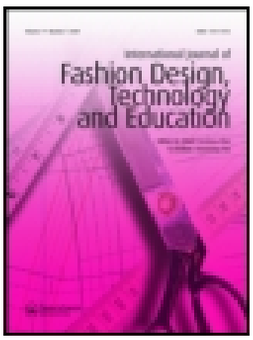

International Journal of Fashion Design, Technology and Education

ISSN: 1754-3266 (Print) 1754-3274 (Online) Journal homepage: http://www.tandfonline.com/loi/tfdt20

Apparel design for female rock climbers: satisfactions and preferences

Megan Johnston & Helen Koo

To cite this article: Megan Johnston & Helen Koo (2016): Apparel design for female rock climbers: satisfactions and preferences, International Journal of Fashion Design, Technology and Education, DOI: 10.1080/17543266.2016.1223755

To link to this article: http://dx.doi.org/10.1080/17543266.2016.1223755

Published online: 01 Sep 2016.

Submit your article to this journal

Article views: 4

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
http://www.tandfonline.com/action/journalInformation?journalCode=tfdt20

Download by: [Cornell University Library] **Date:** 07 September 2016, At: 05:58

INTERNATIONAL JOURNAL OF FASHION DESIGN, TECHNOLOGY AND EDUCATION, 2016
http://dx.doi.org/10.1080/17543266.2016.1223755

Taylor & Francis
Taylor & Francis Group

Apparel design for female rock climbers: satisfactions and preferences

Megan Johnston and Helen Koo

Department of Design, University of California, Davis, Davis, CA, USA

ABSTRACT

This study investigated the needs and preferences women have with rock-climbing apparel to inform the design of female climbing clothing. The purpose of this study was to investigate the needs and preferences women have with rock-climbing apparel to inform the design of female climbing clothing. The results of this study can be beneficial for apparel designers when developing female climbing apparel. A total of 20 female rock climbers were interviewed using the purpose sampling method, and the results indicated that many of the subjects were not satisfied with their climbing clothing's fit, colour, and durability. The majority of interviewees (90%) were dissatisfied with the fit of their climbing pants and 85% experienced rips, holes, and split seams in their climbing pants. Many participants (80%) preferred hip length shirts to prevent the shirt from rising above their harness and 85% of subjects had a preference for tighter fitting pants.

ARTICLE HISTORY
Received 2 April 2016
Accepted 9 August 2016

KEYWORDS
Design; product development; interview; rock climbing

1. Introduction

Rock climbing, an extreme sport, experienced a 19.5% increase in participation over a three-year change and has over 11 million participants in the United States (Outdoor Industry Foundation, 2006). Out of the total rock-climbing population in the United States, 30% are female climbers (Outdoor Industry Foundation, 2006). The participation of rock climbing is increasing, and because many people participate in the sport, rock climbers signify a developing market segment that may see a growth in spending on outdoor apparel.

The literature review of the field covers the styles of rock climbing that exist today, sport climbing, bouldering, traditional climbing, aid climbing, and alpine climbing, as well as rock-climbing clothing's two primary functions, protection and comfort. Rock climbers need protection from weather elements such as rain, wind, or snow as well as protection from abrasions and bruising. Comfort is defined by sensorial or thermal properties; sensorial comfort is the positive tactile response a person has to fabric, often described by terms such as itchy or soft, and thermal comfort is the body's ability to balance heat (Cloud, Cao, & Song, 2013; O'Mahony & Braddock, 2002). Layering is important for warmth, although layering may impede ease of movement due to bulk. Layering is defined as a three-part system, comprising a next-to-skin layer to wick away perspiration, a thermal layer for warmth, and an outer layer for protection (Cox & Fulsaas, 2003). To maintain thermal comfort, it is important that the wearer stays dry and have moisture and perspiration wicked away from the skin, which also prevents chaffing from a climber's safety harness and backpack (Cox & Fulsaas, 2003).

There is little research done on the preferences rock climbers have with their apparel, and even fewer studies focus on the preferences of female rock-climbing clothing. Rock-climbing apparel protects climbers from bruises, lacerations, and weather and it is important to design apparel that protects female climbers while fulfilling women's fit and functional needs. Thus, the purpose of this study was to investigate the needs and preferences women have with rock-climbing apparel to inform the design of female climbing clothing. The results of this study can be beneficial for apparel designers when developing female climbing apparel.

