



# RhyThem Bodywear

## GENDER-AFFIRMING DANCE APPAREL

*The effects of gender dysphoria for athletes in dance and the apparel that will help them perform comfortably with confidence.*

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## Table of Contents

Preface: Definitions	3
Abstract	4
Introduction	4
History of Modern and Contemporary Dance	5
Dance Stage	6
The Athlete	7
Market Size	8
On Binding	9
State of the Art Product	10
Competitor Product	11
Strengths, Weaknesses, Opportunities and Threat Analysis (S.W.O.T.):	15
Physiological & Biomechanical Needs of the Dancer:	17
Materials	20
Manufacturing	22
In Preparation for Data Collection and Ideation	26
Benchmark Research Results	48
Consumer Research Results:	52
Consumer Shopping Trip	55
Ideation Plan:	56
Aesthetic Ideation Plan:	68
Material Sourcing Plan	73
Calendar	78
Ideation	78
Testing and Validation	85
Appendix	100
Connection Building	100
Working to Connect With	100
Data Collection Methods	101
Professional Development	103
Mentor mapping: Names, roles, companies and proof of life	104
Citations	106

## Preface: Definitions

Before embarking on this project and before reading the following paper, it is important to familiarize ourselves with vocabulary that will be used within this paper and project. If the sports and dance communities ever hope to become more inclusive spaces for all athletes to participate, we collectively need to learn and expand our dialogue to be inclusive and representative of all potential communities that will be the subjects of our designs.

*pronouns* - (noun) - a word that can function by itself as a noun phrase and that refers either to the participants in the discourse or to someone or something mentioned elsewhere in the discourse. (e.g., I, you, he, she, they we) (Pronouns, n.d.)

*transgender* - (adjective) - denoting or relating to a person whose sense of personal identity and gender does not correspond with their birth sex (Transgender, n.d.).

*transmasculine* - (adjective) - you were assigned female at birth and your gender identity and/or expression is masculine—but not necessarily male (Gillespie, 2020).

*agender* - (adjective) - denoting or relating to a person who does not identify themselves as having a particular gender (Agender, n.d.).

*non-binary* - (adjective) - one term used to describe individuals who may experience a gender identity that is neither exclusively male or female or is in between or beyond both genders. Non-binary individuals may identify as gender fluid, agender (without gender), third gender, or something else entirely (Understanding, 2020).

*cisgender* - (adjective) - denoting or relating to a person whose sense of personal identity and gender corresponds with their birth sex (Cisgender, n.d.).

*gender dysphoria* - (noun) - the feeling of discomfort or distress that might occur in people whose gender identity differs from their sex assigned at birth or sex-related physical characteristics (Mayo, 2019).

*body dysmorphia* - (noun) - a mental health disorder in which you can't stop thinking about one or more perceived defects or flaws in your appearance — a flaw that appears minor or can't be seen by others (Body, 2019).

*binding* - (verb) - involves the use of tight fitting sports bras, shirts, ace bandages, or a specially made binder to provide a flat chest contour (Bell, 2020).

\*More definitions will be added here as more learning takes place in order to keep this paper and project relevant and respectful.

## Abstract

The inclusion of trans athletes in the competitive sports arena has been challenged by committees and organizations for decades. Even today, as representation of the trans community becomes more accepted by the public, many face discrimination and violence from those who they would consider to be their peers, teammates, and supporters. Their right to participate still remains open for contention when it comes to their gender identity, regardless of their qualifications to perform the sport they chose. This paper hopes to shed light on the challenges that these athletes face by looking through the lens of dance, a sport with a very gender role defined history. Contemporary and modern dance were created as divergent expressions from classical ballet. Many young dancers begin training in ballet where the environment can be highly competitive and unhealthy. For young women, dance can be particularly challenging as an ideal body image is placed on them from a young age. For trans men, assigned female at birth, not only may they face the same scrutiny as women, they are doing so while facing feelings of gender dysphoria. They look to tools like commercial binders and other constraining apparel configurations to achieve an appearance of a flat chest to assuage these feelings of dysphoria. Not only is this uncomfortable, it restricts their breathing, impedes their posture, and can lead to long term health complications. It is the author's belief that if these athletes and dancers are given tools to perform and train comfortably as their gender identity versus their gender expression they can grow and improve in their respective disciplines.

Through researching the current market of products that the trans community utilizes in order to alleviate feelings of gender dysphoria, valuable insight into what works and what does not will allow a hypothesis to form around the type of product that needs to be created in order to properly support the dancer's needs. Further research will be conducted around the materials and manufacturing methods that exist for state of the art product that will allow deeper understanding into how this new product might be manufactured. Finally, intellectual property in the form of patents will be researched as well as current color and graphics in order to create and develop a collection of styles that will be unique in their design, function, and appearance. It is the belief of the author that if trans athletes are given more opportunities to grow and perform, they will gain recognition. With further recognition comes more in depth conversation of proper inclusion and representation in an effort to reduce stigma at the onset of participation and garnering a new wave of inclusion where inclusion is necessary.

## Introduction

Unfortunately, today, teenagers and adults who experience gender dysphoria face discrimination and exclusion while participating in dance. Their desire to perform as their

gender identity is seen as challenging or not accepted by those that train, coach, and support their cis-gendered counterparts. When a dancer joins a studio or training program they are usually placed into gender specific programs at a young age (Scher, 2020). This becomes a quick barrier to entry for trans dancers who want to perform as their identity. For those who identify as transmasculine, there are products that allow them to present in a more masculine format through chest binding and packing. These products are not recommended to be worn for more than eight hours in a day and not to be slept in overnight (Bell, 2020). It is also highly discouraged to perform any type of athletic performance wearing these as they can present health challenges that are dangerous to the wearer (Bell, 2020). For beginning dancers, all of these challenges can be a barrier to entry into this sport as well as many others. If these dancers still want to perform and present as the gender identity, products need to exist in order to give them this ability. This paper will explore how best to execute on this goal for transmasculine modern and contemporary dancers, ages 16-30, of all levels who wish to pursue this sport long term.

### History of Modern and Contemporary Dance

In the early 1900s there were a handful of dancers who were trained classically in ballet but began to feel disenfranchised with the tradition of the performance and desired an ability to inject emotion and free movements into their practice (Macfarland, 2020). Isadora Duncan was one of those dancers. She was classically trained but rejected the fundamentals she was taught in order to pursue choreography that expressed emotion through uninhibited freedom of movement, bare feet, and flowing costumes (Macfarland, 2020). This new style allowed dancers to free themselves from the need for corsets, petticoats, long sleeves and heavy skirts (Macfarland, 2020).

Martha Graham also felt that classical ballet was too focused on grace and fluidity and did not connect with deeper emotions and themes (Macfarland, 2020). She developed a method of muscle control called “contraction and release” which gave her movements hard and angular expressions (Macfarland, 2020).

Merce Cunningham, noted as one of the greatest creative forces in American dance, built off Martha Cunningham’s work and provided his own choreographies and techniques (Merce, n.d.). His work was defined by precision and complexity and many pieces utilized intense physical expression and challenged the roles of dancer and audience, as well as pushing the boundaries of the stage (Merce, n.d.).

The pioneering spirits of these performers has survived to today’s contemporary and modern dance practices and their influence can be seen in Jazz, Tap, Hip-Hop, and even ballet (The Top 10 Types of Dance, n.d.). Upon interviewing a handful of dancers, both transgender

and cisgender, they all discussed how they started their formal training in ballet and eventually switched into modern or contemporary dance due to the freedom of expression and in some cases, the freedom from gender defined roles that were limiting and uncomfortable.

### Dance Stage

Dance training often happens in a studio environment. These studio spaces are kept a moderate temperature of around 21-24 degrees Celsius or 70-75 degrees Fahrenheit (What, n.d.). Illumination with natural light is ideal with windows above eye height to avoid distraction (What, n.d.). If the focus of the space is to prepare the dancers for a theater performance, it is recommended to blackout the space and utilize installed lighting (What, n.d.). Most studios have a marley floor that rolls over a hardwood or other flat surfaces for protection as well as provide a smooth surface for the athletes to move along (Harrison, 2016). Dance studios frequently have mirrored walls to allow dancers and instructors the ability to study their movements while learning choreography, but is advised to have curtains to close the mirrors when they can provide distraction. For music, making sure that the sound is crisp is beneficial but incorporating curtaining in the space to dampen the sound from reverberating around is recommended (What, n.d.).

While formal positions may not exist, like those in competitive sports, within contemporary dance companies there may be different roles or parts that dancers can be cast in for specific performances. These roles come with choreography that must be learned to convey the message or theme of the performance. The New York Film Academy (NYFA) recommends regular practice, cross training, and proper dress can help you be prepared for an audition (Kantilaftis, 2020). To be successfully cast in the role they desire, dancers will train and audition with pieces of the choreography they want to perform, but NYFA also recommends having back up pieces prepared in case the panel of judges asks to see more work (Kantilaftis, 2020). The ultimate goal is to learn the choreography and successfully perform the piece in front of their audience.

The final stage on which dancers execute their performance can be different from the environment that they trained in. They may wear different outfits or costumes that are required for the show and these can vary by culture, location, and performance (Mackrell, n.d.). The stage lighting, costuming, props and sets can enhance the overall dance performance (Mackrell, n.d.). It is theorized that dancers may feel more nerves or pressure during the performance that they do not experience during practice. It is further believed that this

pressure could cause psychological challenges and potentially result in missing movements in their choreography.

For trans dancers, the challenge arises with gender specific roles, especially as they have been defined by classical ballet. Women traditionally receive more delicate roles and are placed on pointe whereas men take bold roles with large jumps, lifts, and dynamic movements (Pettit, 2019). Modern and contemporary dance have less defined gender roles and have recently challenged these roles by switching what would be the classical conventions of ballet. You will see women in roles reserved for men and vice versa. You will also see two women in a performance together as well as two men (Pettit, 2019).

### The Athlete

Many dancers who practice contemporary or modern dance began their formal training in ballet (Fournier, 2018). It is recommended to start this training at a young age and in a studio environment with children of their same experience level and oftentimes, same assigned sex (Contributors, 2016). This training is where many dancers learn the essential building blocks to moving their body. This fundamental training allows dancers to take their expression into their own form and develop into different practices like contemporary and modern (Fournier, 2018).

Key insights were gained after speaking with several dancers, both transgender and cisgender, who received classical ballet training in their youth. The first was how strict formal ballet training is for children and young adults. There was little freedom in the movements needed to perform at a high level for a routine. It was a demanding environment that placed a lot of pressure on their bodies and minds to get the choreography memorized and performed perfectly.

This led to the next insight, the scrutiny placed on having the ideal body type. A dancer needs to wear more form fitting clothing for the instructor to visualize the line of the body (Nolan, 2016). In the past, a large amount of attention was paid to body weight and physique and what was classified as the ideal ballet dancer body (Nolan, 2016). This critical attention leads many dancers to experience body dysmorphia which is defined as "an obsession with an imaginary defect in physical appearance or an extreme concern with a slight physical blemish, which other individuals may not even recognize (Russo, 2020)."

For transgender, non-binary, and agender dancers, not only can they face this body dysmorphia, but as they begin to understand their gender identity further, they may start to experience gender dysphoria, or the discomfort felt when their internal gender identity does not match their external gender expression through their assigned sex at birth (Mayo, 2019). Gender dysphoria can occur at different stages of life (Mayo, 2019). Some experience it at a young age through adolescence as their body develops and others encounter it well into their

adult lives (Mayo, 2019). For transgender men assigned the female sex at birth who practice ballet and dance, this can be exceptionally challenging. Not only is there pressure to have an ideal body type for a female dancer, they are also potentially facing gender dysphoria around the parts of their body that do not represent their internal masculine gender identity.

For this project, it will be important to focus on transgender men, non-binary, and agender dancers who are facing gender dysphoria and need assistance to represent their body as their gender identity and not their physical gender expression. The age range that will be looked at will be 16-30 where dancers have developed into their physical expression post puberty and may be experiencing gender dysphoria with the physical traits of their assigned sex. It must be made clear, however, that not all those who identify as transgender or as non-binary feel the need to pursue gender-affirming surgeries to alleviate their gender dysphoria. While this may be an option for some who experience dysphoria, it may not be an option for others for a handful of reasons, many of which are personal. For those dancers as well as those who do eventually wish to transition, product interventions need to be designed to help them perform as their gender identity.

Many trans men and non-binary dancers choose to use binding techniques to compress their breast tissue to give a flat chest appearance (Bell, 2020). This technique is not recommended for physical activity, as will be discussed later in this paper, due to the many health problems and limitations this can place on the dancer's body (Bell, 2020). They may also choose to place a packing device in their underwear to represent a more masculine appearance (Binding, n.d.). This can take the form of a prosthetic penis or of a padded insert (Binding, n.d.). While this has less physical restrictions and limitations for performance, there are not many solutions for the dynamic movements that dance requires that can help to keep this in place. The goal for this project, then, is to provide transgender, non-binary, and agender dancers with the proper apparel to comfortably dance and not fear exposure or discomfort as their gender identity.

### Market Size

Estimating the size of the market for the transmasculine, non-binary and agender dance community is challenging as there are not many public records that contain questions around gender identity. Investigations have been completed, however, which give a relative estimation to those who may identify as transgender. According to a New York Times article from 2015, the Census Bureau conducted a study to analyze people who were likely transgender based on information from the Social Security Administration that noted people who changed their name or sex (Miller, 2015). It noted 136,367 people since 1936 who had changed their name to that of the opposite sex and 30,006 who had changed their sex (Miller, 2015). According to the



same article, in the 2010 census, 89,667 had changed their names and 21,833 had changed their sex (Miller, 2015). Unfortunately, further investigation to this study from the Census Bureau was not found.

While this information begins to illustrate the number of transgender people in the United States who may benefit from a product like this, it presents many problems as well. According to same Times article, a study conducted by the National Center for Transgender Equality in conjunction with the National Gay and Lesbian Task Force noted that 71% of transgender people hid their gender identity to avoid discrimination (Miller, 2015).

In discussion with Rowan Ching, a non-binary and transmasculine identifying dancer in Philadelphia, it was felt that there could be thousands of trans dancers in the community (R. Ching, Phone interview, November 1, 2020). Their experiences and interactions while participating in different dance festivals and performing in different communities led them to meet many others who dance and identify as transgender or non-binary. They also expressed that many are very scared to identify publicly as transgender or non-binary as it may negatively impact their current or future careers (R. Ching, Phone interview, November 1, 2020). While this is not conclusive data driven information, it sheds light on a community who could benefit from a product that would allow many to perform or practice dance and do so as their gender identity without fear of repercussions.

### On Binding

The act of chest binding is when breast tissue is compressed to give a flat chest appearance (Bell, 2020). This is a common practice among anyone who does not want their chest to look feminine including the trans male/transmasculine, non-binary, and agender communities. The suggested safe methods are commercial binders (like the *gc2b* binders), sports bras, strategic apparel layering, and elastic materials (Bell, 2020). While readily accessible and discreet, binding with duct tape or plastic wrap is not recommended as it can be harmful to the skin. If people chose to bind frequently, it is recommended to take multiple breaks throughout the day. It is suggested to take days off from binding as well (Bell, 2020).

Studies have shown that binding continuously can have negative side effects including skin and tissue problems, pain in the chest, shoulders, back, and abdomen, respiratory problems, and musculoskeletal problems like posture change and rib fractures (Pietzmeier, 2017). Frequent binding can also affect skin elasticity and could negatively impact surgery outcomes if gender-affirming surgeries including double-incision, peri-areolar, or keyhole mastectomies are desired (Pietzmeier, 2017).

Binding is not recommended for athletic activity (Bell, 2020). It restricts proper breathing, limits free body movement, and presents challenges with moisture management

when sweating (Bell, 2020). Many binders provide limited thermoregulation so binding in warm climates and environments as well as when doing high energy activities can be uncomfortable. Sports bras are one of the only options that provide compression without as many limitations. Many trans athletes, however, will use two sports bras (one forward and one backwards) to achieve the desired chest flattening effect (Bell, 2020).

Upon interviewing multiple athletes and dancer's in the transgender and non-binary communities, another consideration with binding is breast size. They mentioned how different methods of binding can accommodate different breast sizes more comfortably. Rowan Ching noted that because they had smaller breast volume, they could use trans tape (trans focused elastic tape) for binding and that did an adequate job of reducing feelings of dysphoria while dancing (R. Ching, Phone interview, November 1, 2020). They did note that because they have asthma, the binding still affected their breathing while performing. Nik Burian, a Crossfit enthusiast and occasional dancer noted that because they have a larger breast volume, they will sometimes wear two sports bras to get the appropriate amount of compression they are looking for (N. Burian, Phone interview, November 25, 2020).

Another factor that can cause varying levels of dysphoria is the ability to see the binding material or binding apparel from outside of any clothes that are layered on top of the binder. As many dancers and athletes who bind do so with the hope to present as either masculine or non-binary, they often do not want to reveal the binding underneath their clothing that may have the appearance of a bra or that they have breast volume that is being concealed. For this reason, it needs to be taken into account that visibly being able to see the binder from underneath a t-shirt or tank top is not desirable when designing the final product.

### State of the Art Product



*Fig 1. A gc2b half binder (OUR, n.d.)*

The *gc2b* half and tank binders are the most popular and most widely recommended binders on the market. They are built for everyday use and not explicitly recommended for athletic use (OUR, n.d.). Since there are not many alternatives to this on the market, this has become a product that some athletes will use when performing sport or dance.

The exterior of the binder is made from an 80% nylon 20% spandex knit blend (OUR, n.d.). The interior is made from an 80% cotton 20% polyester knit blend (OUR, n.d.). The exterior is advertised as built for breathability while the interior is made for comfortable compression (OUR, n.d.). It is a “patented front and back, double panel, mixed material design to construct a flat appearance through superior tissue distribution and comfortable compression (OUR, n.d.).” The binder appears to split horizontally along the back and split at the shoulder straps on the front. There is self-fabric or roll-over binding around the arm hole openings and same at the neck opening. The Half Binder retails for \$33 and the Tank retails for \$35 (OUR, n.d.).

### Competitor Product

As illustrated when discussing binding, there are several options that athletes use to achieve the right level of compression for their gender dysphoria. Sports bras with adequate compression can start to provide a flat chested appearance but depending on the size of the breasts and the amount of compressive material in the sports bra, one sports bra may not be enough. Resources on binding recommend wearing two sports bras, one forward facing, one backward facing to help achieve the level of compression that most transmasculine, non-binary, and agender athletes desire (Bell, 2020).

In a review of popular sports bras that resonated with the queer and trans-inclusive community, these were the ones that performed the best.



Fig 2. A Tomboy X Essentials Soft Bra (Essentials, n.d.)

The Tomboy X Essentials Soft Bra is a 95% cotton, 5% spandex knit blend that provides light support without the use of an underwire or padding (Essentials, n.d.). It has a scoop neck front and back which can be helpful to prevent revealing the bra under clothes. It retails for \$32 (Essentials, n.d.).



*Fig. 3 An Under Armour Mid Sports Bra (Women's, n.d.)*

The Under Armour Mid Sports Bra is 87% polyester, 13% elastane knit blend that provides a tight fit best suited for A to C cup breast volume (Women's, n.d.). It is double-lined without padding that presents an acceptable flattening effect (Women's, n.d.). The material has 4-way stretch and moisture wicking properties. It retails for \$28 (Women's, n.d.).



*Fig 4. A Champion Infinity Sports Bra (The Infinity, n.d.)*

The Champion Infinity Sport Sports Bra features a 89% Nylon, 5% polyester, 6% spandex knit blend (The Infinity, n.d.). It has removable cup padding and seamless construction that helps to reduce chafing. It retails for \$30 (The Infinity, n.d.).



Fig 5. A Joylab High Neck Brushed Jersey Bra (Women's High, n.d.)

The JoyLab High Neck Brushed Jersey Bra features a 87% Recycled Polyester, 13% Spandex knit blend (Women's High, n.d.). The construction utilizes light structure to help provide a compression effect as well as having removable cups to allow for a flatter appearance if desired (Hansen, 2020). It retails for \$19.99 (Women's High, n.d.).

Outside of sports bras, the other popular method for binding is the use of elastic tape. These are a couple of the popular options.



Fig. 6 Trans Tape Material Breakdown (Binding, n.d.)

Trans Tape is knit narrow fabric built from 95% cotton, 5% spandex in roll format with an adhesive backing (Binding, n.d.). It comes in various sizes and is advertised as waterproof and sweat proof and acceptable for exercising (Binding, n.d.). It is applied in various ways to allow for proper compression depending on the user's breast size and comfort preferences (Binding, n.d.). See visual below for visual graphics provided by the Trans Tape website on how best to apply the tape. A single roll of 3" wide Trans Tape retails for \$14.99 (Binding, n.d.).

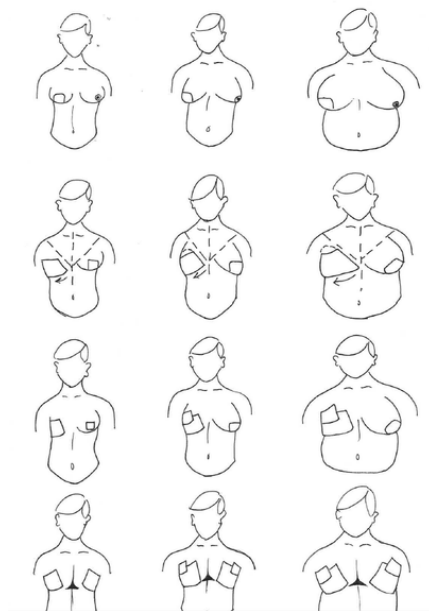


Fig 7. Trans Tape application graphic (Binding, n.d.)



Fig. 8 KT Tape Use Breakdown (Athletic, n.d.)

KT Tape, similar to Trans Tape, is another tape adhesive used by the transgender community for binding (Athletic, n.d.). It is advertised as being constructed from “100% cotton fibers with elastic cores (Athletic, n.d.)” It is built to reduce discomfort and pain by reducing

pressure to muscle tissue (Athletic, n.d.). One roll of KT Tape Original Cotton retails for \$12.99 (Athletic, n.d.).

### Strengths, Weaknesses, Opportunities and Threat Analysis (S.W.O.T.):

The current landscape of products to consider for this project include commercial binders, sports bras, and athletic wear used for training. We will analyze the strengths, weaknesses, opportunities and threats for each to analyze areas for new products opportunities.

#### Strengths:

Current commercial binders, like the gc2b binders, are functional for binding in the non-athletic arena. They are widely popular within the trans community and come in a variety of color and print options depending on your skin tone and graphic preference. They are regarded as relatively comfortable and provide the necessary relief from gender dysphoria that many are looking to achieve. They are priced competitively to sports bras and similar undergarments.

Sports bras and athletic training wear are built specifically for athletic activity. They usually include a combination of the following features: moisture wicking, breathability, compression, mobility, UV protection, comfort, and support. They are made of durable materials like nylon and polyester. They are engineered for the sports and activities they are designed for and give cisgender users the appropriate anatomical support their bodies require. Sports bras can be competitive in price when they do not have as much elastic or added features included. Other athletic apparel comes in a wide range of styles, cuts, shapes for your personal preference or specific needs.

#### Weaknesses:

Current commercial binders are not built properly for athletic activity. Worn during normal everyday activity, they are not recommended to be worn for more than 8 hours (Bell, 2020). They are not recommended to be used for athletic activity due to their highly constrictive nature which can restrict breathing and mobility (Bell, 2020). While they can help to provide ease from gender dysphoria when worn during athletic activity, if they are revealed from underneath the exterior layered garments they can cause further dysphoria. This revelation of a concealment device defeats the intended purpose of the device and has been noted to make some in the transgender community very self-conscious. While made from similar athletic materials as sports bras, they do not provide the same level of moisture wicking and breathability that their athletically designed counterparts provide.

The nature of binders as a means to mask or disguise parts of a person's physical appearance can be a challenging stigma for those in the transgender community to overcome. Younger trans boys and men who may live at home with their parents can often have feelings of shame or embarrassment if they need to ask their parents for help in purchasing these objects. Objects like these that are meant to provide feelings of empowerment can sometimes be seen as the opposite to those who do not fully understand their purpose or are not as accepting of those who are undergoing feelings of gender dysphoria.

Sports bras and athletic apparel can be very revealing for the trans community. While sports bras are compressive, they do not provide the flat chest appearance that trans masculine athletes are looking for. Sports bras often enhance the physical appearance of breast tissue as opposed to reducing their appearance. Tights and leggings can enhance the shape and appearance of hips. If sports bras are worn to provide compression for trans dancers, they will often wear two of them to achieve the level of flat chested appearance they need. No real options exist on the market for the trans community. Sports bras also can be challenging to hide underneath other layers of athletic wear as the straps and breast support can be revealed from the neck line and the arm holes of t-shirts and tank tops.

Cost for all of these pieces of apparel can range widely. Higher performing sports bras and binders can be more expensive if higher quality materials and constructions are incorporated. Many athletes purchase multiple if they are participating in regular activity to have a clean one on hand. If a dancer needs to purchase two sports bras to achieve the level of compression desired during one instance of activity, they may need to purchase two more in order to have two sets of sports bras to rotate between for their athletic needs. The same can be considered for binders which may be used during every day non-athletic activities in the same way undergarments are worn. For younger trans men and non-binary individuals as well as those who may not have as much money to buy these items, it can be challenging to have as many as may be necessary to feel prepared.

#### Opportunities:

As there are currently no products on the market that address binding and packing for the athletic trans community, there is a window for products that can help to provide a relief from gender dysphoria for these performers. Even within commercial binding products, options that provide more breathability and moisture control need to be added to the market. There is an opportunity for both better binding apparel as well as apparel that includes binding as part of the apparel to reduce the need for multiple products and create a new category of gender affirming apparel.



Better sizing considerations for breast volume in binding as well as inclusive language around sizing for the transmasculine community are limited for the current products on the market. A new process for sizing and designing gender inclusive and non-gendered products is necessary for sportswear designers of the future, especially with the inclusion of more transgender and non-binary athletes.

#### Threats:

To create products that can facilitate binding and packing within athletic apparel, different methods of either binding or shaping need to be considered in order to present in the manner that trans dancers wish to present their bodies. If apparel is created that masks the physical expression of a trans man's body within a t-shirt for example, structure may need to be included that presents a flat chest appearance or reduces the appearance of hips. These inclusions could potentially interfere with the mobility needs of dancers. Different body types, bust sizes, and figures will require tailoring and potential product modifications to present to their standards. A one-design fits all approach cannot be applied in this situation. Different body types need to be considered to meet their specific physiological, biomechanical, and psychological needs.

#### Physiological & Biomechanical Needs of the Dancer:

For dancers, the body is the primary instrument for performance and is heavily scrutinized during practice. For young dancers, puberty can play a large role in physical development that can enhance characteristics that are beneficial for movement and appearance. For trans dancers, specifically transmasculine dancers, however, these changes can present many challenges in feeling comfortable within their body.

Dancers have unique needs with regard to the complex set of movements that they place their body through in practice. They need to be visually physically fit and usually can regulate this through diet and exercise. Dance fitness utilizes both aerobic and anaerobic conditions and requires the dancer to develop high levels of muscle tension/muscle strength (Koutedakis, 2004). In comparison to other competitive athletes, a dancer's oxygen uptake may register lower than that of a runner, for example (Koutedakis, 2004). Within the dance world, however, modern and contemporary dancers have been shown to have relatively high VO<sub>2</sub> max values (Koutedakis, 2004). The development of their aerobic capacity is often developed independently of their dance practice as this practice does not always result in high levels of intensity (Koutedakis, 2004). This means that supplementary training or cross-training may be needed to maintain and increase overall aerobic capacity (Koutedakis, 2004).

Dancer's anaerobic needs are usually in short intervals during movements that require a large amount of power (Koutedakis, 2004). Modern dance has seen a higher anaerobic threshold in comparison to ballet as it requires a higher frequency of acrobatic sequences that can last 30-60 seconds (Koutedakis, 2004).

