

A CROSS-CULTURAL STUDY OF READY-TO-WEAR CLOTHING IN RELATION TO WOMEN'S
BODY IMAGE, APPEARANCE MANAGEMENT STRATEGIES, AND EXPERIENCE OF 3D
TECHNOLOGY

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Yingying Wu

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Yingying Wu, Ph. D.

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A cross-cultural research project was conducted to acquire a comprehensive understanding of 34- to 55-year-old mature women's ready-to-wear clothing choices in relation to their body image, appearance management strategies, and attitudes toward 3D technology. To be specific, it aimed to address three research questions: (a) What were the interactions among women's physical body, perceived body in mind, and appearance management strategies?; (b) How is the relationship among women's physical body, perceived body in mind, and projection of self revealed by their wardrobe management practices?; and (c) How do mature women without training experience practice clothing fit evaluation in both real and virtual environments? It was completed in three stages, including a survey study, a wardrobe study, and a simulated fitting room and 3D virtual fitting experiment. Two groups of women living in two different cultures, namely the American and Chinese cultures, were recruited.

First, it was found that mature women's mental perceptions of their physical body and how closely such perceptions were related to their ideal physical body strongly influenced their appearance management behaviors, including their choice and use of ready-to-wear clothing. Second, those mature women's wardrobe management practices, especially their daily practices of dressing, were closely related to their mental perceptions, evaluations, and feelings of their physical body, personal preferences, self-identities, as well as their existing wardrobe. In addition, different issues about the apparel industry in these two countries were identified. Moreover, both the American and Chinese participants, particularly the American group, reported difficulties in fit evaluation. Their understanding of clothing fit was found

to be deviated from that of professionals, and the language they used to describe fit issues was very limited. Last, both the American and Chinese participants reported the potential of 3D technology, particularly in an online setting after they experienced 3D technology. However, they also indicated concerns with the 3D technology, and expressed a lack of confidence in the ability of virtual fit to show the actual fit of garments.

BIOGRAPHICAL SKETCH

Yingying Wu was born in mainland China. She received a Bachelor of Engineering Degree in Fashion Design and Engineering from the Fashion School, Zhejiang Sci-Tech University, in 2009. She received a Master of Philosophy Degree in Fashion Technology from the Institute of Textiles and Clothing, Hong Kong Polytechnic University, in 2011. She has continued to pursue a Doctor of Philosophy Degree in Apparel Design in the Department of Fiber Science and Apparel Design at the Cornell University since 2012.

DEDICATION

This project is dedicated to my parents, Mr. Wu Jinguo and Mrs. Huang Yueyan, for their unconditional love and support.

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PREFACE

This dissertation is submitted for the degree of Doctor of Philosophy at the Cornell University. It is original, unpublished, independent work by the author, Yingying Wu, except where acknowledgements and references are made.

CHAPTER 1

INTRODUCTION

A cross-cultural study was conducted to acquire a comprehensive understanding of 34- to 55-year-old mature women's ready-to-wear clothing choices in relation to their body image, appearance management strategies and attitudes toward 3D technology. Three research questions were asked and addressed in this research project. The first and ultimate research question asked was the interactions among women's physical body, perceived body in mind, and appearance management strategies. The second question asked was how the relationship among women's physical body, perceived body in mind, and their projection of self were revealed by their wardrobe management practices, particularly their ready-to-wear clothing choices. The last question was focusing on clothing fit evaluation practices of mature women without training experience, and how such practices were related to mature women's physical body, perceived body in mind, and appearance management strategies. A sub-question asked was how might mature women without training practice clothing fit evaluation using developing technologies, namely 3D virtual try-on. To be specific, the three research questions are:

1. What are the interactions among women's physical body, perceived body in mind, and appearance management strategies?
2. How do mature women's wardrobe management practices reveal the relationships between their body, the perceived body in mind, and their projection of self?
3. How might mature women without training practice clothing fit evaluation using developing technologies?

This study has three contributions. First, most of the existing knowledge about women's body image, clothing as an appearance management strategy, and attitudes toward 3D technology are based on studies of western culture, and most of the published research is based on college-age female Americans; therefore, the influences of culture and age on women's body image and appearance management

strategies have not yet been addressed. In addition, this study included plus size women which have been excluded by most of previous studies. This study also explored effective use of 3D technology, including both 3D body scanning and 3D virtual fitting in investigating body image, physical body shape, and clothing fit in relation to appearance management in American and Chinese cultures.

This study was conducted in three stages: (a) a survey study was completed to gain understanding of mature women’s body dimensions, body image, appearance management strategies, and experience with ready-to-wear (RTW) products, as well as their demographics and cultural belongingness; (b) a wardrobe study was conducted to investigate those women’s clothing choices, experience with RTW, shopping behaviors, and wardrobe management behaviors; and (c) a simulated fitting room experiment and a 3D virtual fitting experiment were conducted to study mature women’s experiences with and practices of clothing fitting and fit education, as well as their appearance management choices in relation to their physical bodies and mentally perceived bodies. Both actual try-ons of test garments and 3D virtual try-ons of digitized test garments were used in this session. Both quantitative and qualitative data were collected and analyzed to obtain a thorough understanding of the above-mentioned topics.

Figure 1 provides an overview of the research study design.

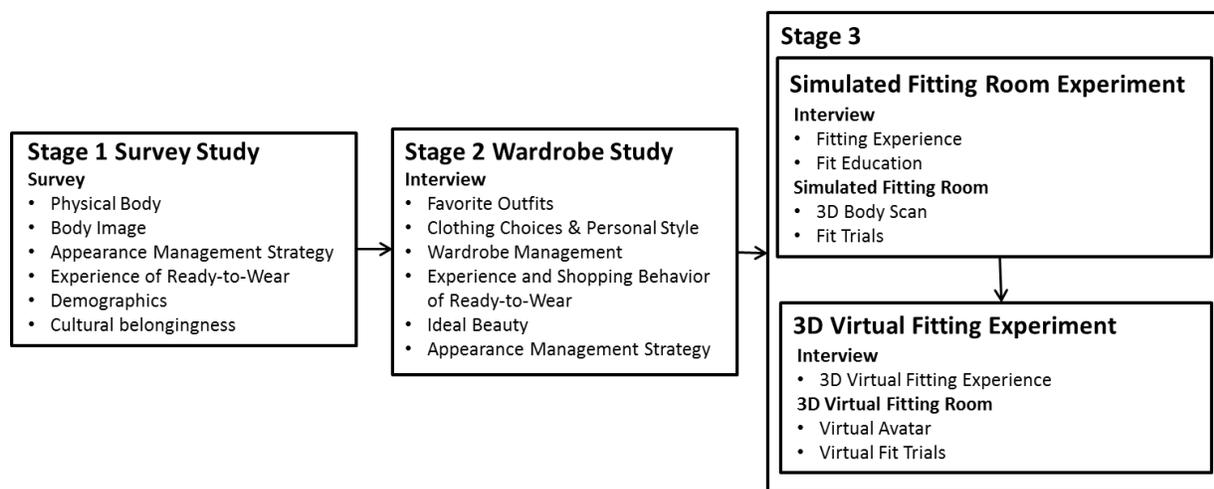


Figure 1. Research study design.

In stage 1, a survey study was conducted to investigate the interaction between women’s adoption of appearance management strategies and their mental perceptions of the body. In addition, it studied the

role the physical body played in this process by looking at self-reported body dimensions. Furthermore, as a cross-cultural study, it investigated how culturally established beauty standards affected women's body image and their adoption of appearance management strategies.

In stage 1, clothing was rated as the most frequently used appearance management strategy, and it was found to have complex interactions with women's physical bodies and their mental perceptions of the body; those issues were therefore studied further in stage 2. An interview-based wardrobe study was completed to examine women's clothing choices and how these clothing choices interacted with women's body image, their self-identities, and their physical bodies by examining their wardrobes as well as discussing their clothing shopping behaviors, identities, and physical bodies. In other words, it investigated why women choose to wear certain types of clothing instead of others in different social situations.

As confirmed by findings generated in the survey study and the wardrobe study, fit is a particularly important criterion in a consumer's evaluation of an apparel product. However, there is a lack of information centering on consumers' experiences and practices of clothing fit evaluation. Thus the simulated fitting room experiment and the 3D virtual fitting room experiment were conducted to aid in an understanding of the definition and practice of clothing "fit" from the perspective of consumers as well as to investigate potential usage of 3D technology, particularly 3D virtual try-on technology in the clothing fit evaluation process. This study focused on investigating the participants' language in terms of clothing fit, on interpreting consumers' needs for well-fitted clothing and concerns about RTW products, and on providing a method and framework to guide a procedure for interpreting and communicating about clothing fit.

This dissertation is organized as follows: the first chapter gives an overview of the whole study, and the second chapter provides a discussion of relevant literature. The third chapter presents and discusses findings from the stage 1 survey study. However, some of the survey responses of the participants who also participated in stage 2 and 3 are also reported in the fourth and fifth chapters. The

fourth chapter focuses on the interview-based wardrobe study, while the fifth chapter combines findings from both the simulated fitting room experiment and the 3D virtual fitting experiment.

CHAPTER 2

LITERATURE REVIEW

2.1 Body Image

Body image, as described by Cash and Pruzinsky (2004), is a multifaceted psychological experience of embodiment. Undeniably, it profoundly influences the quality of human life. For decades, scholars have been making great efforts to understand what it is, where it comes from, how it interacts with people's self-concepts, and how it affects daily life. With all this information in mind, people may be able to know themselves and the outside world a bit better.

2.1.1 The Concept of Body Image

Nearly a century-long effort has been devoted to researching body image, though use of the concept of *body image* was introduced in the 1990s. In its very early stages, research on "body image" mainly focused on neuropathological forms of body experience and was dominated by investigations of "body schema," a proposed neural mechanism whereby changes in body posture and movement were centrally coordinated (Cash & Pruzinsky, 2004). Not until Paul Schilder, who first emphasized the need to examine the sociocultural, neurological, and psychological elements of body image, did body image research emerge out of the boundaries of neuropathology (Schilder, 2013). During early years, researchers mainly focused on studying one's bodily experience of oneself and concentrated on psychodynamic perspectives. In other words, they emphasized the "image" rather than the "body." Later, the emphasis on "body experience" was criticized by other researchers. Franklin Shontz, for instance, argued that the shift from neurological to psychodynamic conceptions had removed "body" from body image (Shontz, 1969). Unlike other researchers, Shontz sought to integrate the "body" and the "image." He sought to put the body back into body image research partly by applying body image concepts to the study of physical

disability. He also endeavored to return the image to body image from the angles of cognitive and perceptual issues of body experience.

On the other hand, Seymour Fisher, another important body image scholar after Schilder, asserted there is no such entity as “The Body Image” (Fisher, 2014). He and his colleagues, in line with the psychodynamic perspective, proposed a theory of “body image boundaries,” assigned meanings to specific body parts, proposed a more generalized concept of body awareness, and elaborated on distortions of body perceptions (Fisher, 2014). However, Fisher’s pioneering thinking, probably because of the growing predominance of the cognitive-behavioral approach to body image and the waning reign of psychodynamic perspectives on body image during that time period, was neglected to a great extent (Cash & Pruzinsky, 2004).

Over decades of exploration, body image scholars have increasingly agreed that body image is a multidimensional phenomenon. To study body image, all three aspects—the body itself, perceptions of the body, and mechanisms by which people experience their own bodies—are essential for understanding the concept of body image. All three of these aspects should be examined. In addition, thanks to pioneering scholars’ contributions, much contemporary body image research has evolved away from a “single problem” perspective in an effort to understand body image among individuals, especially women. However, as Fisher has argued, “multiple branches of work dealing with body attitudes and feelings are . . . disconnected . . . as if the others did not exist. Cross-references by researchers in the different areas are, at best, sparse” (1990). In addition, current investigations of body image are often heavily related to research on eating disorders and other health-related concerns, though some contributions have been made to the literature by researchers from fields other than nutrition. On the other hand, comprehensive exploration of body image inherently results in complex definitions of the central concept. This can contribute to even more serious terminological confusion, which has been a consistent historical and contemporary problem in body image study. As summarized by Thompson and colleagues (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999), at least 16 “definitions” of body image have been

identified, namely body satisfaction, weight satisfaction, size perception accuracy, appearance satisfaction, appearance evaluation, appearance orientation, body esteem, body concern, body dysphoria, body dysmorphia, body schema, body percept, body distortion, body image, body image disturbance, and body image disorder. Among them, now the most frequently used term is body satisfaction.

According to Cash and Pruzinsky (2004), terminological lucidity can be solved by accurately defining conceptual referents within the context of the multidimensionality of body experience. The authors define body images as subjective perceptual and attitudinal experiences about one's body, particularly one's physical appearance. Previous research has found that body image attitudes can be classified into two dimensions: body image evaluation and body image investment (Cash, 2005). *Body image evaluation* refers to satisfaction or dissatisfaction with one's body, including evaluative beliefs such as self-ideal discrepancies. *Body image investment* means the cognitive, behavioral, and emotional importance of the body for self-evaluation, such as the importance or cognitive-behavioral salience of one's appearance. A number of commentators (Grogan, 2008; Tiggemann, Winefield, Winefield, & Goldney, 1994; Tiggemann & Lynch, 2001) have concluded that the former component, body dissatisfaction, remains remarkably stable across the entire female life span. As yet there is little direct evidence concerning the investment component, but there have been some findings that variables such as importance of appearance (Pliner, Chaiken, & Flett, 1990), appearance orientation (Cash, Winstead, & Janda, 1986) and self-objectification (McKinley, 1999; Tiggemann & Lynch, 2001) decrease with increased age. Therefore, a critique of contemporary literature on body image is that the majority of studies only focus on the evaluative dimension while neglecting body image investment (Cash & Deagle, 1997; Cash & Pruzinsky, 2004).

To sum up, body image is indeed a multifaceted construct encompassing one's physical body and one's perceptions, thoughts, feelings, and actions regarding the body (especially its appearance), as well as interactions between the body and experiences of body. Though the study of body image could be conducted from multiple perspectives in different domains and the definition could be very complex, with

precise conceptual referents in specific contexts, it is still possible to examine and elaborate on issues related to body image. Thus, body image is mainly understood to refer in this study to body and appearance satisfaction (the face is not examined here) and is assessed along with the importance of one's body/appearance in self-evaluation. Both of the two dimensions, body image evaluation and body image investment, are under close scrutiny here.

2.1.2 Development of Body Image from Cognitive-Behavioral and Sociocultural Perspectives

Multiple theories and perspectives could be adopted to explain the development and evolution of body image. According to the literature, sociocultural and neurological as well as psychological (particularly psychodynamic and cognitive-behavioral) perspectives are of great influence in past and current body image research paradigms. Among them, the neurological viewpoint is useful in explaining early body image development, especially in the stages of infant and early childhood. Psychological and sociocultural perspectives are more relevant after children have developed their capability for cognitive learning as well as a sense of individuality. In other words, following the timeline, different theories play important roles at different ages. All of the three above mentioned views contribute to informative knowledge foundations of this study. The two viewpoints that are most relevant to this study, namely cognitive-behavioral and sociocultural viewpoints, along with the most closely related theories and important experimental findings, are summarized in this chapter.

Cognitive-behavioral perspectives. Most contemporary research on body image derives directly or implicitly from an integrative cognitive-behavioral viewpoint that reflects no single theory but rather draws on both multiple enduring theories and empirical evidence. From this point of view, not only social learning processes but also cognitive mediation of behaviors and emotions are emphasized in body image study. There are two stages in body image development: shaping of original body image and evolving of body image. The distinction between these two stages is whether there is a prior idea of body image. However, a relatively stable body image is generally held by individuals as they get older and psychologically more mature.

Adapted from Cash's cognitive-behavioral model of body image development and experience (Cash, 2012), Figure 2 shows the author's understanding of the development of body image in stage one, and Figure 3 demonstrates how fundamental body image schemas and attitudes shaped in early age interact with proximal or concurrent factors in stage two.

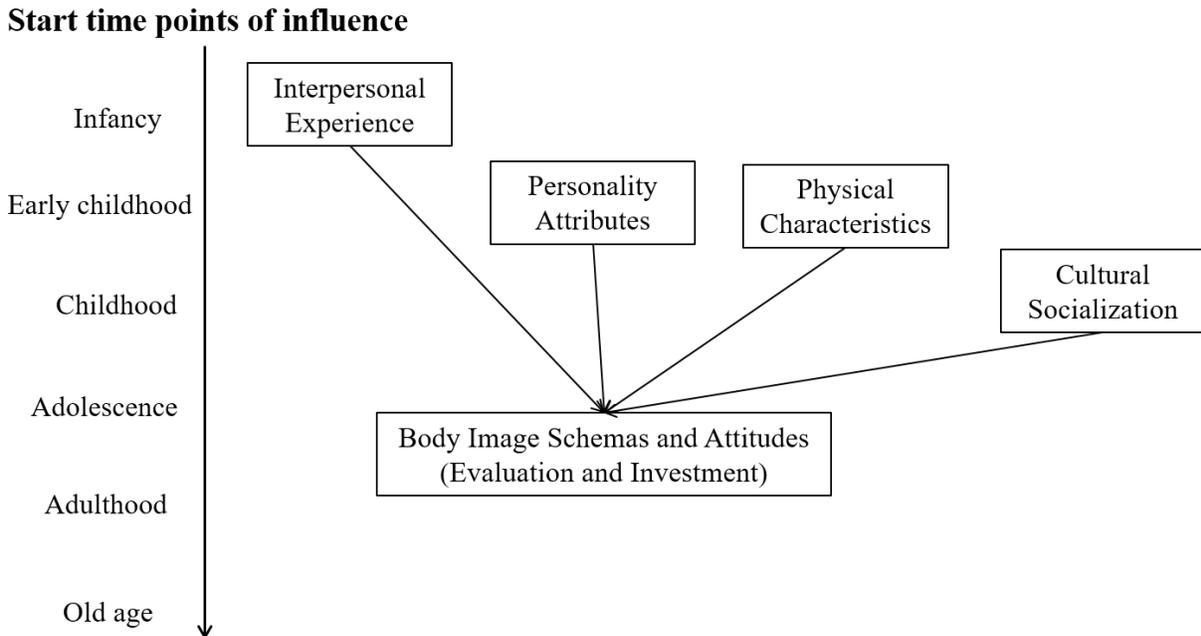


Figure 2. An adapted model of body image development.

As illustrated in Figure 2, body image is originally shaped on the basis of immediate bodily experiences and interpersonal reactions such as early parent-child interactions, physical characteristics and awareness of physical appearance in childhood, personality attributes based on genes and early childhood education, and subsequent later cognitive social learning processes. Past events, personal attributes, and experiences, as well as social learning procedures that predispose or influence how people come to think, feel, and act in relation to their body, are all responsible for the original development of body image. Generally, once a fundamental idea of body image schemas and attitudes and degrees of body image investment is developed and held by an individual, proximal body image events may interact with existing body image and contribute to the individual's cumulative body image.

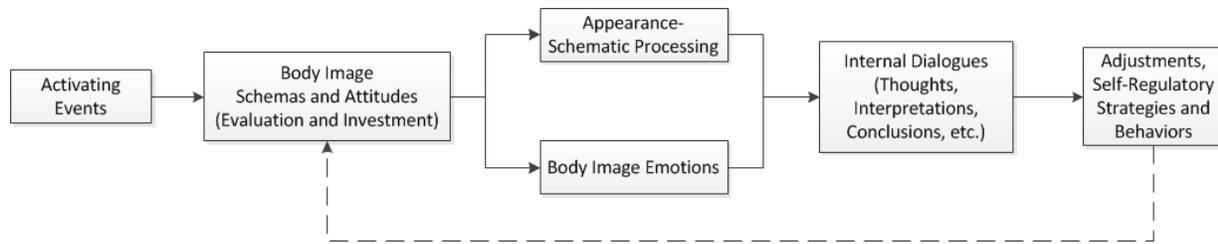


Figure 3. Mechanism of body image.

As shown in Figure 3, proximal factors, including activating events, appearance-schematic processing, body image emotions, internal dialogues, and self-regulation actions, can greatly influence body image experiences. Although body image does not change easily, it is still the dynamically and developmentally evolving mental representation of the body self. As argued by Krueger (2004), body image should not be inaccurately assumed to be something that one either has or does not have, as if it were a fixed representation that is either accurate or distorted.

The literature indicates that although people who grow up in American culture, regardless of gender and age, are dissatisfied with their body and appearance, older people are less negatively influenced by this type of self-discrepancy. One reasonable explanation for this phenomenon is that older people tend to have a better acceptance of themselves. Another possible reason is that for older people, there is a lower standard for physical attractiveness and less emphasis on body and appearance. Another factor may be that accumulating life experiences result in shifting one's focus away from the body. A lowered baseline level and the higher costs of changing body and appearance may result in less body image investment. However, more research is required.

Sociocultural perspectives. As indicated by Jackson (2004), the sociocultural perspective is an approach to understanding human behavior that focuses on how shared cultural values influence individual values and behavior. It is especially important for researchers to investigate how individuals perceive themselves and how they are perceived by others. Beauty standards, ideal body shape, and importance of physical appearance are all important components of sociocultural values. Therefore, it is

understandable that past and current research on social norms and their influence on the development of body image are primarily derived from sociocultural perspectives.

From the sociocultural perspective, culture defines what constitutes an attractive body, and self-perceptions of body attractiveness depend on these cultural definitions. The less discrepancy there is between bodily self-perceptions of and cultural body ideals, the higher the level of self-rated body attractiveness and the more positive one's body image. Thus, from this perspective, body image depends heavily on cultural ideals and on how individuals perceive their own bodies in relation to these ideals.

Another sociocultural theoretical framework is social expectancy theory (Bandura, 1986; Feather, 1982). It argues that cultural values influence perceptions of and behavior toward others, which in turn influence the behavior of both the perceiver and the target. From the perspective of the perceiver, because of the commonly known "self-fulfilling prophecy" or "interpersonal expectancy effects," the perceiver's perception and behavior toward a target receiver is highly constrained by social norms, which consequently influence perceivers' perceptions of themselves and results in behaviors consistent with social expectancy. This outcome, from the target's perspective, is commonly known as "the looking glass self," the tendency for self-concept to primarily be a reflection of how others view the target.

When one examines the effects of physical attractiveness from the angle of social expectancy theory, including beauty standards, ideal body shape and importance of physical appearance, several hypotheses are proposed (Jackson, 2004). The first and most essential hypothesis is that although standards of physical attractiveness vary from culture to culture, within each culture there is consensual agreement. Second, although expectations about attractive and unattractive others (i.e., a physical attractiveness stereotype) may differ in different cultures, there are consensual expectations within a culture. Third, people do behave differently toward attractive and unattractive others, and this can result in differences in how they evaluate themselves and respond to others' behavior toward them. This is based on an assertion of the evolutionary theory that there is a universal basis for preferences of attractiveness. Last but not least, cumulatively, these behavioral differences result in differences in self-

concepts such as individuals' self-esteem, regardless of whether they are socioculturally defined as attractive or unattractive.

Another sociocultural theoretical framework is implicit personality theory (Schneider, 1973). In contrast to social expectancy theory, it focuses on how people understand and predict the behavior of others. It proposes that the knowledge structures that we use to make sense of the social world are highly related to personal attributes (e.g., personality traits) and the degree to which those attributes are related. From this perspective, physical attractiveness is associated with a wide range of desirable attributes in both perceptions of others and self-perceptions. Generally, attractive people are perceived as possessing a variety of desirable characteristics. Experimental research found that the physical attractiveness stereotype is applied equally to strangers and acquaintances, males and females, adults and children, and regardless of culture. For instance, attractive people are perceived as having greater occupational competence (adults) and academic competence (children), greater interpersonal competence, more social appeal, and better adjustment than their less attractive counterparts. Cultural information is transmitted through direct observations of attractive others and by exposure to cultural representations of attractiveness such as mass media (Jackson, 2004). This is also consistent with status generalization theory, which addresses how external status characteristics are used to generate expectation states regarding performance and social interaction as well as outcomes, particularly in informal, task-oriented groups. On the other hand, implicit personality theory also asserts that the number and nature or specifications of standards of physical attractiveness are different from culture to culture, which is similar to social expectancy theory. However, this theory does not address why different cultures associate different attributes with attractiveness.

Limitations of sociocultural perspectives. One limitation of the trend within early research on physical attractiveness toward adopting sociocultural perspectives is that researchers tacitly accepted assertions that there is agreement about standards of physical attractiveness within one culture and

differences in standards of physical attractiveness among different cultures. This has been widely challenged by more recent studies.

First, early research findings were primarily based on the study of physical attractiveness within one culture, particularly Western cultures. For instance, there is considerable agreement within U.S. culture about who is attractive and who is not (Jackson, 2004; Singh, 2002; Swami, Caprario, Tovée, & Furnham, 2006) and different anthropometric ratios were suggested to be useful in measuring female body attractiveness, including the waist to hip ratio (WHR; Singh, 1993a, 1993b, 1995), Body Mass Index (BMI) (Maisey, Emery, & Cornelissen, 1999; Tovée & Cornelissen, 1999, 2001; Tovée, Hancock, Mahmoodi, Singleton, & Cornelissen, 2002), as well as Volume-Height Index (VHI; Fan, Dai, Liu, & Wu, 2005; Fan, Liu, Wu, & Dai, 2004), and facial proportions (Fan, Chau, Wan, Zhai, & Lau, 2012). However, only a limited number of studies have examined the differences in beauty standards, idealized body shapes, and the level of importance assigned to physical attractiveness among different cultures (Swami et al., 2010).

Second, whether different cultures communicate different standards of attractiveness is still in question. Empirical evidence shows that there is considerable cross-cultural agreement. For instance, some experimental findings show that there indeed are universal standards for physical attractiveness, such as the golden ratio and its applications to both facial and body attractiveness. In addition, physical characteristics associated with fertility are generally considered to be attractive, and therefore this argument should be universally applicable (Wade, 2000). On the other hand, multiple previous scholars have recorded differences in beauty standards in different cultures, even though there is increasingly high communication among different cultures in the modern world (Swami et al., 2010).

Thirdly, whether standards of attractiveness are determined by some mechanisms other than culture is not clear. This suggests that other universal mechanisms, rather than cultural transmission, are also possible. Since people not only judge others based on physical appearance but also behave differently toward them, the traits and behaviors of attractive people are “better” in ways consistent with their

preferential treatment by others. Moreover, perceived attractiveness itself has effects on behavior.

However, socially perceived attractiveness is only modestly related to self-perceived attractiveness, be it facial attractiveness or body image, suggesting that others' perceptions, or the "outsider' view," is quite distinct from our own perceptions, or the "insiders' view." Therefore, being attractive or unattractive may differ from experiencing its advantages or disadvantages, and the preferential treatment that attractive people experience may merely be internalized.

Finally, although in more recent years, an increasing number of researchers have been exploring how cultural institutions such as the mass media define and communicate physical attractiveness and associated issues, there is very little research on why there are certain beauty standards within one culture. For instance, questions such as why some faces and bodily characteristics are considered attractive and others are not still has not been addressed, though some theories such as evolutionary theory suggest that preferences in physical characteristics are tightly connected with reproductive abilities, which are crucial for the continuation of a species.

However, the face is not the focus of this research project. Exclusion of facial attractiveness in this study is in line with the realm of previous research on self-perceptions of physical attractiveness that has emphasized the body instead of the face. Although research indicates that social ratings of overall attractiveness were largely determined by facial attractiveness, these findings are more applicable to perceptions of others people's attractiveness than to perceptions of one's own attractiveness. Therefore, in terms of body image, which focuses on self-perception, it is reasonable to conduct research with a focus on the body. On the other hand, the relationship between facial attractiveness and bodily attractiveness, whether socially perceived or self-perceived, requires additional research.

To sum up, generally, the sociocultural perspective predicts that people hold more positive expectations for attractive than unattractive others. It is also predicted that people behave more favorably toward attractive than unattractive others and that more favorable treatment results in more favorable self-concepts for attractive people. The source of cultural values regarding attractiveness and why there

appears to be both cross-cultural agreement and disagreement in what constitutes physical attractiveness are both issues that need to be addressed.

2.1.3 Body Image Observation Methods

People can only get a sense of how others see them and of how others can influence their body image by viewing themselves in another medium such as a mirror, a video, or photos. Psychological theories such as mirror exposure and self-objectification could provide possible explanations for how body image is affected. For instance, a psychologist may argue that the image is influenced by the distance between the viewed image and one's mental perception of oneself. According to Veale and Riley (2001), the more individuals are concerned about their body and appearance, the more likely they compare what they see in front of a mirror with an image in their mind and with their "ideal" look.

Mirror exposure. Throughout the lifespan, physical attractiveness carries clear advantages in society, often leading to self-objectification, especially in terms of women who monitor their own bodies as a reaction to the sexually objectifying gaze of others (Gapinski, Brownell, & LaFrance, 2003). Self-monitoring can be important to these individuals, often involving repeated mirror exposure. On the other hand, Rand and Stunkard (1997) found that 41% of obese patients avoided looking in mirrors while no more than 7% of the nonobese showed such avoidance. Even healthy individuals may be made more self-critical and aware of their own deviations from the ideal by the presence of a mirror (Veale & Riley, 2001). In more extreme situations, Mulkens and Jansen (2009) claimed that individuals who are preoccupied with an imagined defect in body appearance evaluations, such as those with body dysmorphic disorder (BDD), are likely to experience decreased body satisfaction after mirror exposure. These individuals tend to spend a lot of time examining their "defect" in reflecting surfaces, which may lead to a loss of sense of proportions and an obsession with imagined "defects." Women who suffer from BDD also tend to employ safety strategies such as using "mental cosmetic surgery" or using ambiguous surfaces such as the backs of CDs or cutlery for a reflection to maintain their body satisfaction.

On the other hand, contradictory findings were reported by Delinsky and Wilson (2006). They argued that if people systematically observe themselves in a full-length mirror, body-image-related anxiety and body avoidance could be reduced. In other words, repeated mirror exposure is an effective treatment for body image disturbance. However, the participants of this research were people who had body image disturbance (e.g., extreme weight and shape concerns); it is not clear whether these findings could be valid for people who do not have body image disturbance. This research also involved extensive and repeated exposure; whether short-term or infrequent exposure can influence people's body image, such as viewing an image only one time, has not been examined.

Since the majority of current research was conducted using participants who have high body concerns, it would be interesting to know whether exposure processes such as mirror gazing or viewing a photo or video has similar effects on normal individuals. The limited number of research projects with healthy participants also show contradictory findings. On the one hand, as claimed by Veale and Riley (2001), compared to body dysmorphic disorder (BDD) patients, the normal control group did not necessarily feel worse after mirror gazing. Their attention was focused on the external reflection in the mirror rather than an internal impression or feeling. In other words, they merely viewed the mirror as a reflection instead of connecting it to their body image. On the other hand, Windheim, Veale, and Anson (2011) found that both the participants with BDD and a healthy control group experienced an increase in distress and self-focused attention upon exposure to the mirror. In addition, people without BDD experienced even more distress when looking in the mirror for a long period of time as opposed to a short period of time.

However, whether mirror exposure effects could also be observed in media other than a mirror has not yet been examined. To be more specific, could the principle of mirror exposure also apply to viewings of a 3D scanned image of oneself? If so, what kind of effect would it be? This question is important because viewing oneself in 3D also includes a "viewing" process that is in some ways similar to viewing oneself in a mirror. Moreover, how can we compare the influences of the different media, such

as that of a mirror, a 2D photo, and a 3D scan? In this 3D-technology-intense world, it is useful and critical to study all of these issues. A comprehensive and deep understanding of how people observe themselves both physically and mentally in the 3D environment could help build an understanding of people's attitudes toward 3D body scanning technology.

2.2 Appearance Management and Body Image

In contemporary society, the major focus of research on body image has been on the relationship between body shape and weight and health-related issues, especially eating disorders. There is little overlap between contemporary research in the clothing and body image fields; however, empirical knowledge and a handful of studies indicate that clothing and body image are closely related topics.

Research has found that body image is associated with the consumption of fashion products such as clothing, for a variety of purposes. Several authors claimed that clothing is often used to improve one's body satisfaction or hide body dissatisfaction relative to cultural ideals (Kaiser, 1997). On the one hand, it is proposed that clothing could be used as a self-enhancement tool. Cash claimed that body image leads individuals to actively manage their physical appearances by controlling and modifying the aesthetics of their physical appearance and self-presentation using tools such as clothing and cosmetics (2005). Lennon and Rudd (1994) integrated the sociocultural perspective with aesthetic theories from textiles and clothing to investigate how individuals respond to cultural aesthetic ideals regarding bodies. According to their model, women actively create their appearances in accord with cultural aesthetic ideals using appearance-enhancing products and behaviors. Although the cultural aesthetic ideal is narrowly defined, women can experience aesthetic pleasure in the process of approximating it, and individuals can distinguish themselves from others on that basis. Created appearances are positively or negatively evaluated by others (e.g., peers, parents, significant others) in an appreciation process; those perceived evaluations in turn influence the appearance management behaviors of the women themselves.

On the other hand, Kwon and Parham (1994) found that when young women felt a higher degree of body dissatisfaction, they tended to have negative attitudes toward apparel and to be less confident

about their apparel choices. Besides, they tended to depend more on clothing for camouflaging their figures, comfort and concealment, and assurance of self, compared to young women who felt a higher degree of body satisfaction (Lennon, Lillethun, & Buckland, 1999). In contrast, women who are satisfied with their bodies are likely to use clothes for enhancement of the body and self. However, it is also worth noticing that individuals may choose a certain type of clothing to camouflage and to hide undesirable parts of their bodies but still be interested in clothing, mostly as a way of appreciating the beauty of clothing itself.

Different functions of clothing may be important because, in some ways, having a body that differs from the societally prescribed thin ideal (as in the case of most adult American women's bodies) presents women with a choice: either to camouflage and minimize that difference or to accentuate and individualize the difference. The present data suggest that self-esteem might determine and/or be a consequence of which choice is made. Individuals who have a negative feeling toward themselves may use clothing as a tool to enhance their self-esteem and strengthen their self-concept (Dubler & Gurel, 1984; Kwon, 1991). For instance, Kwon (1991) suggested that how individuals perceive themselves influences their clothing selection, and at the same time, what individuals wear affects their feelings about themselves. This relationship is in line with social comparison theory (Kwon, 1991).

To conclude, it is surprising that just a handful of research projects have been done in exploring the relationship between clothing and body image. In addition, those studies were mainly based on college samples (Frith & Gleeson, 2004). It is of interest and potential to go deep and further.

2.3 Social Comparison

After studying the concept of body image and its development, one crucial question that must be addressed is how social norms influence individuals' body image. Social comparison theory is one theory that can be useful in approaching this question.

2.3.1 Social Comparison Theory

Social comparison is a social psychology theory that has been heavily studied for over fifty years. This is not surprising because comparison with others is a fundamental, ubiquitous, and robust human activity (Corcoran, Crusius, & Mussweiler, 2011). The basis for Leon Festinger's social comparison theory (1954) is the process of evaluating oneself in comparison with others in one's social environment. He hypothesized that when a person is uncertain about a specific attribute, he or she will clarify his or her standing by examining the attribute with regard to objective sources of information or against direct physical standards. If these objective standards are not readily available, individuals will examine other individuals as sources of comparison. However, some other researchers (Marsh & Parker, 1984; Ruble, 1983) have argued that even when an objective standard is available, individuals may instead rely on their relative standing in their social environment to define themselves.

Generally, based on social comparison theory there are three reasons why people engage in social comparisons (Chadee, 2011):

1. **Self-evaluation.** According to Festinger, it refers to the desire to know "the self." This, as well as the need for accurate self-evaluation, are two main motives for social comparisons. Comparisons with similar standards on both critical dimensions and related attributes could provide diagnostic information for self-evaluation, therefore helping to interpret incoming information correctly and to communicate outgoing information successfully.
2. **Self-enhancement.** Sometimes people do not seek accurate feedback about themselves but information that could help them create and maintain a positive self-image. Individuals look to another individual or comparison group who are considered to be worse in order to dissociate themselves from perceived similarities and to make themselves feel better about themselves or their personal situation. Based on this phenomenon, Wills (1981) introduced the concept of downward comparison, which emphasizes the positive effects of comparisons in increasing one's subjective well-being. It could be used as a defensive strategy to protect or enhance one's self-

view. Many researchers indicate that people with a threatened self-view will be especially prone to engage in this.

3. Self-improvement. During the early stage of social comparison theory, researchers believed that the need to self-improve was the major reason for upward comparison, both consciously and subconsciously.

It is understandable that different standards are required for self-evaluation, self-enhancement, or self-improvement; however, the processes by which comparers choose standards have been subject to debate. Basically there are two methods in selecting the most suitable standard: empirical evidence and applications of routines. Although collecting empirical evidence is the easiest and most direct tool, finding a standard that is similar on the critical dimension or on related attributes is time-consuming. On the other hand, applications of routines means that the more often a particular standard has been used, the more strongly it would be associated with the self-evaluation task and the more likely one would be to engage in further comparison with this standard. However, people seem to use the routine standard even when an observed person is not an adequate standard from a strategic point of view. One example is constant exposure to fashion media, such as visuals of models. Even though not many women's height and body shapes are comparable to those of models, constant exposure and convenience are theorized to persuade women to use the model as a routine standard. In this case, such women neglect the difference of critical dimension or related attributes, an oversight that is especially dangerous for the dimension of upward comparison.

2.3.2 Social Comparisons and Self-Evaluations

With the development of social comparison theory, more and more research has been conducted to investigate the mechanism of doing social comparison, not only how people select their comparison standard but also what is the most important factor that influences whether people assimilate to or contrast away from comparison standards. Manis and Paskewitz (1984) have shown that the evaluative implications of social comparison depend on the direction of the comparisons and that people are

influenced by both assimilation and contrast effects. When people expect to find similarity, it is more likely they will find it. However, there are also factors associated with ethnicity, race, and culture that may moderate the effects of the comparison process. In addition, in recent years, researchers tended to agree that the way that people construct their selves before engaging in social comparison determines the direction as well as the sequence of participating social comparisons. For instance, various studies have found detrimental effects of viewing only thin models in women who have preexisting body image problems.

The general structure of an investigation of how social comparison might influence self-concept is summarized in four steps (Corcoran et al., 2011):

1. People choose their own hypothesis. They can either test the possibility that the self is similar to the standard or they can test the possibility that the self is dissimilar from the standard. This choice depends on the overall perceived similarity of the self and the standard.
2. Initial assessment of self-standard similarity. Salient features, especially those that are easy to process and those that have immediate implications for target-standard similarity, such as category membership and standard extremity, are especially influential.
3. Once a hypothesis is selected, judgments selectively generate information that is consistent with the focal hypothesis of either similarity or dissimilarity.
4. Empirical evidence should be judged to support or refute the hypothesis. Whereas similarity testing increases the accessibility of self-knowledge, indicating that self and standard are similar on the critical dimension, dissimilarity testing selectively indicates that self and standard are dissimilar on the critical dimension.

Previous researchers found that high self-esteem participants made more downward comparisons, which in general produced an increase in positive affect (Giordano, Wood, & Michela, 2000; Wheeler & Miyake, 1992). In addition, Miyake (1993) found that low self-esteem participants made more upward comparisons and high self-esteem participants responded with less negative or more positive affect to

upward comparisons than low self-esteem participants. Miyake also measured the stability of self-esteem by obtaining the standard deviation of numerous measures of self-esteem over the course of the study. Unstable self-esteem participants made more upward comparisons. Interestingly, the more unstable the self-esteem participants are, the greater the variability in comparison direction. However, there is no way to know the direction of causation. Finally, those with unstable self-esteem responded with more positive affect to lateral comparisons. Miyake concluded that finding a similar comparison target was possibly a relief for the fluctuation of both their self-esteem and their comparison direction.

On the other hand, several other studies have investigated individual difference variables other than self-esteem. Some other researchers argued that the key factor in understanding the comparison process is self-discrepancy. Researchers found that women with high levels of body image self-discrepancy were more likely to engage in social comparison from exposure to thin-ideal advertisements, as well as more likely to have those comparison processes induce self-directed negative consequences (Bessenoff, 2006; Bessenoff & Snow, 2006). According to Bessenoff, processing a self-discrepancy may moderate the likelihood of making social comparisons to thin-idea media and the negative impacts of this comparison (Bessenoff, 2006). However, it is interesting to note that the actual/own-ideal/own discrepancy is the self-concept discrepancy that is conceptually close to low self-esteem (Wilcox & Laird, 2000). In other words, low self-esteem could be viewed as just one kind of self-concept discrepancy, which is a negative self-concept. Conceptualizing low self-esteem in this way, however, is confusing because low self-esteem associated with a person having a negative actual self will vary, depending on whether it is discrepant from the person's ideal self, or ought self. Here, actual self, which is a person's basic self-concept, is the presentation of the attributes that people believe they actually possess or that they believe others believe they possess. Those attributes include but are not limited to intelligence, attractiveness, athleticism, and so on. Ideal self is the representation that people would like to possess or that they believe others wish them to possess. This motivates individuals to change, improve, and achieve. Ought self is the representation of the attributes people believe they should or ought to possess or that

they believe others think they should or ought to possess. In other words, actual self generally refers to who you actually are, ideal self is the person you want to be, and ought self is the person you think you should be.

In addition, as in the model proposed by Rudd and Lennon (2000), self-esteem as a function of that discrepancy was expected to motivate appearance-management behaviors.

Some researchers have argued that besides self-discrepancy, self-schema as well determines the direction and influence of comparison (Jung, Lennon, & Rudd, 2001; Markus, Hamill, & Sentis, 1987). According to Myers and Biocca (1992), a self-schema is a person's construction of those traits that make the person distinctive and constitute the sense of me. Individuals build this sense of self from observation of their own behaviors, the reaction of others to the self, and more general social cues that suggest which attributes of the self are most important. Self-schemas may bias individuals to selectively attend to information of greater relative importance in information processing (Jung et al., 2001).

To sum up, previous research findings supported that varying social comparison tendency is associated with differences in the accessibility of self-knowledge as well as body image disturbance. However, it is still not certain what kind of specific self-knowledge plays the most crucial role in engaging social comparison.

2.3.3 Social Comparison and Body Image

Ideal body types and culture. Body ideals vary among cultures as well as within cultures across groups and time. Contemporary western cultures idealize thinness for females and an average body type for males. Upper-social-class Caucasian women, particularly adolescents and young adults, are the most dissatisfied with their bodies. The thin ideal for women replaced the more full-figured one of the 1950s and may soon be replaced by a "fitness" ideal that began to emerge in the 1990s. Explanations for the thin ideal could be a desire to emulate the upper class, where thinness is equated with wealth and leisure; changing roles of women from maternal to more instrumental or masculine venues; a desire to appear

youthful (where youthfulness is equated with small stature); and a perceived association between thinness and health, as promoted by the medical community.

The effects of idealized beauty portrayed by media on perceivers' body image. People portrayed in the modern mass media, such as actors or models in advertisement campaigns, are mostly highly attractive. However, their images are often manipulated, and thus they often present extreme comparison standards in terms of their physical features. Most researchers have assumed that in comparison to these “perfect” bodies, perceivers should be less satisfied with their own appearance. When women compare themselves to the ideal models displayed in the media, they are likely to engage in a process of upward social comparison, and this may often lead to negative self-evaluation. In line with this view, a number of studies have shown that exposure to such idealized media images can have detrimental effects on self-evaluation; however, other studies also found beneficial effects (Groesz, Levine, & Murnen, 2002), suggesting that the relationship is more complicated than initially thought. Recent research has begun to delineate the conditions that result in assimilation or contrast after comparisons with highly attractive media portrayals. For example, Trampe, Stapel, and Siero's (2007) findings suggest that exposure to thin female body shape is not equally detrimental to all women. In their studies, women who were already dissatisfied with their bodies were especially vulnerable to adverse effects of comparisons with professional models. This effect might be based on these women's specific comparison tendencies. Trampe et al. (2007) found that the unhappier women were with their bodies, the more they reported that they compared their own body with those of other women. Furthermore, they seemed to differentiate less between potential comparison standards. While body-satisfied women did not show comparison effects in response to attractive models, but only to equally attractive nonmodels, body-dissatisfied women showed comparison effects regardless of whether the standards were models or not, and even in response to inanimate objects such as thin vases. Taken together, these findings indicate that characteristics of perceivers, comparison standards, and subtle situational differences all affect the impact of idealized media images on self-evaluation in a way predicted by social comparison theories.

2.4 Physical Body

2.4.1 Physique Variations

A number of theories have been developed to define different types of body sizes and body shapes. The first body shape system was developed by Sheldon (1940). Later, Douty introduced a body shape and sizing study from the perspective of the apparel industry (Douty, 1954). In this research, Douty focused on the body shape that is relative to the fit of garments by the technique of somatography, a method of capturing body characteristics by studying body shape and posture.

In 1981, August developed another system representing the difference of body shapes using letters of the alphabet. Four letters—A, X, V, and H—were used to illustrate the various proportions of human body shapes from a frontal view. Apart from front view, she also developed another way for classifying the body shapes in side views by using lower case letters b, d, i, r.

Later, Joseph-Armstrong divided body shapes into four different categories (Joseph-Armstrong, 2006; LaBat & DeLong, 1990):

1. Hourglass shape: having aligned shoulders and hips with waist/hip circumference difference of 13 or more inches.
2. Rectangular shape: having aligned shoulders and hips but waist/hip circumference difference of 8 or less inches.
3. Inverted triangle shape: a body where shoulder width exceeds hip width.
4. Pear shape: a body with broader hip width and narrower shoulder width.

To evaluate the relationships among body characteristics with reference to 529 3D body scans, Alexander suggested that women more often have pear shapes than inverted triangle shapes (2003).

Connell, Ulrich, Brannon, Alexander, and Presley (2006) developed the Body Shape Assessment Scale (BSAS) with the aim of employing nine body shape templates created by other researchers. The BSAS serves as a tool for people to assess body shape, from both front and side views (Connell et al., 2006).

In comparing to earlier methods, where body shapes are generally identified by subjective comparisons of body silhouettes or by calculating ratios of girths, Song and Ashdown (2011) used principal component (PC) analysis and cluster analysis to develop a reliable and objective categorization method for the lower body shapes of women based on SizeUSA body scan data. They reported that waist to hip silhouette, top hip to full hip silhouette, and buttocks prominence made contribution to explain variance of lower body shapes. They also developed two discriminant functions using raw measurements to define a new person's body shape group.

2.4.2 Body Mass Index

Body mass index (BMI), which is based on weight and height measurements, is one of the anthropometric assessments of the human body that can aid an understanding of human body shapes or build. According to the National Center for Health Statistics definitions (Centers for Disease Control (CDC), 2015), BMI is a reliable indicator of body mass and a tool for indicating weight status in children, teens, and adults. Many organizations like the World Health Organization (WHO), the CDC, and the National Heart, Lung and Blood Institute (NHLBI) also categorize peoples' body builds by BMI range.

Table 1
Calculation of BMI

Measurement Unit	Formula and Calculation
Kilograms and Meters	Formula: $\text{weight (kg)} / [\text{height (m)}]^2$ With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. Since height is commonly measured in centimeters, divide height in centimeters by 100 to obtain height in meters.
Pounds and Inches	Formula: $\text{weight (lb)} / [\text{height (in)}]^2 \times 703$ Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.

According to the CDC (*Body Mass Index (BMI)*, 2015), BMI is applicable to both males and females of all ages. For all adults aged 20 or above, the interpretation of the BMI standard would be the same, while for children and teens, a separate interpretation of standards would be applied.

By comparing BMI scores, four different categories of standard adult male and female body sizes can be distinguished: underweight, normal, overweight, and obese. The CDC also offers definitions of each (2015), as shown in Table 2.

Table 2
BMI Categories

BMI	Weight Status	Definitions
Below 18.5	Underweight	The condition of weighing less than normal or desirable for one's height and build.
18.5–24.9	Normal	An ideal or healthy weight.
25–29.9	Overweight	A condition in which a person's weight is 10%–20% higher than "normal," as defined by standard height/weight chart.
30.0 and above	Obese	A condition in which a person's weight is 20% or more above normal weight.

However, more recently, researchers have found that there should be different standards for BMI categorization of different ethnic groups. For instance, according to the Chinese Medical Association:

The average Chinese BMI is much lower (than that of the Americans); the normal mean is 18.5 to 23.9. Because the Chinese have a lower baseline BMI to begin with, it takes fewer increments to reach an obese level, so that BMI of 24 to 27.9 is considered overweight and ≥ 28 is considered obese.

2.5 Clothing Fit

Clothing fit is one of the most important criteria to evaluate when making apparel purchases (Eckman, Damhorst, & Kadolph, 1990; Hsu & Burns, 2002). Consumer perception of a good-fitting garment may include the individual's desire for a garment to conform loosely to the body, to provide comfort, or perhaps to conform perfectly to the body and provide the desired appearance for women who

wish to reveal their body contours. Perceived satisfaction with fit implies physical comfort, psychological comfort, and appearance, which all work together (Frost, 1988).

Apparel is a high body-involving product with consumption experience closely related to fit and tactile information (e.g., touch and feel). In physical retail stores, body-related information can be examined by trying on the item, which allows consumers to make visual and embodied evaluation of the garment. However, in the online apparel shopping environment, because of the inability to try on the garment, customers need to depend on their imagination (simulation resources) to make the purchase decision, which may increase risk with the transaction (Rosa & Malter, 2003) .

2.5.1 Definition of Fit

Fit is important to garments and can be affected by many factors. However, “fit” is a difficult and abstract concept. The definition of garment fit depends on culture, industrial norms, and people’s perceptions. Many researches and experts have defined the term of “fit” in different ways, including the following examples:

- Efrat (1982) presented the idea that “Clothing fit is a complex property which is affected by fashion, style and many other factors.”
- Frost (1988) advised that physical comfort, psychological comfort, and appearance all play a part in the consumer’s perceived satisfaction of fit.
- With reference to Ashdown & DeLong (1995), fit is the relationship between the clothing items and the body.
- Fit may be defined as the way a clothing item conforms to the body (Workman & Lentz, 2000).
- Stamper, Sharp, and Donnell (1991, p. 15) define “a well-fitting garment as one that is comfortable to wear, with sufficient room to allow for easy movement, no unnecessary wrinkles and bunching of the fabric nor a display of bagginess, and that it should be aesthetically acceptable as well as fashionable.”

- A clothing item with a good fit ought to conceal the wearer's figure faults, complement the body, and provide well-balanced proportions (Tate & Shafer, 1982).
- Liechty, Pottberg, and Rasband (2000) determined that a good fit is based on three factors, namely balance, room for movement, and appearance. Balance means that the garment has to be done to evaluate the hang of the constituent parts making up the garment and judging whether the whole garment is hanging on the body as it was intended to hang.

2.5.2 Clothing Fit and Patternmaking

Traditional pattern making methods. Fashion is always changing, but the principles of pattern cutting remain the same. MacDonald (2002) stated in *Principles of Flat Pattern Design* that there are in total three methods of apparel design used to develop patterns for the 3D human body. These are draping, drafting, and flat pattern making. All three methods should be worked with exact body measurements together with basic ease and design ease.

Flat-pattern design, which is a logical method for producing innovative apparel designs, is extensively used for RTW products. Sets of formulae are developed by the pattern cutters to generate the slopers, which are the foundation for producing effective apparel design. Creative flat-pattern design provides an added dimension to apparel design and a better understanding of the processes involved in producing RTW products.

Different companies or pattern makers have their own rules in pattern making according to their target customers' statistics because people of different ethnicities vary in body shape. They also live different lifestyles and have different clothing fit preferences. In addition, each company's sizing systems or size charts are different. Therefore, sloper-generating methods vary from country to country, or even company to company.

Ease allowance and clothing fit. Ease allowance of a garment, which refers to the quantitative difference between body and clothing dimensions, must be optimized and distributed properly because it is important to the garment's appearance and fit. It is generally recognized that the amount of ease

allowance is determined by four factors: (a) the design and function of the garment, (b) the garment fabric, (c) the body figure of target customers, and (d) personal preference (Cooklin, 1997).

Improper ease distribution may result in poor fit performance. Myers-Mcdevitt defined two types of ease allowances (Myers-McDevitt, 2004): wearing ease and design ease. The wearing ease of a garment is used for providing space for basic body movement, for the reason that wearers must be able to move, bend, breathe, sit, raise their arms, and walk without the garment being overly pulled, pinched, stretched, or strained beyond a natural relaxed position. Design ease, meanwhile, is employed in creating design features.

Computer-aided pattern making. More and more companies are applying computer-aided design (CAD) techniques for both fashion design and pattern creation because they offer greater efficiency and time-saving solutions to complicated tasks and can help facilitate Internet-based communication among designers, manufacturers, and retailers.

Three-dimensional (3D) CAD software packages are available that can produce virtual prototypes of clothing. 3D-to-2D pattern making is a relatively new approach in which the designer develops a clothing design on a 3D body and then flattens the 3D shape into 2D pattern pieces (Huang, 2010).

2.5.3 Standards for Fit Evaluation

Fit evaluation is a complicated process in which the relationship of the garment to the body is analyzed based on multiple criteria. Although it is difficult to understand the concept of fit, there are several evaluation methods developed by researchers. These methods can be divided into subjective and objective fit evaluations.

Subjective evaluation of fit is determined by individuals wearing garments. It allows the wearer who has a personal relationship to the garment to judge its fit based on tactile factors. However, two subjects who are of the same size or body measurements may have different comments on or perceptions of the clothing fit (Alexander, Connell, & Presley, 2005). On the other hand, fit evaluation conducted by expert panels is more consistent, especially when a fit evaluation scale is provided. Trained judges follow

criteria to analyze fit, and they discuss and negotiate rating scales to reach consensus before final decisions are made. Therefore, fit analysis by trained judges is believed to provide reliable and valid data (Ashdown, Loker, Schoenfelder, & Lyman-Clarke, 2004). Consumers' perception of clothing fit is less studied.

In both the case of expert-perceived evaluation and self-perceived evaluation, a fit evaluation sheet is usually developed based on published fit analysis instruments. This fit evaluation sheet provides judges, no matter how much fitting experience they may have acquired, with an organized and systematic guideline for analyzing clothing fit. Fit criteria are generally organized into groups and listed in detail. Responses are often collected in Likert three-point or five-point scales. For instance, criteria such as overall alignment, grainline, balance, and placement of darts, seam, and other details, overall looseness and tightness and looseness and tightness in different locations are asked about specifically.

Different rating scales have been developed for the subjective evaluation of clothing fit, such as the Likert type scale (Likert, 1932), Wearer Acceptability Scale (Huck, Maganga, & Kim, 1997), and Fit Evaluation Scale (Shen & Huck, 1993). Taking the Fit Evaluation Scale, developed by Shen and Huck in 1993, as an example, the rating scale ranges from "Much too tight" to "Much too loose." Thus, the middle of the scale represents a "good fit" garment.

Place a check between each pair of adjectives at the location that best describes <i>how you feel</i> .		
1. Comfortable	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u> *	Uncomfortable
2. Acceptable	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Unacceptable
3. Tired	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>9</u>	Rested
Place a check between each pair of adjectives at the location that best describes <i>the clothing you are wearing</i> .		
4. Flexible	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Stiff
5. Easy to put on	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Hard to put on
6. Freedom of movement of arms	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Restricted movement of arms
7. Easy to move in	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Hard to move in
8. Satisfactory fit	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Unsatisfactory fit
9. Freedom of movement of legs	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Restricted movement of legs
10. Freedom of movement of torso	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Restricted movement of torso
11. Dislike	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>9</u>	Like
12. Loose	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Tight
13. Crotch of overall right distance from body	<u>9</u> <u>8</u> <u>7</u> <u>6</u> <u>5</u> <u>4</u> <u>3</u> <u>2</u> <u>1</u>	Crotch of overall too close or too far from body
* Number added for reader reference only		

Figure 4. Wearer acceptability scale.

Adapted from "Protective overalls: Evaluation of garment design and fit," by J. Huck, O. Maganga, and Y. Kim, 1997, *International Journal of Clothing Science and Technology*, 9, p. 52. Copyright 1997 by Emerald Insight.

The Figure 5 is another example of fit evaluation scale (Fan, Yu, & Hunter, 2004; Yu, Yeung, & Lam, 1998).