2. Literature review

2.1. Styles of rock climbing

Rock climbing began in 1786 with a first ascent on Mont Blanc in the European Alps (Michaelson, 2015). Today, the sport has evolved into five distinct categories: bouldering, sport climbing, traditional climbing, aid climbing, and alpine climbing (Buckingham, 2008; Sanzaro, 2013). Most styles of rock climbing need apparel protection from varying weather and temperature environments as well as protection from abrasion and bruising (Harper, 2001).

CONTACT Helen Koo hskoo@ucdavis.edu Department of Design, University of California, Davis, Davis, CA 95616, USA
© The Textile Institute and Informa UK Ltd 2016

Bouldering is a style of rock climbing where no rope or safety harness is necessary (Buckingham, 2008). The climber ascends shorter routes that are close to the ground and are protected by pads if the climber falls. Bouldering pushes the climber's body to their maximum physical limit and typically involves movement defined as friction climbing, mantling, heel hooking, and stemming. Friction climbing, also known as face climbing, uses balance and foot friction to ascend the rock (Michaelson, 2015). Mantling is a technique that uses pressure of the hands pushing downward to allow the feet to rise, and is used to climb the top of a boulder or over a ledge (Cox & Fulsaas, 2003). Heel hooking is when the climber places the weight of their heel on a hold, typically above the climber's body, and then presses their weight into their heel to transition the climber onto the hold. Stemming is a technique that uses counterforce where one foot pushes against a rock feature while the opposite foot or hand presses upon another feature (Cox & Fulsaas, 2003). Apparel for bouldering provides flexibility for movement and does not consider how a garment will interact with a safety harness, unlike most other forms of climbing.

Sport climbing is a style climbing that ascends technical routes relying on fixed protection, ropes, and a safety harness (Cox & Fulsaas, 2003). Sport climbing uses the same techniques as bouldering, including friction climbing, mantling, heel hooking, and stemming to ascend longer routes up the face of a rock formation. Sport climbers have one end of the climbing rope attached to their safety harness with a knot, and a partner uses belaying techniques to manage the other end of the climbing rope. Belaying is a technique where a climbing partner monitors slack in the rope by applying tension when the active climber is not climbing to protect a large fall, and feeding slack when the active climber wants to move upward (Michaelson, 2015). Sport climbing routes have permanent bolts and anchors placed along the route that the climber clips the rope into using a quickdraw, which is a piece of dynamic webbing with a carabiner attached at both ends. A carabiner is a metal ring with a hinged gate that opens and closes on one side and clips into bolts and ropes (Luebben, 2007). Clothing for sport climbing is similar to bouldering apparel in that the climber needs flexibility in their apparel for movement, but consideration of how the garment will fit under the harness is necessary for mobility.

Traditional climbing, widely known as trad climbing, is when a climber places protective gear in cracks on the rock formation to protect themselves from potential falls (Michaelson, 2015). Trad climbing uses belaying techniques with a rope and safety harness to ascend longer routes up a rock formation. The gear used for trad climbing falls into two categories, active protection and passive protection. Active protection, known as cams, expand and contract to fit into rock cracks and have a carabiner on one end for the climber to fix the rope into (Cox & Fulsaas, 2003). Passive protection, known as nuts or stoppers, are a wedge-shaped metal device which lock into crack constrictions to provide an anchor point and has a wire loop at one end for a carabiner and climbing rope to attach to (Luebben, 2007). Trad climbing uses techniques similar to that of sport climbing as well as crack climbing, traversing, chimney climbing, and lie-back techniques. Crack climbing uses jamming techniques where the climber jams a limb such as a hand or foot to anchor them in the crack in order to ascend the crack formation (Michaelson, 2015). Traversing is when the climber ascends the rock perpendicular to the rock formation using friction or crack-climbing techniques. Chimney climbing is when the climber encounters a large enough space for their body to fit into and the climber uses counterforce between their feet, hands, and back to scoot up the formation. Lie backing, another type of counterforce, involves ascending cracks where the climber uses both hands to grasp the edge of a crack and leans back, away from the formation, on straight arms to ascend the crack (Cox & Fulsaas, 2003). Trad climbing requires versatile apparel to protect the climber from harness chaffing, jamming their body into cracks, and from weather conditions.