A dancer's muscular needs can vary depending on the type of dance they are doing and the required positions and movements they will practice during a performance. As dance can place heavy scrutiny on the aesthetic proportions of the dancer, sometimes a more muscular figure is not as desired. Stronger leg muscles, in particular the hamstrings and quadriceps, can be desirable for improved performance (Koutedakis, 2004).

Dancers are also at risk for injury even though they may not produce the same amount of power output in relation to other athletes. In a study of 324 dancers, it was seen that almost 50% of the dancers needed to take at least one day off due to injury and some needing to take over 3 weeks (Koutedakis, 2004). The most commonly reported injuries are around the lower back, pelvis, legs, knees and feet as much of the work done for performance is in high impact lower body work (Koutedakis, 2004). Building muscular strength can help to prevent these injuries in many cases (Koutedakis, 2004).

Muscle flexibility and joint mobility (MFJM) are also highly desirable for dancers (Koutedakis, 2004). According to the Koutedakis study, there are around 17 known factors that contribute to MFJM but many of them are linked to heredity which leads the author to suggest that younger dancers should be reviewed when they begin training to determine their inherent MFJM and to see their potential moving forward into practice (Koutedakis, 2004).

Body weight is another area for scrutiny within dance practices. Classic practices, like ballet, place heavy emphasis on the lean and aesthetic appearance, especially for female dancers. This can lead to body image challenges and often to eating disorders especially in younger dancers (Russo, 2020). They often will consume 70-80% less of the recommended amount of daily calories needed and this can lead to serious problems like higher risk of injury, and for female dancers, amenorrhoea, and osteoporosis on top of eating disorders like anorexia (Koutedakis, 2004).

From a biomechanical standpoint, there are many dynamic movements that the body must undergo to perform the different routines and positions. Extreme flexion can occur at various joints including the hip, knee, and ankle which can result in many injuries in these locations (Wilson, 2008). The muscles and joints work together to perform these complex series of movements and a development in strength can help make performing these tasks easier for the dancer (Wilson, 2008). Warming up is critical for dancers to prepare the body for the forces that will be placed upon the body during a given series of movements. The dancers will be moving both horizontally and vertically, loading their joints and creating torque that will

propel them through the space (Wilson, 2008). The forces that are placed on the body can be upwards of three to five times their body weight (Wilson, 2008). They can be placed vertically or in a shear direction on bones and joints throughout a series of choreographed movements (Wilson, 2008).

Balance is also critical to maintaining their vertical orientation throughout a variety of directional movements of not only their limbs but their entire body (Wilson, 2008). Postural adjustments along with subconscious motor programming can help maintain this vertical orientation (Wilson, 2008).

Breast biomechanics and physiology need to be taken into careful consideration regarding the target user group. During sport performance, breast tissue moves independently of the torso, though its initial motion is driven by torso movements (Mills, 2018). Breasts contain no muscle and inherently have little internal support (Mills, 2018). As breast size increases, higher demand is placed on the body, especially on the posterior chain of muscles that run down the back that help to correct posture (Mills, 2018). Differences in breast volume and its projection from the chest can affect a person's posture and strain on back and shoulders as well (Mills, 2018). Variations in breast density amidst supple and firm tissue can affect how breasts can be compressed against the torso (Mills, 2018). Attachment shape and location of the breast to the torso can also affect breast pain during athletic activity (Mills, 2018).

All of these considerations and studies are focused around cisgendered athletes (as far as those conducting the studies may be aware). Recognizing this key point is important when considering how a transgender dancer may be facing these physiological and biomechanical movements and challenges. For a transmasculine dancer who may have received training when they were younger that was focused for those who identify as women and girls, there are a handful of concerns around the challenges they may face with their body. First to consider is the development of a transgender man or boy. The sex of their body assigned at birth may be female and during puberty, as they begin to develop the anatomical features of their assigned sex, breasts and hips, they are also potentially facing feelings of gender dysphoria concurrently. This can lead them to feel the need to mask those parts of their body that do not reflect their internal gender identity.

A handful of key challenges may be faced when experiencing gender dysphoria and subsequently binding and packing for transmasculine dancers. Binding the breasts to provide a more masculine and flat chest not only can have inherent issues when not performing dance, as previously noted, it can also reduce the wearer's ability to intake oxygen during their performance. As dance is a heavily aerobic practice, this can prevent a dancer's muscles from receiving the adequate amount of oxygen to perform the tasks at hand. Binding can also shift

the wearer’s center of gravity as they compress their breasts, leading to a shift in their inherent balance. It was also noted that after prolonged binding, some users noted postural changes (Pietzmeier, 2017). For dancers, posture and the vertical line are very important. Packing also can provide a challenge for dancers when wearing an external appendage that their body has not been trained to move with. This appendage can shift and get in the way if not properly placed and secured. Not only can it potentially impede mobility, it can also distract the dancer if it were to move.

The distraction of the dancer leads the review to consider not only the physiological and biomechanical considerations, but also the psychological considerations that a transmasculine dancer will face when practicing and performing dance. Their gender dysphoria can increase their awareness of the parts of their body that do not align with their gender identity. This increase in a self-conscious feeling can also be both distracting and unsettling, leading to poor overall performance.

Materials

The sports bra market was selected as the first area of investigation to understand the different materials that have been used to create support, comfort, and compression during sport performance. Most sport bras are made from a knit blend of fibers including nylon, polyester, cotton (in some instances) in conjunction with elastane for the stretch and compression component. As an undergarment component that is often worn under other pieces of apparel, it is important that the fabric almost becomes like a second skin while still providing the material benefits that a performer needs while dancing (Perling, 2019). Key features that are beneficial from good sports bra fabrics include moisture wicking, comfort, elastic support, reduced chafing, and protection (Perling, 2019).

Brands like Lululemon claim a knit fabric blend of 56% nylon and 44% spandex is best for enhanced stretch and recovery (Enlite, n.d.). The fabric is also able to be free cut to reduce the number of seams needed and increase its overall comfort (Enlite, n.d.). Different brands use different blended percentages for proprietary fit as well as being tailored to specific types of activities. The table below (Fig. 9) cross references different brands, their popular bra style, and their material breakdown percentage.

Brand	Bra Style:	Material Content:	Material Construction:	Designed For:
Lululemon	Elite Bra Zip Front High Support	56% Nylon; 44% Spandex	Knit	Running

Brand	Bra Style:	Material Content:	Material Construction:	Designed For:
<b>Puma</b>	High Impact Women's Front Zip Bra	77% Polyester; 23% Spandex	Knit	High Impact Training
<b>Reebok</b>	Puremove+ Bra	73% Nylon; 27% Spandex	Knit	All Impact Training & Running
<b>Brooks</b>	Dare Crossback	63% Nylon; 37% Spandex	Knit	High Impact/ Running
<b>Athleta</b>	Rise Up Bra A-C	Recycled Polyester; Spandex	Knit	Medium Impact Workout
<b>Outdoor Voices</b>	Apex Bra	77% Nylon; 17% Spandex; 11% Polyester	Knit	Medium Support
<b>Tracksmith</b>	Allston Bra	57% Nylon; 43% Spandex	Knit	High Compression/ Running
<b>Runderwear</b>	Original Support Running Bra	68% Nylon; 32% Spandex	Knit	Running

Fig 9. Brand breakdown of sports bras with different material/elastane contents (Enlite, n.d.; High, n.d.; Reebok, n.d.; Dare, n.d.; Rise, n.d.; Apex, n.d.; Allston, n.d.; Runderwear, n.d.)

This chart details how activities requiring higher bounce retention like running utilize a higher percentage of elastane. The Lululemon and Tracksmith examples, targeted for running, have over 40% elastane content.

Materials like nylon and polyester are performance fabrics built for durability, moisture wicking, breathability and quick drying. Similarly, spandex (also referred to as elastane or brand name Lycra) are built for their compressive capabilities, stretch and material retention. Both materials are constructed from fibers that originate from petrochemicals. While this has become an industry standard for over half a century, it is important to consider alternative materials that may provide similar features while reducing the overall impact on the environment and provide safe solutions for materials that come in such close contact to the body.

Fabrics such as wool and hemp are not as prevalent in this product landscape, though they have a series of performance benefits that could be accessible to this market. Hemp is soft and has inherent bacteria resistance (Pickering, 2020). It also has natural moisture wicking capabilities and it retains color well over its usage (Pickering, 2020). Wool also has plenty of inherently beneficial properties including odor resistance, natural elasticity, breathability and cooling effects (Wool, n.d.). These both will be considered as the project moves into the

materials selection phase. Sustainable and eco alternatives are starting to come into the market as elastane alternatives but they may still be too early in development for consideration.

Initial interviews with a handful of trans and non-binary athletes shed light on the desire for softer fabrics that are worn for binding purposes. Many indicated cotton as a preferred materials that evokes comfort. This should be taken into consideration as well in the material selection process.

### Manufacturing

Current manufacturing practices vary when it comes to binders and sports bras. The gc2b binder is built from a classic cut and sew construction which helps to keep overall costs down (Washington, 2016). Trans Tape is a narrow fabric product that is knit to the specified length and width and has a proprietary blend of elastic and adhesive properties (Binding, n.d.). Sports bras, on the other hand, are built from a variety of different methods and provide unique benefits that may be important to consider for this project.

Seamless knitting construction is one construction method on the market that allows the sports bra to reduce uncomfortable seams that can chafe and dig into key movement zones on the chest (Seamless, n.d.). With this type of manufacturing process, different zones can be built and segmented that can allow for varied compression, support, ventilation, and shape (Seamless, n.d.). This can be beneficial in creating a minimal appearance while providing higher levels of comfort during different movement based activities like dance. A seamless knit garment can be built in one piece on a flat bed knitting machine.

Traditional cut-and-sew methods for bra construction are common and can provide subtle shaping by the nature of the curvature of seam lines and the stretch direction of the fabric (Loehr, n.d.). This construction method takes the direction of the stretch of the material into close attention in order to help shape the cup of the bra (Loehr, n.d.). The stretch direction of the material helps to shape the direction of the breast tissue inside the cup. According to Loehr, placing vertical movement in the fabric is beneficial for the lower pieces of the bra that help with lift in the cup while horizontal movement can help move breast tissue away from the side of the body and towards the center of the torso (Loehr, n.d.).

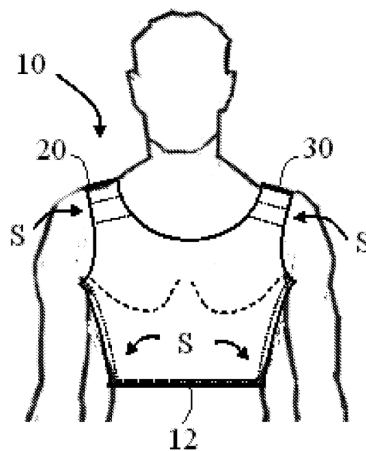
For traditional bras, the lockstitch is used to provide strength and stability whereas the zigzag stitch is essential for accommodating stretch (Apparel, 2020). Where straps are coming together or areas where extra strength is needed, bartacks can be placed to provide reinforcement (Apparel, 2020). Double needle lockstitching is used when applying tape or wire containing components for extra reinforcement (Apparel, 2020).

Another method for providing support and comfort is molded paneling. These panels can be created by laminating foam padding with layers of fabric then heat compressing the

assembly within a set mold shape (Apparel, 2020). Once the laminated foam cup is created, a separately molded fabric layer is stitched onto the cup (Apparel, 2020). This construction can be beneficial for medium to higher impact activities though it can provide a challenge for transgender athletes who do not want to highlight the contours of their breast volume. It could, however, lead to an exploration on different types of paneling that could mask the shape of the chest with a molded design.

Encapsulation construction emulates fashion bras that separate the breasts into two distinct cups (Perling, 2019). They provide support through the patterning and seaming of the product as well as molding or the use of underwires (Perling, 2019). They can provide a better fit and comfort over compression bras (Perling, 2019). For transgender athletes, however, this distinct separation of the breasts and fashionable approach is not as desirable of a feature as they would like to reduce as much attention to the breast volume as possible.

## Patents



*Fig. 10 Patent Drawing of gc2b binding apparatus (Washington, 2016)*

The patent drawing shown in Fig. 10 represents the gc2b binding apparatus that is currently on the market. Classified as “a chest binder for holding great tissue substantially flat relative to a thorax of a wares body” this patent goes through the seaming, panel construction and types of stitching that are used to create this product (Washington, 2016). It also illustrates the material content of stretch versus non-stretch materials and their percentages within ranges which will be useful to analyze while exploring material blends for this project (Washington, 2016).

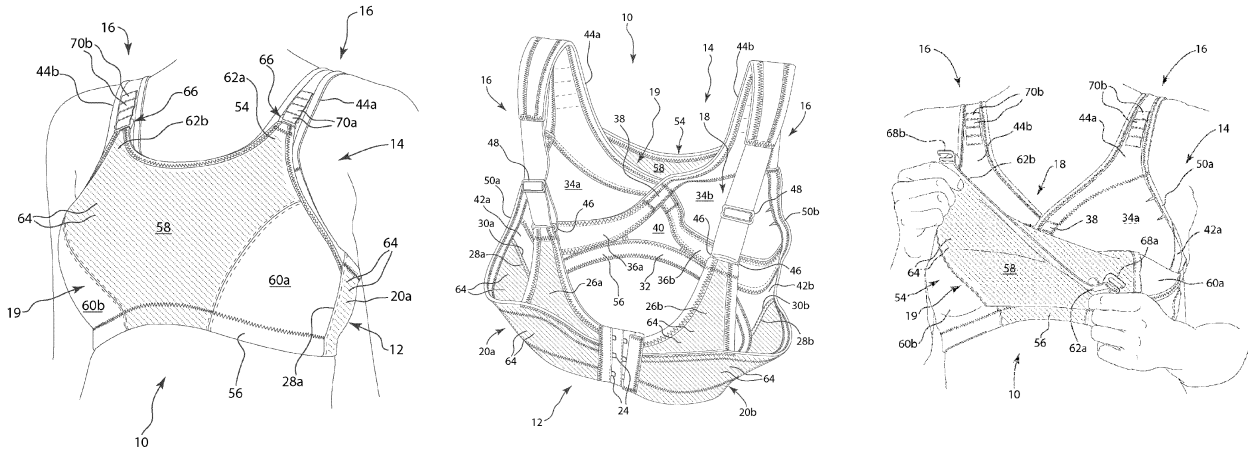


Fig. 11 Patent Drawing of Variable Compression Hybrid Design Sports Bra (Pundyk, 2013)

The variable compression design in Fig 11 is a reference to examine when looking at different methods for the wearer to self-regulate compression as necessary (Pundyk, 2013). It provides the user with maximum control and comfort (Pundyk, 2013). The design reference is a hybrid compression and encapsulation construction that provides the breasts with cup support and bust support (Pundyk, 2013). This reference could allow a transmasculine athlete the ability to increase and decrease compression in various situations.

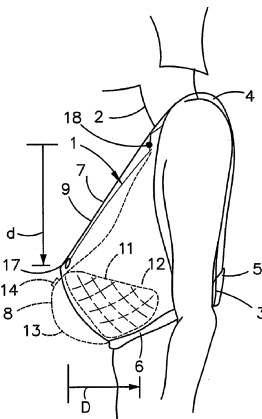


Fig 12. Sports bra design for large breast support and compression to reduce exercise induced breast discomfort (Steele, 2012)

The sports bra design above aims to help those who suffer from exercise induced breast discomfort or EIBD (Steele, 2012). This can happen when the breasts move too much for the user while performing exercise like running, dance, or any athletic activity that causes



the breasts to move in a way that is painful to the athlete (Steele, 2012). This design is aimed more towards those with larger breasts and it works with encapsulations and compression to elevate and compress the breasts (Steele, 2012).

### Color, Graphics, & Logo Applications



*Fig 13. A review of color application in contemporary dance performance*

As binding and packing apparel pieces are usually worn under other garments, many are treated like shape and body wear and the colors come in a range of skin tones. They also may be treated like underwear and receive relatively simple graphic application. With these considerations in mind, it is beneficial to look to materials and colors that work well with a variety of skin tones or can be dyed to match in an appropriate manner. This direction is necessary if the product to be designed goes underneath other garments. Graphics could be applied internally within the garment to provide messaging and instruction that only the wearer can see.

If an apparel solution is created that contains the binding and packing functions within a garment that is visible to the public, then graphics and colors can be considered that are more outwardly appreciated. In this scenario, colors and graphics that are relevant in the modern and contemporary dance worlds can be considered for external application.

For dance, color can elicit emotion and mood within both the audience and the dancer. For that reason, colors worn externally are chosen intentionally by choreographers depending on the theme of the performance (Di Orio, 2016). In an article on how color affects

choreographers, three different choreographers discussed their process in selecting and incorporating color for performance and how it can shape an audience’s emotion and mood (Di Orio, 2016). According to Ursula Verduzco, a New York City freelance dancer and choreographer, “Color can say so much. It can create a mood or enhance a theme, it can transform a powerful dancer into an unstoppable force or help a soft intention become ethereal (Di Orio, 2016).”



*Fig 14. A review of color application in contemporary dance training*

In modern and contemporary dance, logos are not commonly included. No direct rules or guidelines prohibit their usage, but it can be inferred that the use of logos would be distracting from the overall performance. In contrast, however, training apparel for dance can range dramatically.

For this project, it may be beneficial to consider the multiple applications where dance apparel and body wear is needed and explore two sets of color graphic and print palettes, one for performance and one for training. Graphics can also be explored to help illustrate functionality through messaging and iconography only the user can see inside the product.

### In Preparation for Data Collection and Ideation

The conversation around gender identity in sports has received insufficient attention from the public, as well as the brands who support these athletes. Many athletes in fear of

discrimination and violence hide their gender identity to protect themselves so that they can participate and compete in the sports that they love. This fear can prevent more athletes from reaching levels of notoriety that could help bring visibility to the community. There are a handful of notable transgender and non-binary athletes who share important information to their communities around awareness and education but the burden should not rest solely on their shoulders. It is important that resources are available to everyone that can help change the conversation from one of discrimination to one of inclusion. This type of inclusion needs to occur in many different areas, but one where important change can be made is within design.

Traditionally, apparel brands offer products broken up by category and gender allowing customers the ability to narrow down their product focus to their specific needs. While this binary approach provides cisgendered customers with products that mostly meet their needs, it fails to take into consideration the customers that fall outside of the binary categorization. This failure creates holes in product offerings for customers like trans men and non-binary individuals who need supportive products for their needs.

After studying the products that are currently being offered to the trans and non-binary communities for apparel in binding and packing, it was determined that there is a lack in product that allows this user group to perform sports comfortably in their gender identity. It was critical to understand their biomechanical, physiological, and psychological needs to build a landscape for the specific considerations that need to be involved when collecting further user data. Taking this data along with state of the art material and manufacturing explorations, a new design phase can be entered that pays respect to the unique considerations of the athlete's gender identity over their assigned sex. For the transmasculine and non-binary dancers, this means designing a collection of binders that take breast volume and density into consideration to provide comfortable support and compression that is both performance driven and gender-affirming.

#### Detailed SWOT Analysis:

An integral part of the process is to take an in depth look at the current benchmark product to understand how it is built, how it functions, what areas of weakness it might have and what areas of opportunities are there for improving upon the design or creating a new design that outperforms this product. In this analysis, the gc2b Half Tank Binder will be broken down and considered against the project goal to determine how can inclusive bodywear for trans and nonbinary dancers and athletes be designed that improves comfort and mobility while removing feelings of gender dysphoria. During the analysis, the binder was reviewed by its parts of the armhole and neck openings and the chest and back panel. It was further

studied amidst these parts around the areas of mobility, comfort and dysphoria and how the current product addresses these areas in their strengths, weaknesses, opportunities and threats.



*Fig 15. A gc2b half binder (OUR, n.d.)*

#### **A. Chest Binder + Mobility + Armhole**

1. What are the strengths of the chest binder armhole and mobility
  - a) The current armhole on the g2Cb chest binder is similar to a tank top and provides decent opening for the shoulder and arm to move around.
2. What are the weaknesses of the chest binder armhole and mobility
  - a) The armhole on the g2Cb chest binder comes up pretty high under the armpit and could cause discomfort.
  - b) The construction of the chest binder is more like a tank top and does not allow for the “straps” to pivot in order to fit to different body types.
  - c) The material around the armhole is mostly non-stretch material as the chest panel and upper back panel is built more to compress the breast volume so it does not allow for much mobility.
  - d) There is stitching around the armhole that can pucker over time (according to user reviews). Multiple users mentioned that this area failed for them after multiple uses. When studying the construction, there are 3 panels that come together right at the base of the armhole.
  - e) A lot of pressure is placed here as the breast volume that is being compressed is potentially pushing up against this seam.
3. What are the opportunities of the chest binder armhole and mobility

- a) Instead of having a fixed opening shape like that of a tank top, a new design of the binder could allow for the fabric around the armhole to pivot if created more like a strap.
  - b) It could also be enhanced if there was some more flex built in around the opening that could allow the user to move more freely.
  - c) Could there be more specific sizing options and measurements for this area?
  - d) A look into removing key seams from this location might be helpful to prevent failures. Creating a more comfortable and flat construction with less stitching near a high area of abrasion will be important.
4. What are the threats of the chest binder armhole and mobility
- a) Because the breast volume is being compressed and is placing pressure on the seam that ends in the armhole it has a high likelihood of failure.
  - b) Depending on the user's shoulder dimensions and breast volume, this opening can be challenging for users to get into when placing the binder over their head and putting arms through the openings.
  - c) This area also has opportunity for abrasion not only with the user's arms but also with other shirts/tops that are layered over the binder.

## **B. Chest Binder + Mobility + Back Panel**

1. What are the strengths of the chest binder back panel and mobility
- a) The lower portion of the back panel has a good amount of stretch through spandex that allows for good mobility.
2. What are the weaknesses of the chest binder back panel and mobility
- a) The upper portion of the back panel does not have as much stretch in order to provide the necessary compression and support for the breast volume. This can lead to difficulty in putting the binder on over the head.
  - b) There is a seam at the middle backside of the back that is straight across the back. Without articulation, this could be an area of failure and discomfort over time.
  - c) The back panel covers the back pretty extensively and could be challenging for mobility through the shoulder blades.
3. What are the opportunities of the chest binder back panel and mobility
- a) A revised design of the back panel could allow for articulation to enhance mobility for the arms.
  - b) A racerback style could allow for more mobility, though this is already offered on gc2b.

- c) Looking at the placement of the seam that goes across the back could provide areas of opportunity to shape in a way that adds mobility where necessary and support where needed.
  - d) More spandex could be added to the upper portion in strategic locations that allow for mobility without sacrificing support.
4. What are the threats of the chest binder back panel and mobility
- a) The seam that goes across the back could potentially fail if too much lateral force is placed on the seam (bending over to pick up something, inward arm movement that stretches the back).
  - b) The split between limited stretch in the upper portion and more stretch in the lower portion can potentially rise up along the back affecting the position of the panel when worn.

### **C. Chest Binder + Mobility + Neckline**

1. What are the strengths of the chest binder neckline and mobility
  - a) The neckline drops down almost like a V (but not a pure V neck) and provides a decent opening bigger than that of a traditional crew neck t-shirt or tank top.
2. What are the weaknesses of the chest binder neckline and mobility
  - a) This opening is not particularly large for the head to get through with limited stretch material at the opening.
  - b) There is a material shift around the neck line from the chest panel that goes from dense limited stretch to more stretch that could cause awkward movement when wearing the binder during activity.
  - c) There is stitching around the neck that could fail over time with the limited size opening which could cause the neck to sag
3. What are the opportunities of the chest binder neckline and mobility
  - a) A different wider opening shape could be beneficial for donning and dothing the binder when getting over the user's head and placing the arms in the armholes.
4. What are the threats of the chest binder neckline and mobility
  - a) The non-V, non-crew neck shape could wear over time causing it not to lay flat.
  - b) The limited size could cause tension issues around the neck over time causing it to sag or tear.

### **D. Chest Binder + Mobility + Chest Panel**

1. What are the strengths of the chest binder chest panel and mobility

- a) The lower portion of the binder has more stretch to help when donning the binder. This also allows the binder to hug the body.
- 2. What are the weaknesses of the chest binder chest panel and mobility
  - a) The double layer construction along the chest compresses the breast volume tightly placing stress on the torso and back. Studies have shown that binding continuously can have negative side effects including skin and tissue problems, pain in the chest, shoulders, back, and abdomen, respiratory problems, and musculoskeletal problems like posture change and rib fractures (Pietzmeier, 2017).
  - b) The material shift near the top of the chest panel to the “straps” rides up high on the chest and could limit mobility of the arms and upper torso.
- 3. What are the opportunities of the chest binder chest panel and mobility
  - a) The amount of stretch through the chest could be dispersed variably to allow the user to adjust the binder in a way that is the most optimal for their unique mobility needs.
  - b) The placement of the split near the neckline and the “straps” could be explored to see where the most optimal location is for ideal movement.
  - c) Different breast tissue volume could be compressed and shifted in different directions depending on the body type and tissue volume. This could be an area to explore within the chest panel to allow for different methods and directions of compression.
- 4. What are the threats of the chest binder chest panel and mobility
  - a) If the binding is not tight enough, it might not provide the level of chest flattening that the user is looking for.
  - b) If the binding is too tight it prevents the user from performing the types of movements that they hope to achieve.
  - c) The limited stretch through the breast volume does not provide many options for how to compress the breast tissue (in which direction).

#### **E. Chest Binder + Comfort (+Breathability) + Armhole**

- 1. What are the strengths of the chest binder armhole and comfort
  - a) The armhole shape is decently open and allows the arms to move freely.
- 2. What are the weaknesses of the chest binder armhole and comfort
  - a) The bottom of the armhole opening sits differently on different users. On plus sized users, it can cause excess skin to come out from the opening. This can cause abrasion that could be very uncomfortable.

- b) The stitched seam construction under the arm could be uncomfortable over time if it puckers and causes abrasion when moving around.
- 3. What are the opportunities of the chest binder armhole and comfort
  - a) Being able to adjust the armhole opening size or be able to select an armhole opening shape that fits your comfort preference may help with potential chafing and under arm discomfort.
- 4. What are the threats of the chest binder armhole and comfort
  - a) The shape of the opening could be uncomfortable if you have wider or narrower shoulders but larger or smaller breast volume. The size of the binder needed to accommodate the breast volume may not facilitate other factors to the overall body shape of the user that could have the opening sit uncomfortably for the user.

#### **F. Chest Binder + Comfort (+Breathability) + Back Panel**

- 1. What are the strengths of the chest binder back panel and comfort
  - a) The divide in material along the back panel can allow for ease in the lower half of the back.
  - b) The interior is lined with a soft cotton blended fabric to be comfortable against the skin
- 2. What are the weaknesses of the chest binder back panel and comfort
  - a) The seam along the back panel can be uncomfortable especially with the upper portion of the back panel being tighter for chest volume compression.
  - b) The tight fit of the material with limited ventilation/breathability can cause the garment to be hot when warm. This can be uncomfortable in hotter climates.
  - c) The wide upper back construction can increase the warmth felt by the user and limits air flow along the back.
- 3. What are the opportunities of the chest binder back panel and comfort
  - a) Ventilation could be added through various methods to allow the back panel to be more breathable without sacrificing the necessary compression.
  - b) Changes in material in different zones for better moisture management and internal comfort can be considered to help provide comfort to the user when wearing the binder on its own or underneath other garments.
- 4. What are the threats of the chest binder back panel and comfort
  - a) Adjusting the tension or material needs to be considered carefully so as not to sacrifice the support needed for the breast volume.



- b) The construction needs to take into consideration the user's posture. Changing the content of spandex or nylon in the back panel as well as adjusting the patterning needs to be carefully considered so as not to cause harm to the users back and posture.