Jacket #: _____

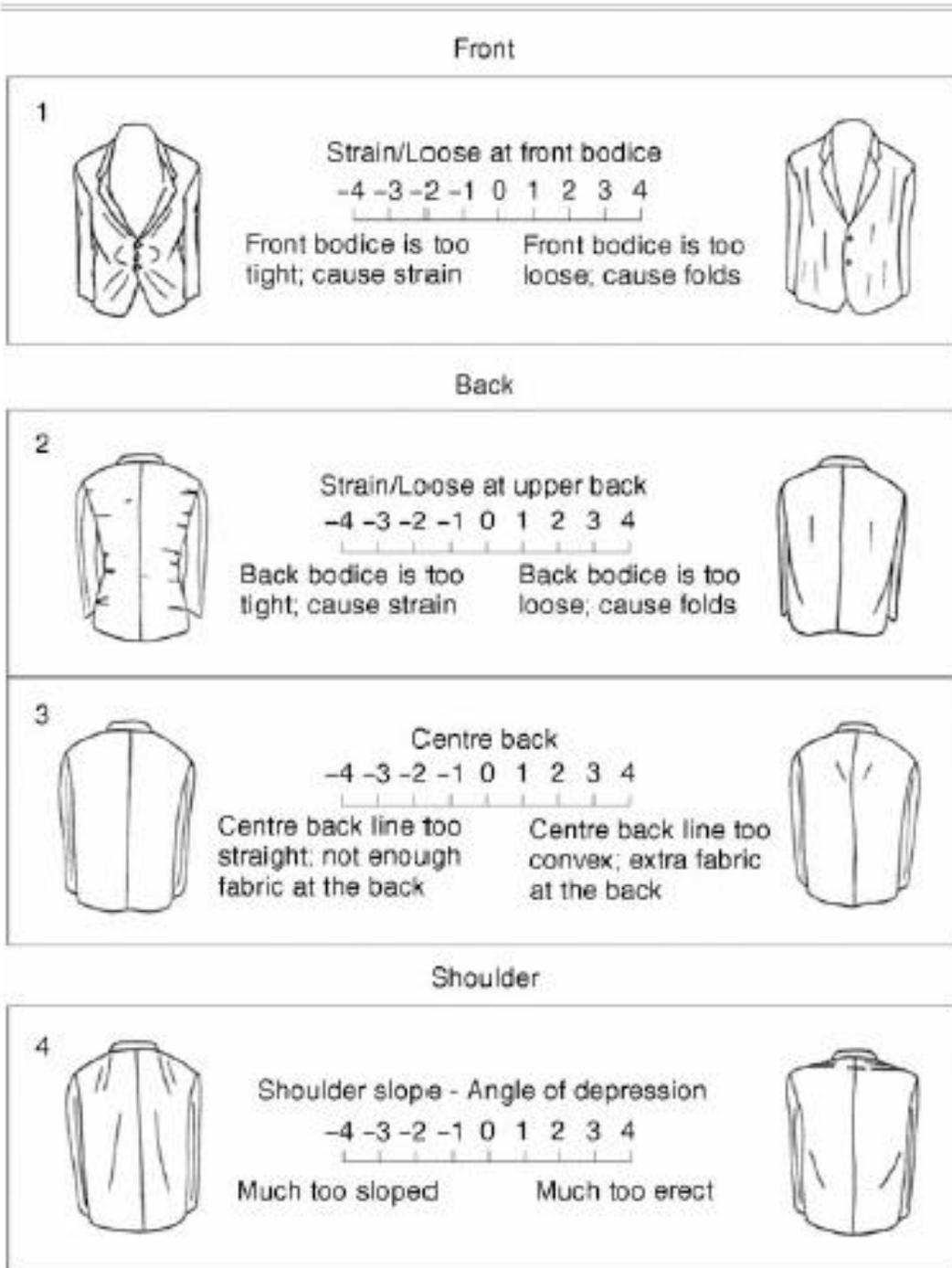


Figure 5. Fit evaluation scale.

Adapted from "Assessment of Garment Fit," Proceedings of the HKITA and CTES Conference on Hand-in-Hand Marching Into 21st Century (p. 125), by W. Yu, K. Yeung, and Y. Lam, 1998. Copyright 1998 by W. Yu, K. Yeung, and Y. Lam.

Apart from subjective assessment in clothing fit, objective assessment also has significance because of its precision and effective communication. Different types of methods, such as Moiré optics methods (Patorski, 1993), algebraic evaluation methods, clothing waveform, pressure evaluation, and 3D modeling of pressure fit (Fan et al., 2004) have been developed to carry out objective assessment.

2.5.4 Concerns on Current Ready-to-Wear Market

Inconsistent and inaccurate sizing, due for instance to vanity and exclusionary sizing, are associated with consumers' concerns with fit and garment size. Because companies adjust sizing for store image purposes, clothes are becoming bigger or smaller within size ranges that were previously somewhat consistent, making consumers even more confused about what size to order. Consumers may feel that apparel retailers are trying to deceive them into thinking that they are slimmer than they are in order to make them purchase their products or slim enough to deserve to wear a brand. In fact, it was found that some consumers are annoyed that they had to spend a lot of time trying on garments in fitting rooms and/or returning ill-fitting products purchased from websites (Kim & Forsythe, 2008).

Sizing systems. Size charts are widely used in the apparel retailing industry for manufacturing ready-to-wear (RTW) items, generally dividing people into different groups according to their body shape and dimensions. Size charts are derived from large amounts of anthropometric data over a long period of development.

Concerns with clothing fit. Ill-fitting garments have serious implications for customer satisfaction and for profits. Concerns with fit and accurate sizing are among the most important reasons why consumers are reluctant to purchase apparel, especially online.

Concerns with fit and size of garments relate to the consumer's subjectively determined expectations and perceived risks in considering a particular purchase decision. As Frost (1988) has suggested, perception of good fit may consist in the consumer's desire for a garment to fit loosely on the body to provide comfort or to fit perfectly to enhance appearance.

Consumers' perceived satisfaction with fit may include physical comfort, psychological comfort, and appearance (Frost, 1988). Therefore, it was expected that concerns with fit and garment size would consist of multiple dimensions and that consumers have different types of concerns with fit and garment size when shopping for apparel online compared to when shopping for apparel in physical stores. In accordance to this, Kim and Lennon (2008) found that concerns with fit and garment size comprised distinct multiple dimensions. It appeared that shoppers in both offline and online contexts shared similar concerns with fit and garment size to some extent, but at the same time, the concerns with fit and size in the two different shopping formats were explained by different dimensions. In the online shopping context, two dimensions were identified—concerns with inability to try on garments and with imagining the fit and size in online shopping—that point to concerns with fit and size unique to online shopping.

In addition, concerns with fit and garment size include psychological concerns associated with self-image. Consumers may have concerns about projecting the self-image they want to show other people or giving correct and positive impressions about themselves when wearing their purchases.

2.5.5 Personal Clothing Fit Preferences

Fit preference and the physical body. Body shape affects clothing fit directly. The U.S. population is so physically diverse that providing quality garment fit has been one of apparel companies' greatest challenges (Ashdown, Loker, & Adelson, 2005). In fact, one-half of women reported that they cannot find apparel that fits. Fit and size issues are the reason behind 50 percent of catalog returns and are a primary reason for not purchasing apparel online (DesMarteau, 2000). Thus, an understanding of physique variations and sizing systems can foster a deeper understanding of clothing fit. In addition, it is essential to have a thorough understanding of the differences between measurements of the actual body and measurements of the garments that fit over the body.

Fit preference and body image. Although a few studies have investigated the relationship between body image, especially body dissatisfaction, and fit preferences, especially concerns with fit and size of garments, researchers have provided empirical evidence that body dissatisfaction is related to

individuals' attitudes toward clothing and satisfaction with the fit of garments. Researchers have found that individuals who are dissatisfied with their bodies tend to have negative attitudes toward apparel and are less confident about their apparel choices (Shim, Kotsiopoulos, & Knoll, 1991; Song, 2011). The higher the body satisfaction, the higher the satisfaction with clothing (Sontag & Schlater, 1982). LaBat and DeLong (1990) also found that women with a higher degree of body satisfaction are likely to be satisfied with how they perceive the fit of the garments. Therefore, it is plausible to assume that individuals who are more highly dissatisfied with their bodies may be less confident about how the garments fit on their bodies. Thus, they feel higher degree of concerns with fit and size of garments. According to the theory of cognitive dissonance, when consumers are confronted with new information that is not consistent with their existing cognitions, they experience a state of dissonance that may cause psychological discomfort. In other words, consumers' body dissatisfaction may be caused by the state of dissonance due to the inconsistency between their actual body image and ideal body. In more recent, Song and Ashdown (2013) analyzed the relationship between garment fit satisfaction, body cathexis, and self-perception of lower-body size and shape for each body location. They studied how different categories of participants viewed themselves and how valid their self-assessments were at various locations on the body. They found that the perceived body and the preferred body were opposite at the waist size, abdomen size, hip size, thigh size, and leg length, resulting in body dissatisfaction. They also identified that customers considered a body with small waist, flat abdomen, full buttocks, curvy waist-to-hip shape, thin thighs, and long as ideal. They expected this study to provide apparel companies with an understanding of fit from a consumer's perspective. However, since their participants were all college female students from a Northeast university, it is not clear whether it is similar in an older age group.

Researchers have found that body dissatisfaction is related to negative attitudes toward apparel, lower confidence with apparel choice, and lower satisfaction with clothing as well as lower satisfaction with how they perceive garment fit (LaBat & DeLong, 1990; Shim & Kotsiopoulos, 1990; Shim et al., 1991). To be specific, individuals who were more concerned about their bodies were likely to be

concerned that garments may not look good on them or at least not as good as on ideal-sized models. They were more concerned that garments might not fit well, that the size may not fit them, and that they may feel uncomfortable in the garment. Furthermore, body dissatisfaction was found to be related to concerns with an inability to try on in online shopping. Online shopping has been associated with higher risk than in-store shopping, due to the lack of tactile information such as textures and an inability to directly inspect or try on the product (Baker, 1986; Bitner, 1992; Lee & Tan, 2003). Individuals who perceived a higher degree of body dissatisfaction were more likely to think that the fit of the garment was different from what they had seen on the website, that garments looked different when they tried them on at home, and that garments fit differently than shown on the models on the websites. In addition, they tended to believe that garments ordered over the Internet may not fit all body shapes and sizes (Kim & Lennon, 2008).

Body dissatisfaction was related to concerns with projecting a correct impression. Individuals who were more dissatisfied with their bodies tended to be concerned that they may not give others a positive or correct impression about themselves when wearing a garment. They were also concerned that the garment they purchase may reveal the parts of their body that they wanted to hide or may be too revealing (Bye & McKinney, 2007; Kang, Johnson, & Kim, 2013; Kwon & Parham, 1994).

As first indicated by the “looking-glass self” theory, the self is shaped through the individual’s imaginative processes in relation to other people; individuals imagine the others’ judgments or appraisals (Cooley, 1902). Self-concept or self-image is defined by role-taking, an estimation of how other people evaluate oneself. In online shopping, consumers may imagine not only their own appearance in the garment but also how other people respond to their appearance. Therefore, when they are not satisfied with and confident in their bodies, individuals may feel a higher degree of concern about others’ appraisals of their appearance in the garments they purchase.

Body dissatisfaction influences concerns with unavailability of size. Individuals who felt a higher degree of body dissatisfaction tended to be more concerned that they may not find their size and a

garment that fits their bodies, that the website may not carry their sizes, and that their bodies may not fit the garments sold (Kim & Damhorst, 2010). Consumers have experienced inconsistency in the sizing systems of apparel brands or stores, due to vanity or exclusionary sizing. Particularly, apparel brands targeting younger customers tend to create exclusionary sizing to keep larger-sized consumers away from their stores in order to project a certain brand image—beautiful garments for only beautiful people. The brands or stores also project these images through their advertising campaigns, particularly in the use of ideal models. Therefore, consumers' body dissatisfaction may be related to concerns with the unavailability of sizes in online shopping.

In addition, body dissatisfaction is related to concerns with imagining fit and size in online shopping. Individuals who felt a higher degree of body dissatisfaction tended to be more concerned that they might have a difficult time picturing themselves wearing the garment and imagining the fit of the garment sold on the website (Kim & Damhorst, 2010). Consumers cannot try on garments prior to purchase in online shopping and, therefore, consumers must guess the fit and size of the garment based on their previous experiences with the brand and with shopping in general and usually with a provided size chart. Even though a size chart generally lists the measurements a brand defines each size to fit, it could be confusing and might not be accurate.

Perhaps individuals who are concerned about their bodies have had more difficulties with fit and are likely to be less confident with their guesses about the fit and size of garments when shopping for apparel online. Researchers and marketing practitioners have been interested in how they facilitate consumers' information processing in online shopping using visual and verbal information. Particularly, because the apparel consumption experience is acquired through body-related information such as fit or touch, e-retailers have developed various technology devices, such as enlargement, panning, zooming, and virtual models, to help consumers visualize the product or consumption experience with the product. In addition, researchers have investigated the effects of these visual devices on consumers' emotional,

cognitive, or behavioral responses in online apparel shopping (Kim & Lennon, 2007, 2008; Park, Lennon, & Stoel, 2005).

2.6 3D Body Scans

Research on developing and applying new computer techniques such as 3D body scanning for anthropometric applications and apparel design has been conducted since the end of the last century. Body scanning has been frequently used for acquiring body measurements for custom fit and size selection applications, as well as anthropometric studies. In addition, integrating 3D techniques with 3D body modeling and customized apparel design is considered a potential solution for improving clothing fit and personalizing designs.

A body scanner creates a dimensionally accurate computer image of the body. Cameras and various types of light sources are used to capture a 360-degree view of the body, resulting in a collection of data points that are assembled on the screen into a 3D model. The 3D body scan is a noncontact method to obtain body measurements and provides a permanent record that can be accessed for future reference and analysis. A variety of software has been developed to extract linear measurements from the data including length, width, circumference, and a variety of angles.

A number of body scanners use various ways for collecting measurements of the human body (Daanen & Ter Haar, 2013). One of the first, developed in the United Kingdom by Loughborough University, used a shadow scanning method to acquire the participant's image. To serve the current apparel industry, there are several suppliers providing specialized 3D body scanning solutions such as Textile Clothing and Technology Corporation ([TC]²), Human Solutions, Size Stream, and Telmat Industries.

Depending on the mechanism for capturing the image, body scanners available on the market can be classified into three categories, namely light-based, laser-based, and stereophotogrammetry (Daanen & Ter Haar, 2013; Istook & Hwang, 2001). The most common body scanners available today are laser- and light-based body scanners. Examples of light-based machines are [TC]²'s body scanners, while Human

Solutions and Cyberware, Inc.'s WBX and WB4 systems are laser based. Fan, Yu, et al. reviewed mainstream 3D body scanning systems available and introduced the underlying principles that allow these systems to work (2004). Researchers also compared 3D body scanning systems and provided some direction for further research (Daanen & Ter Haar, 2013; Istook & Hwang, 2001). Different body scanners in different categories would have their own advantages and disadvantages. For instance, light-based 3D body scanners tend to capture a less-organized point cloud than laser-based systems, but have faster speed (Daanen & Ter Haar, 2013). The volume of the scan capture area also varies, and there are large differences in the size and cost of the systems. In addition, there are potential safety issues with light-based scanners, as their pulsing lights could potentially trigger seizures in some people—but neither this nor the laser systems' issue of danger to the eyes has been tested and studied (Istook & Hwang, 2001). It is very possible that they are just concerns that companies have raised to promote their own system.

2.6.1 3D Body Scanning for Clothing Applications

After more than 20 years of research, 3D body scanning techniques are now quite mature, and some commercial 3D body scanning systems are applied in the garment industry (Gill, 2015; Istook & Hwang, 2001; Nayak, Padhye, Wang, Chatterjee, & Gupta, 2015; Simmons & Istook, 2003). Scanning has the potential to facilitate consumers' information processing with respect to garment fit and size, particularly in online apparel shopping. Furthermore, the body scanning system or body scan data can provide new insights into apparel fit and sizing problems (Ashdown et al., 2005). Body scan data may be used in two ways for the improvement of garment fit and size in the fashion industry: (1) to develop a new sizing system, which can reduce issues caused by vanity and exclusionary sizing and (2) to assist consumers in choosing accurate sizes that fit their bodies in online shopping.

3D body scanning and patternmaking. Apparel design and patternmaking is one of the most popular applications of 3D body scanning and 3D modeling. With the advance of body measuring techniques, the individualized human body can be captured and used for 3D body modeling. In the field of computer graphics and animation, many researchers have been making efforts to develop 3D body

models based on 3D body scans over the past two decades (Cho et al., 2006; Choi, 2005; Wang, 2005; Wang, Chang, & Yuen, 2003; Wang, Wu, Lin, Yang, & Lu, 2007; Zhang, Zheng, & Magnenat-Thalmann, 2015). Applications of 3D models in fields such as apparel design have therefore been booming. Design software such as Optitex 3D Suite and CLO3D 3D Modelist have been adopted in both academia and industry for their 3D modeling functions.

3D body scanning and customer service. Body scanning also has the potential to allow apparel companies to offer better customer service with rapid response. 3D body scanning provides an opportunity for companies to get more information about their customers and thus information costs could be reduced (Keiser & Garner, 2012; McKinnon & Istook, 2002). Several apparel companies, such as Brooks Brothers, Alton Lane, and Arthur Caliman, have already used the automated patternmaking processes and body scanning together to fulfill customer needs in garment fit.

3D body scanning and clothing fit evaluation. Most scanners can collect over 300,000 data points in the form of xyz coordinates. These data can be analyzed in a variety of applications that can assist the process of fit evaluation and provide valuable information to improve garment fit (Connell, Ulrich, Knox, Hutton, Woronka, et al., 2003; DesMarteau, 2000).

In addition, by adopting body scan data in online apparel shopping, e-retailers may be able to decrease consumers' cognitive efforts and the perceived risks caused by guessing the fit and size of garments and to facilitate consumers' decision-making process.

3D body scanning and sizing. Fashion companies have created their own sizing systems in order to distinguish their garments from those of their competitors or to attract certain types of consumers (Loker, Ashdown, Cowie, & Schoenfelder, 2004; Loker, Ashdown, & Schoenfelder, 2005). Researchers suggest an alternative way to improve each apparel brand's distinctive sizing to fit more consumers within their target group. This approach is logistically and financially achievable using 3D body scanners, computer aided design (CAD), and grading. Therefore, fashion companies may use 3D body scanning to develop products that better fit their target customers instead of using existing sizing systems that were

not based on target market body data. In addition, although the system has not been widely used in the fashion industry yet, consumers may use their own body-scan measurements to buy custom-fit garments or choose an accurate fit and size in online shopping. In addition, FIT.ME claims that their Virtual Fitting Room and Fit Recommendation solutions could enable retailers to help shoppers with clothing fit.

2.7 3D Virtual Simulation

3D garment simulation, or draping, means computing the shape of a piece of cloth under the control of gravity (Volino, Cordier, & Magnenat-Thalman, 2005). First a 3D human body model with detailed semantic features is constructed, either standard-sized or customized. Later, either a 3D-to-2D method or a 2D-to-3D method could be used to achieve personalized design. The 3D-to-2D method generally involves putting virtual fabric onto the surface of a 3D human body pattern, which mimics the draping process first and then flattens the virtual fabric to obtain 2D patterns. On the other hand, the 2D-to-3D method involves drafting and digitizing 2D patterns first and then virtually sewing the digitized patterns around a 3D body model. One advantage of both of these two approaches is that users can directly view their design in 3D space.

Compared to the simulation of other objects, garment simulation is specialized and challenging for two obvious reasons: garment fabric is soft, and the human body is a complex, nonstatic shape. Normally, a garment on the human body can be classified into two elements (Cordier & Magnenat-Thalman, 2002): one is fit, in which the garment is in direct contact with the human body, and the other is fashion, in which the garment is draped freely to create the desired aesthetic appearance. The fit element can be directly determined by the semantic features on the human body (Wang & Tang, 2010), while fashion elements are simulated with numerical techniques according to the physical properties of garment materials.

2.7.1 Methods

Prior to the research conducted by Nadia Thalman and her colleagues (Carignan, Yang, Thalman, & Thalman, 1992; Volino et al., 2005; Volino & Magnenat-Thalman, 1995), little had been

done with comprehensive and realistic garment simulation. Only simple scenes such as a blowing flag could be simulated. After two decades of research, many efficient garment simulation models have been proposed with which customers can visualize the realism of a virtual try-on (Volino et al., 2005).

3D garment simulation methods can be divided into two groups: geometric and physical methods. Models based on geometric methods use mathematic descriptions to represent complex geometric details, such as wrinkles and folds in fabrics. Much progress has been achieved. For instance, Jing, Joneja, and Tang (2005) proposed a way to produce realistically fine details in almost real time. In addition, a novel technique for developing an approximation of garment shapes is proposed by Decaudin et al. (2006). This method is commonly favored for its fast speed; however, it involves geometric distortion, which usually causes inaccuracy (Choi, 2005). The draping results of a garment style on a standard body model can be precomputed offline according to a few constraints. Therefore, realistic simulation results of the precomputed garment style could be transferred from the standard-size human to a customized human. For the many textiles that have little stretch, the geometric model could achieve an acceptable level of accuracy.

On the other hand, physical methods using the principles of mechanics have attracted much interest too. This model adopts a triangular mesh equivalent to precisely describe surface deformation; meanwhile, accurate fabric properties are specified in the physical method. This method calculates the mechanical properties of fabrics and has a high level of simulation accuracy. Many proposed types of physical models include mass-spring models, particle models, and elasticity-based models (Fan, Wang, Chen, Yuen, & Chan, 1998; Fontana, Rizzi, & Cugini, 2005; Kang & Kim, 2000; Kunii & Gotoda, 1990; Provot, 1995; Volino & Magnenat-Thalmann, 1995, 1997). In order to take advantage of the merits of both geometric and physical methods, specifically the fast speed of geometric methods and the accuracy of physical methods, some researchers have proposed hybrid methods (Kunii & Gotoda, 1990; Volino & Magnenat-Thalmann, 2000). This model adopts a triangular mesh equivalent to precisely describe surface deformation, while accurate fabric properties are specified in the physical method.

3D virtual sewing. Flat patterns cannot be used directly for the virtual simulation until it is entered into the computer. Digital 2D garment patterns are first constructed and then visually stitched and simulated for fit checking in 3D space in real time. Kim and Park (2006) developed a versatile DXF conversion algorithm to import the DXF files from most commercial CAD systems to enable users to use various garment patterns.

The pre-positioning of garment pattern pieces on a human model is a major task of 3D virtual sewing. Those pieces must be forced together by certain constraints. Igarashi presents the interaction function by allowing the manipulation of clothes around body surfaces on 3D body models (Igarashi & Hughes, 2003). In contrast, Fuhrmann, Groß, Luckas, and Webber proposed a novel geometric pre-positioning approach in which single pieces of clothing patterns are placed with respect to a human body (2003). Although their method is interaction free, it is not suitable for clothing industry application (Meng, Mok, & Jin, 2010). Meng et al. (2010) introduced a set of manipulations that allow users to interact with human models and the placement of pattern pieces around them. This method can make complex garment design details apparent, which was not possible by traditional geometric methods.

Virtual representation of fabric properties. Assessment of different fabric properties is necessary for successfully modeling for virtual fit systems. The quality and appearance of a garment are strongly related to the quality and other properties of its fabric. Traditionally, fabric quality has been evaluated by individual experts in terms of subjective sensations. However, this assessment method is not repeatable or reliable due to individual variation in assessment. As early as 1930, researchers recognized this difficulty and began to develop a quantitative evaluation approach to fabric quality in view of garment design and manufacturing. Peirce first used fabric mechanic properties to describe subjective physiological sensation (Peirce, 1930). Later, human interaction in the fabric assessment process was gradually diminished (Dawes & Owen, 1971a; 1971b; Howarth, 1964). A breakthrough in this field of research was made by Kawabata and his research team in 1980s. After the establishment of the Hand Evaluation and Standardization Committee and the publication of Kawabata's classic paper (1980), the

terminology and procedures used in subjective hand evaluation was standardized and the connection between subjective hand expressions and objective fabric mechanical properties were established (Atkinson, 1995). Based on this research process, a Kawabata Evaluation System for Fabric (KES-F system) testing was developed. It has four instruments: tensile and shear tester, bending tester, compression tester, and surface tester. The KES-F system does not require a skilled operator, and it could test fabric automatically and provide continuous stress-strain curves. This system has been widely used for academic research purposes. However, it also has several disadvantages. For instance, it is relatively expensive, inconsistent, and sophisticated. In view of that, the Fabric Assurance by Simple Testing (FAST), which was developed by CSIRO Division of Wool Technology, is considered an inexpensive and simple alternative. In contrast with the KES-F system, the FAST system can only measure a fabric's resistance to deformation, while the KES-F system can measure a fabric's recovery from deformation. Therefore, these two systems are used for different circumstances.

2.7.2 3D Virtual Try-On for Clothing Applications

A large number of commercial 3D systems have been developed and introduced to the apparel industry. However, 3D methods have some flaws, as well, including high cost, instability, and limited application. To overcome these shortcomings, many researchers have proposed to combine both 2D and 3D techniques in recent years.

3D virtual simulation for fit evaluation and communication. Several 3D virtual simulation systems, such as 3D Runaway Designer by OptiTex, V-Stitcher™ by Browzwear, e-fit Simulator™ by TukaTech, and Modelist by CLO3D, are able to visualize digital garments on 3D virtual avatars. However, they are mostly used by professionals in the apparel industry or in academia for research and education purposes. They all claim that their products are able to simulate the draping effects of real garment to a satisfactory level. However, little information as to how they define and test the “accuracy” of the performance of their products or in support of their claims is available to the public. Among those that have performed publicly available studies, TukaTech worked with Tesco, the UK-based retailer, to test

the accuracy of their 3D simulation software for a children's line. They claimed that it is accurate enough to reflect physical sample production. Meanwhile, My Virtual Model (MVM) was one of the earliest virtual try-on systems available online to consumers of Lands' End, Levi's, and Lane Bryant, among others (Istook, 2008). The retailers who have used MVM reported reduced return rates, longer time stayed on websites, more purchases, and more money spent. However, those early versions of 3D simulation products were mainly for style representations, not for fit analysis. When 3D body scan is integrated with 3D virtual try-on, the virtual image becomes more realistic and relatively more accurate. As discussed by Kim and LaBat (2013), 3D simulation replicates an in-store fitting room experience by creating virtual bodies and garments for trying on. The interactive nature of 3D simulation technology introduces more consumer involvement in online clothing shopping than traditional online clothing shopping, where only 2D visuals such as photos plus text and videos are provided.

2.7.3 Consumers' Attitudes Toward 3D Virtual Simulation

Even though it has been generally accepted that consumers' acceptance level of technology is one of the keys to the success of that technology, little is known about consumers' attitudes toward 3D virtual simulation.

Loker, Ashdown, et al. (2004) reported that female participants within the age ranges of 19–22 and 34–55 both responded positively about using 3D virtual try-on for creating custom fit garments. However, their responses were based on descriptions of the 3D virtual try-on technology only. Lee, Damhorst, Lee, Kozar, and Martin (2012) found that women aged 60 and over had relatively less interest in virtual try-on than in the use of 3D body scanning. However, again, this survey-based study was conducted after showing the participants a short film of the 3D body scan process without actual trial of the 3D technology.

Kim and LaBat (2013) examined 19- to 35-year-old consumers' experience and satisfaction of using 3D virtual simulation technology for online shopping, as well as their willingness to use the technology. They 3D body scanned and then created a virtual model for each participant. In addition,

participants completed a questionnaire and were interviewed after completing a simulated online shopping experience that used 3D virtual simulation technology. The participants reported that the virtual model was impressive and was a good starting point for fit analysis and that they were therefore likely to use it in the future. However, they also reported some inaccuracies in the visual representation of the clothing, and some common concerns raised by the participants included privacy issues, availability of technology, and the discomfort of viewing one's own body scan. Since the participants were relatively young, it is not clear how mature women would respond to the same conditions. Moreover, even though the participants had actually experienced 3D virtual try on, there is no comparison with real fittings. In other words, no baseline for fit analysis was set. The reported result is merely based on imagined fit satisfaction. Furthermore, there is no further information about the participants' level of or past experience with fitting, which may have a great influence on their skills in assessing fit in a 3D virtual environment.

CHAPTER 3

A CROSS-CULTURAL STUDY INVESTIGATING 34- TO 55-YEAR-OLD WOMEN'S BODY IMAGE AND APPEARANCE MANAGEMENT STRATEGIES

3.1 Introduction

This research paper explores and discusses the interactions among mature women's physical body, perceived body in mind, and appearance management strategies, looking at those issues in two different cultures. A comprehensive study of women's body image issues and appearance management strategies, as well as how those two are related to their physical body is needed for two reasons. First, most of the existing knowledge about those topics has been generated based on studies of western culture. The influences of culture on women's body image and appearance management strategies merit further study. Second, most of the published research is based on college-age female Americans. Mature women are an important but under studied age group.

To be more specific, first, some previous research projects have indicated that culture has an influence on body image and appearance management strategies. However, since only a limited number of empirical studies have been conducted to investigate the influence of culture on those topics, their mechanisms and patterns are still not clear. Second, though there is some information indicating the common use of clothing as an appearance management strategy, empirical evidence is not available. In addition, few studies have been identified that systematically study women's current wardrobe and their clothing needs and preferences. This type of research could provide valuable information on how to improve current ready-to-wear clothing (RTW) to better suit customers' demands. Thus, it is necessary to conduct a cross-cultural study to further explore the role of culture and age in shaping women's body image and influencing their adoption of different appearance management strategies, as well as their

effect on women's attitudes toward clothing. In this study we investigated American and Chinese mature women's body image issues, appearance management strategies, and wardrobes.

3.1.1 Body Image

Body image has been conceptualized as a complex and multifaceted construct. As defined by Cash and his colleagues, it refers to subjective perceptual and attitudinal experiences about one's body, particularly one's physical appearance (Cash, 2012; Cash & Pruzinsky, 2004). Researchers have proposed that there are two dimensions of body image attitudes: body image evaluation and body image investment (Cash, Melnyk, & Hrabosky, 2004). Body image evaluation refers to satisfaction or dissatisfaction with one's body, including evaluative beliefs about it, such as actual-ideal appearance discrepancies. In fact, both theories and research on body image have an emphasis on body dissatisfaction and have been largely pathology driven (Smolak & Cash, 2011; Tiggemann & McCourt, 2013). On the other hand, body image investment means the cognitive, behavioral, and emotional importance of the body for self-evaluation. Comparatively, body image investment has received less attention in research. However, conducting research on body image investment is crucial for acquiring a comprehensive understanding of body image and how it influences human behavior (Cash, 2012).

Since body image is such a multidimensional concept, it is important to define the term and how it is used in the present study. The study's goals and framework were based on a definition of body image that encompassed both body/appearance satisfaction and the importance of one's body/appearance in self-evaluation. Therefore, both body image evaluation and body image investment were investigated. In addition, studying body image is about examining not just the mentally perceived body but also the related aspects of the physical body itself and the mechanisms by which people experience their own bodies and how those experiences guide their behavior, consciously or unconsciously. Thus, one of the focuses of the present study was investigating the interactions among these three aspects of body image.

3.1.2 Theoretical Framework

This study was designed under the umbrella of two theories: social comparison theory and self-discrepancy theory. On the one hand, social comparison theory provides a guide to explore how women evaluate their physical appearance and how body image develops and evolves over time in different cultures. This theory centers on the belief that there is a drive within individuals to define the self (Festinger, 1954). It was hypothesized that when people are uncertain about a specific attribute, they will clarify their standing by examining the attribute with regard to objective sources of information or against direct physical standards or will examine others as sources of comparison standards when other sources of information are not readily available. Therefore, different standards could be adopted for different reasons, including self-evaluation, self-enhancement, and self-improvement (Chadee, 2011). In addition, it has been reported in the literature that factors associated with ethnicity, race, and culture may moderate the effects of the comparison process (Aune & Aune, 1994; Bessenoff, 2006; Chaker, Chang, & Hakim-Larson, 2015; Corcoran et al., 2011). In considering this, it is understandable that the standards chosen by individuals greatly influence their self-perception, including their mental perceptions of their physical bodies. In addition, it has been generally recognized that the more often a particular standard has been used, the more strongly it will be associated with the self-evaluation task and the more likely one will internalize this standard and engage in further comparison with it.

On the other hand, the use of self-discrepancy theory, which was first described by Higgins (Higgins, 1987; Higgins, Bond, Klein, & Strauman, 1986; Higgins, Klein, & Strauman, 1985), is proposed to help understand individuals' emotions and behaviors within and after the comparison process because social comparison theory itself is not able to explain the mechanism by which individuals deal with the outcomes of this comparison (Corcoran et al., 2011). Self-discrepancy theory postulates three basic domains of the self: actual self, ideal self, and ought self. It states that a comparison process between ideal self (constructed on the basis of internalized standards of the ideal self), ought self (a representation of the attributes that one believes one ought to possess or that one believes other people

believe one ought to possess), and actual self could result in a gap which can bring in emotional discomfort. Therefore, people are motivated to reduce the gap in order to remove this disparity among internalized standards. Appearance management is one type of behaviors motivated by discrepancy. motivate behaviors (Bessenoff, 2006; Rudd & Lennon, 2000). In fact, the two theories together could leverage the investigation of body image issues and appearance management behaviors; however, they focus on different sections and stages of the story, and they look into it from different angles. In addition, they complement each other. They were therefore both studied and used to shape this study to provide a well-rounded and solid theoretical foundation.

3.1.3 Objectives

With its focus on 34- to 55-year-old women, the present study’s major aim was to investigate the interaction between women’s adoption of appearance management strategies and their mental perceptions of their bodies. In addition, it studied the role that the physical body played in this process. Further, as a cross-cultural study, it investigated how culturally established beauty standards affected women’s body image and their adoption of appearance management strategies.

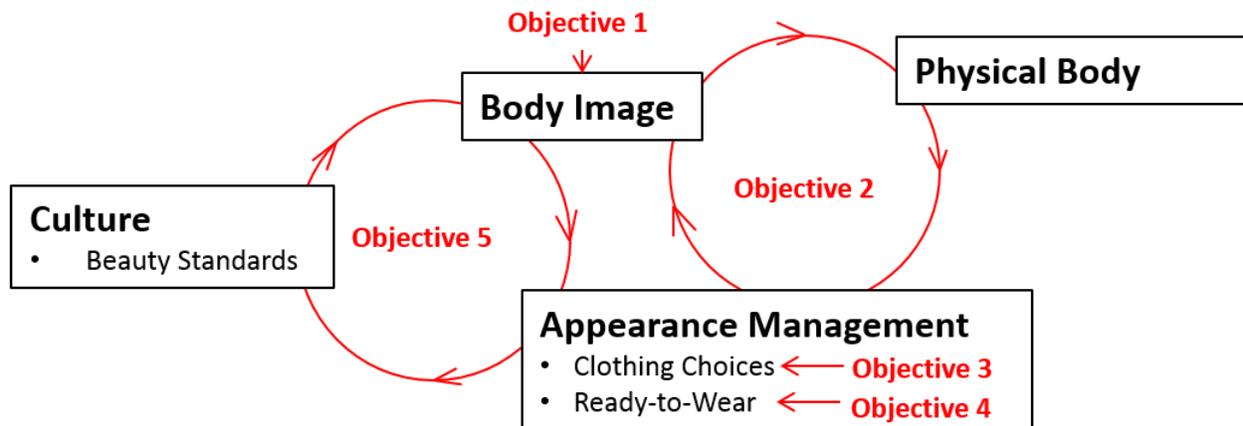


Figure 6. Survey study objectives.

As shown in the above figure, there were five secondary objectives to this study. The first was to understand the body image held by 34- to 55-year-old women living in two different cultures. Second was to study their appearance management strategies, with an emphasis on clothing choices. Particularly, this

study investigated how women's clothing style and fit preferences relate to their body image and to their physical bodies. The third objective was to examine women's clothing shopping behaviors. The fourth was to acquire knowledge about women's expectations of and concerns about ready-to-wear clothing on the market. Last but not least, the study sought to investigate the socially recognized beauty standards in two different cultures and how they affect women's body image and appearance management strategies, especially their clothing choices.

By examining a less-investigated age group in two different cultures, the present study contributes knowledge to the literature on women's body image, appearance management strategies, clothing choices, and concerns about current ready-to-wear products. Therefore, it also provides insights for apparel companies whose target customers are 34-to 55-year-old women living in China or the United States.

3.2 Literature Review

3.2.1 Body Image and Appearance Management

In contemporary society, empirical knowledge and a handful of studies indicate that body image and appearance management are closely related topics, even though the major research focus of body image has been on the relationship between body shape and weight- and health-related issues, especially eating disorders. ;

Previous studies have reported that body image is associated with the consumption of fashion products such as clothing for different purposes, and the process is mostly moderated by self-esteem (Cash & Pruzinsky, 2004; Kang et al., 2013; Lennon & Rudd, 1994; Rudd & Lennon, 2000). Individuals who have a negative feeling toward themselves may use clothing as a tool to enhance their self-esteem and strengthen their self-concept (Dubler & Gurel, 1984; Kwon, 1991). In addition, Tiggemann and Andrew (2012) found that BMI and self-classified weight were positively correlated with the choice of clothes for camouflage. Self-objectification was positively correlated with choice of clothes for fashion and negatively correlated with choosing clothes for comfort. This situation is in line with social

comparison theory and self-discrepancy theory. In addition, several researchers claimed that clothing is often used to improve one's body satisfaction or decrease body dissatisfaction relative to cultural ideals (Kaiser, 1997; Kwon & Parham, 1994; Lennon et al., 1999; Tiggemann & Lacey, 2009).

3.2.2 Body Image, Culture, and Age

It is generally accepted in the literature that culture have an influence on body image; however, the kinds of effects are not clear. For instance, it was found that people who grew up in American culture, regardless of gender, age, and BMI, are dissatisfied with their body and appearance (Domina, Heuberger, & MacGillivray, 2008; Grogan, 2008; Tiggemann & Lynch, 2001). In addition, body image is associated with internalized beauty standards (Chaker et al., 2015; Cheng, 2014; Pozzebon, Visser, & Bogaert, 2012; Shahyad, Pakdaman, & Shokri, 2015). Since beauty standards, including ideal physical body/appearance and the importance of physical body/appearance, vary among cultures as well as within cultures across groups and time, it is understandable that body image also varies in different cultures.

Researchers have asserted that women from different ethnic groups are exposed to, perceive, and react to mainstream Western sociocultural messages differentially with regard to appearance standards and values (Aune & Aune, 1994; Howson, 2013; Mandhachitara & Piamphongsant, 2016; Mellor et al., 2013; Mintz & Kashubeck, 1999; Stanford & McCabe, 2005; Swami et al., 2010; Wardle, Bindra, Fairclough, & Westcombe, 1993; Warren, 2014). A variety of studies have been conducted addressing the cultural differences between the United States and China, such as body image, ideal beauty, and sexuality (Chen & Jackson, 2012; Jackson & Chen, 2008; Liao, Jackson, & Chen, 2014; McCabe et al., 2012). However, contradictory findings are reported. In addition, due to a lack of studies on these issues among Chinese women, there is limited information about middle-age Chinese women's body image and beauty standards (Altabe, 1998; Chen & Swalm, 1998).

It was also found that age influences women's level of body satisfaction and body investment (Runfola et al., 2013). However, older people are less negatively influenced by this type of body image disturbance and indicate less body image investment (Gagne et al., 2012; Runfola et al., 2013). Possible

explanations for this phenomenon could be: (a) there is a lower standard for physical attractiveness for older people, and they tend to accept themselves within this comparatively lower standard; (b) people tend to assign less importance to body, weight, and appearance when they get older; and (c) the costs of changing body/appearance for older people are higher than that for younger group (Cash et al., 1986; Davis, 2013; Howson, 2013; Maine, 2013; Pliner et al., 1990).

3.2.3 Limitations of Previous Studies

One issue in the contemporary literature on related topics is that the majority of studies only focus on the evaluative dimension while neglecting body image investment (Cash & Deagle, 1997; Cash & Pruzinsky, 2004). Second, existing research findings are primarily based on studies within one culture and primarily within Western cultures. Third, the majority of previous studies are based on young Americans. Fourth, the mechanism by which standards of beauty influence body image and appearance management strategies has not been determined.

To conclude, a cross-cultural study investigating 34- to 55-year-old women's body image and adoption of clothing as an appearance management strategy is needed.

3.3 Methodology

A survey was conducted to investigate the proposed research questions, followed by interviews with a subset of the survey participants to further explore survey responses. This study was designed to gain an understanding of how a 34- to 55-year-old professional woman examines, feels, and manages her physical body and appearance. In other words, it provides insight into the interactions among the physical body, body image, and the adoption of appearance management strategies and therefore suggests possible methods for improving wellbeing among this group of women in two different cultural settings. In addition, this study investigated how women use clothing to manage their physical appearance. Additional information about women's body image and their concerns about ready-to-wear (RTW) clothing were also acquired in this study.

After IRB approval was obtained, gatekeepers who have access to potential participants were contacted by phone and/or email. This study was introduced to the gatekeepers first. If they were willing, they introduced this study to potential participants. Participants were also recruited through recruitment posters posted around campus. If a potential participant was willing to participate, she was asked to respond to a survey either online or in hard copy.

Instruments based on previous researchers' work (Alfonso, Allison, Rader, & Gorman, 1996; LaBat & DeLong, 1990; Pribil, 2011; Stunkard, Sorenson, & Schlusinger, 1983; Thompson & Gray, 1995) were developed for the study. It was reviewed by two native speakers for comprehension and updated afterward. Later, it was translated into Chinese by one bilingual speaker and translated back into English by another bilingual speaker to assure the accuracy of translation. The survey was used to gather general demographic information and specific information about body image, appearance management strategies, and clothing choices, as well as consumption of and opinions on RTW. In addition, open-ended questions were included asking about participants' personal beauty standards, opinions about culturally recognized beauty ideals, and how those standards relate to their own physical bodies, body image, and appearance management strategies. The focus of these questions was the use of clothing and issues of clothing fit and proportions in appearance management. At the end of the survey, each participant was asked if she wanted to participate in an interview-based wardrobe study. If so, an individual interview would be scheduled at her convenience.

Interview participants were then asked to wear one of their favorite and best-fitted summer outfits and to bring in one of their favorite and best-fitted winter outfits when they came for the interview. At the beginning of each interview, a brief introduction of the study and the research team was given. Then the interview participant signed a consent form.

The first questions participants were asked in their interviews generally related to their personal style. They were encouraged to introduce their wardrobe and to describe the two favorite outfits they had brought to the interview. After that, they were invited to elaborate on their personal standards of beauty,

followed by questions related to their perceived current culturally recognized beauty ideals. Then, they were encouraged to give opinions about how these ideals related to their own personal beauty standards. Finally, they were asked to elaborate on their overall clothing choices, especially overall clothing fit preferences and personally held dress codes and fashion attitudes with reference to garments in their wardrobes. They were also invited to describe a typical clothing shopping scenario and talk about their fitting experiences. In addition, participants were encouraged to elaborate their choices and providing detailed information by the researcher. For instance, if a participant did not provide details on her own, probing questions such as ‘can you tell me details or give me an example?’ was asked by the researcher.

3.3.1 Participants

Two groups of 34- to 55-year-old female participants were recruited for this cross-cultural study. Qualified participants were (a) female, (b) 34–55 years old, (c) staff at a university located either in a city in the east coast area of China (for the Chinese group) or in a city in the northeast area of the United States (for the American group), and (d) Han Chinese or European American. The constraint on university employment and location was imposed because participants needed to travel to a university that had a 3D body scanner. Therefore, the researcher recruited female university staff in both countries. It is also worth noting that “ethnicity” is too complicated a concept to be fully addressed in this research project because both countries (especially the United States) are very ethnically diverse. Therefore the researcher first made a general division based on potential participants’ ethnicity and then only conducted interviews with Caucasian Americans, who represent 63% of the U.S. population, and Han Chinese, who represent 91.5% of the Chinese population. Both of these groups were social majorities. In addition, the target participants were intended to be comparable in the extent to which they were influenced by mainstream culture in their own country. Thus, only people who were immersed in their own contemporary mainstream culture, instead of recent immigrants, were included in the interview phase. In contrast to the specificity in ethnicity-based selection criteria, there were no constraints on body shape, height, weight, or other related characteristics. Most of the participants were within the standard regular

women's size range; however, they did have varied body shapes, especially within the American group. This larger variation of body shape in the American group than in the Chinese group was expected. More details are presented and discussed in the result and discussion sections. Beyond these selection factors, there were no selection criteria with respect to education level, income level, or other similar attributes. However, as staff working at prestigious universities, participants were generally in the moderate to high categories for their own cultures in terms of social standing, class, and income. For more details, please see Appendix A.

In total, 59 valid survey responses were received for the Chinese group, while 63 valid survey responses were received for the American group. Because of limited time and budget, only 25 eligible women in each group who agreed to participate in the wardrobe study were randomly selected and then contacted. Finally, 20 interviews were conducted for the Chinese group, while 22 interviews were completed for the American group.

3.4 Results

Primarily quantitative data were collected in this study. Quantitative data from surveys were logged into Excel spreadsheets and then imported into SPSS statistical software for further analysis. The quantitative data analysis includes three parts: (a) descriptive information, (b) within-group differences and correlations among different variables in each group of participants, and (c) between-group comparisons of different variables between the Chinese and American groups. These comparisons were analyzed using paired t-tests and chi-square tests.

Qualitative data including responses to open-ended questions, interview transcriptions, and observation records during the interviews were analyzed using content analysis techniques. Crucial topics included participants' descriptions of their personal standards of beauty, perceptions of their physical bodies, opinions toward culturally established beauty standards, shared experiences of fit evaluation, and clothing fit choices for the purpose of appearance management. The primary researcher first read each participant's entire transcript several times to understand the scope of the text and then constructed a

coding frame. Next, the researcher read the transcripts to identify emerging categories and then repeatedly occurring categories. Finally, the underlying meanings of repeatedly occurring categories were identified and formed into themes. Theme analysis techniques were used to discover the relations between themes. This analysis process was cross-checked with other researchers with expertise in qualitative research.

3.4.1 Demographics

Nationality. All participants in China were Han Chinese, and all participants in the United States were European American.

Age. For the Chinese group, the minimum age was 34, and maximum age was 55. On average, participants were 43.6 years old ($SD = 7.02$). One participant did not respond to this question. For the American group, the minimum age was 35, and the maximum age was 55. The average age of the American participants was 44.6 years ($SD = 6.39$). Independent sample t-test results indicated no significant difference between these two groups.

Occupation. Self-reported occupations were coded into the following five categories: (a) administration or lab positions, including participants who worked in their Chinese or American university as administrators or lab assistants; (b) facilitation, including people who worked in units associated with the universities, such as university library systems or clinics; (c) outreach, including those who worked in other nonteaching units, such as the publishing department; (d) other education, including participants who were in teaching-related positions but who were not teaching college students, such as in the further education department, the dancing school, or the kindergarten associated with the university (for the Chinese group); (e) teaching specialists/others, in which a participant was listed if she identified herself as a teaching specialist, if she did not specify her occupation, or if the reported position did not fit into any of the above four categories; and (f) research, including research-related positions, such as research assistants/associates and postdoctoral scholars.

Because of this coding system, a very significant difference in occupation was expected and found according to the result of a chi-square test: $\chi^2(5) = 43.017$, $p = .000$. As shown Figure 7, where *US*

indicates the American group and *CH* indicates the Chinese group, the majority of US participants were in administrative positions (60.3%), while the majority of the CH participants were in teaching-related positions (41.8%). No participants in the American group fell into the outreach category, but 11.1% were in the “research-related position” category. In contrast, among the 55 Chinese participants who responded to this question, only 14.5% were either administration or lab staff, and none had a research-related job. In addition, six (10.9%) were working for either a library or clinic and therefore fell into the “facilitation” category. Four (7.3%) were working for the department of publication (outreach category). About a quarter did not indicate their position or their position did not fall into any of the above-mentioned four categories.

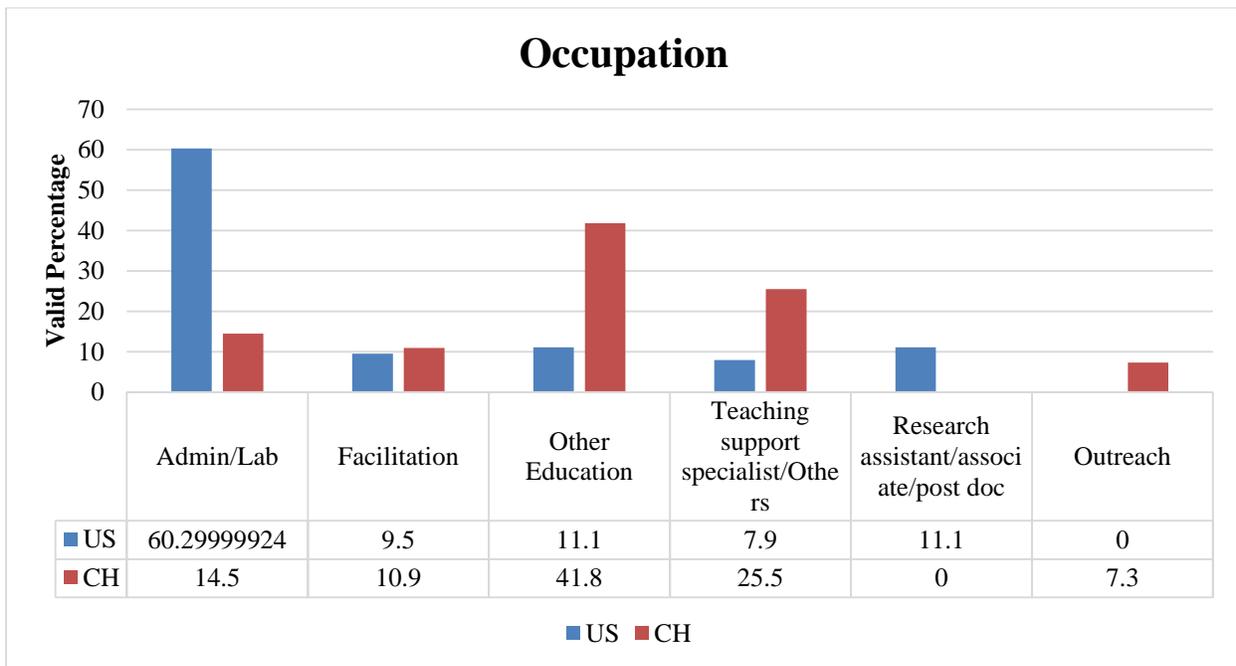


Figure 7. Occupation.

Education. Similarly, a significantly different pattern of education level appeared between the two groups according to the result of a chi-square test: $\chi^2(6) = 22.957$, $p = .001$. The Chinese group had a higher percentage of women who held a bachelor’s degree than the American group. To be more specific, about a third (34.9%) of the American participants had received a college-level education, and about a

quarter had a master’s degree. In comparison, about three-fifths (59.3%) of the Chinese participants had received a college-level education, and about one-fifth had a master’s degree. Both of the groups included two participants who had a PhD. However, the American group had a lower percentage of women who had gone to vocational school (one participant) or had not graduated from high school; six had begun working after they graduated from high school. In contrast, four of the Chinese participants had attended vocational school, while two had begun working after high school. In addition, there were two Chinese participants who had only completed junior high school. Therefore, as shown in Figure 8, the education level of the American group was relatively more evenly distributed.

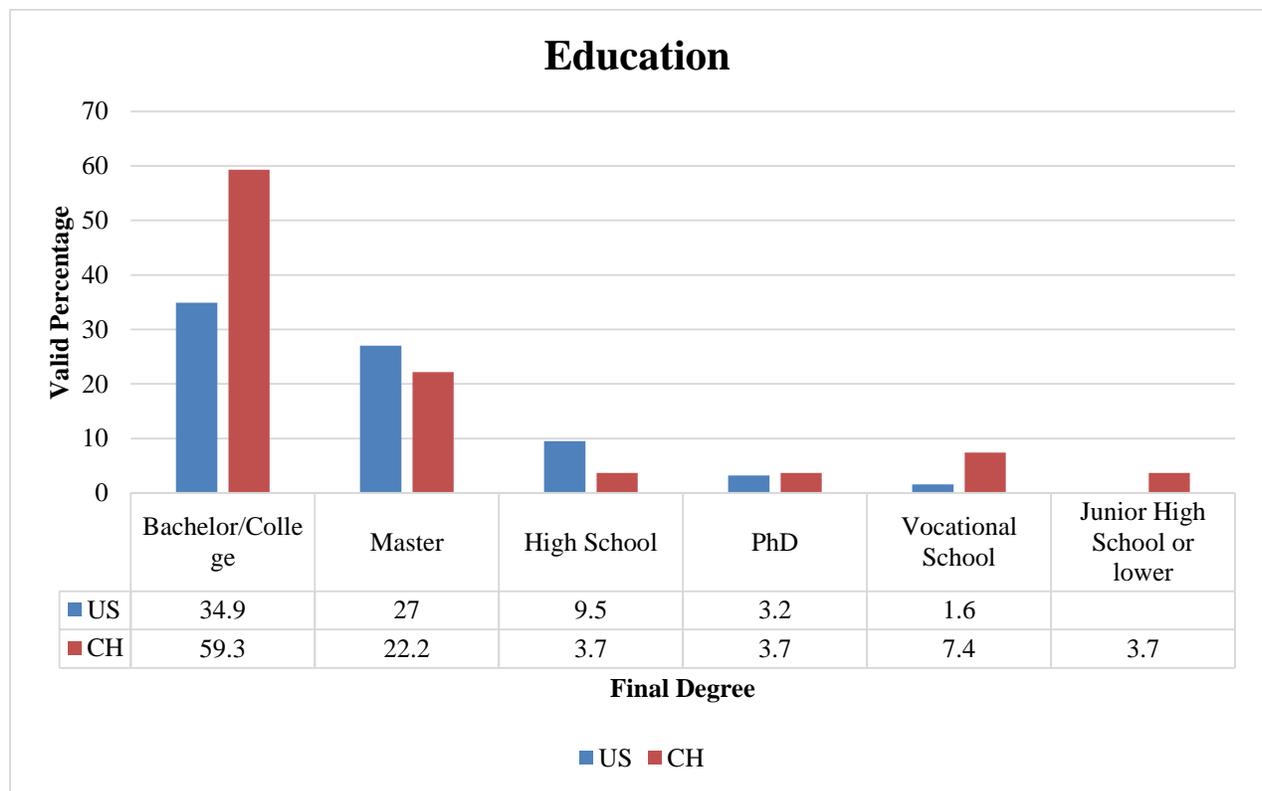


Figure 8. Education.

Cultural belongingness. Participants were asked how much influence cultures other than their original culture had on them. They were asked to indicate the level of influence on a 1–5 scale, where 1 meant “Heavily influenced by other cultures,” 2 meant “Influenced to a certain extent,” 3 meant “neutral,” 4 meant “Influenced just a little bit,” and 5 meant “Not at all.”

In general, the members of neither group believed they were heavily influenced by cultures other than their original culture. However, the Chinese group perceived a greater influence than the American group (mean of Chinese group = 3.255; mean of U.S. group = 3.98). A significant between-group difference was found by chi-square test ($\chi^2(4) = 13.817$, $p = .008$). As shown in Figure 9, nearly half of the U.S. participants believed they were not influenced by any other culture; they believed they were very bonded with their own culture. This is not surprising based on the fact that America is the most powerful country in the world, in terms of economy and politics, as well as culture. In addition, Americans themselves are very self-focused. In contrast, 85.5% of the Chinese participants believed they were influenced by other cultures. In most cases, they reported that they were influenced by other Asian cultures such as Japanese and/or Korean culture or European cultures such as U.K. and/or France culture, but American culture was rarely mentioned.

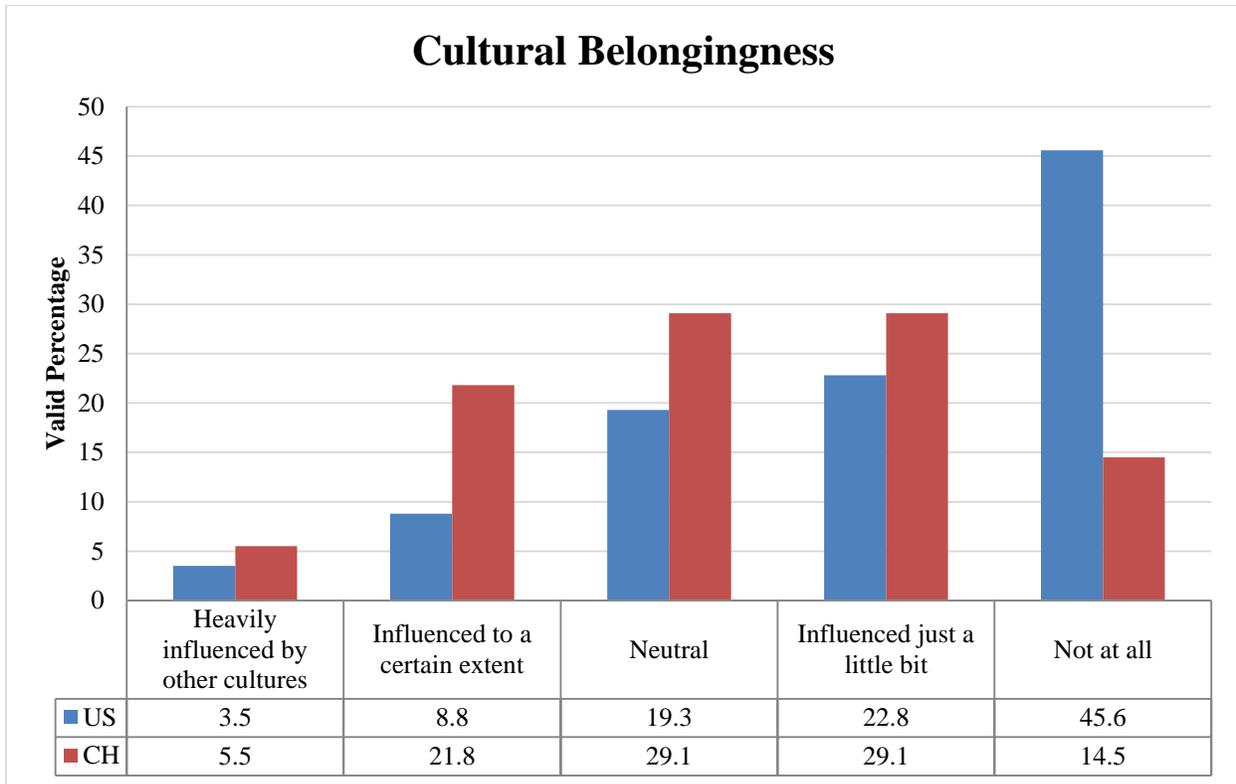


Figure 9. Cultural belongingness.

Overseas life experience. Participants were asked how long they had been living overseas. Here, 1 meant no overseas living experience at all, 2 meant less than a year in total (traveling internationally for less than a month was excluded), 3 meant one to three years in total, 4 meant three to ten years in total, and 5 meant more than ten years. In general, neither of the two groups of participants had had much overseas living experience. The average score assigned by the Chinese group was 1.316 (SD 0.711). More than four-fifths of the Chinese participants had no overseas life experience. Similarly, 71.9% of the U.S. participants had no overseas life experience. The average score indicated by the U.S. group was just slightly higher than that of the Chinese group at 1.54 (SD 0.965). No significant difference was found.