Aid climbing is mainly used to climb 'big walls', a style of climbing where the climbers ascend cliffs over 1500 feet and requires days to ascend the route (Ogden, 2005). Aid climbing involves techniques similar to that of trad climbing, but differs because aid climbers weight protection to ascend the route while trad climbers do not weight the protection to ascend. Aid climbers use etriers, fifi hooks, and jumars to ascend big walls. Etriers are webbing in the shape of a ladder used to clip into protection so the climber can place their feet in the etriers to weight the gear and ascend the rock. A fifi hook attaches the climber's harness to the placed protection so the climber can weight himself or herself onto the gear. Jumars are mechanical devices engineered to clasp on and off the climber's rope and are used to move up the rope (Ogden, 2005). Aid climbing is a gruelling sport requiring physical and mental stamina to spend days on a big wall. Aid climbers need comfortable clothing to protect themselves against weather and chaffing and need durable clothing because they will be climbing in the same apparel for multiple days in a row.

Alpine climbing uses the same techniques and gear as trad climbing but differs because it is a style of climbing used to ascend mountains in high altitude and hard-to-reach places. It requires knowledge of how to navigate

mountain regions, and the climber's time is mostly spent approaching the rock formation through mountainous terrain. Alpine climbers constantly need to assess weather conditions and need protection from changing weather environments. Clothing for alpine climbing needs to protect the climber from weather, chaffing, and abrasions, and needs to be transitional from hiking to climbing apparel.

2.2. Functional aspects of climbing apparel

Layering is recommended to adapt to changing weather environments although layering can create bulk and impede movement (Cloud et al., 2013). A basic climbing clothing system involves three layers, a layer that directly contacts the skin, a middle layer for insulating purposes, and a shell worn as the outer layer (Cox & Fulsaas, 2003). The next to skin layer is crucial to wick moisture away from the skin to keep the wearer dry, while the insulating layer's primary function is to keep warm air next to the body, and the outermost layer provides protection against rain, wind, and sun.

Comfort is an essential function for rock-climbing apparel and is defined by sensorial and thermal comfort. Sensorial comfort is the positive tactile response a person has to fabric, and thermal comfort is defined as thermoregulation, which is the body's ability to balance heat with the existing environment (Cloud et al., 2013). To maintain thermal comfort, it is important that the wearer stays dry and have moisture wicked away from the skin. Sensorial comfort is based on personal preference and uses terms such as soft or scratchy to describe a fabric's tactile quality (Michaelson, 2015).

Clothing for rock climbers is encouraged to allow for ease of movement to ascend the rock. Stretch materials such as spandex are great for allowing movement, but do not always provide the durability and protection needed for climbing. Garments that are typically more protective are inherently stiffer, heavier, and thicker than spandex fabric (Watkins & Dunne, 2015). Ease of movement in climbing apparel is often provided by the use of gussets and contouring the fit of the garment. A gusset is a piece of fabric, usually a small triangular shape, and is sewn into apparel to create flexibility (Watkins & Dunne, 2015). Gussets are typically placed in the crotch of pants and the underarm of shirts to allow for ease of movement. Garment pattern shapes need to be contoured to remove any excess fabric that may impede movement. To contour a garment shape, darts (a folded and tapered wedge of fabric) are used at the garment knee or elbow to remove excess fabric (Harper, 2001). Also, it is common to add mobility to apparel by adding extra width and length to a garment segment, which permits transformation in the body's dimensions while climbing (Simoes, 2013; Watkins & Dunne, 2015). If extra fabric is added to a garment, the bulk may impede movement, and needs to be elasticised so the fabric can move back to its original shape when the movement stops (Simoes, 2013; Watkins & Dunne, 2015).

2.3. The rock-climbing market

In the year 2005, the Outdoor Industry Foundation conducted a study to find out how many people participated in rock climbing using ropes and harnesses in the United States. The study found that five million people participated in outdoor rock climbing and over six-and-a-half million people participated in indoor rock climbing (Outdoor Industry Foundation, 2006). The study also indicated that the total number of female rock climbers participating in outdoor and indoor rock climbing was 30% of the total climbing population (Outdoor Industry Foundation, 2006). More people are participating in rock climbing, and The Outdoor Foundation (2015) indicated in their Topline Report that there was a 3.5% increase of participation in sport climbing, bouldering, and indoor climbing over a three-year change and a 16% increase in traditional climbing and mountaineering. The Outdoor Foundation Participation Report (2014a) also estimated that 11% of outdoor enthusiasts intend to spend more on apparel as they did the year before, while 41% of outdoor enthusiasts intended to spend the same amount as the year prior. Since the popularity and participation with indoor and outdoor rock climbing is growing, and because a large number of people participate in the sport, rock climbers signify a rising market segment that may see a growth in spending on outdoor apparel.