#### **G. Chest Binder + Comfort (+Breathability) + Neckline**

1. What are the strengths of the chest binder neckline and comfort
  - a) The deeper opening in the neckline can allow the user a decent opening to don the binder.
  - b) The flat construction of the neckline should rest on the user's chest/neck/back nicely and comfortably.
2. What are the weaknesses of the chest binder neckline and comfort
  - a) The neckline is not very wide and could dig into the neck if not properly sized.
  - b) The neckline appears to be a folded over and sewn seam that could also dig into the body if the binder is tight fitting.
3. What are the opportunities of the chest binder neckline and comfort
  - a) The construction at the neckline could be seamless to prevent uncomfortable stitching digging into the skin.
4. What are the threats of the chest binder neckline and comfort
  - a) If the neckline is widened and the "straps" become too narrow, then the straps may become uncomfortable and dig into the top of the shoulders.
  - b) If the neckline doesn't lay flat it may become uncomfortable when worn under another piece of clothing.

#### **H. Chest Binder + Comfort (+Breathability) + Chest Panel**

1. What are the strengths of the chest binder chest panel and comfort
  - a) The interior of the chest panel has a soft cotton blended liner for comfort against chest and breast skin.
2. What are the weaknesses of the chest binder chest panel and comfort
  - a) The restrictive nature of the limited stretch material blend in the chest portion, though built for the purpose of the product, if not sized properly, can be uncomfortable with the pressure placed on the breast tissue.
  - b) Because there is no interior division or cupping, breast tissue is forced down against the chest wall and has the potential to move inside of the garment, needing to be readjusted. If the breast tissue moves in certain ways, it can

provide too much constriction in the chest causing difficulty in breathing for the user.

- c) Without necessary ventilation built into this part of the garment, especially during athletic activity, the user can overheat, sweat, and become very uncomfortable.
3. What are the opportunities of the chest binder chest panel and comfort
- a) Zones for ventilation can be added that go through the entire layering system of the garment to allow for better breathability for the user during athletic activity.
  - b) If internal shaping or contour placement to receive the breast tissue is included in order to help prevent the breast tissue from moving while wearing the garment this could be more comfortable to the user.
  - c) If the interior of the garment is structured to a point to allow for air flow within the interior of the garment this could help to reduce sweat build up and help provide more breathability.
  - d) If the chest panel had external rigidity to provide the necessary exterior flat appearance while providing internal comfort, that would be ideal to allow the user a more comfortable experience.
4. What are the threats of the chest binder chest panel and comfort
- a) Too much modification to the chest panel may negate the overall function of the product which is to create the flat chested appearance.
  - b) Providing internal support for the breast tissue instead of just flattening the tissue uniformly could potentially emphasize the tissue rather than mask it.
  - c) Adding any extra seaming within the chest panel could provide areas of chafing if the seams are placed next to the skin.

#### **I. Chest Binder + Dysphoria + Armhole**

1. What are the strengths of the chest binder armhole and dysphoria
- a) The armhole design does not look like a traditional sports bra and could be easily taken for a tank top worn underneath clothing.
2. What are the weaknesses of the chest binder armhole and dysphoria
- a) Because the armhole is pretty closely contoured to the shoulder it could be seen through the sleeve of a t-shirt exposing the user's use of a binder and cause dysphoria.
  - b) If the armhole rides up on the user and they have to readjust the binder while wearing it, that could cause dysphoria.
3. What are the opportunities of the chest binder armhole and dysphoria

- a) If the armhole is increased in size so that it could not be seen when moving the arm around through a t-shirt, this would alleviate dysphoria.
  - b) If the armhole could potentially connect to the armhole of the sleeve of a shirt so as to have direct line of sight to the body and not the binder, this could be helpful, though it would have to be carefully done.
4. What are the threats of the chest binder armhole and dysphoria
- a) Any ability to see the armhole of the chest binder when wearing a shirt over top of the binder is a threat to the efficacy of a binder being used by a user who does not want the public to know that they are wearing a binder.
  - b) If the color of the binder is meant to be skin tone and it does not match the color of the user's skin perfectly, there is potential for the binder to be exposed through the armhole.

#### **J. Chest Binder + Dysphoria + Back Panel**

1. What are the strengths of the chest binder back panel and dysphoria
- a) The wide nature of the back panel is a benefit for dysphoria because there are less opportunities for someone to be able to see the seams of the back pane through other shirts that are worn over the chest binder.
2. What are the weaknesses of the chest binder back panel and dysphoria
- a) Since the back panel does not extend the entire length of the garment (in this version) it could ride up on the user and bunch and become externally visible to others through outer garments.
  - b) The double layering in the upper portion of the back panel as well as the back panel seam provide a slight shelf on the back panel that is slightly visible when just wearing the binder, this could be seen through a shirt if worn over top in wet conditions.
3. What are the opportunities of the chest binder back panel and dysphoria
- a) If the shaping of the back panel is considered in relation to the the cut lines of shirts worn on top of the binder, then it may be able to blend in better with shirts worn on top of the binder.
  - b) If the exterior of the back panel can have as minimal of exterior protrusions or seamliness it can help make a seamless appearance on exterior worn clothing.
4. What are the threats of the chest binder back panel and dysphoria
- a) Not all shirts worn above the binder are made the same. Different t-shirts, tank tops, other athletic apparel have different cuts and one binder cannot accommodate all of the different types of constructions.

- b) Material weight and thicknesses of shirts worn on top of binders, especially when trying not to have too many layers and create too much heat for the user, are not always consistent. Thinner, lighter shirts may help reduce overheating but it can also reveal the binder underneath. The more low profile and breathable the binder is, the easier it will be to layer with other products.

#### **K. Chest Binder + Dysphoria + Neckline**

1. What are the strengths of the chest binder neckline and dysphoria
  - a) The neckline dips down low enough to be hidden from the exterior view of most crew neck shirts worn on top of the binder.
2. What are the weaknesses of the chest binder neckline and dysphoria
  - a) The width of the neckline is too narrow and can sometimes come into view of the neckline of shirts worn on top of the binder.
  - b) The shaping of the neckline does not accommodate for different styles of shirt openings (V neck, button downs/ups, zippered apparel)
3. What are the opportunities of the chest binder neckline and dysphoria
  - a) A slightly deeper and wider neck opening can help to be hidden more from view of other externally worn apparel. The neck line does not have to plunge deep like a bra, but could at least be deep enough to accommodate most shirts worn over top of the binder.
4. What are the threats of the chest binder neckline and dysphoria
  - a) If the neckline goes too deep it may begin to interfere with the efficacy of the binder in providing the necessary breast tissue flattening for flat chested appearance.

#### **L. Chest Binder + Dysphoria + Chest Panel**

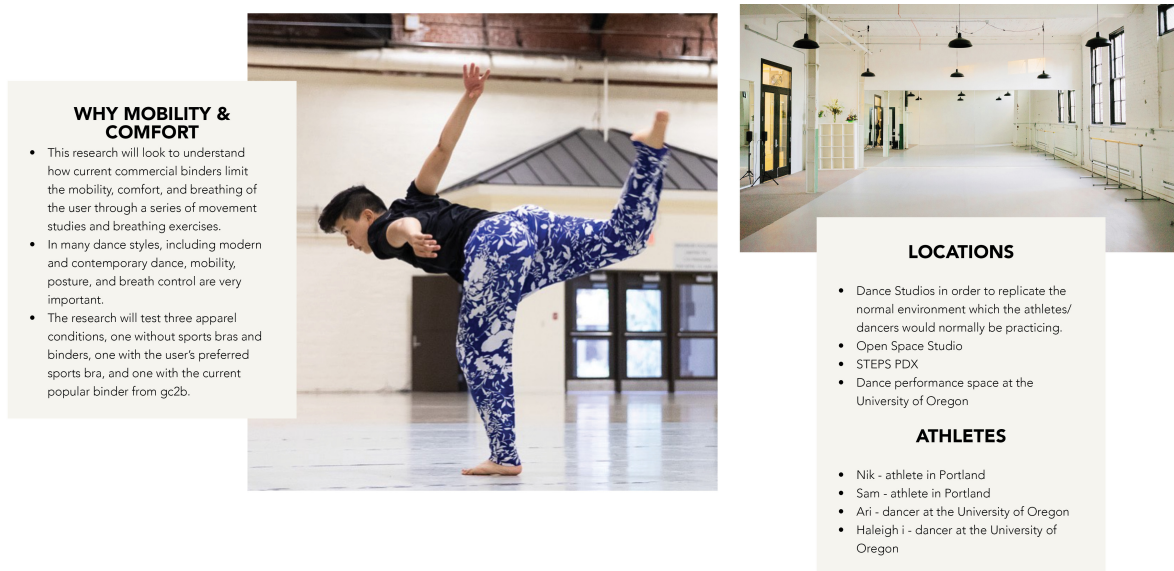
1. What are the strengths of the chest binder chest panel and dysphoria
  - a) Provides a great flat chested appearance for most users across sizing and body types
2. What are the weaknesses of the chest binder chest panel and dysphoria
  - a) The bottom of the chest panel does not always lay flat and can often ride up on the user causing bunching of the binder which can in turn bunch on any apparel worn on top of the binder revealing it to the public.
  - b) The chest panel only flattens the breast tissue but it does not keep it on one place during activity so it is possible for the breast tissue to move which causes

the need for the user to readjust the garment and bring attention to the fact that they are wearing the garment.

3. What are the opportunities of the chest binder chest panel and dysphoria
  - a) If the material of chest panel can maintain its ability to provide a flat chested appearance while also working well with fabrics that go on top of it, glide over top smoothly, there will be less chance that apparel worn over top will snag on the binder, revealing its presence.
  - b) The garment needs to be as flat and comfortable as possible so as to not call attention to it to others and most importantly to the user. The more that the binder can disappear to the user, the less feelings of dysphoria they will experience, allowing them to be able to perform at their best.
4. What are the threats of the chest binder chest panel and dysphoria
  - a) If the binder is not sized properly or if it has lost its inherent material retention properties for stretch it may not properly flatten the chest as necessary rendering it useless to the user for providing a flat chested appearance.

## Benchmark and Consumer Field Research Planning

After reviewing the SWOT analysis, it is important to begin testing the current benchmark product to see where these areas of opportunity may lie ahead of the design process. The following slides catalog the planning that was performed to set up the research that needs to be collected for both the benchmark product as well as the consumer journey.



**WHY MOBILITY & COMFORT**

- This research will look to understand how current commercial binders limit the mobility, comfort, and breathing of the user through a series of movement studies and breathing exercises.
- In many dance styles, including modern and contemporary dance, mobility, posture, and breath control are very important.
- The research will test three apparel conditions, one without sports bras and binders, one with the user's preferred sports bra, and one with the current popular binder from gc2b.

**LOCATIONS**

- Dance Studios in order to replicate the normal environment which the athletes/ dancers would normally be practicing.
- Open Space Studio
- STEPS PDX
- Dance performance space at the University of Oregon

**ATHLETES**

- Nik - athlete in Portland
- Sam - athlete in Portland
- Ari - dancer at the University of Oregon
- Haleigh i - dancer at the University of Oregon

Fig 16. Field Research Planning

# TESTING DETAILS



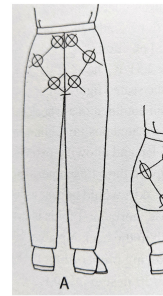
## DONNING AND DOTHING {BINDER VS SPORTS BRA}

- Have the user wear a next to skin low profile base layer and have them place the binder on over top in order to document the process.
- On a scale of 1-5 how easy was that process?
- Did you experience any pain during the process?
- What part gave you the most challenge?
- Repeat above steps for donning the binder.



## REACH, TWIST, AND BEND {BINDER VS SPORTS BRA}

- Before garment is on, document the user going through each movement with markers on key points for baseline mobility reference.
- Once garment is on, place color marker dots at key points on the user's torso and back.
- **Movement 1** Over Head Reach Extension
  - Have user raise each arm over their head while extending the opposite leg. Hold position for 5 seconds (take photo).
- Ask on a scale of 1-5 how easy was that?
- Did you experience any pain during the process?
- **Movement 2** - Torso Twist
  - Have user twist 90 degrees left and right and hold at each position for 5 seconds (take photo)
- Repeat questions
- **Movement 3** - Forward and Back Bend
  - Have the user bend forward and backward as far as they can to determine full range - hold 5 seconds (take photo)
- Repeat questions
- **Garment Movement**
  - Duplicate movement test with a t-shirt on over top and observe if and when the binder becomes visible from the neckline, armhole, and midriff.

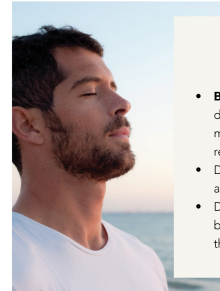


## GARMENT EXPANSION {BINDER VS SPORTS BRA}

- Draw circles on the garment
- Capture images of circle dimension change during reach, bend, and twist testing

## GARMENT MARKING {BINDER VS SPORTS BRA}

- While user is wearing t-shirt over the binder mark with chalk the relief of the binder on the t-shirt in order to see where it may be come apparent externally.

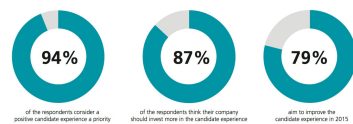
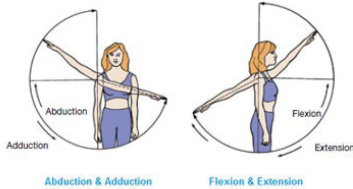


## BREATHING {BINDER VS SPORTS BRA}

- **Breathing Test:** - Have user take a deep inhale to their max and hold. Take measurement at xiphoid. Full exhale and repeat measurement.
- Do this in compression top, sports bra, and binder.
- Do a 5 minute vinyasa flow in just t-shirt vs binder and document the difficulty from the user.

Fig 17. Benchmark Performance Research Planning

# HOW TO REPORT



**Ways to apply**

- Via an online form
- Via email
- Via social media
- Via post

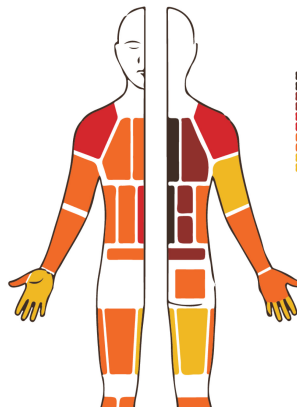
**VISUALIZATION**

Create graphic visuals of the range of motion of each user test in order to overlap and compare results between users.

Charts and graphs for other essential information collected.

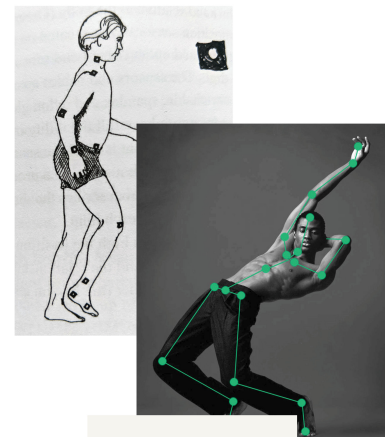
**24%** of all accepted applications via post.

**29%** of the applications take longer than 15 minutes.



## BODY MAP

For donning and dothing, the athlete will mark where they experienced challenge and discomfort and rate 1-5. A separate silhouette will be created for measuring discomfort or challenges during the movement testing.



## PHOTO/VIDEO

Take photos and videos to analyze the movement of the user and the movement of the garments and see where the garment wrinkles and where the binder becomes exposed.

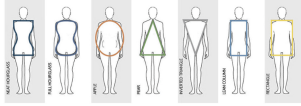
Fig 18. Field Research Reporting Method

# SURVEY AND MARKET SHOP

**Bodywear Survey**  
This survey is aimed at learning about fit and comfort needs for the queer, non-binary and transgender community when it comes to athletic bodywear. Please answer to the best of your ability. If you are not comfortable answering any questions, please skip and move on to the next.

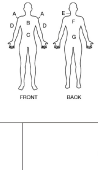
**DEMOGRAPHIC INFORMATION:**

- If comfortable, please provide your gender identity
- Fill in the blank
- What is your age?
  - 15-20
  - 21-25
  - 26-30
  - 31-35
  - 36-40
  - 41-45
  - 46-50
- What is your height?
  - Fill in the blank
- What is your weight? (An approximation or range is acceptable)
  - Fill in the blank
- Based on the image below, what body type would you identify most with:
 




**BINDING & BODYWEAR RELATED QUESTIONS:**

- Have you, or do you currently, utilize a sports bra or compression bodywear for training/athletic activity?
  - Yes/No
- If yes, what size have you worn?
  - Fill in the blank
- What brand/model has worked the best for you?
  - Fill in the blank
- Do you have any problems with the fit of this garment? Use the image as reference to select all areas that apply:
 



**MARKET SHOPPING**

- This research will collect important information around the consumer journey at retail.
- Go with mentor to Title 9 to do a market shop of current products.
- Speak with the store manager about their fitting process.
- Take note on the questions asked and the recommendations given.
- Observe price points, colors, patterns, cuts and fits.

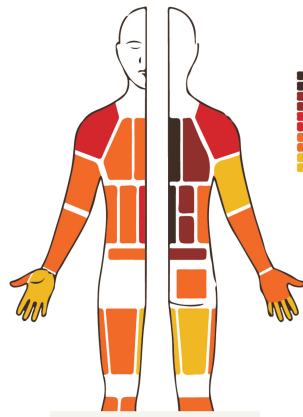
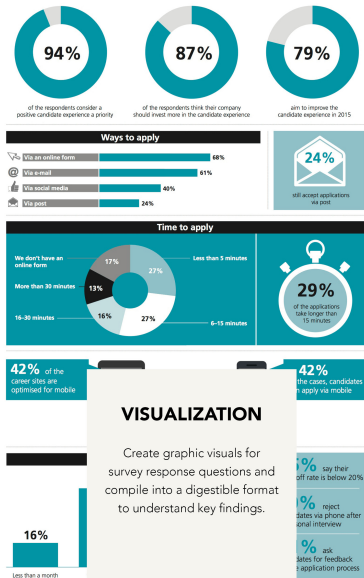


**SURVEY - QUESTIONS**

- This research will learn about fit and comfort needs for the queer, non-binary and transgender community when it comes to athletic bodywear.
- It will be shared through current contacts, shared on social media and email.

Fig 19. Consumer Research Planning

# HOW TO REPORT



**BODY MAP**

Based on answers from questions on survey create multiple silhouettes that mark out fit and comfort comments from participants.



**PHOTOS**

Document the shopping process with Nik at Title 9. Highlight key styles and insights. Create a market shop mood board.

Fig 20. Consumer Research Reporting Methods

## Benchmark Research Detailed Plan

The testing overview helped to prepare the researcher to create a detailed plan that illustrates how the test will proceed with the test subjects.

### Aim and Objective

The purpose of this study is to analyze the binder in movement based activities.

Documentation of this movement with key markers placed on the subject will allow the researcher to review the photos and videos to see how the body moves in the binder versus in a sports bra or without either. The subjects will perform movements that would be affected by the binder and the documentation will also show how the binder moves with the user during each task. The subject will be asked questions about their experience during the study in order to get qualitative feedback about their experience.

### Methodology

Location of Study: The performance study will take place at Open Space Studio in Portland, Oregon, STEPS PDX, and the University of Oregon in Eugene.

Dates: 1/22/2021 - Eugene, 1/23/2021 (Ari & Haleigh) - Open Space Studio (Sam), 1/31 - STEPS PDX (Nik)

Timing: The research study should take an estimated 2 hours.

Subjects: Currently, there are 4 confirmed subjects.

Products to Test: gc2b Half Tank Binder; subject's preferred sports bra

### Materials Required

Printed consent forms (print 10)

Surveys - have on iPad

Testing apparel (T-shirts, binders) for Conditions THREE and FOUR

iPad and charger

Extension Cord

Yoga mat

Laptop for recording user feedback during testing

Laptop charger

Sticky Dots for visual marking on body

Fabric Chalk

Fabric Tape

Floor Tape



Printout of schedule

Camera and tripod

Camera batteries and charger

Measuring Tape

Changing room

Lab space

### Detailed Plan

<b>Phase of Study</b>	<b>Procedure</b>	<b>Data Collected</b>	<b>Timing</b>
Subject Recruitment	Research team solicits for subjects via emails, "word of mouth"	NONE	NA
Subject Sign-Up	Subject contacts the research team (via email) & they directly contact the research team for data collection appointment. Covid protocols are explained.	Name, email, & apparel size	<5minutes
Data Collection (Subject is at the Lab)	Subject reads & signs consent form & receives a copy. Lab door is locked for subject privacy (only the subject & 1 researcher will be in the lab)	Consent (name & signature) to participate in the study	4 minutes
	Covid protocols are re-explained. Masks will be worn by both the research team and the subject at all times. Hand sanitizer will be available during the entire duration of the study. The researcher and the subject will remain socially distant as much as possible.	None	3 minutes
	<b>BEGIN TEST 1:</b> Subject changes into Apparel Condition ONE (next to skin base layer and subject's own leggings/tights). Jewelry is removed & hair is put into bun if necessary.	NONE	3 minutes
	Subject is given the gc2b binder that correlates with their size needs and is asked to put it on. During the donning, the researcher will document with video and photography to collect data on difficulties experienced by the subject.	Photos and Video of the process	4 minutes
	After the subject has the binder on, researcher will ask a series of questions in regards to the process and subject will answer.	Subject's experience donning the binder	2 minutes
	Subject will remove the binder. During the dothing, the researcher will document with video and photography to collect data on difficulties experienced by the subject.	Photos and Video of the process	4 minutes

After the subject has removed the binder, researcher will ask a series of questions in regards to the process and subject will answer. <b>END TEST 1</b>	Subject's experience donning the binder	2 minutes
<b>BEGIN TEST 2</b> - Subject starts in Apparel Condition 1 (next to skin base layer and subject's own leggings/tights). Subject will perform a 5 minute Vinyasa flow. This will be video recorded.	Video recording	5 minutes
At the end of the flow, researcher will ask subject about this experience and to rate its difficulty on a scale from 1-10. <b>END TEST 2</b>	Subject's experience in yoga flow.	1 minute

Phase of Study	Procedure	Data Collected	Timing
Data Collection (Subject is at the Lab)	<b>BEGIN TEST 3</b> - Subject starts in Apparel Condition 1 (next to skin base layer and subject's own leggings/tights). Baseline measurements are taken. Researcher will instruct subject how to take these measurements.	Measures taken - neck, bust, under bust	4 minutes
	Researcher will help the subject place visual markers on their body to be picked up on camera and video during movement test.	None	3 minutes
	Researcher will instruct the subject on the movement positions that they will need to do during the study. Subject will practice movements to become comfortable and familiar.	None	4 minutes
	Subject will perform Movement 1, Over Head Reach Extension, for both the left and right arm. With each reach, they will hold the position for 5 seconds. A photograph will be captured. They will repeat this 5 times on each side.	Photos and videos will be taken	3 minutes
	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 1 in Apparel Condition 1	1 minute
	Subject will perform Movement 2, Torso twist arms out, in both the left and right directions. With each twist, they will hold the position for 5 seconds. A photograph will be captured. They will repeat this 5 times in each direction.	Photos and videos will be taken	3 minutes
	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 2 in Apparel Condition 1	1 minute

Subject will perform Movement 3, forward and backward bend. With each bend, they will hold the position for 5 seconds. A photograph will be captured. They will repeat this 5 times in each direction.	Photos and videos will be taken	3 minutes
The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 3 in Apparel Condition 1	1 minute
Subject will change into Apparel Condition 2 (subject's preferred sports bra and subject's own leggings/tights). Baseline measurements are taken. Researcher will instruct subject how to take these measurements.	Measures taken - neck, bust, under bust	4 minutes
Researcher will help the subject place visual markers on their body to be picked up on camera and video during movement test.	None	3 minutes
Subject will repeat Movement 1, Over Head Reach Extension, 5 times on each side. A photograph will be captured.	Photos and videos will be taken	3 minutes

<b>Phase of Study</b>	<b>Procedure</b>	<b>Data Collected</b>	<b>Timing</b>
Data Collection (Subject is at the Lab)	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 1 in Apparel Condition 2	1 minute
	Subject will perform Movement 2, Torso twist arms out, 5 times in each direction. A photograph will be captured.	Photos and videos will be taken	3 minutes
	Subject will repeat Movement 1, Over Head Reach Extension, 5 times on each side. A photograph will be captured.	Photos and videos will be taken	3 minutes
	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 1 in Apparel Condition 2	1 minute
	Subject will perform Movement 2, Torso twist arms out, 5 times in each direction. A photograph will be captured.	Photos and videos will be taken	3 minutes
	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 2 in Apparel Condition 2	1 minute
	Subject will perform Movement 3, forward and backward bend. With each bend, 5 times in each direction. A photograph will be captured.	Photos and videos will be taken	3 minutes
	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 3 in Apparel Condition 2	1 minute

Subject will change into Apparel Condition 3 (chest binder and subject's own leggings/tights). Baseline measurements are taken. Researcher will instruct subject how to take these measurements.	Measures taken - neck, bust, under bust	4 minutes
Researcher will help the subject place visual markers on their body to be picked up on camera and video during movement test.	None	3 minutes
Subject will repeat Movement 1, Over Head Reach Extension, 5 times on each side. A photograph will be captured.	Photos and videos will be taken	3 minutes
The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 1 in Apparel Condition 3	1 minute
Subject will perform Movement 2, Torso twist arms out, 5 times in each direction. A photograph will be captured.	Photos and videos will be taken	3 minutes
The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 2 in Apparel Condition 3	1 minute

Phase of Study	Procedure	Data Collected	Timing
Data Collection (Subject is at the Lab)	Subject will perform Movement 3, forward and backward bend. With each bend, 5 times in each direction. A photograph will be captured.	Photos and videos will be taken	3 minutes
	The researcher will ask the subject about this process and record their answers.	Subject's experience performing Movement 3 in Apparel Condition 3	1 minute
	Subject will change into Apparel Condition 4 (t-shirt over chest binder and subject's own leggings/tights). No measurements necessary	None	1 minute
	Subject will repeat Movements 1, 2 and 3 and video will be recorded to notate time when the binder may be exposed from underneath the t-shirt. <b>END OF TEST 3</b>	Video recording	6 minutes
	<b>BEGIN TEST 4</b> - While subject is still wearing the t-shirt over the binder, utilize chalk to mark on the t-shirt key seams and protrusions from the binder that rest below the t-shirt. <b>END TEST 4</b>	Chalk markings on t-shirt	5 minutes
	<b>BEGIN TEST 5</b> - Have subject remove t-shirt and remain in chest binder.	None	1 minute
	Have subject perform 5 minute vinyasa flow in binder.	Video recording	5 minutes

	At the end of the flow, researcher will ask subject about this experience and to rate its difficulty on a scale from 1-10. <b>END TEST 5</b>	Subject's experience with vinyasa flow	1 minute
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\*Data will be saved to a disk along the data collection process. All apparel provided to the subject, will be professionally laundered to ensure that is is clean for the next subject.

Fig 21. Detailed Benchmark Research Plan

Consumer Research Survey

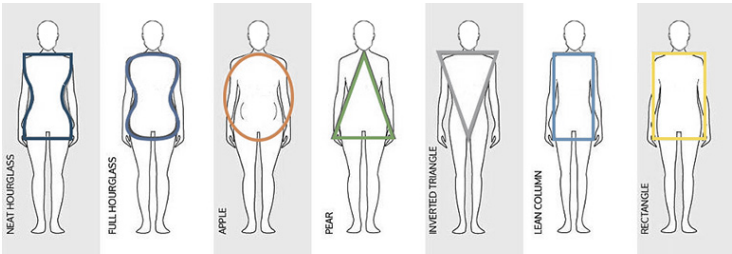
A survey was created to send out to people who identify within the user group to collect their feedback around the fit and comfort of the sportswear and binding garments they currently own.

Bodywear Survey Intro

This survey is aimed at learning about fit and comfort needs for the queer, non-binary and transgender community when it comes to athletic bodywear. Please answer to the best of your ability. If you are not comfortable answering any questions, please skip and move on to the next.

