Professional Women Active Commuters: Apparel Design Criteria

A Thesis
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

Theresa Lastovich

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE

Dr. Elizabeth Bye

May 2013

Acknowledgements

I would like to express my gratitude and thanks to my advisor, Dr. Elizabeth Bye, for her guidance and support. Her mentoring has contributed greatly to my research and design skill set. Without her support, none of this project would have been possible.

I would also like to thank Dr. Karen LaBat and James Boyd Brent for their contributions on my committee and guidance for my research initiatives. My appreciation is extended to the participants who gave their time and knowledge for this project.

I want to thank all of my family and friends that have offered their support and encouragement throughout my life's adventures and academic pursuits.

Above all, I want to thank my parents, Randy and Mary Lastovich, for giving support and encouragement to pursue my academic studies as well as giving their love and time for my career development. I am thankful for their daily calls of encouragement throughout my graduate study.

Dedication

This thesis is dedicated to my parents Randy and Mary Lastovich. Thank you mom and dad for all your love and support throughout my life.

Abstract

The purpose of this research study was to identify the design criteria for professional women's active commuter apparel. Six professional women active commuters living in Minneapolis, Minnesota were interviewed. The women rode their bike and/or walked to their professional work environment. The participants where physically fit and adhered to a business casual dress code at their place of employment. The interviews were audio recorded, transcribed, and coded. The clothing comfort model and activity theory was used as a guideline to analyze the data. Emergent themes revealed that their physical and psychological comfort levels affected the participants' apparel requirements. The study produced the following categories that established the professional women active commuter design criteria: sustainability, financial, health, fabric, fit, aesthetics, air temperature, safety, and peer group affiliations.

Keywords: Professional Women, Active Commuter**,** Fit, Function, Aesthetics

Table of Contents

	Page
Acknowledgements	i
Dedication	ii
Abstract	iii
Table of Contents	iv
List of Appendices	vi
List of Figures	vii
CHAPTER I	
Introduction	1
Definition of Aesthetics	4
The Clothing Comfort Model	5
Theoretical Framework: Activity Theory	10
CHAPTER II – LITERATURE REVIEW	
Comfort	14
Function	19
Aesthetics	23
CHAPTER III – METHOD	
Interview Questions	26
Participants	27
Data Collection	28
Data Analysis	29

Page

CHAPTER IV –RESULTS
Description of Participants 31
Findings 31
Theme: Person/Interests 32
Theme: Clothing Design 36
Theme: Environment/Occasion 52

CHAPTER V –DISCUSSION
Analysis 59
Professional Women Active Commuter Design Criteria 61

CHAPTER VI –SUMMARY, CONCLUSION, RECOMMENDATIONS
Summary 71
Conclusion 74
Recommendations 78

References 80

Appendix 85

List of Appendices

Page

Appendix A 85

List of Figures

Page

Figure 1 1

Figure 2.1 8

Figure 2.2 9

Figure 2.3 9

Figure 3 13

Figure 4 60

CHAPTER I

The state of the economy, personal health, and environmental concerns are issues for many individuals. Bhaduri and Ha-Brookshire (2011) explain, "Today's consumers are conscious about their society and environment..." (p. 135). Personal finances, transportation costs, and parking convenience issues affect many urban commuters. As gas prices, traffic congestion, and parking expenses continue to rise, people are looking for commuting alternatives, such as active commuting (see Figure 1). Active commuters either ride a bike or walk, all or part of the way to work. One study explains, "…parking and transport costs are issues that may promote active commuting (AC) to work…importance of AC for improved health, to air quality, to the convenience of parking and for cost-saving transport" (Merom, Miller, van der Ploeg, & Bauman, 2008, p. 345). Therefore, active commuting is a mode of transportation that can promote economic, health, and environmental benefits.

Figure 1: "The Actual Commitment subscale of the Environmental Attitude and Knowledge Scale was used to assess attitudes toward the environment. This scale was originally developed to identify values and lifestyles related to environment-friendly behaviors" (Bopp, Kaczynski, & Wittman, 2011, p. E12-E13).

TABLE 2 ● Frequencies of Reported Barriers and Motivators for Active Commuting for the Whole Sample and Highest Quartile of EFA

Factor	Whole Sample (n = 431)	Highest Quartile of EFA (n = 88)
Barriers (reporting factor as a barrier),		
Time constraints	67.0	49.4
Traveling to other points before or after work	61.0	42.2
Safety concerns about traffic	64.2	61.4
Unfavorable weather	69.2	59.0
Terrain (eg, hills)	37.4	27.7
Car parking availability and cost	11.3	12.0
Safety from crime	22.0	10.8
Lack of sidewalks	50.6	49.4
Health problems	12.6	7.2
Traveling preferences of others traveling with you	28.0	21.7
Concerns about appearance	58.5	48.2
Motivators (% reporting factor as motivator)		
Traffic congestion	25.8	72.3
Good weather	55.7	66.3
Lack of car parking availability and high parking cost	21.1	24.1
Environmental concerns	45.9	75.9
Economic concerns	47.2	62.7
Health benefits	61.0	79.5

Abbreviation: EFA, ecology-friendly attitude.

Partaking in physical activity is a way for an individual to attain a healthy lifestyle. One study suggests active commuting, which involves walking or cycling to work, can improve overall fitness (Mutrie, Carney, Blamey, Crawford, Aitchison, & Whitelaw, 2002). In addition to health concerns:

> Environmental concerns and consciousness have increased substantially in recent decades…such attitudes have been shown to predict other related behaviors and cognitions, including…taking public transit…engaging in environmental political activism, owning fewer vehicles and driving less, and supporting policies consistent with "new urbanism" philosophies that promote active transportation and discourage vehicle use. (Bopp, Kaczynski, & Wittman, 2011, E10)

Active commuting is a sustainable method of transportation, which can also provide health benefits. This activity gives individuals to a way to contribute to their own well-being and their community. The benefits of active commuting can include a reduction of health care premiums and act as an economic stimulus. Thompson (2012, February 17) explains, "This active living contributes to the quality of life and health of a place, both of which are appealing to the future workforce." As for the economy, Archive for the 'health' category: 30,000 bicyclists, 12 million miles, and 1 national triumph (2012, September 12) states:

> Bicycling and walking projects create 11-14 jobs per $1 million spent, compared to just 7 jobs created per $1 million spent on highway projects. Cost benefit analysis show that up to $11.80 in benefits can be gained for every $1 invested in bicycling and walking.

Considering the economic, health, and sustainability benefits, increasing the frequency of active commuting would have a positive effect on society as a whole. Consequently, by understanding the motives and values of this community, businesses and government

agencies can produce products and services that will help contribute to the increased frequency of active commuting.

Professional women, who lead demanding and complicated lifestyles, make up a large percentage of the daily commuters. Managing the pressure to have a successful career, manage finances, and stay in good health, while practicing a sustainable lifestyle with comfort and an all-encompassing impeccable style, is a feat modern women face. Professional women may have a work dress code of business casual clothing, thus active commuting can be a challenge. Professional women who actively commute have additional daily wardrobe factors to consider such as weather, hygiene, carrying capacity, and mobility.

Clothing plays an integral part in a professional woman's active commuter workday. She needs to consider what she will wear during her physical commute and work activities, and how to transition between the two. A women needs to feel comfortable in both circumstances in order for her to continue performing the activities to the best of her abilities. Roy Choudhury, Majumdar, & Datta (2011) explains, "Comfort is a fundamental and universal need of a human being…when the comfort condition exists, the mind is alert and the body operates at maximum efficiency" (p. 3-4). This study will explore the clothing comfort needs of professional women's active commuting apparel. The purpose of the study is to discover the design criteria for professional women's active commuter apparel. This study will examine clothing that maximizes comfort during biking and/or walking as well as meets business casual work attire expectations. Defining the clothing requirements for this market will contribute to the

development of apparel that provides wearer comfort and increase frequency of active commuting for professional women.

There are many factors that need to be considered in the design of professional women's active commuter garments. The apparel needs to address comfort, function/fit, and aesthetic characteristics. The active commuters' garments need to perform during the commute as well as transform into appropriate work attire. The clothing comfort model (see Figures 2.1-2.3) by Branson and Sweeney (1991) and activity theory (see Figure 3) provides the framework for this study. This study will utilize Branson and Sweeney's (1991) clothing comfort model as guide to understand the clothing attributes involved in the wearers clothing comfort. Activity theory is used to understand the relationships that are involved in the activities. The aim of this study is to identify the professional women active commuters apparel design criteria.

Definition of Aesthetics

The basic level of an aesthetic response is an individual's emotional view or perception of a given object. However, an individual's aesthetic response is not limited to an object, but can also include perceptions of elements of culture, nature, sound (such as in music compositions), and various components of linguistics. An aesthetic response is a visceral emotion that involves a relationship between the form, viewer, and context. "Aesthetic theories concentrating on the artist explain such key terms as 'beauty', 'art', or 'aesthetic' in terms of things thought to be special about artistic psychology or activity" (Eaton, 1999, p. 6). Aesthetic reactions are complex and can provoke a personal evaluation of any and/or all-visual, auditory, or tactile elements in a given context.

Viewer centered aesthetic responses bring into question an individual's level of 'taste' (Eaton, 1988, p. 35). An individual's level of 'taste' can be an inherent quality. Also 'taste' can be an innate characteristic and a viewer may instinctively understand the aesthetically pleasing qualities of a composition. Therefore, some viewer's level of 'taste' can evolve and their aesthetic response and perception may change, while other individual's 'taste' level may remain the same throughout their lives. A viewer's perception can provoke a positive emotional feeling and deem something as 'beautiful'. On the other hand, the viewer can have a negative response to an object that provokes a perception of 'ugliness'. Both responses are important and there is value in both positive and negative aesthetic responses.

A collective aesthetic response can be both in sync with an individual's response or in contrast. An aesthetic response is personal and relative to one's own emotion state. A collective response is just an agreement between everyone's own personal feelings.

The Clothing Comfort Model

Branson and Sweeney's (1991) clothing comfort model is the framework used for this study to understand the attributes that contribute to the comfort of the professional women active commuters. The clothing comfort model (Branson & Sweeney, 1991) was based and developed from existing models by Fourt and Hollies, Rohles, Pontrelli, and Sontag. Branson and Sweeney (1991) illustrate how these researchers influenced their model by explaining how, "Fourt and Hollies (1970) conceptualized comfort as a triad consisting of the person, the environment and clothing" (p. 94). Development of Rohles

(1971, 1978, 1985) model is based on thermal comfort, which Branson and Sweeney (1991) state:

> Rohles conceptualized thermal comfort as a whole consisting of three interrelated parts. These parts were identified as adaptive factors, organismic factors, and physical factors. The physical factors include those variable required to define the physical environment such as sound light, area-volume, radiation, inspired gas, atmospheric pressure, force field, air movement, temperature, and relative humidity. Organismic factors, or those variables that define humans in the physical environment are age-sex, genetics, rhythmicity, body type, and psyche. (p. 95)

Pontrellie (1977) "…conceptualized clothing comfort as involving physical stimuli, psycho-physiological stimuli and a filter" (Branson & Sweeney, 1991, p. 96). The Pontrellie (1977) comfort's gestalt's model conveyed the complexity of a human's perception of comfort. Furthermore, Sontag (1985) defined "Human comfort is conceived as a mental state of ease or well-being, a state of balance or equilibrium that exists between a person and the environment" (p.10).

The model in Figure 2.1, illustrates "…four major elements influencing judgments of clothing comfort...identified the concept of the triad (i.e. the person, clothing, and environment)…" (Branson & Sweeney, 1991, p. 100). The model identifies the attributes that affect wearer comfort, including the wearer's physical dimension, social-psychological dimension, and physiological/perceptual response. Sontag defines the physical, psychological, and social comfort in relation to clothing as the following:

> Physical comfort is defined as a mental state of physical well being expressive of satisfaction with the physical attributes of a garment. Psychological comfort is defined as mental state of psychological well being expressive of satisfaction with desired affective states. And social comfort is defined as a mental state of social well-being expressive of the appropriateness of one's clothing to the occasion, satisfaction with the impression conveyed to others, or with degrees of desired conformity to the dress of one' peers." (Branson & Sweeney, 1991, p. 98)

Branson and Sweeney (1991) explain, "…that each element of the triad has both physical and social-psychological dimensions that potentially influence physiological and/or perceptual responses and subsequent comfort judgment for an individual in a given context" (p.100). The model illustrates the relationships between the dimensions, responses, and the triad of the person, clothing, and environment. This model also suggests that the context of a given circumstance will influence the comfort judgment of an individual. For instance, a person may experience changes in air temperature that results in a feeling of thermal discomfort.

Branson and Sweeney (1991) further break down the variables and illustrate within the physical dimension of a person, clothing, and environment the attributes that affect clothing comfort judgment (see Figure 2.2). Branson and Sweeney (1991) continued to build upon earlier models that focused on the contributing variables of clothing comfort. Branson and Sweeney (1991) state:

> In an attempt to represent our ideas in a way that may serve to: 1) clarify key concepts terminology and measurement, 2) provide a structure or framework to permit visualization of the whole as well as influential factors already established in the literature, and 3) illustrate the dynamic aspects of comfort judgments. (p. 100)

This model can be used to understand the relationship of variables that affect the wearers' judgment of clothing comfort. The attributes listed in the model can be connected both vertically and horizontally. All the listed attributes can coincide and interact within both dimension triads illustrating possibilities that affect clothing comfort. The variables listed (see Figure 2.1-2.3) illustrate specific measurable components that may affect an individual's clothing comfort judgment, and shed light on the physical or social

psychological implications of a given clothing design. The model considers past experiences that may affect clothing comfort judgments.

The clothing comfort model is micro in scope. This model examines relationships between individuals and clothing to offer insight on how various variables affect an individual's comfort level and answer questions about an individual's judgment. This is a descriptive level model that acts as more of a guide to understand interactions between the level of comfort an individual feels at given time and environment.