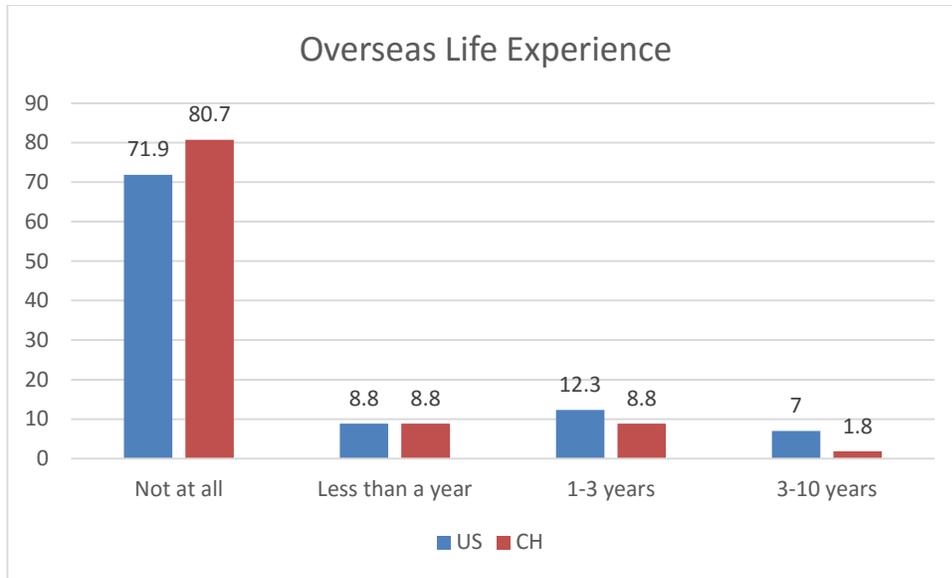


Figure 10. Overseas life experience.

Frequency of international trips. Participants were asked how often they traveled to other countries. Here, 1 meant “I have never traveled to another country,” 2 meant “I have only several times in my life, but not regular,” 3 meant “Once to twice per year,” 4 meant “Three to six times per year,” and 5 meant “More than six times per year.” In general, the two groups showed very similar patterns. The majority of both groups did have international traveling experience but not on a regular basis. No significant difference was found.

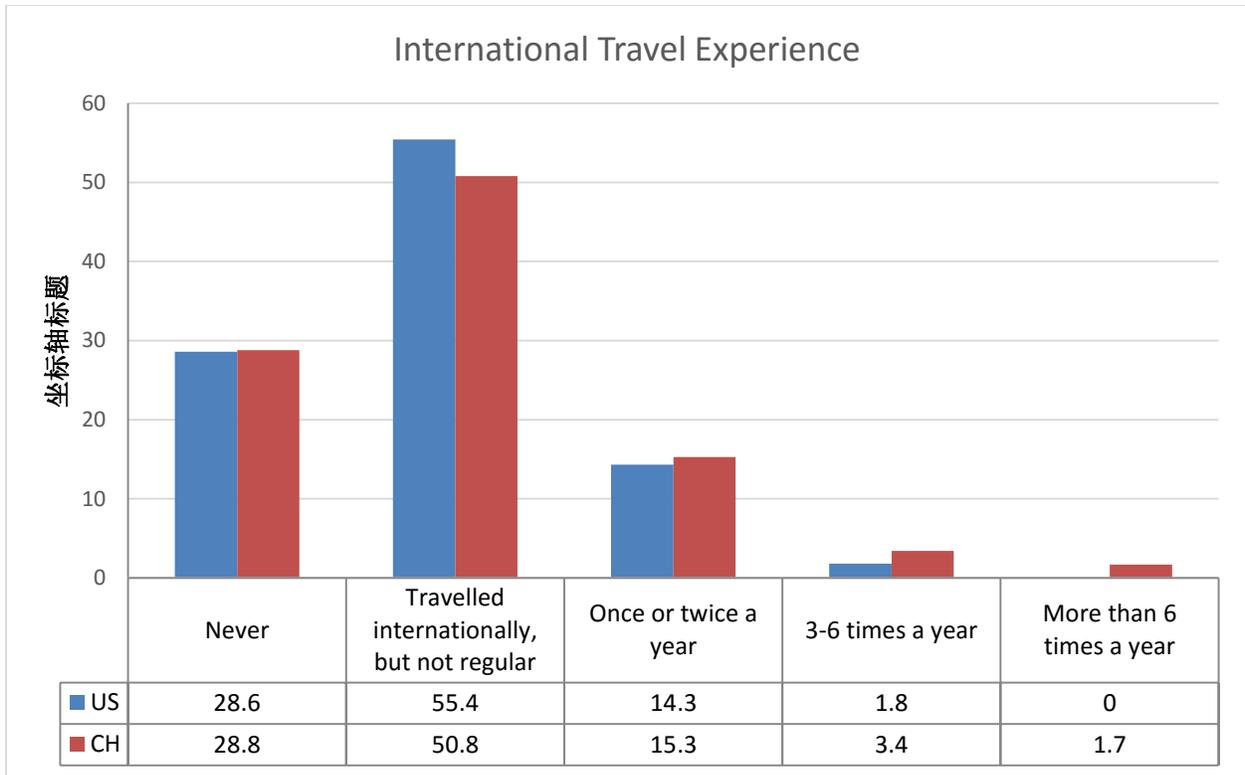


Figure 11. International travel experience.

Relatives living overseas. Participants were asked whether they had relatives living outside of their home country (China for the Chinese group and the United States for the U.S. group). All Chinese participants responded to this question, and 30.5% reported that they had relatives living outside of China. Six U.S. participants did not respond to this question; only 21.1% of the participants had relatives living outside of the United States. No significant difference was found.

Relatives living in the other country. Chinese participants were asked whether they had relatives living in the United States, while the American participants were asked whether they had relatives living in China. One Chinese participant did not respond to this question, and 17.2% reported that they had relatives living in the United States. Six U.S. participants did not respond to this question, and only one had relatives living in China. A significant difference was found by chi-square test ($\chi^2(1) = 7.971, p = .005$).

3.4.2 Physical Body

Participants were asked to report their weight, height, and waist circumference. They were instructed to actually measure their weight, height, and waist circumference before they reported those measurements. They were also informed that waist circumference refers to the narrowest part of their torso. The Chinese group was asked to report their weight in the unit of kilograms and height and waist circumference in the unit of centimeters; the American group was asked to report their weight in the unit of pounds and height and waist circumference in the unit of inches. Later, the American group's responses were converted into the same units used by the Chinese group. If a participant did not report those measurements according to the required units, her responses were manually converted by the researcher or discarded. For instance, if a Chinese woman reported her waist circumference in the unit of a Chinese foot, which equals one-third of a meter, it would be converted to centimeters accordingly. In the case of an unspecified or unclear unit, the answers were discarded.

Weight. For the Chinese group, the minimum self-reported weight was 43.1 kg, while the maximum weight was 75 kg. On average, participants weighted 57.6 kg (SD = 7.80). For the American group, the minimum self-reported weight was 46.7 kg, and the reported maximum weight was 136.1 kg. The average weight for this group of participants was 74.6 kg (SD = 19.80). An independent-samples t-test was conducted to compare the weight of the American participants and the weight of the Chinese group, and a significant difference was found, $t(112)=-6.026, p=.000$.

Height. For the American group, the minimum self-reported height was 150 cm, and the maximum was 180.3 cm. The average height for this group of participants was 165.6 cm (SD = 7.04). The minimum self-reported height of the Chinese group was 150 cm, and the maximum height was 174 cm. On average, the height of the Chinese participants was 161.4 cm (SD = 4.54). An independent-samples t-test was conducted to compare the height of the American and Chinese participants, and a significant difference was found, $t(115)=-3.789, p=.000$.

Waist. It is worth noting that 20 U.S. participants and 15 Chinese participants did not indicate their waist circumference. The reason could be that women were generally less familiar with their waist circumference than with their weight and height. They do not measure their waist as frequently as they weigh themselves, and waist circumference is less stable than height. Also, it may be because they were not sure how to measure it, did not bother, or did not have a right tool such as a tape measure to measure it when they were taking the survey.

It was found that the minimum self-reported waist size of the American group was 63.5 cm, and the maximum was 118.1cm. The average waist circumference among the American participants was 85 cm (SD = 14.46). The minimum self-reported waist size of the Chinese group was 63 cm, and the maximum was 100 cm. The average waist circumference among the Chinese group was 76.12 cm (SD = 8.58). An independent-samples t-test was conducted to compare the waist circumferences of the American and Chinese participants, and a significant difference was found, $t(81)=-3.394$, $p = .001$.

BMI. BMI was calculated based on the formula $BMI = \text{weight in kilograms}/(\text{height in centimeters})^2 * 10,000$. It was found that the minimum BMI for the Chinese group was 17.15, and the maximum BMI for this group was 28.58, with an average of 22.15 (SD = 2.66). The minimum BMI for the American group was 18, and the maximum was 45.8, with an average BMI of 27.152 (SD = 6.6). An independent-samples t-test was conducted to compare the BMIs of the two groups, and a significant difference was found, $t(111)=-5.227$, $p = .000$.

BMI—categorized. According to U.S. standards, a BMI of 18.5 to 25 indicates optimal weight, a BMI lower than 18.5 suggests the person is underweight, above 25 indicates the person is overweight, and a number above 30 suggests the person is obese. However, according to the Chinese Medical Association,

The average Chinese BMI is much lower (than their Caucasian counterpart); the normal mean is 18.5 to 23.9. Because the Chinese have a lower baseline BMI to begin with, it takes fewer increments to reach an obese level, so that BMI of 24 to 27.9 is considered overweight and ≥ 28 is considered obese.

Thus the U.S. BMI standard was adopted for categorizing the American group, while both the updated Chinese standard and the U.S. BMI standard were used for classifying the Chinese group. The results of BMI categorization are presented in the next table.

Table 3
BMI Categories

BMI Category	American (U.S. standard)	Chinese (U.S. standard)	Chinese (Chinese standard)
Underweight	2 (BMI < 18.5)	5 (BMI < 18.5)	5 (BMI < 18.5)
Normal	23 (18.5 ≤ BMI < 25)	45 (18.5 ≤ BMI < 25)	37 (18.5 ≤ BMI < 24)
Overweight	19 (25 ≤ BMI < 30)	6 (25 ≤ BMI < 30)	13 (24 ≤ BMI < 28)
Obese	14 (BMI ≥ 30)	0 (BMI ≥ 30)	1 (BMI ≥ 28)
Missing	5	3	3
Total	58	56	56

Figure 12 shows the distribution of BMI categories, if different standards are used for the two groups. The BMI category for the American group was relatively more evenly distributed than that of the Chinese group. A significantly different pattern was identified between these two groups according to the result of a chi-square test, $\chi^2(3) = 16.914$, $p = .001$. To be more specific, significantly more American participants were overweight or obese than the Chinese group.

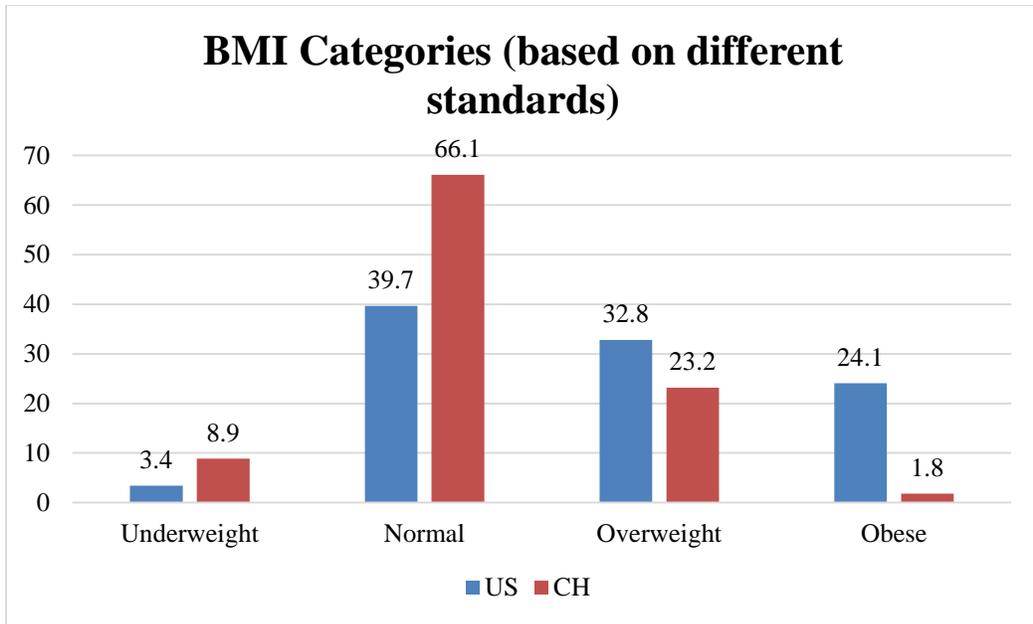


Figure 12. BMI categories.

Participants were instructed to report the size of their pants and tops. If they wore different sizes for different brands, they were asked to report the most frequently worn size. Their responses were coded and analyzed. If participants' responses were not following a S/M/L sizing system, their responses were carefully converted based on a size chart (see Appendix B).

Size of pants. Interestingly, the average sizes of pants and tops were very similar between the two groups of participants (Figure 13). For the Chinese group, the most frequently worn pant sizes were size M (28.1%), size L (21.1%), and size S (19.3%). In addition, the average size was a little larger than M (3.561, M = 3) but smaller than L (L = 4). For the American group, the most frequently worn pant sizes were size S and M (both 20.7%), size L (17.2%), and size XS (10.3%). In addition, the average size was larger than M (3.67, M = 3) but smaller than L (L = 4).

Size of tops. Compared to the patterns observed for the size of pants, there was even less difference shown for the size of tops. For the Chinese group, the most frequently worn top sizes were size M (27.1%), size L (23.7%), and size S (15.3%), but the average size was a bit larger than M (3.737). For

the American group, the most frequently worn top sizes were size M (31%), size L (20.7%), and size S (17.2%), but the average size was larger than M (3.72).

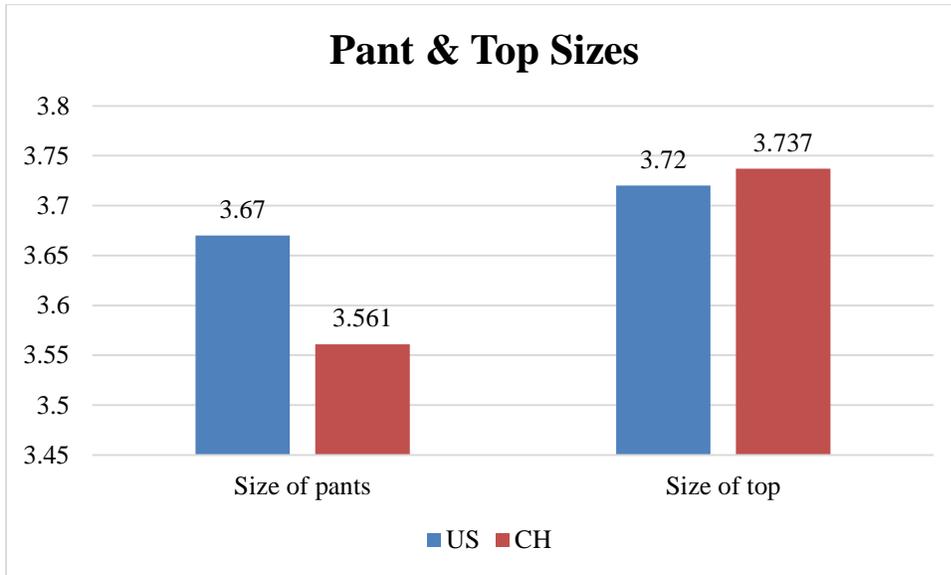


Figure 13. Average size of pants and tops.

As indicated in Figures 14 and 15, the sizes of pants and tops worn by the U.S. group were more evenly distributed than those worn by the Chinese group. However, the between-group differences were not significant for either pants or tops, according to chi-square test results.

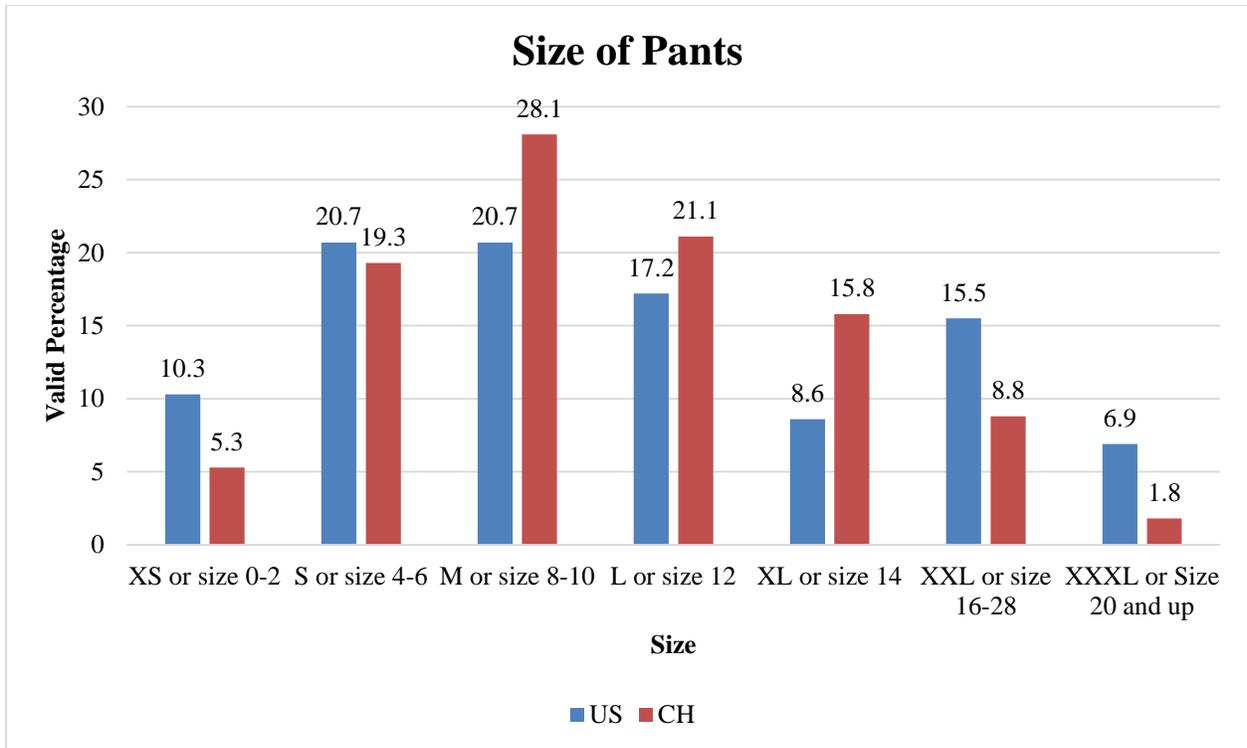


Figure 14. Comparison of sizes of pants.

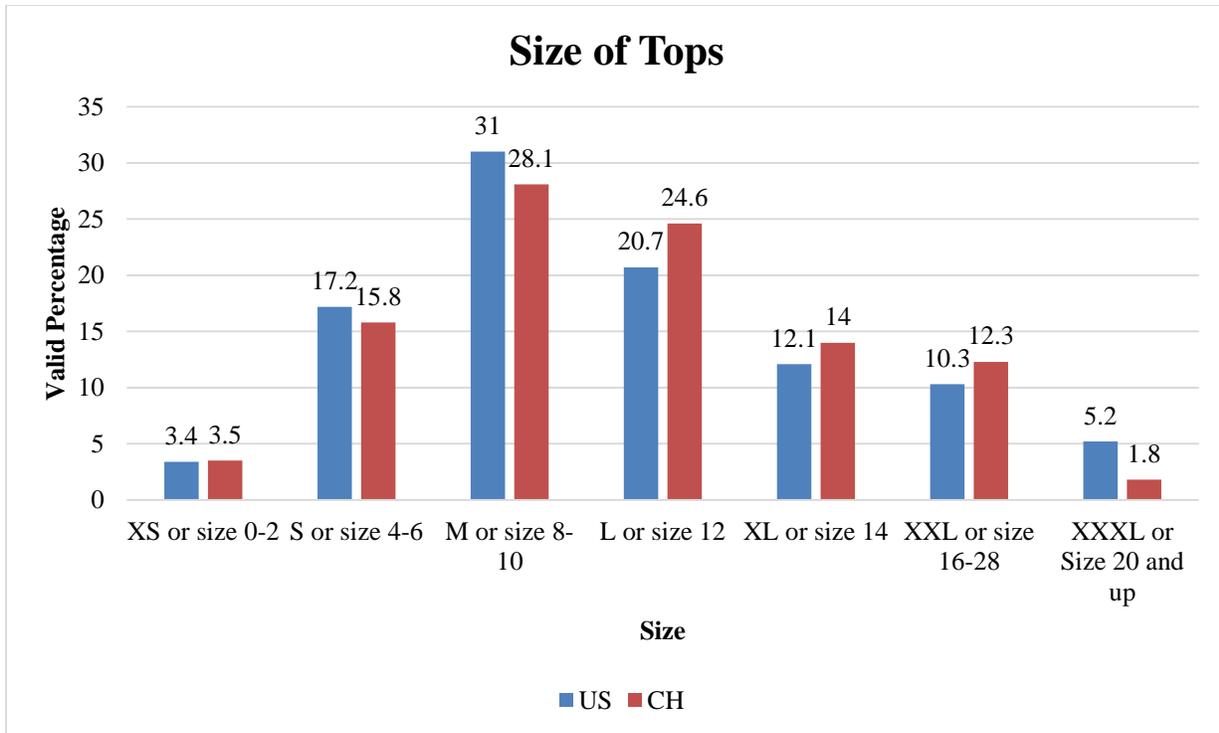


Figure 15. Comparison of sizes of tops.

3.4.3 Body Image

Body parts. Participants were asked to specify their favorite and least favorite body parts. Later, their responses were coded into 13 categories. If more than one area was chosen, the first choice was coded. The 13 categories were face, neck, bust (including answers such as upper body), arms/hands, stomach/abdomen area, waist area, hip/buttocks (including answers such as lower body thighs, legs/calves/feet, other (including answers such as height, skeleton, body build, proportion of the body, shoulders, skin, hair, etc.), none, all (a lot), and neutral/empty. An answer was coded as “none” if they indicated that there was no body part they liked or that they did not like their body at all. A response was coded as “all” if they mentioned that they loved every part of their body. The “neutral or empty” category was used if they did not respond to these questions or if they indicated that they did not have a preference over different body parts.

For the American group, the body part most often named as favorite was the face (23.3%), while four further indicated their eyes as their favorite. The second-favorite body part was “other,” with two choosing hair, two choosing height, two indicating body build, and five not specifying their favorite “other” body parts. The third most popular choices were legs/calves/feet and neutral (16.7% for each category). Among the ten American participants who reported legs/calves/feet, four chose legs, four chose feet, one chose calves, while one participant did not specify. In addition, ten participants indicated that they did not have preference among different body parts. The fifth most common response to the favorite body part question for this group was none (8.3%), with five American participants reporting that they had no favorite body part.

Although the two body parts most often chosen as favorites among the Chinese group were similar to their American counterparts—face and legs/calves/feet (17% each), a chi-square test indicated there were very different patterns, especially with respect to the participants’ preferences concerning the other body parts, $\chi^2(12) = 25.830, p = .011$. For instance, the third most popular choice in the Chinese group was arms/hands (15.1%), followed by waist (9.4%) and bust (7.5%). In the American group, only two (3.3%) chose arms/hands, one chose waist (1.7%), and one chose bust (1.7%) as their favorite body parts. The fifth most frequently chosen body part categories for the Chinese group, alongside bust, were other (7.5%) and all (7.5%). One participant reported that she like her skin, and four favored other areas such as height and shoulders. Only two of the Chinese participants indicated that they did not have a single favorite body part. However, four Chinese participants claimed that they loved every part of their bodies or that they loved their bodies as a whole.

In general, participants from both groups claimed that they liked their facial features, especially their eyes. However, it is interesting to notice that for both of the groups, stomach/abdomen and thighs were the least favorite body parts. No American participant chose thighs or stomach/abdomen as their favorite body parts, while only one and two Chinese participants chose stomach/abdomen and thighs, respectively. More details are shown in Figure 16.

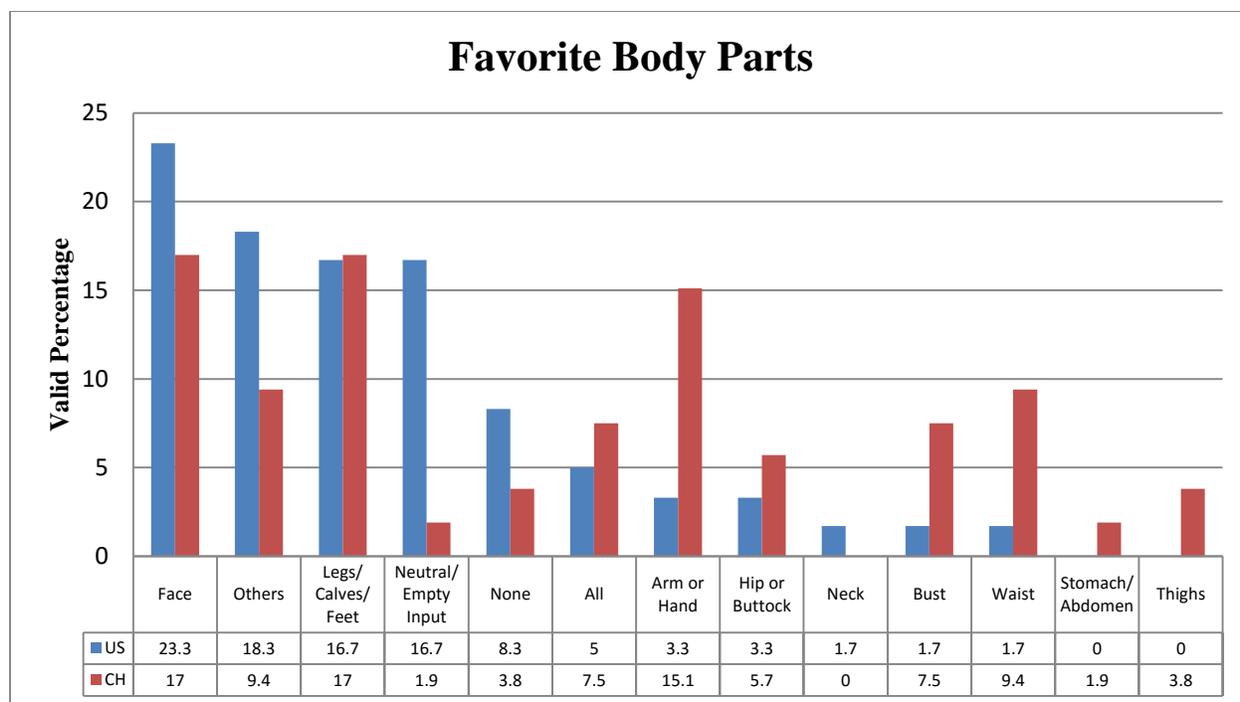


Figure 16. Comparison of favorite body parts.

Least favorite body parts. Participants were asked to specify their least favorite body parts. Their responses to this question were coded following the same coding system as for the question on their favorite body parts. The 13 categories were face, neck, bust (including answers such as upper body), arms/hands, stomach/abdomen area, waist area, hip/buttocks (including answers such as lower body thighs, legs/calves/feet, other (including answers such as height, skeleton, body build, proportion of the body, shoulders, skin, hair, etc.), none, all (a lot), and neutral/empty. An answer was coded as “none” body part, if they indicated that there was no body part they disliked or that they liked every part of their body. A response was coded as “all” if they claimed that they did not love their body at all or that they hated every part of their body. The “neutral or empty” category was used if they did not respond to these questions or if they indicated that they did not have a preference over different body parts.

In line with the findings for the question on favorite body parts, about half of the U.S. participants indicated the stomach/abdomen area (49.2%) as their least favorite body parts. This was followed by hip/buttock (15.3%). Surprisingly, only two (3.4%) U.S. participants indicated the thighs as their least

favorite, and only one (1.7%) U.S. participant indicated waist as her least favorite. Only one American participant had indicated waist as her favorite body part, and no one had chosen thighs as her favorite.

However, this was not the case for the Chinese group. In fact, the least favorite part of body was the thighs (23.1%), followed by stomach/abdomen (17.3%) and waist (17.3%). The category chosen fourth most often for least favorite body part was other (9.6%), indicating for instance height and body build, followed by legs/calves/feet (7.7 %). Furthermore, three participants reported that their bust was their least favorite body part, while another three complained about their arms/hands. In addition, three Chinese women disliked their hip or buttock areas, while only one disliked her face and one disliked her neck.

To sum up, the majority of both groups did not like their midtorso. However, they indeed had different views toward other parts of their body as indicated by chi-square test, $\chi^2(12) = 32.959$, $p = .001$. Comparatively, the U.S. group had clearer attitudes toward different body parts— they either liked or disliked them—while this was more ambiguous for the Chinese group. The waist, for example, was many Chinese women's favorite body part but also the least favorite body part for others. A similar attitude applied to the hip/buttock area and the thighs for this group of women. The patterns for least favorite body part can be seen in Figure 17.

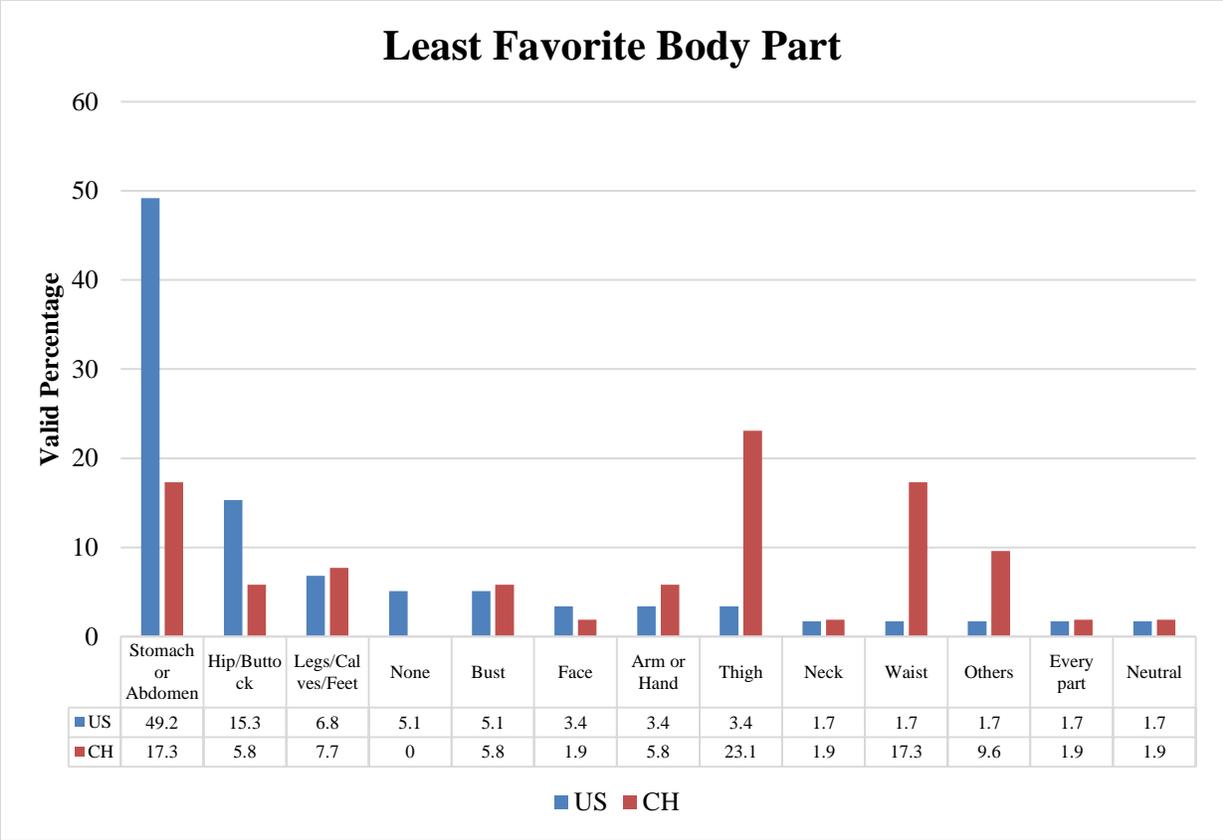


Figure 17. Comparison of least favorite body part.

Current and ideal body size. A modified version of the Stunkard Scale (Stunkard et al., 1983; Thompson & Gray, 1995), a contour drawings rating scale representing female body sizes, was presented in the survey. In this scale, the first drawing represented an extremely underweight female body, while the ninth represented an obese female figure. Participants were asked to specify which figure looks the most close to their “current” body figure and which one seems the most close to their “ideal” figure based on these nine line drawings of female bodies.

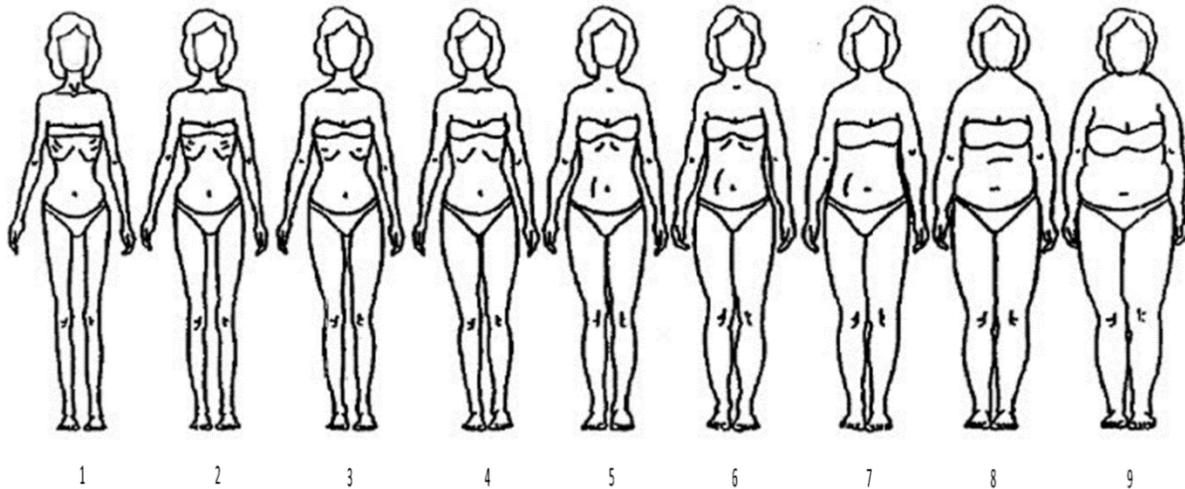


Figure 18. Stunkard Scale.

Adapted from “Use of the Danish adoption register for the study of obesity and thinness,” by A. J. Stunkard, T. Sorenson, and F. Schlusinger, in S. Kety, L. P. Rowland, R. L. Sidman, and S. W. Matthysse, (Eds.), *Genetics of Neurological and Psychiatric Disorders* (p. 117), 1983, New York: Raven. Copyright 1983 by Raven.

It was found that the average perception of current body size for the Chinese group was 5.74, with a standard deviation of 1.73. The average perception of current body size for the American group, meanwhile, was 6.6, with a standard deviation of 1.78. No significant difference was found for the perception of current body size reported by these two groups.

In addition, the mean ideal body size reported by the Chinese group was 4.07, with a standard deviation of 1.06. On the other hand, the mean ideal body size reported by the American group was 4.48, with a standard deviation of 1.25. A significant difference was found for the ideal body size reported by these two groups, $\chi^2(6) = 13.156$, $p = .041$. More body size variations were observed for perceived current body size than for ideal body size for both groups of women. This could indicate that even though women may vary in their perceptions of their current body size, their ideal body size could be similar, regardless of culture. However, this finding could not be generalized or applied to population other than the sampled groups.

Furthermore, the gap between perceived current and ideal body size was calculated by subtracting perceived current body size from ideal body size. Interestingly, the majority of both groups—76.3% of

the Chinese participants and 84.5% of the American participants respectively—wanted to shrink at least one body size. On average, the Chinese women wanted to be 1.64 sizes smaller, while their American counterparts wanted to be 2.12 sizes smaller (Figure 19). However, the group difference in the gaps between perceived current and ideal body size was not found to be significant.

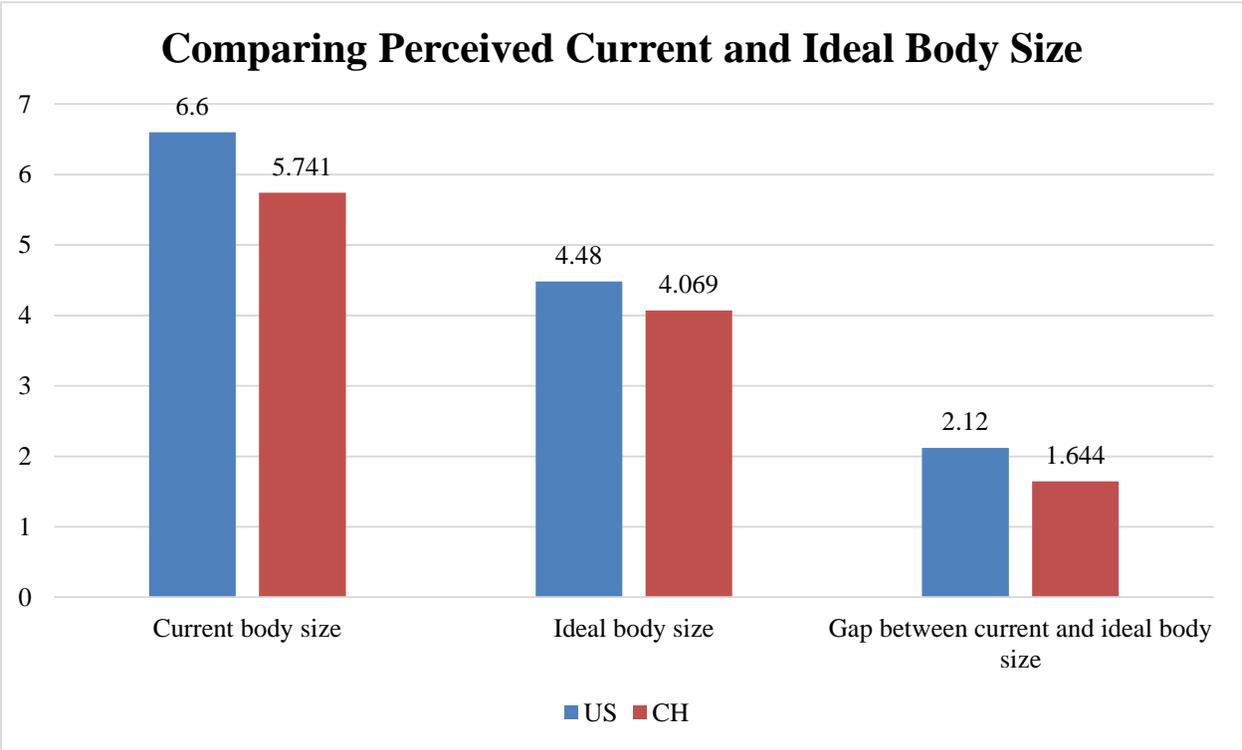


Figure 19. Comparison of perceived current and ideal body size and size gap.

As shown in the following figure, however, the size gap distribution across the Chinese group was much flatter and broader than across the U.S. group. To be more specific, for 10.2% of the Chinese participants, current size and ideal body size were the same, while this number for the American group was only 5.2%. Furthermore, 13.6% of the Chinese participants wanted to be at least one size larger, but no American participants wanted to increase their body size.

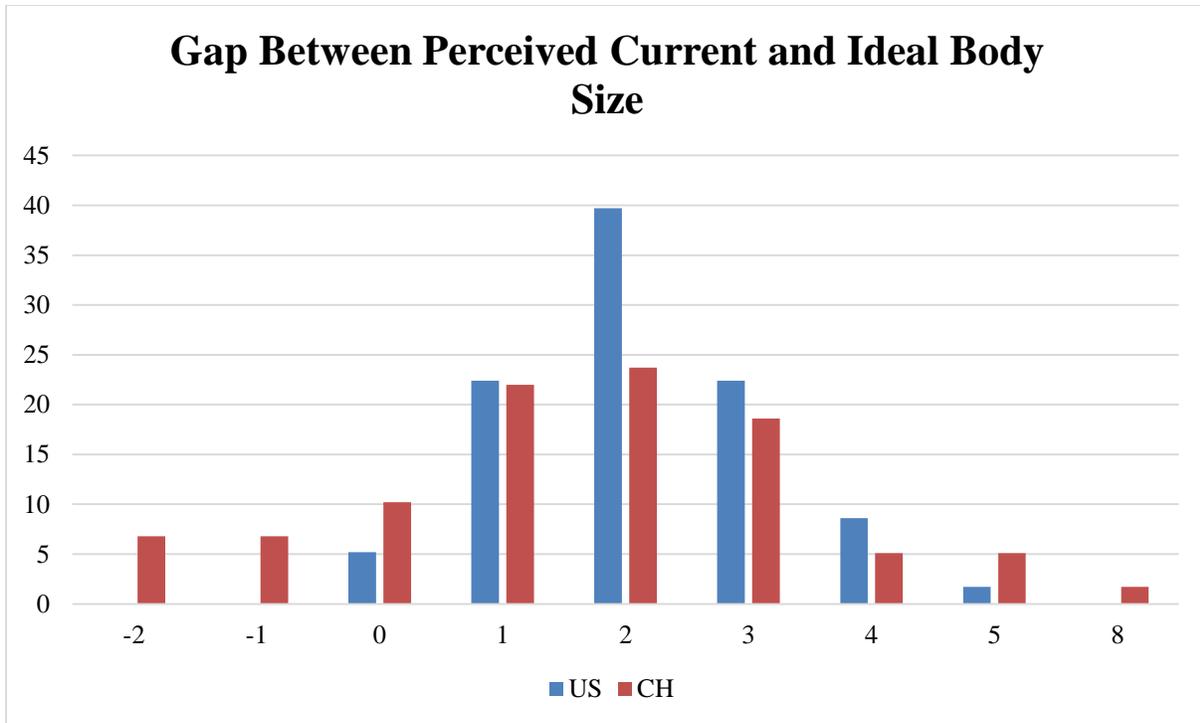


Figure 20. Gap between perceived current and ideal body size.

Current body size. Based on the Stunkard Scale (Figure 18), seven was the most frequently chosen perceived current body figure (Lynch et al., 2009) for both groups. About a quarter of the Chinese women (24.1%) and 29.3% American participants selected size seven. However, for the Chinese groups, there was no significant difference among the frequencies of sizes five (20.7%), six (22.4%), and seven (24.1%). As indicated in the following figure, the perceived current size distribution across the U.S. group was skewed toward the right, while it was less skewed for the Chinese group.

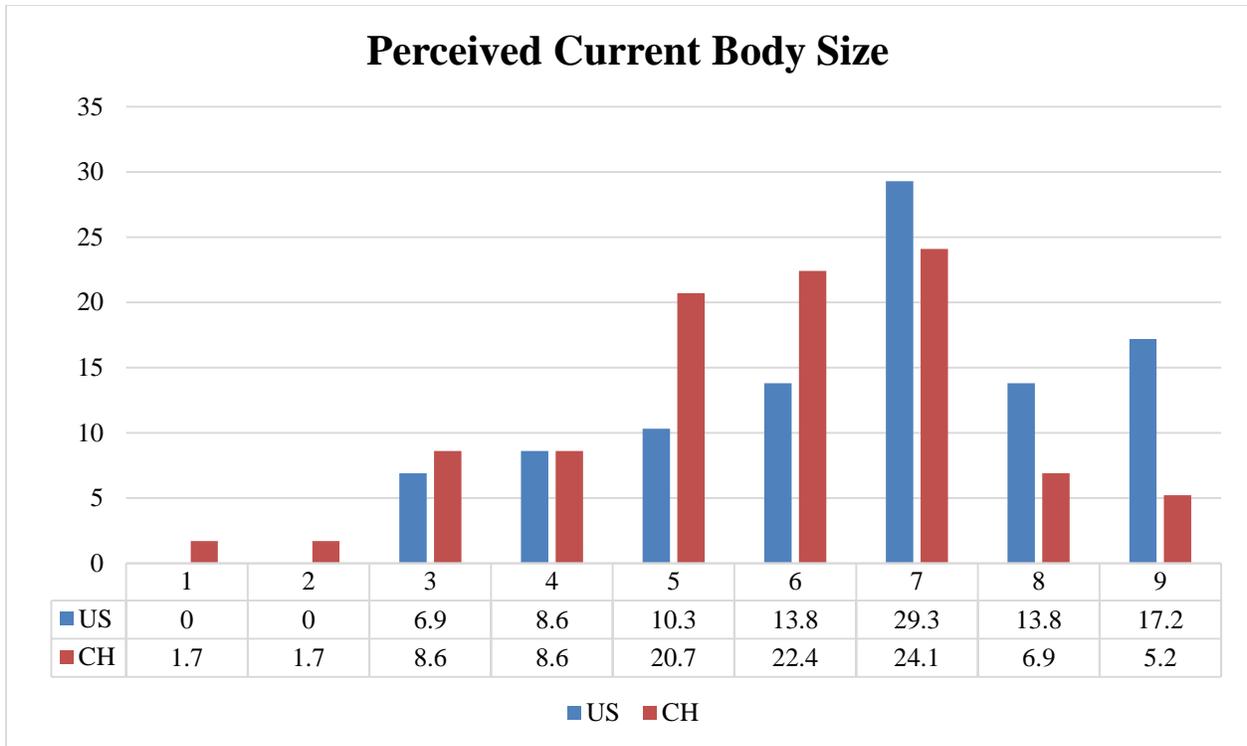


Figure 21. Comparison of perceived current body size.

Previous studies on the validations and applications of the Stunkard Scale (Bhuiyan, Gustat, Srinivasan, & Berenson, 2003; Cardinal, Kaciroti, & Lumeng, 2006; Lynch et al., 2009; Must, Phillips, Stunkard, & Naumova, 2002) recommended to classify these nine figures into underweight (figures 1 and 2), normal weight (figures 3 and 4), overweight (figures 5 through 7), and obese (figures 8 and 9). Following this classification, the following table compares self-reported BMI and perceived current body size.

Table 4
BMI and Perceived Body Size by Nationality

BMI category	United States (%)		Chinese (%)		
	Perceived current Body size	BMI category (U.S. standard)	Perceived current Body size	BMI category (U.S. standard)	BMI category (Chinese standard)
Underweight (Stunkard figures 1 & 2)	0	3.4	3.4	8.9	8.9
Normal weight (Stunkard figures 3 & 4)	15.5	39.7	17.2	80	66
Overweight (Stunkard figures 5, 6, & 7)	53.4	32.8	67.2	10.7	23.2
Obese (Stunkard figures 8 & 9)	31	24.1	12.1	0	1.8

Ideal body size. In terms of ideal body size, the most frequently selected size among the Chinese women was size five (39.7%). The second most frequently chosen size was size four (32.8%), followed by size three (19%). In contrast, even though the American women had a relatively larger current body size than the Chinese women, they reported smaller ideal body sizes than the Chinese group. The most frequently selected size among American participants was size four (32.8%). The second most frequently chosen size was size five (25.9%), followed by size three (19%).

As shown in Figure 22, the ideal body size distribution for the U.S. group is more centralized, while that of the Chinese group skewed a little toward the right. This could mean that the Chinese group's has a more achievable ideal body size for themselves (larger ideal size) than is the case for the American group. Their ideal probably is more realistic than that of the U.S. group.

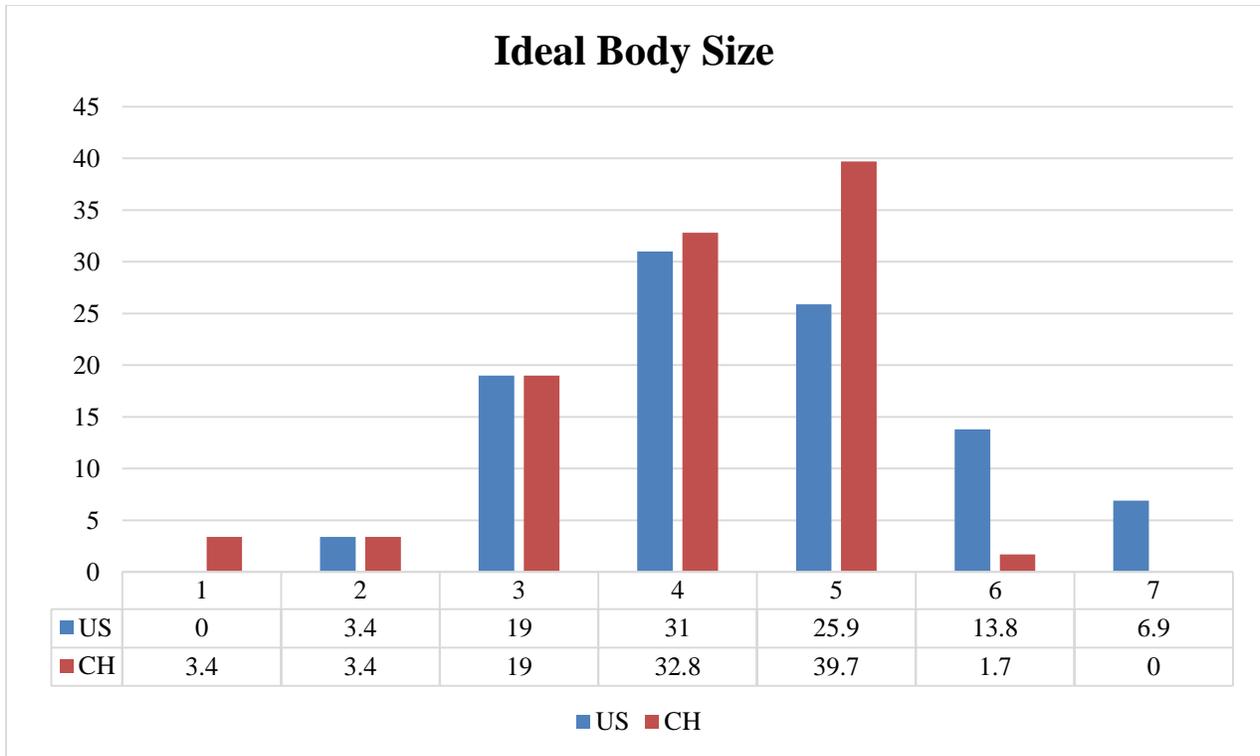


Figure 22. Ideal body size.

General body satisfaction. Participants were asked how strongly they agreed with seven statements related to their current and ideal body and appearance. They were asked to respond using a five-point scale, in which 1 indicated disagreement, 2 indicated slight disagreement, 3 stood for a neutral response, 4 indicated slight agreement, and 5 indicated agreement. The seven statements were:

1. Satisfaction of current appearance (Q1): I am satisfied with my physical appearance.
2. Gap between actual and ideal appearance (Q2): In most ways my actual physical appearance is close to my ideal physical appearance.
3. Willingness to change current appearance (Q3): There is nothing about my physical appearance that I would like to change.
4. Importance of ideal body shape (Q4): I think it is very important for me to have ideal body shape.
5. Importance of ideal appearance (Q5): I think it is very important to for me to have ideal appearance.
6. Appearance could decide who am I (Q6): I think my body/appearance decides who I am.

7. Great effort for ideal appearance (Q7): I am trying my best to pursue/maintain good body and appearance.

In general, the American and Chinese groups had similar body satisfaction levels. Both reported being slightly satisfied with their appearance (Q1); however the U.S. group perceived a larger gap between their current and ideal appearance than the Chinese group did (Q2). In combination with the significantly different ideal body sizes reported by these two groups (average ideal body size was 4.48 for the American group and 4.07 for the Chinese group), this indicated that the American group had an ideal for themselves that would be more difficult to achieve. In addition, in view of the larger perceived current body size reported by the American group than by the Chinese group, despite the lack of significant difference in perceptions of current body size, another reason could be that the American group was further from “standard” body size. However, further exploration is still needed.

Both groups also indicated that they were making efforts to change their appearance (Q7). In fact, both groups reported similar levels of effort toward pursuing their ideal appearance. However, the U.S. group had a much stronger desire to change their appearance, $\chi^2(4) = 34.437$, $p = .000$ (Q3). This could indicate a lower body satisfaction level and stronger motivation for adopting appearance management strategies for the American group than their Chinese counterparts.

What makes this story even more interesting, however, was that the Chinese participants valued ideal physical body ($\chi^2(4) = 33.503$, $p = .000$) (Q4) and appearance ($\chi^2(4) = 20.651$, $p = .000$) (Q5) much more strongly than their U.S. counterparts. They also placed more importance on physical appearance ($\chi^2(4) = 24.991$, $p = .000$) in terms of their definition of themselves (Q6). The following figure shows this difference in more detail.

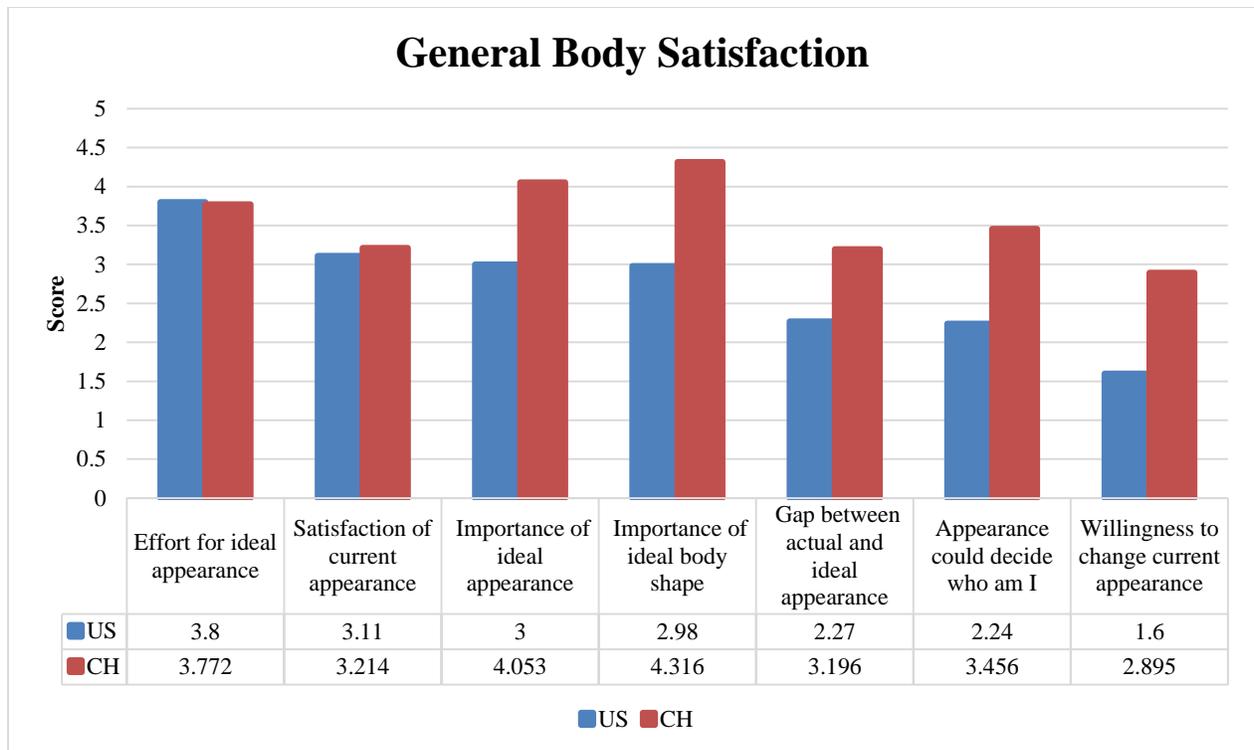


Figure 23. Comparison of general body satisfaction.

Satisfaction with current appearance: I am satisfied with my physical appearance. As shown in Figure 24, Chinese participants on average were slightly satisfied with their physical appearance (mean = 3.214; SD = 1.0739); 26.8% stated that they were at least slightly dissatisfied with their physical appearance, while 42.8% claimed they were satisfied (10.7%) or slightly satisfied (32.1%) with their physical appearance. On average, American participants were also slightly satisfied with their physical appearance (mean = 3.11, SD = 1.227), with 38.2% stating that they were at least slightly dissatisfied with their physical appearance and 45.4% claiming they were satisfied (12.7%) or slightly satisfied (32.7%). No significant difference can be identified between the groups.