2.4. The 'shrink it and pink it' mentality

Today, a 'shrink it and pink it' mentality is sometimes imposed on the design of women's active clothing. The 'shrink it and pink it' paradigm is when products that may have first been designed for men are re-designed for women by being made smaller and coloured pink (Hunley & Boyer, 2015; Min, 2014). Some women have started their own companies to reject the 'shrink it and pink it' mentality such as Jen Gureki, owner of Coalition Snow, who started a women's ski and snowboard product line to rebuke 'shrink it and pink it' and design products women actually want (Spillman, 2015). Although climbing apparel is typically designed to meet performance standards, having more colour options could appeal to more female climbers.

2.5. Current reviews on women's climbing clothing

Reviews on climbing apparel praise the thermo-regulation of fabrics, softness of materials, the fit of the apparel, and flexibility of extra-stretchy and woven fabrics. *Climbing Magazine* conducted a study in which climbers tested apparel during four months of gym climbing and found that the female testers appreciated the softness of fabric, breathability and airflow of apparel, durability of fabric, resistance of body odour to the fabric, the fit of the garment, and perspiration wicking capabilities (Ellison, 2016). When reviewing the brand Ibex's Shark Hoodoo Hoody, the testers praised it for having a soft merino fabric that easily fits over next-to-skin layers and did not retain odour (Ellison, 2016). Other testers commented on the brand Stonewear's Fusion Tights admiring its soft, stretchy fabric, breathability qualities, and airflow capabilities from the mesh panels located behind the knees of the tights (Ellison, 2016). Other climbers tested the brand Black Diamond's Six Shooter Tank Top praising the fit of its built-in-bra and its stretchy, breathable, durable, and moisture wicking fabric (Ellison, 2016).

Although improvements have been made in the design and function of women's climbing clothing, some evaluations criticise the fit and flexibility of climbing pants and their unattractive silhouette (Farley, 2014). In the article *The sisterhood of the climbing pants* (2014), Cate Farley discusses how yoga clothing is not durable enough for rock climbing and many alternative pants do not look attractive. The article moved on to apparel reviews where three female rock climbers tested four climbing pants praising the aesthetics, fit, pocket detailing, and flexibility of the material. After wear-testing the brand Prana's Meme Climbing Pant, it was praised for having five pockets, a skinny-jean silhouette, and for its quick-drying material (Farley, 2014). The reviewers also warned that the Meme Climbing Pant was for leaner climbers and would not fit all body types (Farley, 2014). Upon reviewing the brand Lululemon's Wonder Under leggings, it was praised for having a versatile fit that would work with many body types as well as for its tight compression and for its high-waist silhouette. The brand Fabletic's Calama pant was praised for having zipper pockets, soft fabric, an affordable price, and a drawstring waistband that allowed the fit to be adjusted (Farley, 2014). Last, the brand Athleta's Bettona Pant was admired for being a legging but looking like a skinny jean. The reviewers also liked the Bettona Pant's fabric stretch recovery, pockets, flexibility of its fabric, and the colour options available (Farley, 2014).

3. Methods

Interviews were conducted after receiving an IRB approval and asked a series of close-ended and open-ended questions in person, over the phone, or through the video messaging service Skype. The questions were formatted using Michaelson's (2015) open-ended research questions on climbing pants, and changed to focus on female preferences of climbing pants and shirts. The questions asked about the fit of climbing pants, the favourite details climbers have in their climbing pants, if the climbers ever wore pants that they did not like, and what do the climbers focus on when purchasing climbing pants (Michaelson, 2015). The interviews were audio recorded and transcribed by the researcher. It should be noted that the interviewees had the opportunity to express several preferences per open-ended question. The transcriptions were interpreted using Creswell's (2014) and Gibbs' (2007) methods for qualitative data analysis. First, major themes and sub-themes were identified and interview quotes were grouped based on the similarities of the responses (Creswell, 2014; Gibbs, 2007). Second, the responses were examined and separated into themes and sub-themes (Creswell, 2014; Gibbs, 2007). The data were peer reviewed by two researchers and the total number of dividing agreements was calculated. The reliability was assessed through SPSS and the correlation coefficient was .987, which is greater than .90, and a high degree of reliability was established (Shrout & Fleiss, 1979).