Figure 2.1 Clothing Comfort Model (Branson & Sweeney, 1991)

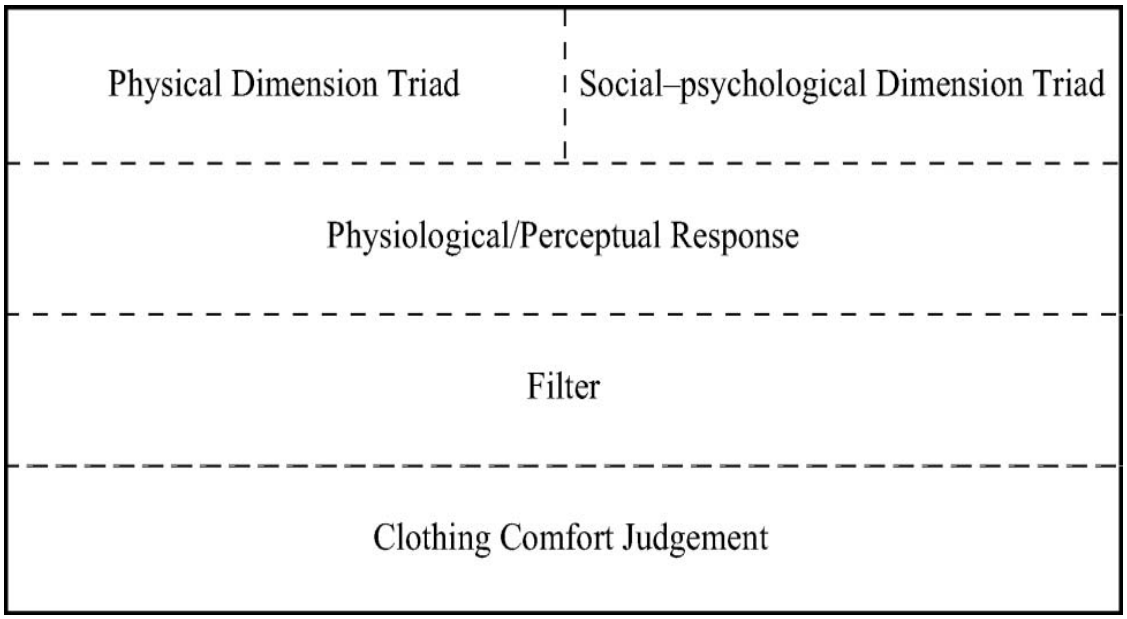


Figure 2.2: Physical Dimension Triad of the Clothing Comfort Model. (Branson & Sweeney, 1991)

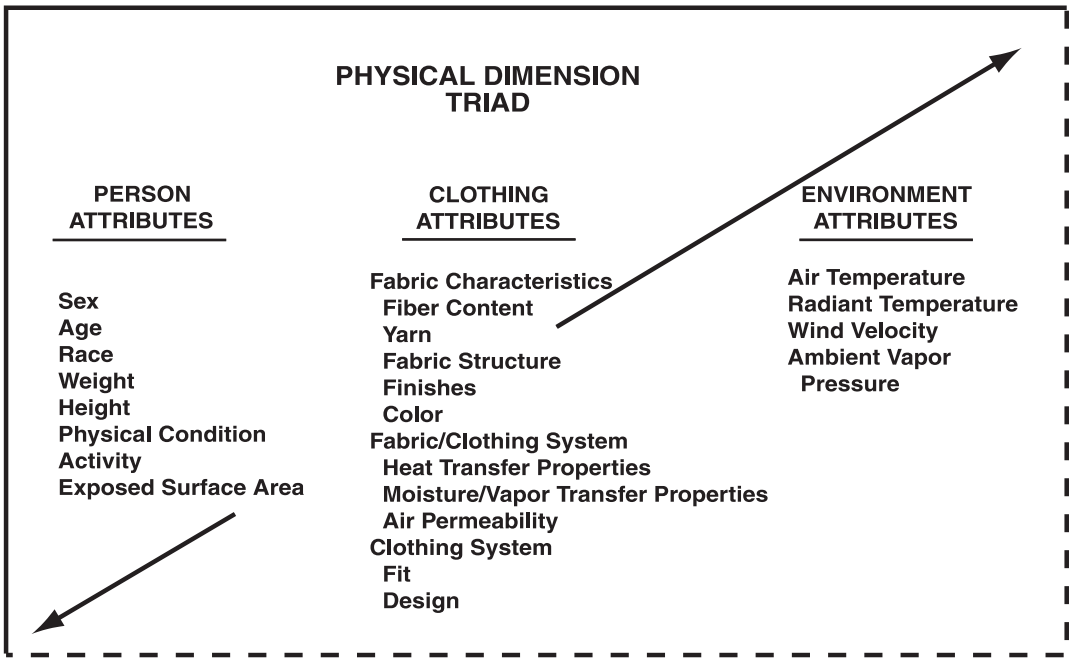
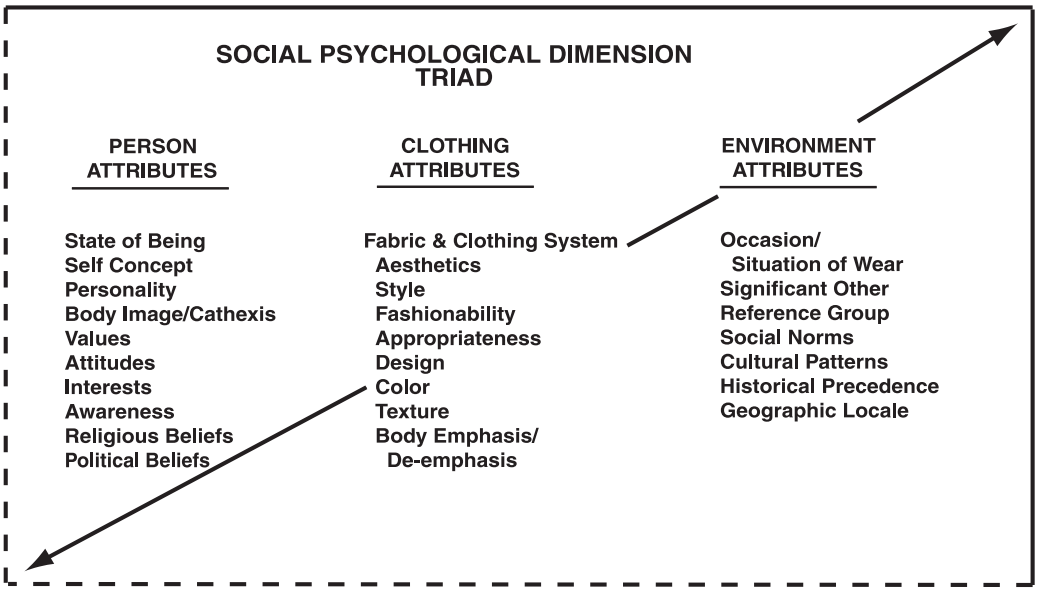


Figure 2.3: Social Psychological Dimension Triad of the Clothing Comfort Model (Branson & Sweeney, 1991)



Theoretical Framework: Activity Theory

Kaptelinin and Nardi (2012) explain, "Activity theory, a conceptual approach originating in the Russian psychology of the 1920s and 1930s…can only be understood in the context of purposeful, mediated, and developing interaction between active "subjects" and the world (that is, "objects")" (p. 2). This theory aids in the understanding of how professional women active commuter (subject) activities are connected and interact with clothing (object). The basic principles of activity theory are as follows: hierarchical structure of activity, object-orientedness, internalization/externalization, tool mediation, and development (Kaptelinin & Nardi, 2012). This theory "aims to help researchers and practitioners orient themselves in complex real-life problems, identify key issues that need to be dealt with, and direct the search for relevant evidence and suitable solutions" (Kaptelinin & Nardi, 2012, p 6-7). Engeström's (1999) activity system model is used to examine professional women's active commuting relationships. The activity theory framework (see Figure 3) illustrates the complex relationship between active commuters (on left) and professional women (on right).

Activity theory will be used to understand the motives and discover the variables that contribute to the subject's comfort needs and increased commuting frequency outcome. Kaptelinin and Nardi (2012) define motive as "an object that meets a certain need of the subject" (p. 25). The motives of the subject (professional women/active commuters) in the active commuting process can be understood through the object (clothing). "Subjects have their own needs and, in order to survive, must carry out activities, that is, interact with objects of the world to meet the needs" (Kaptelinin &

Nardi, 2012, p. 12). Human activities are influenced by subject needs, which in turn produce objects that contribute an increase of activity. A subject's need is fulfilled by producing an object from the criteria based on the social dynamics of a given community. Davydov (1999) states:

> The initial form of activity is the production of material tools that help people produce objects satisfying their vital needs. Material production or labor has a universal character because it can produce any tools and objects. Such production is achieved in definite social relations. (p.40)

This activity contributes positively to the economy, personal health, and the environment, by considering commuter's personal needs. The theory identifies a subject's comfort level as an important human 'need' to be considered in an activity. Kaptelinin and Nardi (2012) state:

> …according to activity theory, the ultimate cause behind human activities is needs…At the psychological level, needs can be represented in two different ways. Needs which are not "objectified," that is, not associated with a concrete object cause general excitement which stimulates the search for an object to satisfy the need. The subject may experience discomfort ("a need state")…the object becomes a motive and the need not only stimulates but also directs the subject. (p. 25)

This theory explains the correlation between the activity frequencies, the subjects' comfort level, and the object.

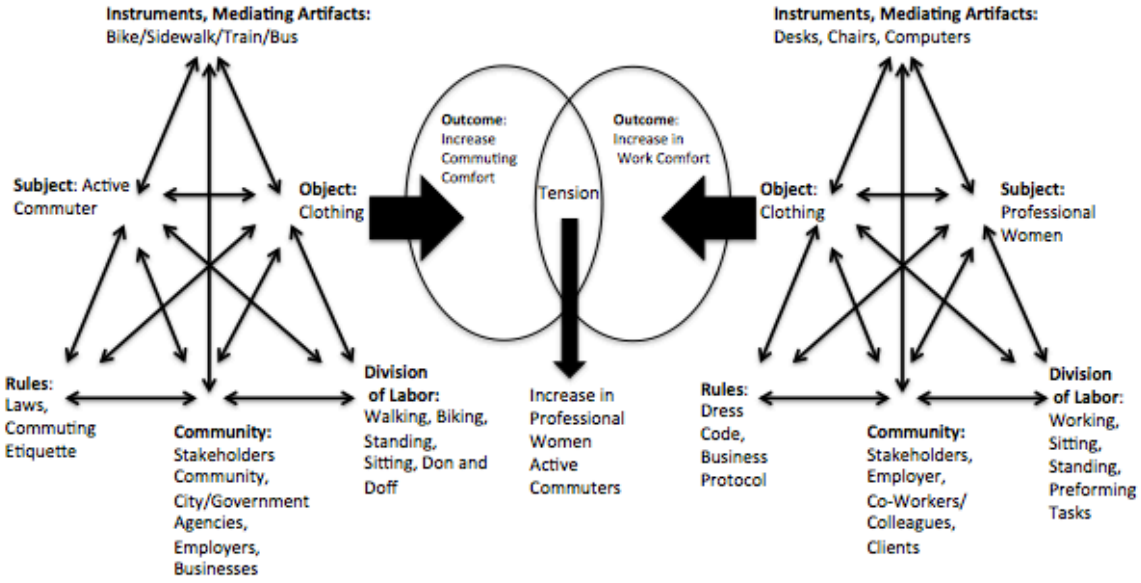
Activity theory uses the concepts of internalization and externalization to understand and guide development of the design criteria that will ultimately produce new artifacts. Engeström and Miettinen (1999) explain, "…internalization is related to reproduction of culture; and externalization as creation of new artifacts makes possible in transformation" (p. 100). By understanding the internal and external elements of a human activity, the social role of a subject within a community will be revealed.

> Activity theory is a powerful socio-cultural and socio-historical lens through which we can analyze most forms of human activity. It focuses on the interaction of human activity and consciousness (the human mind as a whole) within its relevant environmental context. (Jonassen & Rohrer-Murphy, 1999, p. 62)

Understanding the environmental context includes community rules, norms, division of labor, and related artifacts, which is essential to increasing the comfort of professional women's commuter apparel. Engeström (1999) explains, "Activity theory has the conceptual and methodological potential to be a pathbreaker in studies that help humans gain control over their own artifacts and thus over their future" (p. 29). This complex theory gives insight into how the motives help produce objects that will in turn increase the activity, which will ultimately fulfill a subject's needs and benefits the community.

The professional women and active commuter information was plugged into the Engeström's (1999) activity system to apply the model (see Figure 3). This framework illustrates the complex relationships between mediating artifacts, subject, rules, community, division of labor, and an object. The relationships are connected to illustrate an outcome. When the active commuter and professional women outcome meets, there is tension. This tension produces an increase in commuting frequency. These relationships will be evaluated during the study to understand what variables need to be considered for professional women's active commuter apparel design criteria**.**

Figure 3. Activity Theory: Active Commuters/Professional Women Framework



The purpose of the study is to discover the design criteria for professional women's active commuter apparel. This research will explore the participant's motivations and community relationships. It will aim to understand how the environmental conditions and functional performance of both the outdoor and indoor activities affect the clothing requirements for this market. The study will answer the research question: What are the design criteria for professional women's active commuter apparel?

CHAPTER II

Literature Review

There are many complex variables involved in designing clothing for professional women active commuters. The design must consider the physical activity of walking and/or riding a bicycle as well as functioning professionally while performing tasks in a place of employment. Ashdown (2011) explains, “Well fitted and well designed clothing should not interfere with the movement appropriate to the occasion for which the garment is worn” (p. 278). Active commuting is a physical process that involves many human factors. The clothing involved with these activities needs to consider wearer comfort, function, and aesthetics. Therefore, one way to address the issues surrounding active commuters and their professional dress code is to understand their motivations and comfort needs. A review of literature that considers wearers’ comfort will reveal important variables and guide the development of design criteria for professional women's active commuter apparel.

Comfort

Previous research has found physical and psychological attributes to be important to a wearer’s perceived level of comfort. A study done by Barker and Black (2009), used Branson and Sweeney’s (1991) comfort model as a framework to analyze police officers' clothing needs that specifically addressed their perception of comfort while wearing a ballistic vest. “The purpose of the study was to use Branson and Sweeney’s model to determine ballistic vest attributes that influence police offers’ clothing comfort…using preliminary interviews with law enforcement officers, previous literature and a prior wear

test…" (Barker & Black, 2009, p. 61). The study evaluated the satisfaction level of the wearer in relation to the vest properties and looked for considerable associations with clothing comfort. There were 91 male and female participants that ranged from 22 to 54 years old and their research found:

> …officers were not dissatisfied with their uniform or ballistic vest, but they were not extremely satisfied either…better fit when standing than sitting…responded more positively for vest properties than vest fit…easy to take on and off…positive rating for vest function…rated slightly positive for comfort factors related to mobility…vests are hot to wear…regarded their overall comfort as either neutral or negative. (Barker & Black, 2009, p. 64-67)

The study analyzed a wearer's needs and determined attributes that affect comfort while wearing the ballistic vest. Overall the study concluded, "…fit and vest properties were found to be significantly correlated with clothing comfort" (Barker & Black, 2009, p. 67). The clothing comfort model helped to identify the attributes needed to analyze comfort for a police officer wearing a ballistic vest. When considering garments that need to function with the wearer, the type of fabric, ergonomic fit, as well as aesthetic appropriateness affect the wearer's mental state. For a textile to be perceived as comfortable, thermal and sensorial characteristics are important factors for consideration. Branson and Sweeney's (1991) clothing comfort model (see Figure 2.1-2.3) illustrates key clothing attributes for perception of wearer comfort. As Barker and Black (2009) explain:

> … past experiences and prejudices serve as a filter by allowing the wearer to determine his/her comfort judgment based on what has been experience or preferred in the past, as well as his/her response to the set of conditions currently being experienced. (p. 60)

The wearer's level of perceived comfort may influence the frequency and performance of a given activity.

A study conducted by Horridge, Caddel, and Simonton (2002) also used Branson and Sweeney's model for clothing comfort as a conceptual framework to examine the comfort and wear of trooper uniforms (p. 350). This exploratory research study was used to examine the fabric characteristics and how they affect comfort. The researchers used Branson and Sweeney's (1991) clothing comfort model physical dimension attributes to hypothesize that there would be significant differences between the measured variables (Horridge et al., 2002, p. 351). The researchers found a significant correlation between the fiber content and individual attributes of age, weight and activity. The study by Horridge et al. (2002) noted that the fit and design was controlled in this study however "Significance was observed for eight main effects-fiber content: age…weight…hours uniform worn…activity level…humidity…temperature…trooper weight...and relative humidity" (p. 373).