Demographic Information

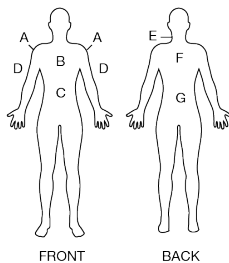
1. Question: If comfortable, please provide your gender identity
  - Response Type: Free Response
2. What is your age?
  1. 15-20
  2. 21-25
  3. 26-30
  4. 31-35
  5. 36-40
  6. 41-45
  7. 46-50
3. What is your height?
  - Response Type: Free Response
4. What is your weight? (An approximation or range is acceptable)
  - Response Type: Free Response
5. Based on the image below, what body type would you identify most with:



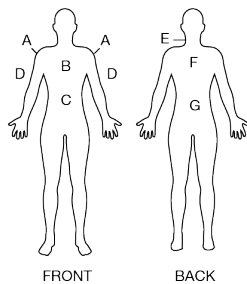
### Binding & Bodywear Related Questions

The questions in the first part of this section are around sports bra and compression bodywear worn on the chest.

6. Have you, or do you currently, utilize a sports bra or compression bodywear for training/ athletic activity?
  - Yes/No
7. If yes, what size have you worn?
  - Response Type: Free Response
8. What brand has worked the best for you?
  - Response Type: Free Response
9. What style has worked the best for you? (i.e. the shape and cut of the sports bra)
  - Response Type: Free Response
10. What level of compression do you like in your garment
  - 1 being loose - 5 being tight
11. Do you have any problems with the fit of this garment? Use the image as reference to select all areas that apply:



12. If you can, please explain these fit problems in more detail.
  - Response Type: Free Response
13. Do you have any problems with the comfort of these garments? Use the image as reference to select all areas that apply:



14. If you can, please explain these sports bra comfort issues in more detail.
  - Response Type: Free Response

15. On a scale of 1 - 10, 1 being very little and 10 being extreme, what level of dysphoria do you feel when wearing a sports bra?

- 1-10 rating

16. If you can, please explain about any feelings of dysphoria when wearing the sports bra.

- Response Type: Free Response

17. Have you ever modified your sports bra or compression garment? If yes please explain why.

- Response Type: Free Response

The questions in this section are around chest binders.

18. Have you, or do you currently, utilize a binder

- Yes/no

19. What brand of binder has worked the best for you?

- Response Type: Free Response

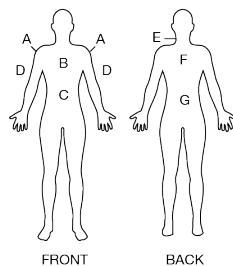
20. What style of binder has worked the best for you?

- Response Type: Free Response

21. What level of compression do you like in your binder?

- 1 being loose - 5 being tight

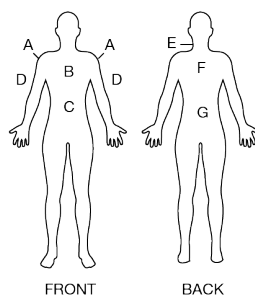
22. Do you have any problems with the fit with the binder? Use the image as reference to select all areas that apply:



23. If you can, please explain these binder fit problems in more detail.

1. Fill in the blank

24. Do you have any problems with the comfort of the binder? Use the image as reference to select all areas that apply:



25. If you can, please explain these binder comfort problems in more detail.
- Response Type: Free Response
26. On a scale of 1 - 10, what level of dysphoria do you feel when wearing a binder?
27. If you can, please explain about any feelings of dysphoria when wearing the chest binder.
- Response Type: Free Response
28. Have you ever modified your binder? If yes, please explain why.
- Response Type: Free Response
29. What size t-shirt do you wear?
- Response Type: Free Response
30. What is your fit preference in shirt
1. Loose fit
  2. Baggy
  3. Box
  4. Tight fit
31. Any other comments that you think the researcher may find helpful in relation the to study.
- Response Type: Free Response
32. If you are interested in learning more about this project and would be willing to be contacted for further research purposes, please provide your email below:
- Response Type: Free Response

### Benchmark Research Results

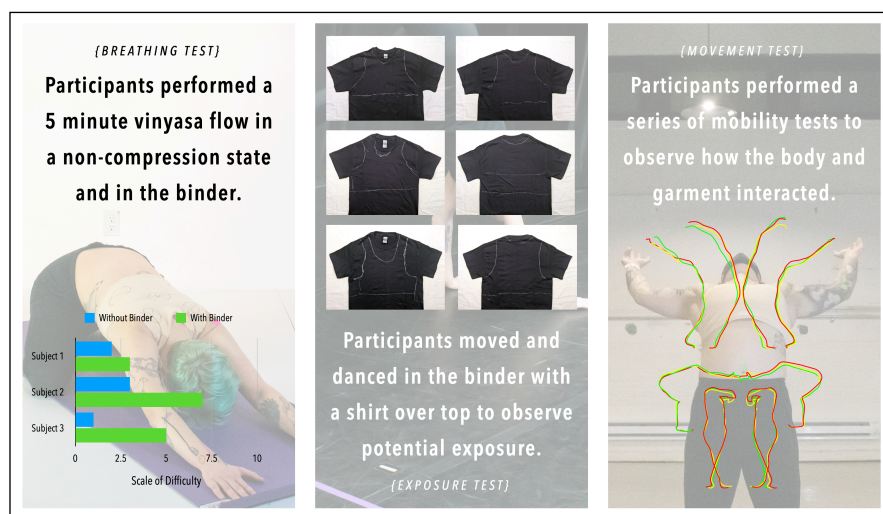


Fig 22. Benchmark Research Results Overview



### Breathing Test:

The breathing study had each of the participants perform a 5 minute guided vinyasa flow in both their non compression apparel and the binder in order to see a difference in the levels of breathing room each garment allowed for during the flow. The non-bound condition was relatively easy for each of the participants and they noted low levels of challenge using a likert scale from 1-10 of difficulty (1 being easy and 10 being most difficult). When performing the flow in the binder, each subject noted an increase in difficulty with one subject noting the flow to be a 7 with the binder though they didn't note any specific time when their breathing was challenged during the flow.

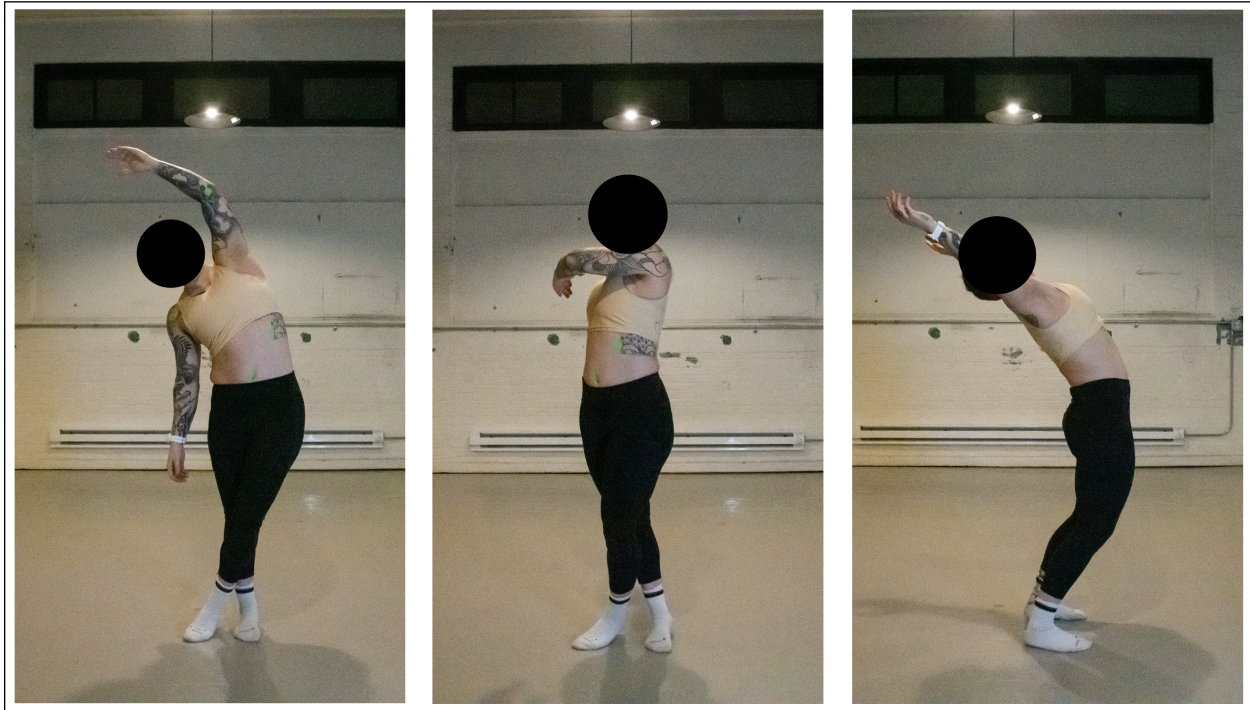
	Subject 1	Subject 2	Subject 3
	<b>5 minute vinyasa flow - Apparel Condition 1 - Next to Skin base layer</b>		
<b>Were you able to maintain steady breath during this flow?</b>	Yes	Yes	Yes
<b>Were there any times when you felt your breath was challenged?</b>	In downward dog	No	No
<b>On a scale of 1-10 how difficult was this?</b>	2 - not very difficult	3	1
	<b>5 minute vinyasa flow - Apparel Condition 3 - Binder</b>		
<b>Were you able to maintain steady breath during this flow?</b>	Yes	Yes	Really hard, especially in Down dog and rag doll
<b>Were there any times when you felt your breath was challenged?</b>	No	No	Couldn't get a full breathe at all
<b>On a scale of 1-10 how difficult was this?</b>	2/3	7	5

Fig 23. Breathing Test Results

### Exposure Test:

An exposure test was conducted to understand potential dysphoria from wearing an overshirt over the binder and having the binder become exposed from underneath the shirt. The potential exposure locations could be the neck and armhole openings as well as being visible if bunched underneath the shirt. The test had the subjects move around for a few minutes in the shirt and binder and have this video taped for review. Though in review the binder was difficult to see, the subjects were also asked mark the shirt with a marker in order to see where the binder was underneath the shirt and how close it rested in relation to the neck and armhole openings. In some cases, the binder was right next to the neck opening and in risk of being revealed from under the shirt.

## Mobility Test:



*Fig 24. Benchmark Research Mobility Positions*

Each subject was asked to conduct a series of movements in order to see how their mobility was affected in three different apparel conditions. Condition 1 was in their own next to skin base layer. Condition 2 was in their preferred sports bra or athletic apparel. Condition 3 was in the gc2b half tank binder provided to them by the researcher. They performed an overhead arm reach in both the lateral and medial directions. This was followed by lateral and medial torso twist and then a forward flexion and backward hyper extension from the hips. They did this four times rotating 90 degrees each time and their extension was captured in photos in order to study the range of motion.

The results of these movements were documented by tracing a line along the outer line of their body while doing each movement in each apparel condition. These different conditions were compared by layering each color-coded outline to see the ranges of motion during each movement. It was noted that the range of motion was negatively affected in some movements by the use of the binder and positively affected in other movements. The researcher hypothesizes that there are some movements that the subjects were performing that caused them to feel more or less levels of dysphoria depending on the garment that they were wearing.

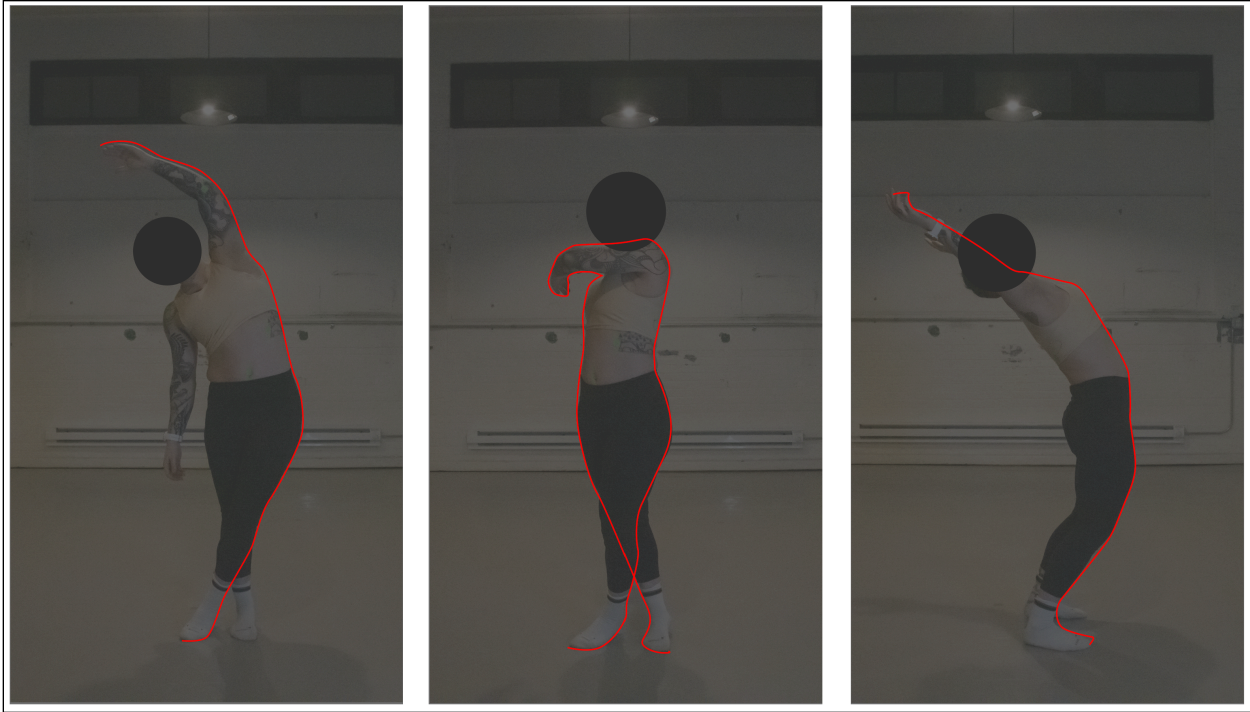


Fig 25. Benchmark Research Mobility Analysis

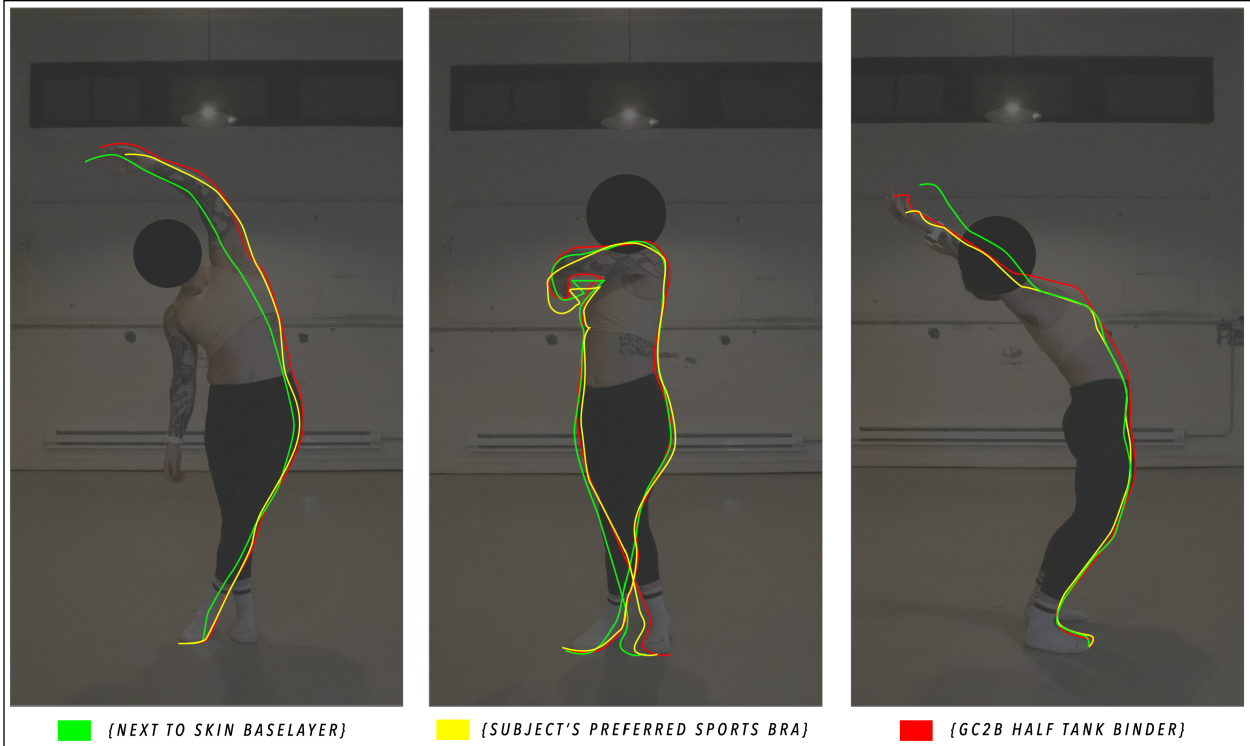


Fig 26. Benchmark Research Mobility Study All Garment Comparison

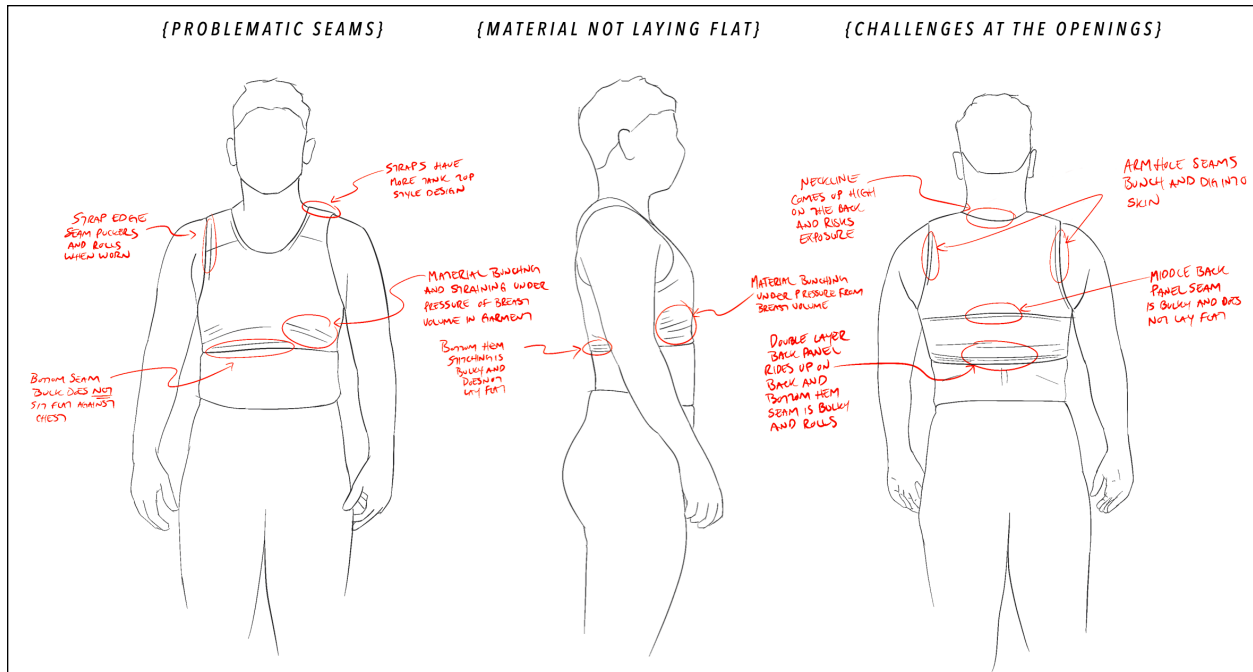


Fig 27. Benchmark Research On Body Garment Analysis

The secondary result of reviewing these movement studies was to observe how the garment worked on the body during the athletic activity and in each movement. It was observed that the side seams caused discomfort to the subjects and also created extra seam bulk that did not lay flat on the body. The seams at the neck, armhole, and waist hem also had excess bulk that did not rest nicely on the body and in some cases, dug into the subjects arms or abdomen. It was also noted that the extra panel of nylon/elastane that came over the layer of woven cotton/ polyester would bunch. Finally, the openings at the neck and armhole were tight for the user and could cause difficulties in donning and dothing the binder.

### Consumer Research Results:

The consumer research was collected through a survey that reached out to members of the transgender and non-binary communities across the US. The chart above showcases the results collected from the survey. The survey was able to connect with a good spread of different identities, body types and sizes. The survey was also built to collect information around the participants athleticwear and binding preferences. The questions asked about their fit and comfort challenges as well as their preferred tightnesses and brands. There were questions that spoke to dysphoria in order to understand the levels of dysphoria they felt while wearing different garments.

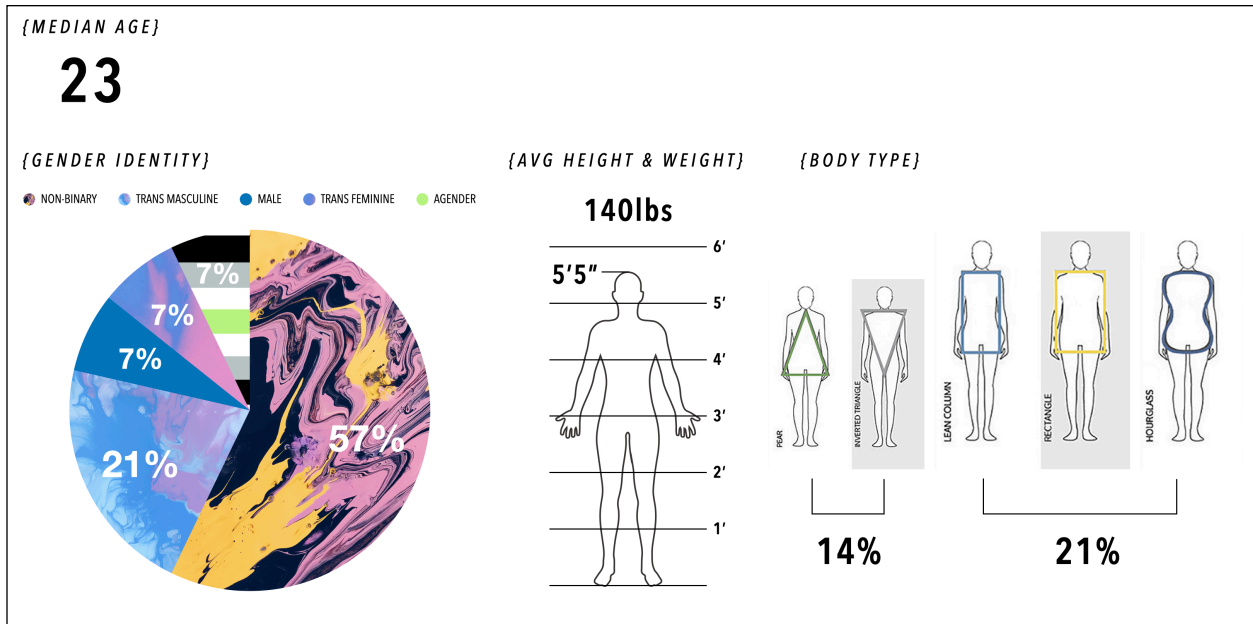


Fig 28. Consumer Demographic Breakdown

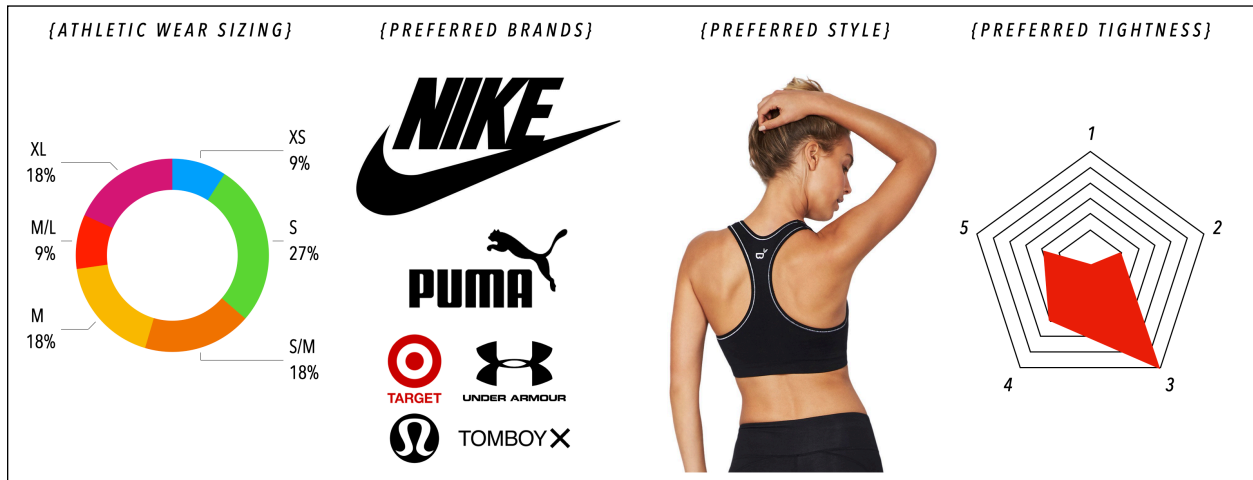


Fig 29. Consumer Sports Bra/Athleticwear Preferences

The athleticwear section of the survey provided insight into the size ranges and preferred brands and styles of the participants. In the fit and comfort sections, quotes elaborated on different challenges that the participants experienced with dysphoria in garments that did not correlate with their gender identity.

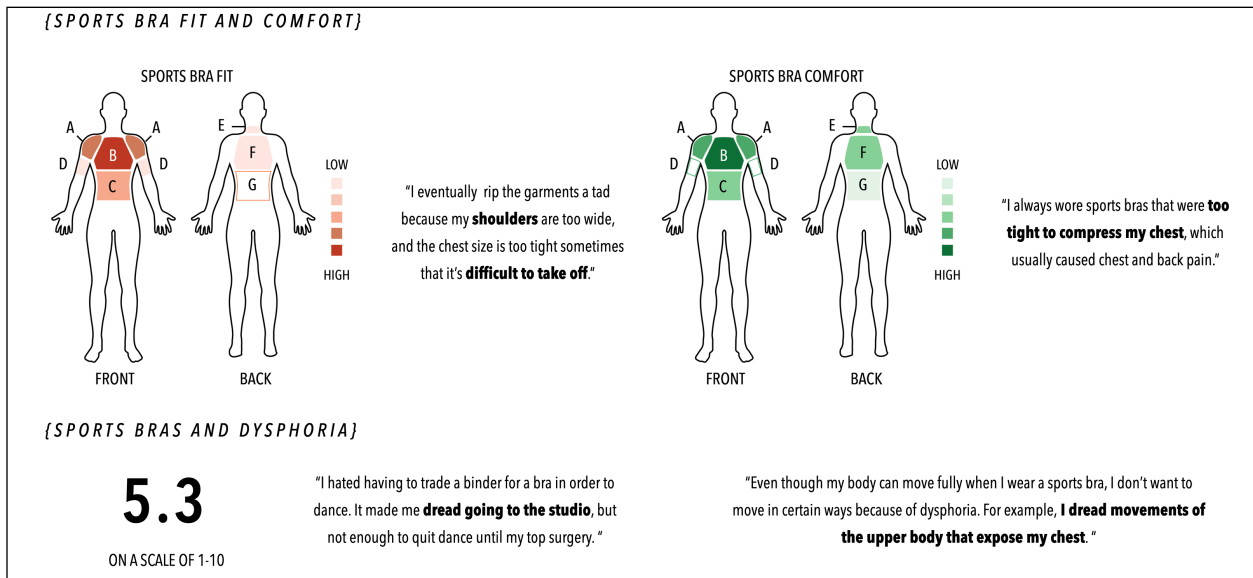


Fig 30. Consumer Sports Bra/Athleticwear Preferences - Quotes



Fig 31. Consumer Binder Preferences

The binder section of the survey provided insight into the unique challenges that the participants experienced with these restrictive garments and how the fit and comfort could be difficult to their breathing.