4. Findings and discussions

4.1. Sample characteristics

A total of 20 female rock climbers were interviewed using the purposive sampling method; participation was limited by age, gender, and number of years spent rock climbing. The interviews were voluntary and incentives were not provided. The participant's age range was from 21 to 39 years of age; the average age was 29.75 and 4.76 was the standard deviation. This age range represents a large portion of the female climbing population since the median age range for beginning rock climbers in the United States was 31 for traditional climbing and alpine climbing, and 26 for sport climbing (The Outdoor Foundation, 2014b). An active female rock climber was described as anyone participating in rock climbing for 1 year or more. The participants were from six popular outdoor climbing areas: nine from Southern California, six from Northern California, two from Rhode Island, one from Colorado, one from Utah, and one from Washington. The United States has more

established rock-climbing routes compared to any other country, with over 145,000 outdoor climbing routes (MountainProject.com). More outdoor climbers live in the western region of the United States due to the mountainous terrain; a total of 6% of the western United States' population participated in rock climbing and 4% of the population in Midwestern and Northeastern territories participated in rock climbing (Outdoor Industry Foundation, 2006).

4.2. Rock-climbing experiences

The most popular style of rock climbing that respondents participated in was sport climbing (90%) followed by bouldering (80%), traditional climbing (70%), and alpine climbing (30%). None of the interviewees participated in aid climbing. The most preferred rock-climbing style was traditional climbing (45%) followed by bouldering (40%), sport climbing (30%), and alpine climbing (5%). Also, 25% of participant responses chose two forms of climbing as their favourite and 80% articulated that they participate in more than one form of rock climbing. The amount of years spent rock climbing was grouped into 1–2 years (15%), 3–4 years (20%), 5–6 years (20%), 7–9 years (15%), and >10 years (30%).

4.3. Experiences with climbing clothing

A total of 45% of participants have 4–7 pairs of climbing pants, 35% of participants have 1–3 pairs of pants, and 20% own 8 pairs or more of climbing pants. Respondents of 55% owned 8 or more climbing shirts, 30% owned 4–7 climbing shirts, and 5% owned 1–3 climbing shirts.

In regard to rock-climbing clothing failure experiences, a total of 85% of participants expressed forms of rips, tears, holes, and split seams in their pants. Of the 85%, 40% found failures in the knee area, 30% reported failures in the seat of the pant, and 15% reported a split seam in the crotch of the pant. Some participants (15%) reported rips, tears, holes, and split seams in their climbing tops, usually in the sleeves and cuff of the shirt.

The experiences related to rock-climbing clothing that caused movement restrictions were asked. Pants were catching the respondent's feet while climbing due to excess length and fabric in pants (30%). Themes were discovered indicating if the pants are too long or too wide, they get caught on the climber's feet and restrict visibility of their foot placement. Another 20% of responses addressed hip and mobility restriction while climbing in jeans. Most participants avoid purchasing climbing clothing they do not like. The more skilled climbers expressed that after years of climbing, they understood their preferences through experience.

The preferred changes of existing rock-climbing clothing were asked. The response analysis was broken down into two main themes: changing the fit for climbing shirts, and changing the fit for climbing pants. All participants answered in different ways and some participants responded with several comments for both major themes. Eighteen participants (90%) expressed a need for a change of fit in their climbing pants. Five responses (25%) fit a sub-theme calling for an improved fitting waistline in pants, stating it is hard to find pants the fit in the waist as well as the legs. Another five responses (25%) expressed that climbing pants were too baggy, stating that they wanted a more form fitting option. The following sub-themes were also calculated with the following results: 15% expressed a need for longer pant options, 15% addressed an issue of the pant rise not being high enough, and 10% expressed a need for shorter pant options.