A study done by Sontag (1985) involved one of the models from which Branson and Sweeney (1991) deduced the clothing comfort model. Sontag (1985) investigated:

> Three dimensions of human comfort with respect to clothing are proposed: physical, psychological, and social comfort. A pilot study of 60 women, aged 60 to 80, was conducted to develop and test a semantic differential measure of these three human comfort dimensions with respect to actual and ideal insulative clothing for indoor wear. (p. 9)

This study evaluated comfort through the relationship of thermal and insulative properties of clothing. The perception of the wearer was taken into consideration on whether they felt the garment possessed ideal qualities. There are many factors to consider when

making an assessment on comfort. This study used personal attributes, such as age and sex, combined with the clothing attributes, which included the weight, style, and texture of the garment, therefore creating another layer of complexity. Further, the environment where the wearer is donning the garment can affect the overall judgment of comfort and those attributes were also measured in this study. Sontag (1985) evaluated the insulative garments on attributes involving physical, psychological, and social comfort, which gave the researcher a focused guideline for evaluation of the wearers' perception level of comfort. The pilot study revealed that:

> (1) physical comfort and psychological comfort were both highly correlated with overall evaluation before wearing the garment (2) physical comfort was more highly correlated with psychological comfort for the garment for the garment that was externally visible than for the other garments. (3) physical comfort was more highly correlated with overall garment evaluation than was psychological comfort after participants wore the garment (4) avoidance of extremes may be important for older women's psychological comfort; (5) actual garments presented to and worn by the participants did not met their expectations for ideal insulative clothing; (6) participants' expectations for ideal insulative clothing may have affected selection of garment type; (7) the experience of wearing the insulative clothing modified perceptions of physical comfort, psychological comfort, and overall evaluation; and (8) garment types differentially approached the expectation for ideal insulative clothing on the separate comfort dimensions. (Sontag, 1985, p. 16-17)

This study illustrates how perception of comfort can change with experiences. The study looked at the perception of the wearer before and after donning the garment. This study identifies the complexity of an individual's perception of comfort and provides an understanding of the factors involved in an assessment of comfort.

A person's judgment of clothing comfort is affected by specific fabric properties. A definition of comfort by Randolph and Langford (2002) states "Comfort describes the way a textile product affects heat, air, and moisture transfer and the way the body

interacts with the textiles product" (p. 396). Regulating body temperature during physical activity is a concern, as women sweat from their torso and back rather than under the arms, where ventilation is traditionally placed (Weede, 1997). Comfort is greatly affected by the inherent properties of a given textile. The fabric should provide a breathable environment that keeps the body warm, without getting too hot, because the person could start to sweat. If the wearer starts to sweat, the fabric needs to have wicking qualities to take the moisture away from the body and evaporate into the air, keeping them cool, warm, and dry all at the same time.

The wearer's portable environment should consider related aesthetic senses. These senses include: touch, pain, pressure, vibration, and temperature sensations. According to Tominaga and Caterina (2004), "We feel a wide range of temperatures spanning from cold to heat. Within the range, temperatures over about 43 °C and below about 15 °C evoke not only a thermal sensation, but also a feeling of pain" (p.3). In order for a person to feel comfortable, their pressure, pain, and temperature thresholds cannot be exceeded in any location where the fabric comes in contact with the body.

The fabric hand and weight can contribute to overall skin irritation. Fabric that feels prickly, rough, scratchy, or damp during wear can create pressure sores and cause discomfort. A pressure sore is "…an area of the skin in which pressure has destroyed the surface tissue with progressive destruction of the underlying tissue" (Bardsley, Fowler, Moody, Teigen, & Sommer, 1964, p. 82). The skin can be broken down by wetness, so it is essential to also keep the wearer dry. There should be no bulky, protruding seams or points as well as no scratchy or skin irritating elements within the fabric characteristics to

achieve maximum wearer comfort. Hatch, Markee, and Maibach (1992) explained, "Fabrics that are abrasive or poke the skin may produce this irritant response" (p.56). Therefore, the garment closures should not rub or constrain the wearer, for that could also create pressure sores and skin irritation. The garment seaming should be flat and soft to also minimize pressure points and skin irritation.

Fabric softness and dryness were found to be the most important variables indicating comfort in a study that evaluated natural and synthetic fiber socks. The researchers administered a questionnaire that rated overall comfort in regard to variables of "…softness, dryness of foot, weight, fit, breathability, and thermal comfort" (Morris, Plato, and, White, 1984, p. 15). In another study that researched skin responses to fabric, Hatch et al., (1992) stated, "…clothing contact comfort studies have assessed fabric parameters and have related these to the perception of unpleasant sensation such as rough, prickly, sticky, and clammy" (p. 54). Further, a study by Hollies, Custer, Morin, and Howard (1979) explored the wearer's perception of clothing comfort during physical activity, or a change in climate, and considered the fabric's fiber, structure, and finish.

Function

The functional requirements of clothing encompass all aspects of a professional women's active commuter clothing design. The wearer's movements during activities as well as their interaction with their environment and peer community are key factors to consider in functional clothing design. As Bartels (2011) explains, "For sportswear, the situation is more complex as ergonomic comfort must be balanced with the specific needs of a particular sport…[due] to their high level of comfort, sports clothes are often worn in everyday situations…" (p. 393). However, the active commuter is traveling to a

professional work environment, which requires appropriate hygiene and business casual dress attire. Without showers and changing facilities active commuters may have trouble meeting office dress codes (Shephard, 2008). Fabric characteristics, aesthetics, fit, and mobility play key roles in the functionality of a garment. As Ashdown (2011) explains, "Fabric properties and garment design are the two primary, interacting factors that contribute to, or impede garment comfort" (p. 287). In order for the garment to be comfortably worn during an activity, these functional elements need to be considered.

The garment's fit and design can affect the wearer's range of motion and therefore affect the mobility and safety of the active commuter. In a study that focused on women's sailing apparel, Bye and Hakala (1999) explain, "Functional needs also include mobility… Fit is a critical element in how a garment functions and performs, but also affects how garments feel (expressive) and look (aesthetic)" (p. 47). A garment needs to be able to be comfortable and perform the functional requirements of an activity. Bye and Hakala (1999) state, "Functional needs included thermal balance, safety, mobility, and fit…Aesthetic needs include appearance and tradition" (p. 46). Considerations in professional women active commuter apparel needs to include the ability to safely perform the active commuter tasks, while possessing the ability for the wearer to have a clean and presentable appearance at the workplace.

Mobility is important for the wearer in order to effectively perform the tasks involved in active commuting. Ashdown (2011), states, "The level of comfort in clothing related to movement is predicted by the fit of the garment, the material properties, and the

design of the garment" (p. 282). The garment should move with the body without causing stress and/or restriction for the wearer. Ashdown (2011) further explains:

> Proper fit is also essential to create garments of any type that move and balance well on the active body. Good design of clothing requires the development of garment shapes that provide proper ease (the added circumference or length of the garment that allows the body to move) and proper set (the 'balance' of the garment that keeps it in place so that the interaction of gravity and frictional properties of the fabric do not displace the garment on the body with movement. (p. 287)

Without proper garment fit or balance, the wearer can experience a loss in productivity and energy. Ashdown (2011) explains, "Restrictions to movement from a garment also have the effect of increasing the metabolic cost of wearing the garment overall" (p. 287). This is an important consideration in designing for this market since active commuting is a very physically demanding activity that requires energy, and the wearer still needs to perform work tasks throughout the day and then commute back home. The movements performed by the wearer during the activities are important to understand in order to accommodate for mobility. Ashdown (2011) explains, "An understanding of the human anatomy and function is necessary in order to understand the body in active position, and to design clothing that will move appropriately with the body" (p. 279). It is essential to understand the range of motion requirements of the active commuter to meet their apparel needs.

The proprieties of the textile in a garment can contribute greatly to the performance and efficacy of an individual performing an activity. The wearer of a garment may perform various tasks throughout their day. The professional women active commuter must consider the outside and inside environment while making their dress

choices. Rengasamy (2011) explains, "Key factors controlling thermal comfort of the clothed body are: ambient conditions (air temperature, mean radiant temperature, air velocity, and humidity); permeability (liquid and vapour); ventilation and insulation of the clothing activity level; heat production rate, etc" (p. 205). Considering the ambient conditions, the fabric structure is an important design element to consider in apparel, since it is a major factor in how a garment will preform and function. Hosseini Ravandi and Valizadeh (2011) explain:

> Cloth is made from fabrics, which are even knitted (interlocked loops), or woven (interlacing threads), or nonwoven (matted fibers). Fabric physical properties create the comfort characteristics of the cloth. The major properties are fabric density, porosity, bulkiness, thickness, structure and pattern. (p. 74)

The fabric that is utilized in a garment design involves a formula of various combinations of fiber, yarn, structure, and finish. The fiber content of a fabric can significantly contribute to a clothing systems function. Ho, Fan, Newton, and Au (2011) explain:

> During walking, the air space between the fabric layers of a porous clothing system and the skin will change according to the walking speed and rhythm. This movement of fabric will cause air penetration in and out of the clothing system and thus reduce the heat and moisture transfer resistance…Designers can utilize mesh fabric in sportswear for better ventilation…(p. 167)

Black and Cloud (2008) aimed to identify the bicycle patrol officer's uniforms' "…instrumental and expressive performance requirements" (p. 35). In this study the researchers discovered that comfort, fabric characteristics, and fit all contributed to the wearers' perception while performing the activity of biking. Black and Cloud (2008) stated:

> Not surprisingly, officers commented on the thermal comfort issues…The most common concern was the heat build-up in the chest area and wetness from sweating since moisture did not wick away from the body…Fit issues affecting

> garment comfort were also raised…restriction of movement were related to fit as well as comfort. (p. 40)

The functional requirements involved in thermal regulation and fit are important consideration in activewear and professional women's clothing design. Consequently, thermal comfort and fit contribute to the functionality and comfort of the wearer.

Aesthetics

Aesthetics is another element for consideration in an apparel design. There is a community involved in active commuting as well as dress code expectations for the work place. Therefore, the aesthetic response and experience of the individual wearing the garment, the viewers of the individual, and the collective peer group can all play a role on the comfort level of the wearer. Bartels (2011) explains, "Psychological comfort influences the subjective comfort sensation. This depends on fashion and the attitude of the wearer towards brand image, colour, pattern, textile material and production" (p 390). The aesthetics and physical comfort of a garment are affected by the fit, color, style, and material combination (Cheng & Cheung, 1994; Smith, 1986; & Yu, 2011). The design details are correlated with the overall garment aesthetics and the design elements work in harmony to create a comfortable experience for the wearer. "Wearers feel more comfortable, because they feel themselves to have a more attractive appearance" (Bartels, 2011, p. 398). An individual's self-identity and professional image is communicated through the clothing they wear.

The aesthetic response of the individual and peer group affects the comfort level of the wearer. Rudd and Lennon (2001) state, "Attractiveness also affects social interaction…Individuals whose appearances represent deviation from the norm may be

socially disadvantaged" (p. 124). When a wearer's *program* is *challenged* and not *accepted* the wearer will change their dress to be *validated* by their peers (Stone, 1962, p. 398). Therefore, the messages sent by the active commuter and business communities could be a factor that may influence a person's perception and aesthetic response. A person's desire to be *validated* by their peers may be a strong force that could influence dress choices within a group. This concept exemplifies how appearance non-verbally communicates to the *viewer* the *wearer's* identity.

There are many considerations for professional women's active commuter apparel. The garment must function and look aesthetically pleasing while commuting, when arriving to work, and throughout their workday. The appropriateness and aesthetic characteristics of a garment are essential in whether a women will wear a garment. In regards to women sailors, Bye and Hakala (1999) explain, "Although functional need was their primary concern, most were also looking for garments that would flatter the body" (p. 51). If women do not feel that a garment is flattering, the function may not be enough to purchase and wear the garment. "Women are more in tune with how clothes make them feel, how the woman feels in them, and whether or not it is flattering are key features beyond mere function" (Weede, 1997, p. 97). The wearer's body image is affected by the clothing and appropriateness of the garment. There is a physical and psychological element that coincides with clothing choices.

A study involving a random sample of 199 undergraduate students investigated the relationship between physical and psychosocial attributes of the body also used Branson and Sweeney (1991) clothing comfort model as a framework (Chattaraman &

Rudd 2006, p. 46). The researchers used this framework to find the correlation "…between physical and psychosocial attributes of the body, and aesthetic attributes preferences in clothing" (Chattaraman & Rudd, 2006, p. 46). Chattaraman and Rudd (2006) "…determine whether women's aesthetic response to apparel is related to their body size, body cathexis and body image... The results indicated that body image and body cathexis had a negative linear relationship with aesthetic preference in styling…" (p. 46). Chatteraman and Rudd's (2006) study did not specifically measure comfort, however they used the clothing comfort model to look at the psychological and socio-cultural aspects that affect an individual's responses and preferences for clothing.

The success of the design is contingent on the wearablity and salability of a garment. Rudd and Lennon (2001) explain, "Product utilization encompassed aesthetic considerations, consumer motivations for purchase and use, psychosocial and socio-cultural behavior, and the nature of fashion change" (p. 121). Product consumption is connected to a multi-faceted aesthetic experience. "The value of aesthetics is vital to the initial sale and overall success of a garment" (Watkins, 1995). Stakeholders will not benefit from a design if the market does not find the garment to be aesthetically pleasing, and/or appropriate.

CHAPTER III

Method

This qualitative research study was exploratory and sought to discover the design criteria for professional women active commuter apparel. The study aimed to answer the research question by examining the complex requirements involved in professional women business casual dress code as well as active commuting. The requirements were identified based on the participant's perception and level of clothing comfort. The research method for this study is discussed in the following order: interview questions, participants, data collection, and data analysis.

Interview Questions

The data for this study resulted from interviews with six participants exploring the apparel needs of professional women active commuters. A literature review, the attributes illustrated in the clothing comfort model (Branson & Sweeney, 1991), and the relationships involved in activity theory guided the interview questionnaire for this study. The participants answered five open-ended questions (see Appendix A for questionnaire) that involved: motivations, environment conditions, currently worn clothing/satisfaction, clothing performance requirements, community involvement, and clothing comfort. In addition, the interview questions explored desired changes to current clothing, additional opinions relating to their satisfaction, community expectations, and functional/aesthetic characteristics. The goal was to understand the relationships involved in both activities and ultimately develop the design criteria for professional women's active commuter

apparel, thus improving wearers' comfort and potentially increasing the frequency of active commuting.

Participants

The variables of age, sex, physical condition, activity, and occasion/situation were controlled in the study. It was required that the participants were 22-32 year old, female, and physically fit. The participants lived in the Minneapolis, Minnesota metropolitan area. The women needed to be actively commuting to work, at least one day a week, within Minneapolis, Minnesota. The active commute needed to involve biking no more than 10 miles and/or walking 5 miles and could also include a partial commute to a train and/or bus. The dress code at their place of employment was business casual attire.

The purpose of the study was to discover the design criteria for professional women's active commuter apparel. These 22-32 year old, professional women active commuters were recruited from the University of Minnesota campus through snowball sampling. The initial inquiries were made through personal contacts. This was a homogeneous sample of participants who had an active commuting lifestyle as well as a business casual workplace dress code. These participants were selected because they are part of a community that possesses values and ideas that would maximize the output of information on the subject. This demographic was chosen because they have experience in active commuting and their knowledge would provide an understanding of the needs involved in the future active commuting apparel market. The location of Minneapolis, Minnesota was an appropriate location, since in 2012 this city was rated second on the Bicycling.com list of American's best bike-friendly cities.