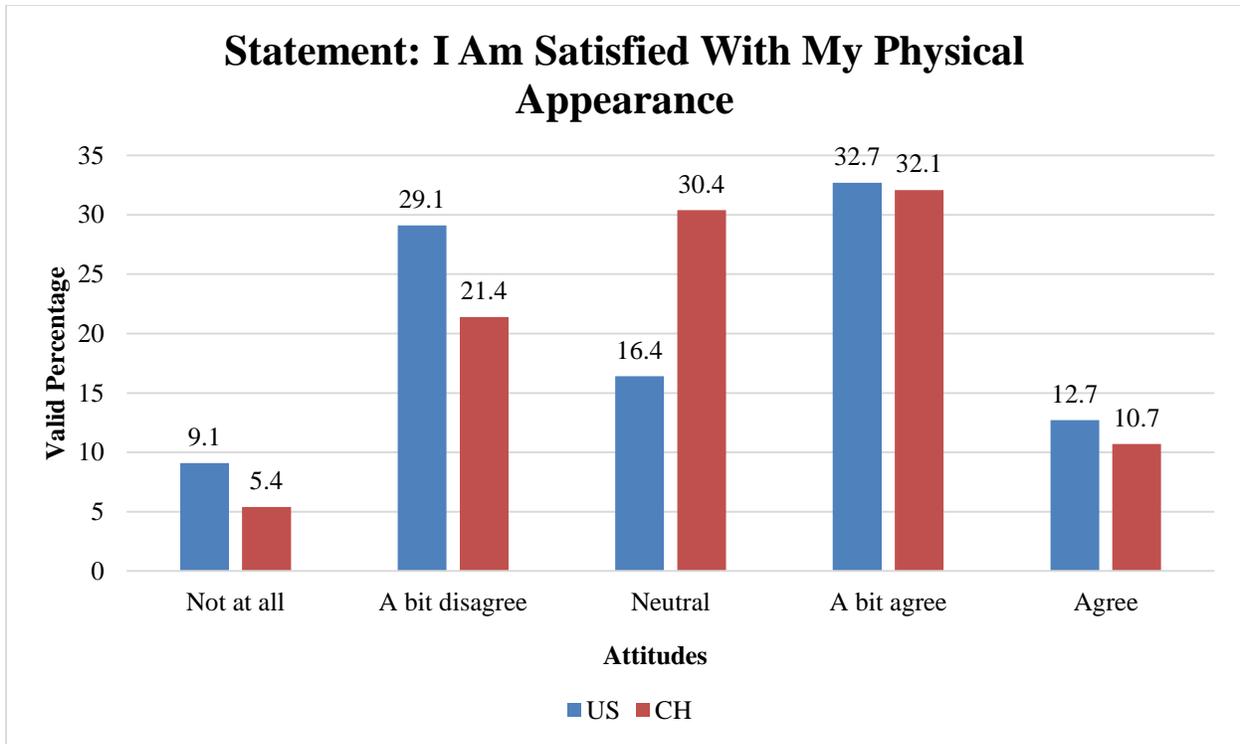


Figure 24. Satisfaction with current appearance.

Gap between actual and ideal appearance: In most ways my actual physical appearance is close to my ideal physical appearance. The Chinese participants believed their actual appearance was somewhat close to their ideal appearance (mean = 3.196; SD = 1.242). About half (48.2%) stated their current physical appearance was at least a bit similar to their ideal. However, 42.8% thought their actual physical appearance was not close to their ideal. In contrast, the majority of the American participants were not satisfied with their current appearance. For 32.7%, current appearance was completely different from ideal appearance, while 36.4% reported that there was at least some gap between their current and ideal appearance. As shown in Figure 25, the Chinese group tended to agree with this statement and showed a relatively higher satisfaction level with their current appearance.

In fact, Figure 25 also conveys significantly different patterns in the two groups ($\chi^2(4) = 16.325, p = .003$). To be more specific, the U.S. group perceived a much larger gap between their current and ideal appearance than the Chinese group did. This could mean that the U.S. group had a higher standard for

their appearance, suggesting they strive harder to achieve their perceived standards for appearance or body shape.

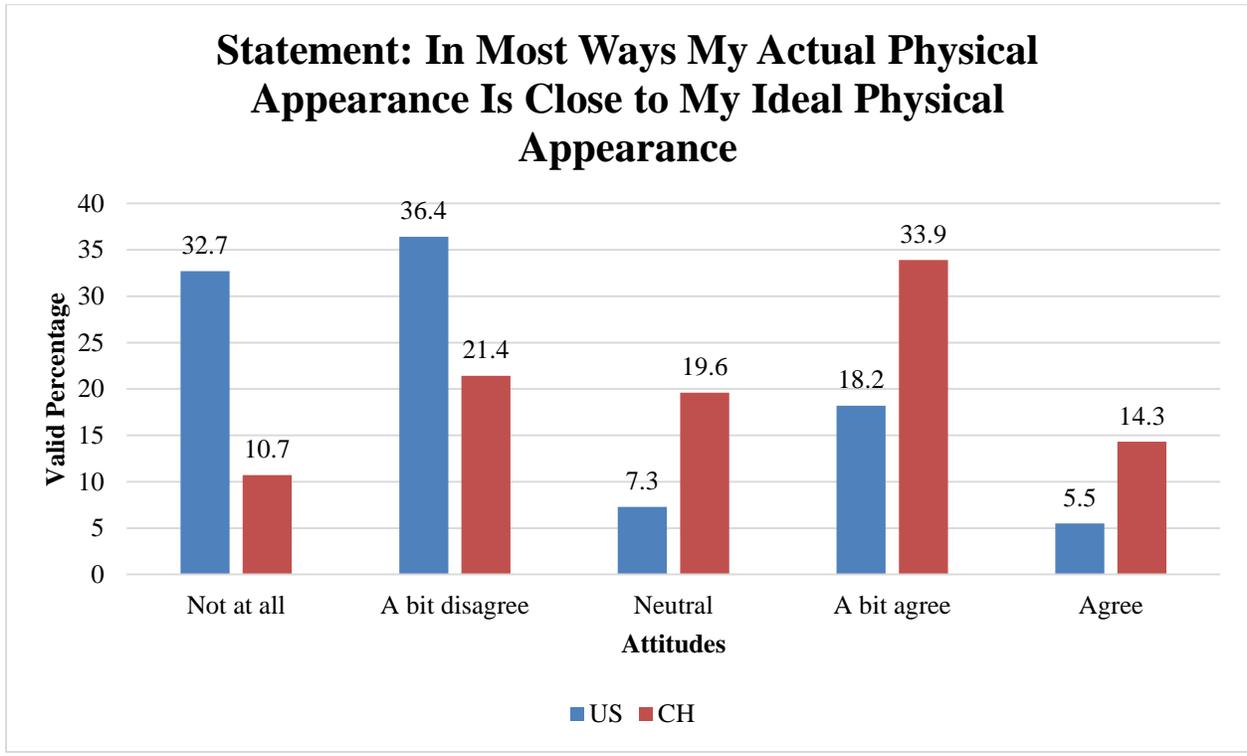


Figure 25. Gap between actual and ideal appearance .

Willingness to change current appearance: There is nothing about my physical appearance that I would like to change. Interestingly, 43.9% of the Chinese participants claimed that they wanted to change their physical appearance, which was much more than the number who claimed that they were dissatisfied with their look (26.8% in response to the first statement). This may reflect a belief that “There is always room for improvement.” The average score was 2.895, which was the lowest among the seven questions about general body/appearance satisfaction. Only 22.8% indicated they did not want to change their look at all. However, the American group presented an opposite impression. More than half (52.7%) of the American participants strongly disagreed with the statement, and 41.8% slightly disagreed with the statement, which meant that there were many things they wanted to change about their appearance. According to their responses in the interviews, they most commonly wanted to lose about 15 pounds and

have a flatter stomach and abdomen area. This is consistent with their least favorite body part choices and reflects their dissatisfaction with current body size. The U.S. group had a much stronger desire to change their current appearance than the Chinese group had ($\chi^2(4) = 34.437, p = .000$). In contrast, the Chinese women did not have such an overwhelming preference (see Figure 26).

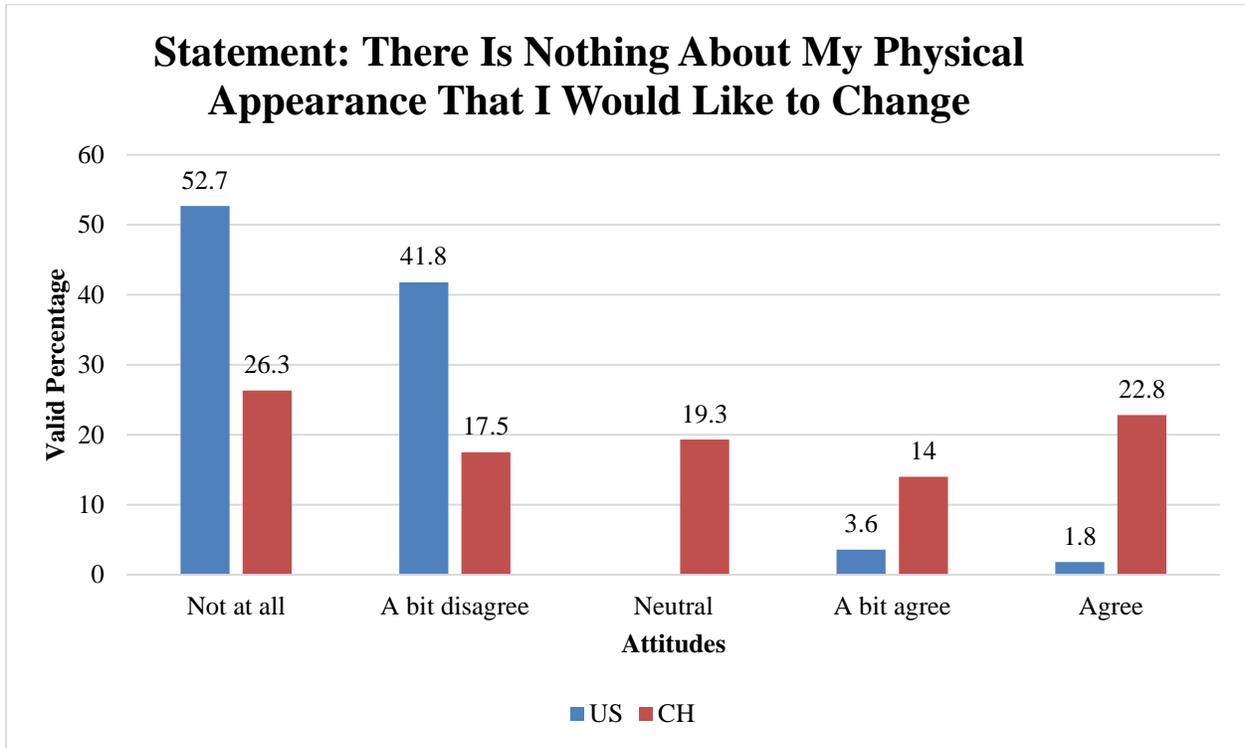


Figure 26. Willingness to change current appearance.

Importance of ideal body shape: I think it is very important for me to have an ideal body shape. The Chinese group admitted placing greater importance on ideal body shape than the American group did ($\chi^2(4) = 33.503, p = .000$). The average score assigned by this group was 4.316, with a standard deviation of 1.04. In fact, the majority (59.6%) agreed with the statement that “I think it is very important for me to have ideal body shape,” with only two disapproving of the statement. This indicates that having an ideal body shape was very important for the majority of the participants (six participants stood neutral).

However, a much higher percentage of the American participants disagreed with this statement, with only 10.9% agreeing with it (Figure 27).

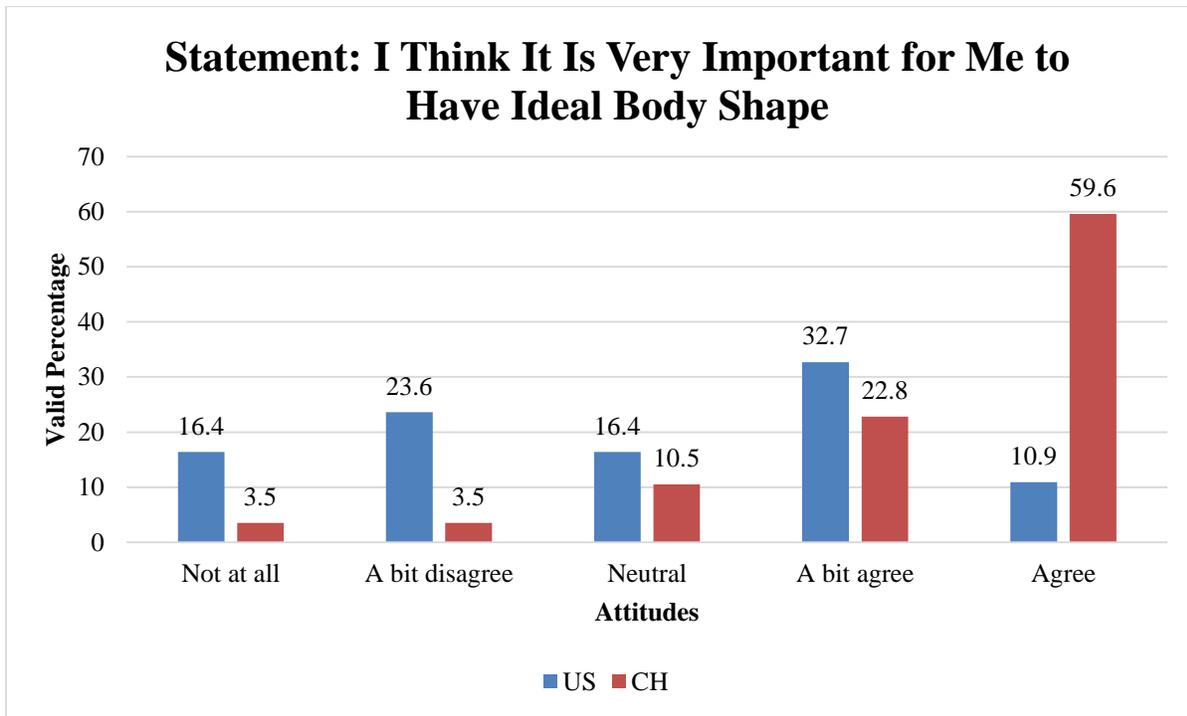


Figure 27. Importance of ideal body shape.

Importance of ideal appearance: I think it is very important to for me to have an ideal appearance. The Chinese group placed greater importance on ideal body appearance than their U.S. counterparts ($\chi^2(4) = 20.651, p = .000$). For Chinese women having their ideal appearance was very critical. On average, this group of participants assigned a mean of 4.053 to the importance of having ideal appearance, with a standard deviation of 1.16. Seven participants disagreed or slightly disagreed with the statement “I think it is very important to for me to have ideal appearance,” while 71.9% agreed or at least slightly agreed with the statement. However, the American participants tended to disagree (18.5%) or slightly disagree (20.4%) with this statement, with only 13% agreeing with it.

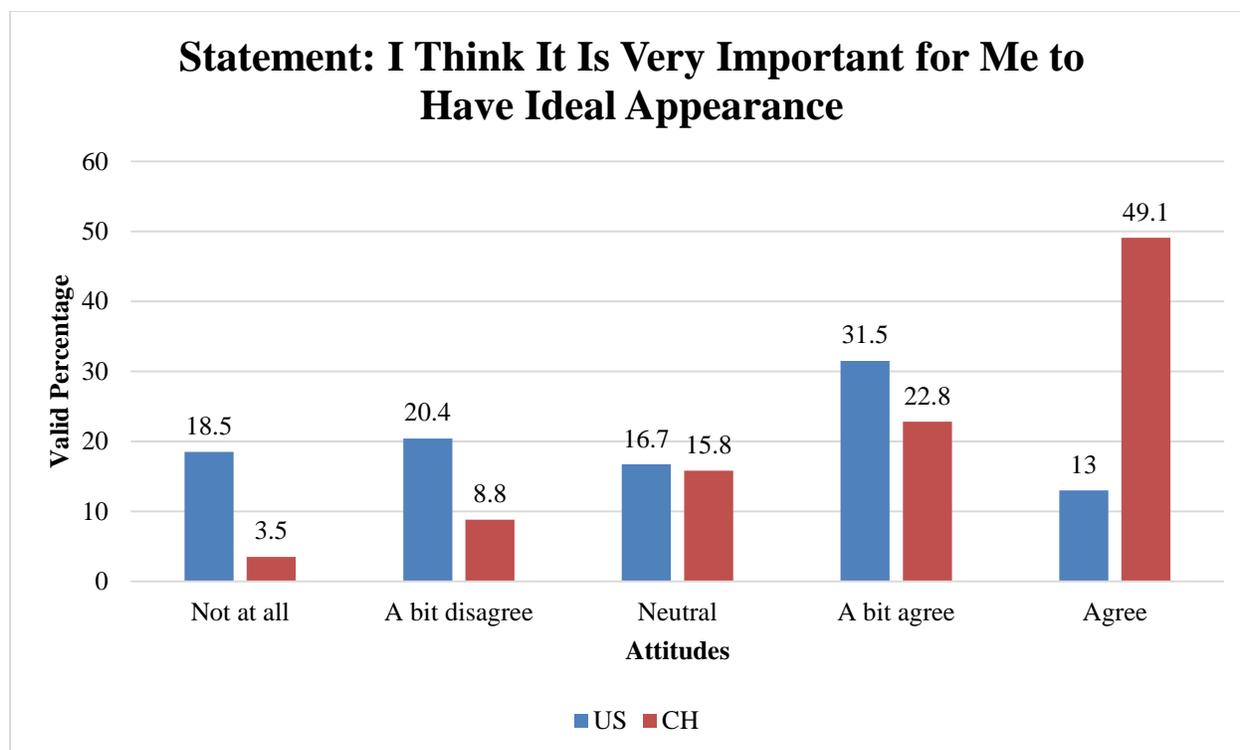


Figure 28. Importance of ideal appearance.

Appearance determines who I am: I think my body/appearance determines who I am. The Chinese group tended to believe more that appearance could determine who they are than their American counterparts. In other words, the Chinese women placed more importance on physical appearance ($\chi^2(4) = 24.991, p = .000$) when they were doing self-evaluation than the American group did. However, even though Chinese participants believed having ideal body/appearance was crucial for them, they tended to believe their look was just one of the important things that can influence their self-identity, instead of the only one. It was probably not even the most important one, according to their interview responses. About a quarter of the Chinese participants did not agree (24.6%), and another quarter claimed to be neutral (24.6%) toward the statement. This resulted in an average score of 3.456 ($SD = 1.2546$). On the other hand, more than a third of the American participants disagreed with this statement, and 21.8% slightly disagreed with it. Only 18.2% slightly agreed with this statement, and only one American participant agreed with it (Figure 29).

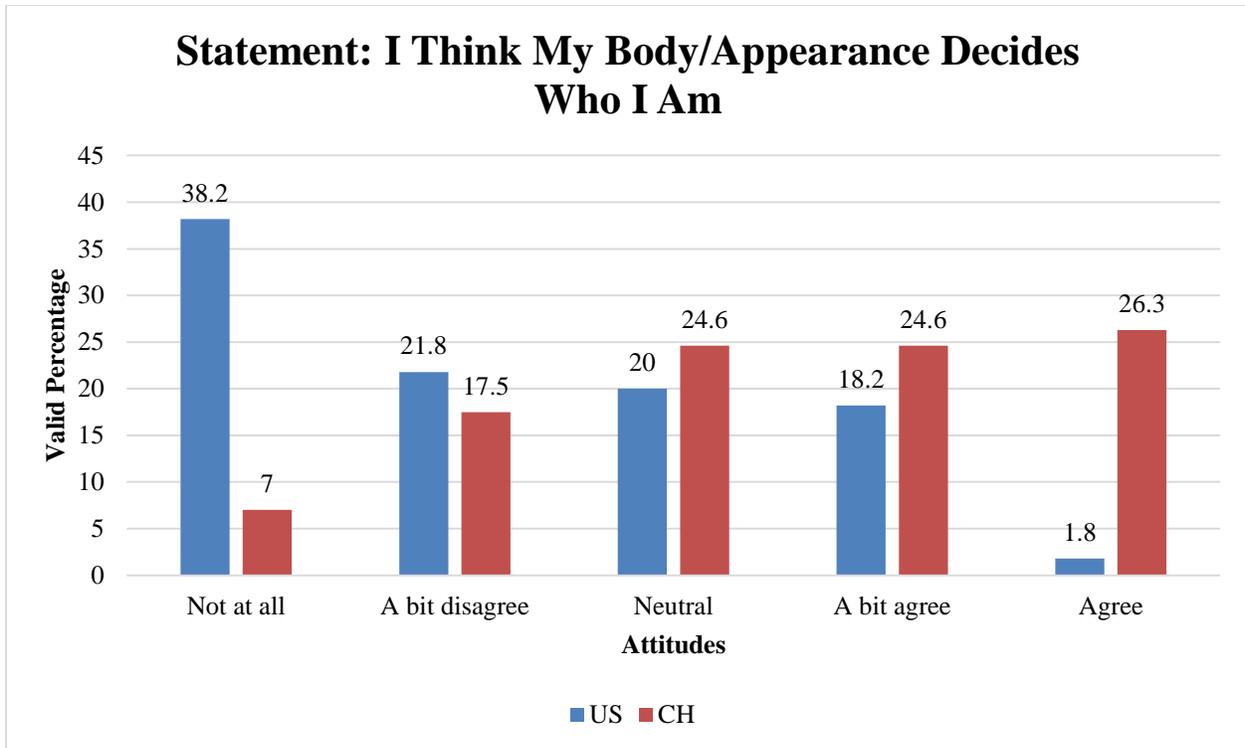


Figure 29. Appearance could determine who I am.

Great effort for ideal appearance: I am trying my best to pursue/maintain a good body and appearance. Both groups reported that they made great efforts to pursue or maintain what they considered to be a good body and appearance. No significant between-group differences was found. The majority of the Chinese participants said they were making efforts to pursue or maintain a good physical look; 36.8% and 21.1% stated that they were trying their best or at least making efforts to pursue or maintain a good physical look, which resulted in an average of 3.77 with a standard deviation of 1.17. For the American group the mean was 3.8 with a standard deviation of 1.01; 43.6% of the American participants slightly agreed with the statement, and 25.5% agreed with the statement (Figure 30).

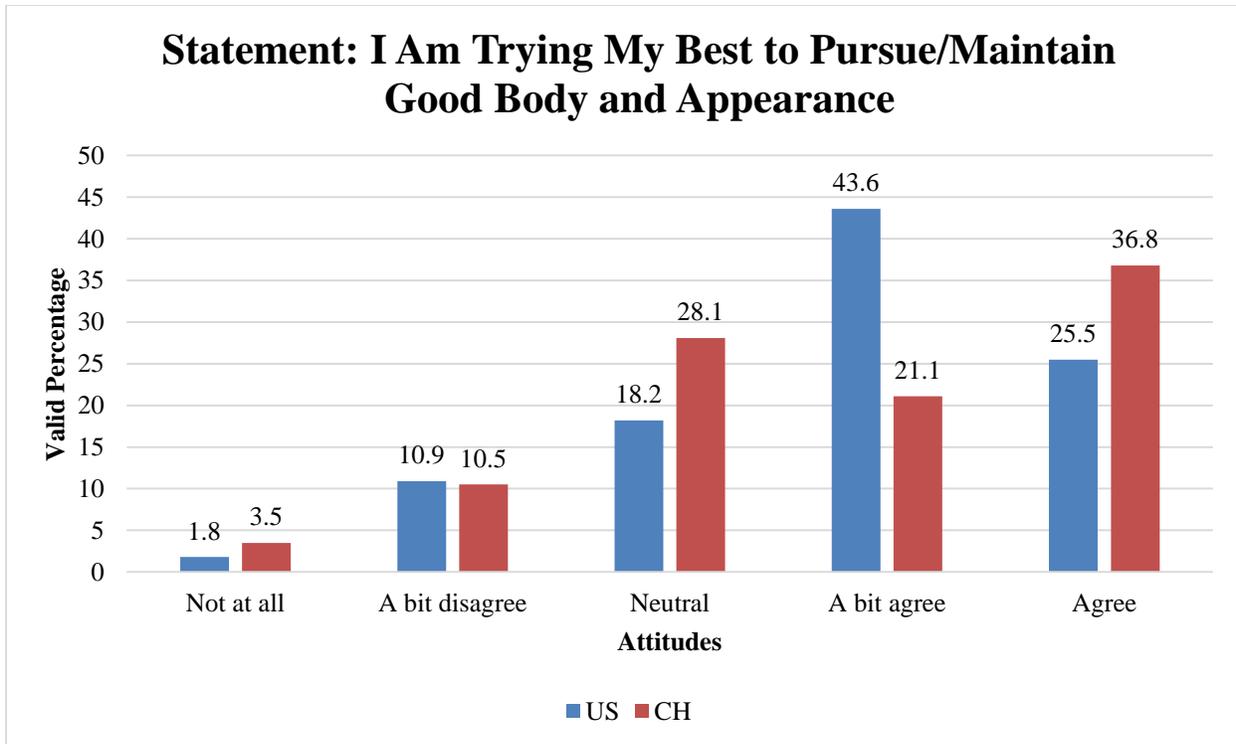


Figure 30. Great effort for ideal appearance.

3.4.4 Appearance Management Strategies

Most frequently used strategy. Clothing was the most frequently used strategy for both groups because it is easier, cheaper, and less time consuming to use, and the changes could be observed instantly. In addition, exercise was considered the second most frequently used strategy, even though it was believed to be the healthiest and most effective method. In fact, the two groups indicated very similar patterns when choosing the most frequently used strategy.

When asked about their most frequently used body/appearance management strategy, 63.8% of the American participants used clothing, followed by exercise (25.9%), makeup (1.7%), and diet (8.6%). Similarly, 61% of the Chinese participants used clothing, followed by exercise (28.8%), makeup (5.1%), and diet (3.4%); see Figure 31.

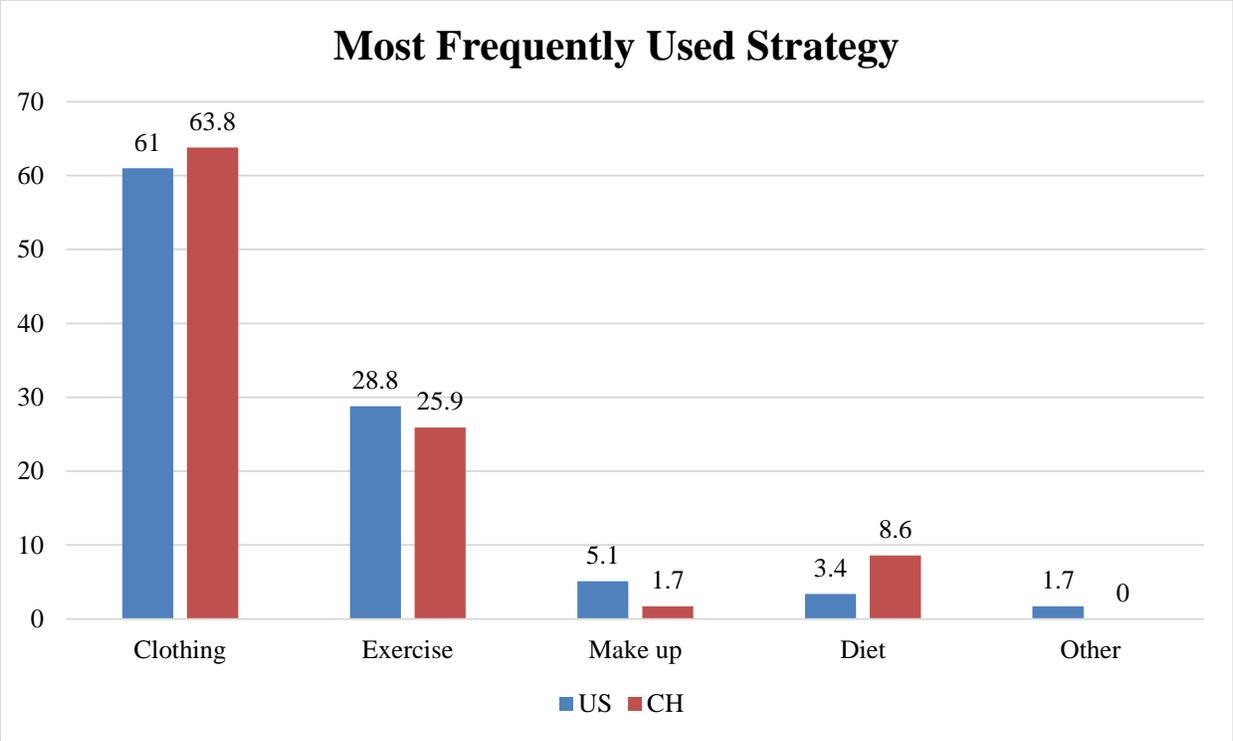


Figure 31. Most frequently used strategy.

Perceived most useful strategy. Both groups believed exercise was the most useful strategy, followed by clothing and diet (Figure 32); no significant difference was observed. Comparatively, more American participants believed exercise was the most useful strategy than the Chinese group did, while more Chinese participants believed clothing was the most useful strategy than the U.S. participants. More than half of the U.S. participants believed exercise to be the most useful strategy (55.2%), followed by clothing (22.4%). According to their annotations and further explanations in interviews, they believed exercise could result in long-term health benefits, which meant they could be fitter and healthier rather than merely looking good. Similarly, for Chinese participants, exercise was believed to be the most useful strategy (49.2%), also followed by clothing (32.2%). Again, they believed exercise can provide long-term health benefits. Interestingly, no U.S. participant believed makeup or surgery was useful, but a few Chinese participants (three and two) did.

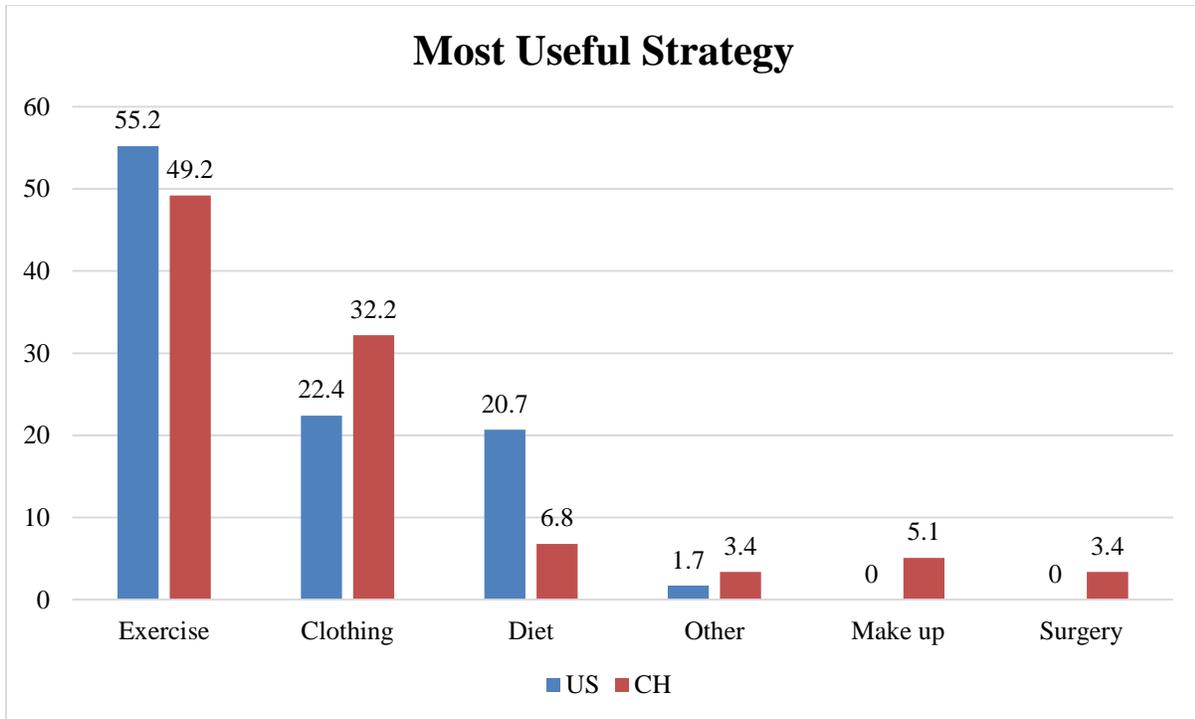


Figure 32. Perceived most useful strategy.

Diet. Participants were asked to report how often they dieted. In general the U.S. participants reported dieting significantly more frequently than the Chinese participants according to the results of chi-square test, $X^2(4) = 15.364$, $p = .004$. Of the American participants, 11.7% indicated that they did not diet at all, and 18.3% stated that they rarely diet. About a third reported that they sometimes diet. More than a quarter indicated that they often diet, while 11.7% indicated that they always diet. In contrast, about a third of the Chinese participants noted that they sometimes diet, while another third indicated that they did not diet at all; 22.2% of the Chinese participants claimed that they rarely diet while 13.6% reported that they often pay attention to food intake.

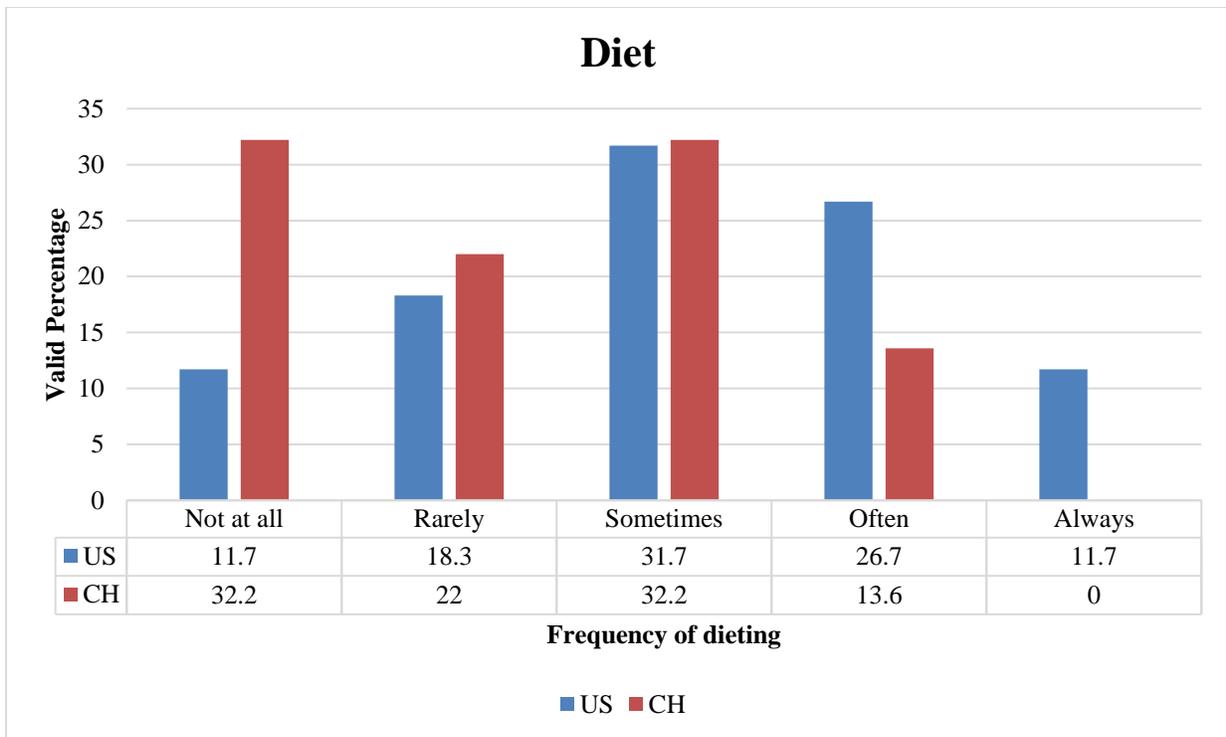


Figure 33. Diet.

Physical activity level. When asked about their physical activity level, participants were asked to choose from five categories: not active at all, only daily activities, sometimes, regularly (two to three times per week), always (more than three times per week). It is worth noting that “daily activities” may indicate different levels of physical activity for different people. For people who do mostly paperwork indoors, daily activity can mean something very different from what it means for people whose jobs involve physical activity. In addition, it is also affected by what kind of transportation people employed to get to work. It is obvious that people who drive to commute perform much less daily activity than those who walk to their workplaces. These factors all need to be kept in mind when discussing physical activity levels.

As indicated in Figure 34, the American group appears to exercise more and to do so more frequently than the Chinese group. However, the chi-square test suggests that the result is close to significance but does not quite attain it, $\chi^2(4) = 9.291$, $p = .054$. To be more specific, it was found that

28.3% of the U.S. participants did not exercise regularly, and one-fifth indicated that they sometimes exercise, but more than a third indicated that they exercise regularly. In comparison, it was found that two-thirds of the Chinese participants did not exercise regularly while a third only engaged in daily activities.

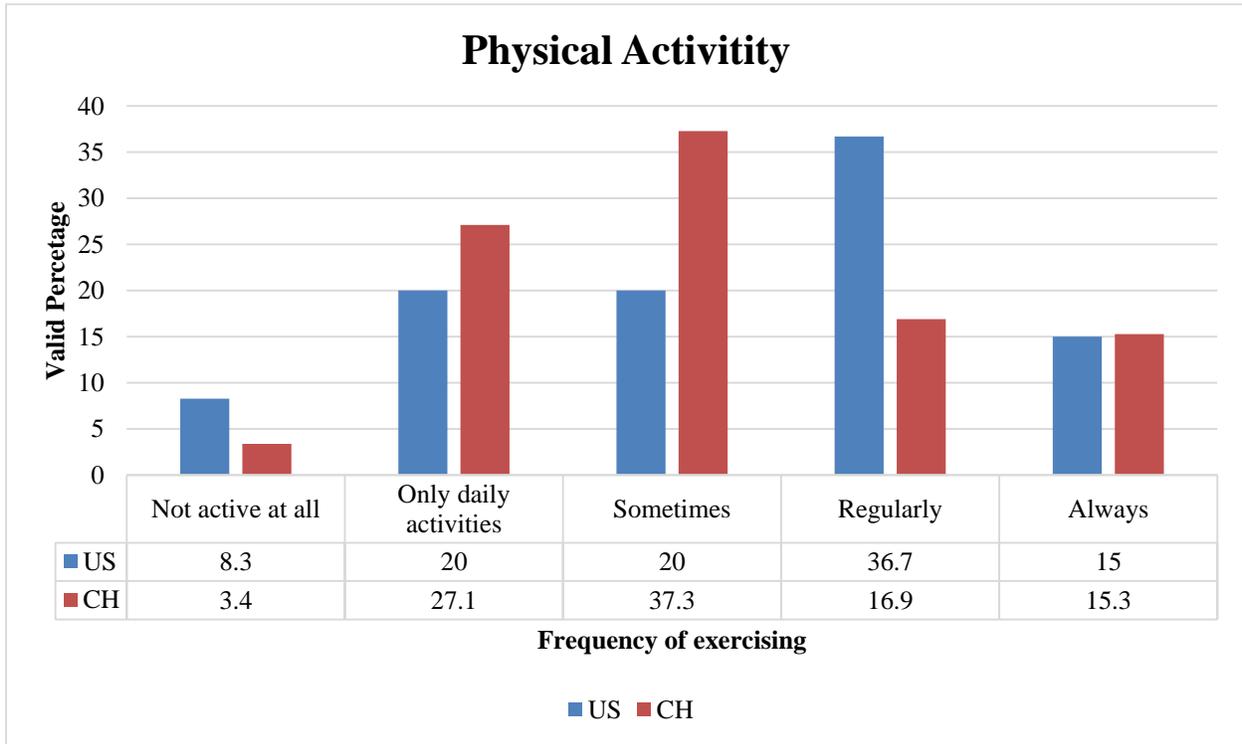


Figure 34. Physical activity level.

3.4.5 Concerns About Ready-to-Wear Products (RTW)

Statements about RTW. Participants were asked how strongly they agreed with the following four statements about ready-to-wear clothing. They were asked to respond using a five-point scale, in which 1 indicated disagreement, 2 meant slight disagreement, 3 stood for neutral, 4 meant slight agreement, and 5 meant agreement.

1. I could easily buy styles I like in the current ready-to-wear market.
2. I could easily buy garments that fit me well in the current ready-to-wear market.
3. Most of my clothes are ready-to-wear.
4. I prefer tailor-made clothing over ready-to-wear.

As shown in Figure 35, both groups were ready-to-wear consumers in general. In addition, both groups preferred ready-to-wear clothing to tailor-made clothing. The American group was comparatively more satisfied with the style and fit choices available to them in the ready-to-wear market. They shopped for ready-to-wear clothing more, and they were slightly less interested in buying tailor-made items than their Chinese counterparts.

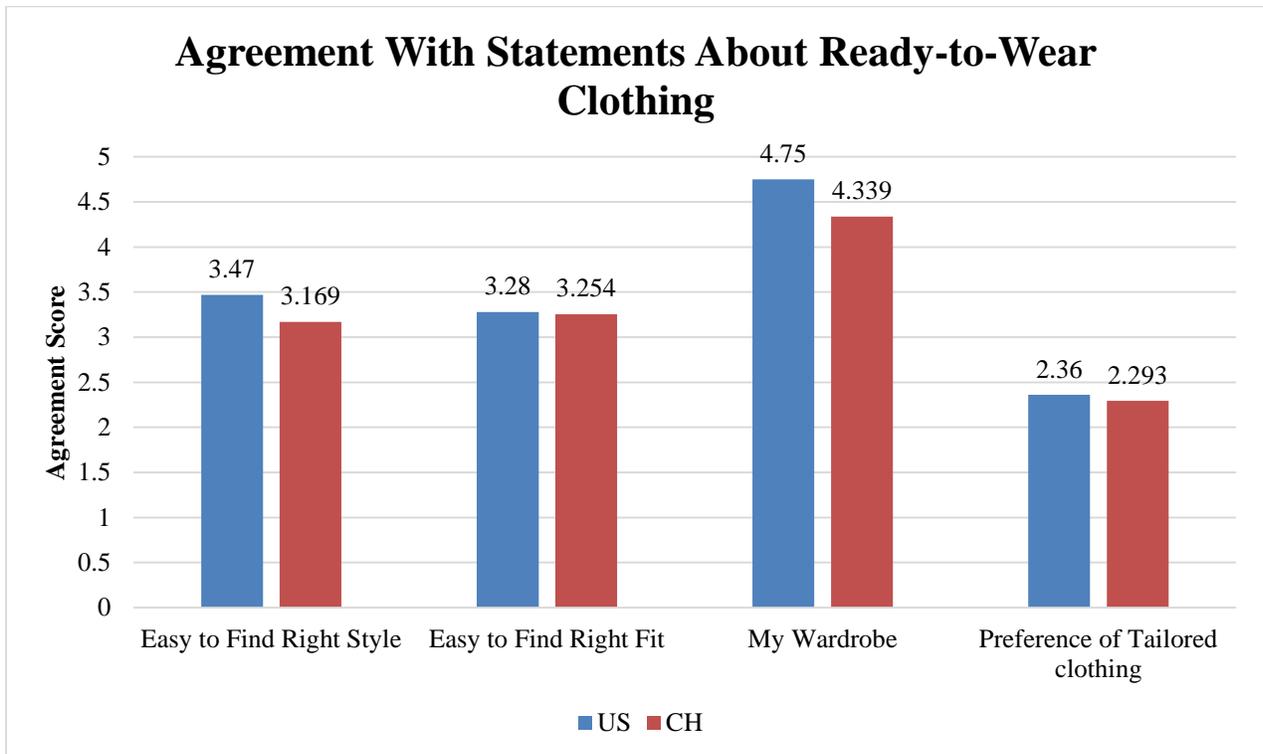


Figure 35. Agreement with statements about ready-to-wear clothing.

In general, both groups were fundamentally ready-to-wear (RTW) consumers; 96.5% of the American participants and 86.4% of the Chinese participants stated that most items in their wardrobe were ready-to-wear. Only 14.3% of American group and 13.8% of the Chinese group preferred tailored products to ready-to-wear.

On the one hand, 44% of the Chinese participants believed it was not very difficult for them to locate styles they liked in the current ready-to-wear (RTW) market. In terms of clothing fit, 55.9% found it was possible to buy garments with a satisfying fit in the current ready-to-wear market, while 29.4% did

not agree. This was a bit surprising to the researchers because it has been well reported that dissatisfaction of fit was one of the biggest reasons for returning products (Ashdown et al., 2004). Survey results for this study indicated that Chinese participants thought that it was slightly more difficult for them to find the right style than to find the right fit; however, it was the opposite case for the U.S. group. On the other hand, only 33.3% of U.S. participants believed it was difficult (7%) or a bit difficult (26.3%) for them to buy styles they liked in the current ready-to-wear (RTW) market, while about half found it was possible to buy garments with a satisfying fit in the current ready-to-wear market.

Statements concerning important clothing features. Participants were asked how strongly they agreed with three statements about ready-to-wear clothing. They were asked to respond using a five-point scale, in which 1 indicated disagreement, 2 meant slight disagreement, 3 stood for neutral, 4 meant slight agreement, and 5 meant agreement. Therefore, the higher the score, the more important the feature was. Here are the six statements:

1. When I am making a clothing buying choice, I think style is very important.
2. When I am making a clothing buying choice, I think the quality of fabric is very important.
3. When I am making a clothing buying choice, I think fit is very important.
4. When I am making a clothing buying choice, I think function (room to move/work) is very important.
5. When I am making a clothing buying choice, I think fashion trends are very important.
6. When I am making a clothing buying choice, I think price is very important.

For both the Chinese and U.S. groups, it was found that among style, quality of fabric, fit, function, fashion trends, and price, fit was rated as the most important criterion for participants' buying choices (4.661 out of 5, Chinese; 4.82 out of 5, American). For the Chinese participants, the second-highest score was assigned to fabric (4.621), followed by style (4.474), function (4.035), price (3.544), and fashion trends (3.123). In contrast to the Chinese group, the second-highest score assigned by the American participants applied to price (4.70). The third most important factor for this group was function

(4.55); the fourth most important features were style and fabric (4.37 each), followed by fashion (3.42). Therefore, it was reasonable to conclude that neither of the two groups was fashion oriented, though fashion was a more important factor for the American group than for the Chinese group.

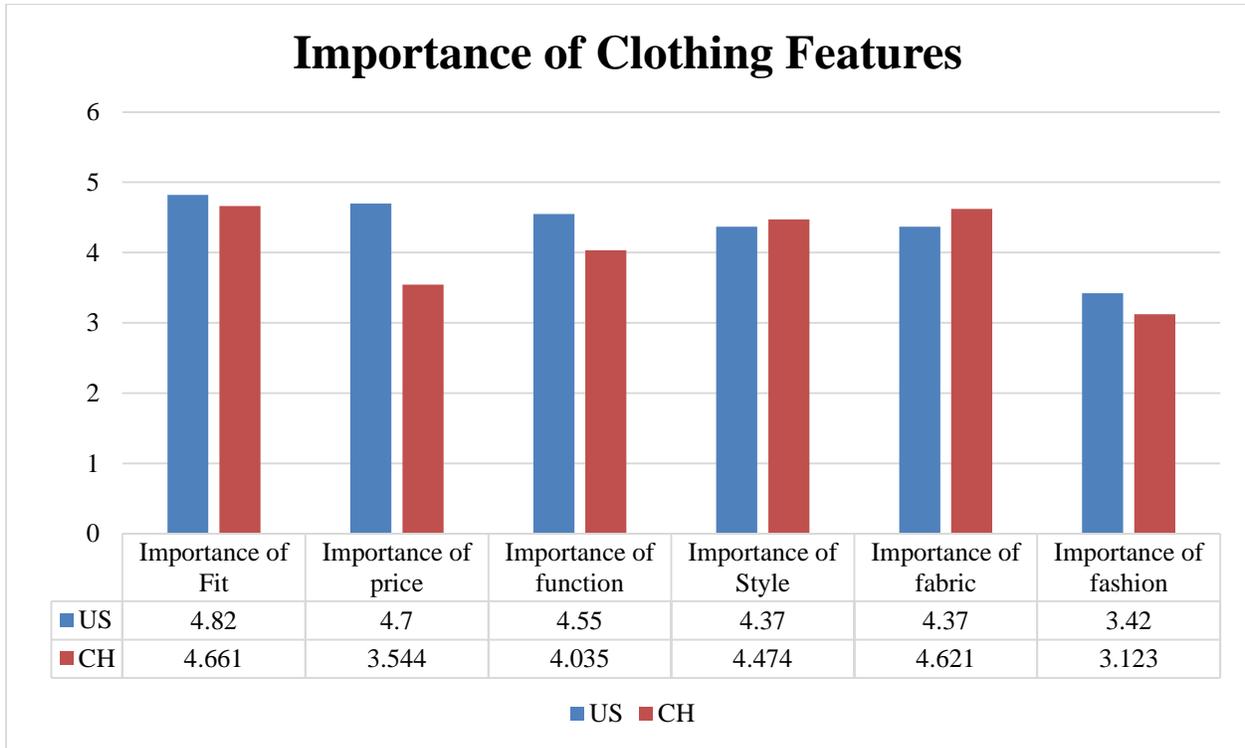


Figure 36. Statements concerning important clothing features.

In general, there was a small between-group difference identified for the levels of importance placed on fit, style, and fashion. However, the U.S. group placed significantly more importance on price and function and significantly less importance on fabric than the Chinese group did, according to the chi-square test results.

Importance of fabric. The two groups placed significantly different levels of importance on fabric when making a clothing buying choice, according to the chi-square test results, $\chi^2(4) = 11.064$, $p = .026$. The Chinese group had a stronger opinion toward fabric than the American group did.

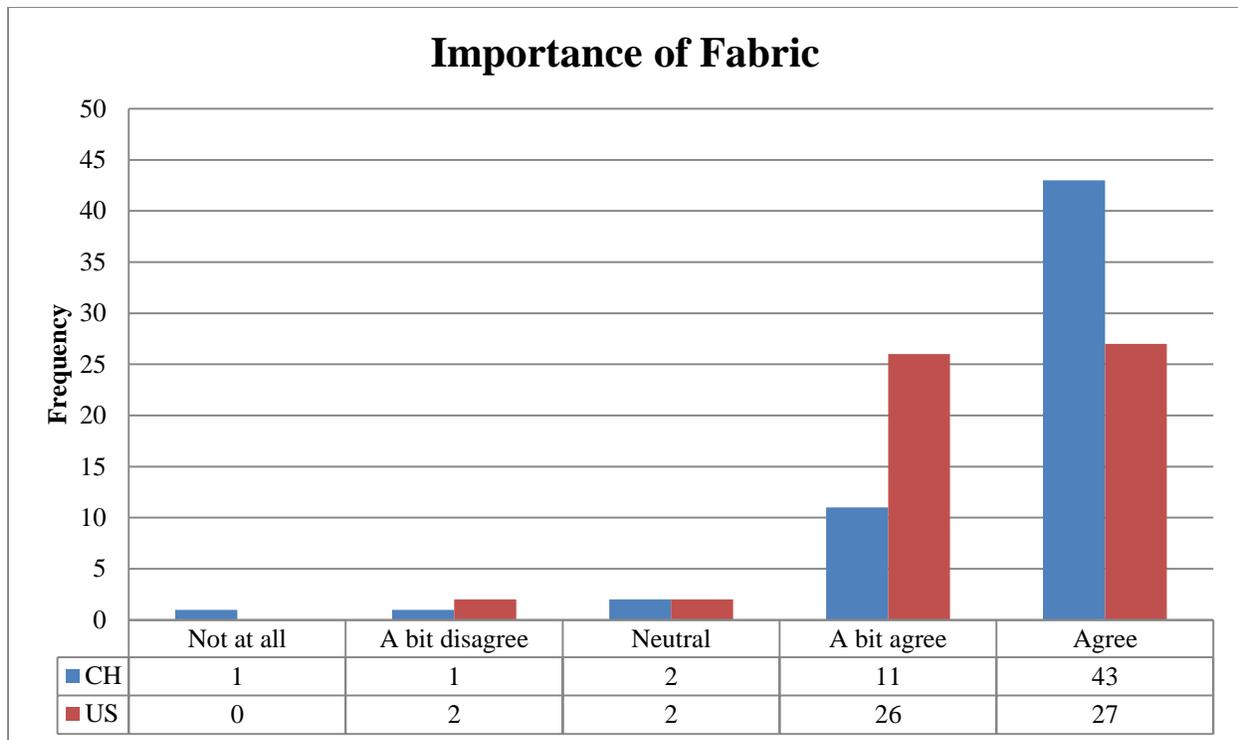


Figure 37. Importance of fabric.

Importance of price. Price was significantly more important for the U.S. group (4.7) than for the Chinese group (3.544), according to the chi-square test, $\chi^2(4) = 50.429$, $p = .000$. This was a surprising finding to the researchers because it was expected that women who had higher incomes and were living in a more developed country would place less importance on price than women who had lower incomes.

In addition, as shown in the following chart, the Chinese participants had more consistent responses when asked about how important price was to them than their American counterparts. This difference might also be a result of the different values promoted in different cultures. For many Chinese women who are committed to traditional Chinese culture, money or price has always been something difficult to express or talk about. Even though they may be greatly concerned about price, it was possible that they intentionally minimized its influence or blurred their responses when responding to a survey like this one. However, there was no way to more closely examine their real thoughts in this survey-based study.

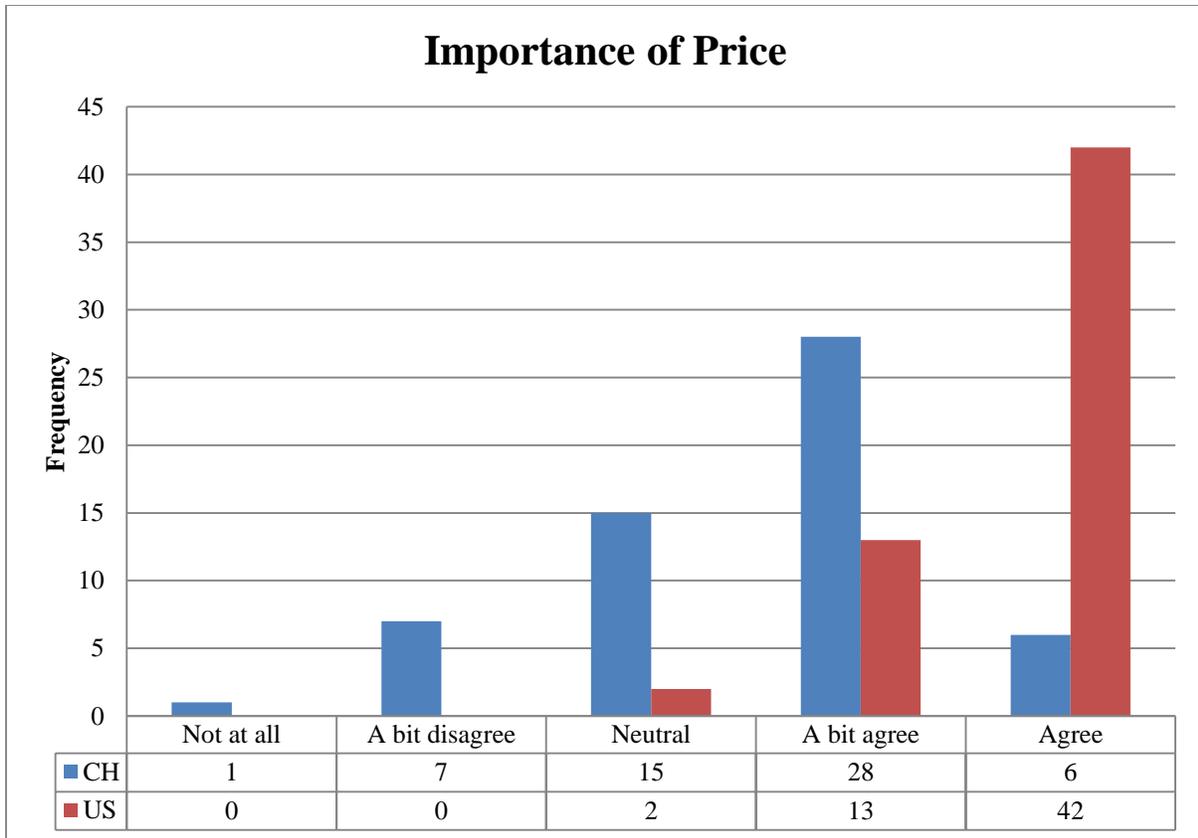


Figure 38. Importance of price.

Importance of function. A significant difference was found between the groups based on the chi-square test, $\chi^2(4) = 14.387$, $p = .006$. As shown in Figure 39, the U.S. group placed much more importance on function. According to their further explanations in the interview session, they placed a lot of value on comfort, referring to space for body movement and for the ability to work in the garment. Interestingly, the Chinese participants were more willing to sacrifice function and comfort for a “more presentable and appropriate” look, especially when they were outside of their private spaces.

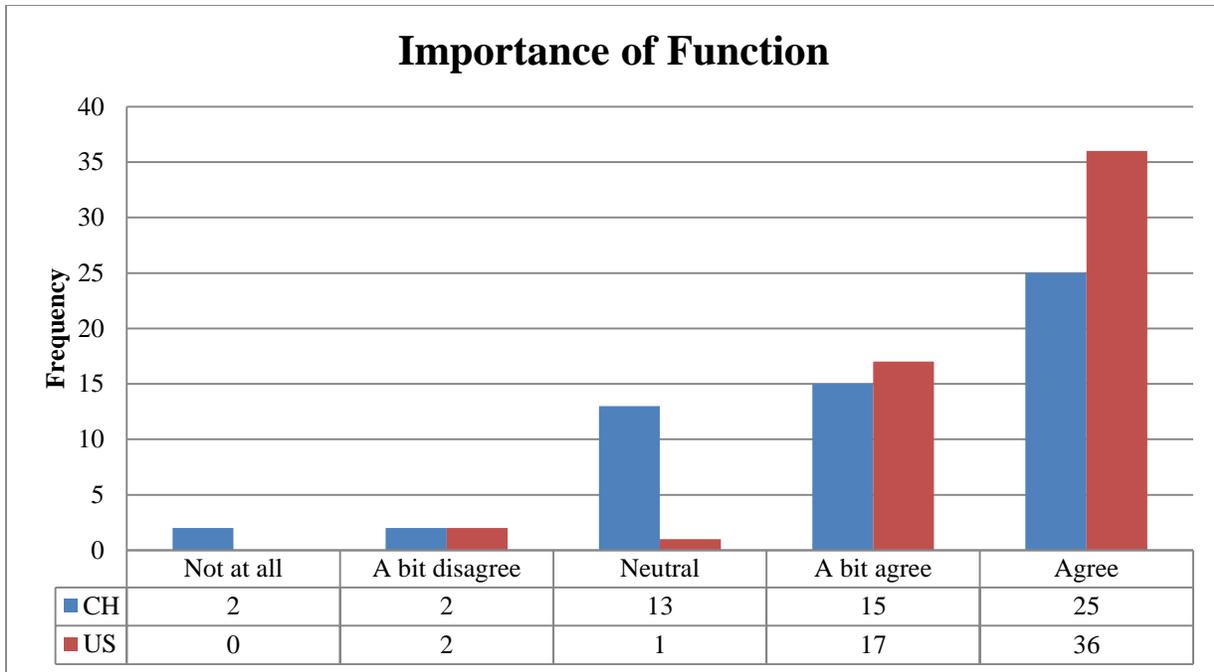


Figure 39. Importance of function.