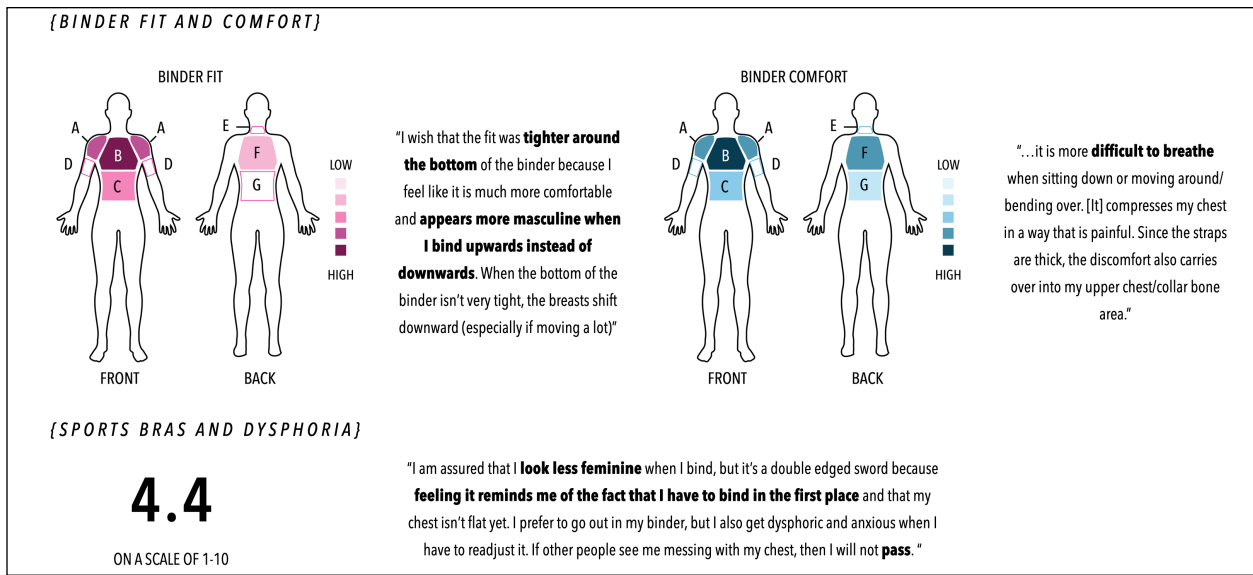


Fig 32. Consumer Binder Preferences - Quotes

### Consumer Shopping Trip

A consumer shopping trip was also conducted with a non-binary mentor in order to understand the experience of a trans and non-binary consumer at retail at two locations, Title 9 and REI. Each trip provided a unique view into the successes and challenges that a consumer of these demographics might face while looking to buy compression wear, bodywear, or athletic apparel that gives them the support they are looking for as well as a garment that does not cause too much dysphoria.



Fig 33 - Wall of bra options at Title 9

At Title 9, the consumer is met with a wall of bras that range in varying levels of support and compression depending on the activity. While some bras provided low profile compression, most contained cup padding and were in bright colors that were not as appealing to the consumer. The retail manager did not have experience helping a consumer of this identity before but was able to come to the conversation with compassion and provided thoughtful recommendations. The final suggested garment based on the consumer's asks was a sports bra that was built for high impact sports and gave the user multiple ways to adjust and compress the chest tissue. Unfortunately, the design of this garment emphasized the breast shape instead of compressing them. The garment was also red in color which called more attention to it instead of blending in.

At REI, the experience was much more comfortable for the consumer. The options were not presented in an intimidating manner and more options were geared towards compression and less towards encapsulation. The color options were more neutral and inviting. The consumer was able to find a Brooks Running bra that they gravitated towards that was comfortable, rested nicely on their body and fit to their general needs.



*Fig 34 - A selection of sports bra options at REI*

#### Ideation Plan:

After collecting benchmark and consumer research, a plan was put into place that took into consideration the unique needs of the user discovered during the process. The plan was broken up into each garment that was to be designed, three sizes of bodywear half tanks and



one shirt bodywear piece that would become alternatives to binders during athletic activity. Each area of mobility, comfort and dysphoria were explored to see what areas of opportunity there were for ideation.

<b>Chest Bodywear Size 1 - Small</b>	<b>Armhole</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Armhole comes up too high</b>	-Adjust opening shape -Consider more tank strap design
<b>Consumer Insights - Shaping/Silhouette/Adjustability</b>	-Look at racerback/Tank top hybrid for load bearing -Higher nylon content at this location -Provide room for shoulder mobility -Provide internal adjustability like straps
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Underarm pinching/discomfort</b>	-Remove seam bulk -Freecut materials -Laser cutting -Smoother material to reduce abrasion
<b>Benchmark Insights - Ventilation</b>	-Laser cut ventilation
<b>Consumer Insights</b>	-Secure band around armhole opening
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Widen opening to prevent external view
<b>Chest Bodywear Size 1 - Small</b>	<b>Neckline</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Donning/Dothing Challenges</b>	-Adjust shape opening for better head access -Consider more strap like design
<b>Benchmark Insights - Materials gathering by neck</b>	-Look to lay flat freecut material to prevent bunching
<b>Consumer Insights - too high</b>	-Explore different neckline designs: -Crew neck -V-Neck -Wide U-neck
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Seam bulk</b>	-Seamless construction -Freecut materials
<b>Consumer Insights</b>	-Provide a way to adhere to skin better so it does not move around

<b>Chest Bodywear Size 1 - Small</b>	<b>Neckline</b>
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Adjust shape to be wider to remove external visibility
<b>Benchmark Insights - Layering</b>	-Expand larger than traditional crew neck shirts (comes too close)
<b>Consumer Insights - Visibility</b>	-Do not want it to become visible. -Secure banding around neck line to keep in place
<b>Chest Bodywear Size 1 - Small</b>	<b>Back Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Shoulder mobility</b>	-Contour pattern to reduce bunching -Explore tape inspired design -Provide wider opening for shoulder blades
<b>Benchmark Insights - Bunching</b>	-Zoned stretch
<b>Consumer Insights - Hunching</b>	-Zoned stability for posture -Areas of non-stretch
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Bunching/ Paneling</b>	-Freecut materials at edges of garment -Reduce paneling
<b>Benchmark Insights - ventilation</b>	-Laser cutting ventilation -Look at cooling materials like Spectra
<b>Consumer Insights - excess tightness</b>	-Adjustable tension across back/shoulders -Zoned stretch by shoulder blades
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility when sweating</b>	-Make sure the material can glide with shirts over top
<b>Benchmark Insights - riding up</b>	-Secure the bottom of the binder around the ribcage so it does not ride up on the user.
<b>Consumer Insights - Don't want it too look like a bra</b>	-Tank top shaping
<b>Chest Bodywear Size 1 - Small</b>	<b>Chest Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Paneling and material stiffness</b>	-Simplify to one layer -Explore tape inspired design -Explore bemis/heat transfer tape -Look into shima semi -Internal adjustability -Look to simple flat compression for lower breast volume

<b>Chest Bodywear Size 1 - Small</b>	<b>Chest Panel</b>
<b>Benchmark Insights - too tight on ribcage</b>	-Variable compression towards lower ribcage for less constriction
<b>Consumer Insights - tightness through chest to waist</b>	-Adjustable tension for donning/dothing process -More stretch near lower portion of garment.
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Ventilation</b>	-Soft/moisture wicking lining -Zoned ventilation -Laser cut ventilation -Freecut material edges
<b>SWOT Insights - Breast support</b>	-Internal divided breast padding/securing so no need to readjust
<b>Consumer Insights - breathability, tightness</b>	-Variable tension fabric for different tightness preferences -Adjustable interior fit styles for different breast volume/shape
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Breast visibility</b>	-External padding for flattening appearance -Pectoral shaped zoning -Secure banding at the bottom of the garment -Explore tank style/torso length -Make sure exterior fabric can glide over exterior chest panel
<b>Consumer Insights</b>	-Skin tones -Have masculine pec shaping versus breast highlighting -Prevent nipple exposure
<b>Chest Bodywear Size 2 - Medium</b>	<b>Armhole</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Armhole comes up too high</b>	-Adjust opening shape -Consider more tank strap design
<b>Consumer Insights - Shaping/ Silhouette/Adjustability</b>	-Look at racerback/Tank top hybrid for load bearing -Higher nylon content at this location -Provide room for shoulder mobility -Provide internal adjustability like straps
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Underarm pinching/discomfort</b>	-Remove seam bulk -Freecut materials -Laser cutting -Smoother material to reduce abrasion
<b>Benchmark Insights - Ventilation</b>	-Laser cut ventilation
<b>Consumer Insights</b>	-Secure band around armhole opening

<b>Chest Bodywear Size 2 - Medium</b>	<b>Armhole</b>
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Widen opening to prevent external view
<b>Chest Bodywear Size 2 - Medium</b>	<b>Neckline</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Donning/ Dothing Challenges</b>	-Adjust shape opening for better head access -Consider more strap like design
<b>Benchmark Insights - Materials gathering by neck</b>	-Look to lay flat freecut material to prevent bunching
<b>Consumer Insights - too high</b>	-Explore different neckline designs: -Crew neck -V-Neck -Wide U-neck
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Seam bulk</b>	-Seamless construction -Freecut materials
<b>Consumer Insights</b>	-Provide a way to adhere to skin better so it does not move around
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Adjust shape to be wider to remove external visibility
<b>Benchmark Insights - Layering</b>	-Expand larger than traditional crew neck shirts (comes too close)
<b>Consumer Insights - Visibility</b>	-Do not want it to become visible. -Secure banding around neck line to keep in place
<b>Chest Bodywear Size 2 - Medium</b>	<b>Back Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Shoulder mobility</b>	-Contour pattern to reduce bunching -Provide wider opening for shoulder blades
<b>Benchmark Insights - Bunching</b>	-Zoned stretch
<b>Consumer Insights - Hunching</b>	-Zoned stability for posture -Areas of non-stretch
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Bunching/ Paneling</b>	-Freecut materials at edges of garment -Reduce paneling

<b>Chest Bodywear Size 2 - Medium</b>	<b>Back Panel</b>
<b>Benchmark Insights - ventilation</b>	-Laser cutting ventilation -Look at cooling materials like Spectra
<b>Consumer Insights - excess tightness</b>	-Adjustable tension across back/shoulders -Zoned stretch by shoulder blades
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility when sweating</b>	-Make sure the material can glide with shirts over top
<b>Benchmark Insights - riding up</b>	-Secure the bottom of the binder around the ribcage so it does not ride up on the user.
<b>Consumer Insights - Don't want it too look like a bra</b>	-Tank top shaping
<b>Chest Bodywear Size 2 - Medium</b>	<b>Chest Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Paneling and material stiffness</b>	-Simplify to one layer -Explore tape inspired design -Explore bemis/heat transfer tape -Look into shima semi -Internal adjustability -Look to simple flat compression for lower breast volume
<b>Benchmark Insights - too tight on ribcage</b>	-Variable compression towards lower ribcage for less constriction
<b>Consumer Insights - tightness through chest to waist</b>	-Adjustable tension for donning/dothing process -More stretch near lower portion of garment.
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Ventilation</b>	-Soft/moisture wicking lining -Zoned ventilation -Laser cut ventilation -Freecut material edges
<b>SWOT Insights - Breast support</b>	-Internal divided breast padding/securing so no need to readjust
<b>Consumer Insights - breathability, tightness</b>	-Variable tension fabric for different tightness preferences -Adjustable interior fit styles for different breast volume/shape
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Breast visibility</b>	-External padding for flattening appearance -Pectoral shaped zoning -Secure banding at the bottom of the garment -Explore tank style/torso length -Make sure exterior fabric can glide over exterior chest panel

<b>Chest Bodywear Size 2 - Medium</b>	<b>Chest Panel</b>
<b>Consumer Insights</b>	-Skin tones -Have masculine pec shaping versus breast highlighting -Prevent nipple exposure
<b>Chest Bodywear Size 3 - Large</b>	<b>Armhole</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Armhole comes up too high</b>	-Adjust opening shape -Consider more tank strap design
<b>Consumer Insights - Shaping/ Silhouette/Adjustability</b>	-Look at racerback/Tank top hybrid for load bearing -Higher nylon content at this location -Provide room for shoulder mobility -Provide internal adjustability like straps
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Underarm pinching/discomfort</b>	-Remove seam bulk -Freecut materials -Laser cutting -Smoother material to reduce abrasion
<b>Benchmark Insights - Ventilation</b>	-Laser cut ventilation
<b>Consumer Insights</b>	-Secure band around armhole opening
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Widen opening to prevent external view
<b>Chest Bodywear Size 3 - Large</b>	<b>Neckline</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Donning/ Dothing Challenges</b>	-Adjust shape opening for better head access -Consider more strap like design
<b>Benchmark Insights - Materials gathering by neck</b>	-Look to lay flat freecut material to prevent bunching
<b>Consumer Insights - too high</b>	-Explore different neckline designs: -Crew neck -V-Neck -Wide U-neck
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Seam bulk</b>	-Seamless construction -Freecut materials
<b>Consumer Insights</b>	-Provide a way to adhere to skin better so it does not move around

<b>Chest Bodywear Size 3 - Large</b>	<b>Neckline</b>
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Adjust shape to be wider to remove external visibility
<b>Benchmark Insights - Layering</b>	-Expand larger than traditional crew neck shirts (comes too close)
<b>Consumer Insights - Visibility</b>	-Do not want it to become visible. -Secure banding around neck line to keep in place
<b>Chest Bodywear Size 3 - Large</b>	<b>Back Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Shoulder mobility</b>	-Contour pattern to reduce bunching -Provide wider opening for shoulder blades
<b>Benchmark Insights - Bunching</b>	-Zoned stretch
<b>Consumer Insights - Hunching</b>	-Zoned stability for posture -Areas of non-stretch
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Bunching/ Paneling</b>	-Freecut materials at edges of garment -Reduce paneling
<b>Benchmark Insights - ventilation</b>	-Laser cutting ventilation -Look at cooling materials like Spectra
<b>Consumer Insights - excess tightness</b>	-Adjustable tension across back/shoulders -Zoned stretch by shoulder blades
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility when sweating</b>	-Make sure the material can glide with shirts over top
<b>Benchmark Insights - riding up</b>	-Secure the bottom of the binder around the ribcage so it does not ride up on the user.
<b>Consumer Insights</b>	-Take inspiration from racerback design but do not make it feel like sports bra.
<b>Chest Bodywear Size 3 - Large</b>	<b>Chest Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Paneling and material stiffness</b>	-Simplify to one layer -Explore tape inspired design -Explore bemis/heat transfer tape - body map paneling -Look into shima semi - need knit 20-22 gauge -Internal adjustability -Look to simple flat compression for lower breast volume

<b>Chest Bodywear Size 3 - Large</b>	<b>Chest Panel</b>
<b>Benchmark Insights - too tight on ribcage</b>	-Variable compression towards lower ribcage for less constriction -Adjustability to release after workout
<b>Consumer Insights - tightness through chest to waist</b>	-Adjustable tension for donning/dothing process -More stretch near lower portion of garment.
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Ventilation</b>	-Soft/moisture wicking lining -Zoned ventilation -Laser cut ventilation -Freecut material edges
<b>SWOT Insights - Breast support</b>	-Internal divided breast padding/securing so no need to readjust
<b>Consumer Insights - breathability, tightness</b>	-Variable tension fabric for different tightness preferences -Adjustable interior fit styles for different breast volume/shape
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Breast visibility</b>	-Pectoral shaped zoning -Smooth transition from breast binding section to waist -Explore tank style/torso length -Make sure exterior fabric can glide over exterior chest panel
<b>Consumer Insights</b>	-Skin tones -Have masculine pec shaping versus breast highlighting -Prevent nipple exposure
<b>Integrated Shirt Binder</b>	<b>Sleeves</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Tightness</b>	-Widen opening connected to internal binding -Can internal binder connect/disconnect from shirt?
<b>Consumer Insights - Shoulder room</b>	-Reinforce material at this location -Provide room for shoulder -Gusset
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Soft and breathable</b>	-Soft material next to skin -Look at Tencel/Hemp
<b>Benchmark Insights</b>	-Loose fit
<b>Consumer Insights - loose fit</b>	-Soft material next to skin -Look at Tencel/Hemp
<b>Problem Identification</b>	<b>Dysphoria</b>



<b>Integrated Shirt Binder</b>	<b>Sleeves</b>
<b>SWOT Insights - Visibility</b>	-Any view through sleeves goes direct to skin -Gusseted construction to connect inner panel to binder -Create intentional seams to cover over any indication of lower binder
<b>Consumer Insights</b>	-Can be a variety of colors. -Make process of donning/dothing feel just like standard t-shirt
<b>Integrated Shirt Binder</b>	<b>Neckline</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Donning/ Dothing/Fit</b>	-Adjust shape opening -Explore different cuts
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Soft</b>	-Seamless construction -Provide good stretch at neck opening
<b>Benchmark Insights - freedom of movement</b>	-Let it flow
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Adjust shape to be wider to remove external visibility
<b>Benchmark Insights - excessive movement can shift garment</b>	-Connect at neckline to inner binder -Narrower neckline provides limited access to seeing internal binder
<b>Consumer Insights</b>	-Make process of donning/dothing feel just like standard t-shirt
<b>Integrated Shirt Binder</b>	<b>Back Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - material flow over each other</b>	-Reduce paneling -Sweat wicking through both layers -Paneling in strategic connection locations for movement
<b>Benchmark Insights - heavy materials move awkwardly</b>	-Explore lighter weight materials -RPET -Hemp -Tencel
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Lower back ride up and breathability</b>	-Freecut materials -Laser cutting -Look at cooling materials like Spectra
<b>Consumer Insights - too tight</b>	-Adjustable tension across back/shoulders

<b>Integrated Shirt Binder</b>	<b>Back Panel</b>
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Visibility</b>	-Make sure the material can glide with shirts over top -Secure the bottom of the binder around the ribcage so it does not ride up on the user.
<b>Consumer Insights - don't want it to feel different from a t-shirt</b>	-Explore patterns for camouflage of binder -Make process of donning/dothing feel just like standard t-shirt
<b>Integrated Shirt Binder</b>	<b>Chest Panel</b>
<b>Problem Identification</b>	<b>Mobility</b>
<b>SWOT Insights - Want it to move fluidly</b>	-Create floating connection from binder to shirt -Internal adjustability
<b>Benchmark Insights - chest compression</b>	-Reduce feeling of extreme constriction of ribcage -Exterior fabric needs to flow over binder and no snag
<b>Consumer Insights - difficulty donning/dothing</b>	-Expansion for donning -Balance stretch from chest to waist
<b>Problem Identification</b>	<b>Comfort</b>
<b>SWOT Insights - Breathability and chaffing</b>	-Soft material lining -Zoned ventilation -Laser cut internal ventilation/wicking -Internal divided breast padding/securing so no need to readjust
<b>Benchmark Insights - tight scratchy material</b>	-Internal material can be non-stretch but needs to be soft.
<b>Problem Identification</b>	<b>Dysphoria</b>
<b>SWOT Insights - Breast visibility</b>	-External zoning or paneling to cover or prevent binder exposure -Explore crop top -Make sure exterior fabric can glide over exterior chest panel
<b>Consumer Insights - Camouflage</b>	-Explore patterns for camouflage of binder -Make process of donning/dothing feel just like standard t-shirt -Prevent nipple exposure

*Fig. 35 Ideation Plan*

In tandem with the ideation plan, a series of mood boards were created to represent the different types of apparel inspiration pieces that could be referenced for the different types of features and benefits this garment was hoping to provide. Breathability, zoned compression, engineered fit, masculine shaping, and comfort were all considered in this process.

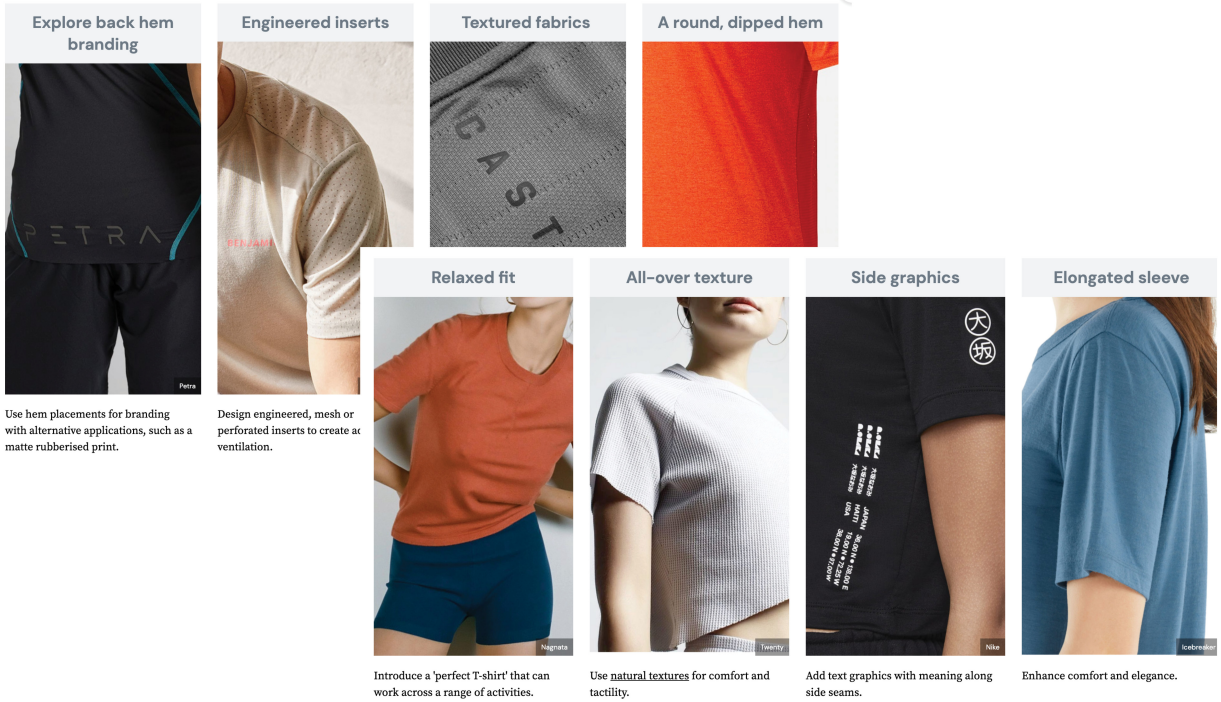


Fig. 36 Athletic T-shirt Inspiration



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Fig. 37 Combat Lines



ACTIVEWEAR\_DESIGN\_LINES

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Fig. 38 Activewear design lines

Aesthetic Ideation Plan:

An aesthetic ideation plan was created through a series of mood boards that looked at color, design, and fashion. A font package was created in order to convey a light but strong feel through thin fonts that come close together to show support.

*rhythm*

AVENIR NEXT CONDENSED | RHYTHM\_BODYWEAR |  
**RHYTHM** | *RhyThem* | **RHY/THEM** | *rhythm\_bodywear*

{FIND YOURS}

(TITLE CUSTOM KERNING)

**HEADINGS\_AVENIR NEXT CONDENSED\_BOLD\_30PT\_KERNING 50**

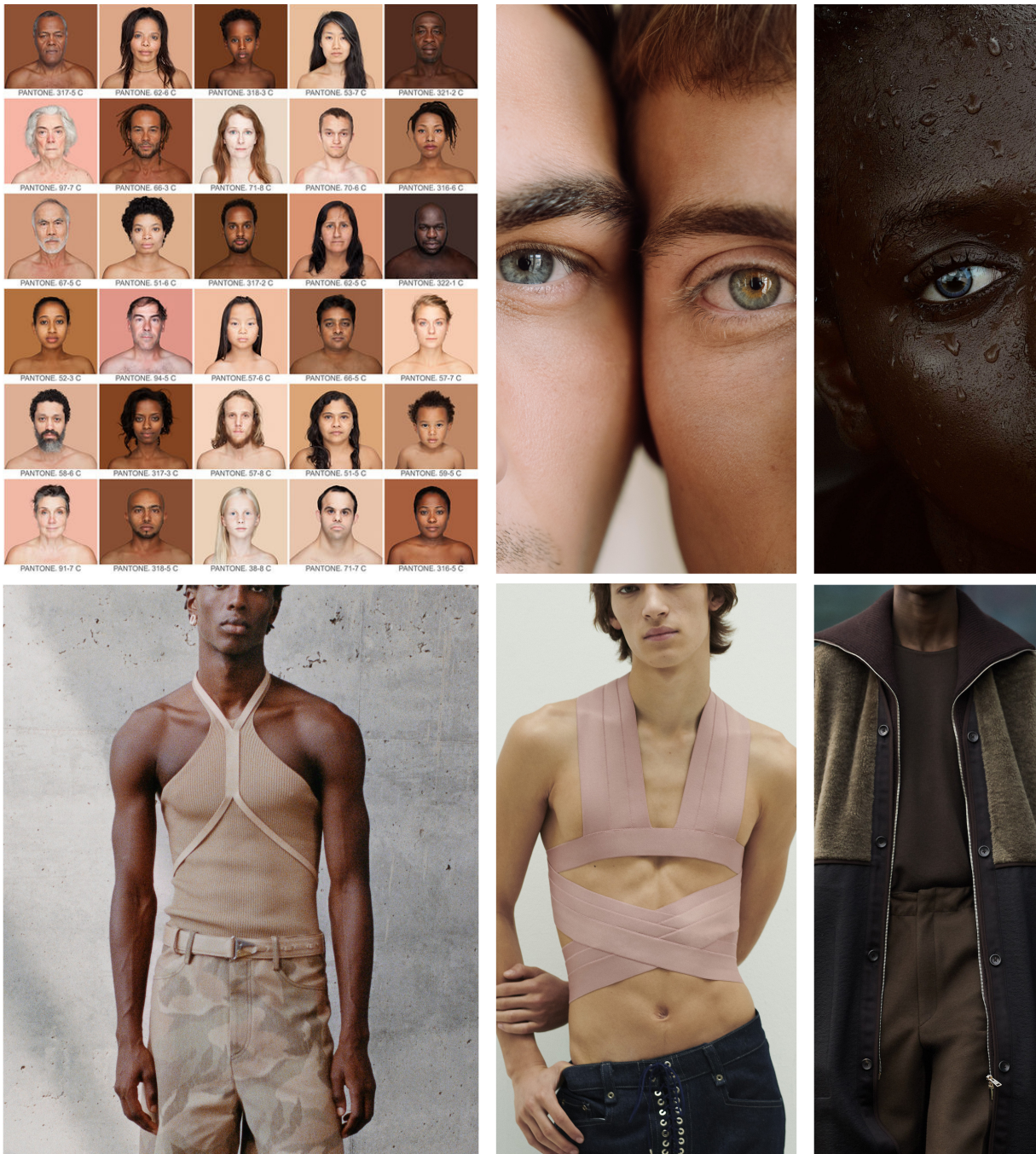
{CAPTIONS}\_AVENIR NEXT CONDENSED\_MEDIUM ITALIC\_18PT\_KERNING 200

Body\_Avenir Next Condensed\_Regular\_16pt\_kerning 0

PAGE CAPTION\_AVENIR NEXT CONDENSED\_MEDIUM\_12PT\_KERNING 200

Fig. 39 Font Package

Skin tone was considered for the need to create a garment that blends in for all users.



*Fig. 40 Skin Tone Mood Boards*

Pride was also considered as the flip side to blending in which could give the user the ability to celebrate their identity.