Data Collection

After attaining Institutional Review Board approval, the interview data were collected from January to March 2013. This study included six audio recorded interviews, (interview questions, see Appendix A) and coinciding field notes. The interviews took place at a neutral site where the participants felt comfortable expressing their personal knowledge and opinions. The participants were informed prior to the interview recording that their autonomy would be protected. Also, prior to the start of the interview, the participants were informed of the purpose of the study. Three of the interviews took place on the University of Minnesota campus, two interviews at local coffee shops, and one at a bike shop/cafe. The interviews took approximately 45 to 60 minutes to conduct.

The participant consented to audiotaping before the start of the interview. Six personal interviews where conducted and each participant was asked five exploratory open-ended questions (see Appendix A). They were instructed to answer the questions in a descriptive manner. At times, the participants where asked to clarify and/or elaborate on their response. They were instructed to provide the context, the season of year, and/or weather condition that coincided with their response. The participants were asked to further elaborate on their responses in order for the researcher to find meaning in the cause and effect relationships. For example, when participants stated they wanted to be more comfortable, they were directed to be specific in what variables affected their clothing comfort perception. Therefore, the participants' perception provided the information for the study. Throughout the interview process, member checking was used

to ensure accuracy and reliability. Further, field notes included personal observations and descriptions of the interview site.

This qualitative research method involved reading back the participants' responses to assure clear and accurate data was captured. This process involved acknowledging the researchers personal bias, which allowed for an accurate interpretation of study results. This reflexivity was used throughout the entire research process to produce quality and non-bias results. Rigor was ensured through validating participant responses. The interview research instrument was utilized to aid the verification and trustworthiness of the study and the data collection method was consistent. Overall, this research study was design to be replicated, transparent, and reliable. The study incorporated validity strategies such as: member checking, rich, and thick descriptions, bias clarification, negative case, and peer debriefing. (Creswell, 2009, p. 191-92).

Data Analysis

After the interviews were conducted, activity theory and the clothing comfort model (Branson & Sweeney, 1991) were used to guide the analysis of the interview data. The interviews were transcribed and organized by the researcher. Then the data was sorted into chunks, coded, and organized into categories and sub-categories. The analysis started by chunking data into text units, which is a process referred to as “unitizing” material (Guetzkow, 1950). The data was coded and categorized:

> …to reflect on what the coded segments tell you about the category, and its meanings in the project…to ask questions about how the category relates to other ideas from the data…to make further, finer categories, from finding different dimensions in the data gathered by the first coding…to search for blends or combinations of categories, to find patterns in attitudes on this subject…seeing the category from a different viewpoint… (Richards, 2009, p.95)

The subcategories reflected the attributes and relationships illustrated in the clothing comfort model (Branson & Sweeney, 1991) and the activity theory. Therefore, after the text units where categorized, the expanded subcategories revealed the complexity within the data and themes emerged. This inductive approach searched for meaning within the patterns and ultimately discovered similarities and negative cases within the data. To ensure the dependability of interpreting the data accurately, after the data was sorted into themes, the process was repeated and a reexamination by a comparison process was conducted several times. Axial coding produced emergent themes, which were analyzed within and across the active theory framework and Branson and Sweeney's (1991) clothing comfort model. The themes that emerged during the coding process revealed the participants' comfort perception and apparel needs. A comprehensive taxonomy was developed from the synthesis of data (see Figure 4, p. 61).

CHAPTER IV

Results

Description of Participants

The purpose of this research study was to identify the design criteria for professional women's active commuter apparel. Professional women, 22-32 years of age, who were active commuters in the Minneapolis, Minnesota metropolitan area, were recruited. This was a homogeneous sample of participants who had an active commuting lifestyle and had similar workplace dress codes. These participants were involved in the active commuting community and their views on the subject produced valuable data for the study. Two of the participants did not own a car and used active commuting as their sole mode of transportation to and from work. The other four participants owned a vehicle and stated that in certain situations they would sometimes drive a vehicle, but the majority of the time they actively commuted to and from work.

Findings

The relationships involved in professional women's active commuter apparel are complex and multi-faceted. This commuter is actively biking and/or walking to work and their clothing requires compliance with company business casual dress code when arriving to the workplace. There are many variables in these activities and the relationships involved should be considered during the clothing design process. When these two opposing activity requirements come together to achieve a common goal, there is tension. This tension between the two activities provides insight to the design criteria for this market segment (see Figure 4, p. 61). This exploratory study investigated

variables that affect the physical and psychological comfort of this consumer in order to simultaneously meet the apparel needs of both activities. An analysis of the relationships and requirements of the professional women active commuter are essential to determine the design criteria for this consumer market.

In the following discussion, emergent themes revealed from the participant interviews are presented. These themes illustrate this consumer's viewpoint and are discussed in an order that tells the participants' stories. Physical and psychological comfort elements are present within each theme as a fundamental element in professional women's active commuter apparel. The themes consist of the personal interests, clothing design, and the environment/occasion for which the participants wear the garments. The professional women's active commuter design criteria framework (see Figure 4, p. 60) illustrates the relationships and depicts the requirements involved in active commuting and working in a business casual dress code environment. There is a filter that further delineates the design criteria subcategories to include: sustainability, finances, health, fabric, fit, aesthetics, air temperature, safety, and peers. The activity theory and Branson and Sweeney's (1991) clothing comfort model guided development of the framework (see Figure 4, p. 60) and analysis of interview data.

Theme: Person/ Interests.

During the interview, the participants where are asked about their motives for active commuting to their place of employment. This question revealed the participants' value system which guided their decision making process. Sustainability, financial, and health benefits were motivations for active commuting. These motivations reflected their

values and influenced their actions, the apparel they chose to wear, as well as buying behavior. As participant six explains:

> *My active commute makes my lifestyle healthier, cardiovascular exercise and all that stuff. Then there are environmental considerations, reducing my personal emissions and use of fossil fuels for transportation. There's also the economic side of it. It's vastly cheaper to walk places than to own a car or pay for gas. I guess actually there's a fourth reason, which is that when I'm walking it's like meditation. I feel more aware of my own thoughts and my surroundings and my place in the world when I'm walking.*

These motivations also influenced clothing choices and were inter-related with personal goals and peer groups associations.

Sustainability.

The participants considered sustainability an important social issue and personal responsibility. They sought to live a lifestyle and made apparel choices that reflected their social values. The overall well-being of the environment was stated as an important value and social responsibility.

Sustainability was found to play a role in their personal apparel selection. Some of the participants paid attention to the garments' fiber content and where the garment was manufactured before purchasing a garment. For instance, participant six expressed that:

> *This is ideologically motivated; concern about the environment. I think that a lot of people who have similar perspective would appreciate material choices that are more socially conscious, sustainable, and ethical and that stuff… Things that are made in America and materials that are made organically, stuff like that works for me.*

When asked about motivations for active commuting, participant one stated: "…it's the environmental impact of having a car and buying gas and all that stuff." This participant chose to commute to work to do her part in reducing the environmental impact associated

with having a car. When participants explained the details of the clothing they purchased, sustainable fabrics, ethical manufacturing, and fair trade practices were mentioned as considerations before purchasing a garment. Participant four explained, “I avoid biking in cotton, it is not environmentally friendly.” This is an example of how these active commuters' socially conscious values play a role in the design criteria for this market.

These participants placed high value on sustainable practices and made lifestyle choices to reflect these values. Although, participants stated that they were not always able to choose clothing that was sustainable due to financial constraints, they would make the effort and seek out ways to participate in sustainable activities.

Health.

Physical and mental health was mentioned by all six participants as being an important reason for choosing to active commute. Participant three stated how biking and/or walking to work benefited her by explaining, “It is good for my health…a good way to start the day for both my mental and physical health.” Further, participant four stated how the activity affected her attitude by stating, “…it is a nice way to get exercise in and stay in shape…it puts me in a better mood…it makes me happy.” Physical and mental health was greatly valued by the participants interviewed in this study.

Time constraints of professional women come into play as particpant five explained, “I really like biking and like to work out, since I’m busy, that’s pretty much often times one of the only times during the week that I can get that in.” This participant explained in order to achieve her fitness goals she incorported active commuting into her weekly routine.

Financial.

All the women interviewed worked in a professional environment and fiscal responsibility was mentioned as an important motivator in their daily commuting choices. As participant three explains, "I save my money, no bus, or parking fees." Individuals can save money by not having to pay the expenses associated with driving a vehicle to work every day. Participant one did not own a vehicle and justified this decision by stating, "I don't have to pay for parking or gas, or car insurance, and you get to have a lot of fun because of it." Many participants explained how Minneapolis is an active commuter friendly city. There are infrastructure and city programs in place to support and promote this activity. As participant one explains, "… financially it makes a lot of sense for me in a town that is commuter friendly as Minneapolis." These active commuters felt that the financial benefits were more important than driving a vehicle to work every day.

The women interviewed mentioned the trade-offs of cost versus quality in clothing. As participant six stated, "…the other part of it for me is financial business. I really need income to get a new wardrobe at this point." When asked if price was a consideration when purchasing clothing participant six stated, "There are a lot of things made of bamboo and made in a sustainable way that are way out of my price range." Participants mentioned frequently that cost contributed to the desire to purchase clothing that worked for both activities. Therefore, when asking how expense played a role in their clothing choices, participant four stated, "I would rather buy quality, but if I am going to spend a lot of money, I want it to be what I am looking for." This participant explained how she would invest in a high quality pant by a company that was manufactured in the

United States and paid their workers a fair wage. However, she explained how she would not usually invest as much in tops as she would in high quality bottoms. She further explained how she would rather purchase quality clothing that met her commuter needs and lasted longer. Participant two provided another example of how financial considerations affected clothing choices by stating:

> *Wool is the big one especially in my friend group. People that are new to cycling obviously they'll complain and say they get really sweaty or like in the winter I get really cold and then when I wear the synthetic long underwear I get kind of clammy and stuff. I'll be like, "Have you ever tried wool because it's amazing." I know it's expensive, but it's worth the cost. It's much more comfortable…*

The women inviewed were busy working professionals and choose to partake in activities that reflected their value system. They valued particpating in a sustainable, healthy, and a finaically responsible lifestyle. The overall well-being of the environment was stated as an important personal value and social responsibility. Their interests reflected their activities and clothing choices.

Theme: Clothing Design.

Clothing design is complex and has many variables that can be considered to meet the needs of a consumer market. These studies reveal overlapping themes and within the themes subcategories. These categories illustrate patterns and provide insight into viewpoints of the participants. Active commuting is a physical activity and the clothing to accommodate this activity requires many design considerations. There is an added layer of complexity to the professional women active commuters which involves the element of maintaining a professional appearance in a business casual dress code work environment. Therefore, the clothing must be functional in walking/biking, while also

appropriate in the work place. Every participant in the study mentioned the importance of fabric, fit, and aesthetic of the garment they wore actively commuting to work.

Fabric.

During the interview, participants were asked what garments do you currently wear during your commute and how do they work/perform? In response, the participants continually mentioned the fabric characteristics of their garments. Fabric plays a major role in the function and aesthetic qualities of the garments they either choose to wear, or desired to purchase. Fabric is comprised of the fiber, yarn, structure, and finish. Specifically, the participants focused on the fiber and structure of the fabrics in their garments.

Fiber.

The fiber qualities mentioned in the interviews involved physical and psychological clothing comfort elements. For example, the participants explained how the qualities of the fiber affected function, texture, odor, wash, and care. Having the proper fiber provided the wearer with a sense of physical and psychological comfort. The majority of the participants valued wearing fabric made of sustainable fibers. Therefore, certain fibers where mentioned to be ideal for their psychological comfort. However, the physical comfort was mentioned to be the most important factor due to their functional requirements. For instance, participant two explained:

> *I prefer to wear wool most of time because one it's antimicrobial and it doesn't build up the odor that a lot of other things do and I find it wicks moisture away really easily and it's more comfortable in a range of settings. Then, if I do get kind of warm and I end up in an air-conditioned building it kind of keeps me a little warmer than damp, cotton shirt does just because of the properties of the fiber. I don't wear a lot of synthetics. I tend to avoid polyester and nylon at all*

> *costs when I'm riding in the summer because I just feel like a swamp when I get done riding. Cotton is not ideal, but I'd rather wear that then something polyester.*

When asked to further explain why she does not like to wear polyester participant four stated, "I feel clammy and sweaty and it doesn't breathe very well. Then, when it is cold it's really cold. I just don't like it… next to my skin I prefer to have a natural fiber." Participant five explained she seeks out, "…something that's made out of a material that is sweat-resistant and adjusts to temperature changes and durable, too."

Participants mentioned the importance of their clothing being made of a fabric that resists stains, and/ or ease of wash and care. Participant four explained a concern by stating she would wear a fabric "…if it is made out of a material that you can get chain grease out of, and that definitely isn't cotton." The ability to have garments that would not stain or show dirt was important for both meeting dress codes at work, as well as ease of laundry and care.

Fabric Structure.

The texture of the fabric was mentioned as a key element related to the physical comfort of the wearer. For instance participant four exclaimed, "I don't want something itchy!" If the fiber creates the need for an individual to have to scratch themselves while riding a bicycle, it is not only a comfort issue, but also a safety issue. Elaborating more on texture, participant two explained:

> *If it's too abrasive, it can be really annoying especially in the underarms or like where you're sitting. That can be kind of annoying. I'd say underwear is probably more … you need that to be comfortable because it will dig in….also in the seat. Then sometimes like, it just depends on how warm it is and where you're going, like when hot textures tend to bother me a lot more than winter or in the fall or spring when it's a little bit cooler out.*

The consensus was that the fabric needs to be soft against the skin in order for the active commuter to feel most comfortable. The fabric can create chafing and pressure sores. In addition to the fabric material, the way the fabric was sewn together can also affect comfort. Participant one explained, "Flat lock seams if you're going to have it down the middle. Even on normal cycling shirts…I've heard people buy the higher-end brands because there's less discomfort with the flat lock seams."

The participants continually explained the importance of wearing a garment that was constructed out of fabric with thermal and wicking properties. This was an issue for performance while commuting as well as dress code compliance at the workplace. When asked to explain how thermal regulation affected comfort participant four replied:

> *In the seat, which isn't visible, but its uncomfortable when you get kind of damp and this is just from sitting on a bike seat. It's really any activity you do that tends to be a problem if you're working and there's a ledge so it pools anywhere there's like a crevasse like behind your knee, in your elbows or kind of like drips down your neck. My hair gets sweaty really easily probably just because I have a lot of it.*

Participant one explained how she utilized thermal fabrics and a layering system to function comfortably:

> *It gets a little bit wrinkled; I use outer layers to block wind, again in fall, as a light rain barrier, multi-purpose stuff helps. This is very warm though, it's the first thing I put on when I'm cold and the first thing I take off when I get warm. A couple, again, a wicking layer underneath*.