4.4. Preferred designs of climbing pants

A total of 30% of participants agreed that stretchy fabric was one of their favourite details in climbing clothing. Participants of 25% also expressed an appreciation for pant pockets that sit on the side of the thigh and below the harness because the pocket can be accessed without the interference of the harness. Also, 20% of participants expressed an appreciation for durability in the climbing pants they own, with a preference for reinforcement in the knees.

When asked if the participants had a preference between climbing in woven pants or leggings, the participants answered in different ways and some participants expressed a preference for both styles depending on the type of climbing they are participating in. Eleven total participants (55%) stated a preference for climbing in pants, and 14 women (70%) preferred climbing in leggings; a few participants expressed the desire to wear leggings, but due to lack of durability in leggings, they wear climbing pants. Overall, 35% of participants chose pants for durability factors, 10% of participants chose pants for leg protection, and 10% of participants chose pants for comfort. For legging preferences, 50% of participants chose leggings for personal style, 15% chose leggings for flexibility features, 10% preferred leggings for sport climbing, 10% preferred leggings for bouldering, 5% chose leggings because they are versatile and can be worn for other activities, and 5% chose leggings to avoid excess fabric getting in the way of their feet.

The participants were asked silhouette questions regarding the length and fit of their climbing pants. When discussing, 85% of interviewees indicated they prefer a tighter fitting pant while climbing; 35% chose

a tighter fit for personal preference, 30% to avoid excess fabric getting caught, and 15% for aesthetics. A total of 25% of interviewees preferred a looser fit for climbing pants because they felt looser pants were less restrictive. In regards to pant length, 80% preferred a full-length pant, 40% because full-length pants offered more protection, 15% because they were warmer, 15% for aesthetics, and 10% for personal preference. Regarding a preference for mid-calf and knee-length pants (40%), climbers preferred this style for breathability (15%), personal preference (15%), aesthetics (5%), and knee coverage (5%).

4.5. Preferred designs of climbing shirts

The total of 20% of participants expressed a desire for interesting details on the back of their climbing tops because back details are flattering and look good in photographs. Other themes reported on were an appreciation for hoods (10%) and longer sleeves that turn into gloves (10%). When asked about the fit preference of climbing shirts, 55% indicated a preference for a tighter fit either to keep excess fabric out of the way (25%), for aesthetics (15%), for personal preference (10%), and for ease of movement (5%). When discussing the length of climbing shirts, 80% of participants expressed a need for climbing shirts to come down to the hips; of the 80%, a total of 35% of participants liked their shirt down to their hips for protection against the safety harness, 15% expressed a need to cover their stomach, 15% because if the shirt was any longer, too much fabric would get in the way, 10% wanted a hip length shirt to cover their lower body, and 5% for personal style preference. Also, 20% of participants liked their shirt length to be at their waist so the shirt could be tucked under the harness without excess fabric.

4.6. Colour preference of climbing clothing

When asked the participant's preference for climbing pant colour, 80% indicated dark colours such as black, dark grey, brown, and navy were preferred for pants, with 30% indicating this preference for personal style. Also, 25% indicated a darker colour preference for pants to easily match shirts, 15% to prevent visibility of dirt and stains, 5% because darker colours stay warm in the sun, and 5% because the participant looks thin in darker colours. A total of 15% of participants per colour indicated that blue, red, green, and mustard yellow was their preference for climbing colour bottoms, and 10% indicated they preferred prints and patterns. Regarding shirt colour preferences in climbing clothing, 30% of participants stated they did not have a colour preference. A total of 25% of participants preferred teals and greens, while 20% of participants preferred blues, earth tones, or brighter colours. Other subjects indicated a preference for blacks and greys (15%), purple (15%), red (15%), and pink (5%) in their climbing shirts.

The participants were asked what colours they avoid when selecting their climbing apparel. Ten themes were expressed with sub-themes (Table 1). Participants stated discontent with colour choices available because the colour options are limited to pink, purple, or teal and six participants (30%) expressed a dislike for pink or neon colours and fluorescents.

4.7. Fibre preference of climbing clothing

An equal amount of participants preferred synthetic fibres (25%) and natural fibres (25%) in their rock-climbing apparel. Participants preferring synthetic fibres favoured them because of synthetic's moisture wicking properties and lightweight features as well as to avoid skin allergies to wool. Participants favouring natural fibres preferred them because of natural fibre's breathability, tactile qualities, and because natural fibres retain less odour compared to synthetics. The total of 30% of participants had trouble choosing a preference due to positive and negative aspects of both fibres, such as the durability and affordability of synthetic materials versus the minimal odour retention of wool.