Fig. 41 Pride Mood Boards

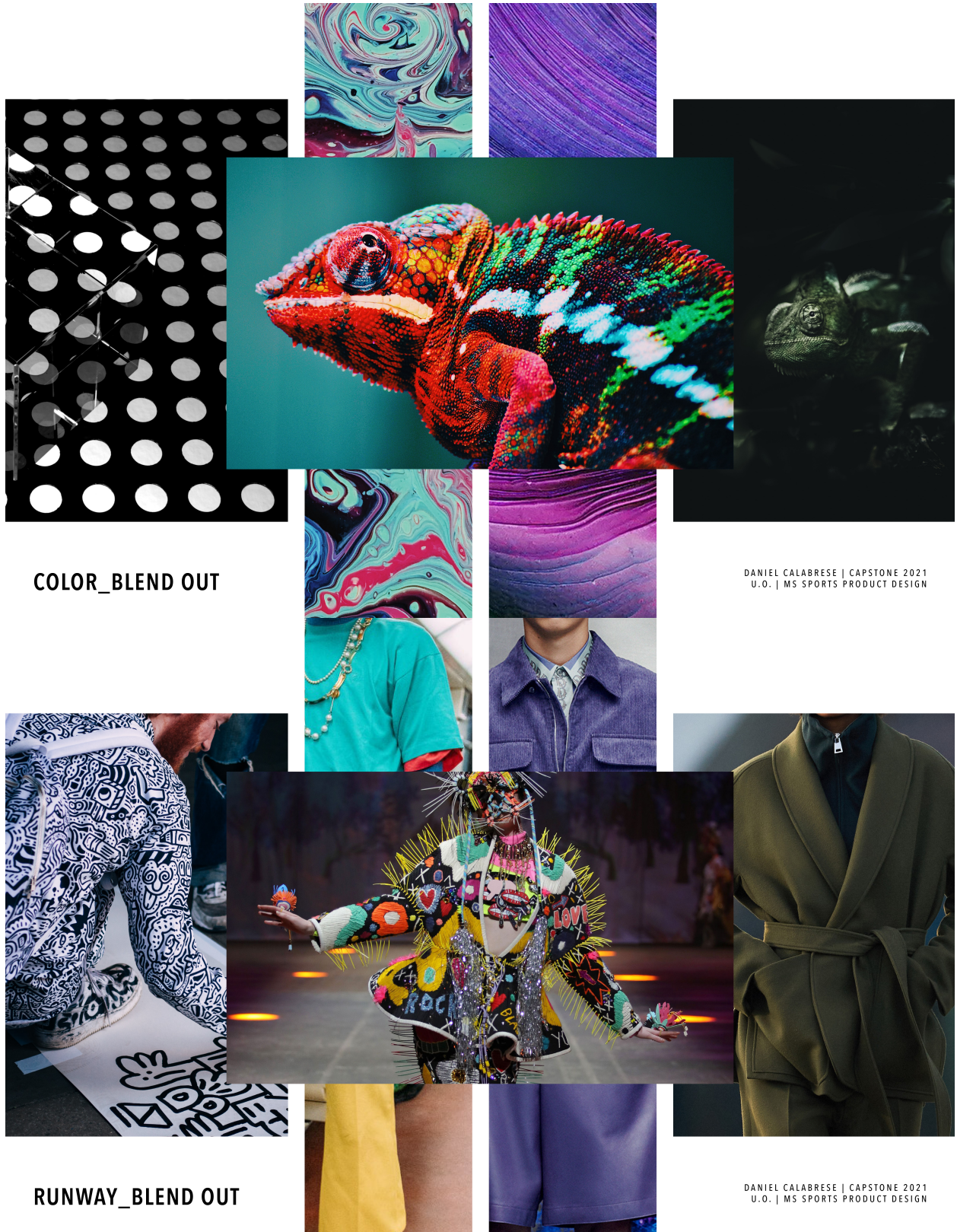


Fig. 42 Blend Out Mood Boards

These juxtaposing concepts made for a new idea of Blending Out, which spoke to this communities need to blend in when they want to and stand out and celebrate at other moments.



Fig. 43 Architectural Mood Boards



Finally, architectural forms in nature and the built environment were studied to see how to create structure while also maintaining a smooth appearance so that the user could blend into the world around them and focus on their dance.

### Material Sourcing Plan

The material sourcing plan was broken into the different garments that were to be designed and the different needs of the components in each garment. The performance goals helped to derive the types of materials and potential locations for finding these materials.

<b>Product - Chest Binder (S, M, L)</b>			
<b>Part</b>	<b>Performance goal</b>	<b>Material to solve</b>	<b>Ideas on where to source</b>
<b>Chest Panel</b>	Breathability	Polyester Mesh	Mesh Bins Mesh rolls under tables Take from existing bra/athletic wear Contact suppliers at NW show Laser cut ventilation Denver Fabrics
	Compression	Free-cut Nylon/spandex blend 170-200grams	Knit Bins Stretch Knit rolls under tables Take from existing product Contact suppliers at NW show Hoyu Tex - Taiwan Reach out to Rebecca DR Utilize KT tape/sport bandage Custom knit Shima Seiki Custom knit kniterate
	Comfort	Microfiber	Knit Bins Knit rolls under tables Take from existing product Contact suppliers at NW show Mill End
	Structure	Spacer/Neoprene	3D mesh bins Spacer rolls under tables Take from existing product Contact suppliers at NW show Ducksan Use poly board for placeholder 3D printed Mill End
	Structure	Bemis/Stahls	On shelves Contact Stahls Rep

**Product - Chest Binder (S, M, L)**

<b>Back Panel</b>	Breathability	Polyester Mesh	Mesh Bins Mesh rolls under tables Take from existing bra/athletic wear Contact suppliers at NW show Laser cut ventilation Denver Fabrics
	Compression	Free-cut Nylon/spandex blend 170-200grams	Knit Bins Stretch Knit rolls under tables Take from existing product Contact suppliers at NW show Hoyu Tex - Taiwan Reach out to Rebecca DR Utilize KT tape/sport bandage Custom knit Shima Seiki Custom knit kniterate
	Comfort	Microfiber	Knit Bins Knit rolls under tables Take from existing product Contact suppliers at NW show Mill End
	Structure	Spacer/Neoprene	3D mesh bins Spacer rolls under tables Take from existing product Contact suppliers at NW show Ducksan Use poly board for placeholder 3D printed Mill End
	Structure	Bemis/Stahls	On shelves Contact Stahls Rep
<b>Neckline</b>	Comfort	Microfiber binding	Knit Bins and rolls Denver Fabrics/Fabric.com Take from existing product
	Comfort	Free-cut Nylon/spandex blend 170-200grams	Take from existing product Reach out to Rebecca DR Utilize KT tape/sport bandage
<b>Straps</b>	Breathability	Fine gauge mesh	Bins Under tables Take from existing product Contact suppliers at NW show Old company contacts Laser cut ventilation Local supplier

**Product - Chest Binder (S, M, L)**

	Comfort	Stretch mesh	Mesh Bins Mesh rolls under tables Take from existing bra/athletic wear 3D print Local supplier Laser cut ventilation Denver Fabrics
--	---------	--------------	---

**Product - Integrated Shirt Binder**

Part	Performance goal	Material to solve	Ideas on where to source
Chest Panel	Breathability	Polyester Mesh	Mesh Bins Mesh rolls under tables Take from existing bra/athletic wear Contact suppliers at NW show Laser cut ventilation Denver Fabrics
	Compression (interior)	Free-cut Nylon/spandex blend 170-200grams	Knit Bins Stretch Knit rolls under tables Take from existing product Contact suppliers at NW show Hoyu Tex - Taiwan Reach out to Rebecca DR Utilize KT tape/sport bandage Custom knit Shima Seiki Custom knit kniterate
	Comfort	Microfiber	Knit Bins Knit rolls under tables Take from existing product Contact suppliers at NW show Mill End
	Structure	Spacer/Neoprene	3D mesh bins Spacer rolls under tables Take from existing product Contact suppliers at NW show Ducksan Use poly board for placeholder 3D printed Mill End
	Exterior shell	Eco poly blend	Knit Bins Knit rolls Under tables Take from existing product Hoyu Custom knit Shima Seiki Custom knit kniterate

<b>Product - Integrated Shirt Binder</b>			
<b>Back Panel</b>	Breathability	Polyester Mesh	Mesh Bins Mesh rolls under tables Take from existing bra/athletic wear Contact suppliers at NW show Laser cut ventilation Denver Fabrics
	Compression	Free-cut Nylon/spandex blend 170-200grams	Knit Bins Stretch Knit rolls under tables Take from existing product Contact suppliers at NW show Hoyu Tex - Taiwan Reach out to Rebecca DR Utilize KT tape/sport bandage Custom knit Shima Seiki Custom knit kniterate
	Comfort	Microfiber	Knit Bins Knit rolls under tables Take from existing product Contact suppliers at NW show Mill End
	Structure	Spacer/Neoprene	3D mesh bins Spacer rolls under tables Take from existing product Contact suppliers at NW show Ducksan Use poly board for placeholder 3D printed Mill End
	Exterior shell	Eco poly blend	Knit Bins Knit rolls Under tables Take from existing product Hoyu Custom knit Shima Seiki Custom knit kniterate
<b>Sleeves</b>	Breathability	Polyester Mesh	Mesh Bins Mesh rolls under tables Take from existing bra/athletic wear Contact suppliers at NW show Laser cut ventilation Denver Fabrics
<b>Collar</b>	Structure	Bemis	On shelves Contact Stahls Rep
	Comfort	Microfiber binding	Knit Bins and rolls Denver Fabrics/Fabric.com Take from existing product

Fig. 44 Material Sourcing Plan

MATERIAL	IDEATION	PROTOTYPING	CAD	FITTING	PRESENTATION	DEADLINE
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
FEBRUARY	1	2	3	4	5	6
				MAT. EXPLORE COMPRESSION	MAT. EXPLORE COMFORT	MAT. EXPLORE BREATHABILITY
7	8	9	10	11	12	13
MIDTERM PREP	HW 9 - MIDTERM REVIEW	MIDTERM PREP	MIDTERM	Processing feedback and making any final adjustments to calendar.	BREAK	IDEATION - BINDER S/M - STRAPS (25 IDEAS) AND OPENINGS (25 IDEAS)
BACK ENGINEER GC2B BINDER - CREATE TECH FLATS	MAT. STRUCTURE/ SUPPORT	ORDER SWATCHES		BUILD OUT TEMPLATE PAGES FOR PRESENTATION		PROTO TOP 4 STRAP IDEAS IN MINI
14	15	16	17	18	19	20
IDEATION - BINDER S/M - IDEATE ON CHEST PANEL BACK PANEL (25 IDEAS)	BRING IDEAS TOGETHER ON S/M BINDER - (CREATE TECH FLATS) TOP 4	IDEATION - BINDER LARGE - STRAPS (25 IDEAS) AND OPENINGS (25 IDEAS)	IDEATION -BINDER LARGE - CHEST PANEL (25 IDEAS) AND BACK PANEL (25 IDEAS)	BRING IDEAS TOGETHER ON LARGE BINDER (CREATE TECH FLATS) TOP 4	IDEATE SHIRT SLEEVES (25 IDEAS) AND NECKLINE/ WAIST (25 IDEAS)	IDEATE SHIRT CHEST PANEL BACK PANEL (25 IDEAS)
BUILD GC2B BINDER IN BROWZWEAR	PROTO CHEST PANEL (TOP 4 IDEAS) MINIS	PROTO BACK PANEL IDEAS (TOP 4 IDEAS) MINIS	LASER CUT VENTILATION IDEAS (5 IDEAS)	PROTOTYPE LAMINATION OPTIONS (4 IDEAS)	MAT EXPLORE ECO SHIRT FABRIC OPTIONS	START MINI PROTOS OF TOP 4 IDEAS
21	22	23	24	25	26	27
IDEATE SHIRT INTEGRATION (25 IDEAS)	BRING IDEAS TOGETHER ON SHIRT - (CREATE TECH FLATS) TOP 4	DRAFT AND DIGITIZE PATTERNS FOR S/M BINDERS - CUT MATERIALS	PROTOTYPE S/M BINDERS	RE-PROTOTYPE S/M BINDERS BASED ON TESTING FEEDBACK	DRAFT AND DIGITIZE PATTERNS FOR LARGE BINDER - CUT MATERIALS	PROTOTYPE LARGE BINDERS
UPDATE PRESO W/ CURRENT CONTENT	PROTO INTEGRATION CONNECTION (TOP 4 IDEAS)	PROTOTYPE S/M BINDERS	FIT S/M BINDER ON MODELS/. MAKE ADJUSTMENTS	CAD MODEL BINDERS (S,M,L) (BROWZWEAR)	PROTOTYPE LARGE BINDERS	FIT LARGE BINDER ON MODELS/ MAKE ADJUSTMENTS
28	MARCH 1	2	3	4	5	6
RE-PROTOTYPE LARGE BINDERS	DRAFT + DIGITIZE PATTERNS FOR SHIRTS - CUT MATERIALS	PROTO SHIRT	RE-PROTOTYPE SHIRT BASED ON TESTING FEEDBACK	CAD MODEL BINDERS (BROWZ)	START FILLING CONTENT INTO PRESENTATION	PHOTO/VIDEO ALL GARMENTS
CAD MODEL BINDERS (BROWZ)	PROTO SHIRT	FIT SHIRT ON LIVE MODELS, MAKE ADJUSTMENTS	MAKE FINAL MATERIAL SELECTIONS	ORDER MATERIALS	UPDATE PAPER W/ NEW CONTENT FROM DESIGN	UPDATE PAPER W/ NEW CONTENT
7	8	9	10	11	12	13
EDIT PHOTOS + DROP INTO PRESEO	FINAL PREVIEW	MAKE ANY PRESO ADJUSTMENTS + PRACTICE	FINAL REVIEW			

Fig. 45 Ideation Calendar

## Calendar

An ideation calendar was created to help keep the process on track that allowed the designer to hit key milestones in a timely manner.

## Ideation

To kick off the design process, a line plan was created that would help guide the designer through the garments that needed to be designed for and the inspiration that would help guide design lines and concepts. The base layers or half tanks would be broken into each size and a quick guide for which size correlated to which cup size helped the designer to visualize the support needs within each size offering. The shirt garment would stream off of the medium sizing for the time being in order to finesse and focus on the patterning of the garment.

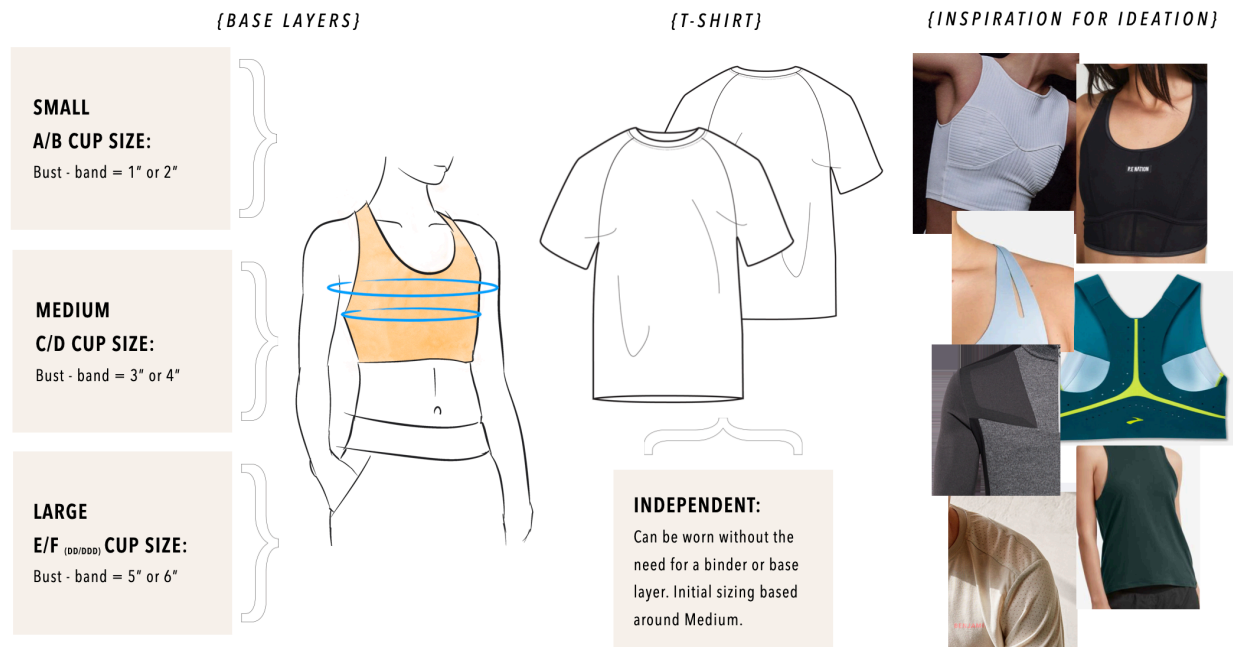


Fig. 46 Line plan

The beginning of the ideation process focused on the half tank binder in the small, medium, and large sizes. Each was ideated on around the unique needs of the different chest volumes to provide a custom experience for the wearer. Neck and armhole ideations were the beginning of the ideation process, but when it was realized that the garment is small enough that the full garment could be ideated on at the same time, the shift when to look at how

paneling and blocking can work together to provide the user with the breathability they need in key zones as well as structure and support they need to facilitate each type of chest volume.

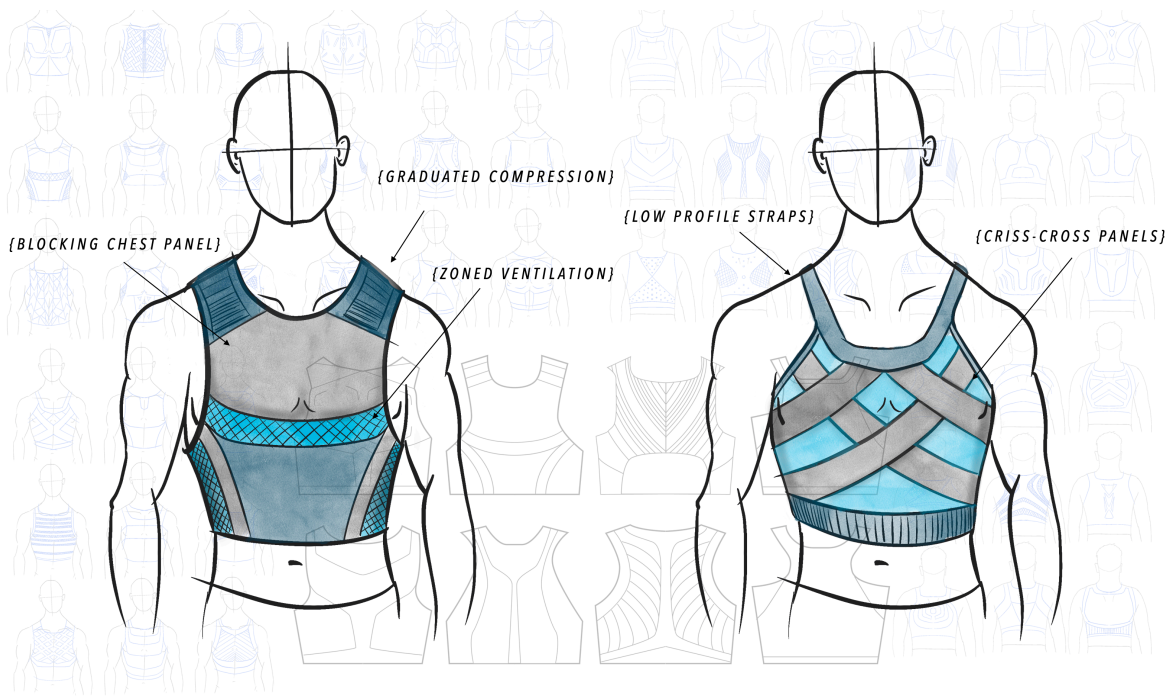


Fig. 47 Small Medium Ideation

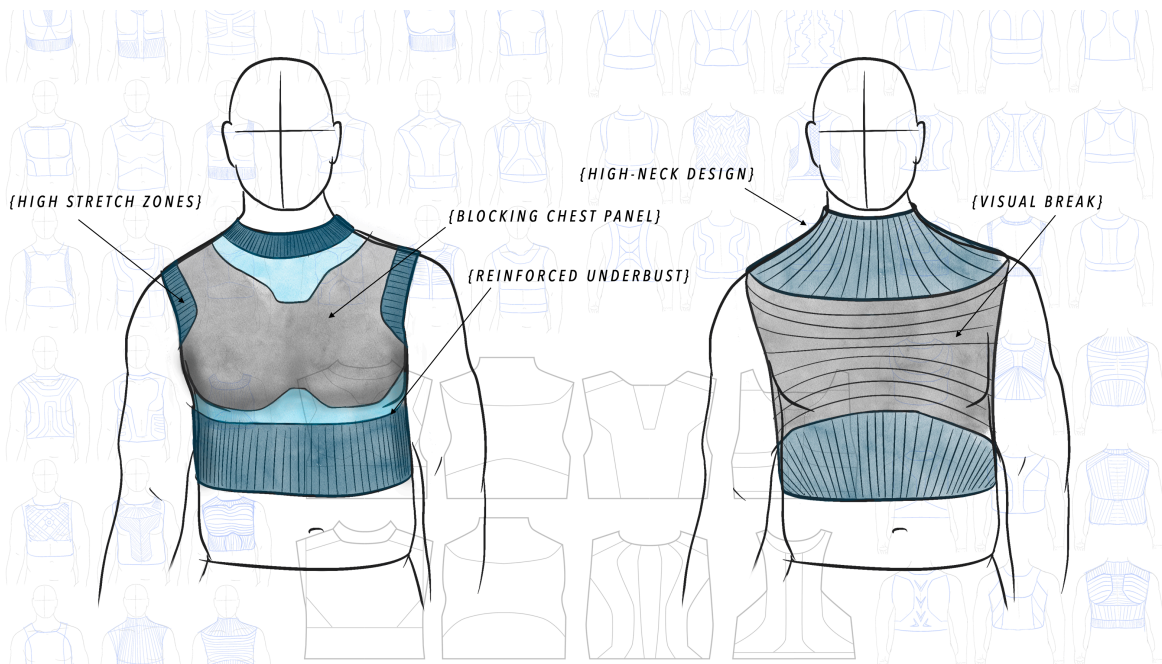


Fig. 48 Large Ideation

The materials were ideated on in tandem with the design of the garment to help understand the different stretch needs that would be taken into consideration for each garment. The inspiration came from the Brooks Running Dare Crossback Run bra. Built from a nylon/polyester double-knit material, this bra is able to be free cut on the edges as well as laser cut in key zones for ventilation. This clean construction allows for a comfortable experience for the wearer. Different material explorations were done in order to try and replicate this type of material as well as try to create a new version that would be uniquely suited to the needs of the trans and non-binary athletes and dancers. Building in areas of stability and ventilation through the lamination process would be essential to help make the garment feel custom built for the user.



*Fig. 49 Material Ideation*

Fig 49 shows ventilation, lamination and a built prototype that follow through in this process and will help guide the design forward. The end goal is to create a new material called Flowform that will take all of these key features into consideration.





Fig. 50 Base layer prototyping

To quickly see how the ideation of the small and medium base layer could be functional, quick prototype studies were built that could be tested on a non-binary subject to illicit their feedback on the fit and function. The gc2b Half Tank Binder acted as a control to remind the user what the goal of the prototypes were from a flat appearance standpoint. While some of the samples failed and others did an okay job at compressing the chest volume, one sample, seen on the bottom left of Fig 50, was able to do a very good job at both compressing the chest volume as well as keeping it in a secure location for the user.



Fig. 51 Base layer prototyping, round 2

With this new information in mind, a second round of iterative prototypes was created that took the success of the first round and built upon them in tandem with user feedback. Small, medium, and large prototypes were built to see how the successful design could be graded up and down to provide unique support for the different chest volumes.

The successes found in the ideation and prototyping of the base layer garments led to a revised look at the ideation for the shirt bodywear piece. Initially the concept was to include an internal base layer garment that would connect to the outer shirt, but the complications with how this would feasibly work well for the user led the designer to shift focus on a bodywear piece that would incorporate the compression directly into the shirt.

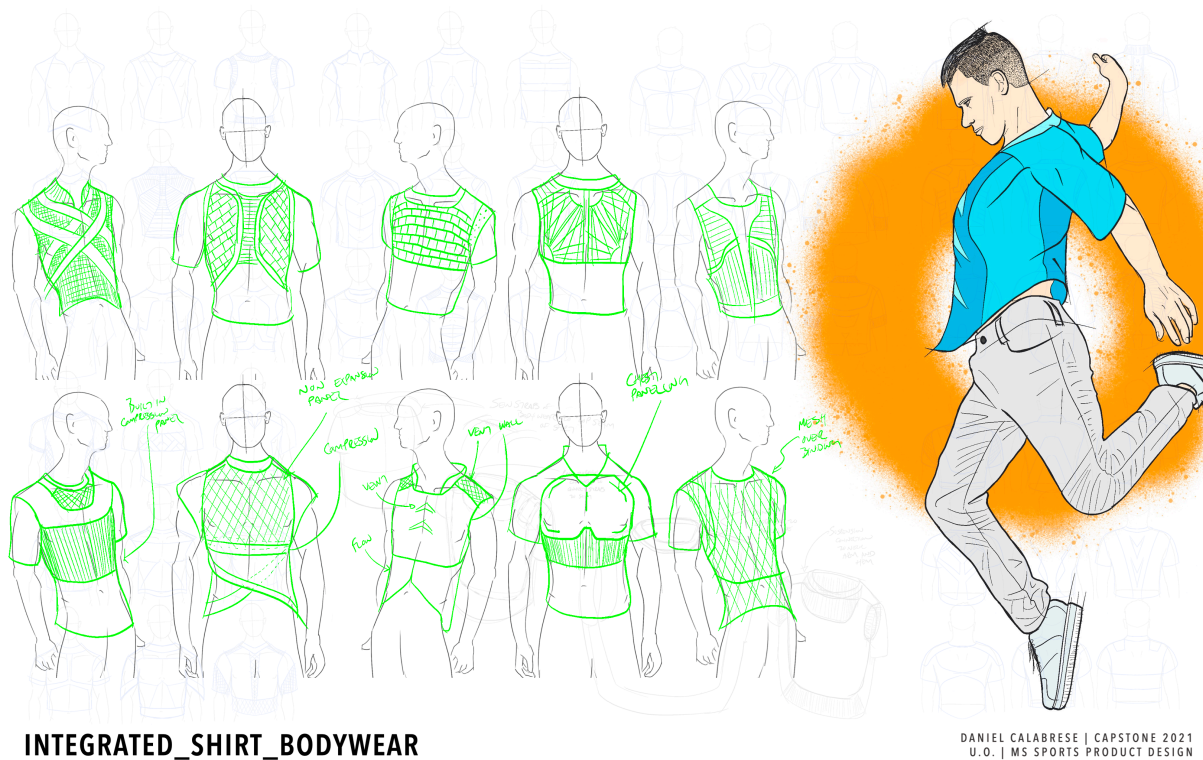


Fig 52 Ideation of shirt bodywear

This ideation looked at how to incorporate different zones of compression and ventilation as well as how to use different materials to camouflage the compression components of the garment. For dance, this garment would most likely be used more in a training capacity and not as a garment that would be worn on stage so its design is flexible to be more athletically inspired and less minimal for the dance aesthetic.



Fig 53 Prototyping shirt bodywear

The prototyping of the shirt started from a raglan design that created more masculine lines on the user. From there different materials were ideated between polyester, cotton and a fine nylon mesh that could allow the user to feel different material conditions to gauge which would be best for practice and exercise conditions. Bemis was applied, similar to the base layer to create the zoned areas of non-stretch that would act as a barrie for the chest volume. The user gravitated towards the design in the bottom left of Fig 53.



Fig 54 Prototyping shirt bodywear

Based on the user's direct feedback during the fitting, the designer was able to apply another piece of bemis under the arm that connected the back and front panel bemis to provide a full 360 degrees of support that they felt was better for their chest volume.

### Features and Benefits

The ideation and prototyping process was instrumental in locking in on a set of features and benefits for each garment that would be successful for the user to be able to wear an athletic garment and feel lower levels of dysphoria.