In an attempt to understand the importance of the transition from active commuting to the work place, the participants were asked to talk about how their clothing needed to perform throughout the whole workday. The participants explained the complexity and issues of finding a fabric that would be presentable when arriving to

work, as well as functional during the commute. All six participants explained the importance of being professionally presentable when walking in the door at work. When asked how they address this issue, participant six stated, "I choose outfits that won't show pit stains. Aren't I lovely?" When asked to clarify how they dealt with thermal requirements and how they handled the transition into work participant one explained:

> *I would probably arrive early with a bag and if we had a shower, I might shower beforehand or at least things I've learned from bike tour, if you have a soft pack of baby wipes to clean yourself up when you have to work if you have a longer commute. That would be something I would definitely do. In a quick time, you know? So you don't have to take a whole shower but enough so you can freshen up when you're at work because I feel like that keeps a lot of people from commuting.*

Participant five explained that she wore clothes that would function for in both situations, so she did not require a full shower, but a "bird bath" in the bathroom sink would suffice. Participant three exclaimed, "...after biking, I can smell."

Further, participants mentioned that fabric wrinkling was an issue from not only the activity, but also the clothing packed in a bag that was brought to change at the work place. When asked to explain the issues with wrinkling and being presentable at work participant one stated, "Pack-ability is important, I'd say in regards to wrinkling. If I'm just out with my purse I pack a coat that gets the size of a baseball with minimal wrinkling." The complexity of integrating the clothing requirements for the two different activities was discussed. The participants stated there were sometimes tradeoffs in regards to clothing choices when actively commuting to work.

When asked to clarify if they preferred either knits or woven garments, the majority preferred knits or fibers that offered stretch. They sought out fabric structures

with the ability to stretch and allow for dynamic movements during their commute. However, this seemed to be more of an issue for most of the participants for the bottoms than for the tops. For example participant two explained:

> *Stretch is helpful just because you have such a range of motion with your legs. Over your knees is where pants tend to be really tight when you're like lifting up on the pedals and that can be really uncomfortable.*

Participant four had a specific preference and stated, "I generally wear knits on top, I like stretchy woven for pants." When asked if she wore woven on the bottom participant two stated in regards to a woven skirt, "I guess anything that is openable and closeable is good. This particular kind of skirt, if it's not knit, it doesn't have any give at all. Things that are a little more flexible are actually better..." When asked what kind of garment she would like to own for actively commuting to work participant four explained, "If I could find a really light weight marino wool dress, like a knit for summer." The fiber and structure of the garment was addressed throughout all of the interviews. The weight of the fabric was also mentioned as a consideration that depended on the season of year. The structure was referenced in regards to their ability to have the desired range of motion required to perform walk/biking and work related tasks.

Color.

The color of the garments was an issue that involved not only aesthetics, but also safety concerns during the commute and the season. Fabric color was an element that was related to garment function, market availability, and professional dress expectations. When asked specifics about their desired clothing and what they were wearing during their day, participant three stated, "…not too much color, because when I go to work I

want to be professional." Participant six stated, "When I first started working I was trying to be more professional looking and that led me to fewer, more achromatic color schemes. Now I'm trying to bring color back..." When asked to elaborate on the clothing worn to satisfy the requirements for both activities participant five explained:

> *I would usually prefer something a little bit more neutral or subdued and I think that's hard to find for workout clothes at least for the most part. I've got some that are bright stripes. I mean they're made to be visible which makes sense but then I feel a little out of place when I wear that. I have a bright, red Lulu pullover with reflectors on it that I feel a little out of place wearing to work.*

The participants addressed preferences, seasonal differences as well as the functional reasons behind their color choices in garments. Participant four stated, "…top colors don't matter, but I wouldn't want black for summer… for things on the bottom it is better to be darker, because if you get chain grease on them it wouldn't be as noticeable."

When asked to elaborate on how color plays a role in getting sweaty, or dirty from the commute participant two explained:

> *I tend to like a lot of color, if it's raining. My current rain jacket's a really bright color. It's not a reflective jacket…Black tends to work well though because it doesn't show when you're sweaty. Heather gray tends to show everything so I tend to avoid that color. ... mid tone colors tend to show sweat a lot more so I opt to wear either a brighter color or a darker color. Sometimes it is visible and that's where I would generally wear darker colored pants because then it's not noticeable at all; whereas if you're wearing, like I would never wear khaki pants because that would be so noticeable or gray pants would be super noticeable. There's a reason in think that bike shorts are generally black.*

When asked to explain the balance between wearing bright colors for safety and their work wardrobe participant five answered, "…all my biking clothes are very, either bright-colored or have reflectors on them…When teaching I need to be a little bit more professional and I would be not be comfortable wearing this type of active wear…"

Overall the fabric fiber, structure, and color were addressed as important design elements to consider for professional active women's commuter apparel. The participants referred to these variables in relation to safety, function, and aesthetics.

Fit.

The interviews revealed fit was an important issue for both active commuting and dress code concerns. The participants interviewed correlated fit to comfort, safety, and function. These participants explained that range of motion was attributed to fit in order to perform tasks efficiently and safely. They explained that if the fit restricted the dynamic movements, it was considered physically uncomfortable. When wearing clothing that restricted movement, a participant expressed that time and performance became an undesirable issue. For instance participant six explained:

> *…skirts that restrict the distance of my stride. That makes me a lot slower and usually I don't leave in quite enough time. I really like pencil skirts for example. If I'm going to wear one when I come here I have to leave five extra minutes.*

In addition, there were psychological comfort issues if they felt the garment was not the right fit to be appropriate and modest at the work place. The wearer often changed clothing at work due to their need to balance function while commuting and appropriateness in a professional work setting. For instance participant three explained the correlation of fabric and fit by stating: "Fit matters! High tech stretch fabric, nothing puffy, but just for biking, I would not feel comfortable wearing stretch in the office." When asked to further explain the requirements for biking and work apparel, participant five spoke about not wanting to wear tight fitting clothing to work and explained, "I would not feel comfortable while I'm biking wearing anything loose-fitting…but I would

not be comfortable wearing tights to work. I definitely wear fitness clothes to bike." This illustrates a conflicting circumstance between the apparel choices between the two activities.

When asked how clothing fit affects movement during their commute, participant four stated, "I don't like clothing that is restricting." A garment's fit can greatly impact mobility, so when asked to further explain fit and movement participant three explained, "I don't move upper body a lot, but I wear stretch skirts, woven and knits to accommodate for lower body movement." Participant two explained:

> *I think it depends a lot, the type of bikes I ride are like semi upright. I'm not like hunched over the handlebars like on a super-fast road bike, so I don't need to have quite the range of motion on top. Although, I do need to be able to bring my arms forward comfortably … I also have a problem with clothing where I think it cuts off my circulation in the front of my arms, like in front of my sleeves*.

The hemline of skirts and pants were addressed as a functional issue and major consideration for both activities. Participant four explained:

> *If I were to design a biking dress it would have an adjustable length. I tend to prefer skirts that hit right above my knees…sometimes you want it to be a little bit higher but not too high….*

Another participant stated that biking was very physical and that she needs to have full range of motion on the top and lower body extremities. When asked to further explain the preferred garment design details and fit participant two stated:

> *The thing is like if your yoke fits just too rigid you can't bring your arms across. A lot of times jackets like wool blazers don't always have the range of motion that you need and across the back so it kind of pulls. It's nice to have things that have gussets in underarms…*

When participant five was asked about what preferred design features she stated, "...the bike pants, they're maybe three-quarters length, or like knee-length

and so they're just tighter for movement." Further, participant two explained:

> *Little cap sleeves are really hard to wear because they tend to dig right into the top of your arms, so something with a more full sleeve or like a little bit of gathers so that it has a little bit more fullness is helpful. It doesn't have to be full. It just has to not be that like; you know those caps that kind of just come from or opposed to the other side? Those are really not comfortable. A lot of women's shirts and dresses have those. I don't find them comfortable at any time particularly when I'm biking.*

The fit and function of the garment can also be affected by body type. The fit of the garment affects both physical and psychological comfort. Participant two explains:

> *I prefer pants that are higher in the back. It doesn't have to be like high waist pants, but that's really a personal thing because like pants fit everyone so different. Pants on me that the rise is too low are totally comfortable on someone who has a less curvy rear-end*.

Also, fit coincides with the wearer's appearance and self-evaluation. For instance, participant three states, "I want to look slimmer, I do not want to look big, but also looking professional is important." In addition to work functions, this concept can affect performance while commuting. Participant five states, "I don't like to have loose, baggy layers when I'm riding because they flap in the wind and that's kind of distracting."

The durability of the garment was stated to be another important aspect of the active commuter clothing design. Participant four exclaimed, "The clothing needs to hold up well, durability is important" Participant two stated, "You want clothing that is made really well, like with reinforced seams." While, participant five elaborated:

> *If I wear it a lot and I'm sweating in it, they wear out faster than if I'm just wearing it in that comfortable office environment, a little bit more heavy-duty or better made I think. I don't know too much about apparel to say but just something that's crafted well so that it's again fitted but like need to move and stretch a little bit if I'm moving since I move my arms a lot too when I'm biking.*

Overall, all six participants explained that fit was important to the mobility

and function of an active commuter's garment. The fit plays a significant role in the appropriateness of a garment for biking as well as the business casual dress code at the work place. In regards to an inquiry about the design of a garment for work, participant three simply said, "…it needs to be professional. I choose clothing based on work place situations and expectations." When asked about what clothing she wore biking and at work participant three explained, "For biking it needs to be modest and comfortable to move, I wear leggings when biking under my skirt." She explained how she did not want to change all of her clothing at the office and prefers minimal changing, if any. Also participant three stated, "I don't want to look silly, I want to wear something appropriate…I cannot teach in sporty clothing." She spoke about her need to wear protective clothing while commuting, but there are conflicts since this type of garment does not match the rest of the office appropriate outfits. Participant four explained the issue of walking through the door at work by stating, "I am more worried about what I look like when I get to work then when I am biking."

Design details are important for an active commute and being compliant with business causal dress expectation. Participant six stated how she tried to dress for work and commuting by explaining:

> *I generally do not wear super low necklines. I wear them but I usually feel a little self-conscious. It depends on where I'm going and what type of day it is. A lot of times I'll throw a scarf on over it and then it's not a big deal. Usually something stretchy tends to be more comfortable, but I have biceps shirts that as long as they have enough room in the back to like bend over your handlebars they're fine too. I'm usually not wearing something to flowy because it's all over and it gets caught in the bike and I get bike grease on it. It starts flying in the wind...*

When asked to further explain what work attire was appropriate she stated, “I do not like showing certain parts of your upper body, I am more modest on the upper body.” Participant five stated:

> *I would definitely not feel comfortable wearing yoga pants in the work environment, so that’s not okay. I would definitely bring something else to work and change…There’s certainly that fear that I would probably need to bring, a change of clothes…*

While interviewing, all six participants thought modesty was an issue that needed to be addressed in clothing design for professional active commuters. Participant one explained, “Modesty is a big thing that I noticed in this town. I spent time on the Greenway, sometimes people see me biking in a skirt and they’ll be like, Oh my… sometimes people are going to whistle or whatever.” When asked how she addressed this issue she stated:

> *I have some really nice cotton V-necks that I used to wear a lot but I don’t so much anymore because it depends on what bike I’m riding. If I’m on my road bike and I’m at a relatively steep angle I don’t want my V-neck to be giving anyone a free show, I guess. But I guess I have changed that, though, by also wearing a tank top or something underneath so I guess including a layer or bringing that t-shirt with me to work instead. Some necklines you would avoid…I’m not going to hike up my skirt. There are certain ways to ride in a skirt, people are still going to heckle because they’re gross sometimes, but again if it’s a 90 degree day I’m probably going to be wearing something I can get a breeze, because it’s hot, working up a sweat commuting to work.*

When other participants spoke about the clothing they choose to wear, they continually addressed modesty issues. Participant four stated, “I don’t want the world to be able to look down my shirt… I would want to wear a scoop neck because you’re bending over… and I wear bike shorts under skirt, because I feel more comfortable.” In regards to modesty issues participant five stated:

> *…not having something that's too open at the neckline that you can see down as I'm biking or no skirts. I don't think I'd be comfortable wearing a skirt when I'm biking either. That's something that I would consider if I will get glance or something so it has do with mental comfort.*

The silhouette and fabric were important elements of modesty and safety for participant four, she explained:

> *I would want to wear something that is not see through, something appropriate…as for modesty, I wear bike shorts with a skirt and then I change when I get to work…As for skirt length…a little above the knee, so it doesn't show everything, or get caught. I have had fabric get caught in the chain.*

The participants were concerned with wearing appropriate clothing for active commuting, but at the same time they were also concerned with wearing appropriate workplace attire. They expressed a need for garments that would function and be appropriate in regards to modesty for both situations.

Aesthetics.

The aesthetics of a garment was also an important element in garment selection, as was self-expression. For instance, participant six explains:

> *One of the things that I think that differs from drivers to active commuters is your car is an expression of your personal taste and all of the things you carry... When you don't have a car all of that gets compressed onto yourself. All the function and self-expression have to be redistributed about your body…*

This example illustrated how what you wear while biking and/or walking created an aesthetic message for the viewer and collective peer group and establishes self-identity.

When asked how a garment would need to perform to take them through their active commute as well as throughout their workday, overwhelmingly the participants mentioned how aesthetics and function were important and affected comfort both physically and psychologically. As participant three explained, "…my number one

concern is aesthetics. …aesthetics comfort is important!" However, participants felt that they had to often trade their desired aesthetic for function. The participants spoke of a desire for more functional active commuter apparel that also would meet the requirements of their business casual dress work expectations. When asked about how she decided what to wear and what information she had available to help her make her decisions, participant five explained:

> *I learned a lot of the tips about where to get things and what types of materials are good and what types are not good, but they have nothing to do with aesthetic, fashion and or my personal taste preferences in terms of how things look. It's all about functionality*.

Most participants expressed that they felt they had to sacrifice a more sophisticated business casual style for function in order to be meet the physical requirements of active commuting. For instance, participant two explained her ideal professional active commuter apparel would involve:

> *It has to have the range of motion without looking athletic and that's what I feel like is lacking in women's clothing. Is that you often have to compromise on the function to get the aesthetic. Then, I just feel like why can't more attention be paid to both of those things?*

The participants expressed a desired to have more clothing options that would meet the requirements for both active commuting and work apparel. For example, participant six stated, "I wish I had a dressier solution." All of the participants with the exception of one spoke of wanting a functional garment that did not have a traditional sporty aesthetic. For instance, participant four stated, "I want things that function… something that is sporty, but doesn't look sporty…I don't want it to look like I am wearing a cycling dress…I want it to look like a normal dress, but it's made for cycling."

When asked about the requirements of an outfit that would meet women's professional active commuting apparel needs participant two stated:

> *…it needs to be durable and wicking, but not look like you're going to go climb a mountain in them. That's what's hard to find is like pants that are that in-between because if you wear really nice work pants they can get ruined on a bike. When it comes to work pants the legs are so wide that they're going to get caught in your gears.*

These participants felt there was a void in the market that met the requirements for both activities involved in professional women active commuting.

Many participants felt that if they needed to dress up for a meeting or special work event, they would seek an alternative mode of transportation, or pack additional clothing and change after arriving at work. For example, participant three explained, "I change clothing if I want to wear something more formal, but usually if I want to wear something formal, I will drive my car, or take the bus." Many participants felt there was an issue of arriving to work sweaty. They felt they were presenting themselves in an unprofessional manner when walking through the doors of the work place in sporty clothing. When talking about her favorite biking pants and why she wore them so often, participant four explained, "No one can tell they are biking pants." All six participants expressed this as an obstacle and sought out various alternative solutions at times in order to feel comfortable and appropriately presentable at the work place.