Statements of importance of outside influences. Participants were asked strongly they agreed with five statements about how much influence others' opinions had on their clothing choices. They were asked to respond using a five-point scale, in which 1 indicated disagreement, 2 meant slight disagreement, 3 stood for neutral, 4 meant slight agreement, and 5 meant agreement. Therefore, the higher the score, the more important it was.

1. My friends' opinions have a great influence on my clothing choices.
2. My spouse/partner's opinion has a great influence on my clothing choices.
3. My other close family members' opinions have a great influence on my clothing choices.
4. Current fashion trends (designers/celebrities/models) have a great influence on my clothing choices.
5. Mass media has a great influence on my clothing choices.

In general, neither of the two groups considered themselves to be greatly influenced by others' opinions when it came to their clothing choices. Basically, they reported making clothing buying choices independently. The opinions of friends, partners, and other close family members might affect their

clothing choices, but the participants suggested that the influence was not very strong. They indicated that current fashion trends and mass media had even less influence on them. However, a significant difference was observed for the influence of close family members and for the influence of fashion trends.

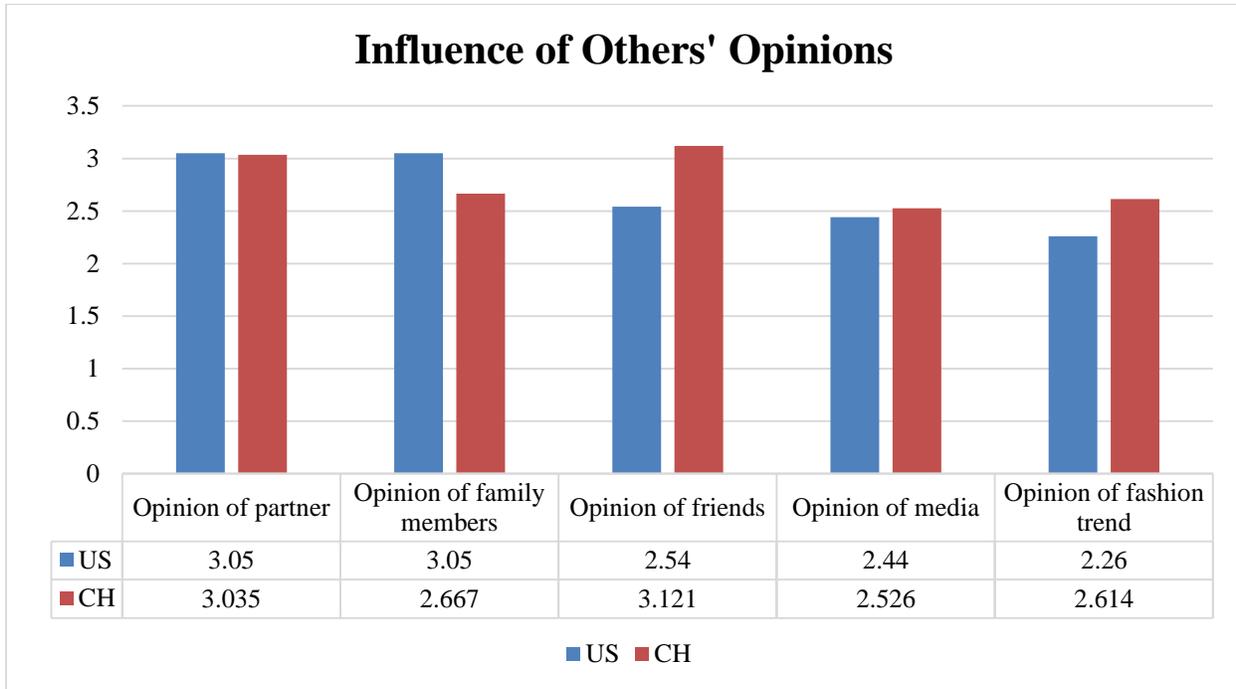


Figure 40. Influence of others.

Influence of other close family members' opinions. Compared to the American group, the Chinese group reported less influence from other family members (chi-square test result: $\chi^2(4) = 12.281$, $p = .015$). Significantly more Chinese women than American women offered a neutral or negative opinion toward this statement. As further explained by interviewees, the Chinese women usually went clothing shopping alone, and they were the ones who made buying decisions for other family members. In contrast, the American women often shopped only for themselves and gave more freedom to other family members to make their own clothing choices. Therefore, this difference was expected.

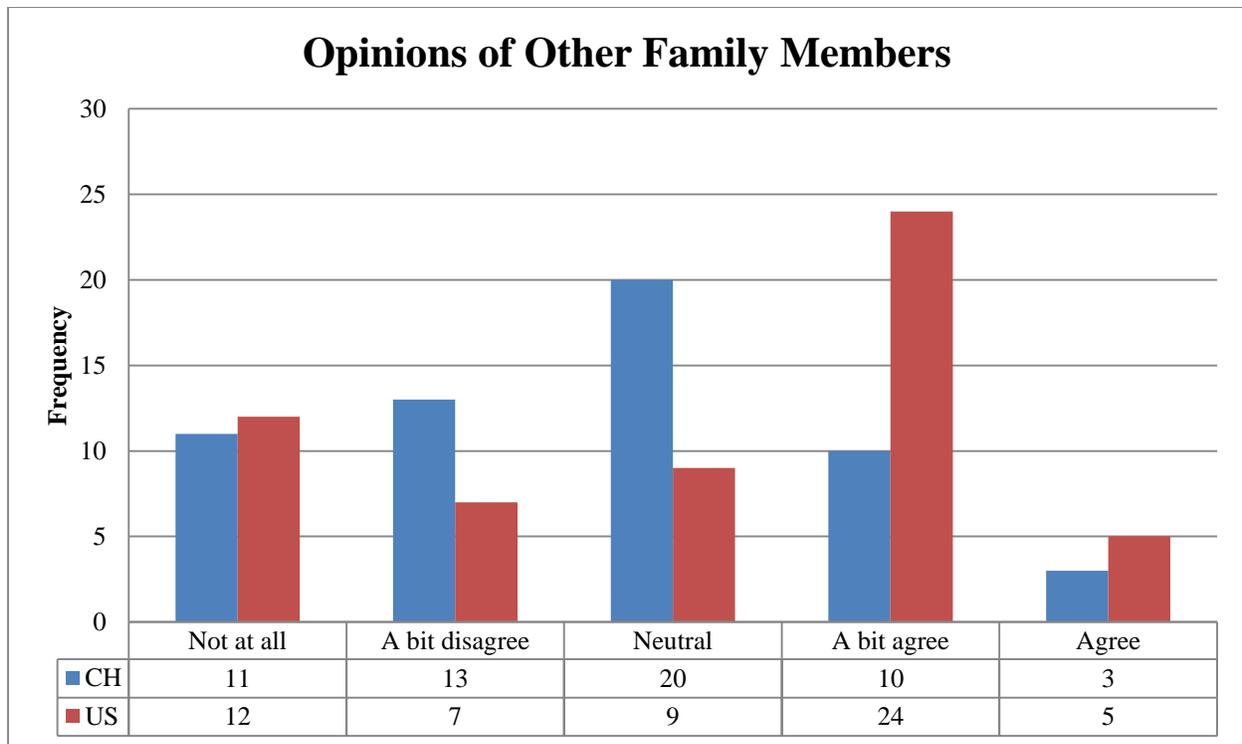


Figure 41. Influence of other family members.

Influence of fashion trends. Neither of the groups perceived a great influence from fashion trends, even though a significant between-group difference was found ($\chi^2(4) = 13.230, p = .010$). As shown in the Figure 42, the American participants had a stronger opinion on the influence of fashion trends; 40.7% did not believe fashion trends influenced their clothing choices, while 22.8% slightly disagreed that they did. However, many more Chinese women than American women were neutral on this topic (42.1% versus 14%).

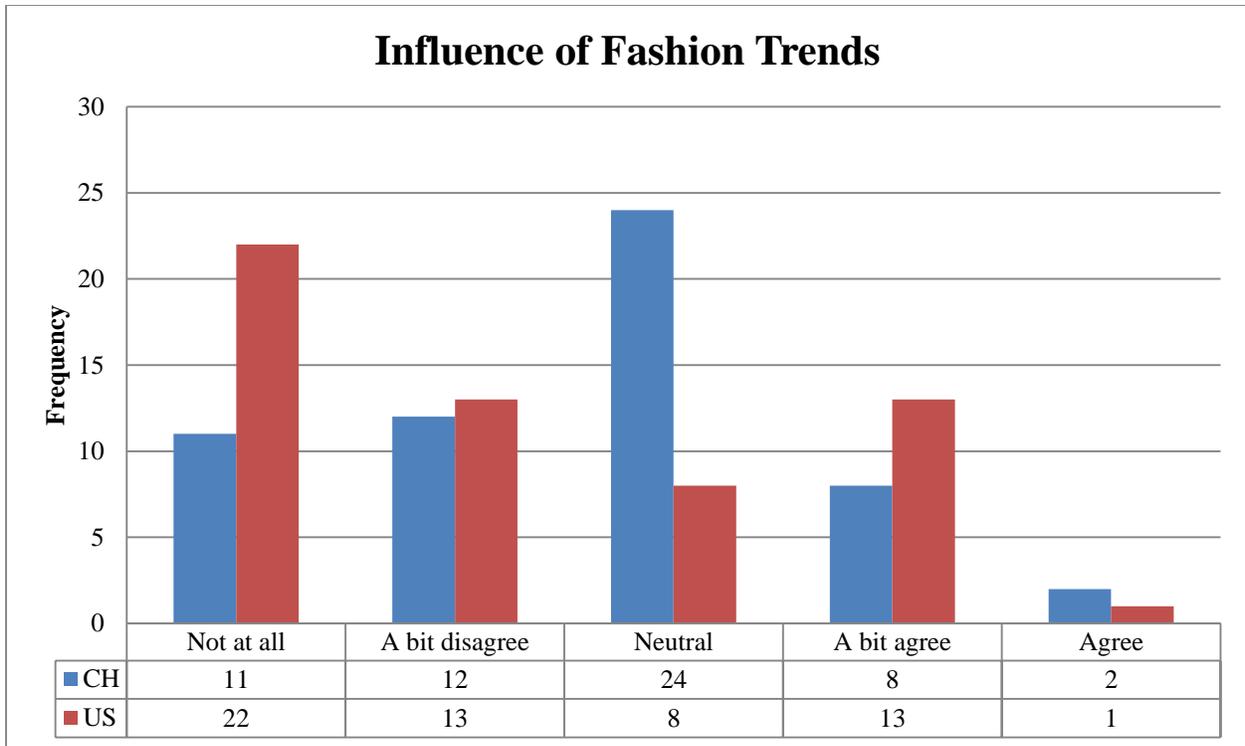


Figure 42. Influence of fashion trends.

Clothing choices. Participants were asked how strongly they agreed with three statements about their clothing choices. They were asked to respond using a five-point scale, in which 1 indicated disagreement, 2 meant slight disagreement, 3 stood for neutral, 4 meant slight agreement, and 5 meant agreement. Therefore, the higher the score, the more important it was. Here are the three statements:

1. My style choices are very similar to those of other women of my age.
2. I am very confident that I know what kind of style looks good on me.
3. I am very confident that I know how to do fit evaluation.

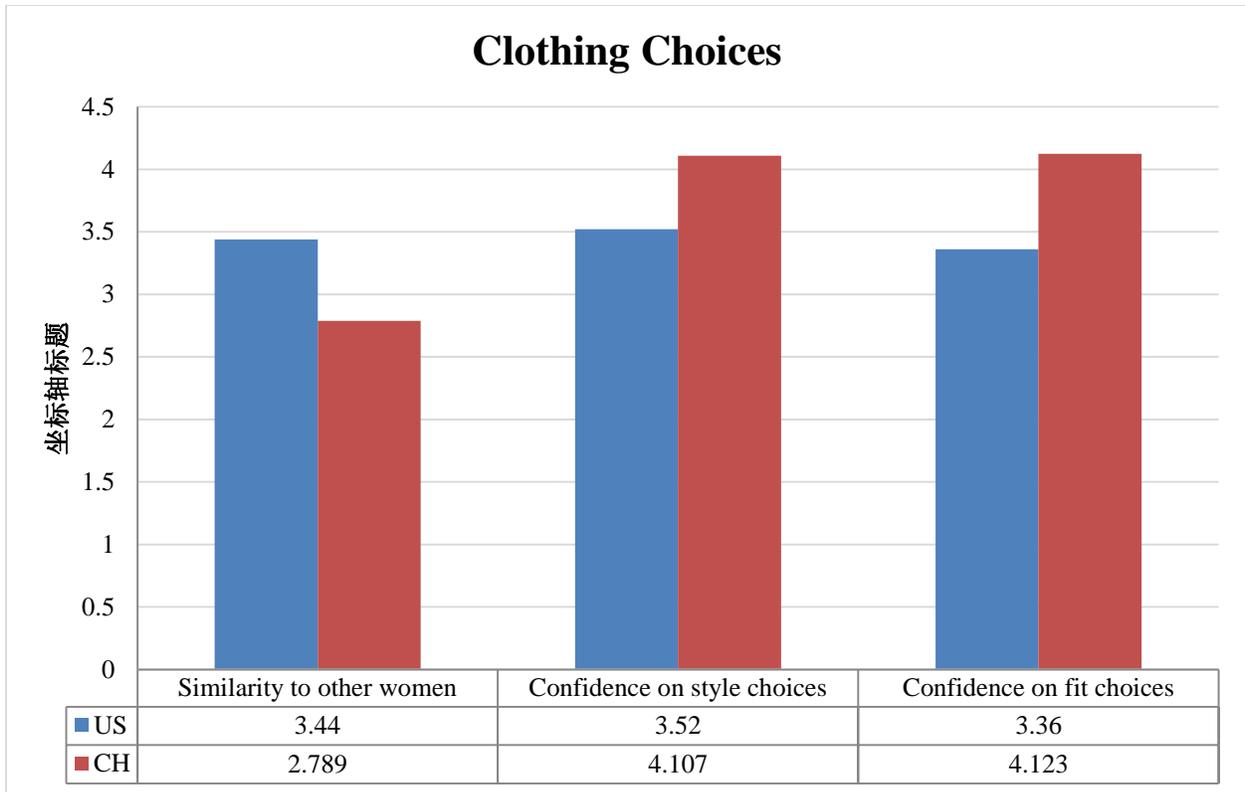


Figure 43. Clothing choices.

Comparison with women at similar age. Interestingly, it was found that the Chinese group did not believe their choices were similar to those of other women of the same age, while the U.S. group did. Chi-square test results indicated a significant between-group difference ($\chi^2(4) = 11.924$, $p = .018$).

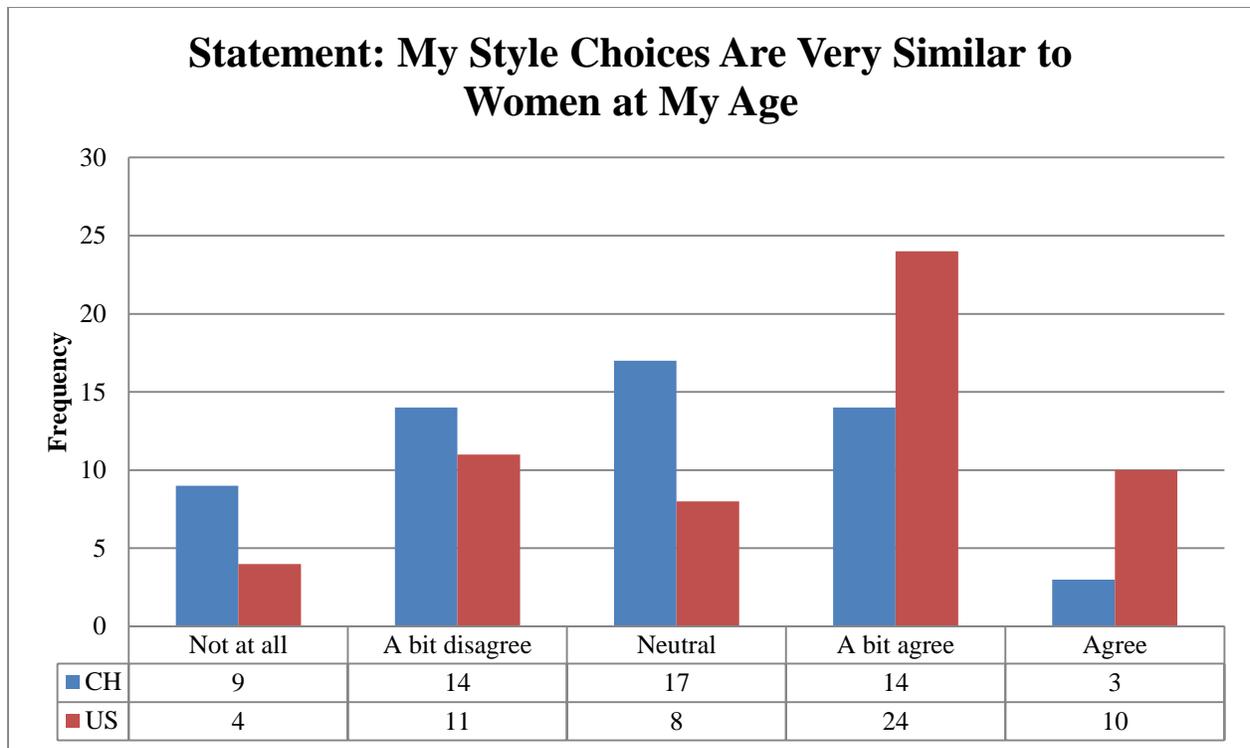


Figure 44. Similarity to women of similar age.

Confidence in clothing style and fit choices. As shown in Figures 45 and 46, the Chinese group was much more confident than the U.S. group in both clothing style choices and fit choices. Chi-square tests indicated a significant between-group difference on levels of confidence in clothing style ($\chi^2(4) = 12.695, p = .013$) and clothing fit choices ($\chi^2(4) = 19.300, p = .001$).

The Chinese women were more confident in their clothing style choices than the American women (see Figure 45). Even though about half of the American participants (48%) were a bit confident in their style choices, only 18% were very confident. In comparison, 42.9% of the Chinese participants were very confident in their clothing style choices, while about another a third (33.9%) were slightly confident.

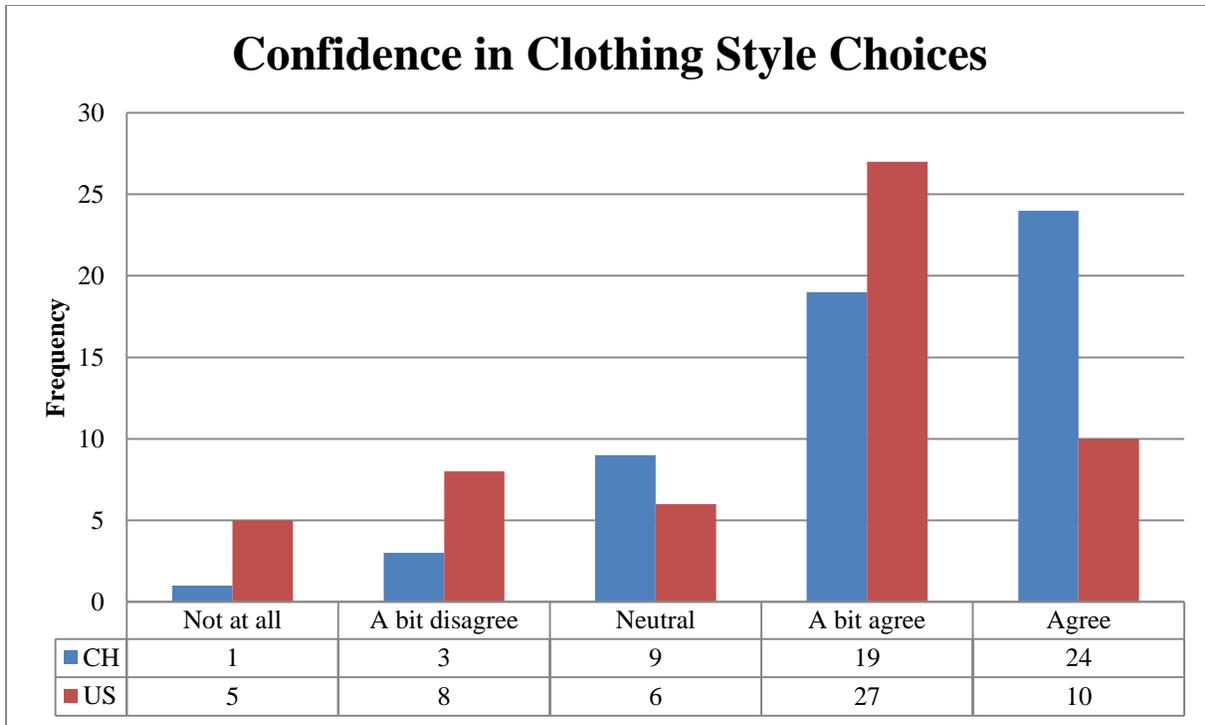


Figure 45. Confidence in style choices.

More than a third of the American participants indicated they were not confident in their fit choices while the number for the Chinese group was only 7%. In addition, 43.9% of the Chinese women were very confident in their fit choices, while the number for the American group was only 17.9%. Therefore, even though it was not possible to determine whether the Chinese women could actually do a better job of fit evaluation than their American counterparts, they were at least much more confident about doing so.

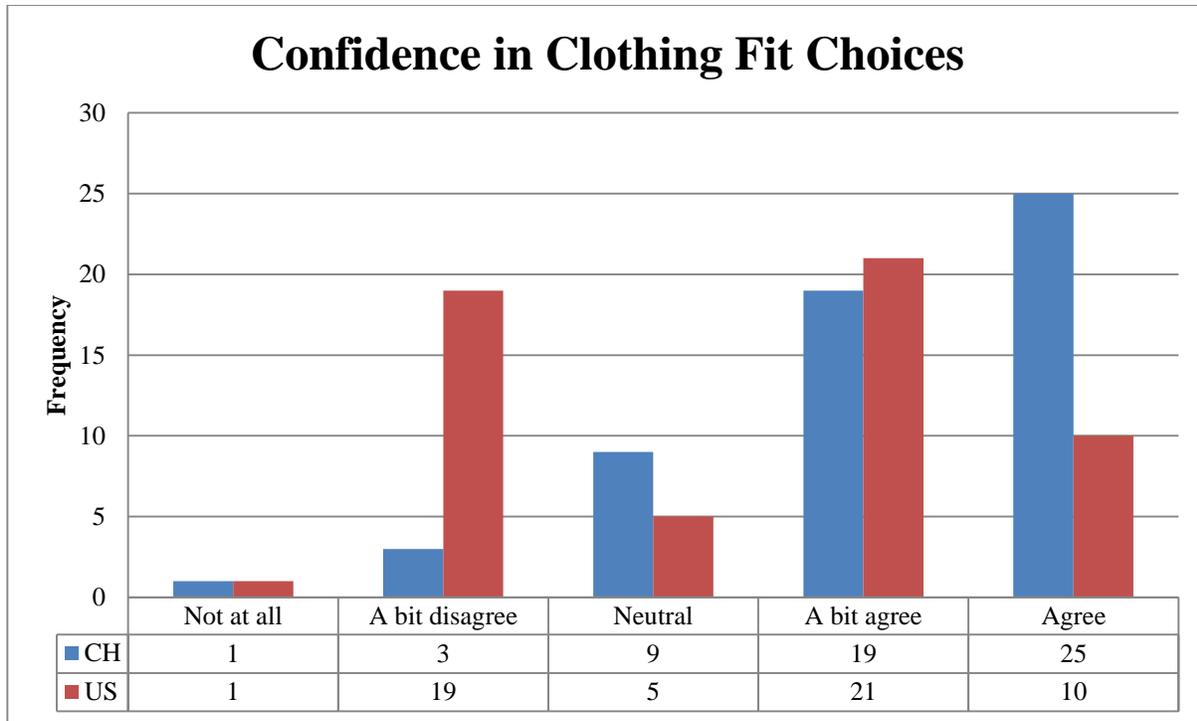


Figure 46. Confidence in fit choices.

Spending on clothing. Participants were asked about their spending on clothing per season in a multiple choice question. Later, their choices in Chinese RMB were converted into USD (currency rate 1 USD = 6.2 RMB). Here, point 1 means that on average they spent less than \$100 on clothing per season. Similarly, point 2 equaled \$100–250, point 3 meant \$250–500, point 4 indicated \$500–1000, and point 5 represented more than \$1000.

Interestingly, the Chinese group on average spent a bit more than their U.S. counterparts. This was surprising to the researchers because according to limited information reported by these two groups about their annual and household annual incomes and public statistics such as average annual income in these two locations, the Chinese group had lower incomes than the American group. However, it is important to point out that the relative price of clothing, especially branded and designer clothing, is much higher in China than in the United States. As shown in Figure 47, a bikini set sold in Shanghai, China, is 36.6% more expensive than the same one sold in the United States.

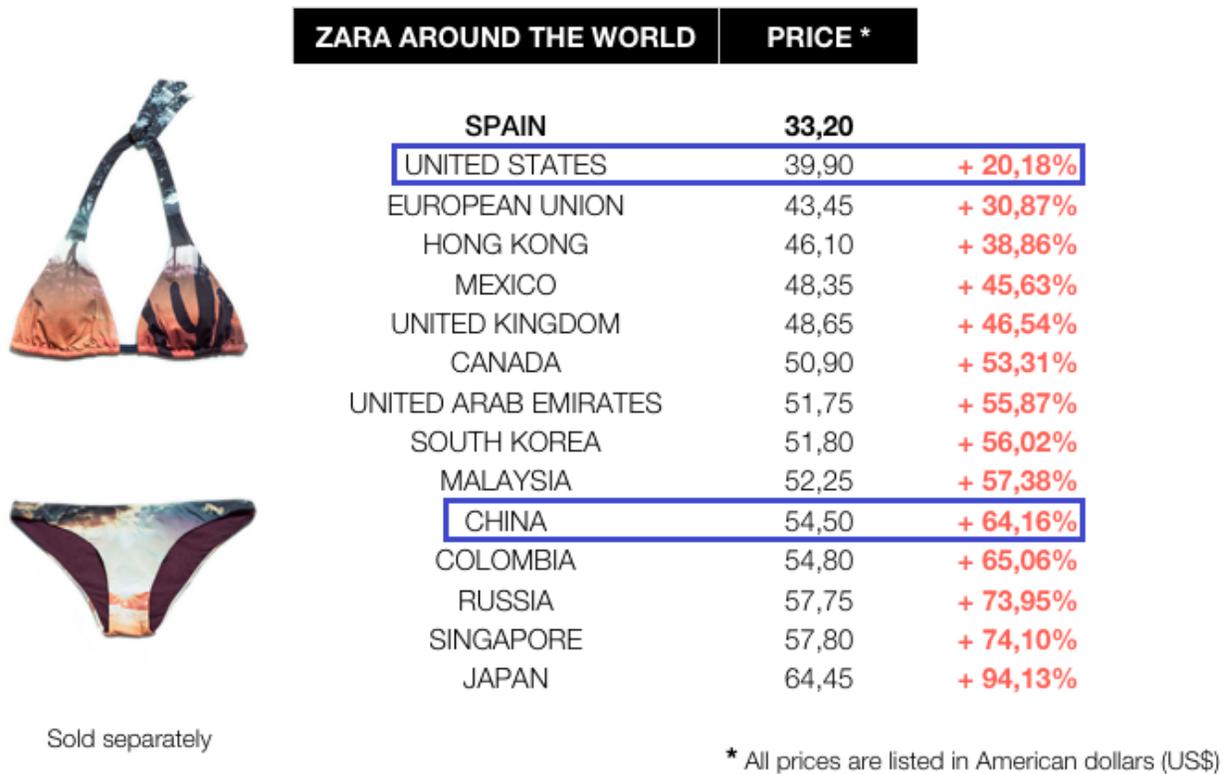


Figure 47. An example of different product prices in different countries. From “Zara Prices Worldwide Comparative: Spain is the Cheaper,” 2014 (<http://zaraforwarding.com/spain/zara-prices-worldwide-comparative-spain-is-the-cheaper/>). Copyright 2014 by Zara Forwarding from Spain. .

For the American group, the most frequently reported range was \$100–250 (42.1%), followed by \$500–1000 (19.3%) and \$250–500 (17.5%). For the Chinese group, however, the most frequently reported range was \$250–500 (35.1%), followed by \$100–250 (26.3%) and less than \$100 (15.58%).

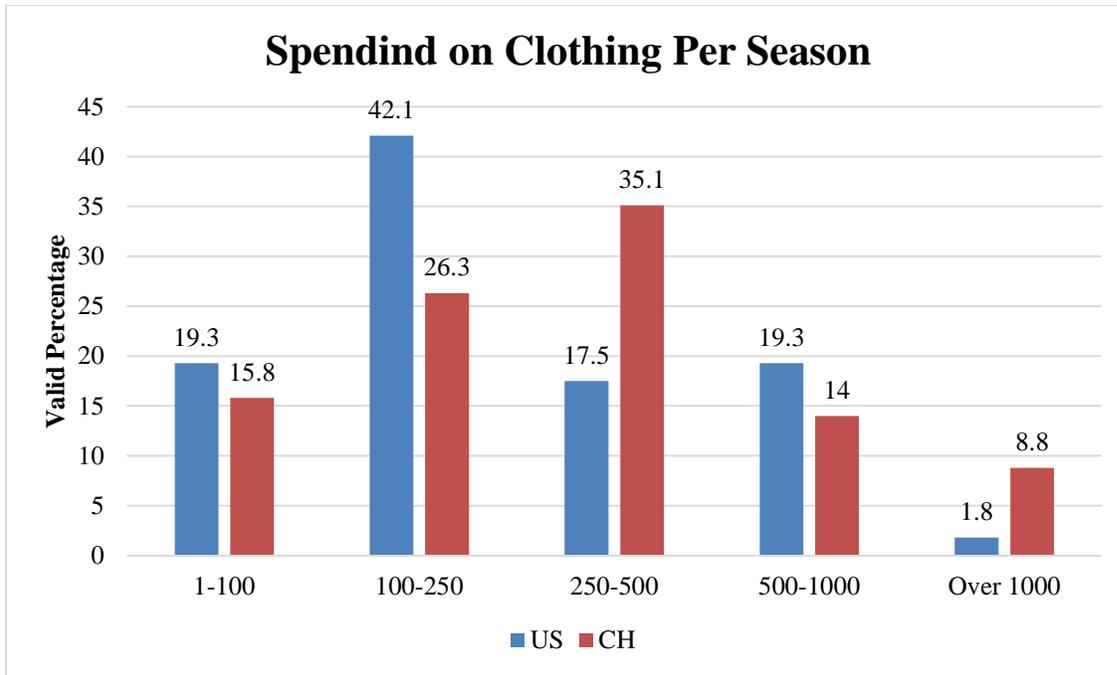


Figure 48. Spending on clothing per season.

Media influence. Participants were asked to indicate how much time (on average) they spent on reading clothing- and beauty-related information per day. About half of both the Chinese and the U.S. participants spent no time reading fashion-related materials at all. However, more than a third of the American women reported that they do read clothing- and beauty-related information, but not on a regular basis. In contrast, about two-fifth of the Chinese women reported that they read this type of information on a regular basis, even though it was less than half an hour. A significant between-group difference was found by chi-square test ($\chi^2(4) = 26.279, p = .000$).

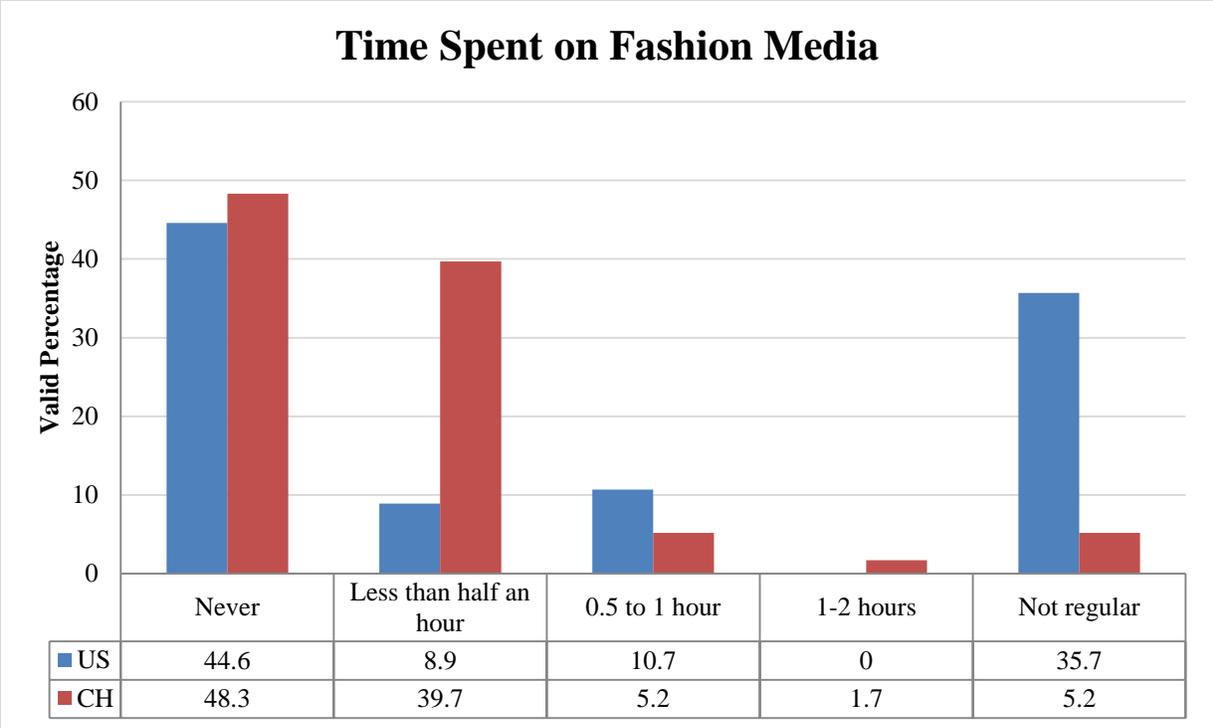


Figure 49. Time spent on fashion media.

3.5 Discussion

As expected, mature women’s body image, appearance management strategies and practices, and choices of RTW clothing are all related to physical body. However, how they perceived their physical body and how closely such perception related to their ideal physical body strongly influenced their appearance management behaviors as well as how they evaluated clothing and used clothing for appearance management purpose. Furthermore, the process of body perception and evaluation was greatly affected by social and cultural settings, and it also changed during the aging process.

As presented in the result section, discrepancy between physical body and mental perception of physical body has been observed in this study. It was very likely low body satisfaction was a result of the discrepancy between actual and ideal body. In other words, the size of the discrepancy between actual and ideal body figure was a better indicator of the satisfaction level of physical body than absolute BMI number or figure size. Similarly, practices and motivations of appearance management were better

observed in women with large actual-ideal gap. In addition, higher confidence of clothing fit and style choices, less tendency to engage social comparison as well as more clothing shopping behaviors were all related to smaller discrepancy. Furthermore, stronger desire and greater efforts of physical appearance improvement were observed in the American group than in the Chinese group, even though the Chinese group placed more importance on physical beauty. A possible reason for this could be the influence of Chinese culture. According to further explanations provided by Chinese interviewees, Chinese women believed in natural beauty—they believed that their body and appearance were gifts from their parents—and therefore were only willing to commit a certain amount of effort to maintain the level of beauty that they thought belonged to them. They said it was not necessary to make extreme efforts to pursue ideal beauty or to modify their physical appearance and body to fit into an ideal. They believed this was not natural and unachievable. Those beliefs were very different from those held by American women, who believed in things like subjective initiatives.

Other than that, the two groups of different ethnicities had varying body shapes and BMIs. In general, more variations and higher BMIs were found within the American group. It is very interesting that even though these two groups fell into significantly different BMI categories, they did not have significantly different perceived current body sizes. On the other hand, the Chinese women reported lower ideal body sizes. They also reported a smaller gap between their perceived current and ideal body size than the American group. Comparatively, they were more satisfied with their current physical body than their American counterparts.

In this study disparity between self-reported BMI and perceived current body size was found. The most obvious within group difference was found in the normal BMI category. Normal and underweight female overestimated their current body figure by choosing a figure that was supposed to represent a larger BMI. In contrast, overweight and obese women underestimated their current body figure by choosing a figure that was supposed to represent a smaller BMI. Those two types of discrepancies were identified in both the U.S. and Chinese groups, however, misperceptions were stronger for the Chinese

group, especially in the circumstance of adopting U.S. BMI classification standard. This finding is in line with previous findings that small size women tend to overestimate their figure while large size women tend to underestimate their figure. It is very possible that figure scale can more closely reflect actual body size when used by an observer instead of self-rating, however contradictory findings of the accuracy and validity of using figure scale for measuring body image have been documented (Cardinal et al., 2006; Gillen & Lefkowitz, 2011). This study indicated that classification of figure drawing need to be tested and improved. In addition, this study also provides evidence for encouraging the adoption of a different BMI classification standard for the Chinese group.

On the other hand, it is worth noticing that BMI was calculated based on self-reported data in this study. A great amount of literatures has indicated that self-reported BMI data should be taken with cautious even though it generally is highly correlated to actual BMI (McAdams, van Dam, & Hu, 2007; Spencer, Appleby, Davey, & Key, 2002; Stommel & Schoenborn, 2009). It has been reported repeatedly that underweight people, especially young female underweight adults, tend to overestimate their BMI while overweight people tend to underestimate their weight, across culture, age and ethnicity. However, Stommel and Schoenborn (2009) reported that discrepancies between actual and self-reported BMI is vary systematically with age, gender and the ethnic/racial background of the respondents. Discrepancy was less severe among adults in the age range of 35 to 55 than other age groups since younger groups tend to underestimate weight and old group tend to overestimate height (Kuczmarski, Kuczmarski, & Najjar, 2001; Stommel & Schoenborn, 2009).

In addition, the Chinese women were more satisfied with their current physical bodies than the American women were. However, almost all of the women believed there was some room for “improvement.” In addition, different patterns of “favorite” and “least favorite” body parts were identified in the two groups. A possible interpretation of this result was that these two groups of women had different standards of ideal beauty. They had strong feelings toward different body parts. Since genetically they were born with different body types and grew up in different cultures, it is

understandable they gradually developed fond feelings toward different body areas. Literatures have also indicated that women tended to use clothing to hide disliked body parts and highlight favorite body parts (Grogan, Gill, Brownbridge, Kilgariff, & Whalley, 2013). Therefore, this study provides firsthand information on customers' need and desires as well as practical guides to the apparel industry, especially RTW producers on how to increase customer satisfaction. Interestingly, the American group emphasized physical beauty less than their Chinese counterpart. However, even though the American group placed significantly less importance on ideal appearance and body, they made or indicated a significantly stronger desire to make great effort to pursue ideal appearance. Actually, they were more physically active and reported more dieting behavior. It may be that the actual efforts of the two groups are more equal than this finding implies. It is possible that the kind of efforts made by the two groups of women and their standards of evaluating "efforts" were different. In fact, it was possible that the appearance management strategies used by the Chinese women were so mundane and consistent that they became part of their daily routine. Therefore, they did not even recognize their behaviors as efforts for improving or maintaining good physical appearance. For instance, even though they did not engage in vigorous physical activities such as jogging or other aerobic activities in a gym, which were frequently reported by the American participants, the Chinese women walked and did physically active work almost on daily basis. Also, even though they reported that they rarely dieted, their daily diet was relatively healthy and light. Many were in favor of a plant-based diet and were cautious about sugar and fat intake, even though they did not choose to do this for dieting purposes. They were also careful about their daily presentation both in public and in private, and used clothing and makeup to enhance their physical outlook. However, it was not because they want to improve their physical appearance but because they believed it was impolite if they are not presentable in front of people.

Notably, even though the U.S. group reported dieting more frequently than the Chinese group, they did not see diet as a frequently used appearance management strategy. One reason could be that the American women may indeed diet more frequently, but they did not do it for the sake of appearance

management. Or they did not state what they really believe, consciously or unconsciously. Another explanation is that they indeed diet a lot, but comparing to other strategies, dieting plays a less important role. In other words, if they emphasized diet this much but could only rank it as the fourth most frequently used strategy, they indeed made a great amount of effort to pursue ideal appearance by adopting other strategies.

These two groups reported different concerns with ready-to-wear clothing. In general, fit was very important to both groups as reported by previous studies. However, the American women were function- and price-driven than their Chinese counterpart, while the Chinese women cared about fabric and the balance between general quality and price. Caution must be taken in interpreting this because the availability and the relative price of RTW products on the Chinese and U.S. markets could be very different. In addition, neither group reported being fashion-oriented. Different patterns were reported by previous studies based on different age groups (Eckman et al., 1990; Lee & Burns, 1993).

Interestingly, the Chinese group did not believe their clothing choices were similar to those of other women of the same age, while the U.S. group did. In addition, they were happy to be different and wanted to differentiate themselves from the group they were in. This was very surprising because in a collectivist culture like the Chinese, it is reasonable to assume that Chinese women would tend to assimilate themselves more with others, while it would be the opposite for an individualist culture such as the United States. One interpretation of this could be that the Chinese women wanted to be different within boundaries. In interviews, when they said their choices of clothing were different from those of other women at the same age, they meant they tried to show some personality through their outfits. They mostly referred to their careful selections of design details and fabrics in their outfits, instead of trying to be very different from the group. They did not want to be identical with other women, but they did not want to stand out either. In other words, they wanted to be recognized as someone who had some thought about their outfit and cared about their outlook without being one of “those women.”

It is very important to keep in mind that the sizing systems used in these two different countries are actually different. The same letter or number used to indicate sizes could mean totally different dimensions. This is reasonable because each sizing system is developed based on the physical body dimensions of a certain group of people, and it aims to accommodate the physical body and the needs of that group of people. For instance, the medium size usually targets the median size of a certain group. Since the physical dimension of medium-sized people among different groups can be very different, consequently, the “medium” size developed for these different groups is actually different. Thus, even though the American and Chinese participants indicated very similar pant and top sizes, it does not necessarily mean the two groups had very similar body dimensions or body shapes.

However, it is still interesting and informative to learn the distributions of each size, which provide valuable information for studying those participants’ concerns about current ready-to-wear (RTW) products and their need for better-fitted clothing. In addition, it may also provide preliminary information on how to improve the current sizing system to accommodate the body shapes and needs of this age group. A less evenly distributed size choices reported by the U.S. group maybe was the result of more diversified body shapes within the U.S. group. It may also be due to the more complicated and sometimes confusing sizing system used in the U.S. ready-to-wear market. Comparatively, the sizing system used in the Chinese ready-to-wear market is more unified and the body shapes of Chinese women less diversified.

Moreover, the Chinese women were more confident in their fit and style choices than the American group were. There could be several reasons for this. First, the Chinese women had much less variation in their body shapes and types; therefore, the sizing system in China can be less confusing than that in the United States. In other words, it is relatively easier for Chinese women to look for the “right” fit. It is also easier for brands that target the Chinese market to develop their own sizing system to fit their target customers. Second, traditionally, Chinese women receive education on sewing and fitting from their older family members, especially from their mothers. Third, in Chinese culture, it is more common for people to give positive than negative feedback (if they do give negative feedback, they tend to

minimize it and make it subtle). Therefore, it is understandable that there might be a high possibility that the Chinese women have received positive reinforcement during the clothing shopping and fitting process. Gradually, they have indeed come to believe they are able to make the right clothing style and fit decisions, even though this may not be the case. Last but not least, the Chinese women are, in general, in charge of their family members' clothing, and they have the authority to buy clothing for other family members; they are believed to be experts, which could be another source of confidence. This indicated that the Chinese group had more diversified ideas about their relationships to their ideal body size than their American counterparts.

3.5.1 Limitations

A limitation of the study was the use of self-reported measures. Reliance on such measures presupposes that individuals will accurately and honestly answer the survey instruments and often raises particular concerns regarding self-reports of weight and height. Previous researchers, however, have indicated a high concordance between actual and self-reported height and weight (McAdams et al., 2007; Stunkard & Albaum, 1981). Since a number of participants failed to report weight and/or height (a potential sign of high dissatisfaction itself), the results obtained may be biased.

The second limitation was the comparability of the two groups. The Chinese group was recruited from a university located in a metropolitan city on China's east coast, while the American group was recruited from a university located in a small city in upstate New York. The choice to recruit among university employees was fundamentally made based on the availability of 3D technology. Both of the two universities had a 3D body scanner, which is crucial for the extended study, even though it was not used in the survey study. In addition, as a cross-cultural study, many other differences were expected. These two groups of women have been living in two different sociocultural environments, where they have been engaging in different social activities and have been exposed to different levels of fashion media and other sources of influence. In addition, there were different levels of RTW product availability. Lastly, they had different body shapes. In fact, there were more variations of body shape in the American

group than in the Chinese group. On the other hand, there were no selection criteria that addressed education level, income level, or other similar factors. However, as staff working at prestigious universities, participants were generally in the moderate to high category for their own culture in terms of social standing, class, and income.

Last but not least, the small sample size was a limitation. Only 59 Chinese and 63 American women responded to this survey study; it was considered to be a relatively reasonable sample size for this type of study, but it would be desirable to replicate the study with larger samples to verify the findings.

3.6 Conclusion

Based on the analysis of collected data including survey and interview responses, an understanding of the interactions among women's physical body, body image issues, and their appearance management strategies is presented in this paper. Mature women's definition of 'ideal body' is greatly influenced by socio-cultural environment, life experience such as aging, as well as physical body conditions. These factors also affect how closely their perception of the physical body is related to their actual physical body. In sum, it was found the discrepancy between actual and ideal body strongly influenced their appearance management behaviors as well as how they evaluated clothing and used clothing for appearance management purpose.

Detailed findings are summarized as follows. First, a variety of body image issues were identified for 34- to 55-year-old women living in two different cultures. Varied body shape and size were found in these two groups. Greater body shape variation and higher BMI were found within the American group. However, the American women reported a larger gap between their perceived current and ideal body size than the Chinese group. In general, they reported lower body satisfaction level than their Chinese counterparts. However, almost all women believed there was some room for "improvement", regardless of their current body condition. As long as there is a gap between the perceived actual body and the ideal body, women would make efforts to manage their physical body in order to minimize the gap.

Second, the two groups of mature women adopted a number of appearance management strategies to maintain and/or pursue ideals of beauty. It was interesting that the Chinese group reported engaging less vigorously in appearance management behaviors such as exercise and diet than their American counterparts, but emphasized physical beauty more at the same time. It is possible that the kinds of efforts made by the two groups for pursuing physical beauty were different. In addition, the use of clothing was reported to be the most frequently used appearance management strategy. However, clothing was utilized in different ways depending on individual's concerns of her physical body as well as her satisfaction level of the physical body. She could use clothing to enhance as well as to camouflage their physical appearance. In terms of clothing choices, the Chinese women were more careful about their daily presentation both in public and in private. Moreover, it was found that the Chinese women were more confident in their fit and style choices than the American group were. On the other hand, exercise was considered to be the most useful strategy for its long-lasting effect and health benefits.

Third, it was found that the Chinese group did not believe their choices were similar to those of other women of the same age, while the U.S. group did. However, it may be because the Chinese women maintained differences within boundaries.

Fourth, the Chinese and American women were fundamentally consumers of ready-to-wear (RTW) products and they reported different concerns about RTW. This could be heavily influenced by the availability of RTW products in the two different markets.

Last but not least, the two groups of women held different ideas of what that "ideal beauty" meant and they displayed different patterns in reporting their favorite and least favorite physical body parts.

3.6.1 Future Research

Future research could be built on the current study. First, it is interesting to see if the same findings would apply to other populations such as, plus-size women, older women, women of different ethnicities, or even males. Second, it was found that there was a disparity between mature women's actual body and her perception of the actual body, however the mechanism and effects of the disparity is still not

clear. Third, it was found that the gap between mature women's perception of her actual body and the ideal body in her mind can greatly influence her body satisfaction level, adoption of appearance management strategies as well as her clothing choices. However, further study is required to gain deeper and more detailed understanding. Last, it would be interesting to incorporate other formats of information besides self-reported information. For instance, in addition of description of one's wardrobe and recalled past experience of clothing shopping, on-site exam of one's wardrobe and on-site shopping experience would provide much information that was limited by the format of current study.

CHAPTER 4

**A CROSS-CULTURAL STUDY INVESTIGATING 34- TO 55-YEAR-OLD WOMEN'S
WARDROBES: CLOTHING CHOICES, CLOTHING FIT AND THE PHYSICAL BODY, AND
SELF-IDENTITY**

4.1 Introduction

Everyone has multiple identities. In addition, these identities are continually shifting depending on a person's age, activities, social and cultural environments, and relationships with others. Clothing is one of the most direct and powerful means of self-representation and communication; therefore, people consciously or unconsciously choose certain garments with which to present themselves in the way they want to be perceived. Thus it is understandable that dressing is a complex matter that involves the mental processes of self-recognition, judgment, and decision making. It is not just about what kinds of garments one is going to wear but also about what side of oneself to show or how one wants to be perceived. Clothing choices are thus closely related to an understanding of the self, the body, and both the natural and sociocultural environments.

This cross-cultural study therefore investigated how mature women's wardrobe management practices reveal the relationships between their body, perceived body in mind, and their projection of self. In other words, it took a deep look at the relationships among women's clothing choices, their self-identities, and their physical bodies by examining their wardrobes and discussing their clothing shopping behaviors, identities, and physical bodies. It studied why women choose to wear certain types of clothing instead of others in different social situations. As a critical and the most frequently discussed aspect of wardrobe management, the process of making a clothing buying decision revealed abundant information

about the intertwined relationships among the above-mentioned topics. Therefore, this study also proposed a model for understanding this process.

To be specific, first, it looked at women's clothing selection criteria, including aspects of the clothing itself (quality, style, fit, price, etc.) and criteria based on the physical body, as well as interpretations of dress codes in different settings. Second, it studied women's experience of personal style development and clothing fit evaluation. Third, it studied women's experiences of shopping for available mass-produced clothing, namely ready-to-wear (RTW) products with a focus on how women make compromises when they are not able to find items with complete satisfaction in the current RTW market. Fourth, issues related to wardrobe management such as why women keep purchasing clothing even though they are not very satisfied and why they keep items in their wardrobe that do not get worn were also discussed. Fifth, it studied perceived beauty standards and discussed how culturally recognized beauty standards influence body image and appearance management strategies. In this study, *appearance* refers to both the body (including the face) and dress. Last but not least, it examined how women perceive and evaluate their physical bodies (how do women construct their bodies in their mind and how do those constructions influence other aspects of their lives, including self-identity and social interactions). All of these questions were investigated for women from two different cultures for comparison.

As a cross-cultural study examining a relatively less-studied age group, this exploratory study examined, in theory and practice, an overlooked yet large segment of apparel consumers. This study contributes knowledge in three areas. First, it provides insight into how culturally established beauty standards influence the way women perceive and evaluate their physical bodies as well as their self-identities by examining their daily practices of appearance management. In fact, this study investigates how women use clothing to manage their physical appearance with a focus on clothing fit choices as a part of appearance management. It also identifies issues in clothing fit education for consumers and proposes strategies on how to communicate clothing fit when nonprofessionals are involved. Additional information about women's body image was also acquired in this study.

This study also provides insight for the apparel industry in two ways. First, it systematically examined women's clothing selection criteria, therefore modeling a new method for studying target consumers and suggesting a method for understanding consumers' needs and standards. Second, it suggests directions for the improvement of ready-to-wear products by studying women's concerns about current RTW. In addition, as a cross-cultural study, it accommodates the issues brought by globalization and cultural differences and provides suggestions for designing and manufacturing clothing for a variety of body shapes. To sum up, it provides apparel design and manufacturing companies targeting this age group with suggestions on how to improve the satisfaction level of their products.

4.2 Literature Review

Previous researchers in the well-established fields of sociology and anthropology have contributed knowledge toward understanding the relationship between the human body and sociocultural environments by studying clothing. In most of these studies, however, clothing was basically viewed as a carrier of social practices with underlying meanings, while the materiality of clothing (the clothing itself) was neglected or given minimal importance. According to Taylor (1998), compared to object-centered methods, these social, cultural, and historical approaches use an object as a medium for obtaining knowledge and understanding of a topic. On the one hand, as Wilson (2003) points out, clothes break down the distinction between nature and culture; therefore, they are suitable for studying the relationship between culture and the body. In earlier years, sociologists placed an emphasis on the importance of the body for social interaction (Bourdieu, 1984). Later, with the rise of consumer culture, researchers began studying consumption as a relationship between the social and the material (Cambell, 1987, 1996; Ger & Belk, 1996; Isherwood & Douglas, 1979; Miller, 2005; Slater, 2014; Slater, 2015). In more recent studies, there has been an increasing interest in understanding clothing and its relation with the human body (Fraser & Greco, 2004; Howson, 2013). However, the majority of studies in this field continued to minimize the objective existence of clothing, focusing instead on studying the interactions between the body and society through practices of dressing. As argued by ven der Laan and Velthuis (2013), the

emphasis on symbolic aspects of clothing in previous sociological studies caused researchers to overlook the role of routines and rules in daily dressing. Similarly, in anthropology, anthropologists have studied clothing and the daily practice of dressing to understand the biography and commoditization of things (Eicher, 2000; Ingold, 2011; Kopytoff, 1986). In both cases, clothing was primarily used as a pair of glasses to examine sociocultural issues, but the “glass” was neglected as a topic of study.

On the other hand, development within the field of dress and fashion is more focused on investigating the relationship between the body and the clothes. As stated by Klepp and Bjerck (2014), clothing as a type of material is not just “a carrier” of different types of symbols but an active element in daily practices. In this view, clothing becomes an object under scrutiny, not simply a channel or tool to study the body, social interactions, culture, and history. However, the emphasis of this type of research is still on understanding the symbolic meanings presented by the relationship and practice of dressing. In fact, study of clothing as a physical object and clothing practice has been considered “tacit knowledge.” For instance, clothing practices are characterized as automatic and thus invisible even to the person who practices them (Klepp & Bjerck, 2014). Little has been said about how people manage to get dressed (Cwerner, 2001). As a rising interdisciplinary field, the study of dress and fashion should place more attention on both the material and symbolic sides of clothing.

Cwerner (2001) argued that the storage habits and procedures associated with clothes are intimately related to the meanings, functions, and identities activated by dress and fashion. The wardrobe articulates, both spatially and temporally, a set of material and symbolic practices that are fundamental for the constitution of selfhood, identity, and well-being.

Bye and McKinney (2007) used a web-based questionnaire to investigate why women keep clothes that do not fit. Their participants, who were in the age range of 35 to 65, were instructed to describe up to four garments in their closets that no longer fit, the reasons they did not fit, and their reasons for keeping them. Four themes emerged: weight management, investment value, sentimental value, and aesthetic object. The researchers also suggested a model for the process of separating the self

from the garment and the garment from the closet. However, since their participants were all clients of image consultants and interested in clothing and appearance, the experiences shared by this group of women may not be reflective of the general population. In addition, the focus of this study was clothes that were not worn but had not yet been discarded; thus it provided limited information on women's daily practice of dressing. Finally, as a questionnaire-based study, the information gathered was limited by its format.

Thomas and Peters (2009) studied the attitudes, self-concept, lifestyles, and apparel-related preferences and shopping behaviors of women over 65 years old. They conducted 20 in-depth interviews and found that women over 65 were still interested in fashion and that looking fashionable for themselves and others was important. Their findings also indicated that senior adult women continued to remain physically and socially active and had a need for a variety of garments.

Dunne, Zhang, and Terveen (2012) conducted an empirical analysis of the contents of 11 home wardrobes across three to six months of daily dressing decisions for five users. This study focused on just which pieces the participants selected to wear on a daily basis without analyzing their choices. They found that on average only 7% of their female participants' wardrobes and 47% of their male participants' wardrobes were in regular use. Therefore, they advocated a sustainable way of clothing shopping.

Van der Laan and Velthuis (2013) used "wardrobe interviews" to study how young Dutch men dressed themselves. They found that young Dutch men dressed rather inconspicuously but with an awareness of the fact that their inconspicuous dress is similar to that of their companions. For them, dress was primarily directed at conformity to meet social and situational requirements. In addition, those young men used clothes as a tool in constructing coherent and authentic identities. They believed their dress should express who they think they are. Finally, most of those young Dutch men sought to avoid attracting attention through their dress. For them, dress was a source of comfort rather than distress.

Saiki and Crecelius (2016) studied the effects of psychological characteristics (body image and self-esteem) and demographic characteristics (gender and age) on frequency of closet cleaning. They

found that individuals with a higher appearance orientation and young individuals tended to dispose of clothing more frequently than others. In addition, they found that women had more varied reasons to dispose of clothing. However, they did not find a statistically significant relationship between self-esteem measures and disposal frequency among any of the age and gender groups.

4.3 Methodology

4.3.1 Wardrobe Study

The study of dress and fashion encompasses a number of different methodological approaches and a variety of methods, as it has been evolving into an interdisciplinary field with a high degree of international exchange, unifying of institutions, and increasing publishing channels (Klepp & Bjerck, 2014). Researchers in this field have been learning from researchers in other fields, especially sociologists and anthropologists. However, the focus on body and social interactions in sociological approaches as well as in economic, historical, and cultural approaches has neglected or minimized the role of the existence and role of the physical material itself.