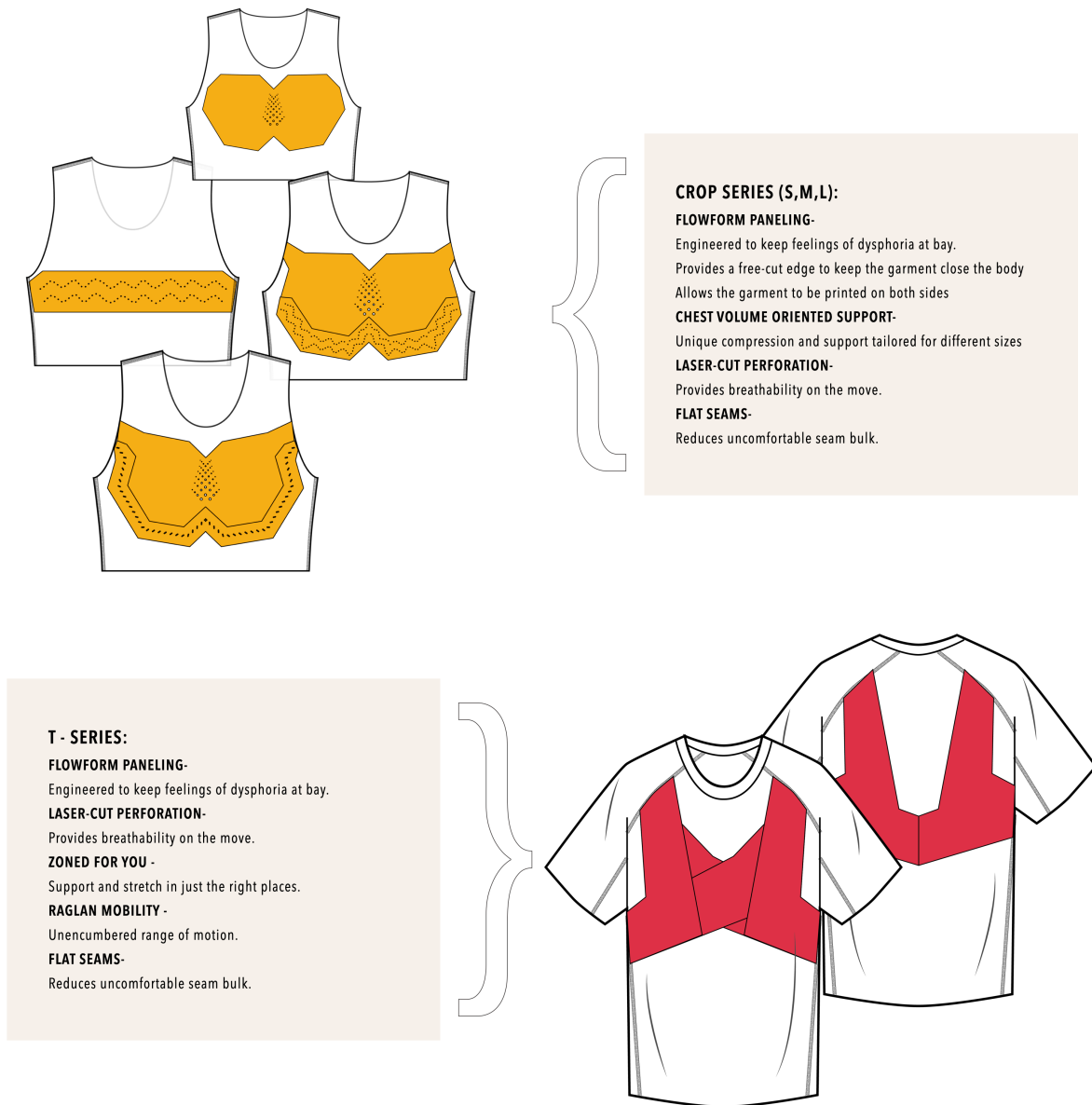
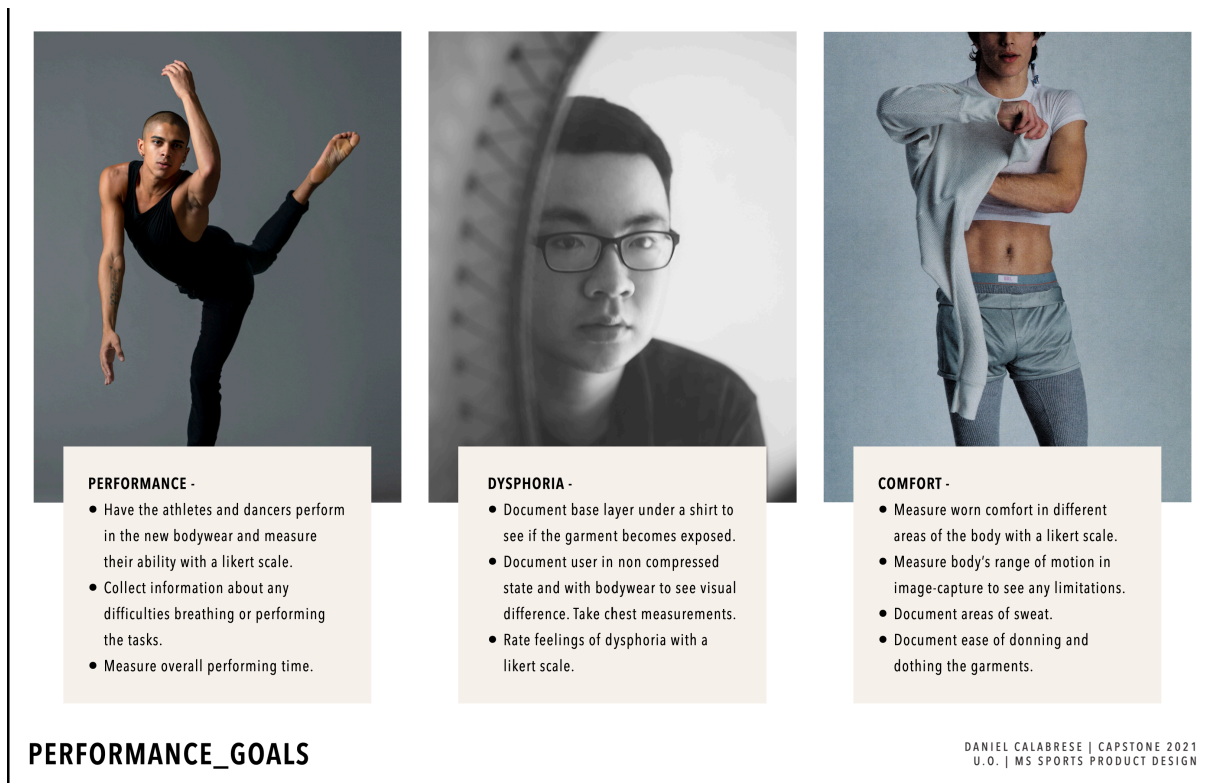


Fig 55 Features and Benefits of the Base Layer and Shirt garments

## Testing and Validation



**PERFORMANCE -**

- Have the athletes and dancers perform in the new bodywear and measure their ability with a likert scale.
- Collect information about any difficulties breathing or performing the tasks.
- Measure overall performing time.

**DYSPHORIA -**

- Document base layer under a shirt to see if the garment becomes exposed.
- Document user in non compressed state and with bodywear to see visual difference. Take chest measurements.
- Rate feelings of dysphoria with a likert scale.

**COMFORT -**

- Measure worn comfort in different areas of the body with a likert scale.
- Measure body's range of motion in image-capture to see any limitations.
- Document areas of sweat.
- Document ease of donning and dothing the garments.

**PERFORMANCE\_GOALS**

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*Fig. 56 Testing and Validation Plan*

To make sure that these concepts actually perform to the needs of the user, a series of tests, similar to the tests performed for the benchmark testing, will be performed that will look at the athletic capabilities of the user, their overall comfort and their general feelings of dysphoria while wearing the garment. These tests will look to prove that the new designs are successful and can be marketed as garments that can be worn to ease feelings of dysphoria for the trans and non-binary communities.

## Revised Ideation

With new considerations in mind from the proof of concept, new ideations were explored that looked at refining the design from initial concepts. Three styles were ideated around, a half tank that could be worn under other garments, a full tank that could be worn under other garments or on its own, and a t-shirt that could be worn on its own.

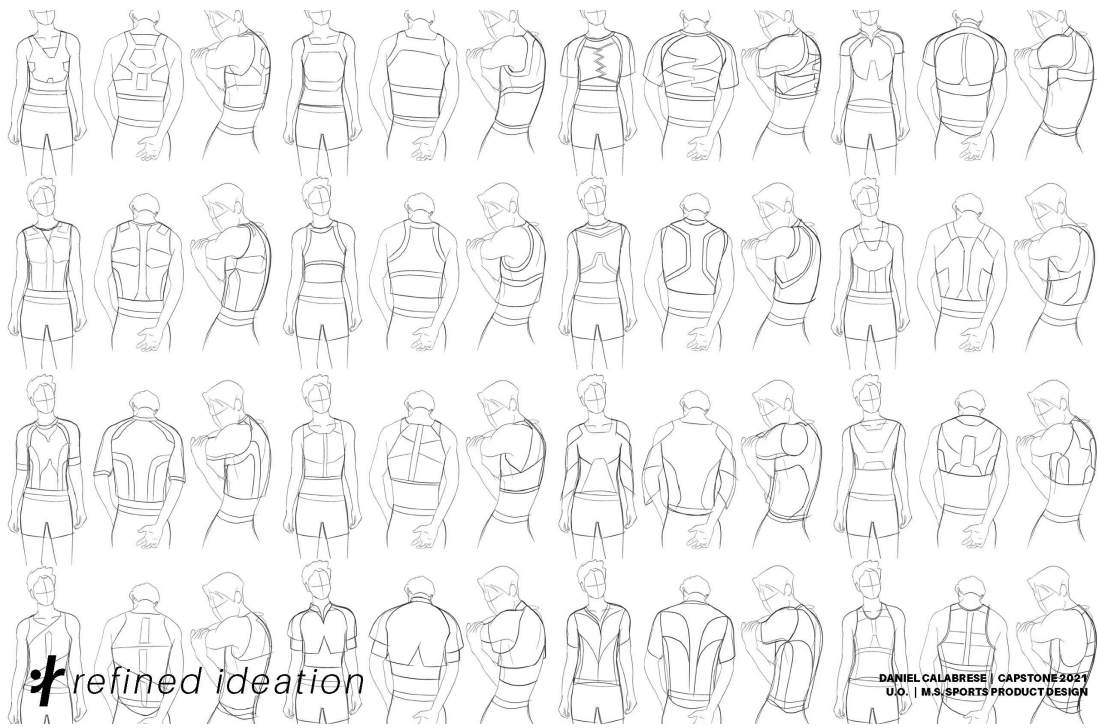


Fig. 57 New Ideation

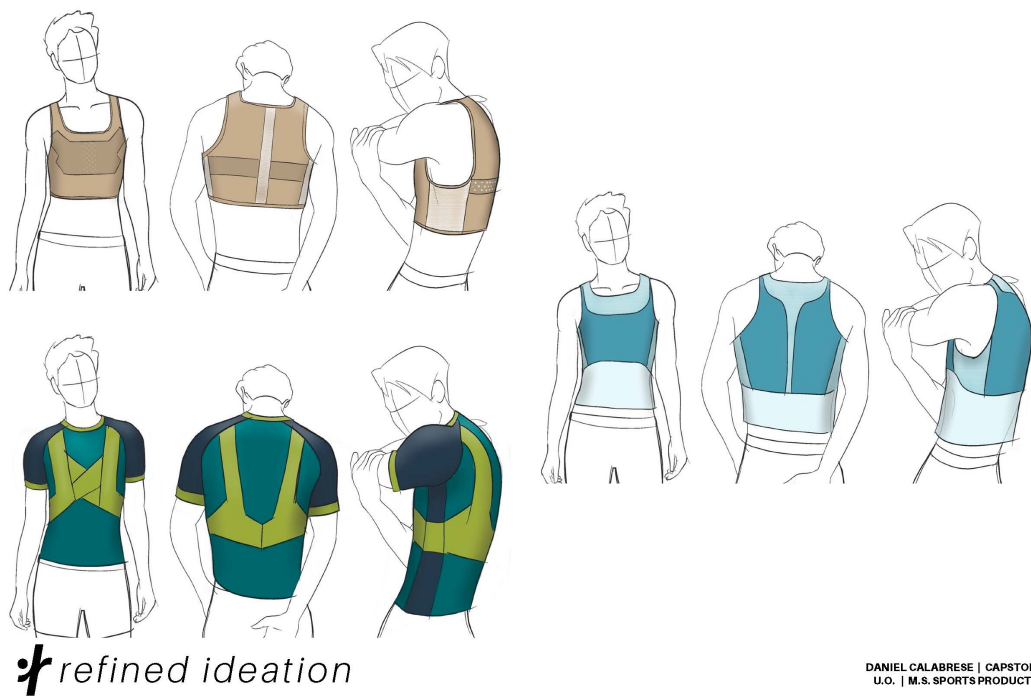
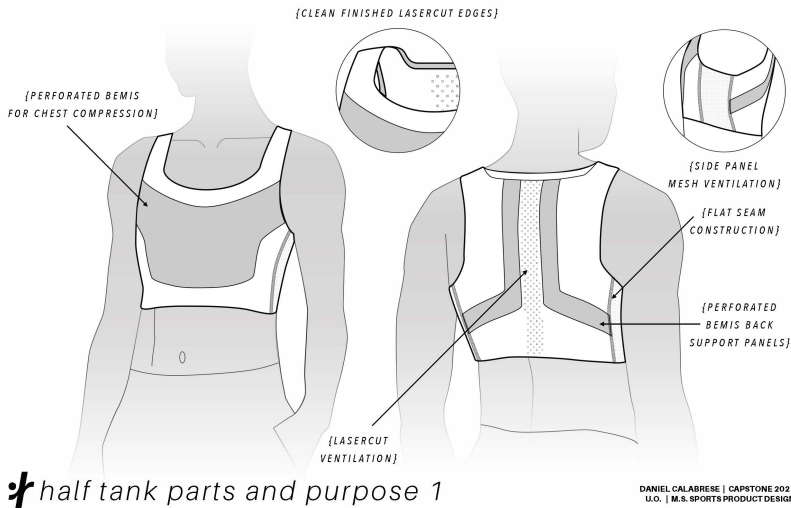


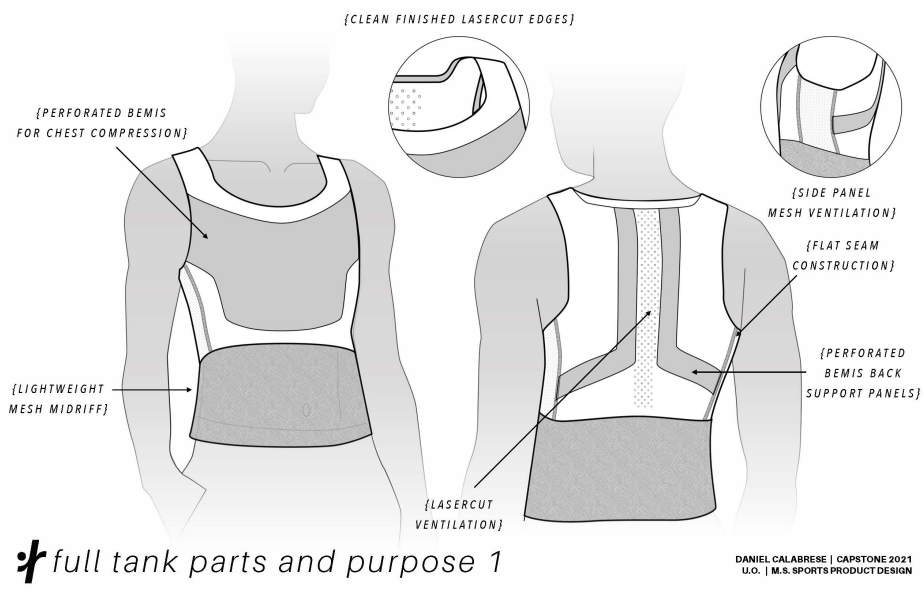
Fig. 58 Rendered Ideation



✦ half tank parts and purpose 1

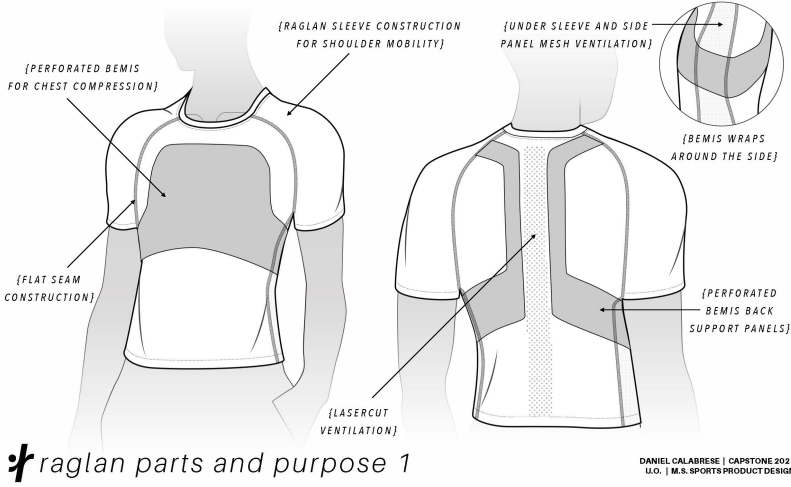
After directions were selected for further exploration, refined parts and purpose drawings were created.

Fig. 59 Half Tank Parts and Purpose



✦ full tank parts and purpose 1

Fig. 60 Full Tank Parts and Purpose



✦ raglan parts and purpose 1

These parts and purpose drawings helped to establish the key final criteria needed for the final prototype exploration.

Fig. 61 Raglan Parts and Purpose

## Revised Prototypes



*the proto process*

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Fig. 62 Revised Prototypes

The new prototypes looked at exploring different material combinations and zoning to allow for the user to get in and out of the garment and looked to use bonded materials to reduce seam bulk at the neck and armhole openings.

The prototypes were refined over a series of samples until new clean styles were created that could be used for validation testing with the athletes. A trip to Eugene was conducted to meet with three dancers at the University of Oregon in order for them to try on the garments and perform the same testing that was conducted on the benchmark products. Each athlete tried on the new garments and performed mobility testing, exposure testing and dance practice to see how easy it was to breathe in the garment. The users overall were happy with how the garment performed but some issues with fit around the neck hole and bottom hem on the garments needed to be addressed in order for the garments to fit perfectly.





{IMPROVED MOBILITY}

{LOW PROFILE GLIDE}

{EASY TO BREATHE}

 validation testing

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*Fig. 61 Athletes conducting validation testing*

With the feedback from the validation received final designs were created and new final samples were produced for the last photo documentation.

The new samples employed the new material construction practice branded *flowform* which is a unique combination of laminated materials, zoned compression and expansion and laser cut ventilation that provides the trans and non-binary dancers with the fit and function they need to succeed.

*flowform*  
by *rhythm*

A proprietary material construction that provides the necessary features for trans and non-binary athletes to perform comfortably in their own skin.

**IP strategy**

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Fig. 62 Flowform Technology

*rhythm*

**sport top**

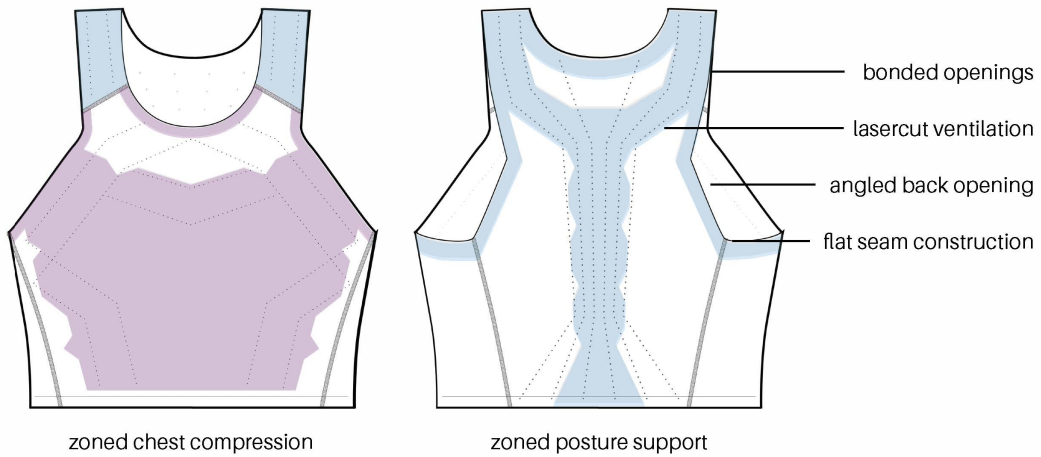
low profile + breathable + supportive

FOB US: \$11.25 | MSRP: \$45



Fig. 63 Rhythm Sport Top

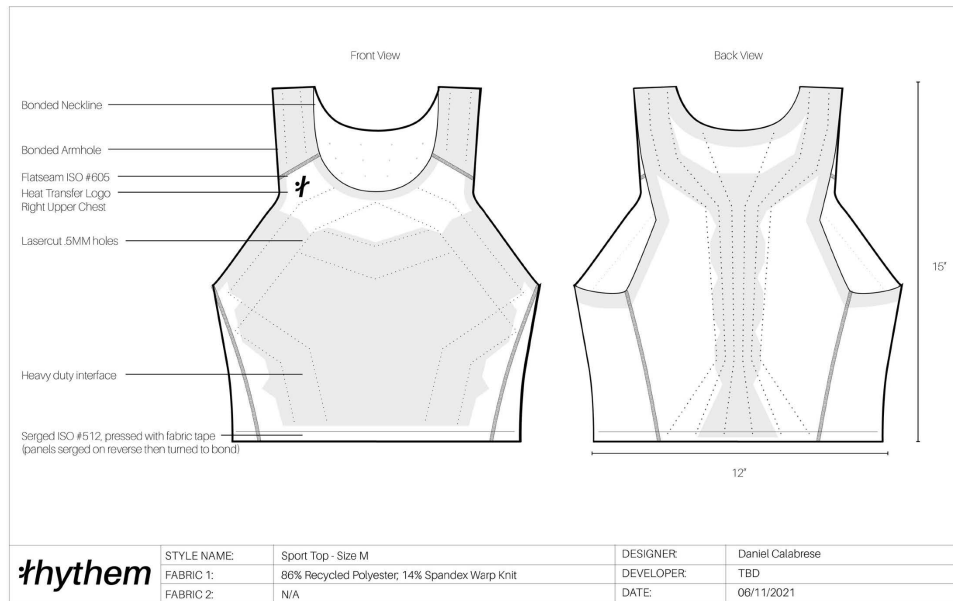
84% warp knit recycled polyester/16% spandex  
with wicking and anti-microbial finishes



**#** sport tank features

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Fig. 64 Rhythm Sport Tank Features and Benefits



**#** sport top tech flats

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Fig. 65 Rhythm Sport Tank Tech Flats



nude

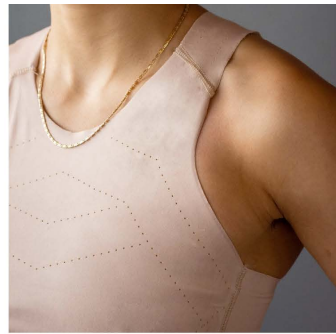


Fig. 66 Nude Colorways



pride

Fig. 67 Pride Colorways

# rhythm

## flow tank

crossover + expressive + flexible

FOB US: \$13.75 | MSRP: \$55



Fig. 68 Rhythm Flow Tank

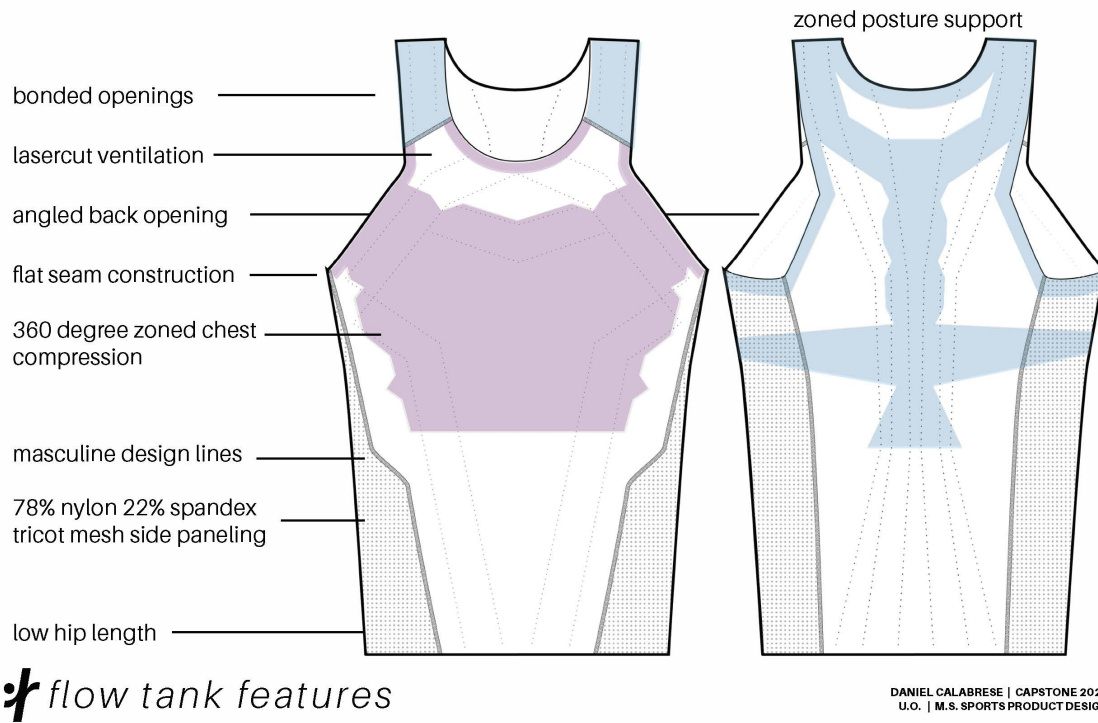
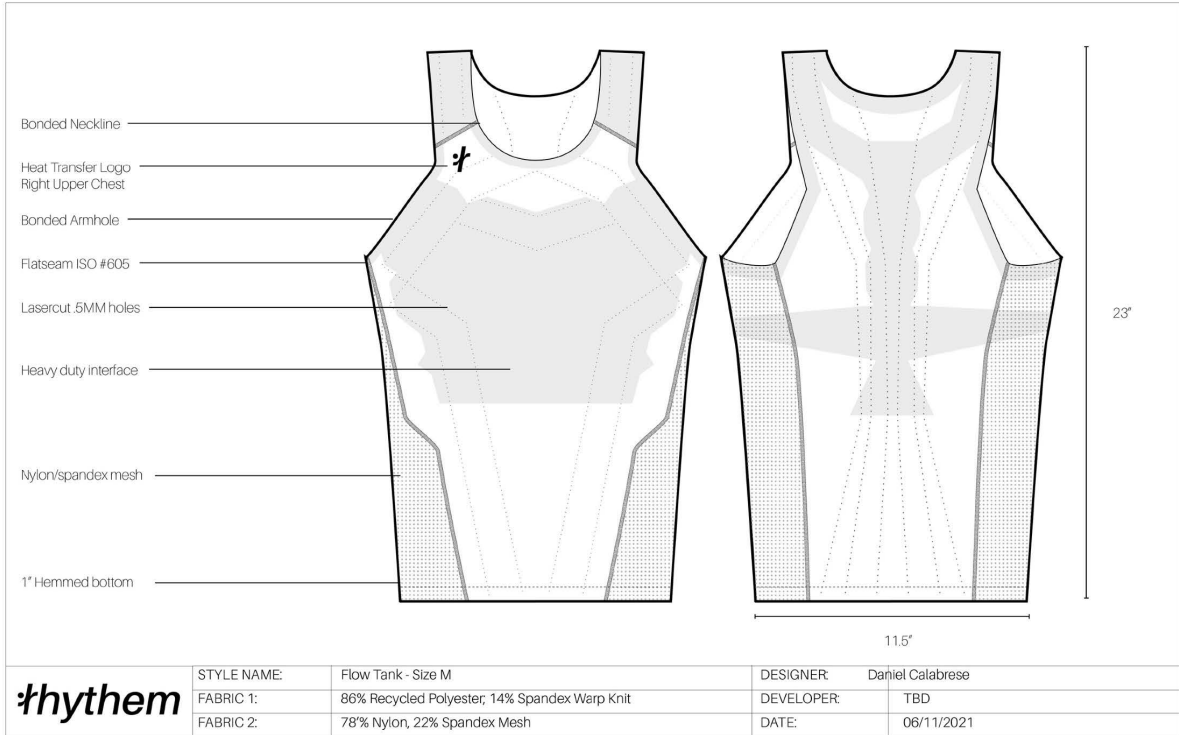