The style of the desired garments as well as what they currently wore was another topic that the participants discussed in detail. When asked about style and design preference for active commuting to work, participant five stated, "If I could have a cardigan or a button-up type jersey that could transition, like a multipurpose cardigan.

Maybe even reversible... if it's the same color inside too so if it's dirty, you turn it inside out…" Participant four addressed this question and stated, "…adjustable necklines, and buttons if you get hot, but it has to easy to use, but looks stylish… It's like dresses that have interesting style lines, looks really professional, and it performs really well on the bike...." When asked about specific style elements that they currently wore participant two explained:

> *My dresses are always like at the knees or above because otherwise they're kind of a pain to bike in. My sense from women that I know that has similar lifestyles have said to me is that they would like more mixing and matching pieces.*

Some of the participants stated they would like more options and more sophisticated styles of clothing. Nonetheless, participant one stated a desire for active commuter clothing to be:

> *…a bit more youthful. It doesn't have to be sexy. I do wear some skirts that are to the knee and I'd say they are a bit more modest but a bit more fun...Wear your little cycling dress that is not like your mom's sundress…*

The participants explained they had a need for versatile clothing that was easy to mix and match and transition from active commuting to the work place.

During the interviews, the participants provided detailed descriptions of garments they wore throughout the workweek. The participants often mentioned garment silhouettes when describing the apparel that they wore for active commuting to work. For example, participant four explained:

> *I love pencil skirts, but you really can't bike in them, so if someone was to invent a pencil skirt with zippers, or something that would be cool, because usually I just change when I get to work if I want to wear a pencil skirt.*

Overall, the participants stated they preferred actively commuting in streamline silhouettes, such as garments that fit close to the body. Participant six described what she would like to see in active commuter apparel designs and stated, "I guess more silhouettes oriented. Emphasizing the female figure, interesting shapes of sleeves and colors, more form conscious design. Like the shape of a hood can have so much character." However, many participants felt that the tight, form-fitting silhouettes worn during their commute conflicted with the business casual dress code. The participants explained how they addressed this issue by packing a change of clothing, or dressing in layers.

Theme: Environment/Occasion.

The study found that the occasion and situation of the activity could influence the apparel requirements of a professional women active commuter. The wearer has to consider the weather conditions in the outside environment as well as the air temperature of the indoor work setting and personal safety. Peers from their personal, professional, and active commuting community were also key factors.

Air Temperature.

When asked how environmental conditions contributed to their active commuting apparel choices the participants responded by providing information on how temperature played a role. At first, an explanation of how they addressed the outside temperature was given. Participant two explained:

> *It depends I used to wear a lot more layers. When it's cold out I wear a lot of layers because the temperature fluctuation is so much more noticeable. In the winter when I'm riding I tend to wear a lot of really thin layers because a lot of times in the morning it's a lot colder than it is at night, so then I can adjust… If*

> *it's really hot and it's a short commute, I'll sometimes change shirts just because I get really warm and I don't want to be wearing like a physically sweat stained shirt when I'm at work.*

All six participants mentioned wearing multiple layers of clothing and choosing certain fabrics to handle the outside and inside temperature fluctuations. Participant two explained:

> *I am going back to wearing wool. I wear that a lot because I feel like temperature wise it's really comfortable in a lot of different environments. My office is super cold so I tend to wear a lot of wool and then layers so that when it warms up I can take one off.*

Participant five addressed this issue by stating:

> *I think of type of material for sweating and heat or whatever the temperature is outside...When I'm heading into work I probably would wear a wool shirt, or I'll just do cotton over a technical layer with warm layers over. When I get to work some days I do take this off because it is a little bit warm and again when I get to work it's a heated environment and it could be warm when you get there….*

When asked if the weather affected the top and bottom choices, participant six explained:

> *…the top is less problematic, except there is the issue of as your walking there is this huge change in temperature. If it's very cold outside, I will bundle up a lot, probably more than people who are driving, like layers and layers and layers, but if I'm in a hurry then by the time I arrive I'm sweaty, which is gross…*

When asked how her apparel changed when the weather was warm outside, participant two stated:

> *Then, I can wear a greater variety of things. A lot of times I'll wear a tank top with a shirt and then I'll…or I'll just wear a tank top while I'm biking and then put on another shirt when I get somewhere. That's kind of to try to stay as cool as possible.*

Some participants stated they drove to work in a vehicle when it rained. However, some participants did not own a vehicle and rode their bike and/or walked to work in every weather condition. When asked how this issue was addressed in their clothing choices participant two stated:

> *I would just put on a raincoat and either wear pants that I could change out of when I get to work, or I have rain pants that I can wear. It gets really hot to wear an entire rain suit while you're riding, particularly in the summer, so usually I'll just wear something that I can change out of or will dry superfast.*

The participants stated that planning ahead and packing extra clothing was sometimes needed to be prepared for the various weather conditions. Participant five explained:

> *I definitely plan for it. In the spring for example, if I have to do something in the morning or teach in the morning, so I'd look at the weather first of all and then if it's going to rain, if I bring my rainproof jacket or windbreaker. I have a ski jacket also and then I make sure if I need to bring that and I always pack everything beforehand too as much as possible, usually like a sweater or something because I get really hot when I bike too, so I dress lightly but then I make sure to bring an extra layer at least…*

The participants also explained how packing a lot of clothing could be a comfort issue. Participant five explained:

> *I pack that when I bike, but then making sure my bag isn't too heavy, too, because that gets really uncomfortable so being able to have to carry as little as possible but still being able to wear what I'm comfortable in biking.*

The participants emphasized that the air temperature was a major consideration and greatly affected their comfort while actively commuting and at the work place. They planned ahead and made adjustments in their clothing to accommodate for environmental conditions.

Safety.

Some women active commuters in the study addressed personal safety as an issue that influenced their clothing choices. Wearing clothing that protected them from falls during accidents, reflective clothing features, as well as harassment issues were concerns that were mentioned during the interview process. The participants mentioned design details that they seek out in clothing to address their personal safety concerns.

One participant explained how she had an accident that affected her both physically and emotionally. Participant three explained, "…one day when I [was] riding [my] bike and my stocking got caught and I fell down, it was an embarrassing experience…physical comfort is important, you can fall down and it can be a safety issue." She went on to explain that she tried to make clothing choices that would reduce the risk of accident. She chose to not wear anything that would snag or get caught in the bike chain. She also mentioned another situation when her bike slipped on ice and she desired elements in her clothing that would protect her from being hurt during a fall. She stated, "I need clothing that will allow full range of motion. Also, I don't want to ruin my clothing if I fall. Maybe a detachable pad in the knee in case of a biking accident." In addition to having clothing protection from an accident, this participant was also concerned about ruining her clothing in the process. Participant four expressed her accident concerns by stating, "I would just cuff or tie my pants down, but it doesn't work for me, because I still worry about if they are going to get caught, it is just not comfortable!"

In another scenario, participant six talked about how she ripped her pencil skirt and then she continued to elaborate on the importance of her clothing allowing for full range of motion. She explained after that experience, "I think it was extreme and that made me be a little more willing to plan my wardrobe around my habits."

Some participants mentioned the issue of being harassed by on lookers and they had concern about how their wardrobe choices might encourage unsolicited comments. Participant six stated, "I would like to bike more but I'm a little bit afraid of most of the

routes that I would take to various places. These routes would be more dangerous than I'm comfortable biking." Participant four addressed this issue by stating, "I wear dresses with leggings underneath or I'll wear just like really short shorts underneath so I'm not flashing anyone while I'm riding." Participant two further explained:

> *It's not very comfortable to not wear shorts under a dress because it tends to chafe like between your thighs, but it's also a modesty thing because if the wind blows up and you're showing everybody your underwear while you're riding.*

All six participants mentioned safety concerns involved with the occasion of the activity and environmental conditions. They also offered ways to address these concerns through the garments they chose to wear for active commuting.

Peers.

The participants were asked how the active commuting community contributed to their active commuting apparel choices. Some participants explained the work dress code expectations, while other addressed fellow active commuters, and personal friend influences.

During the interviews many participants explained how their peers affected their dress choices. Many mentioned that they have a desire to minimize the reaction of their co-workers when arriving into the office after active commuting. Participant six addressed the question by stating:

> *I think it makes me self-conscious, but I haven't thought of a good solution for that yet. Then I feel like I always have to explain myself. People will be like; "Oh you're so out of breath." Then I try to justify my appearance.*

Participant two also described the issue as an uncomfortable situation. She stated:

> *Then, it's like you're like this weird topic of conversation at work. Everyone thinks you're a nut job because you ride a bike in the winter. Some people get*

> *really like wound up about commuters and then you feel kind of like it can politicize things a little bit. If you show up in bike stuff sometimes they're like, "Oh, you're a biker, so you probably think I'm a jerk because I drive a car." Even though I don't, sometimes I encounter that. Yeah, it's like it makes them feel guilty and then they get defensive about it even though it's like I'm just riding a bike. I just like to ride my bike. I'm not judging you for not riding your bike.*

Participant three explained how she was more concerned with how her personal friend group viewed her while wearing clothing that was designed for biking. She felt that there was an expectation in the biking community to dress ultra-sporty, however that did not coincide with her friend peer group dress expectations. She explained, "…with the biking community I feel pressure to have and wear biking clothing, but I think the style is too much." She explained how the sporty apparel was too over the top for her and desired more professional style work clothing. She also explained how she feared what her friends would think of her wearing clothing that met the biking communities' expectation. Her peer influence involved the opinion of her friends, not the biking community's expectations. She stated, "I worry about what my friends are going to think, because they do not bike." She explained how she wanted to wear clothing that was not specific to biking, but functioned like biking apparel.

In contrast, other participants' personal friends group also involved active commuters. These participants felt they wanted to present themselves in a way that reflected their peers' dress and value system. Participant two explained:

> *We all tend to dress kind of similar. The bike culture, if you pay attention to commuters in particular, they tend to have an aesthetic. They don't really dress different, but there's definitely a look like the rolled up pants or skinny jeans, button down shirts. It's pretty cohesive even though nobody would probably say it…I would almost feel weird not to ride my bike somewhere because I would feel like pressured that I was not living up to my expectations or something.*

When asked to elaborate on her friends influence participant two stated:

> *My friends and I talk about it…bike clothing is probably like on the top of things that we talk about in a consistent manner…We have a lot of conversations like this brand of pants works really well because the back rise is higher, or these shirts are really comfortable to bike in because they dry really fast and they don't show sweat stains. We'll talk about something like that all the time, or like we all tend to spread the word of wool and how amazing it is and how super comfortable to wear…*

Every participant in this study mentioned a peer influence, whether it was through direct conversations, or indirect aesthetic responses. Therefore, the individual's peer aesthetic responses to their dress played a significant role in their clothing choices.

CHAPTER V

Discussion

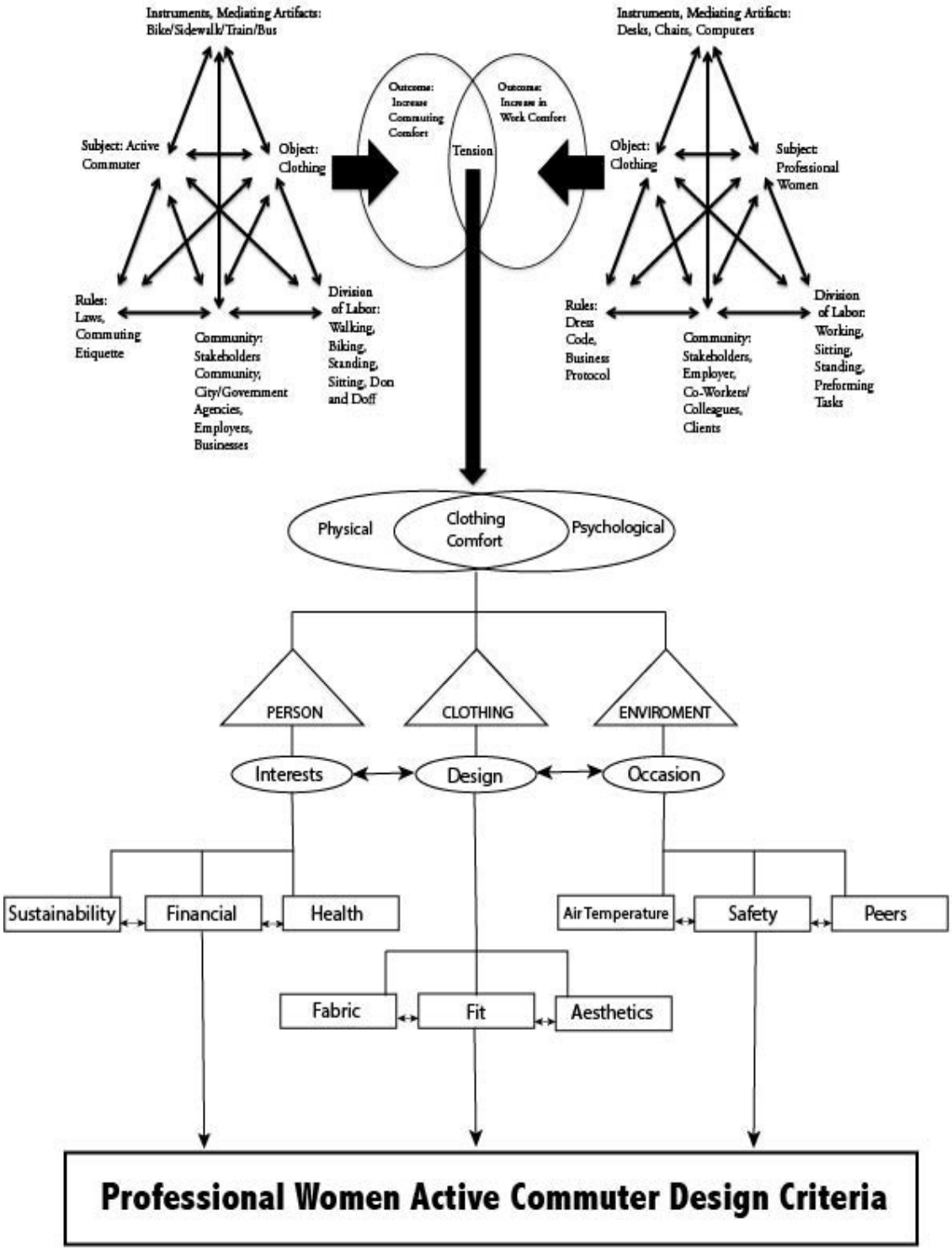
Analysis

The clothing comfort model (Branson & Sweeney, 1991) and activity theory were used as guides to develop the professional women's active commuter apparel design criteria. The resulting framework (see Figure 4, p. 60) illustrates the relationships involved in professional women working at a business casual setting as well as the active commuting activity.

The relationships illustrated between the two activities are all encompassing. The framework (see Figure 4, p. 60) depicts the interactions that are involved with the subject (professional women active commuter), the object (clothing), the instruments and mediating artifacts, rules, community, and division of labor. The variables involved in the two activities come together and create a tension. This tension represents the conflict involved in defining the design criteria that will guide the design of professional women's active commuter apparel. The apparel designs for this market must meet the needs of both active commuting and the professional work environment in order to reduce or remove the tension.