4.8. Purchasing climbing clothing

When asked about the features participants consider when purchasing climbing pants and shirts, they answered in several different ways and their responses were broken down into 7 major themes with 15 sub-themes (Table 2). When discussing, participants focused on the cost of climbing clothing mostly because climbing clothes easily get destroyed while other respondents commented that they focus on the restriction of climbing apparel and that they sometimes imitate climbing movements while trying on clothes to see if the apparel is

Table 1. Avoiding colours in rock-climbing apparel.

Theme	Sub-theme	Participant no. (%)
Neon & fluorescent	Too Flashy; attract too much attention; personal style preference	6 (30%)
Pink	Too much pink offered, too girly, personal style preference	6 (30%)
Purple	Too much purple offered, too girly, personal style preference	4 (20%)
Pastels	Not flattering; see through	3 (15%)
Yellow	Not flattering; too bright	3 (15%)
White	Easily becomes dirty	3 (15%)
Brown	Blends too much into the rock; personal style	2 (10%)
Red	Not flattering	2 (10%)
Teal	Too much teal offered	1 (5%)
Prints	Personal style	1 (5%)

Table 2. Considering aspects when purchasing climbing clothing.

Theme	Sub-theme	Participant no. (%)
Fit of pant	Waist & leg of pant; rise of pant; length of pant	13 (65%)
Fabric	Stretch fabric; function of fabrics; fabric feel; avoiding see-through Fabrics	12 (60%)
Aesthetics	Shirt back details; colour; general aesthetic comments	11 (55%)
Comfort	Non-restrictive clothing; general comfort comments	7 (35%)
Cost	Affordability; not worth the cost To purchase clothing that will get Destroyed quickly	7 (30%)
Ease of washing	Easy to clean; machine washable; shrink resistant	4 (20%)
Pockets	Small Pocket for lip balm; garment flips into its pocket and clips to harness	3 (15%)

limiting. The preference varies widely from participant to participant, but overall, the majority of the participants focus on their climbing clothing aesthetics, fit, and fabric.

The question was asked if participants considered sustainability when purchasing climbing clothing, and the responses were separated into five themes: yes (20%); no (25%), it is a plus but not always important (35%), consideration of the garment's length of life (35%), and purchasing of used clothing (10%). When discussing climbing clothing sustainability, one participant said she buys sustainable clothing because when she does not, she feels guilty about it. Another participant indicated that she does not consider sustainability because she cannot afford it and seven participants said they think sustainable climbing apparel is a great selling point, but they do not always consider it when shopping.

A price range was asked for regarding the amount participants spend on climbing shirts and pants. The pricing amount in US dollars for shirts and pants was grouped into: $0–20; $21–40; $41–60; $61–80; $81–99; and >$100. A total of 35% of participants said they would spend more on well fitting, durable pants if they thought they would last a year or longer. For pants, 5% of participants said they spend up to 20 dollars, 20% spend up to 40 dollars, another 20% spend up to 60 dollars, 5% spend up to 80 dollars, 15% spend up to 100 dollars, and 45% spend over 100 dollars. A total of 25% of participants said they would spend more on shirts if they thought the shirts were long lasting. When discussing shirts, 15% of participants said they spend up to 20 dollars, 25% spend up to 40 dollars, 25% spend up to 60 dollars, 10% spend up to 80 dollars, and 5% spend over 100 dollars.

5. Conclusion

These results can be used to inform active apparel designers on the preferences females have in their climbing pants and shirts. Similar themes were found compared to Michaelson's (2015) open-ended interview questions on the fit assessments of men's and women's climbing pants such as a need for high-waist climbing pants that sit above the harness, an improved fitting waistline, a preference for stretchy fabric without sacrificing durability, a desire for reinforced fabric in the knees, a preference for longer pants for protection, the need for pants to not get caught in the climbers feet, and a preference for a slimmer fitting climbing pant. Furthermore, based on the results of this research, designers are encouraged to develop shirts to be at hip length, and to design pants with a zipper pocket on the thigh below the harness in dark colours.