Fig. 69 Flow Tank Parts and Purpose



# rhythm sport top tech flats

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Fig. 70 Flow Tank Tech Flats



Fig. 71 Flow Tank Photos

# rhythm

## raglan

comfortable + masculine + performance

FOB US: \$16.25 | MSRP: \$65

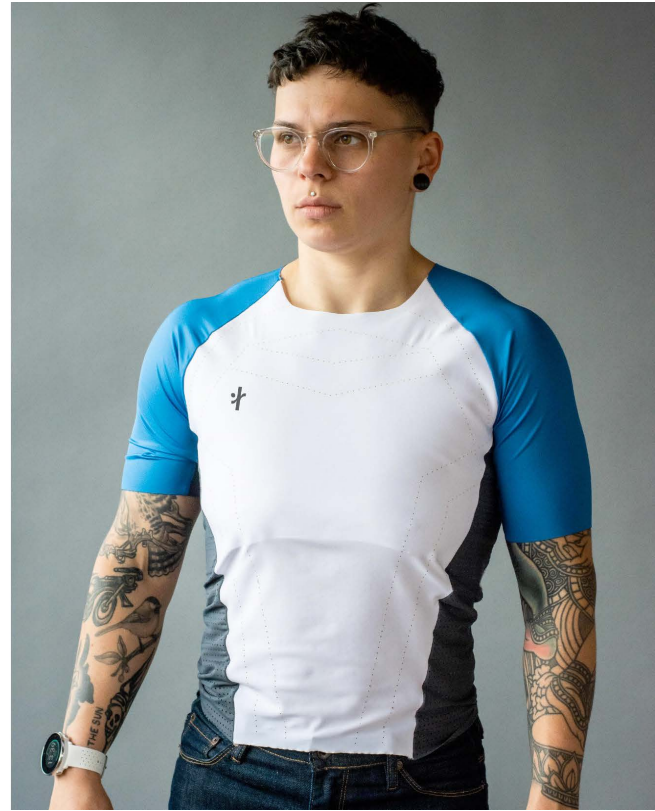
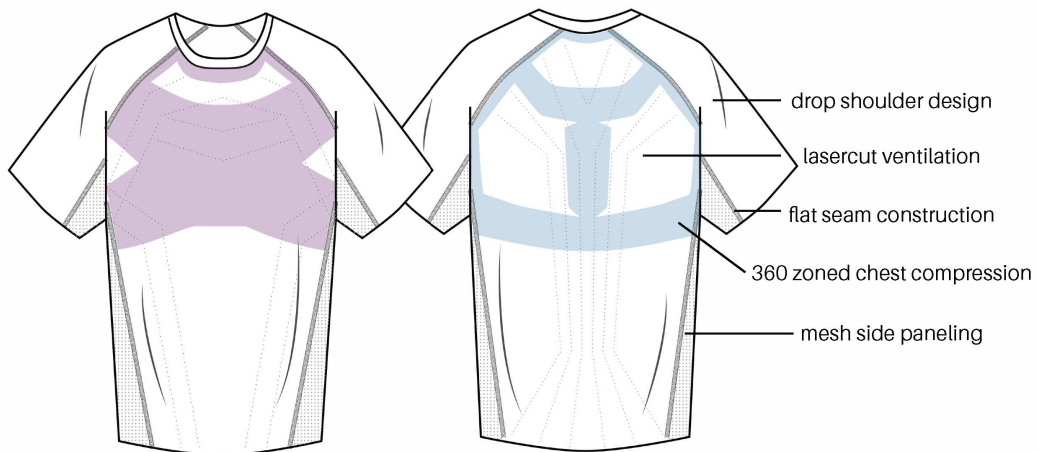


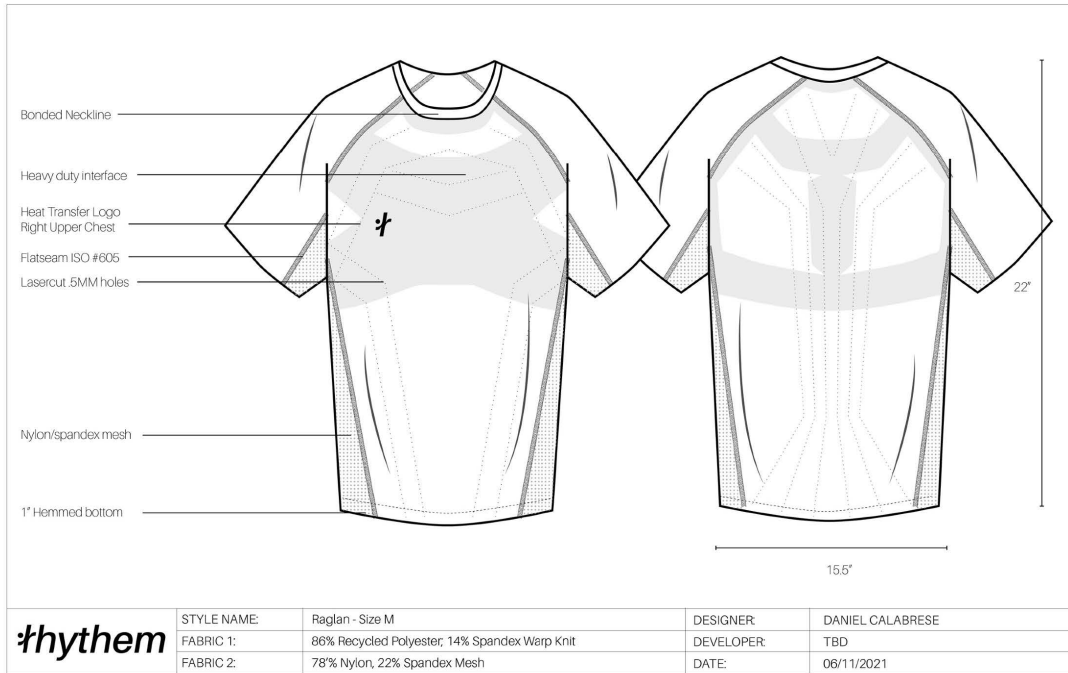
Fig. 71 Rhythm Raglan



**r** raglan features

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Fig. 72 Raglan Features and Benefits



**#** raglan tech flats

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Fig. 73 Raglan Tech Flats

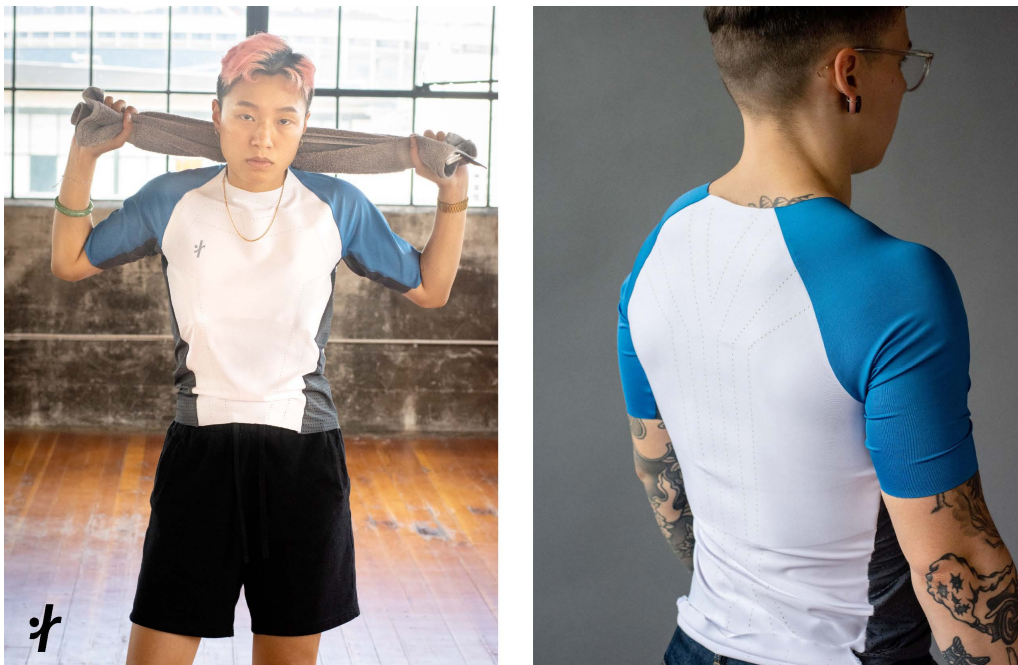


Fig. 74 Raglan Photos





**\*** mesh raglan camouflage

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Fig. 75 Mesh Raglan Camouflage Layer

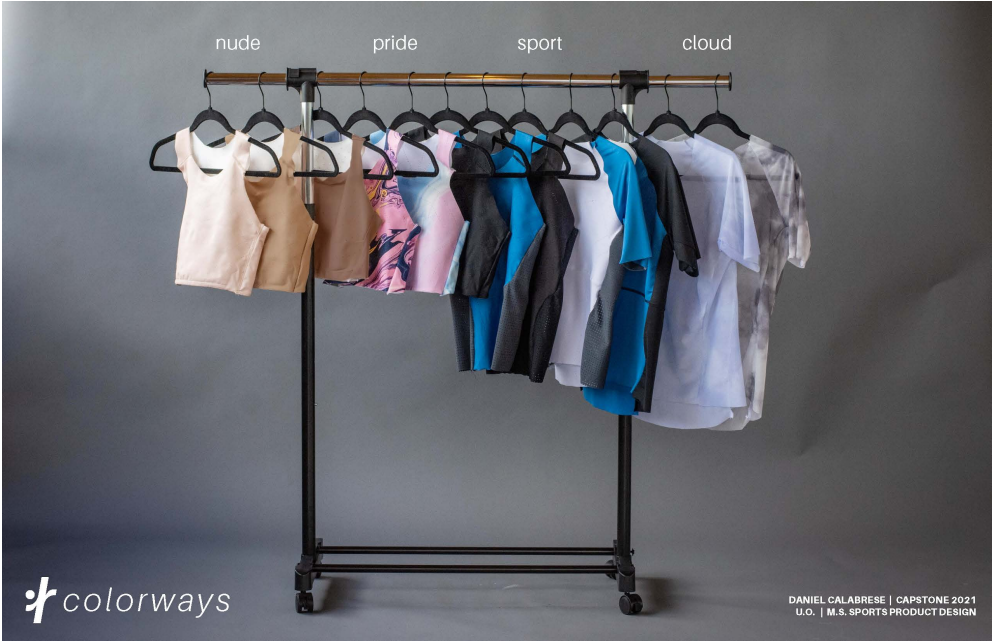
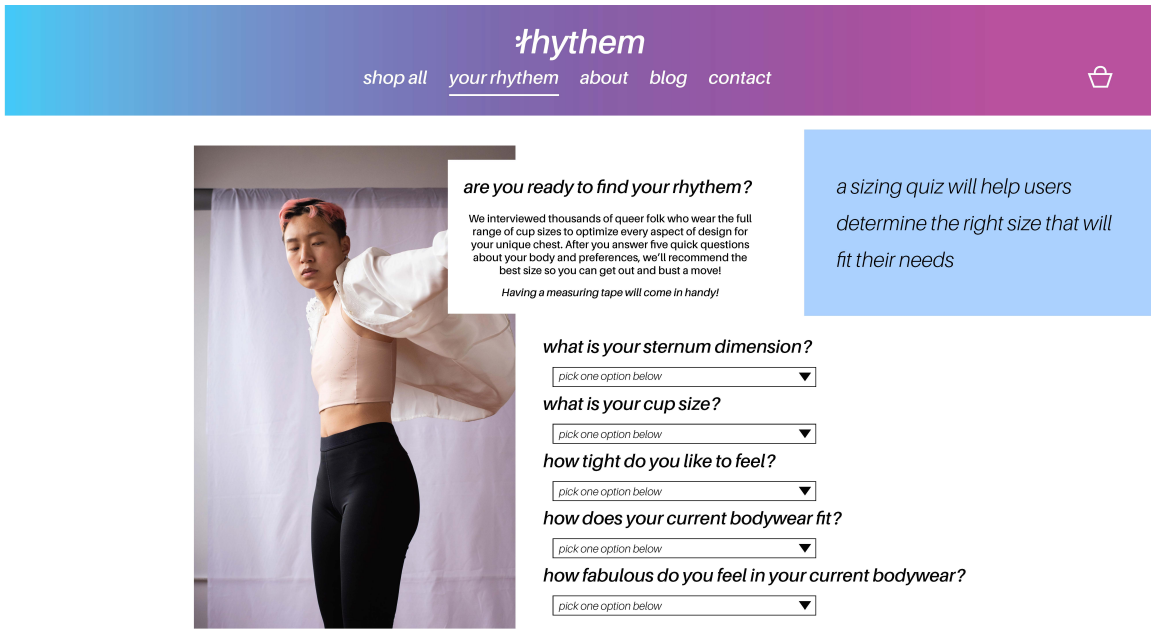


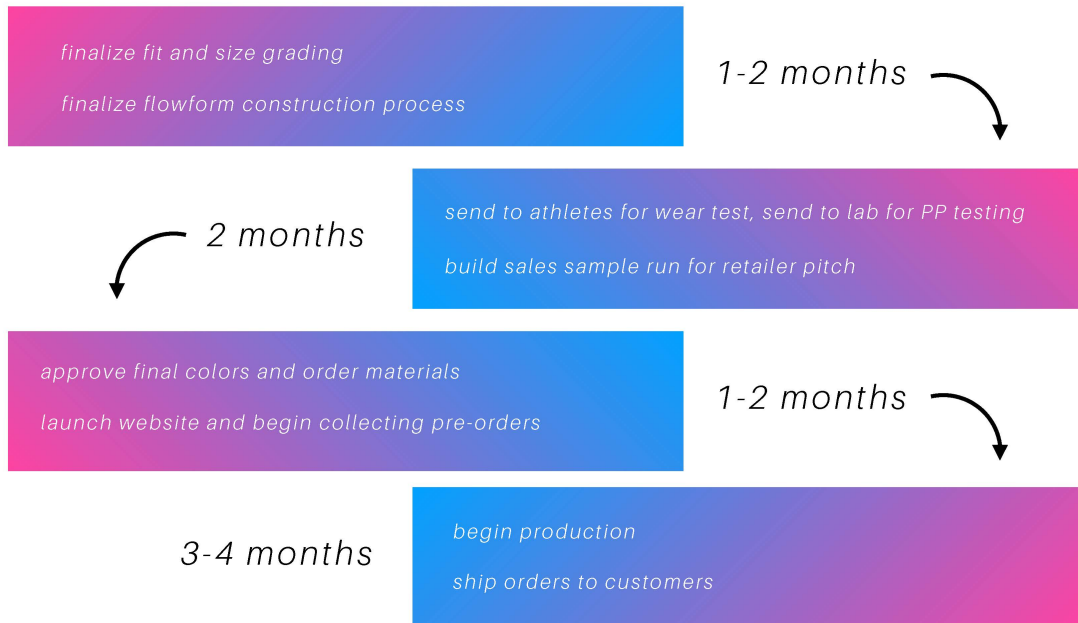
Fig. 76 Rhythm Colorways



**rhythm** website mockup

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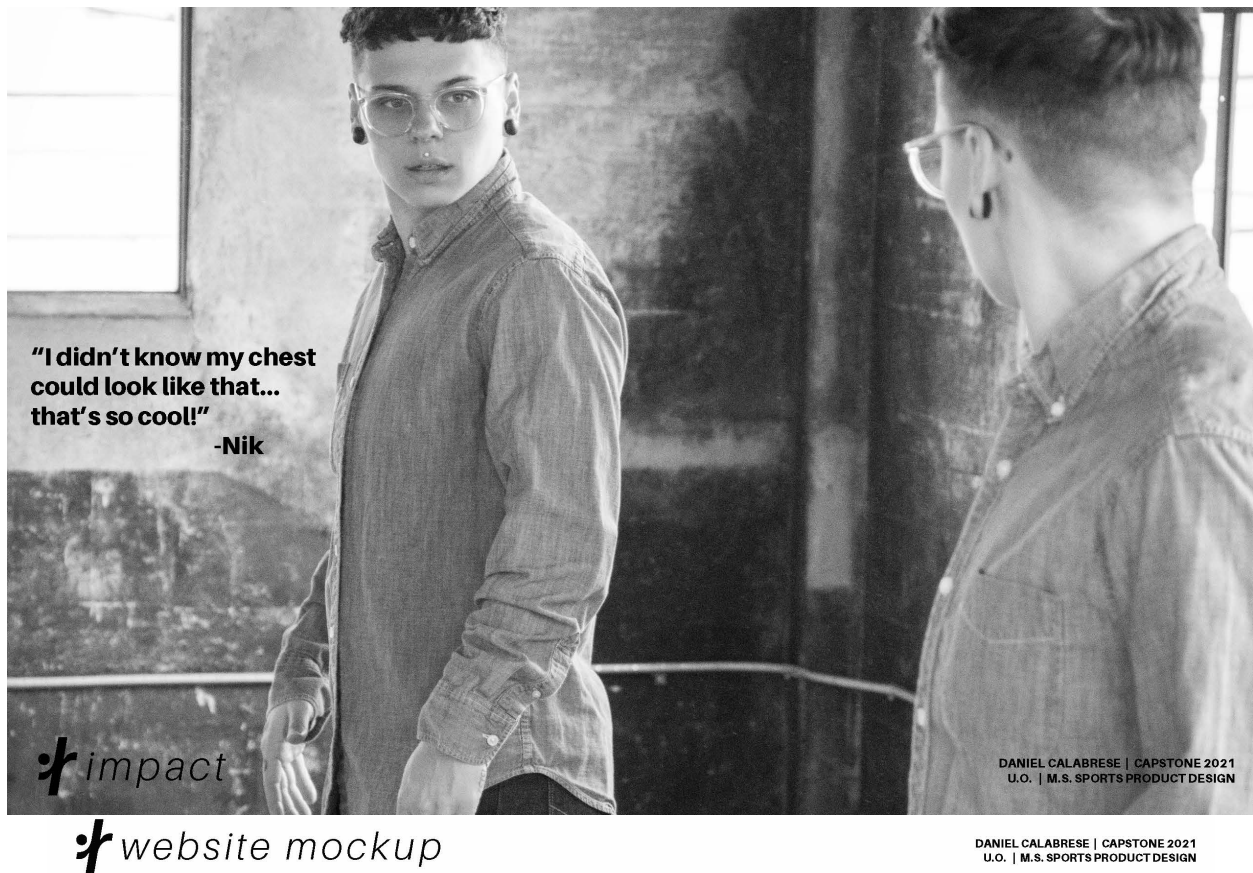
Fig. 77 Rhythm Business Strategy



**rhythm** timeline

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Fig. 78 Rhythm production timeline



*Fig. 79 Website Mockup*

*Fig. 80 Packaging Mockup*

*Fig. 81 Final Impact*

The goal of rhythm is to provide trans and non-binary (TNB) athletes with gender affirming garments that alleviate feelings of dysphoria and increase their ability to breathe and move. rhythm sets itself apart from other binders for the TNB community by introducing flowform, a unique laminate construction technique that allows for free cut edges and zoned compression to their athletic needs and body shape. Through wear testing on different athletes, rhythm is successful in allowing TNB athletes to perform comfortably without restricted breathing or affecting posture. It helps to provide a flatter chest appearance that reduces feelings of dysphoria and is easy to don and doff. Zoned areas of non-stretch, located around the breast volume and across areas of the back, provide chest compression and support. For different

cup sizes, graded designs provide size appropriate fit and function. Materials are lightweight, moisture wicking and breathable – enabling thermal comfort and confidence.

## **Appendix**

### **Connection Building**

There will be several representatives across dancers, instructors, product and biomechanical specialists that will be important to reach out to during this project.

Stephanie Muhlenfeld is the founder of the The Squad Nation and a veteran in the bra design industry. She started the Aerie line at Victoria's Secret and has supported Nike's bra division as it expands. She has critical knowledge around breast physiology and biomechanics as well as bra design and development that will be critical in bringing this project to life.

Rebecca Durivage Jacobs is the Director of Operations at Nike in the Bra Category. She has had many years of experience in sports bras and has extensive business knowledge bringing product concepts to global retail completion.

Nik Burian is a queer, nonbinary Portland poet who is an avid Crossfit enthusiast and has participated in dance classes. They have agreed to consult on this project in fittings, interviews, and any other needs.

Rowan Ching, is a non-binary transmasculine dancer based out of Philadelphia and has agreed to be involved in this project in various capacities.

Esselen Moore and his partner Kai are two transgender men in the Portland area who have also agreed to be interviewed and participate in product testing in the project. Both are university students and athletes who have experienced performing sport and/or dance while wearing a binder or other sports equipment and have valuable insight.

Allison Jacks is a dancer and dance instructor who has worked with many dancers in the LGBTQ+ community over the years and has many insights into experiences of dancers who face body dysmorphia while performing. She has also worked with brands like Nike in the development of products for dancers in the past.

### **Working to Connect With**

Danza Orgánica is a dance organization based out of Boston, MA that celebrates and supports underrepresented and marginalized communities through movement and narratives that are expressed through dance performance.

Ballez is a dance organization based out of Brooklyn, NY that is lesbian owned and LGBTQIA+ inclusive with heavy representation in the trans community.

Rae Angelo Tuteria and Daniel Friedman are the founders of Bindle & Keep, a tailoring studio that caters to the transgender community.

Joanna Harper is a medical physicist from Portland who wrote the book *Sporting Gender: The History, Science, and Stories of Transgender and Intersex Athletes*.

### Data Collection Methods

In order to further understand the challenges that users face when interfacing with binding products while dancing it will be important to collect key points of information to support new design decisions.

#### Collection Method 1 - Interviews

Data gathered by other researchers and key influencers in the field is important to review, but it is also imperative to speak with the users, instructors, and other influencing powers in the trans dance community in order to hear their first hand accounts. A preliminary group of people will be interviewed to gather background information that will be useful for further survey collection. A need to understand their background, their challenges, and their successes will help inform areas to focus on in improving or inventing a new solution.

#### Collection Method 2 - Surveys

After the interview portion is complete, a survey will be released that will be comprised of pertinent questions around experiences using binding products, experiences in dance training and performance, product specific questions, and general demographic information. This will help inform sizing, performance needs, and product features that are desirable for the community at large.

#### Collection Method 3 - Observation

In tandem with interviewing and surveying users, it will be important to collect documentation of users in action using the product and register their experiences using different products to understand what works and what does not work for them. This information, with consent from the subjects, will be photographed and video taped as well as recording audio of their feelings pre and post use case scenario.

#### Collection Method 4 - Product Autopsy

The state of the art product along with competitor products will be acquired in order to analyze construction, sizing, overall design, and materials used.

### Collection Method 5 - Body Scan

While potentially invasive, if consent is received from subjects, body scan of the subject without wearing a binding apparatus and with wearing a binding apparatus can help understand how the body compresses and where there are areas of discomfort and potential biomechanics issues that can be addressed through better design.

## Professional Development

How this project aligns to my Strengths Finder Strengths

My Strengths Finder Strengths:

- Individualization - looking for strengths in others
- Responsibility - emotional responsibility to see it to the end
- Input - Collect information, ideas, and connections
- Arranger - organize, align, manage
- Relator - deep connection with people

As an innovator and designer, I utilize these skills regularly. Through the visual lens created by my Input strength I look to things from 30,000 ft and 30 ft respectively. I enjoy visualizing my projects from a holistic view and a more narrow and personal view. This allows me to see and hear perspectives from multiple views at the same time. I play both the facilitator and the devil's advocate to see potential pitfalls or opportunities. Individualization allows me to connect with people and see how they can bring new perspectives to a project. This in tandem with my Relator strength help build my network into a group of people who I want to support through my design work. My Responsibility strength has strengthened my resolve to see this project to its rightful conclusion. As a representative for the LGBTQIA + community, I want to do right by my trans community members. They have not received the attention they deserve to get the products and support they need. And all information and connections built get organized and aligned with the Arranger strength to cleanly and clearly move forward.

For this project, deep empathy needs to be fostered with the user group to provide them with the comfort and environment that will result in good data collection. Through my ability to see and arrange things with a wide and narrow lens, I hope to be able to connect the dots of disparate needs in order to build a cohesive and gender affirming solution for these athletes. It is my responsibility of an LGBTQIA+ designer to give voice to those in the community who have not received the attention that they deserve.

Utilizing strengths as an innovator in support of the project

I seek to bring products to the market that have real functional need without frivolity or excess. This project requires delicate finesse and respect for the needs of a diverse set of individuals who have gone through life experiences not many can relate to. I hope with an





empathetic mind I can bring light to the challenges and words to the needs that these users may or may not be able to verbalize on their own. Through my connections and ability to establish new connections, I hope to gain access to the necessary resources that will bring this project into three dimensions and test until satisfied with a solution that is not only productive for the user but also the environment.

How this body of work supports my career goals in the sport/design industry

This project requires research and data collection as well as data visualization that will showcase the needs of the user to the world at large. This work is truly problem driven and the user group does not have a solution that is equitable and adequate to their unique situations. My body of work to this point has only had a handful of pieces that go beyond a profit driven need for a solution. Having worked in industry, I have had great experience bringing incremental change to products without creating innovation at a scale like this project may require. The problem is not one driven by profit but by equity; to bringing more athletes into the fold and to allow them to reach their full potential in a comfortable and confident manner. I hope to work in project innovation that helps people and create a more inclusive environment for all types of athletes, regardless of gender and regardless of skill.

### Mentor mapping: Names, roles, companies and proof of life

- Rebecca Durivage Jacobs - Director of Operations - Bra Category - Nike


 **Durivagejacobs, Rebecca** Mon, Nov 30, 9:35 AM (8 days ago)   

to me ▾





Hey Daniel,

Thanks for the reminder! I absolutely would love to be a mentor for your capstone! The recurring timing sounds great, 1 hour a month is no problem. Please schedule! I too, am grateful to be reconnected with you!

Best, RDJ



- Nik Burian - Queer/Non-Binary Athlete - Fitness - Portland Local Muse

 **Nikki Burian** Wed, Nov 25, 10:16 AM (13 days ago)   

to me ▾

Hi Daniel,

It was so awesome chatting with you! I am excited to see how this project turns out. You have my consent to continue with Zoom calls, body scanning/images, product testing, etc. Happy to do all of that.

Looking forward to the next chat!

Warmly,  
Nikki



- Stephanie Muhlenfeld - Founder of the Squad Nation

## Re: Introduction



From [stephanie muhlenfeld](#) on 2020/12/02 15:18

 [Details](#)  [Plain text](#)

Hi Daniel

Absolutely! It was nice to meet you and it was exciting to hear about your project exploration. I would be happy to continue to support and tb on your project as it unfolds. We can set up a monthly TB, Tuesdays or Wednesday afternoons are usually best for me. 1<sup>st</sup> week of January or 2<sup>nd</sup> week of January are currently open.

Thank you

Stephanie Muhlenfeld

Founder, The Squad

[stephanie@thesquadpdx.com](mailto:stephanie@thesquadpdx.com)

[www.thesquadteam.com](http://www.thesquadteam.com)

Linkedin: Stephanie Muhlenfeld

- Allison Jacks - Dance Instructor - (proof of life email to come)
- Esselen Moore - Portland Local Muse - Student - Trans Athlete (Text confirmation, proof of life email to come)

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