Nowadays, with an increasing interest on studying materiality and the human body, a relatively new method of study named “wardrobe study” has been adopted. First, it is necessary to define the term *wardrobe* within the scope of wardrobe study. Literally, the word “wardrobe” has two meanings in English: (a) a physical items, such as a cabinet, that provides a space for clothing storage and (b) a collection of clothes. With respect to the second definition, it is very common that one may have a number of collections of clothes for various occasions and situations. Wardrobe studies have primarily been used to analyze the “materiality” aspect of clothing as well as the interactions between wearers and the clothing. This method is used to examine not only the way in which clothes are related to each other on the whole or in parts of the wardrobe (Bye & McKinney, 2007; Dunne et al., 2012; Saiki & Crecelius, 2016) but also the practices of dressing, such as acquisition, styling, maintenance, cleanliness, and disposal of clothing.

Therefore, an interview-based wardrobe study was conducted to acquire an understanding of the practice of appearance management of 34- to 55-year-old professional women living in China and in the United States. It was designed to help gain an understanding of how a 34- to 55-year-old woman examines, feels, and manages her physical body and appearance. The study was dominated by verbal statements, which were recorded and then transcribed for subsequent content analysis and text production. Here the word “wardrobe” only refers to physical items stored in a personal space for the purpose of wearing, including clothing, accessories, jewelry, and so on. This study focuses on understanding the materiality of clothing and how it relates to both the physical body of the wearer/owner and the perceived physical body in the wearers/owners’ mind. In other words, this study looked at the role of clothing in presenting the wearer in the way she wanted to be perceived, both physically and mentally, and both for herself and for others, in a variety of situations. It focused on answering the “how” questions: first, how clothing helps the wearer achieve the body/appearance she wants (physically shaping), and second, how clothing helps the wearer pursue/confirm self-identity and obtain positive self-image.

4.3.2 Recruitment Procedure

After IRB approval was obtained, gatekeepers who have access to potential participants were contacted by phone and/or email. This study was introduced to the gatekeepers first. If they were willing, they introduced this study to potential participants. Participants were also recruited through recruitment posters posted around campus. If a potential participant was willing to participate, she was asked to respond to a survey either online or in hard copy. The survey were developed based on the work of previous researchers (Alfonso et al., 1996; LaBat & DeLong, 1990; Pribil, 2011; Stunkard et al., 1983; Thompson & Gray, 1995). It was reviewed by two native speakers for comprehension and updated afterward. Later, it was translated into Chinese by one bilingual speaker and translated back into English by another bilingual speaker to assure the accuracy of translation. The survey was used to gather general demographic information and specific information about body image issues, appearance management strategies, and clothing choices, as well as consumption of and opinions on RTW. At the end of the

survey each participant was asked if she wanted to participate in an interview-based wardrobe study. If so, an individual interview would be scheduled at her convenience.

Participants. Two groups of 34- to 55-year-old female participants were recruited for this cross-cultural study. Qualified participants were: (a) female; (b) 34–55 years old; (c) staff at a university either located in a city in the east coast area of China (for the Chinese group) or in a city in northeast area of the United States (for the American group); and (d) Han Chinese or European American. The constraint on university employment and location was imposed because participants needed to travel to a university that had a 3D body scanner. It is also worth noting that “ethnicity” is too complicated a concept to be fully addressed in this research project because both countries (especially the United States) are very ethnically diverse. Therefore the researcher first made a general division based on potential participants’ self-reported ethnicity and then only conducted interviews with Caucasian Americans, who represent 63% of the U.S. population, and Han Chinese, who represent 91.5% of the Chinese population. Both of these groups were social majorities. In addition, the target participants were intended to be comparable in the extent to which they were influenced by mainstream culture in their own country. Thus, only people who were immersed in their own contemporary mainstream culture, instead of recent immigrants, were included in the interview phase.

In contrast to the specificity in ethnicity-based selection criteria, there were no constraints on body shape, height, weight, or other related characteristics. Most of the participants were within the standard regular women’s size range; however, they did vary in body shape, especially within the American group. This greater variation of body shape in the American group than in the Chinese group was expected. More details are presented and discussed in the results and discussion sections. Beyond these selection factors, there were no selection criteria with respect to education level, income level, or other similar attributes. However, as staff working at prestigious universities, participants were generally in the moderate to high categories for their own cultures in terms of social standing, class, and income. For more details, please see Appendix A.

In total, 59 valid survey responses were received for the Chinese group, while 63 valid survey responses were received for the American group. Because of limited time and budget, only 25 eligible women from each group who agreed to participate in the wardrobe study were randomly selected and then contacted. Finally, 20 interviews were conducted for the Chinese group, while 22 interviews were completed for the American group.

4.3.3 Procedure

Selected participants were asked to wear one of their favorite and best-fitted summer outfits and to bring in one of their favorite and best-fitted winter outfits when they came for the interview. At the beginning of each interview, a brief introduction of the study and the research team was given. Then each interview participant signed a consent form.

Each interview was audio recorded with participants' permission. During interviews, each participant was encouraged to introduce their wardrobe and to describe the two favorite outfits they had brought to the interview—one summer outfit and one winter outfit. After that, they were asked to explain why those items were their favorites, with specific prompts about whether fit and proportion were important, if these factors were not addressed initially. In addition, they were asked to describe their feelings when wearing their favorite outfits and how this related to other aspects of their lives. They were also invited to describe a typical clothing shopping scenario and talk about their fitting experiences. Next, they discussed their wardrobe in earlier years and whether they had noticed any changes. Furthermore, they were asked to elaborate on their personal style, overall clothing choices, especially overall clothing fit preferences and personally held dress codes and fashion attitudes referring to garments in their wardrobes. Then, they were invited to discuss their personal standards of beauty, followed by questions related to their perceived current culturally recognized beauty ideals. Finally, they were encouraged to give opinions about the beauty ideals they perceived in their own cultures and how these ideals related to their own personal beauty standards.

Even though “aging” was not a topic specifically addressed in the interview, many women spontaneously spoke about their experience of aging and changes in their bodies and lives.

4.4.4 Data Analysis

Both quantitative and qualitative data were collected in this study. First, qualitative data, including interview transcriptions and observation records during the interviews, were analyzed using content analysis techniques. Researchers first listened to audio recordings and reviewed any notes made during the interviews while identifying the general patterns of the conversation. Afterward, transcripts of each interview were prepared from the audiotapes.

The emerging theme method that was developed and described by Marshall and Rossman (1989) was used to extract themes from interviews. It was used in this study to compare, contrast, and quantify data. In addition, two basic methods of content analysis, namely conceptual analysis and relational analysis (Busch et al., 2016) were employed in this study. In other words, not only the implications of data but also how data were related and how they were linked together were under close scrutiny.

The primary researcher first read each participant’s entire transcript twice and updated earlier thematic notations to create basic themes using coding software NVivo. According to Mayring (2014), this data reduction method assists the researcher in capturing “conceptually intriguing phrases” while dividing the data into manageable chunks—word, word sense, phrase, sentence, or theme. Initially, transcripts were analyzed using open coding, considering the data in minute detail while developing some initial categories. Later, the researcher read through the transcripts again and moved to more selective coding where systematic codes with respect to core concepts were developed. The third step was reading the transcripts to identify emerging categories and repeatedly occurring categories. Identified crucial topics included participants’ descriptions of their wardrobe, personal style, and personal standards of beauty, perceptions of their physical bodies, opinions toward culturally established beauty standards, shared experiences of fit evaluation, and clothing fit choices for the purpose of appearance. The last step was sorting these categories. the underlying meaning of repeatedly occurring categories were identified

and formed into themes. Theme analysis techniques were used to discover the relationships between themes. Finally, this analysis process was cross-checked with other researchers with expertise in qualitative research.

In addition, quantitative data from surveys were logged into Excel spreadsheets and then imported into SPSS statistical software for further analysis. Additional quantitative analysis took place when conceptual analysis and relational analysis was completed. As the data were coded and themes were identified, the number of comments related to each theme or concept was counted. In some cases, a comment fell under two thematic categories and thus was counted for both.

For the Chinese group, interviews were conducted in Chinese and then transcribed in Chinese. In this case, data analysis was completed based on Chinese transcripts. The last step was to translate findings into English. To establish interrater reliability, the data was coded twice. The primary researcher, who is bilingual, coded both the Chinese and English transcripts. Another bilingual researcher coded only the Chinese part, and an English native speaker coded only the English part. All three coders conducted data analysis independently and then compared the results. In cases of discrepancies, the three coders discussed until agreement was achieved.

4.4 Results

Eight topics were identified and discussed in this study: background, self-identity, beauty standards, physical condition, appearance management strategies, selection criteria of clothing, shopping experience of ready-to-wear (RTW), and wardrobe management (Table). Detailed findings are discussed as follows. If no between-group differences were specified, the same findings were found in both groups.

Table 5
Coding Framework of Wardrobe Interviews

Theme	Sub-theme
Self-identity	<ul style="list-style-type: none"> • Self-reflection
Appearance management strategies	<ul style="list-style-type: none"> • Clothing • Diet • Exercise • Make-up • Plastic surgery • Skin and hair care • Reasons of choice(s)
Beauty standard	<ul style="list-style-type: none"> • Body satisfaction • Body dissatisfaction • Ideal beauty • Importance of external beauty • Perception of practices of dressing in the other country • Traditional Chinese clothing
Experience of aging	<ul style="list-style-type: none"> • Self-reflection • Changes observed/experienced
Personal style development	<ul style="list-style-type: none"> • Favorite outfits • Incidence • Style change • Sources of information
Selection criteria of clothing	<ul style="list-style-type: none"> • Criteria based on dress code • Criteria based on social cultural settings • Criteria based on physical body • Criteria based on the clothing itself • Other criteria
Shopping experience of ready-to-wear	<ul style="list-style-type: none"> • Concern on online shopping • Concern on RTW • Counterfeit article • Location • Shopping scenario • Shopping for others
Wardrobe management	<ul style="list-style-type: none"> • Existing items in wardrobe • Disposal • Management • Styling • Others
Experience of fit education	<ul style="list-style-type: none"> • Definition of fit • Fit evaluation procedure • Information sources

4.4.1 Self-Identity

It is interesting and surprising that the Chinese women discussed issues of “being different from others,” yet they did not want to be the ones who stood out or were considered to be outside of a group. How much difference was considered to be appropriate? What were their strategies in possessing and expressing “appropriate” levels of differences? The majority mentioned strategies of looking for distinct design details in clothing (to be discussed more fully later in this chapter). The Chinese women also emphasized that clothing is a tool of communication. It helps them express who they are and helps them know other people. One Chinese woman said (translated from Chinese):

I mean that clothing is an external reflection of our personality. Actually, we can tell a lot from someone’s dress, such as their lifestyles, life standards, age, career, and many other things. When other people are reading me [through my dress], I am reading them through their outfits and behaviors at the same time. In fact, I hope other people could see me as someone who is easy to get along with through my loose-fitted, natural, casual, and relaxed personal styles.

This participant and the women she refers to believed that clothing is a tool for them to identify people who are in the same circle or level as themselves, and it helps them determine whether they have a desire to get to know each other.

I pay attention to design details. For instance, [when I meet someone] I usually have a quick look at their outfits to figure out whether they are wearing domestic brands or foreign brands. I also check the quality and fabric of their outfits. This is because I want to find out whether this person has the same level of life quality as mine, or whether we belong to the same circle. Then I will know whether I want to get to know this person and how to get to know this person.

In contrast, American participants’ identities were barely connected with their outfits. They constructed their identities mostly on the basis of their life experiences, such as careers and families. It seems that for this group of women, clothing did not have the same amount of meaning outside of its physical property as that for the Chinese group.

4.4.2 Beauty Standards

In general, when asked about ideal beauty, the Chinese group mentioned both body and facial features, such as large, almond-shaped eyes, oval-shaped faces, and healthy, light skin. The American group referred the most to body shape and build.

Being thin and looking young were the most frequently cited standards. However, the Chinese women tended to hold on to comparatively identical standards, while the American women's standards were more diversified. An American participant explicitly suggested, "There are a few different beauty standards you can fit into."

Body. "Fit" was the word most frequently used by the American group in discussing body attitudes. They were in favor of a toned body with a certain amount of muscle. The Chinese women, meanwhile, preferred a well-balanced body with obvious female curvature. An ideal female body should not be skinny but should not have extra fat either. Actually, none of the Chinese women mentioned the word "muscle" in a positive way. In their eyes, muscle is too masculine to be seen on a beautiful woman.

Face. In the eyes of the Chinese women, a beautiful woman should have an oval- or heart-shaped face and well-balanced facial features, including big eyes and high nose bridge, but a small mouth. The American women, in comparison, discussed much more diverse standards. In fact, most of the American women had difficulty sharing their opinions of "ideal beauty" because they have observed many varieties of beauty promoted in their culture. If they discussed any standard of beauty, it would be looking young and healthy.

Skin. The Chinese women emphasized the importance of having clear and light skin, while the American women did not mention skin color at all. Only a few talked about having smooth skin. It was viewed as a sign of being young, while being young is an important component in measuring beauty.

Height. In general the Chinese women preferred a height a bit taller than average. This reflects an underlying Chinese ideology of "being one of the greatest ones, but never being the best one." Even though the American group did not mention height as a standard of beauty, some indeed complained that they were too short or too tall and thus were far away from the ideal.

Inner beauty. Interestingly, both groups mentioned inner beauty as a factor in evaluation of beauty. The Chinese women believed a beautiful woman must have a soft outlook and strong heart but also a smart brain. They should like themselves and enjoy living in this world. They must be wise,

knowledgeable, gentle, kind, and easy to get along with. In comparison, the American women focused on “self-confidence.” In addition, many of the Americans believed in “personalized beauty,” by which they meant being the best version of oneself. In short, the Chinese women valued qualities that are shared by all women, but the American group valued individuality. It seems that the Chinese women were living in other people’s eyes and cared about other people’s opinions about their looks, while the American women cared more about their inner feelings and emphasized being comfortable with their own bodies.

4.4.3 Dress Codes

In the interviews, participants were asked to talk about the dress codes they had experienced in working settings first, and then they were encouraged to talk about dress codes they had experienced in other settings. Dress codes usually were not explicit but were accepted as social norms and obeyed as common practices. They could be self-imposed too, however, especially for Chinese women. In addition, a common feature shared by both groups was that participants tended to avoid labeling their own outfits “good” or “bad” but sometimes gave “good” or “bad” examples of others. They might comment on other people’s dress using expressions such as “I think I am doing fine, but I have seen someone wearing . . .”

Dress codes, inherently and as the participants explained, are indeed very situational. In the interviews with both groups, three settings were talked about the most: work environments, family (in house) settings, and outdoor recreational settings (with family or friends, light active level). Participants also discussed perceived dress codes (expectations regarding clothing practices), as well as their actual practices of dressing in different settings. According to their descriptions of different settings and of the typical outfits they would wear in each setting, “dress codes” were observed and followed the most in formal and public situations, such as in offices. Some between-group differences were found when it came to work settings. However, even more contrast emerged when it came to relatively casual settings.

In general, different dress codes were perceived and followed in the three frequently mentioned settings. Women’s clothing choices in a certain setting mostly depended on (a) types of activities they were expected to perform in the given setting, (b) types of identities that they wanted to project in this

setting, (c) types of people they were expected to interact with in the given setting, and (d) types of clothing other people might wear in the same setting.

First, the primary standard on which many participants based their dressing choice is what types of activities they were going to perform. Then they could decide what types of clothing were appropriate for accomplishing that activity. For instance, an American woman mentioned that if she had a meeting scheduled on a specific date, she would wear her “business outfit,” typically a two-piece suit, on that date. Another American woman also admitted that even though she loved dresses and knows empire-style dresses were the right style for her body shape, she could not wear them in a lab setting. Usually, women would change into “relaxing” outfits as soon as they got back home. Those outfits have less constraint and can therefore provide the wearer with the physical and mental conditions for doing activities such as housekeeping. When they went out with friends or families for leisure activities, they tended to wear casual outfits such as jeans and T-shirts. Thus, it is not surprising that this is the theme mentioned the most by both groups.

The second important issue is what types of identities they wanted to project in a given setting. For instance, in work settings, dressing professionally could help participants build up and project a positive image as professionals, both to themselves and to those they interact with (Karl, Hall, & Peluchette, 2013; Smith, 1998). Both groups of women thought this was important and chose their outfits accordingly. However, there were some differences. First, more variations were observed in the American group than in the Chinese group in the examples of typical outfits the participants said they would wear in different settings. In addition, Chinese women seemed to dress relatively more formally than the American women did in each of the three above-mentioned settings. For most American women in an office setting, a pair of capris or jeans, a T-shirt or a casual top, and a knitted sweater is fine for a normal day, while they would wear suits for important days. The Chinese women, in contrast, would wear a skirt with a shirt and jacket on a normal day; they might then add some accessories or opt for darker colors to add some sense of being formal (see the contrast in Figure 50). In addition, the Chinese women

emphasized that they would not wear jeans to the office but preferred to wear jeans when they were with their families and friends. However, they acknowledged that their younger colleagues did wear jeans to the office.

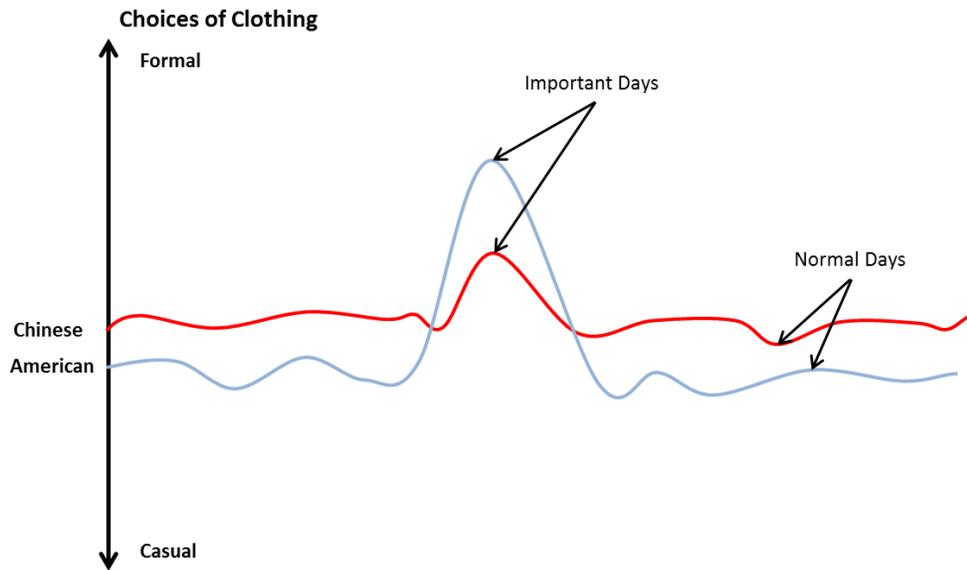


Figure 50. Choices of clothing in different settings.

The third important issue for members of both groups to think about was what types of people they were expected to interact with in a given setting and what types of clothing those people might wear. These two factors were always brought up together. Interestingly, many American women mentioned that they opted to not dress up because they wanted to be similar to their colleagues on a “regular” day. Some American women even joked about the favorite outfits that they were asked to wear for the interview. They felt that they were somehow dressed up and they had received too much attention in their working space before they showed up in the interview. Even though most received positive feedback, they did not feel very comfortable. For instance, an American participant who works in a lab setting described her experience:

Well, you know I work in a lab . . . everyone wears dark color and very simple style such as long-sleeve t-shirt and long pants. I usually dress in the same, but today I am wearing a red wrap skirt and a floral printed top. More than three of my lab mates have commented on this, like “Wow, skirt!” or “Is there any good news, XX?” Honestly, it feels weird. Not very comfortable. You know.

Following a dress code gave participants a permit to join a group. Therefore, it is especially important for them to acquire information about dress codes in certain instances and to follow them. Both were commonly mentioned dress code practices for many women.

Last but not least, in fact, some participants, especially Chinese participants commented that the way people dress themselves shows their standards for themselves and life qualities and that, therefore, it should be valued and emphasized. Comfort was important to participants and should be guaranteed in private spaces, but they emphasized that being presentable in public spaces was the most important thing. Dressing very casually in public can make people lose “face.”

4.4.4 Perceptions of Dressing Practices in the Other Country

The Chinese group was asked to comment on American women’s style and dressing practices, while the Americans were asked about their thoughts on Chinese women’s style. There were more comments reported by Chinese women than American women. The Chinese women believed that Americans were always dressed very casually and they dressed more formally than American women. In their opinion, T-shirts and shorts were the most frequently worn daily items for American women. The American group, in comparison, had few comments on Chinese women’s styles. They admitted that they did not know much about Chinese women and their clothing. However, some offered opinions on East Asian or European styles, such as Japanese and British. They admitted they were attracted by those cultures, and their styles were influenced accordingly.

4.4.5 Physical Condition

The female body. Some women mentioned that they realized that people are made differently and that the body therefore has a great influence on their choices of clothing. An American participant gave her thoughts:

So even if you have two people that are both two hundred pounds, one can look fifty pounds lighter. And another one can look like fifty pounds more. So there is difference at the density of their body. . . . So if I happen to be somebody with a lot of give in my belly. It might be more comfortable for me [to] wear snag-fit pants than somebody who has a really packed torso.

4.4.6 Clothing and Aging

Their styles tended to be more stable, and they usually had some classic items in their closet. They also had some brands in mind; they were loyal customers. Usually through years of trial and error, they found some brands fit their body best and tended to stick to those brands.

The Chinese women were less interested in experimenting with styles but cared more about the quality and fabric of clothing as they aged compared to when they were younger. They also cared about design details more than they did when they were younger.

4.4.7 Appearance Management Strategies

Both groups of women cared about their appearance and adopted multiple appearance management strategies to enhance or maintain their current look. Among those strategies, clothing and exercise were mentioned the most. For instance, women would use clothing to shape their bodies, cover body parts they found less satisfactory, and show off the parts they were proud of. They also complemented the color of their clothing with their skin tones. In addition, they used clothing to enhance their facial features such as by matching their necklines with the shapes of their faces. They also emphasized the importance of being “put together” in projecting a sophisticated look of themselves. In terms of exercise, most women indicated that they exercise regularly, not just for the sake of maintaining or pursuing an ideal physical body but more for the purpose of being healthy and fit and for mental health.

Other strategies included diet, makeup, skin care, and hair care. Diet received the greatest variety of comments. Many women believed that it is the most useful strategy in the short term but also noticed that dieting for losing weight was not smart for its lack of a lasting effect and for its negative mental and physical influences.

4.4.8 Clothing Selection Criteria

In selecting clothing, both groups cared about clothing fit and style the most. The Chinese women were comparatively more willing to compromise comfort and function for style and fit than the American women. However, the American women mentioned comfort and function more and cared more about

these aspects than the Chinese women did. In addition, the Chinese women also emphasized design details because they wanted their outfits to stand out from those of other women. Fabric quality was also frequently mentioned by both groups. Almost every Chinese participant talked about her preference for natural fabrics such as cotton, silk, and wool. They felt more comfortable when wearing products made of natural fabrics than synthetic fabrics. Brand was another important criterion. Some Chinese participants noted that they believed branded garments had higher quality. Many had some brands in mind, and they checked products from those brands on a regular basis. They spent very limited time considering a brand they were not familiar with.

In contrast, the American group more frequently indicated price was very important for them. This group mentioned fabric and brand much less often than the Chinese women did. However, neither group claimed to care about fashion much.

Style. For both groups, style was crucial. Both were in favor of styles that had moderate coverage and that could flatter their body shapes at the same time. Women in this age group were in favor of classical styles and simple but clean silhouettes. They believed a great design should be able to hide the body parts the wearer was not satisfied with but also highlight the parts she was proud of. In addition, the Chinese women insisted that there should be no overexposure of skin, especially in the shoulder, neck, bust, waist, and hip areas. The American women were comparatively more comfortable with showing some bare skin than the Chinese women. Moreover, there were some additional slight differences. The Chinese women were stricter in their style choices, and their choices were more closely related to their physical body condition. For instance, some Chinese women mentioned that they preferred skirts below knee level because this skirt length matched their age and could protect their knees from cold.

Fit. For both groups of women, tight-fitted clothing was rejected because it can show too many curves and extra body fat. However, loose-fitted items were also rejected because baggy clothing made them look less feminine. It could also make them look bigger than they really are. In fact, the Chinese women preferred a balanced fit, while the American women went a little bit more toward the loose end.

Some Chinese women complained that even though products by some foreign brands were available on the market, they did not fit Chinese customers' bodies because they were made to fit a different population.

Function. Both groups appreciated easy don-and-doff and emphasized that clothing should allow basic body movement. The American women, however, were more concerned about function than the Chinese women were. They were more reluctant to compromise function for other factors.

Price. Both the Chinese and American groups were concerned about price, albeit in different ways. The Chinese women put quality before price, but they were looking for a balance between price and quality. Purchasing a bunch of clothing at one time, especially during sales season, was more common in the American group. One possible reason was that clothing, especially branded clothing that meets a certain level of quality, is expensive in China. It requires much consideration before a buying decision can be made, and Chinese women do not generally buy items on impulse. In the United States, however, consumers are sometimes tempted by sales, especially during holiday seasons.

Another difference is that the American women spoke more explicitly about price than their Chinese counterparts. Many called themselves "price savvy" and enjoyed securing a good deal. They claimed that they found it difficult to say "no" to sales even though they might not be very satisfied with an item. They tended to purchase items because they were cheap or on sale. One American woman said, "it (the skirt) was a bit too long, but it was just . . . em . . . 3 dollars? So I told myself, yeah, I can buy it." The Chinese women, however, considered not only whether they could afford a product but also whether it was necessary to buy it. For them, price was important, but it was also the secondary consideration.

According to one Chinese woman:

I only buy garments that are worth it. It is not just about the price. It is secondary (for me). If it is high quality and I could wear it many times, even though it is more expensive than other items, it is worth the price. If it could only be worn once, even though it is as cheap as 100 RMB [\$15], I lost my money completely.

Design details. Design details in clothing were crucial for many Chinese women. They considered finding detailed designs a very practical and useful strategy for differentiating themselves

from the crowds while still possessing a suitable level of group belongingness. Design details could be something small but out of ordinary. For example:

Design details could be something that has some interesting but small design features, like some Chinese design element or something elegant. Or it could be (something add-on), like a brooch, or pleats, or asymmetrical design. The point is not being the same as everyone else.

Fabric. The quality of fabric was a huge factor for both the Chinese and American participants. Natural fabrics, especially cotton, silk, and wool, were favorites for both groups. Some women claimed that they would not purchase anything unless it was made of 100% natural fabric. This was especially true for pants. One Chinese participant explained:

I do not wear pants very often, (but if I wear them) I usually wear a pair that has a certain level of elasticity. This type of cotton/lycra blended pants is comfortable to wear. However, a common problem of this type of pants is that they could become very loose after several times of wash. Therefore, the quality of fabric is very important for me. I have been wearing the pair of pants I am wearing now for about six years, but it still feels the same as a new one.

Whether a fabric had elasticity was an important issue participant considered. Some of the others, mostly Americans, were in favor of blended materials because they could have better performance in areas like elasticity, air permeability and crease resistance, and “easy care.” As an American woman indicated, many women were prepared to attune/compromise their personal fit preference when it came to stretchy fabrics:

I think that’s why I would choose a knit, rather than something that does not have any give. Either that or something that like the shirt you are wearing [the researcher was wearing a shirt with stretchiness]. It is sheering and goes straight down, if it is this type of material, I would probably go for something with loose fit. But my personal preference would be something more fitted.

Color. In terms of color, the key aspect mentioned by many women was to complement the color of a garment with her skin tone. At the same time, some women in both groups said they would take current “in” colors into consideration.

Quality. The word “quality” has multiple meanings and could be used very broadly in relation to clothing. However, women of both groups narrowly defined quality as (a) quality of fabric (as described in the foregoing section on the subject), (b) quality of construction, and (c) the garment’s overall performance.

Brands. Many mature Chinese women are loyal to some brands in their minds, though they believed clothing fit, price range, and product quality were more important than brand. The significance of brand name for the participants represented the greater likelihood, based on their previous experience with the brand, of finding a satisfactory garment. They were most concerned with whether the quality of the product matched its price, not the status attached to the brand name.

Fashion trends. The mature women in this study indicated that they had developed their personal style. Therefore, they did not consider themselves easily influenced by current fashion trends. However, this does not mean they did not care about what is “in” on the market. Instead, they preferred to show their care about and interest in the trends through careful selection of design details and color.

Comfort. The word “comfort” used by women to elaborate on their clothing selection criteria had multiple meanings in different contexts. In many cases, it referred to a feeling influenced by multiple components, a hybrid standard resulting from a balance among fit, style, fabric, and function.

Convenience. Here, convenience refers to easy care. For instance, many women mentioned that even though they liked silk and wool products, they might not purchase them because of the extra amount of work and the cost of taking care of those products. In those cases, convenience was not a selection standard but had its impact on a consumers’ decision by adding constraints on primary and secondary selection criteria.

4.4.9 Ready-to-Wear (RTW) Shopping Experiences

The primary places members of the Chinese group reported going to for clothing shopping were department stores, followed by small-scale boutiques. A few shopped online, but the majority were not in favor of it because they were concerned about clothing fit and fabric. They preferred to try on clothing in a brick-and-mortar (B&M) store, though they agreed that there were more choices and price could be relatively lower if they shop online. Also, shopping in department or brand stores was so convenient for the Chinese women living in a big city that they went shopping frequently and regularly. However, many indicated that they usually went shopping as a way of relaxing, and they bought only one or two pieces of

clothing once in a while. In fact, the Chinese participants reported being very careful and strict when they were shopping for clothing. They described being forced to think carefully before purchasing. It is also worth noting that it could be very different for the younger generation, whose priorities might diverge from those of this study's participants, but this is out of the scope of this study. A Chinese interviewee noted:

I do not shop a lot. I am the kind of person who does not do binge shopping. If I cannot find an item I am very satisfied with, or the price of an item is out of my budget, I would buy nothing. I do not make compromises [on clothing].

The Americans did more online shopping and secondhand clothing shopping in comparison, perhaps due in some part to the limitations in the number of B&M stores in the smaller town. They also tended to buy multiple items every time they shopped for clothing. This could be a reason why the American women complained more about so many items in their wardrobe that they did not wear. In addition, the Chinese women tended to shop alone and were very confident in their clothing choices. They felt that they knew their bodies and themselves well and therefore knew what was right for them. Compared to their American counterparts, the Chinese group often had a set of standards in mind and just searched for the item that fit into the framework, no matter whether they shopped regularly or when they noticed a need.

4.4.10 Wardrobe Management

Existing items. For summer outfits, the Chinese women had multiple dresses, shirts, skirts, and capris. The Americans had relatively more T-shirts and jeans. For winter outfits, the Chinese women had suits, shirts, slacks, knit tops, sweaters, jackets, trench coats, and coats. The Americans mentioned suits less but jeans more. Both groups, especially the Chinese group, reported that when they are making a buying decision, they care whether a potential purchase could mix and match with other items in their wardrobe. They expected classic items to be of use in multiple ways and to be wearable for years. One Chinese woman explained:

Basically, the items I bought could be used in many ways and be worn over ten years. I would add some new items which could mix and match with existing items in my wardrobe regularly to give

myself different looks every year. For instance, I may match a top with a pair of shorts or capris this year, but match it with a skirt next year. Many items in my wardrobe could be utilized again and again. Therefore, for those stable items I would not change or buy new ones frequently.

Favorite outfits. The most frequently mentioned favorite summer outfit among the Chinese group was dresses, while the Americans favored loose-fit tops and capris. In terms of winter outfits, the Chinese women loved wearing suits and matching skirts or pants with coats, while the Americans preferred to wear sweaters and jeans or dressy pants. In response to the question “What makes a favorite outfit?” the most common answers included (a) it flatters my body; (b) it is associated with positive memories (this included positive feedback they received when they were wearing this outfit or memorable occasions or instances it reminded them of); or (c) the wearer felt it had great value of some sort. For example, it could mix and match with other items in her wardrobe or could be worn in many different ways or for many occasions.

Managing the wardrobe. Both the Chinese and American women indicated that they sort and clean out their wardrobes regularly. The shortest frequency reported was twice a year, once at the end of spring and again at the end of fall. A typical scenario involved taking out items they were going to wear in the coming season and putting items from the past season into storage. At the same time, they disposed of items they were no longer wearing and added new items if necessary. However, it is interesting to see the different patterns reported by these two groups in the practice of disposal.

Disposal. The most commonly reported reasons for disposal were loss of quality, stains, poor fit, and the item becoming out-of-date. For both groups, poor quality (especially fabric quality) was a common reason for disposal. After several rounds of washing, the shape of a garment may change. It may no longer fit the body well or might feel different to the touch. In addition, if a garment has stains that cannot be removed, the owner is very likely to throw it away. Among other reasons to dispose of a garment, the American women complained more about poor fit, while the Chinese group more frequently mentioned items being out-of-date. For the American women, poor garment fit could be the result of changes in their physical body over time, but the garment could also have fit poorly at the moment of

purchase. Some of the American participants described having made compromises when they were shopping, for example because of price or design, but seldom wore those items afterward. In order to free some space in their wardrobes, they finally decided to discard those ill-fitted items. Only a limited number of Chinese women reported the same. Instead, they were concerned about out-of-date items, not necessarily meaning the clothing was out of the latest fashion, but that the items had been purchased years ago and had come to look old-fashioned by any modern standard.

In terms of means of disposal, the American women tended to sell their old garments to secondhand stores or donate them to charities. The Chinese women, in contrast, tended to reuse old items and said that the particular means of reuse depended on the reasons for disposal. For instance, if there was a fit issue, they might go to a tailor for alteration. If this was not possible or not worth doing, they would change it into a housekeeping item such as a mop or a handcraft such as a shopping bag. One Chinese participant said, for instance, that “she cut the dress short and added a piece of lace in the middle, and made it into another dress.” Some Chinese women considered it enjoyable to find a creative way to reuse a garment. A Chinese woman talked about this process:

Yes, just need 20 RMB (\$3) [I can] have a new item [by modifying an old item]. I do this type of thing a lot. Sometimes, it could be a silly move. For instance, I dyed a piece of clothing because I could not get rid of a stain on it; however, I found the color was really ugly afterward. I decided to give it away and wished I didn't do the extra effort of dyeing. However, I do have successful trials—(I guess) failure is the mother of success.

Clothing fit and fit evaluation education. There were three main sources of fit education: (a) hands-on experience from an older generation, such as mothers and grandmothers; (b) trial and error; (c) formal education; and (d) casual education such as through magazines and TV shows. The Chinese women had received comparatively more guidance and hands-on experience from an older female generation. Two Chinese participants had received formal education on how to evaluate clothing fit, while none of the American women had. More Chinese women indicated that they knew to make their own clothing and had made items for other family members or friends. The Chinese participants also mentioned more frequently than their American counterparts that they spent a certain amount of time

reading fashion-related magazines and TV shows and practicing those self-taught skills. In addition, many Chinese women started to make their own clothing buying decisions when they were teenagers. They usually went clothing shopping with their girlfriends or with family members, and they shared fit evaluation experiences consisting of trial and error processes. Different experiences were described by the American group. Many mentioned that they did not know how to find a fitted garment for themselves or for others. They also used very limited vocabularies in describing clothing fit. Furthermore, the American group reported less time spent on clothing shopping and other strategies for managing their physical appearance than the Chinese group did. Therefore, it is understandable that the American group was less confident on their clothing fit choices as well as style choices.

4.5 Discussion

As shown in the above result section, mature women's wardrobe management practices indeed revealed the relationships between their body, the perceived body in mind, and their projection of self. In fact, those women's clothing choices and wardrobe management practices were closely related to their physical bodies, personal preferences, self-identities, and existing wardrobe. Purchase of new clothing, as a core component of wardrobe management, has been greatly discussed by both groups of participants. During this decision making process, a consumer identifies her needs for a product by evaluating her physical condition, thinking about the identities/images she wants to project, taking considerations of her current wardrobe as well as taking account her personal preference consciously or unconsciously, and then figures out what kind of product is suitable for her. Later, she searches on the market based on her clothing selection criteria. Every participant has to balance her needs with the availability of products on the market and make compromises in many cases before a final decision can be made. This process of making compromises uncovered details of mature women's clothing selection criteria and availability of RTW products in two different markets. In addition, it was found both groups followed the same procedure when they made clothing buying decisions (Figure 51). However, they had different focuses at different stages and within each stage.

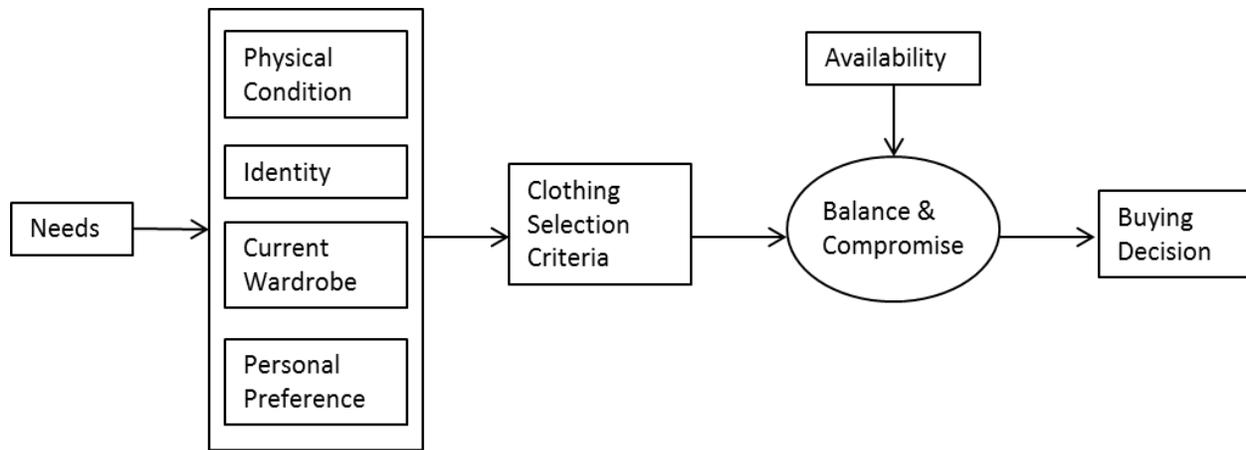


Figure 51. Buying decisions.

When a woman makes a clothing buying decision, she usually needs to identify her needs first. She asks herself the *why* question: Why do I want to buy new items? According to participants' elaborations, possible reasons are analyzed and presented in Figure 52. Here, physical needs refer to needs resulting in issues related to the physical body, such as body shape changes resulting from aging or needs resulting from physical activities. Needs brought by the natural environment could be the need for bodily protection from weather conditions or harmful environmental conditions. Sociocultural settings could also result in a need for clothing. Different dress codes exist in different sociocultural settings, and different practices of dressing are required in different settings. For instance, it is often necessary to update or even change one's attire to fit into a new social circle, culture, or job. On the other hand, clothing shopping is sometimes not very rational. It is very common for people, especially women, to go clothing shopping based on psychological needs or external triggers. Here, psychological needs include a need to shape or express one's self-identity or the many other mental needs such as releasing stress. In addition, external triggers could be promotions, sales, media, and influences from other people.

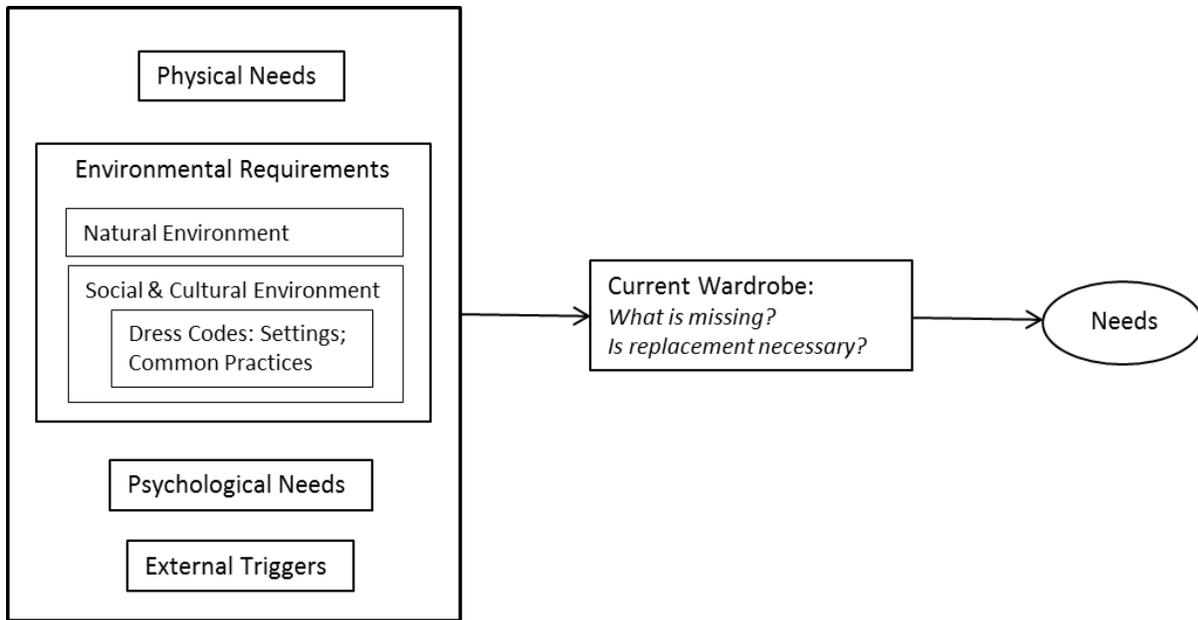


Figure 52. Identifying needs.

After a consumer figures out her needs, she then may go to her wardrobe and determine whether she has the item she wants or not. If she has something that fits her need, she asks herself whether it is necessary to replace the old one with a new one or simply add a new one.

As soon as she assesses her needs, the consumer takes several factors into consideration, including her physical condition, self-identity, and current wardrobe, as well as her personal preferences or personal style, in order to construct more details of the ideal products that could suit her needs (Figure 51). To be more specific, physical condition includes but is not limited to body shape, face shape, age, skin tone, and hairstyle. Current wardrobe includes all the items the consumer currently owns. Both groups care whether a potential purchase could mix and match with other items in their wardrobe. Identity in this context refers to the specific image the consumer wanted to project in a certain setting. Availability refers to items that were available to them on the market. Those items could be custom-made, but in most cases, they were RTW products.

Later, if a consumer knows what kind of products she is going to look for, she starts her clothing search journey. As presented in the result section, participants' clothing selection criteria generally fell

into twelve categories. Even though no participant was asked explicit to assort or right those subthemes, the three-level hierarchy system emerged based on the descriptions and natural response given by participants (Figure 53). The primary criteria include fit, style, function, and price. The secondary level includes design details, fabric, color, and quality. The third level includes brand, fashion trend, comfort, and convenience.

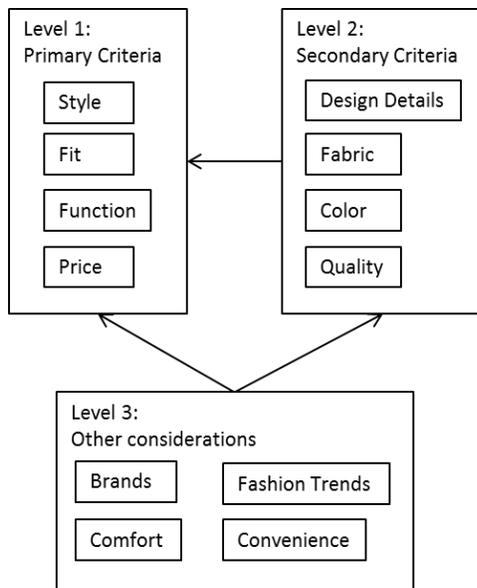


Figure 53. Clothing selection criteria.

The main difference between primary and secondary criteria is whether customers have pre-made decisions when they are searching the market. Usually, a customer will at least have thought about what kind of fit and style she wants, what her budget is, and what kind of function she needs before she jumps into searching. She might then add criteria during the process of searching. Secondary criteria can also often influence a consumer's buying decision indirectly by interacting with primary criteria. For instance, design details are very closely related to all four of the primary criteria, and fabric has great influence on price and function. In addition to the above-mentioned primary and secondary criteria, for mature women, at least our participants, elements such as brands, fashion trends, comfort and convenience fall into the third level of selection standards. Consumers may take brands and fashion trends into consideration, but the influence of those aspects will have been fundamentally worked through during assessment of the

primary and secondary selection criteria. The same is true for “comfort,” because comfort itself is not a criterion but the result of a good combination of the primary and secondary criteria.

To summarize, first, fit is the most important element for developing brand loyalty in both the Chinese and American women. It is one of the most memorable components the customer observes when she finally finds an item with satisfactory fit. Even though many other clothing selection criteria, such as fabric and style, were mentioned almost as frequently as fit, our interviewees believed it was relatively easy to find alternatives of a similar fabric and style in the RTW market but not fit. For them, a well-fitted item is the biggest trigger for remembering a brand and encouraging them to come back and shop for this brand again.

Different issues about the apparel industry in these two countries were also identified in this study. For the U.S. market, the price of RTW clothing is so low that the American participants reported being easily tempted by sales. They described overstocking their closets and making clothing compromises easily. But eventually, they said, they would reach a point at which they could not find anything “right”; many items in their closets were left unworn, sometimes with tags on. Without experience of an item with the “right” fit, they are lost in the sea of searching—they may not even know what they are looking for since they do not know what “right fit” should look and feel like on them. Without a standard, they do not know how to evaluate and could not make a good decision. This could be a reason why the American group were less confident in their styles and fit choices. The most ironic thing for the Chinese market, meanwhile, is that even though mainland China is the biggest manufacturer of clothing in the world, branded RTW products sold in mainland China are much more expensive than the same products overseas. Branded RTW products, no matter whether they are domestic brands or foreign brands that meet a certain level of quality, are expensive for the Chinese consumers. For these reasons,

The Chinese women were more willing to trade a little comfort for being “presentable”; it was more important for them to have standards for themselves and to present themselves as having the power and willingness to maintain those standards, in both formal and casual settings. For example, a Chinese

woman mentioned that when she is at home, she takes her work clothing off and changes into her “at home” dress which is more feminine than her work outfits. However, she did not do it for comfort but for demonstrating the idea that “I am a woman has standards for myself, and I don’t let myself go easily.” Similar ideas were implied by many of the Chinese women in conversations. Fewer American women mentioned this than Chinese women.

In addition, it was found that concerns with fit and garments size with respect to body image appeared to be influenced by the use of ideal images in the fashion industry. Because apparel companies display and advertise their products on idealized models or in other ways that increase the desirability of the products, consumers may feel disparities between their bodies and those of ideal models. Even though some studies found that consumers’ perceived discrepancies between actual and ideal body image were related to their body dissatisfaction and concerns with fit and garments size, especially in the context of online shopping, it does not necessarily mean that apparel retailers should not use idealized models on their websites. Rather, they need to use advanced devices to effectively assist consumers of various sizes to access the fit and size of the garment. An example of an online shopping experience that addresses these issues is the Lands’ End website. It displays styles on models of different body sizes. Therefore, consumers can look at the fit of the garment on a body shape more similar to theirs by clicking buttons representing different size and shape types, including regular, petite, tall, and plus. This type of device may help consumers imagine the fit and size of the garment and may decrease perceived body discrepancy between their actual body image and that of the model on the website.

On the topic of aging, women suggested strategies that can potentially improve women’s experience of their physical body as they grow older. Though it was not a focus of the current study, some interviewees offered information about their experience of aging, both mentally and physically, as well as their coping strategies. The fact that they volunteered these comments suggests that potential methods for improving the well-being for this group of women could be a valuable direction for both academia and the apparel industry.

4.5.1 Contributions

This study contributes knowledge in five different areas of research. First, it contributes to methodological developments by suggesting a novel way to study clothing by combining traditional social research methods with practices in the field of dress and fashion. Instead of viewing clothing merely as a tool for studying the relationship between the physical body and the sociocultural environment and/or self-identity, it also includes an analysis of the clothing itself. It explores not just the intangible side of clothing (as a carrier of symbolic meanings or social practices) but also its physical and material elements. It contributes knowledge on how clothing interacts with the physical body and how it relates to identity construction and projection. Second, this study not only provides insights for the industry by investigating the needs and concerns of consumers but also provides information to academia about how to improve education on fit evaluation and personal style. It also contributes to an understanding of physical body variations and of the interactions among personal preference, wardrobe management strategies, and the physical body. In addition, it provides insight into strategies for improving body image. Third, in terms of theoretical contribution, this study suggests a model for understanding women's clothing choices, especially what makes a garment suitable for a woman in different settings. In other words, it addresses women's expectations of clothing and their selection criteria when they are presenting one of their identities. Fourth, as a cross-cultural study, it provides insight into how to improve consumer satisfaction in two different cultural settings. Finally, this research project contributes to the knowledge of women's aging bodies and associated issues like body image, self-acceptance, and appearance management strategies.

4.5.2 Limitation

As an interview-based qualitative study, this study shares a common scientific problem in studies of materiality, the problem of grasping nonverbalized experiences through language. The translation of the nonlinguistic, such as practices tied to clothing, through the medium of language is a main challenge. In many cases of clothes practices, people feel something is wrong, but they are to a lesser extent able to

explain why. In addition, it is even more difficult to translate the practice of dressing and possession of clothing into written academic language.

One limitation of this study is the comparability of the two groups of participants. The Chinese group was recruited from a university located in a metropolitan city on the east coast of China, while the American group was recruited from a university located in a small city in upstate New York. The choice to recruit university staff was fundamentally made on the basis of the availability of 3D technology. Both universities had a 3D body scanner, which was needed for the study. In addition, as a cross-cultural study, many other differences were found as expected. The two groups had been living in two different sociocultural environments, where they engaged in different social activities and were exposed to fashion media and other influences to a different degree. In addition, there were differences in the availability of RTW products. Last, they had different body shapes. In fact, there was more variation in body shape in the American group than in the Chinese group. There were no selection criteria regarding participants' education level, income level, or other similar characteristics. However, as staff working at a prestigious university, participants were generally in the moderate to high category for their own cultures in terms of social standing, class, and income.

Another limitation was the small sample size. Only 59 valid surveys were collected for the Chinese group and 63 valid surveys were collected for the American group in the stage 1, the survey stage of the study, and only 20 Chinese and 22 American women participated in stages 2 and 3. However, it was considered to be a relatively reasonable sample size for this type of study, and abundant information was generated from both interviews and experiments. It is important that the study be replicated with larger samples to verify or dispute the findings.

4.6 Conclusion

In this study mature women's wardrobe management practices were under close scrutiny to uncover the relationships among their body, the mentally perceived body, and their projection of self. In

addition, as a cross-cultural study examining a relatively less-studied age group, this exploratory study examined, in theory and practice, an overlooked yet large segment of apparel consumers.

Two groups of mature women presented their thoughts on varied topics range from self-identities, appearance management, physical body, style, personal preference and usage of clothing, ready-to-wear (RTW) clothing shopping to other wardrobe management behaviors. In general, this study found that women women's daily practices of dressing is closely related to their perception, evaluation and feelings of their own physical body as well as their expected projection/image of themselves. In other word, their choices of clothing are intertwined with the side of herself, including both the physical body and the identity, she wants to present and to be viewed by other people. Therefore, it is very common for those women to use clothing to highlight the body parts she likes, cover the parts she dislikes, as well as obeying certain dress codes in different social environment. This was found in both groups, even though different patterns of dress code applications were identified between these two groups.

To be specific, first of all, this research project proposed a three-level model for understanding mature consumers' clothing selection criteria. Different from earlier researches, it studied clothing selection criteria from the consumers' perspective. Consumers' standards were then categorized standards into twelve categories and classified as three levels based on consumers' usage of them. It was found that even though the two groups of consumers generally followed this categorization, they actually varied in which criteria they were focusing on among the twelve categories. Thus this study can assist the process of marketing research and can help the industry understand consumers living in different cultures.

Second, this study studied women's experience of personal style development and clothing fit evaluation. It was found that these two groups of women generally have experienced style changes. However, they also admitted that there usually was no dramatic change, but style evolvement. They shared that such changes were mostly triggered by changes of status such as starting to work or childbirth, instead of fashion media or other people. In fact, their personal styles or preferences of clothing were usually from their family, especially female family members such as mother, grandmother, sisters, etc.

This study also identified issues in clothing fit education for consumers and proposes strategies on how to communicate clothing fit when nonprofessionals are involved.

Third, it studied women's experiences of shopping for available ready-to-wear (RTW) products and therefore proposed a model for understanding a critical aspect of wardrobe management – the process of making a clothing buying decision. Comparing to other aspects of wardrobe management such as organization and disposal, the process of making a clothing buying decision was discussed the most and revealed abundant information. Basically, both groups followed the same procedure when they were making a clothing buying decision, though they have different focuses at different stages and within each stage. The first stage usually involves identifying a need for a product, followed by figuring out what kind of product is suitable for the consumer, in terms of physical and actual needs for a piece of clothing, as well as psychological needs and other requirements. As soon as the consumer confirms her needs, she takes several issues into consideration, including her physical condition, self-identity, current wardrobe, and personal preferences or style, in order to construct more details about the ideal products that could suit her needs. Next, she searches the market, based her shopping choices on her clothing selection criteria, often having to balance her needs against the availability of products and making compromises in many cases before a final decision can be made. Usually women need to make compromises when they are not able to find items with complete satisfaction in the current RTW market. The shared thoughts of making a compromise can help the industry to understand consumers' needs and concerns better, therefore provide better products to consumers.

Fourth, other aspects of wardrobe management including disposal, organization and styling was also investigated to generate a rounded and sound understanding of women's relationship with their wardrobe, their body as well as the perceived body in mind, in addition to issues related to the process of making a clothing buying decision. It revealed that women's practices of wardrobe management could also be out of emotional needs, impulsive, and unorganized. Further study is needed.

Fifth, this study found that culturally recognized beauty standards influence women's evaluation of physical appearance, including their own body and other's body. The two groups of women shared some thoughts, but in general they reported different beauty standards. The American group was in favor of "internal and individualized" beauty while the Chinese women were generally sharing the same standard which was being feminine, natural, and kind.

Last but not least, it was possible that culturally recognized beauty standards affect women's body image by influencing their perception of the physical body. Therefore, this can trigger or change their appearance management strategies consciously or unconsciously, in both short term and long term. However, further study is needed.

4.6.1 Future Research

Future research could be built on the current study. First, it would be interesting to incorporate other formats of information besides self-reported information. For instance, in addition of description of one's wardrobe and recalled past experience of clothing shopping, on-site exam of one's wardrobe and on-site shopping experience would provide much information that was limited by the format of current study. Second, it is interesting to see if the same findings would apply to other populations such as, plus-size women, older women, women of different ethnicities, or even males. Last, it would be interesting and beneficial to further study women's practice of clothing in the process of aging. Even though 'age' has been found to be related to women's body image and practice of dressing, it is still not clear what exactly the relationship is and what the mechanism is. During the interviews, women frequently mentioned their experiences of aging, and some mentioned how it related to her wardrobe in the interviews. They shared their experience of physical and psychological changes, as well as life style changes and evolvement of personal styles. However, a more systematically designed study of this topic is needed to gain a deeper and more detailed understanding, and then provide guides to the industry too.

CHAPTER 5

A CROSS-CULTURAL STUDY OF FIT EVALUATION: AN EXPLORATION OF CONSUMER FITTING PRACTICES FOR REAL AND VIRTUAL GARMENTS

5.1 Introduction

Appropriate clothing fit is important throughout the process of apparel design, manufacturing, and marketing, whether from the angle of consumers, industry, or academia. Fit is a particularly important criterion in consumers' evaluation of an apparel product. The fit session is the main focus of evaluation for a garment both by the manufacturer during the product development process and by the consumer in the clothing purchasing process.

Great efforts have been made in both academia and industry to improve clothing fit; however, relatively less work has been devoted to understanding the definition and practice of clothing "fit" from the perspective of consumers. Even though concerns about educating and communicating information about clothing fit have been raised, published work is more focused on academic and industrial practices and reflects the perspectives of professionals. More effort and information centering on consumers' experiences and practices of clothing fit evaluation are needed, as consumer assessment of fit is the essential deciding factor in clothing purchases.

It is important to teach consumers how to understand clothing fit and how to communicate their needs for clothing fit. Without an appropriate understanding of fit, a consumer is not able to locate and identify "fitted" items for themselves. It is very possible for consumers to pass by products with the "right fit" for their body, even though it is right in front of their eyes. They may leave stores complaining they could not find anything that fits or settling with unsatisfactory choices. Since "right fit" is defined by fitting professionals, and a consumer may not have the knowledge to make the same judgements, it is not

known whether the market has no appropriate product available. Therefore, the purpose of studying clothing fit and fit education is not just to provide consumers with more racks of items but also to train their eyes and facilitate communication. It is not enough for insiders in the field of apparel design to simply ask their customers what they need and what their concerns are. It is also important for professionals to understand the consumers' language and to know how to interpret and use their expressions.

This study was an attempt to understand how mature women from two different cultures practice clothing fit evaluation and how they practice clothing fit evaluation using developing technologies. To be specific, the study's first purpose was to investigate the fitting experiences, practices, and usage of language of 34- to 55-year-old women living in two different cultures. Its second purpose was to investigate potential usage of 3D virtual try-on technology. In addition, this study was designed to acquire the consumers' language in terms of clothing fit, to interpret consumers' needs and concerns, and to provide a method/framework to guide a procedure for interpretation and communication of clothing fit from the angle of consumers who have received no training on fit evaluation from professionals. Thus, in this study we explored the issue of fit education and suggested improvements in effective clothing fit communication too. The apparel industry, academics, and consumers would greatly benefit from this study.