More research needs to be done to assess the preferences female aid climbers have in their climbing apparel. The participants in this study expressed a need for change in their climbing clothing's colour, fit, flexibility, and durability. Thus, designers would need to consider to how to change the existing climbing apparel to be more attractive to female consumers in colour, fit, flexibility, and durability. Men and women have different needs in their climbing clothing, and a focus on female preferences would tailor to a growing market segment that may see an increase in spending as popularity in rock climbing grows.

This research was conducted by interviews to hear consumers' experiences on climbing apparel and their opinions and preferences on designs and functions. It will be worthwhile to conduct a quantitative approach such as an online or offline questionnaire survey with many participants. In future research, prototypes will be developed based on the research results such as make into dark coloured-climbing pants and leggings in tight styles with added durable fabrics. Thus, user-tests or a focus group can be conducted for modification and fabricating the final designs in the development process.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Buckingham, L. (2008, July 18). *Climbing vs bouldering*. Retrieved from http://www.theguardian.com/lifeandstyle/2008/jul/19/healthandwellbeing

Cloud, R., Cao, W., & Song, G. (2013). Functional finishes to improve the comfort and protection of apparel. *Advances in the Dyeing and Finishing of Technical Textiles*, 258–279.

Cox, S. M., & Fulsaas, K. (2003). *Mountaineering: The freedom of the hills*. Seattle, WA: Mountaineers Books.

Creswell, J. (2014). *Research design: Qualitative, quantitative and mixed methods approaches*. Los Angeles, CA: Sage

Ellison, J. (2016, March). Top gym apparel. *Climbing Magazine*, *342*, 41–45.

Farley, C. (2014, August 18). *Sisterhood of the climbing pants*. Retrieved from http://cruxcrush.com/2014/08/18/sisterhood-of-the-climbing-pants/

Gibbs, G. (2007). *Analyzing qualitative data*. Los Angeles, CA: SAGE Publications.

Harper, R. (2001). *Sewing outdoor gear: Easy techniques for outerwear that works*. Newtown, CT: Taunton Press.

Hunley, B., & Boyer, M. (2015, February 9). *Is women's empowerment marketing the new 'pink it and shrink it'*? Retrieved from http://www.entrepreneur.com/article/242677

Luebben, C. (2007). *Rock climbing anchors: A comprehensive guide*. Seattle, WA: Mountaineers Books.

Michaelson, D. M. (2015). *Assessing functional needs of rock climbing pants* (Master's thesis). Auburn University, Alabama.

Min, L. (2014, September 18). *Designing for 'women'? You're doing it wrong | Akendi UX Reflections*. Retrieved from http://akendi.com/blog/designing-for-women-youre-doing-it-wrong/

Ogden, J. (2005). *Big wall climbing: Elite technique*. Seattle: Mountaineers Books.

O'Mahony, M., & Braddock, S. E. (2002). *Sports tech: Revolutionary fabrics, fashion and design*. London: Thames & Hudson.

Outdoor Foundation. (2014a). *Outdoor participation report 2014*. Retrieved from http://www.outdoorfoundation.org/research.participation.2014.html

Outdoor Foundation. (2014b). *Outdoor recreation participation topline report 2014*. Retrieved from http://www.outdoorfoundation.org/research.participation.2014.topline.html

Outdoor Foundation. (2015). *Outdoor recreation participation topline report 2015*. Retrieved from http://www.outdoorfoundation.org/research.participation.2015.topline.html

Outdoor Industry Foundation. (2006). *Outdoor recreation participation study: Climbing- natural rock- artificial wall- ice*. Retrieved from http://www.outdoorfoundation.org/pdf/ParticipationStudy2006Climbing.pdf

Sanzaro, F. (2013). *The boulder: A philosophy for bouldering*. UK: Stone Country Press.

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, *86*(2), 420–428.

Simoes, I. (2013). Viewing the mobile body as the source of the design process. *International Journal of Fashion Design, Technology and Education*, *6*(2), 72–81.

Spillman, B. (2015, December 25). *Women's ski, board maker rejects 'shrink it and pink it'*. Retrieved from http://www.washingtontimes.com/news/2015/dec/25/womens-ski-board-maker-rejects-shrink-it-and-pink-/?page=all

Watkins, S. M., & Dunne, L. E. (2015). *Functional clothing design: From sportswear to spacesuits*. London: Bloomsbury Publishing.