c')
39       W = W - 1;
40     if (key == 'd')
41       W = W + 1;
42     if (key == 'e')
43       H = H - 1;
44     if (key == 'f')
45       H = H + 1;
46
47     println("ALPHA = " + str(degrees(ALPHA)));
48     println("RATIO (horizontal) = " + W *(width / (W+3 * G*tan((ALPHA/2)))) + ":" + width);
49     println("RATIO (vertical) = " + H * (height / (H+G))  + ":"+  height);
50     println("NEW (horizontal) = " + W * (width / (W+3 * G*tan((ALPHA/2)))));
51     println("NEW (vertical) = " + H * (height / (H+G)));
52
53
54 }
```

```
1  //Jasmijn Braakhuis 02/12/2020 adjustments of Jasmijn Vugts
2  //Honeycomp
3
4
5
6  int G = 20;
7  int W = 20;
8  int H = 20;
9
10
11
12 void setup() {
13   size(440, 440);
14 }
15 void draw() {
16   background(255);
17   for (int j = 0; j*H < height-H; j++) {
18     for (int i = 0; i*2*W < width - 2*W; i++) {
19       pleat(2*W*i, j*2*H);
20       pleat(W + 2*W*i, H + j*2*H);
21     }
22   }
23 }
24
25
26
27 void pleat(int x, int y) {
28   line(x, y, x + G, y);
29 }
30
31
32
33 void keyPressed() {
34   if (key == 'a')
35     G = G + 1;
36   if (key == 'b')
37     G = G - 1;
38   if (key == 'c')
39     W = W + 1;
40   if (key == 'd')
41     W = W - 1;
42   if (key == 'e')
43     H = H + 1;
44   if (key == 'f')
45     H = H - 1;
46
47
48
49   println("G = " + str(G));
50   println("W = " + str(W));
51   println("H = " + str(H));
52   println("TOP2TOP (horizontal) = " + 2*W + " (pixels)");
53   println("TOP2TOP (vertical  ) = " + 2*H + " (pixels)");
54
55   println("RATIO (horizontal) = " + ((2*W-G) * (width/(2*W))) + ":" + width);
56   println("RATIO (vertical) = " + height + ":"+  height);
57   println("NEW (horizontal) = " + ((2*W-G) * (width/(2*W))));
58   println("NEW (vertical) = " + height);
59 }
```