Therefore, a simulated fitting room study and a study of 3D virtual fitting was designed to achieve the above-mentioned goals. Those objectives were achieved by (a) a comparison of fitting experiences including language usage and non-oral activities in both real and virtual fitting settings. Participants' choices of the perceived "best fitted" real and virtual items were also compared; and (b) studying those women's attitudes, acceptance of, and concerns with 3D virtual technology, particularly their experience with the customized body avatar and the experience of virtual fitting

5.2 Literature Review

5.2.1 Clothing fit

Certain elements of a garment are crucial to determining the fit of clothing (Erwin, Kinchen, & Peter, 1979; Song & Ashdown, 2010). Erwin et al. (1979) identified five criteria: ease, line, grain, balance, and set. Ease is defined as the amount of space between the garment and the body: a tight-fitting garment has less ease, while a loosefitting garment has more ease (Branson & Nam, 2007; Erwin et al., 1979). Erwin et al. (1979) also noted two different types of ease—functional ease and design ease. Functional ease refers to the amount of fabric that allows for body movement, and design ease is defined as the amount of fabric needed to demonstrate the design of the garment (Erwin et al., 1979). Adequate basic ease for body movement and comfort is required. This is usually determined by a person's physical body dimensions and fabric choices. On the other hand, other than basic ease, preference of design ease is very personal and highly influenced by fashion trends.

Line is associated with the seams of a garment. Vertical seams should be vertical to the floor and parallel to the center of the body (Erwin et al., 1979). Grain refers to the relationship between fabric, pattern, and wearer; the grain of the fabric when the garment is worn should be either parallel to or perpendicular to the floor, or at a 45-degree angle if cut on the bias (Erwin et al., 1979). Balance, for a symmetrical garment, means having the same distance from the right and left sides of the body to the center (Erwin et al., 1979). Set indicates the smoothness of the fabric on the body, with an absence of wrinkling and pulling of the garment (Erwin et al., 1979).

5.2.2 Clothing Fit Evaluation

Clothing shopping involves many different decisions, although this decision-making process is often seen as either mundane or arbitrary. Fit is one of the most frequent, important, complex, situational, and dynamic issues to consider in assessing clothing quality and making a buying decision in both online and brick-and-mortar situations (Hsu & Burns, 2002; Song & Ashdown, 2010). It requires the wearer and/or viewers to recognize certain qualities in a garment, commonly categorized as ease, line, grain, set,

and balance (Erwin et al., 1979). On the one hand, a well-fitted garment should flatter the body by incorporating pleasing proportions, skillfully accentuating positive features, and making less preferred body parts less noticeable (Frost, 1988). It should hang smoothly and evenly on the body, with no gapping, pulls, or distortion of the fabric. If intended, hems should be parallel to the floor (Ashdown et al., 2004). On the other hand, the garment should provide comfort and functional performance at the same time (Farmer & Gotwals, 1982). For instance, the garment's armholes and crotch should not constrict the body (Ashdown et al., 2004).

Previous studies on apparel fit generally fall into two categories: expert-perceived evaluation and self-perceived evaluation. The former includes a panel of professionally trained clothing fit experts reviewing and rating the fit of a particular garment on a body. Clothing fit is usually assessed on the basis of specific standards that can give replicable results. This type of fit evaluation is adopted in both industry and academia. On the other hand, self-perceived evaluation comes directly from the wearer and the wearer's opinions about clothing fit in relation to their body. Although this method usually does not give the same results as the former, it allows the wearer who has a personal relationship to the garment to judge the fit based on tactile factors. The language and assessment categories for this type of fit evaluation are, however, generally provided by the professional researchers, in order to align results with the expert evaluation.

Even though the majority of reported findings are based on the conduct of fit evaluation in academia, the perceptions and practices of apparel industry professionals regarding best practices and areas for improvement in fit sessions have also been studied (Bye & LaBat, 2005). It was found that fit sessions encompass product development decisions that extend beyond the fit of the garment to evaluation of design. Using new technology to address the organization and communication of industry fit sessions as well as to improve garment fit was suggested.

In the case of both expert-perceived evaluation and self-perceived evaluation, a fit evaluation sheet is usually developed on the basis of published fit analysis instruments. This fit evaluation sheet

provides judges, no matter how much fitting experience they may have acquired, with an organized and systematic guideline for analyzing clothing fit that also allows comparison and aggregation of expert fit panel responses. Fit criteria are generally organized into groups and listed in detail. Responses are often collected in Likert three-point or five-point scales. For instance, criteria such as overall alignment, grainline, balance, and placement of darts, seam, and other details, overall looseness and tightness, and looseness and tightness in different locations are asked about specifically. However, in order to explore the issue of clothing fit from the perspective of consumers and learn from their usage of language, no such evaluation sheet was provided in this study. Instead, our participants were constantly encouraged to share their common experiences of fitting in their own language with the researchers. In this study the actual fit of the garments was secondary; the participants' thoughts and language about fit were more important.

Clothing fit evaluation for online shopping. Fitting issues are magnified when it comes to online clothing shopping. It is difficult to find items with the “right fit” even in brick-and-mortar stores where a consumer is able to select a size by actually seeing and trying it on. It is even more difficult when shopping online because there is no option to physically try garments. In other words, in the case of online clothing shopping, traditional trial and error methods are not possible. Therefore, it is understandable that fit dissatisfaction has been of greatest concern in online clothing shopping (Kim & LaBat, 2013). Furthermore, since the majority of available visual information on products provided online for the current ready-to-wear market is in 2D format, including photos, text, and videos, it is very hard for consumers to see, feel, or imagine themselves wearing those products. This creates both physical and psychological distance between the clothing products and the consumers.

To sum up, in this consumer-driven market, it is important to provide consumers with well-fitted garments. However, it is equally important, if not more important, to help consumers develop a personal guideline for clothing fit evaluation based on an understanding of their physical bodies and personal preferences. This can only be achieved through (a) gaining a deep understanding of consumers'

perspective of clothing fit and their usage of language about fit and (b) providing appropriate and effective fit education to consumers. It is extremely important to teach consumers not only the definition of good fit but also the methods of identifying good fit from poor fit based on their physical body.

5.2.3 Applications of 3D Technology in Apparel

The use of 3D technology for clothing-related research and commercial purposes has been a topic of active discussion for decades (Loker, Ashdown, & Carnrite, 2008; Staples, Pargas, & Davis, 1994). Research on developing and applying computer techniques for anthropometric applications and apparel design has been booming since the end of the last century (Gill, 2015). For example, 3D body scanning was first used as a noncontact method developed to obtain body measurements. A variety of software has also been developed to automatically extract linear measurements from the scan data including length, width, circumference, and a variety of angles. The scan also provides a permanent 3D record that can be accessed for future reference and analysis. More recently, body scanning has received broad interest and is applied to a variety of studies. In addition, integrating 3D body scanning techniques with other 3D technology, including 3D body modeling, 3D virtual simulation, and customized apparel design is considered to be a possible solution for improving ready-to-wear (RTW) clothing fit and for achieving personalized design (Loker et al., 2008; Loker, Ashdown et al., 2004; Loker, Cowie, & Ashdown, 2004; In Shim & Lee, 2011).

Technical and psychological issues must both be taken into consideration when applying 3D technology to the field of apparel design. To be specific, the first and major challenge in 3D simulation is the accuracy of 3D simulation, including in size and fit representation, fabric draping and textures, and the interactions of body and garment (Volino et al., 2005). This is the major task studied by people applying computer graphics and software development to this field. The second major challenge is consumers' attitudes toward the technology. It has been generally hypothesized that innovative applications of 3D technology could increase consumers' involvement, whether in a traditional retail store or online. However, many concerns about the application of 3D technology in the apparel industry have

been identified, including consumers' acceptance of 3D technology, their reactions to the 3D body scan process and 3D scan images, their reactions to 3D virtual garment simulation, and the perceived usefulness of virtual information provided by 3D technology for appearance management.

However, research regarding the applications of 3D technology for clothing, especially 3D virtual simulation of clothing, is at an early stage and is so far inconclusive, as these technologies are improving rapidly. Initial research addressed issues with early, less sophisticated versions of the images produced by this technology (Kim & LaBat, 2013); therefore, research using the more recent and visually sophisticated versions of these programs is needed. In addition, previous studies were often based on a description of 3D technology instead of actual experience with the technology. Moreover, relatively more studies have been conducted that focus on 3D body scanning than on 3D virtual try-on. Much effort has been made to explore 3D body scan technology and clothing fit, in the hope that it could provide consumers with realistic and helpful information about their bodies and the acceptability of specific clothing size and/or style combinations. In addition, these topics have been studied with limited populations such as young Americans and generally from the perspective of professionally trained people. Few studies have been conducted to systematically study women's experience of clothing fit evaluation, fit preferences, and sources of fit education. Furthermore, even fewer studies are designed to investigate the reliability and perceived usefulness of 3D virtual try-on technology from the perspective of consumers. The study of the potential of 3D virtual simulation as a communication tool of clothing fit as well as a teaching tool for educating clothing fit is important for this globalized, digitized, and fast-paced world. To conclude, a cross-cultural study investigating mature women's attitudes toward 3D technology for fitting and appearance management (especially the use of 3D virtual garment simulation technology for clothing fit evaluation) is needed.

3D body scanning. After more than 20 years of research, 3D body scanning techniques are currently quite mature, and many commercial 3D body scanning systems are widely available for the garment industry. 3D body scanners that became available in the late 1990s were basically based on three

different technologies: laser-based scanning, light-based scanning, and stereophotogrammetry (Istook & Hwang, 2001). Different body scanners in different categories would have their own advantages and disadvantages. The quality of raw scans produced by laser scanners is relatively higher than that of light-based scanners. Daanen and Ter Haar reviewed new developments in 3D whole-body scanners, reporting an increase in 3D body scanners with a parallel cost reduction in recent years (2013). They also discussed new 3D body scanners, based on techniques such as infrared and millimeter waves, that have also entered the market (Daanen & Ter Haar, 2013). Among recent developments, the Kinect™ camera has received great attention for being relatively inexpensive and for working under difficult light conditions. However, it is criticized for its low depth map resolution (Daanen & Ter Haar, 2013).

With 3D body scanning, researchers and apparel companies can address many different possible issues by (a) obtaining body dimensions directly from target customers; (b) using target consumers' information to select garments for style and fit (Loker, Ashdown et al., 2004); (c) identifying apparel fit and sizing issues (Ashdown et al., 2004); (d) accommodating personal design and fit preferences (Connell, Ulrich, Knox, Hutton, Woronka et al., 2003; DesMarteau, 2000; Devarajan & Istook, 2004; Istook, 2008); (e) reducing the cost of design and manufacturing by automating some of the traditionally labor-intensive processes such as pattern development (Keiser & Garner, 2012); and (f) offering better customer service. In addition, it has the potential to be particularly useful in online apparel shopping (Kartsounis, Magnenat-Thalmann, & Rodrian, 2003; Kim & Forsythe, 2008). E-retailers may be able to decrease in consumers the cognitive efforts and perceived risks caused by having to guess the fit and size of garments and to facilitate consumers' decision-making processes by adopting 3D body scanning and 3D virtual simulation. When shopping for clothing, consumers whose bodies are far from those of the idealized models shown on the sites may feel a higher degree of body image self-discrepancy and body dissatisfaction, which may enhance concerns with fit and size of garments and require additional behavioral efforts.

3D body scan and clothing fit evaluation. In addition to the above-mentioned applications, 3D body scanning can assist the process of fit evaluation. Most scanners can collect over 300,000 data points in the form of xyz coordinates. These data can be analyzed in a variety of applications that can assist the process of fit evaluation (Daanen & Ter Haar, 2013; Devarajan & Istook, 2004).

Researchers have used 3D scans of clothed bodies and expert judges to evaluate the fit of garments from scan images (Ashdown et al., 2004; Bye & McKinney, 2010; Nam et al., 2005; Song & Ashdown, 2010). Ashdown et al. (2004) found that a 3D scan was a great representation of the body/garment relationship that minimized visual distractions such as color and texture and concluded that 3D scan models have the potential to substitute for live fit models. Nam et al. (2005) found using 3D scan images for fit analysis convenient and accurate because there were no constraints due to time, model availability, or fatigue.

Bye and McKinney compared the use of a live model with the use of a 3D scan model, focusing on judges' ability to evaluate fit criteria and the reliability of fit scores. Four judges analyzed the fit of 19 students' design projects, which used dresses and pants constructed on the basis of basic slopers. They found there was no significant difference between using a live model and a 3D scan in their ability to assess looseness and tightness of dresses or pants, but significant differences were identified in their ability to assess alignment and detail placement for both pants and dresses. They reported that "the judges felt they could evaluate looseness and tightness on a scan, but actually scored many criteria differently" (2010, p. 98). They reported no significant difference in fit scores between live and scan models but acknowledged that fit scores may be lower when using a 3D scan. They also reported no significant interaction between the fit analysis model (3D scans versus live models) and garment evaluated (dress versus pants).

Song and Ashdown (2010) examined the validity of 3D scans as a tool for visual analysis. They compared results from fit analyses using live models with those using 3D scans of the same models. They invited professionals from the apparel industry to provide feedback on the 3D scan fit analysis process

and to suggest ways to improve the process. They found different levels of reliability in 3D virtual fit analysis in different areas of the body. Among the reported areas, the most reliable results were found in the bust area, while the waist area showed the least consistency in fit interpretation overall. They also reported that the hip area was not reliable for identification of misfit but was relatively reliable for estimates in alteration amounts.

However, there are some issues with using 3D scans for fit evaluation based on published studies. First, some specific issues with fit were difficult for judges to evaluate from a 3D scan (Nam et al., 2005). For instance, some dimensions of a live fit analysis cannot be addressed from a 3D scan (Ashdown et al., 2004). Other issues were influenced by the thickness and irregularity of the surface, expert training, and the need to develop a reliable instrument (Bye & McKinney, 2010). Furthermore, all of the above-mentioned studies investigated the fit of clothing from the perspective of judges, who have a certain level of apparel background and experience. Even though it is generally accepted that trained experts can perform fit analysis in a more professional and organized way, the wearer's fitting experience should not be neglected. It is equally important, if not even more so, to understand clothing fit from the perspective of consumers.

Consumers' attitudes toward 3D body scanning. A relatively less studied area is people's willingness to be scanned and psychological concerns about 3D body scanning. Both Fiore, Seung-Eun, and Kunz (2003) and al-Mousa (2011) have conducted questionnaire-based studies to investigate how their participants perceived the body scanning process and their willingness to be 3D body scanned. The majority of published work has been generated based on young female participants; however, Lee et al. (2012) found that women aged 60 and over had positive attitudes toward the use of 3D body scanning. This survey-based study was conducted after the participants were shown a short film of the 3D body scan process without actual trial of the 3D technology. However, without physical experience of 3D body scanning, their positive findings are not well grounded.

Studies based on actual experience of 3D body scanning have revealed varied patterns of results. Loker, Cowie, et al. (2004) surveyed 203 women aged 35–55 years after they had experienced 3D body scanning. They found clothing size did not predict comfort with the process of being scanned, and nearly all were willing to be scanned again, even though only about half were comfortable with viewing their 3D scans. Similarly, Grogan, Gill, Brownbridge, Waenock, and Armitage (2016) investigated how women feel about being whole-body scanned and studied the impacts of whole-body scanning on women's body satisfaction. A total of 91 out of 451 women between 18 and 81 years (average age 51 years) who had experienced a whole-body scan in July or September 2013 responded and subsequently completed an online questionnaire. In general, those women who responded were comfortable being scanned and wanted to see an accurate and objective view of their size and shape. However, they also acknowledged that they felt threatened and vulnerable when seeing their bodies on the printed output. In addition, more than one third reported greater body dissatisfaction while only 7% reported increased body satisfaction. However, positive changes in satisfaction were only predicted by current body satisfaction and not by body mass index (BMI) at time of scanning or by age.

Current body satisfaction was not, however, found to be a predictor of changes of body satisfaction after scanning (Domina et al., 2008). Domina et al. (2008) investigated women's willingness to be body scanned and found that neither body satisfaction nor self-esteem predicted willingness to be scanned; 86% of 85 women aged 18–25 were comfortable with being scanned and with viewing their scans, even though they were on average in the overweight category and chose an ideal body that was thinner than their perceived current figure. In addition, increased body satisfaction after body scanning has been reported (Grogan, 2008; Grogan et al., 2013). Grogan et al. (2013) interviewed 20 women who had been whole-body scanned. The participants reported that they looked slimmer and more “in proportion” than they had expected, suggesting higher satisfaction levels as a result of scanning.

Consumers' concerns about the security of body scan data and measurement information were also identified as a barrier to using 3D technology (Anderson-Connell, Ulrich, & Brannon, 2002).

3D virtual try-on. In the field of apparel design and production, 3D virtual simulation originally referred to technology that can digitally reproduce the shape of a piece of cloth under the control of gravity (Volino et al., 2005). During the early years of development, only simple creations such as a blowing flag could be simulated using geometric approaches, and little research work was done on comprehensive physics-based cloth simulation (Fan et al., 1998; Kang & Kim, 2000; Kunii & Gotoda, 1990; Okabe, Imaoka, Tomiha, & Niwaya, 1992; Provot, 1995; Volino & Magnenat-Thalmann, 1995, 1997, 2000; Zhang & Yuen, 2001). However, a great amount of progress has been achieved during the past fifteen years in the field of computer-aided design (CAD) and computer graphics. Many efficient garment simulation models, with which customers can visualize realistic looking garments, have been proposed (Fontana et al., 2005; Meng et al., 2010; Wang, Lu, Li, Chen, & Sakaguti, 2009).

There are two advantages to applying 3D simulation technology to the apparel industry: (a) designers and manufacturers can directly view apparel items in 3D space, even before physical products are made; and (b) the technology could contribute to the development of personalized design and customized fit.

In order to maximize its advantages, a 3D body avatar with detailed semantic features needs to be constructed first. It could be customized either manually, based on measurements, or based on actual 3D body scans. If made manually, a specific set of body measurements of an avatar provided by a 3D simulation system is adjusted to generally mimic those of a real human body. However, no matter how similar this manually tuned avatar is to the real body, it is never an exact replica. On the other hand, avatars can be created directly from a 3D body scan. First, the scanned body is processed to get rid of extra points, to patch holes, and to smooth the surface. Then, the processed 3D scan is imported into a 3D virtual fitting system. This method is more intuitive and theoretically more accurate than the first; however, the “patching and smoothing” work may bring in inconsistency to the original scan, and the method may be slow and cumbersome (Kim & LaBat, 2013). Lim and Istook (2010) conducted a comparison study of virtual avatars by using the automatic and manual methods and reported that virtual

avatars generated automatically from 3D body scans were relatively more accurate than those made manually in five different body shapes (Lim & Istook, 2010).

After generating a customized 3D body avatar, either a 3D-to-2D method or a 2D-to-3D method is used for 3D simulation. On the one hand, 3D-to-2D methods generally involve draping virtual fabric around a 3D avatar and then flattening the 3D virtual fabric to 2D patterns (Decaudin et al., 2006; Sul & Kang, 2006; Turquin, Cani, & Hughes, 2007; Wang, 2005) It is similar to free-form 3D object design through 2D sketches on a screen. On the other hand, the 2D-to-3D method involves using existing 2D patterns that are virtually stitched around a 3D body model for design and fit checking in 3D space in real time (Kim & Kang, 2003; Kim & Park, 2006). This method is comparatively less time-consuming, less costly, and more stable. However, garment pattern pieces must be pre-positioned on a virtual avatar. This initial task in the 2D-to-3D method requires additional time and skill (Istook & Hwang, 2001). How well this step is performed has a great influence on the results of the 3D simulation. Many researchers have been working on this method for over two decades (Aono, Breen, & Wozny, 1994; Fan et al., 1998; Fontana et al., 2005; Fuhrmann et al., 2003; Igarashi & Hughes, 2003; Kang & Kim, 2000; Meng et al., 2010; Okabe et al., 1992; Provot, 1995; Volino & Magnenat-Thalmann, 1995, 1997). In addition, since both of the 3D methods have some flaws, some researchers have in recent years proposed to combine both 2D and 3D techniques to create a more effective system. Both DressingSim® in Japan and Assyst-Bullmer in the United Kingdom provide a variety of software applications for the apparel industry with 3D design and simulation components. Further research is required to bridge 2D patternmaking systems and 3D simulation systems.

3D virtual simulation for fit evaluation and communication. Several 3D virtual simulation systems, such as 3D Runaway Designer by OptiTex, V-Stitcher™ by Browzwear, e-fit Simulator™ by TukaTech, and CLO by CLO3D, are able to display digital garments on 3D virtual avatars. However, they are mostly used by professionals in the apparel industry or in academia for research and education purposes. They all claim that their products are able to simulate the draping effects of real garments to a

satisfactory level. However, little information, such as how they define and test the accuracy of the their products' performance, and little evidence supporting their claims is available to the public. Among this group of companies, TukaTech worked with Tesco, the U.K.-based retailer, to test the accuracy of their 3D simulation software for a children's line. They claimed that it was accurate enough to reflect physical sample production. My Virtual Model (MVM), meanwhile, was one of the earliest virtual try-on systems available online to consumers of Lands' End, Levi's, Lane Bryant, and others (Istook C. L., 2008). The retailers who have used MVM have reported a reduced return rate, longer time stayed on websites, more purchases, and more money spent. However, those early versions of 3D simulation products were mainly for style representations, not for fit analysis. When 3D body scans started to be integrated with 3D virtual try-ons, virtual images became more realistic and relatively more accurate. As discussed by Kim & LaBat (2013), 3D simulation replicates an in-store fitting room experience by creating virtual bodies and garments for trying on. The interactive nature of 3D simulation technology introduces more consumer involvement in online clothing shopping than traditional online clothing shopping, where only 2D visuals such as photos, text, and videos are provided.

3D virtual fitting has similar advantages to fit evaluation based on 3D body scan, including the potential to minimize visual distractions such as color and texture and a lack of constraints due to time, model availability, or fatigue. Beyond those advantages similar to those that lend 3D virtual simulation the potential to substitute for live-fit models, it has some additional strengths. First, fitting for multiple items with varied styles could be completed on the basis of one single 3D body scan, instead of requiring a 3D body scan for each style. As soon as a 3D body scan in minimal clothing is recorded and processed, the scan having captured 3D body dimensions, shape, and proportions, it could be used to generate a 3D customized virtual avatar for the individual. This virtual avatar can then be used unlimited times for trying on any styles. Therefore, there are no constraints on time, geographic location, or availability to 3D body scanners afterward until and unless the individual's body shape changes enough to require a new scan . Thus it is especially suitable for online applications, such as internet shopping. In addition, with

the assistance of virtual fitting tools provided by 3D virtual simulation software, such as a fit map and a tension map, the scan provides additional objective information to users for fit analysis, though their reliability and possible validity need to be explored further. Finally, there are reported concerns about ability to analyze fit on 3D scans, because of missing information in important fitting areas such as armholes and crotch. However, with generated 3D virtual avatars, where those areas are patched and smoothed, there is the potential to evaluate the fit of clothing in those areas. A scan of the person wearing actual garments could be used as a comparison to test the validity of the fit of the virtual garment. The scan will show all of the small variations in the relationship of the garment to the body that may still be impossible with virtual fit at its present state of development.

Consumers' attitudes toward 3D virtual simulation. Even though it has been generally accepted that consumer acceptance level of technology is one of the keys to the success of technology, little is known about consumers' attitudes toward 3D virtual simulation.

In an early study, Loker, Ashdown, et al. (2004) reported that female participants within the age ranges of 19–22 and 34–55 were both positive about using 3D virtual try-on technology for creating custom-fit garments. However, their responses were based on verbal descriptions of a possible 3D virtual try-on technology. Lee et al. (2012) found that women aged 60 and over had relatively less interest in virtual try-on than in the use of 3D body scanning. However, again, this survey-based study was conducted after showing their participants a short film of the 3D body scan process without actual trial of the 3D technology.

Kim and LaBat (2013) examined 19- to 35-year-old consumers' experience of and satisfaction with using 3D virtual simulation technology for online shopping, as well as their willingness to use the technology. They 3D body scanned and then created a virtual model for each participant. In addition, participants completed a questionnaire and were interviewed after completing a simulated online shopping experience that used 3D virtual simulation technology. The participants reported that the virtual model was impressive and was a good starting point for fit analysis and that they were therefore likely to

use it in the future. They also reported some inaccuracies of the visual representation of clothing, and some common concerns were raised by their participants, including privacy issues, availability of technology, and discomfort with viewing one's own body scan. Their participants were relatively young; it is not very clear how mature women would respond to these conditions. Moreover, even though their participants had actually experienced 3D virtual try-on, they did not compare the experience with that of a real fitting. In other words, no baseline for fit analysis had been set. The reported result is based merely on imagined fit satisfaction. Also, information about the participants' level of past experience with fitting was collected; this may have had a great influence on their skills in assessing fit in a 3D virtual environment.

5.3 Methodology

5.3.1 Recruitment Procedure

After IRB approval was obtained, gatekeepers (administrators at the universities) who had access to potential participants were contacted by phone and/or email with a description of the study. If they were willing, they then introduced this study to potential participants. If a potential participant was willing to take part in the study, she was asked to respond to a survey gathering information about demographics, body image issues, appearance management strategies, and clothing choices, as well as consumption of and opinions about RTW. At the end of the survey she was asked if she wanted to participate in an interview-based wardrobe study, as well as the simulated fitting room study and 3D virtual fitting study. If so, an individual interview was scheduled for each participant. Findings obtained from the survey and the wardrobe study are reported in previous chapters.

Participants. Two groups of 34- to 55-year-old female participants were recruited for this cross-cultural study. Qualified participants were (a) female; (b) 34–55 years old; (c) staff at a university located either in a city in the east coast area of China (for the Chinese group) or in a city in the northeast area of the United States (for the American group); and (d) Han Chinese or European American. There was no constraints on body shape, height, weight, or other related attributes. Most of the participants were within

the standard regular women's size range; however, within that range, there was variation in body shapes and body sizes, especially within the American group. In addition, there were no selection criteria with respect to education level, income level, and other similar characteristics. However, as staff working at a prestigious university, participants were generally in the moderate to high category for their own culture in terms of social standing, class, and income.

In total, 59 valid survey responses were received for the Chinese group, while 63 valid survey responses were received for the American group. Because of limited time and budget, only 25 women of each group were randomly selected and then contacted for this study. Ultimately, 20 Chinese women and 22 American women were recruited for this simulated fitting room study. Their demographics are reported in the result section.

5.3.2 Procedure

The proposed study was divided into two parts: (a) a simulated fitting room experiment and (b) an experiment using 3D virtual fit analysis. Figure 54 demonstrates the procedure. Participants came for an initial visit for Steps 1 and 2 and then returned at a later date (once avatars and virtual garments were prepared) for Steps 4 and 5.

Part 1: Simulated Fitting Room Experiment

Step 1: Interview

1. Real garment fitting experience
2. Fit preferences over time
3. Experience of fit education

Step 2: Simulated Fitting Room

1. 3D body scans in minimal clothing;
2. Fit trials;
 - *Pants & Shirts*
 - *Self-negotiation*
 - *Choices of 'Best Fitted' items*
3. 3D body scans in 'Best Fitted' items

Step 3: Preparation of 3D Virtual Fitting Tools

- Customized 3D Avatar
- Virtual garments: *Pants & Skirts*

Part 2: 3D Virtual Fitting Experiment

Step 4: Interview

- 3D virtual fitting experience
- *Before – Expectations*
 - *After – experiences & Concerns*

Step 5: 3D Virtual Fitting Room

1. Observations of 3D customized avatar;
2. Virtual fit trials;
 - *Pants & Shirts*
 - *Self-negotiation*
 - *Experiment with virtual fitting tools;*
 - *Choices of 'Best Fitted' items*

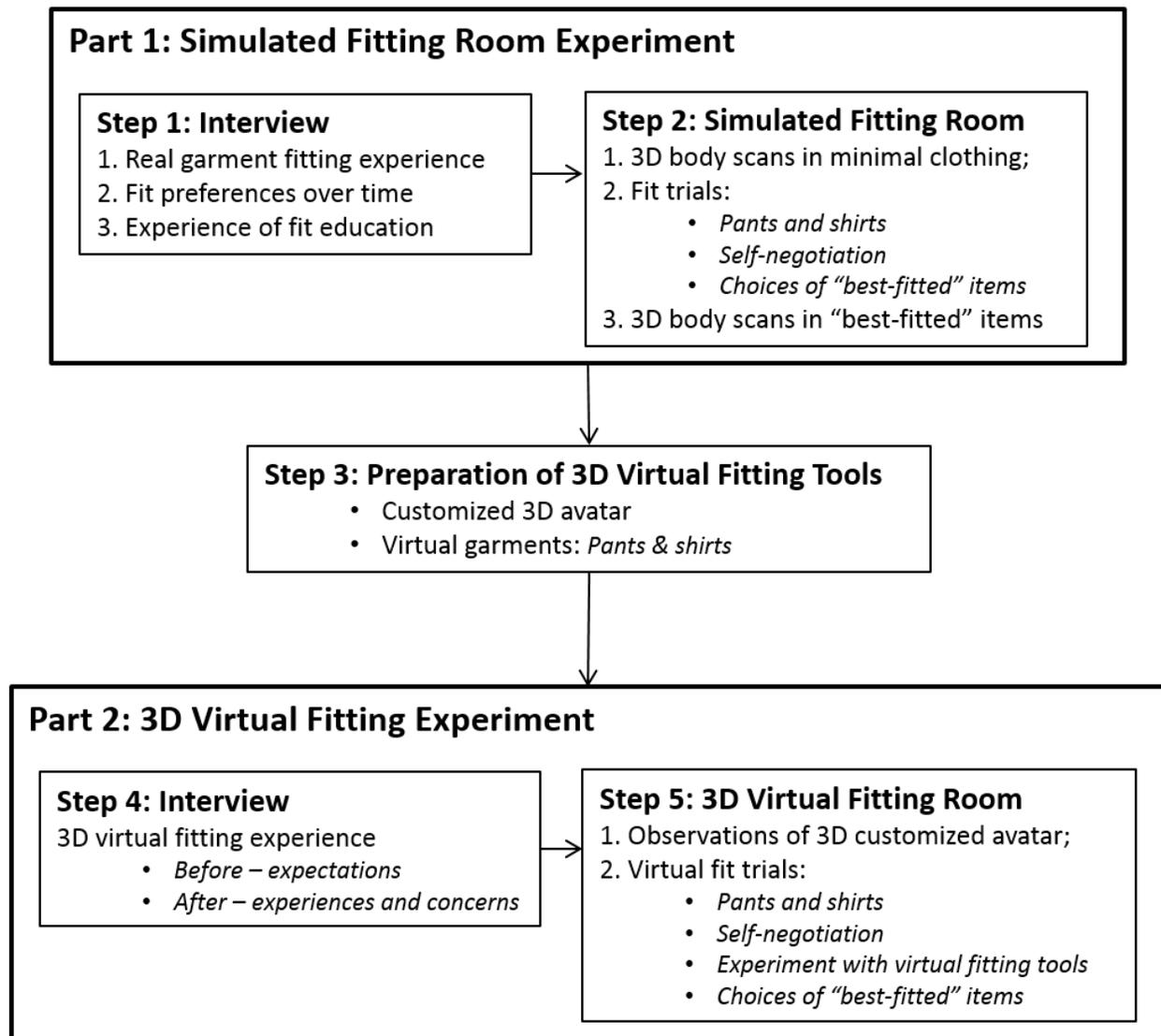


Figure 54. Methodology.

The simulated fitting room experiments incorporated two phases: an interview (Step 1) and a real garment fitting session (Step 2). In the interview session, participants were asked questions about garment fitting experience. They were asked to describe how they usually evaluate the fit of garments when shopping, including the procedure, criteria or standards, and details such as posture and body movements used in the fitting process. Questions about their preferences for clothing fit over time were also asked. Finally, they were asked about their past experiences of fit education, including when, where, and how they learned to evaluate clothing fit. The simulated garment fitting session was developed to study

interactions among clothing fit, the physical body, and the mentally perceived body, to investigate the dynamics in a fitting room, and to understand the self-negotiation process consumers use when fitting clothing.

In this experimental session, participants were first asked to change into minimal clothing (a tightly fitted tank top, a pair of leggings, a cap) for an initial 3D body scan (Figure 55). A Human Solution 3D body scanner was used for the American participants and a TC² 3D body scanner was used for the Chinese participants because of the availability of equipment. The 3D body scans provided important information about participants' physical body dimensions. In addition, a processed 3D body scan was imported into 3D virtual fitting software CLO3D for the automatic creation of a 3D virtual avatar (Figure 56). After the first scan in minimal clothing, participants were asked to reproduce the garment selection process that they usually performed in a fitting room of a brick-and-mortar store, but in a lab setting, trying on garments from a set of tops and bottoms in a provided size range. During this simulated fitting process, participants were instructed to focus on clothing fit, even though they may also comment on the style. Neither fit evaluation sheets nor similar instruments were provided; instead, participants were constantly encouraged to share their thoughts and fitting experiences with the researchers throughout the process of real garment fitting.

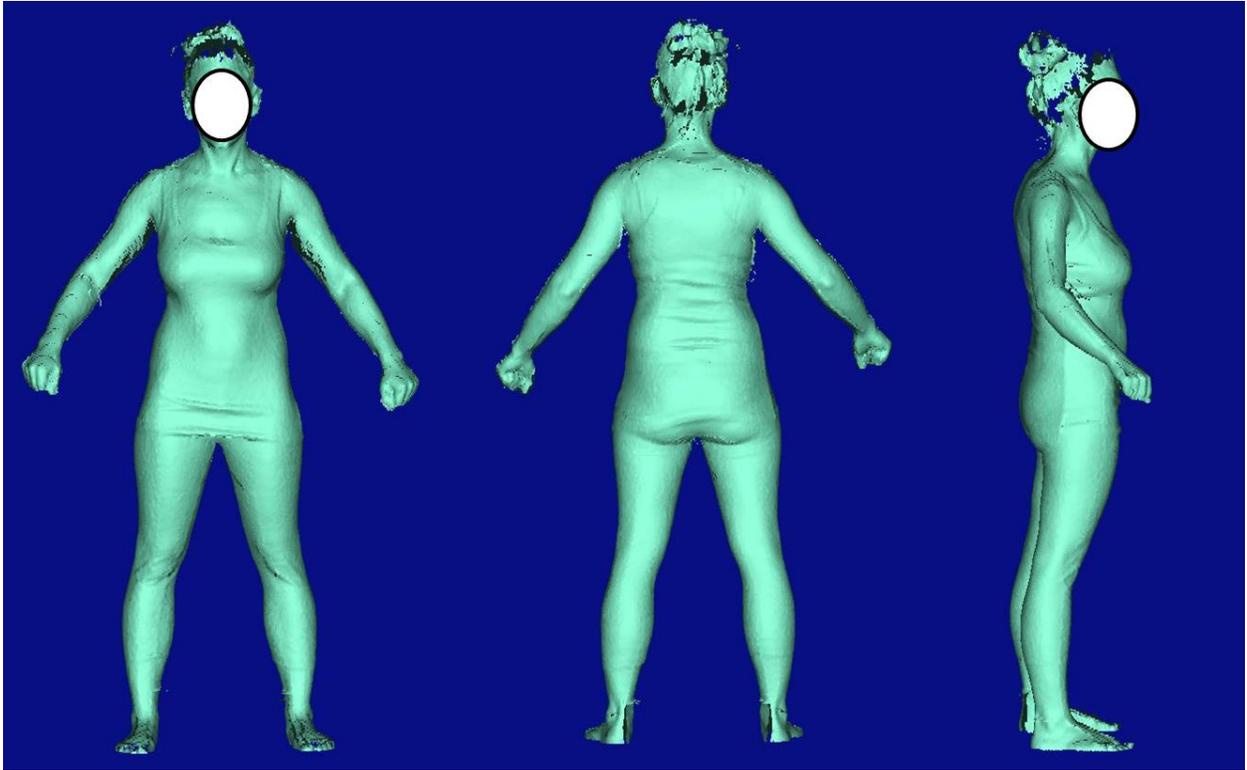


Figure 55. 3D body scan (unprocessed, Human Solution).

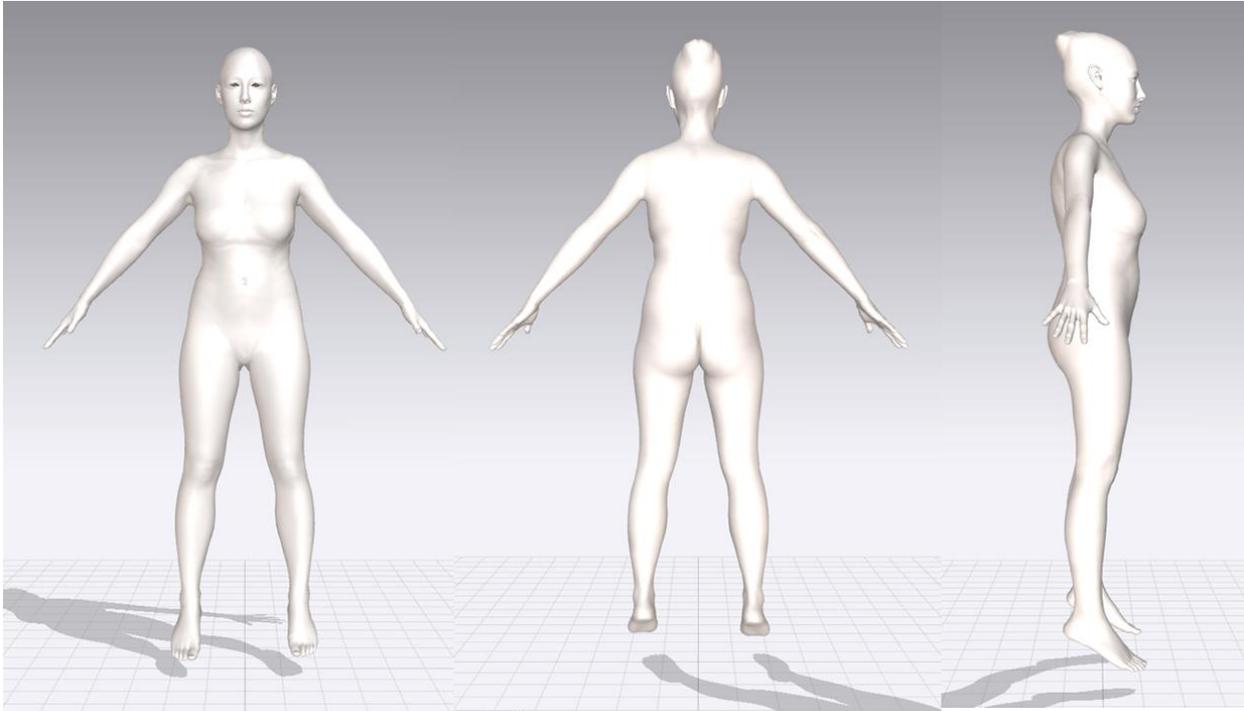


Figure 56. 3D avatar.

After the first 3D body scan in minimal clothing was obtained, a rack of neutral-colored cotton classic-style pants (Figures 57 and 58) and shirts (Figures 59–62) were provided in a range of sizes. However, no size information such as labels were available to participants. These garments were named and labeled with a color for the fit trials instead of reflecting a commonly seen numerical or letter method. This choice was made to avoid the situation in which participants are so bonded with “their size” that their choices of best-fitted items and their experience of fitting could have been influenced or even biased by their previous experiences with fitting and size selection.

Garments for fit evaluation. A set of seven pairs of pants (Figure 57) made of 95% cotton blended with 5% polyester and a set of seven button-down (85% cotton, 15% polyester) short-sleeved shirts (Figure 59) were used for the fitting test in China. They were sourced in mainland China. In order to expand the size range to fit the American women, three additional larger pairs of pants using the same fabric were made by grading up from the existing sizes. In addition, it was necessary to provide a new set

of shirts of a similar style to fit the different upper body proportions of the American women (Figure 61). This set of seven shirts were purchased in the United States, and three additional larger shirts were made from the same fabric (61% cotton, 34% polyester, 5% spandex) by grading up from the existing shirts. Therefore, in total, seven shirts and seven pairs of pants were used for the Chinese group; ten pairs of pants and a different set of ten shirts were used for the American group.



Figure 57. Real pants.

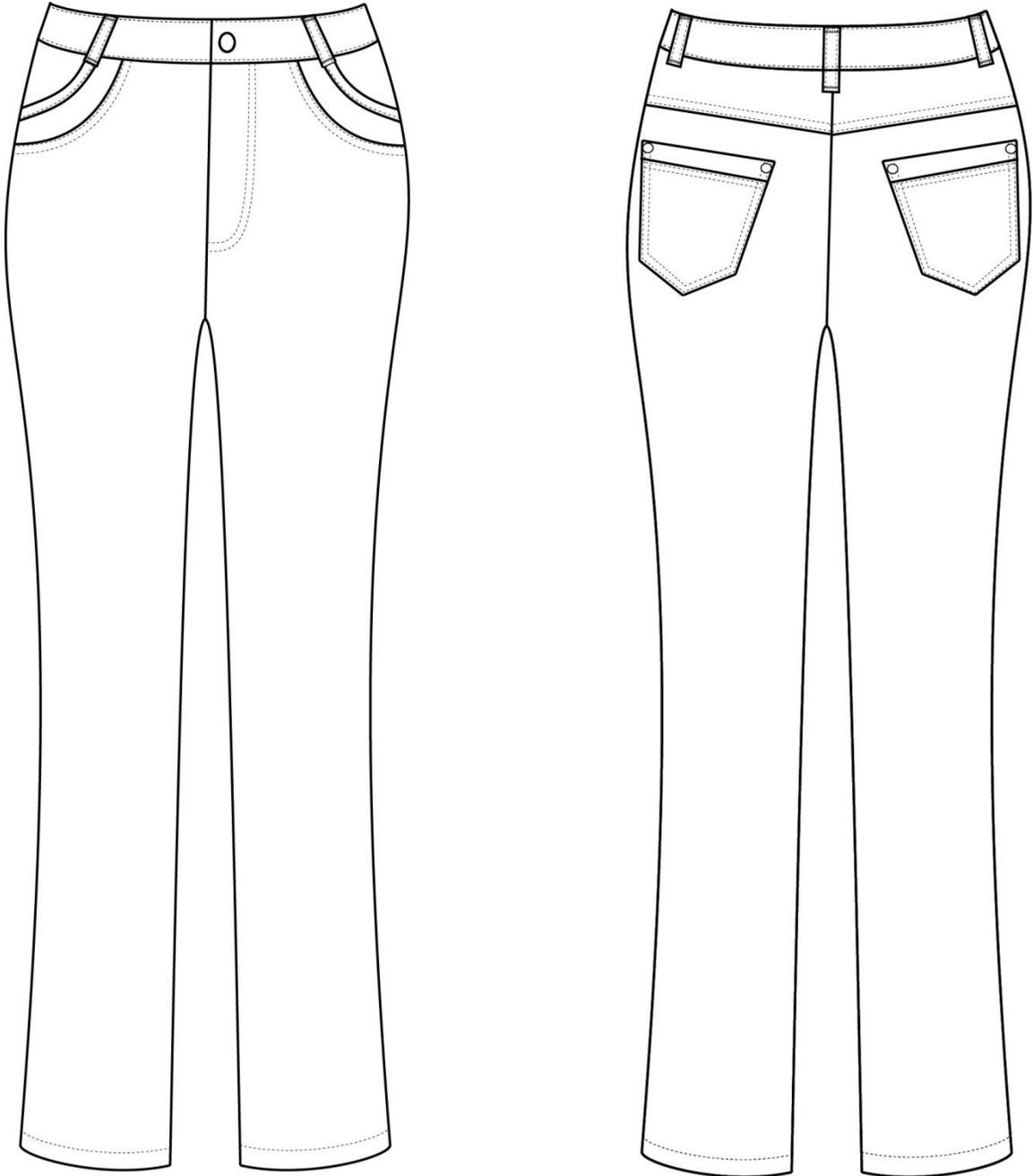


Figure 58. Pants flats.



Figure 59. Real shirt (Chinese).

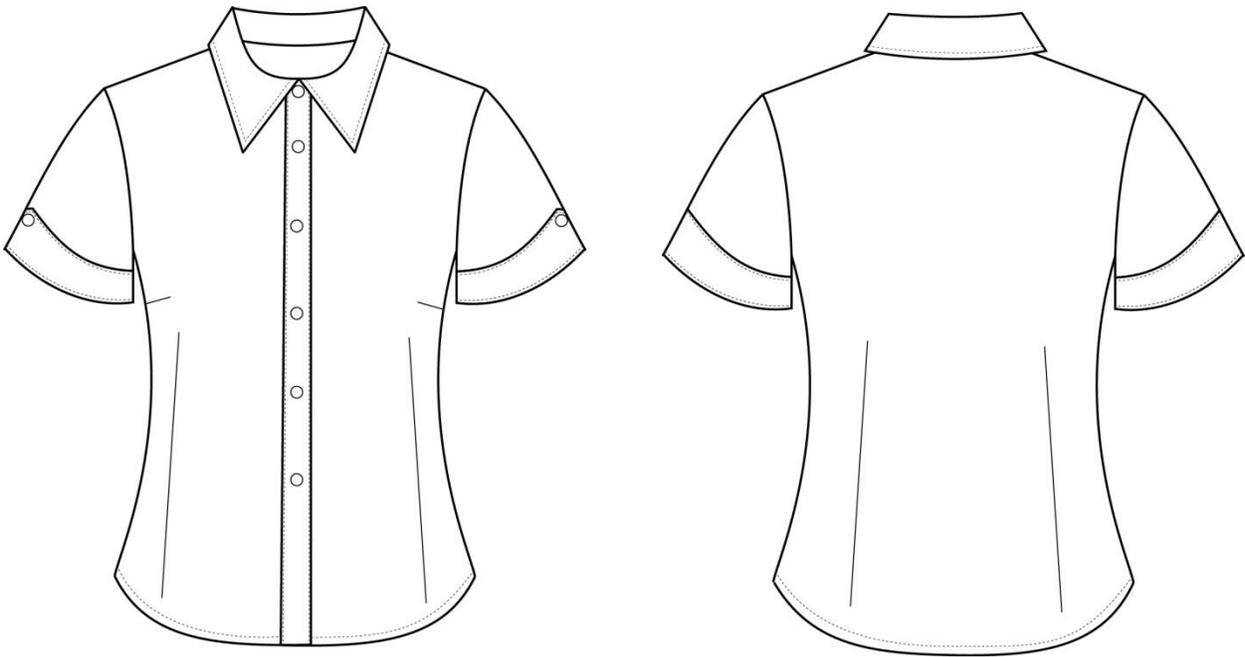


Figure 60. Shirt flats (Chinese).



Figure 61. Real shirt (American).

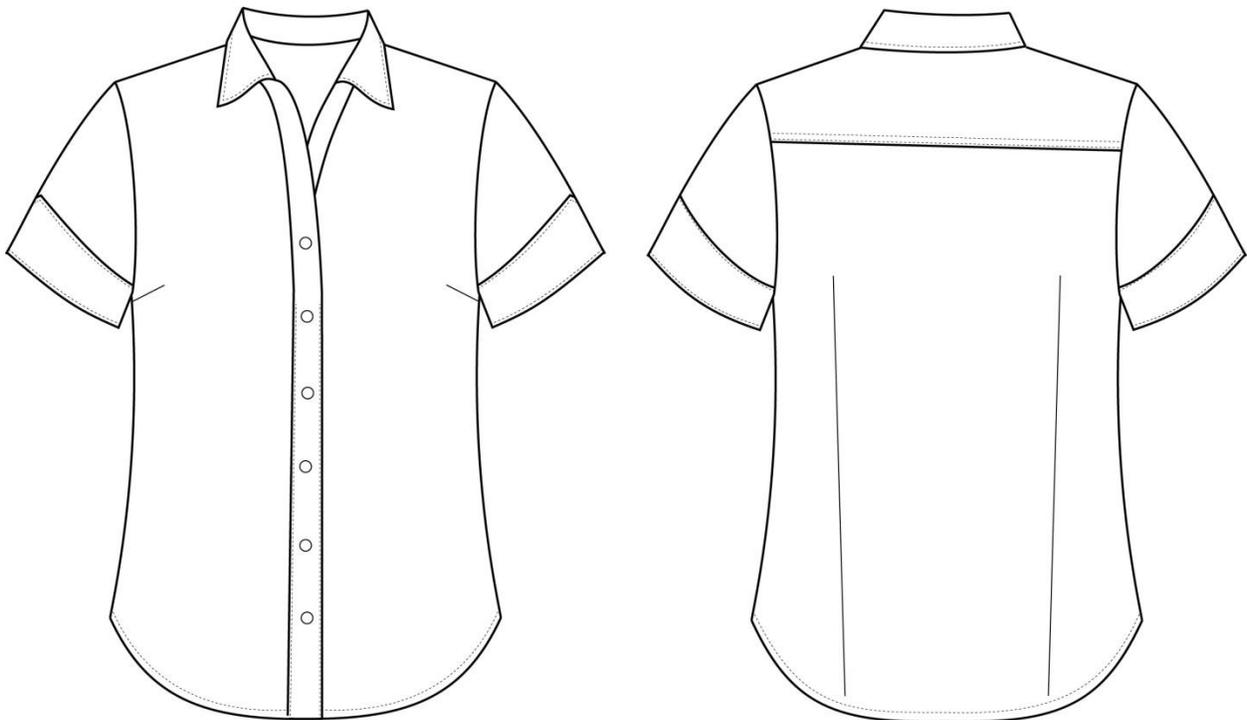


Figure 62. Shirt flats (American).

The garment styles selected for the experiment were classic styles that are worn by many women in both cultures. During the simulated fitting session a researcher acted as a shopping assistant in a retail

store and helped participants find items to start with based on the key body measurements extracted from their 3D body scans in minimal clothing. Then the participant evaluated the fit of each item she put on independently to find the best-fitting items. They had to negotiate with themselves about clothing fit if they could not find an item with a completely satisfactory fit. During the simulated fitting process, they were instructed to speak out whatever thoughts came to their mind as they were trying different items. In addition, if a participant did not spontaneously share her thoughts on the fit of the pants or shirt she was trying, they were prompted with questions. Next, they were instructed to make final “best-fitted items” Choices. If they were not completely satisfied with the fit of the items they chose, the researcher, who had fitting expertise, would make some minor alterations by pinning the garment as instructed by the participant. As soon as a participant was satisfied with the fit of the pants and shirt they chose, they were asked to elaborate on why. Finally, they were scanned again in the chosen “best-fitted” items. Participants were then told they would be contacted for the virtual fit stage of the study.

The next step (Step 2) was the preparation of files for 3D virtual fitting. First, a personalized 3D virtual avatar was created for each participant based on her 3D body scan in minimal clothing. The 3D scans were sent to BodyLab, a company that converts 3D body scans into 3D virtual avatars. These avatars were smoothed and patched and given standard hand and foot shapes. Second, 3D virtual pants and shirts were developed based on the digitized 2D patterns of the pants and shirts used in the simulated fitting room experiment. The researcher disassembled each purchased shirt and pants and then digitized the pieces into OptiTex to make a set of digital patterns. After nesting and correcting those digitized patterns, the researcher exported the patterns into CLO3D, a 3D virtual simulation software, to construct 3D shirts (Figure 63) and 3D pants (Figure 64). This step would guarantee that each 3D garment simulated the fit of its real garment counterpart as closely as possible.

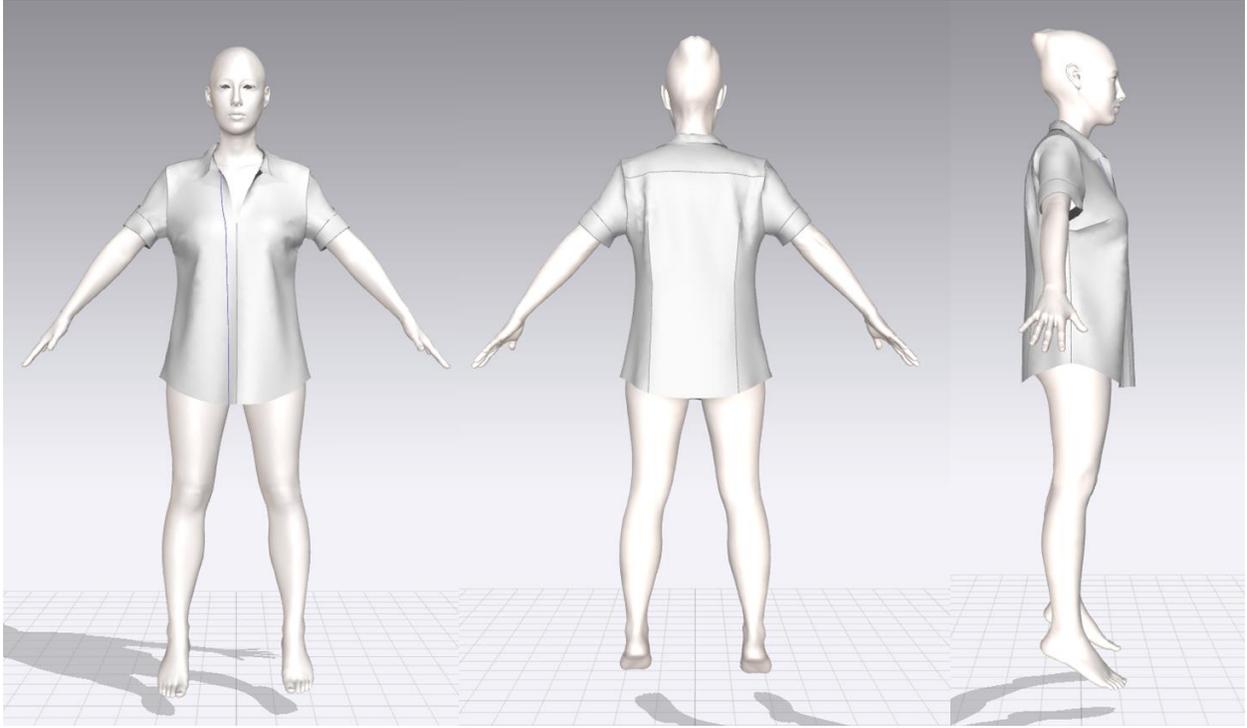


Figure 63. 3D shirt simulation.

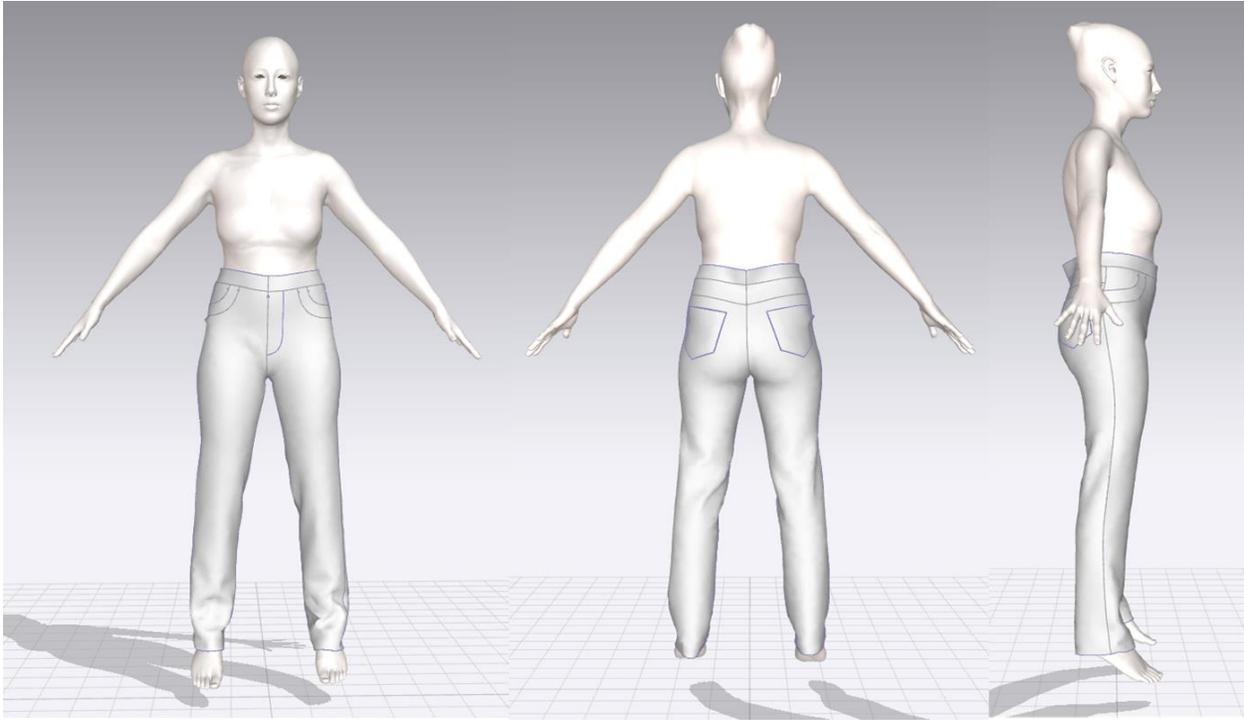


Figure 64. 3D pants simulation.

This software was chosen for three main reasons. First, in CLO3D, the 3D design and 2D patterns are connected; therefore, changes made in one can be observed in the other in just a few seconds. This is a critical feature for this study because the researcher could do some minor alterations on the 2D patterns according to the participants' comments about fit. This feature allows the user to see the differences in fit in the virtual environment immediately. Second, it has good performance with virtual draping. Last, CLO3D is easy to manipulate and user-friendly. It also provides multiple tools for assisting fit evaluation. For instance, fit map (Figure 68) depicts the tightness of the garment through colors. Strain map (Figure 69) shows how the garment is affected by outer forces (pressure) in percentages. Stress map (Figure 70) displays the strength of the friction applied to the garment through color codes and numerical values according to the fabric's unit area. However, it is also worth noting that CLO3D's 2D pattern drafting function is not as strong as that of Optitex; therefore, both applications were used in this study to achieve maximum performance.