This study revealed that clothing comfort, both physical and psychological, was an important element in the design criteria for this market. The design criteria developed from the tension was guided by the attributes listed in Branson and Sweeney's (1991) clothing comfort model, relationships illustrated in the activity theory, as well as the themes revealed through the interviews of professional women active commuters.

Figure 4. Professional Women Active Commuters Design Criteria Framework



The two activities create a need for clothing that is comfortable for the participants to wear throughout the day. The activities require the garments to function and be business casual dress appropriate. The themes are personal interests, clothing design, and environment/occasion. These themes involve interrelated relationships, and are further divided into specific sub-categories that inform the professional women's active commuter design criteria.

Professional Women Active Commuter Design Criteria

The interviews reveal that sustainability, finances, and health were interests that motivated the women to actively commute to work. As the activity theory states, "A motive is an object that meets a certain need of the subject" (Kaptelinin & Nardi, 2012, p. 25). These motives create a need for the subject (professional women active commuters). The need is fulfilled by an object, which in this case is clothing. The motives set the requirements for the object (clothing) and seek a solution to fulfil the need of the subject (professional women active commuters). Therefore, the personal interests reflect the motivations and influence the design criteria.

Person Interests.

Within the theme of person interests there are subcategories of sustainability, financial, and health. These interests are found to influence the professional women active commuter's choices in apparel. The design criteria that address these subcategories are as follows:

Sustainability.

- Respect Sustainability Practices and Fair Trade

A designer should consider fabric that utilizes sustainable methods of manufacturing. The fabric should be able to maintain its shape and integrity by withstanding multiple washings. Also, the fabric should be durable and be able to withstand the impact of vigorous movement. Reinforced seaming, garment quality, and ethical manufacturing practices are valued apparel requirements for professional women active commuters.

Financial.

- Value: Cost-Performance Ratio

Financial responsibility is important to this consumer market. This is a fiscally responsible and savvy consumer; therefore the price point should reflect the products performance level. The garments should be made with quality fabric and construction techniques that allow for long wear in extreme weather conditions and rigorous physical movement. However, this price conscious consumer seeks value in clothing and at times targets lower price point clothing options when performance is not as much of an issue. They are more likely to spend more money on bottoms than tops. In regards to their work attire, this market is cautious and does not wear expensive dress clothing that has the potential to be ruined during their active commute.

Health.

- Support Optimal Health

This consumer market values the health benefits that coincide with active commuting. The importance of the wearer's health transposes onto their garments' ability to promote physical movements. The active commuter garments must effortlessly move

with the body, because constraints will negatively impact the physical and psychological health of the wearer. A designer should consider utilizing fabric that does not harm the wearer's skin and overall health. The garment construction, sizing, and measurements at: the sleeves, armscye, across back, rise, and hem lengths should be considered to promote wearer health. Further, in the case of a commuting accident, clothing that offers the body protection from impact will be beneficial to the wearer.

Clothing Design.

The clothing design theme provides requirements for the subjects (professional women active commuters) object (clothing). The study reveals that fabric, fit, and aesthetics are important variables in professional women active commuter apparel design criteria, and address the subject's physical and psychological clothing comfort.

Fabric.

Fabric should have most or all of the following: antimicrobial, wicking, breathability, softness, durability, stain resistance/hides soil, wrinkle resistance, stretch, proper weight, and ease of care/wash. The fabric of the professional women active commuter apparel also includes consideration for the fabric fiber, structure, and color choices to meet the two activities requirements. This study found that desirable fabric properties to include:

- Antimicrobial

This market has a high level of physical activity. Therefore, a garment constructed out of an antimicrobial textile will be beneficial for the overall health and well-being of the individual. In addition, a textile that has antimicrobial properties helps inhibit odor

from bacteria and fungus. Antimicrobial fibers and fabric treatments promote the wearers physical and psychological comfort during active commuting as well as meeting employment business casual dress code requirements.

- Wicking

Since this market is performing rigorous activity, a fabric that helps move the moisture away from the body will help the wearer's physical comfort. It is important for professional women to be in compliance with dress code at work and wicking fabric will help reduce the appearance of perspiration on the garment.

- Breathability

Thermal regulation is important to the physical and psychological comfort of the wearer. Their comfort level will be enhanced by utilizing breathable fabrics. Fabrics that allow for high moisture vapor transmission will be important to keep the wearer comfortable and dry.

- Softness

The fabric texture is another important consideration in this apparel market. The fabric should feel soft against the body, with no itchy, protruding, or scratchy elements that irritate the skin.

- Durability

Due to the wearers activity level sweating occurs and the body extremities can rub together, which creates friction. The durability of the fabric is important in maintaining the integrity of the garment and meeting professional women's active commuter apparel requirements. Also, due to perspiration there is a need to frequently launder the garments.

Active commuting places demands and strain on a garment, increasing the need for durable fabric. Further, the wearer could also encounter an accident during their commute that may jeopardize the integrity of the fabric.

- Stain Resistance/Hides Soil

To meet the needs of this markets' work dress codes and activity, the fiber and fabric structure, or surface color/pattern of the garment should either hide soil and/or possess stain resistant properties.

- Wrinkle Resistance

These activities require movements that may cause fabric wrinkles. In order to meet work dress code, a wrinkle resistant fabric would be ideal. In addition, this market dresses in layers and packs clothing into a bag. Therefore, the packablity and ability to have wrinkle free garments is important to meet this consumer demands.

- Stretch

Due to the amount of body movement required in active commuting, fabric that allows for full range of motion is important. A stretch fabric that allows for maximum mobility will enhance the wearer's physical and psychological comfort.

- Weight

The season of the year, air temperature, and packability are considerations when determining the appropriate fabric weight. A lightweight fabric may be appropriate for the summer months, while a heavy weight may be better suited for the winter months. However, the air temperature in the office needs to be considered and may require the consumer to dress in layers and/or pack additional garments. The weight of the garment

that is packed into a bag and carried during the commute needs to be considered for wearer comfort and safety.

- Ease of Care/Wash

These activities produce perspiration and require the consumer to wash the garments regularly. This consumer is a busy working professional, so time and financial constraint are important to consider. A garment that is constructed out of a fabric that is easy to wash and does not require dry cleaning would be beneficial. Also, due to the need of frequent washing, a colorfast fabric is needed to meet the apparel requirements.

Color.

- Color Supports Active Commuting/Work Place Dress Codes

The color of the fabric is important to professional women active commuter. They like various bright colors for active commuting, but desire a neutral color palette for the workplace. The color of the garment should be carefully considered when designing for the season. For instance, dark colors may retain heat; hence provide discomfort for the wearer in warmer weather conditions. However, lighter color fabric may show perspiration and stains from bike grease. Color placement to reduce stain visibility, support thermal comfort, and enhance slimming effects are a consideration in this market. Strategically incorporating small amounts of color on a neutral base may provide a solution. In addition, the fabric should be opaquee in order to achieve modesty requirements.

Fit.

The fit of the garment is important for maximum performance, comfort, and appropriateness for professional women's active commuter apparel. The garment needs to allow the wearer to perform the activities without constraint and meet both physical and psychological requirements. The garment fit should be modest and appropriate for personal safety and business casual dress codes.

- Range of motion

The garment designs need to allow for maximum mobility. The silhouettes should not restrict movement while performing physical activity and work related tasks. The garments need to allow for the lower extremities to be functional during peddling and walking, the upper extremities need to be able to perform active commuting and work related tasks without restriction. The garment design should allow for ease across the back, underarm, sleeve, torso, crotch, and legs.

- Modesty

The silhouette should fit the body to provide personal safety and modesty to the wearer. Considerations in garment design should include appropriate necklines, hem lengths, and the back waistband. The necklines should be fitted to provide coverage and modesty in the chest area. Plunging, low, and revealing necklines should be avoided for modesty, safety, and dress code requirements. The back rise of the pant should provide full coverage in the seat area in order to maintain comfort and modesty.

- Silhouette

The silhouette should be functional during active commuting, while being appropriate for business casual dress code expectations. The garment should be tight and close fitting to the body while biking, yet not too tight for the workplace.

Aesthetics.

The clothing needs to be functional and meet aesthetic expectations for both activities. The aesthetics of the garment provide the wearers with the ability to be self-expressive and communicate their identity through dress.

- Style that is Fashionable, Functional, and Professional

This consumer is fashion conscious and desires a professional, youthful clothing style. A garment that performs like athletic wear, yet appears as sophisciated as professional work attire is desirable for this consumer. This market is physically fit and prefers clothing that has a slimming effect. Flowing and billowing clothing may be appropriate for the workplace, however it is not functional during the commute. This market desires versatile mix and match options in: skirt silhouettes, outer wear, dresses, tops, pants, and sleeve shapes. However, the clothing designs must incorporate range of motion and safety requirements.

Environment/Occasion

The environment was another key factor in the design criteria including occasion of the activities. Air temperature, safety, and peer groups were identified as key influences that affect a person's clothing requirements during professional women active commuting activities.

Air Temperature.

- Supports Thermal Regulation

The air temperature of the outside environment influences the clothing requirements for the active commuting activity, while the inside enviroment influences the clothing requirements for work place activites. This is complicated since there is a desire and need for an individual to transition between the two activies with minium changing and/or packing. The fabric selections should be based on the season of year and air temperature fluctuations between the outdoor and indoor environments. These consumers dress in layers and their clothing includes consideration for color and packability to accommodate for fluctuations in air temperature.

Safety.

- Supports Visibility and Modesty

The personal safety of the wearer must also be considered in development of professional women's active commuter apparel. The study found that the participants desired modest, durable clothing that provided added protection from accidents. Active commuting apparel should provide visibility and operational safety for the wearer. Design elements that offer protection from falls and/or accidents may provide additional safety to this consumer. Garment design considerations for modesty may aid in the safe well-being of the active commuter. Since the wearers dress in layers and experience temperture fluctuations during their commute, incorporating design elements that provide easy donning and doffing will provided safety benefits to this consumer.

Peers.

- Supports Seamless Transition from Commuting into Workplace

The peer group's aesthetic responses influence the clothing choices of professional women active commuters. Meeting the expectations of the business casual dress code is important to maintain positive work relationships. Professional women active commuters desire garments that seamlessly transition into the workplace without attention to their active commuting mode of transportation. However, the active commuter also belongs to a community that communicates their identity, group affiliations, and value system through their clothing choices. Consideration of all the peer groups is essential in meeting the professional women active commuter design criteria requirements.

Overall, the study found that the professional women active commuters were a socially conscious consumer segment. Their clothing choices were influenced by their activities, peer groups, and value system. The design criteria for professional women commuters must encompass the variables illustrated in Chapter V, Figure 4 on page 61. These requirements must be considered harmoniously to achieve physical and psychological comfort through clothing.

CHAPTER VI

Summary, Conclusion, Recommendations

The purpose of this study was to discover professional women's active commuter design criteria. This study investigated the coinciding requirements and relationships involved in the related activities and tasks. Interviews involving six professional women active commuters were used to collect data that informed the apparel design criteria that meets the needs of this consumer. This chapter summarizes the procedures and findings of this study, presents conclusions, and makes recommendations for future research.

Summary

The interview process was used to examine the needs and values of professional women active commuters. This information was used to establish the apparel design criteria for this consumer market. A review of literature, Branson and Sweeney's (1991) clothing comfort model, and activity theory were utilized to focus the objectives of this study and develop the questionnaire. The participants were asked five open-ended questions (see Appendix A for questionnaire). The interview data were analyzed and themes emerged. The themes guided the development of the design criteria for professional women's active commuter apparel.

Participants of this study were six women who biked and/or walked to and from a professional place of business within the Minneapolis, Minnesota metropolitan area. The dress code expectation of their place of employment was business casual attire. The participants actively commuted throughout the four seasons and lived in the Minneapolis, Minnesota area. Two of the participants did not own a car and used active commuting as

their sole mode of transportation to and from work. The other four participants owned a vehicle and stated that in certain situations, such as weather events and special occasions, they would sometimes drive a vehicle, or take the bus or train, but the majority of the time they actively commuted to and from work.

The study had six objectives. The first objective was to understand the relationships involved in active commuting and working at a professional place of employment with a business casual dress code. Activity theory provided a framework (see Figure 3 for relationship details) for understanding how the instruments/mediating artifacts, rules, community and division of labor interacted with the subject (professional women active commuter) and object (clothing). The goal was to understand these relationships and develop the design criteria for this market. This information could be used to guide the design of garments and provide a comfortable way for women to participant in these activities. The object (clothing) was established as means to increase comfort and increase the frequency of active commuting.

The second objective was to understand the participant's motivations for active commuting. The study found that sustainability, financial, and health interests were motivations for active commuting. By understanding the importance of their motivations, the study revealed a value system that informs the design criteria.

The third objective was to examine the clothing design requirements for this market. Fabric, fit, and aesthetics were found to be important design attributes to consider. In regards to fabric, the fiber, structure, and color were found to be essential characteristics. The fit of the garment was another significant consideration. The

participants shared that the fit affected comfort, mobility, function, and range of motion. In addition, the fit needed to be appropriate to meet business casual dress expectations. It was important to the participants that the aesthetics of the clothing invoked a positive response, while maintaining appropriateness and style.

The fourth objective was to understand how the active commuting community and environmental conditions contributed to these women's apparel choices. The study found that the air temperature, safety, and peer group all influenced the apparel choices of professional women active commuters. The participants stated that wearing garments with thermal properties, layering, and packing additional clothing to change at work were ways that addressed air temperature fluctuations. In regards to safety, wearing clothing with good visibility that was durable and incorporating design features to support modesty were desired to reduce the risk of harm to the participants. The participants explained how meeting the expectations of their peers influenced their clothing choices. They desired a solution that would allow them to function during active commuting, while presenting themselves at work in a dress code compliant fashion. They expressed a desire for a solution that would draw less attention to them while transitioning into the work place.

The fifth objective was to investigate what design and performance elements would be needed in their wardrobe to take them throughout their active commute as well as throughout the workday. The professional women active commuter design criteria framework (see Figure 4, p. 60) illustrates the complex relationships that need to be

considered to design clothing for this market. The relationships depicted in this framework (see Figure 4, p. 60) illustrate the clothing design criteria for this market.

The sixth objective was to understand how comfort plays a role in active commuting and working in a professional work environment. The study revealed that both physical and psychological comfort was extremely important to the participants of these activities. The participants valued comfort and explained it was a key way for them to evaluate the functionality and wearability of a garment. They felt that their garments must be comfortable and functional, or they would find a different mode of transportation to work.

Conclusion

The results of this study provide guidelines and important considerations for apparel companies that create clothing for this market. This knowledge can be applied to the stages of product development from concept to point of sale. An accurate account of the data and findings was achieved through a rigorous research process.

The discoveries found in this study can be applied to create garments that will seamlessly, comfortably, and appropriately transition from one activity to another. By maximizing the wearer's ability to transform between activities, they are empowered. When the wearers are provided with clothing that meets their multiple activity requirements, then they are able to concentrate on maximizing their personal performance potential. The resulting clothing designs will provide an opportunity for the wearers to focus more on personal development and less on finding ways to overcome restrictions and clothing obstacles.

Designed objects (clothing) tells a story. A sucessful design will communicate and reflect the wearers' values and identity. Utilizing the design critria for professional women active commuters requires a human centered design appraoch. This approach involves careful considerations and understanding of the users needs, wants, and limiations. These apparel designs should allow the the wearers to experience a seamless transformation between activities. The tension resulting from confliciting activities should release and produce a harmounous relationship between the wearers and their clothing. The object (clothing) should allow the wearers to feel beautiful (positive aesthetic response), while seamlessly transitioning from one activitiy to the next. This transformation will provide the wearers with the confidence to focus on tasks other than their clothing attributes.

The study found the requirements involving person interests, clothing design, and environment/occasion for two opposing activities. The tension formed from the two opposing activities creates the need for a multi-functional object (clothing) that would allow for a seamless transition between activities. The apparel design criteria found in this study needs to be addressed in order to make the seamless transition between professional women active commuter activities.

The main purpose of this study was to discover the design criteria for professional women's active commuter apparel. Physical and psychological comforts were found as the most important factors in meeting this consumer's apparel needs. Activity theory was instrumental in examining the relationships of the two activities. This theory was used as a guide to understand how motivations produce designed objects to fulfill a need.

Activity theory offered insight into key relationships that affected clothing comfort in both active commuting and working in a professional place of employment. The clothing comfort model (Branson & Sweeney, 1991) was useful in exploring the clothing attributes that affected comfort in both the physical and psychological dimensions.

The participant's motivations reflected their personal interests. The majority of the participants placed financial benefits and health as their main reasons for active commuting. Sustainability was also stated as a valued interest. The value placed on sustainability influenced some of the participants' fabric and garment choices. The participants' motivations influenced their decision to partake in active commuting. Active commuting takes place in the outdoor environment, while their employment is indoors. Active commuting and employment was the occasion. The participants' personal interest and environment/occasion established the clothing requirements. Therefore, this provided an all-encompassing framework (see Figure 4, p. 60) of the requirements and relationships that established the professional women active commuter design criteria.

The participants placed high value on functionality and aesthetically pleasing active commuting apparel. However, they felt they had to trade off function in order to wear professional, stylish, and aesthetically pleasing garments. In order to achieve the desired aesthetic response, the participants felt they either had to utilize an alternative mode of transportation, modify their dress expectations, spend time planning ahead, and/or pack additional clothing to change at work. All the participants stated that they sought ways to minimize the need to change or shower at the work place. At times some participants would either push the boundaries of the dress code, or sacrifice safety, and/or

function during their commute. Others found ways to compromise and choose clothing that would accommodate both activities.

The environment produced a need for the participants to accommodate for thermal regulation in their clothing. Safety was also an important issue for the participants. However, the issue of safety provided another conflict for some participants. They explained that most biking apparel looked too sporty with bright colors and reflective elements that they felt were not appropriate for the work place. They desired durable clothing attributes that possessed feminine qualities and did not appear too rugged and utilitarian. They wanted to have the function of athletic apparel, but desired the look of business casual apparel. This desire presented an unmet need in the market.

In conclusion, clothing provides a way for the wearer to establish identity and self-expression. Clothing also provides protection from the elements and covers the body. The clothing worn by an individual must meet their needs in order to fulfill its purpose. If the garment does not meet the needs of the wearer, the individual will modify their behaviors and/or clothing to meet their requirements. There is an opportunity for clothing design firms to provide the consumer with functional business casual attire for professional women active commuters. In today's culture, there is a rise in the costs involved in commuting to work by car and government agencies are promoting more sustainable modes of transportation. Some businesses are giving health insurance benefits to employees that actively commute. Providing comfortable, functional, and aesthetically pleasing garments could increase the frequency of this sustainable mode of transportation and add financial benefits. Promoting this activity by providing the desired clothing will

contribute positively to the environment, personal health, and provide financial benefits to the individual and the community.

This new knowledge will benefit professional women active commuters and the clothing design industry. Developing a line of apparel that enhances active commuting and professional women's comfort may contribute to the wearer's healthy and lifestyle. This study provides a better understanding of active commuters clothing values and clothing requirements. A long-term measure of active commuter frequency would give further insight into the impact of how clothing affects the community and personal activity. This information will be valuable to active commuters, the community, and the clothing design field.

This study will provide the stakeholders information on the design criteria for active commuting apparel and an understanding of active commuters clothing values and cultural influences. The stakeholders that benefit from this information are clothing designers and clothing manufacturers. The findings from this research provide an understanding of this market's requirements and suggest the design criteria for professional women active commuters.

Recommendations

Future studies are needed to continue to explore the needs of women professional active commuters. The relationships and requirements involved in this market are complicated and multi-faceted. This study provides a basic foundation for the design criteria, however there is a need for more in-depth knowledge within the subcategories of fabric and fit.

Future studies of appropriate fabric characteristics for professional women's active commuter apparel may provide more detailed design criteria. For instance, examining what fiber and fabric structures provides the following properties: antimicrobial, wicking, breathability, softness, durability, stain and wrinkle resistance. This study could look into the different fabric structures that offer the appropriate amount of stretch for movement and modesty, while also maintaining garment shape.

Another study could examine the desired fit of professional women active commuter apparel. This study could provide more specific information on wearer range of motion and mobility requirements. Designs providing modesty could be developed and tested. This research could involve an observational study that tests various prototypes on participants. These prototypes could include a variation of necklines, hem lengths, and adjustable design features.

Since this current study interviewed a small sample of six participants from one geographical region in Minneapolis, Minnesota, additional studies that investigate the apparel needs in various climates, cultures, and a larger, more diverse sample is needed. Personal interviews provided valuable but limited data; therefore, a mixed methods approach incorporating quantitative data with qualitative interviews utilizing a larger participant sample would give a more in depth understanding of this subject.

References

America's top 50 bike-friendly cities. (2012). *Bicycling.* Retrieved from: http://www.bicycling.com/ride-maps/featured-rides/2-minneapolis

Archive for the 'health' category: 30,000 bicyclists, 12 million miles, 1 national triumph. (2012, September 12). Retrieved from: http://blog.bikeleague.org/blog/category/research/health-research

Ashdown, S. P. (2011). Improving body movement comfort in apparel. In G. Song (Ed.), *Improving Comfort in Clothing* (pp. 278-302). Philadelphia, PA: Woodhead Publishing.

Bardsley, C., Fowler, H., Moody, E., Teigen, E., & Sommer, J. (1964). Pressure sores: A regimen for preventing and treating them. *The American Journal of Nursing, 64(*5), 82-84. Retrieved from http://www.jstor.org/pss/3419146

Barker, J., & Black, C. (2009). Ballistic vests for police officers: using clothing comfort theory to analyse personal protective clothing. *International Journal of Fashion Design, Technology and Education*, *2*(2-3), 59-69. doi: 10.1080/17543260903300307

Bartels, V. T. (2011). Improving comfort in sports and leisure wear. In G. Song (Ed.), *Improving Comfort in Clothing* (pp. 385-411). Philadelphia, PA: Woodhead Publishing.

Bhaduri, G., & Ha-Brookshire, J. E. (2011). Do transparent business practices pay? Exploration of transparency and consumer purchase intention, *Clothing & Textiles Research Journal, 29*(2) 135-149. doi: 10.1177/0887302X11407910

Black, C., & Cloud, R. M. (2008). Assessing functional clothing needs of bicycle patrol officers. *International Journal of Fashion Design, Technology and Education, 1*(1), 35–42.

Bopp, M., Kaczynski, A. T., & Wittman, P. (2011). "The relationship of eco-friendly attitudes with walking and biking to work" *Journal of Public Health Management & Practice*, 17(5), E9–E17. doi: 10.1097/PHH.0b013e31821138de

Branson, D. H., & Sweeney, M. (1991). Conceptualization and measurement of clothing comfort: Toward a metatheory. In S. B. Kaiser & M. L. Damhorst (Eds.), *Critical linkages in textiles and clothing subject matter: Theory, method and practice* 94-105. Monument, CO: International Textile and Apparel Association.

Bye, E. & Hakala, L. (2005). Sailing apparel for women: A design development case study. *Clothing and Textiles Research Journal, 23*(1), 45-55.

Chattaraman, V., & Rudd, N. A. (2006). Preferences for aesthetic attributes in clothing as a function of body image, body cathexis and body size. *Clothing and Textiles Research Journal*, *24*(1), 46-61. doi: 10.1177/0887302X0602400104

Cheng, K., & Cheung, Y. (1994). Comfort in clothing. *Textiles Asia*, *25*, 48-52.

Creswell, J.W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* (3rd Ed.). Thousand Oaks, CA: Sage Publications, Inc.

Davydov, V. V. (1999). The content and unsolved problems of activity theory. In Y. Engestrom, R. Miettinen, & R. L. Punamaki (Eds.), *Perspectives on activity theory.* Cambridge, United Kingdom: Cambridge University Press.

Eaton, M. M. (1988). *Basic issues in aesthetics.* Belmont, CA: Wadsworth Pub. Co.

Eaton, M. M. (1999). *Basic issues in aesthetics.* Long Grove, IL: Waveland Press, Inc. (Original work published 1988).

Engestrom, Y. (1999). Activity theory and individual and social transformation. In Y. Engestrom, R. Miettinen, & R. L. Punamaki (Eds.), *Perspectives on activity theory.* Cambridge, United Kingdom: Cambridge University Press.

Engestrom, Y., & Miettinen, R. (1999) Perspectives on activity theory. In Y. Engestrom, R. Miettinen, & R. L. Punamaki (Eds.), *Perspectives on activity theory.* Cambridge, United Kingdom: Cambridge University Press.

Fourt, L., & Hollies, N.R.S. (1970). *Clothing: Comfort and function*. New York: Marcel Dekker.

Guetzkow, H. (1950). Unitizing and categorizing problems in coding qualitative data. *Journal of Clinical Psychology*, *6*, 47-58.

Hatch, K.L., Markee, N.L., & Maibach, H.I. (1992). Skin Response To Fabric. Review of Studies and Assessment Methods. *Clothing and Textiles Research Journal, 10*(4) 54-6. doi:10.1177/0887302x9201000409

Hollies, N. R. S., Custer, A. G., Morin, C. J., & Howard, M. E. (1979). A Human Perception Analysis Approach to Clothing Comfort. *Textile Research Journal, 49*(10), 557-564. doi: 10.1177/00405175790490100

Ho, C. P., Fan J., Newton, E., & Au R. (2011). Improving thermal comfort in apparel. In G. Song (Ed.), *Improving Comfort in Clothing* (pp. 165-181). Philadelphia, PA: Woodhead Publishing.

Horridge, P. E., Caddel, D. K., & Simonton, J. L. (2002). Texas trooper uniforms: Assessment of fabrics, comfort, and wear. *Family and Consumer Sciences Research Journal, 30*(3), 350-381. doi:10.1177/1077727X02030003002

Hosseini Ravandi, S. A., & Valizadeh, M. (2011). Properties of fibers and fabrics that contribute to human comfort. In G. Song (Ed.), *Improving Comfort in Clothing* (pp. 61-78). Philadelphia, PA: Woodhead Publishing.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environment . *Educational Technology, Research and Development*, 47(1). 61-79.

Kaptelinin, V., & Nardi, B. (2012). Activity Theory in HCI: Fundamentals and Reflections. In J.M Carroll (Ed.), *Synthesis Lectures on Human-Centered Informatics* (pp.1-129). San Rafael, CA: Morgan & Claypool. Online publication date: April, 2012. doi:10.2200/S00413ED1V01Y201203HCI013

Merom, D., Miller, Y. D., van der Ploeg, H. P., & Bauman, A. (2008). Predictors of initiating and maintaining active commuting to work using transport and public health perspectives in Australia. *Preventive Medicine, 3*(47). 342-346. doi:10.1016/j.ypmed.2008.03.014

Morris, M.A., Prato, H.H., White, N.L. (1984). Relationship of fiber content and fabric properties to comfort of socks. *Clothing and Textiles Research Journal,* 3, 14-19. doi:10.1177/0887302x8400300103

Mutrie, N., Carney, C., Blamey, A., Crawford, F., Aitchison, T., & Whitelaw, A. (2002). "Walk in to work out": a randomized controlled trial of a self help intervention to promote active commuting. *J Epidemiol Community Health*, *56*. 407–412. doi:10.1136/jech.56.6.407

Pontrelli, G.J. (1977). Partial analysis of comfort's gestalt. In N.R.S. Hollies & R.F. Goldman (Eds.), *Clothing comfort*. (p. 71-80). Ann Arbor, MI: Ann Arbor Science

Randolph, S. J., & Langford, A. L. (2002). *Textiles.* (9th ed.). Upper Saddle River, NJ: Prentice Hall.

Rengasamy, R. S. (2011). Improving moisture management in apparel. In G. Song (Ed.), *Improving Comfort in Clothing* (pp.182-215). Philadelphia, PA: Woodhead Publishing.

Richards, L. (2009). *Handling qualitative data: A practical guide*. (2nd Ed). London: SAGE Publications.

Rohles, F.H. (1971). Psychological aspects of thermal comfort. *ASHAE Journal*, *13*. 86-90.

Rohles, F.H. (1978). Comfort and the man-environment system. *Proceedings of the clothing and energy resources workshop,* (pp. 22-35). East Lansing: Michigan State University.

Rohles, F.H. (1985). Environmental ergonomics in agricultural systems. *Applied Ergonomics, 16.* 163-166.

Roy Choudhury, A. K., Majumdar P. K., & Datta, C. (2011). Factors affecting comfort: human physiology and the role of clothing. In G. Song (Ed.), *Improving Comfort in Clothing* (pp. 3-60). Philadelphia, PA: Woodhead Publishing.

Rudd, N. A., & Lennon, S. J. (2011). Body image: Linking aesthetics and social psychology of appearance. *Clothing and Textiles research Journal, 19*. 120-133. doi: 10. 177/0887302X0101900303

Shephard. R. J. (2008). Is active commuting the answer to population health? *Sports Med, 38*(9). 751-758.

Smith, J. (1986). Comfort of clothing. *Textiles.* 15, 23-27.

Sontag, M. S. (1985). Comfort dimensions of actual and ideal insulative clothing for older women. *Clothing and Textiles Research Journal, 4*(1), 9-17. doi: 10.1177/0887302x8500400102

Stone, G. P. (1962). Appearance and the self. In Stone, G. P., & Farberman, H. A., (1970). *Social psychology through symbolic interaction*. (pp.394-414). Waltham, MA: Ginn-Blaisdell.

Thompson, K. (2012, February 17). Report: 46% of downtown commuters travel via active transport. *303Cycling.* Retrieved from: http://303cycling.com/active-transportation-denver

Tominaga, M. & Caterina, M. J. (2004), Thermosensation and pain. *Journal of Neurobiology, 61*, 3-12. doi: 10.1002/neu.20079

Watkins, S.M. (1995). *Clothing: the portable environment.* Ames, Iowa: Iowa State University Press.

Weede, J. (1997). Women's suffrage: Women liberate themselves from men's outdoor apparel. *Sportstyle, 19*(1), 79-97.

Yu, W. (2011). Achieving comfort in intimate apparel. In G. Song (Ed.), *Improving Comfort in Clothing* (pp. 427-448). Philadelphia, PA: Woodhead Publishing.

Appendix A

Interview Questions:

1. What are your motivations for active commuting?

2. What garments do you currently wear during your commute? How do they work/perform?

3. Does the cycling/active commuting community or environmental conditions contribute to your active commuting apparel choices? How?

4. How would a garment or wardrobe need to perform to take you through your active commute as well as throughout your workday?

5. Does comfort play a role in your active commuting and work apparel choices? Please describe – or How?