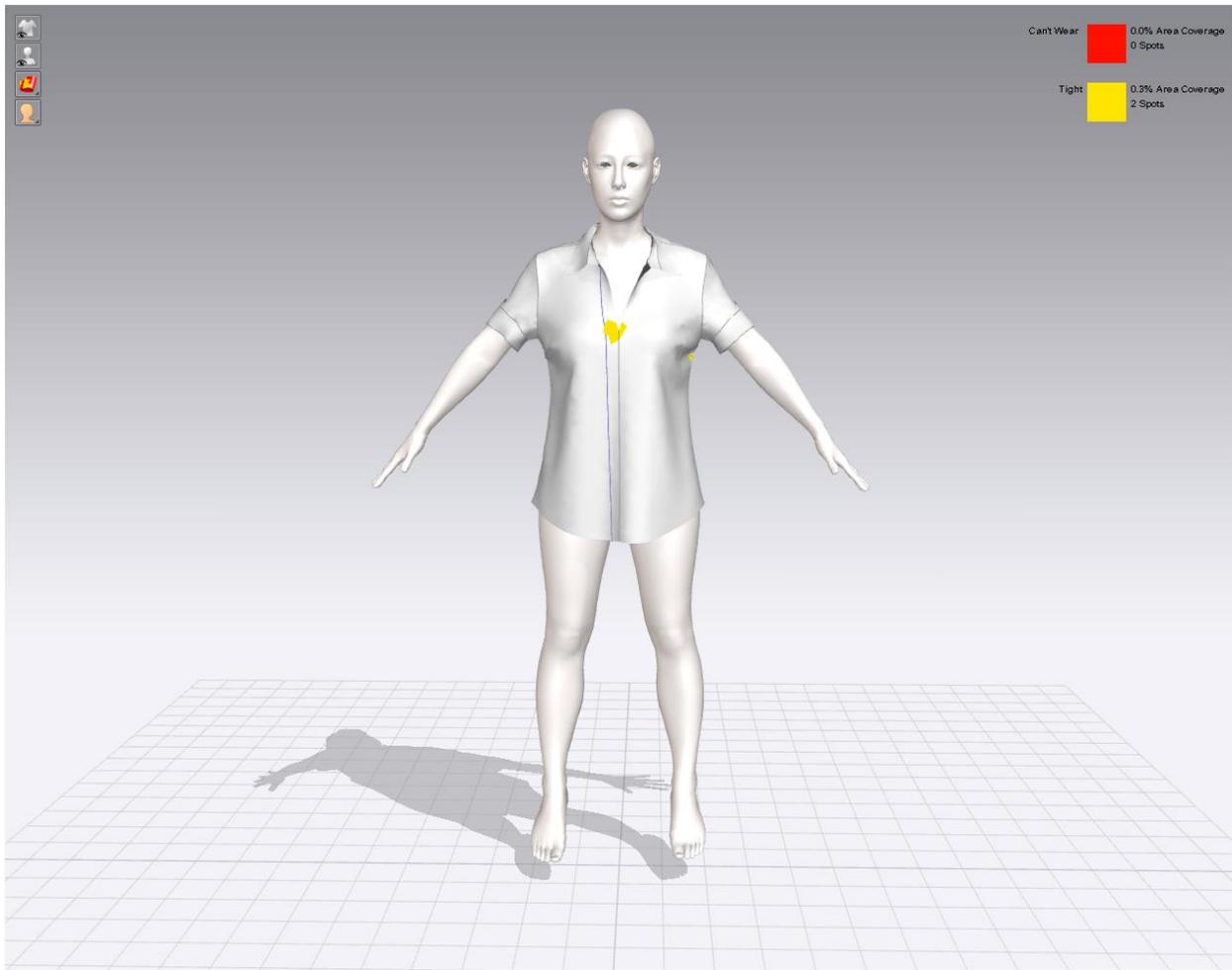


Figure 65. Fit map.

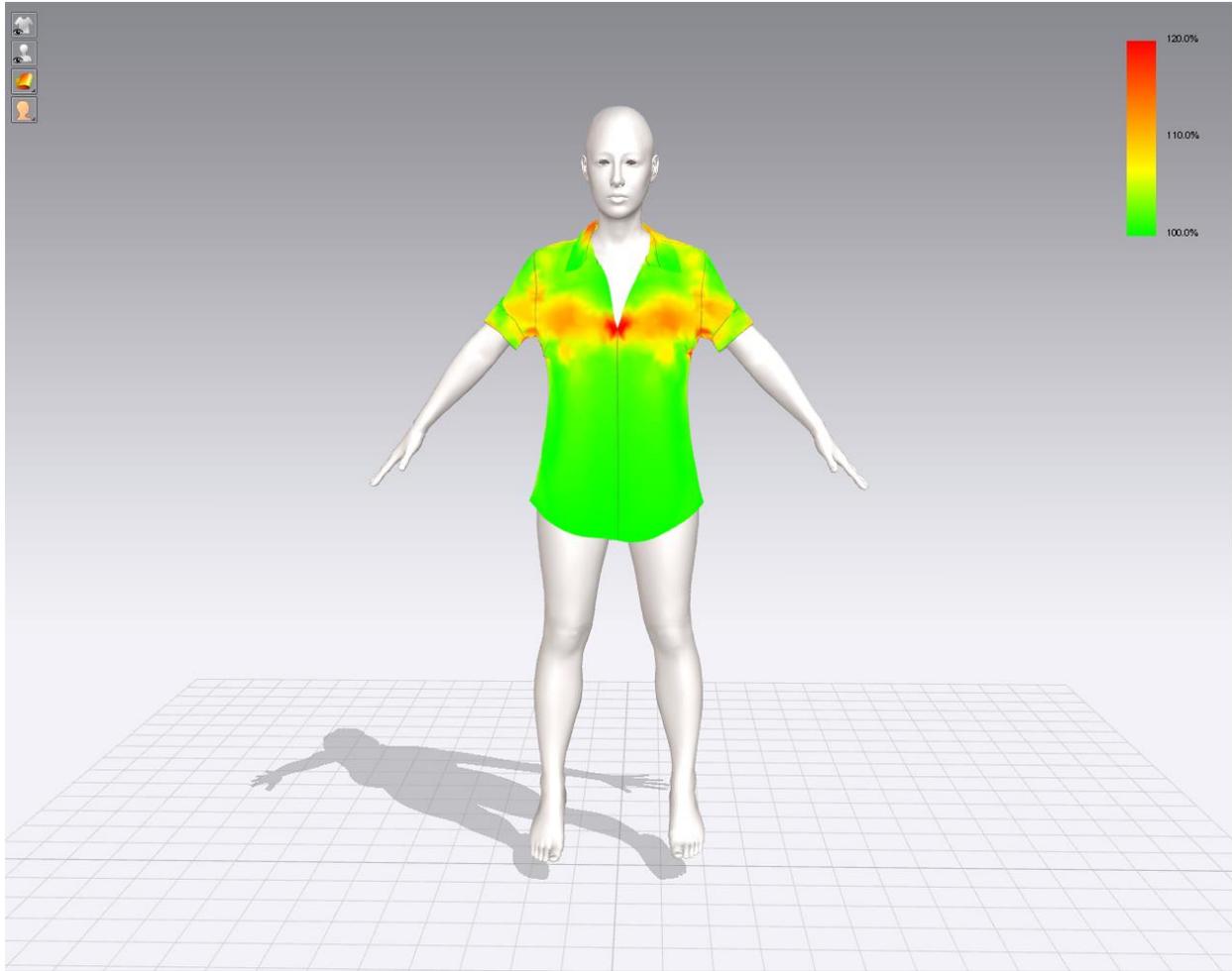


Figure 66. Strain map.

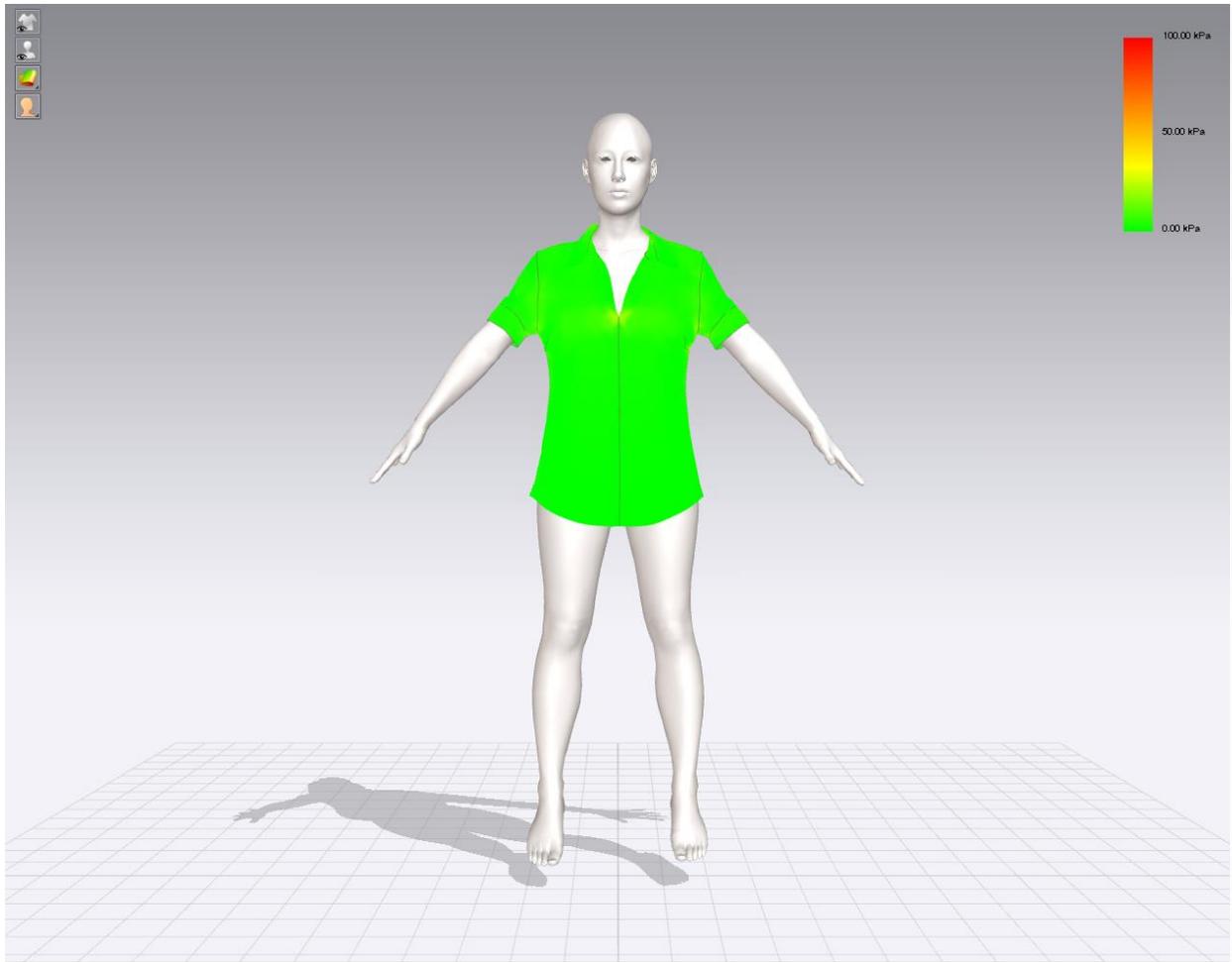


Figure 67. Stress map.

Once the virtual fitting room was prepared, participants were invited to come back and try a 3D virtual fitting, where the 3D-simulated shirts and pants were virtually sewn around customized avatars. The researcher assisted with the technical operation of the 3D virtual try-on software throughout the virtual fitting process. First, participants were asked about their previous experience and knowledge of 3D virtual fitting, as well as their expectations of 3D virtual fitting (Step 4). Then they were asked to observe and comment on their own personal 3D avatar and start the trial and error process (Step 5). The researcher helped participants find virtual items to start with based on their body dimensions.

Throughout the trial and error process, every participant had to negotiate clothing fit with themselves to figure out the “best-fitted” virtual shirt and pants. They were encouraged to take advantage

of virtual tools provided by the 3D virtual try-on software and to try as many items as possible until they found an item with satisfactory fit. After a participant made her final virtual fit decision, they interacted with the researcher to discuss the reasons for their choices. If they wished for minor modifications of the chosen items, the researcher would modify the digitized 2D patterns accordingly to generate customized 3D items for them.

As with the simulated fitting room part of this study, no structured questions were asked and no fit evaluation instruments were provided to participants. Instead, they were asked to interact with the software however they liked and to perform the activities they usually performed in a real fitting room. At the same time, they were asked to report whatever they were thinking and whatever fit issues they noticed throughout the virtual fitting process.

5.3.3 Data Collection and Analysis

Institutional Review Board approval was received before data collection procedures were initiated. Technical help was available throughout the whole study. There was no time limit to evaluating fit at any stage.

Both qualitative and quantitative data were collected. First, qualitative data, including digital recordings and observation records obtained in the simulated fitting room experiment, were transcribed and then analyzed using content analysis techniques. Participants' monologues and responses to prompted questions and their interactions with the researcher were all audio-recorded with their permission. At the same time, the researcher observed and recorded participants' body movements, gestures, postures, facial expressions, eye movements, and time spent assessing fit. All of this information together provided valuable information about participants' fit choices and about the relationships among their physical body, their mentally perceived body, and clothing as an appearance management strategy.

The primary researcher first read each participant's entire transcript several times to understand the scope of the text and then constructed a coding frame for each issue (real fitting experience; experience of fit education; experience of virtual fitting). Next, the researcher read the transcripts to

identify emerging categories and repeatedly occurring categories using the qualitative research software application NVivo. Finally, the underlying meanings of repeatedly occurring categories were identified and formed into themes. Theme analysis techniques were used to establish the relationships among themes.

In order to establish interrater reliability, this analysis process was cross-checked with other researchers with expertise in qualitative research. For the Chinese group, interviews were conducted in Chinese and then transcribed in Chinese. The data analysis was completed based on the Chinese transcripts. The last step was to report the findings in English. The primary researcher, who is bilingual, coded both the Chinese and English transcripts. Another bilingual researcher coded only the Chinese part, and an English native speaker coded only the English part. All three coders conducted data analysis independently, and then compared the results. In cases of discrepancies, the coders discussed until agreement was achieved.

Second, for quantitative data collection, each participant's final "best fitted" real and 3D virtual garment choices were recorded and compared. An analysis of each participant's final choices provided valuable information about how female consumers who had no professional knowledge about clothing fit and 3D simulation technology might react to the promising but not fully studied 3D virtual try-on technology. In addition, the size and measurement information of the real and virtual clothing, as well as the body dimensions of each participant, were logged into Excel spreadsheets and then imported into SPSS statistical software for further analysis. The quantitative data analysis included two parts: (a) within-group differences in each group of participants and (b) between-group differences between the two study groups of participants (a comparison of Chinese and American women). Participants' fit evaluation experiences with the real garments and the 3D virtual garments were analyzed using paired t-tests, and the comparison ratings between the real and virtual garments' fit were analyzed using descriptive statistics.

5.3.4 Justifications of the Study Design

The survey- and interview-based wardrobe study (which asked participants' opinions directly) and the simulated fitting room experiment (which engaged participants in actual interactions with clothing) together provided both verbal and behavioral information. That is, the pool of information was not just about what participants said but also about what they did. Therefore, this study provides an understanding of how a middle-class mature woman examines her physical body and performs a fit evaluation as a part of appearance management in two different cultures. Additional information about women's body image and their concerns with ready-to-wear clothing were also investigated in this study.

5.4 Results

Table 6
Coding Framework of Comparing 3D Virtual Fitting and Real Fitting

Theme	Sub-theme
3D virtual try-on experience	<ul style="list-style-type: none"> • General comments on the 3D simulation system • Experience of viewing 3D avatar • Fit evaluation in 3D virtual environment
Concerns on RTW	<ul style="list-style-type: none"> • Availability in current RTW market • Sizing system
Fitting experience	<ul style="list-style-type: none"> • Fit issues • Definition of fit • Fit evaluation procedure • Personal preference • Information sources
Experience of 3D body scan	<ul style="list-style-type: none"> • First impression • General impression
Comparison of virtual and real garment fitting	<ul style="list-style-type: none"> • Experience of virtual fitting • Preference • Reasons/comments

5.4.1 Demographics

As shown in Table 5, the average age of the Chinese women was three years younger than that of the American women. A wider variation of age was also observed within the Chinese group. The average BMI among the Chinese women was much smaller and varied much less.

Table 7
Age and BMI

Item	Group	N	Minimum	Maximum	Mean	Std. Deviation
Age	American	22	36.00	55.00	47.5909	5.78717
	Chinese	20	35.00	54.00	44.0000	7.05617
BMI	American	22	18.65	45.61	28.0591	7.00179
	Chinese	20	17.15	25.10	21.7720	2.34290

According to U.S. standards, a BMI of 18.5 to 25 indicates optimal weight, a BMI lower than 18.5 suggests the person is underweight, above 25 indicates the person is overweight, and a number above 30 suggests the person is obese. Furthermore, BMI between 30 and 35 is classified as class 1 obesity (moderately obese). BMI between 35 and 40 is classified as class Class 2 obesity (severely obese). BMI above 40 is classified as class 3 obesity (very severely obese). The following two charts show the distribution of BMI categories in these two groups of women.

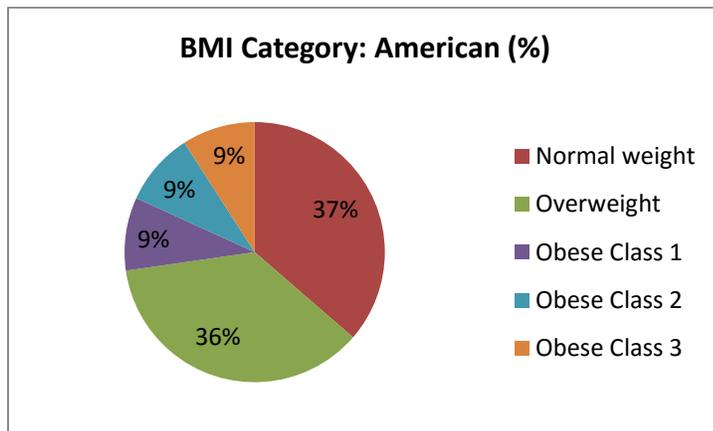


Figure 68. BMI category (Americans).

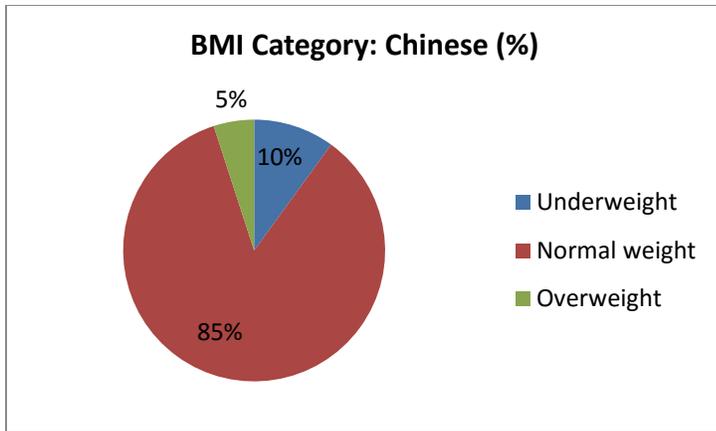


Figure 69. BMI category (Chinese).

Even though there were no constraints on body shape, height, weight, or other related characteristics, most of the participants were within the standard regular women's size range. However, body shapes and body sizes showed some variation within that range, especially within the American group.

5.4.2 Actual Fitting Experience

In the simulated fitting room study, participants were asked to mimic what they usually do in a fitting room in a brick-and-mortar store. A common four-step shirt fit evaluation practice was observed for both groups. First, participants would put on a shirt. If they noticed any difficulty in donning and doffing, they would directly ask the researcher, who was acting the part of a sales assistant, for a different size. After putting on a shirt, most participants then stood still in front of a mirror with their arms slightly open or with their hands rested at their hips. Usually, they would then notice any issue with shirt length and ease at key areas such as bust, waist, and abdomen. Some women also noted fit issues at the shoulder and sleeve. Next, they turned their body around but twisted their upper body to see the rear fit in the mirror. About half crossed their arms in the front or stretched their arms forward to test if there was enough room across the back of the shirt for body movement. The most commonly reported areas of poor fit were cross back and back waist. They felt it was generally tight at cross back but too loose at back

waist. The fourth step was turning to the side. They checked the drape of fabric at bust, waist, abdomen, and buttocks. They usually stood straight and kept their stomach muscles in for a few seconds before relaxing them to see the difference in fit. This was also often the moment they complained about their protruding abdomen area and flat buttocks. Many American women complained about their large breast size, but not the Chinese group. In contrast, many Chinese women mentioned that they wish their breast size could be larger. Even though many women chose to turn front and back several times to see the fit of the shirts they were wearing, their body movements were limited and the checking procedures were random.. Some women lifted their arms to feel the fit of sleeves. Only one Chinese woman bent her body to see if the shirt was long enough.

Subsequently participants tried multiple pairs of pants to find the “best-fitted” one. Generally, they followed the same procedure: front, back, and side views. Very few Americans but about half of the Chinese women used different postures such as sitting to evaluate clothing fit in different postures. They usually talked about issues with length and waistband placement. Most of the American and Chinese women found the length of the pants to be longer than they expected. The Chinese women preferred a normal waist level rather than a low waist, which was a feature of the pants style they were trying. In contrast, more variations in preferred waist placement were reported by the American group. Some wanted a high or normal waist, but some preferred it to be even lower than the style of the test garments. Both of the groups had concerns about fit at the crotch area. They could instantly observe wrinkles at the front of the crotch and reported their physical discomfort to the researcher. However, they were “not sure what happened there.” This was the moment when they started to talk about the difficulty of finding a pair of “well-fitted” pants. Many, especially the Americans, had to compromise—they had to balance the fit in the abdomen area and around the thighs. Usually, if it was fitted at the abdomen area, it was loose at the thighs. In addition, they had to balance the fit at the hip and around the waist. In many cases, if it was fitted at the hip, it was loose at the waist. It was interesting that many American women chose to compromise the fit at the thighs for the fit at the abdomen area and compromise the fit at the waist for the

fit at the hip. In other words, they tended to make their fit choice based on the tight areas— they chose comfort first. In contrast, relatively more Chinese women chose to compromise comfort for “good look.” They also mentioned that their choices were heavily influenced by the style of pants and the way they styled them. For instance, a Chinese woman stated:

It depends. Depends on the length of the top. If I am wearing a long one, I would choose a more fitted one [the one fits at thighs, but tight at abdomen area] because I can hide my abdomen area. Similarly, it depends on whether I am going to tuck the top. . . . It also depends on my physical activity level and how long I am going to walk, stand, or sit. If I am going to sit for a long time, I would choose the loosely fitted one.

Moreover, many Chinese women explained that, when shopping, they did not make compromises in terms of clothing fit. If they could not find a completely satisfactory fit, they normally walked away and kept searching. If they could find a completely satisfying item in one brand, especially a fitted pair of pants, they would remember that brand and check for other products by that brand regularly. Sometimes they even became loyal to that brand. More Americans were willing to settle for “relatively good fit.” They argued that “I can wear a belt” or “I can trim it [hemming].” One potential reason for this is price. The relative price of clothing (compared to monthly income), especially of branded items, is relatively high for the Chinese women but more affordable for the American women. For instance, an American woman mentioned that she bought four wrap skirts, even though one “was loose at waist,” and another one “was too long” because “it was very cheap, just a few bucks.”

Throughout the whole fitting process, almost all of the 42 participants talked about some of their difficulties in finding ready-to-wear clothing that fitted their body shape. They complained more about pants than shirts. However, throughout the whole process, nobody reported any issues about grainline, side seam placement, hem level, and placement of darts and yokes, even though there were many obvious issues from the researcher’s point of view. In general, participants’ fit concerns were in the midtorso, hip, and crotch areas. The fit issues the participants complained about most are summarized in Table 6.

Table 8
Common Fit Issues

	Shirts	Pants
American	Shirt length; tight at cross back, bust, and, abdomen; loose at back waist.	Wrinkles at crotch and back of thighs; length; gap at back waist; tight at hip; waistband fit; tight in abdomen area.
Chinese	Sleeve length; extra fabric at front abdomen area and waist; uncomfortable at armhole.	Length; wrinkles at crotch; waistband fit.

Fitting experiences and concerns about RTW. Participants were invited to share their fitting experiences and their general concerns about products available in the current ready-to-wear (RTW) market. For the American women, one of the most frequently mentioned issues was the very confusing sizing system and their difficulty in finding the right fit for their body shape. Fewer fitting issues were reported by the Chinese group, for whom the most frequently mentioned issue was the fit of the abdomen area and upper arms. In addition, another concern they had about available RTW products was the balance between quality and price.

Interestingly, about a third of the American participants reported that it was common for them to buy something and subsequently to become dissatisfied with the fit very quickly. They attributed this mostly to not being careful or considering the garment thoroughly when they were evaluating clothing fit in the store or to changes of fit after washing. Other reported reasons were being impulsive or irrational, good bargains, and right timing. No similar case was reported among the Chinese women.

Fit issues resulting from body shape variations. A common issue encountered by many American women was the gap between the waistband and her waist in the back. In other words, this

difficulty was a result of the proportion of their waist and hip. “It is my eternal problem. Pants never fit me there,” said one.

Another three issues reported several times by American women were length, fit in the crotch area, and fit at the buttocks. A tall American woman mentioned that:

That's why I like capris, because it [the length of pants] doesn't matter. I usually have to buy them in talls, and they end up being a little too long, but I can't buy regular length because they're too short.

Many pear-shaped women reported that they had a smaller to average upper body but a very large lower body. Therefore, they had a problem finding the right fit in bottoms, and they were not able to find well-fitted one-piece dresses. It was easier for them to find well-fitted tops, though some of them had problems with the fit at the bust.

So I have a hard time finding pants. And then tops, because I'm busty, then I have to get an extra large, but a lot of times they make those for people with really large arms. So then the top just ends up making me look very heavy because there the whole thing is sized really large.

The Chinese women had comparatively more problems with their waist: “Yeah in some ways, but, yeah. Yeah, I just still don't have a waist, much of a waist. I mean, I have a little waist but you would think I just don't.” Furthermore, women in both groups appreciated design details, such as design lines (yoke) and the design of the back pockets on the pants. Those design features and their placement could change women's perception of fit. This was observed in both groups; an American woman observed:

But I think the pocket in the back there helps. . . . I feel it does help make it look thinner or like that in the butt area. . . . Even though the leg might be the exact same line, I feel like the pocket helps visually, but that's me.

5.4.3 3D Virtual Try-On Experience

A brief description of the 3D virtual fitting system was given to every participant at the beginning of each 3D simulation session. First, they were shown their 3D avatar. Many instantly commented on their virtual body and shared their first impressions of the technology. Then they evaluated the fit of several pieces of virtual clothing and had the opportunity to interact with 3D virtual tools. They chose their perceived best-fitted visual shirt and pants. Third, some expressed their expectations of the 3D

virtual try-on system and gave suggestions. Throughout the virtual fitting session, they shared their thoughts on virtual fit evaluation and talked about their general impressions of the 3D virtual simulation system. They elaborated on their fit choices, explaining such details as how they negotiated with themselves and made compromises in cases where they could not find a completely satisfactory fit.

General comments on the 3D simulation system. Participants' first and general impressions of the 3D simulation system were positive. They described the tool as "fun" and "neat." They were amazed by the 3D virtual tools provided by the 3D virtual try-on system, especially when the researcher was manipulating the virtual garment at their command. They also found the technology interesting and promising because they were able to view the body from any angle they wanted and to zoom in to see every detail. An American woman commented, "Wow. It's just amazing you're able to manipulate it up and down and around, from the view at the top, that's really interesting. . . . Yeah, it's great. It's actually really good to see all these angles." In addition, they recognized that they could view their backs and sides without distortion. They also shared their thoughts on potential future applications of the technology.

Experience of viewing 3D avatar. Many women in both groups jumped right into commenting on their 3D avatars when they were shown them. The midsection and buttock areas received the most attention, followed by arms, thighs, and bust. However, there was a mix of reactions to the 3D avatars. When asked whether they could recognize their body as a 3D avatar, both the Chinese and American women commented that their 3D avatars represented how they saw themselves in the mirror, but they also expressed different levels of unfamiliarity. More than 95% could recognize their body in profile as well as through some of their unique body proportions and features. However, some also reported that looking at their body in 3D format also triggered their awareness of their physical female bodies. Some referred to their 3D avatar, on first look, as frightening, but others were happy to see their avatars. In general, more American women than Chinese women were happy about their 3D avatars.

In addition, it was found that women's first impression of their 3D body avatars was not related to her BMI or body dissatisfaction level. The majority of Chinese women gave negative comments on their

3D avatars regardless of their baseline body satisfaction levels, as measured by a 5-point Likert scale in the initial survey. However, varied body satisfaction levels and varied responses to 3D avatar were found within the American group. Comparing to their Chinese counterpart, a discrepancy between body satisfaction level and satisfaction with one's 3D avatar was more frequently observed in the American group. Particularly, a higher percentage of Chinese women were satisfied with their physical bodies compared to their American counterparts. The majority of Chinese participants reported low body satisfaction and believed their 3D avatars looked worse than they thought, but no such dominance was found in the American group. In contrast, comparing to the Chinese group, higher percentage of American participants reported that their 3D avatars were better looking and had better body proportions than they expected to see. In many cases, they further elaborated on their dissatisfaction with certain areas of their physical body, such as the upper arms and buttocks, even after they gave positive comments on their 3D avatars.

In both groups, some participants also commented that examining their physical bodies in 3D was is different from looking at the body really quickly in just one small- to medium-sized mirror inside their houses, but similar to looking at their bodies in a dressing room with three mirrors. In 3D visual environment, they can look at their bodies from multiple angles and examine it closely. "It's kind of like going into a dressing room when they have the three mirrors, so you can see," said one participant.

Many women in both groups suggested that certain areas, especially in the back, felt unfamiliar. There was a mixed response to this kind of "unfamiliarity." Many made very specific and negative comments on their body—they blamed their weight and not-that-perfect body shape and proportion, especially the midtorso. Some expressed their desire to make some improvement, but some indicated that they were good with their current body in consideration of their age and childbirth experience. Some thought their 3D avatars were shorter, fatter, wider, and more disproportionate than they thought their bodies were. Here are some typical comments made by women from both groups:

- “And then, yeah, I like the side view in the back. It looks good. It does stick out a little right there [finger pointed to the buttock area], which I think might highlight how short I am, actually now that I think about it.”
- “Yeah, it just looks like a good intro to fat all over [LAUGH] that should come off. It just shows all the lumps and extra fat.”
- “There’s more in my upper belly than I thought it was here, in the front. I thought I had less. But that’s OK. I mean it’s good to know just for me.”
- “That’s what I normally see, but on the side in the mirror I look thinner than I do here.”
- “It’s reinforcing how much weight that I put on. You start to see that weight. It’s very unattractive and motivates me more to get back to my exercise routine and to my diet.”

Some women in both groups believed the 3D avatars looked better than what they thought their bodies looked like. A smaller percentage of Chinese women (10%) than of the American women (41.1%) made these types of positive comments on their 3D avatars. In addition, the Chinese women tended to comment on overall fitness, while the American women commented on both overall fitness and shape in different areas that inspired their positive feelings. An American participant commented, “I expect it to look bigger, and it doesn’t look as big as I imagined it would, like I just thought I would just be gross and disgusted looking at myself,” while another laughed when she said, “That butt looks better than what I think my butt looks like. I mean it’s my butt, I can really see it . . . yet, it looks better than I thought. It’s still big, but it’s better,” and a third observed, “Actually I would have thought my stomach protruded more on myself than it does in the picture.”

Participants also noticed the difference between the body they saw in a mirror and the perceived body in their minds.

I do look bigger there [in head, perceived body] than I think I do when I’m looking in the mirror. But in the mirror, I only see one component and I can move my body the way I want it to make it look skinnier too.

Interestingly, even though some women found their bodies looked better as 3D avatars than they expected, they still stuck to their original self-perceptions and believed their “actual body” was inherently “bad”: “Yeah, the midsection I am at is much worse. [LAUGH] I don’t . . . It [the body in my mind] is worse, but thank you for making me feel better.” It is very interesting that women usually found their 3D avatars looked smaller than their mental self-perceptions but larger than the bodies they saw in the mirror. One American woman’s response explains this finding well:

I do look bigger there [in head, perceived body] than I think I do when I’m looking in the mirror. But in the mirror, I only see one component, and I can move my body the way I want it to make it look skinnier too. I can just do that. So I think I look smaller in mirrors than I do in this.

When asked about their feelings toward the body with minimum clothing as well as the clothed body in the 3D virtual environment, an American woman described her complicated views toward 3D virtual images, comparing it to her “fixated” feeling toward herself in a mirror.

My feeling is that this [clothed body] is not as bad as the way I think it looks. . . . Yeah, like imagining I were standing in front of the mirror, I would say this looks OK. It doesn’t look awful. But if I were actually standing in front of the mirror, I would think that was awful.

Some women, especially the American women, observed different proportions.

My impression, a little bit, I feel like my chest is like really big in there versus what I see and when I’m looking. I mean, I know that I’m not flat chested or anything but I don’t know, compared to the rest of my body it just looks larger than when I look at myself when I’m dressing, you know what I mean?

Women from both groups complained that their 3D avatars lost some detail too. For instance, they mentioned that there was no dimpling on their 3D avatar, and it showed a smoother surface than they expected. They also compared the 3D virtually simulated avatars with 3D body scans they had seen in the simulated fitting room study. They commented that they liked to see those little bumps they saw in their raw body scans. However, none mentioned concerns about the skin color or the textures skin on their 3D avatars.

Some American participants raised the question of whether their level of body satisfaction at the time they were presented with their 3D virtual avatar had an influence on how they reacted to it. No such reaction or comment came up in the Chinese group.

Yeah, I wish I could see myself (as a 3D avatar) as it was in last summer when I felt like I was happy with my degree of fitness and my weight. And I'm not this year, so I'm curious what it would [have] looked like if I had seen this last summer; would I say yep, that looks pretty good, because that's how I felt last summer.

When participants were asked what triggered their negative feelings toward their bodies, the most frequently cited reasons were being out of shape and having no shape. Protruding stomach and abdomen areas, flat buttocks, and saggy arms were the areas most commonly disliked by the American women. In contrast, the Chinese women complained more about having a rounded abdomen area and thick waist, a flat chest, and big thighs.

Aging. Interestingly, both the American and Chinese participants often discussed their age as part of their discussions about their bodies. Their aging experience included physical body and mental changes with pregnancy and their lifestyle changes that came with taking care of kids. First, both American and Chinese women discussed those changes they had gone through when they were observing their 3D body scans and avatars. In terms of physical body changes during the process of aging, women in both groups reported the changes they had observed in their waist and abdomen areas. However, the American women mentioned other parts of their bodies such as arms much more than the Chinese women did. They also mentioned issues other than body shape, size or weight, such as skin and hair. For instance, an American participant mentioned that "As women get older you can see the wrinkles start forming in there [fingers pointing to her face and neck] and then my back. I didn't realize it was starting to get that." On the other hand, in terms of mental changes, the majority claimed that they are more tolerant of their bodies as a mature woman than they were when they were younger. For instance, a participant mentioned that "My arms don't look too bad. . . . My legs don't look too bad for a 41-year-old". In addition, although some admitted that they missed their 20-year-old bodies, they acknowledged that the aging process was not avoidable or reversible. Many said they were fine with their current body, even though it was less fit and toned than it was. In fact, they made an effort just for pursuing and maintaining the best condition their current body could achieve. For instance, an American woman said:

I've always, from the time I was very young, had a weight problem. I've never been a thin person. So I've always not really liked my body type, but the older I get I don't like it but I realize—that's who I am. [LAUGH] I still keep trying to diet and keep as slim as I can.

Fit evaluation in 3D virtual fitting room. Few American participants had any previous experience with 3D virtual try-on online. Some Chinese women had heard of virtual try-on, but none had actually experienced this technology.

In this study, participants were asked to comment on how they assessed both overall fit and fit in certain areas. Issues of garment length and waist fit were the easiest to identify and were often reported by the participants at the very first glance. In general, most fit issues in the shirts were at the cross back, shoulder, and armhole. There were also some concerns about the fit at the center front and side seam areas. The most frequently mentioned fit issues in the pants were at the buttocks and crotch.

For both the American and Chinese participants, numbers, sizes, and directions of wrinkles were a great indicator of clothing fit. They used wrinkles shown on the screen to assess clothing fit, especially in certain areas. They also decided whether there was enough room for body movement in certain areas by assessing how much extra fabric could be seen around the body.

Compromising on clothing fit in 3D virtual environment. Participants had to make compromises when they could not find a completely satisfactory fit. Their decisions depended mostly on their physical body shape and personal preferences. Usually, they compromised the look and fit of the back of the body for that of the front of the body, and participants were more willing to compromise length for horizontal circumference fit. They also tended to compromise the fit of sleeves for that of the bust and waist. However, in the case of choosing between waist and buttocks, most of the women chose to satisfy their needs in the waist area first. Here is a typical comment: "At least the back doesn't look like it's really baggy. That's a problem I have. Cuz once I get it to fit my waist, my rear is kinda flat, so they're baggy in the back." Another participant observed:

Well, the pants are usually . . . [if] they are made of curvy fit, so that's for people with very big hips and a big rear end which I don't have. Or like this modern fit, which has the low waist that I like. But they're way too long. I'm tall. So I don't know what is with that. Or like, people have

very wide thighs, so they're really wide [at thighs], which I don't like, cuz then it makes me just look really heavy.

In line with our previous findings, the American women were more likely to compromise overall fit for comfort than the Chinese women. For areas where they thought they were heavy, they tended to prefer a loose fit. Even though an American participant thought a shirt was baggy in general, she chose to compromise this for the sake of comfort and good fit in the abdomen area. However, the Chinese women facing a similar issue generally chose the more fitted garment even if it fit across the abdomen tightly. An American participant stated, "Yeah, I don't like them really tight, because I don't like to accentuate my belly," while a Chinese participant decided, "Hm, I would go for the smaller one, if I have no other choice. I just don't think it is a good idea [to go for the baggy one]."

Women also discussed how they would style a garment and match it with other items. The way they are going to wear their shirts and pants (e.g., tucked in or not) would influence their choice of fit. When discussing the proper length of shirts and pants, a Chinese woman said, "It [the choice of the length of a pair of pants] depends again on the type of shoe I'm wearing for the day, but that looks more similar to what I would wear." An American woman also talked about her decision-making strategy:

You know, I think I feel like a little bit tighter fit, only because I wear my shirts long. So I tend to cover up just so I don't tuck. Just gives me that more pulled-in feeling, like I'm smoother. But maybe, I don't know. like pull it out a little bit? Like maybe it is a little tight, but I don't concentrate too much [on this area] because I throw my shirts over top. So that other shirt would just fit over the top and you wouldn't even see it [refers to the tight-fitted abdomen area on the pants].

Comments on provided 3D virtual fitting tools. The researcher gave a brief introduction to the virtual tools for assessing clothing fit provided by the CLO3D software. The researcher also assisted participants in using those virtual tools for both pants and shirts. During this process, participants gave some comments on those virtual tools. First, they felt the tools were cool and interesting, especially for online shopping when there is no tactile information available.

Well, I like how it highlighted the tight areas. Because I don't think we always recognize that. So if you want to like something, I think you talk yourself into it. So I think that's really neat that it just highlights what's tight, and then you can figure out what you can live with and what you can't.

However, they also had doubts about the accuracy of those virtual tools provided by the 3D virtual try-on system, particularly in tight-fitted areas such as armholes, bust, and crotch. For instance, an American woman gave her comments as follows: “But I wouldn’t have imagined the smaller one would be in that green region on that scale [green color indicates no tightness]. It seems tighter than the map indicates. That’s interesting.”

Concerns with 3D virtual try-on. First, some participants were suspicious about the visual representation of the fit of virtual garments. They questioned how much a virtual garment could reflect a real garment. For instance, an ill-fitting shirt can still be virtually sewn around a 3D avatar but not possible to be assembled in real world. Another issue questioned by a great many participants in both groups is visual fabric. Since it is not possible to experience the fabric or to estimate stretchiness and shrinkage, it is very difficult to predict the drape and fit of a garment. For example, the degree of stretchiness has a great influence on women’s fit choices. In addition, participants complained that they could not tell the fabric’s texture and structure from what they saw in the screen. The third issue raised was the use of a fixed standard posture. One posture is not enough for conducting fit evaluation when other postures and body movements are needed. For instance, sitting, doing a squat, bending, and arm lifting are all very useful and important postures that need to be performed for fit evaluation in a real setting. Here are two typical comments:

I guess . . . I would have suspected that. That would have looked worse than it does on the screen. And I’m wondering what it would feel like. What would happen if I put my arms down or cross my arms in front of me? What would happen across the back?

I feel like I [as a virtual avatar] can wear that [pair of virtual pants], but I am pretty sure if I actually put it on and see it in front of the mirror . . . I don’t think so. I don’t think so, but I don’t know.

3D body scan feedback. Some participants spontaneously recalled their 3D body scan experience and talked about their first impressions of 3D body scans, when they were shown their 3D virtual avatars. Different from the complicated initial reaction to 3D avatars, in general participants

described their views and feelings toward their own 3D body scans as “very negative.” Many (among both the American and Chinese women) mentioned that they were very shocked when they first saw their 3D body scan. One American woman suggested that the researcher give a warning to viewers before she showed them their 3D body scans, even though she also insisted that the experience was not so bad. Further exploration is needed to answer this question. Many also thought their 3D avatars looked much better than their 3D scanned bodies and what they perceived or saw in the mirror.

Suggestions for the industry. Participants were asked to give suggestions based on their experience with the 3D simulation software. They were asked what function or information they would appreciate having when they are using this 3D software for actual online shopping. Fewer thoughts were given by the Chinese group compared to the American participants. First, the American women mentioned that they would appreciate a function for comparing virtual choices, such as a side-by-side view of different choices. In addition, this group also wished the software could mimic fit in different postures as well as in active conditions. Both groups of women were concerned about the lack of tactile information. They complained that it was difficult for them to assess the fabric quality and physical properties, particularly stretchiness.

Participants, especially the American women, also expressed their desire to see improvements in the current sizing system. For instance, an American woman joked about one brand’s confusing sizing strategy:

It’s a clothing store. And so their sizes are like zero zero, zero, one, two. And I worked out with size one PM [petite medium]. I mean, I had to ask the saleswoman what size do you think I am. Also they fit snug. And I never wear them.

5.4.4 Comparison of Virtual and Real Garment Choices

Each participant was introduced to the idea of virtual fitting and shown the 3D virtual simulation process in the virtual fitting session first and then asked to choose a best-fitted virtual shirt and a best-fitted pair of virtual pants. Their choices of real and virtual garments as well as the size gap between

them—as calculated by subtracting the size of the chosen virtual garment from the size of the chosen real garment—are summarized in this section.

As shown in Table 7, in general, none of our American participants chose a larger size for virtual shirts than for real shirts. More than half (55%) of the American women chose the same size for shirts, and 45% chose a virtual shirt one size smaller than their chosen real shirt. In comparison, 35% of the Chinese women chose the same size shirts, but 40% chose a virtual shirt larger than their chosen real shirt. Some Chinese women chose a smaller size for their virtual shirts but not as many as among the American women. Only 25% of the Chinese women chose a virtual shirt one size smaller than their chosen real shirt.

Table 9
Comparison of Best-Fitted Items

	Shirt			Pants		
	Condition 1	Condition 2	Condition 3	Condition 1	Condition 2	Condition 3
American	0	55%	45%	41%	36%	23%
Chinese	25%	35%	45%	25%	35%	40%

Note. Condition 1: Choice of virtual garment is larger than that of real garment; Condition 2: Choice of virtual garment is the same as that of real garment; Condition 3: Choice of virtual garment is smaller than that of real garment.

For both groups, more discrepancy appeared between their choices of virtual and real pants. Only around a third of the American women and Chinese women chose the same size for both the virtual and real pants. However, 41% percent of the American women chose a pair of virtual pants larger than the real pants they chose, but 40% of Chinese women chose a pair of virtual pants smaller than the real pants they chose. Larger size gaps were also observed for both groups in terms of pants. All of this indicated that the accuracy of virtual pants simulation needs to be improved.

Correlation between BMI and the choices of perceived best fitted garments. As expected, for both groups of women, BMI correlated highly with participants’ choices of best-fitted real and virtual

shirts. It also correlated highly with the choices of perceived best-fitted virtual pants for both the American and Chinese women. However, in terms of perceived best-fitted real pants, such a correlation was only found in the American group and not for the Chinese group (though it was close, $p = 0.056$).

With respect to the discrepancy between the choices of best-fitted real and virtual shirts, a correlation was found between BMI category and the perceived best-fitted shirts size gap in the American group ($r = 0.45$, $n = 22$, $p = 0.035$). The larger the BMI, the more size gap could be found. However, no such correlation was found for the Chinese group, nor between BMI category and either group's perceived best-fitted pants size gap. Tables 8 and 9 show more detail.

Table 10
Choices of Best-Fitted Items (Americans)

BMI category	Choice of best-fitted shirt				Choice of best-fitted pants		
	BMI	Real	Virtual	Size gap	Real	Virtual	Size gap
Normal	18.65	S	S	0	29	30	-1
	18.84	S	S	0	29	29	0
	21.30	M	M	0	33	34	-1
	22.31	S	S	0	30	29	1
	23.22	XL	XL	0	34	34	0
	23.69	M	M	0	33	33	0
	24.46	XL	L	1	35	34	1
	24.62	M	M	0	33	34	-1
Overweight	25.06	L	L	0	34	36	-2
	25.68	L	L	0	33	33	0
	25.97	L	M	1	35	34	1
	26.52	L	M	1	32	33	-1
	27.21	XL	XL	0	36	35	1
	27.79	XL	L	1	35	36	-1
	27.89	2XL	XL	1	36	36	0
	27.98	L	M	1	34	33	1
Obese	31.75	2XL	XL	1	35	36	-1
	33.28	2XL	XL	1	36	40	-4
	36.71	4XL	3XL	1	36	37	-1
	37.42	4XL	4XL	0	37	37	0
	41.34	5XL	4XL	1	38	38	0
	45.61	7XL	7XL	0	39	39	0

Table 11
Choices of Best-Fitted Items (Chinese)

BMI category	Best-fitted shirt				Best-fitted pants		
	BMI	Real	Virtual	Size gap	Real	Virtual	Size gap
Underweight	17.15	M	L	-1	29	28	1
	17.15	L	S	2	28	28	0
Normal weight	18.99	L	S	2	29	28	1
	19.16	XL	L	1	31	30	1
	19.23	L	L	0	28	29	-1
	21.12	3XL	3XL	0	33	33	0
	21.26	2XL	XL	1	30	30	0
	21.94	XL	2XL	-1	31	31	0
	22.06	XL	2XL	-1	29	29	0
	22.19	XL	XL	0	29	30	-1
	22.48	XL	XL	0	30	32	-2
	22.55	XL	XL	0	31	29	2
	22.58	2XL	2XL	0	31	30	1
	22.86	3XL	3XL	0	34	31	3
	22.96	XL	2XL	-1	30	30	0
	23.34	XL	L	1	32	32	0
24.03	XL	L	1	32	33	-1	
24.45	3XL	M	4	33	32	1	
24.84	2XL	L	1	33	32	1	
Overweight	25.10	2XL	3XL	-1	32	34	-2

5.4.5 Beauty Standards

Throughout the process, many women elaborated on their opinions of ideal beauty. Being thin and looking young were the most frequently cited standards. However, the Chinese women tended to hold on to comparatively identical standards, while the American women's standards were more diversified. The American women tended to believe that "there are a few different types of beauty you can fit into," but none of the Chinese women vocalized an equivalent view.

Both groups emphasized the importance of "being healthy." They noted that they had higher body acceptance than when they were younger, though they somehow still missed their 20-year-old bodies. The Chinese women appreciated having great body proportion and being lean, while the American women wanted to be "fit." Interestingly, the majority of American women indicated that they exercised regularly, at least three times per week, while only 20% of the Chinese women exercised on a regular basis. However, many Chinese women mentioned that they were cautious about their food intake while American women rarely talked about their own diets. In fact, more American women than Chinese women advocated the idea of "individual beauty" and criticized the "thin" ideal. Only American women talked about other people's stereotypes about large people and about engaging in unhealthy behavior in an effort to pursue the "thin" ideal, possibly because only 5% of the Chinese women were overweight while 63% of the American women were either overweight or obese.

5.4.6 Experience of Fit Education

It was found that both the Chinese and American women had some difficulties in fit evaluation, and they both expressed great concerns over the fit of current ready-to-wear products. Both groups had years of clothing shopping experience, but they had limited ideas about fit criteria and what good fit meant in relation to their own physical bodies. However, compared to their Chinese counterparts, the American women were less confident in their fit and style choices and had even less knowledge about fitting.

Four issues were identified from observing consumers' perceptions of clothing fit and their practices of fit evaluation. First, their ideas about fit criteria were limited. In particular, participants in both groups completely neglected important fit evaluation criteria such as grain, balance, line (side seam placement or hem line), and position of darts and yokes, despite very obvious fit issues from the researchers' point of view. In addition, only 7.1% (3/42) commented on shoulder seam placement. Furthermore, they rarely commented on the neckline, even though some shared thoughts on the collar. On the other hand, ease and set, meanwhile, were the two categories that consumers mentioned the most. Overall ease distribution and ease distribution at key circumferences including bust, waist, and hip were often identified based on visual cues such as wrinkles, folds, bulges of fabrics, and visible gaps between the body and the clothing. Moreover, they were usually able to notice issues with length such as shirt length, pants length, and sleeve length at first glance. However, in many cases, they talked themselves through the issue of length and often compromised on length for overall fit.

Second, they did not know how to assess fit when it went beyond general impression into details. This occurred more often among the American participants than among the Chinese women. They could not see the difference between "good" and "poor" quality fit in almost every criterion. A possible reason was that they did not know what good fit should look and feel like on their body. They expressed great concern with the fit of current ready-to-wear products. However, it was possible that they neglected or gave up well-fitted items but kept searching and complaining about misfit ones.

Third, the majority of the participants did not know how to look at the clothing they were wearing using different postures and checking from different angles. Instead, they were just turning their body around randomly in front of a mirror or in the virtual environment. Less than half changed body posture or performed body movements including sitting down and standing up, crossing their arms in front of their chests, twisting or bending their bodies to examine clothing fit. Almost all of those who did change body postures added that they learned this through past unsuccessful fitting experiences.

Finally, it was found that the language participants used in the process of fit evaluation was very limited. In many cases, participants noticed some fit issues, but they were only able to describe those issues as “strange,” “weird,” or “uncomfortable to see” without any further information.

5.5 Discussion

The 42 participants who have had received no professional training on clothing fit evaluation practiced clothing fit evaluation in both real and virtual settings. By examine their practices of negotiating clothing fit, participants’ genuine and natural responses including both behaviors and languages were collected and analyzed. Therefore their practices provided valuable information to both academia and the industry on how to understand consumers’ language and needs in terms of clothing fit, and revealed the need of improving and expanding clothing fit education to consumers. In addition, it also provides guides on how to improve clothing fit education. Furthermore, by comparing participants’ real and virtual fitting experience, potential usage of 3D virtual try-on technology and related issues were identified.

First of all, it was found that both the Chinese and American women had some difficulties in fit evaluation, even though they had had years of clothing shopping experience. Differences, in terms of clothing fitting process and quality, between the practice of fitting professionals and that of mature women without training experience therefore was uncovered. Most of previous studies focusing on clothing fit were conducted or guided by fitting professionals, none-professional’s clothing fitting practices have been less studied. Particularly, our non-professional participants had limited idea of the standard of good fit as well as limited knowledge and experience on how to examine clothing fit. In addition, compared to their Chinese counterparts, the American women had even less knowledge about fitting and were less confident in their fit and style choices. Other than that, participants had limited language in talking about clothing fit. For instance, some participants in both groups either neglected problematic areas or reported feeling “uncomfortable” without further explanation. There could be three reasons: those women did not see problematic areas, did not know the reason for the misfit, or did not have the right vocabulary to explain their concerns. In the first case, those women lacked knowledge of fit

evaluation. In the second case, many admitted that they did not know what attracted their attention or what triggered their dissatisfaction and thus did not know what to understand from the misfit. In the last case, inefficient or even unsuccessful communication was observed when participants had difficulty in expressing their thoughts. In order to resolve any of these three cases, consumers strongly need improved clothing fit knowledge and vocabulary. To sum up, expanding knowledge of fit evaluation by consumers is indeed very important and needed.

Therefore improvement and expansion of fit education to the general population is indeed needed. People need to be educated on what good fit should look and feel like on their body. They also need to learn how to look for good fit, as well as how to communicate clothing fit.

The majority of the participants in both groups expressed great concern with the fit of ready-to-wear products available to them. However, it was possible that they overlooked well-fitted items but kept searching and complaining about misfit garments. Sometimes consumers focus on specific factors such as certain sizes so attentively that they prevent themselves from trying something new or different from what they expect to need. They believed that they “were made for a certain size, therefore never actually go for a different item labeled in an unfamiliar size,” even though that piece may be right for them. If they thought they could not find something right within the size range they thought they belonged to, some participants said, they usually left and thought there was nothing right for them. That may be a reason why people complain that they cannot find the right fit.

This study also found that 3D virtual fitting could be a promising and helpful tool for fit evaluation, especially in online setting. As consumers’ acceptance of developing technology is crucial but challenging to measure, this study provides encouraging information. After experimenting with 3D virtual try-on technology, in general, both the American and Chinese participants gave generally positive reactions to the 3D virtual try-on technology. They recognized 3D virtual try-on as an “interesting” and “useful” tool for fit evaluation, especially in an online environment. This is similar to earlier studies on consumers’ experience of 3D technologies including both 3D body scan and 3D virtual try-on. On the

other hand, this study also pointed out the need for understanding women's perception and acceptance of their visual body. Therefore, it is crucial to improve the quality of 3D avatar and to improve consumers' acceptance of 3D avatar. In this study, dissatisfaction of one's 3D avatar was commonly mentioned, but further investigation is required to understand how this may affect consumers' clothing fit evaluation practice and perception. For instance, women in both groups expressed some negative feelings and thoughts toward their 3D avatars. Height and the abdomen were the two particular areas the Chinese women most frequently mentioned as problematic, while the concerns reported by the American women were more diversified.

All 42 participants mentioned that they could recognize their physical body when it was presented as a 3D avatar. However, many of the women made contradictory comments regarding their physical body and their 3D virtual avatar. This is in accordance with a psychological process that states that people tend to accept what they have and to develop fond feelings toward what they have. This only happens when the person does not have strong feelings toward certain things at the very beginning. However, this was not in line with the findings reported here. Instead, this discrepancy in self-recognition could be a result of unfamiliarity or a defense mechanism. Another alternative explanation is that the discomfort or unfamiliarity reported by our participants could be a result of the examination process, not merely the 3D format. This part needs further investigation.

It was expected that if a participant had strong body dissatisfaction (low body image) before she had a look at her 3D avatar, she had a higher possibility of responding negatively to her 3D avatar. However, no such correlation was identified. In fact, the relationship between body satisfaction and responses to one's 3D virtual avatar was very complicated.

Fit evaluation in 3D environment was found to be promising, however further improvement and test must be performed. Comparing to real garment fitting, it was assessing clothing fit in 3D is interesting and convenient, but is also challenging. The fitting procedure in real and virtual environment was found to be similar, but the experience was different since many important visual cue and tactile

information are missing in virtual world. In addition the quality of 3D virtual garment should be improved as fit choices were found to be very different.

5.5.1 Limitations

First, the fit options were limited: only seven to ten shirts and ten pairs of pants were available to participants. It is not clear if, had there been a smaller or larger range of choices, the participants would have made different choices. Two American participants ended up with the smallest shirts and the smallest pair of pants. Another two Americans ended up with the largest shirt, and one ended up with the largest pair of pants. No Chinese woman ended up with the smallest shirt, but four ended up with the smallest pair of pants. No Chinese women ended up with the largest shirt or pants.

Second, there are limitations in the comparability of the two groups. The Chinese group was recruited from a university located in a metropolitan city on the east coast of China while the American group was recruited from a university located in a small city in upstate New York. The choice to carry out the study with employees of these two universities was fundamentally made on the basis of the availability of 3D technology. Both of these universities had a 3D body scanner, which was crucial for this study. In addition, as a cross-cultural study, many other differences were expected. The two groups had been living in two different sociocultural environments, where they have engaged in different social activities and have been exposed to different levels of fashion media and other influential sources. In addition, there were different levels of RTW product availability. Lastly, they had different body shapes, with more variation in body shape in the American group than in the Chinese group. There were no selection criteria based on education level, income level, and other similar factors. However, as staff working at a prestigious university, participants were generally in the moderate to high category for their own cultures in terms of social standing, class, and income.

The small sample size was another limitation of the study. Only 20 Chinese and 22 American women participated in the simulated fitting room study and 3D virtual try-on study; however, it was

considered to be an appropriate sample size because no new information was pulled from the last few participants in each group.

5.6 Conclusion

Clothing fit has been one of the areas of consumers' greatest dissatisfaction with ready-to-wear products. Both researchers and professionals in the industry have made great efforts to understand and assess clothing, in order to provide well-fitted products to consumers. This is challenging partially because consumers have both different body shapes and different personal preferences. However, it is particularly difficult when consumers' perceptions of clothing fit deviate from that of fitting experts and when the discrepancy is no more clear to the industry than it is to academia. In addition, in this technology- and internet-driven world, consumers have been engaging in online clothing shopping but complaining about the difficulty of finding the "right fit" particularly in an online setting. Therefore, the simulated fitting room and the 3D virtual try-on study were conducted.

First of all, this study found that both the Chinese and American women, particularly the American women, had some difficulties in fit evaluation. Four issues were identified from consumer perceptions of clothing fit and their practices of fit evaluation. First, consumers' knowledge about fit criteria was limited. Second, they did not know how to assess fit in detail. Third, they did not know how to assess fit using different postures and by checking from different angles. Fourth, the language and vocabulary participants used in the process of fit evaluation was very limited. Therefore, expanded information on fit evaluation for consumers is indeed very important and needed.

Moreover, in this study, participants reported that they saw the potential of 3D technology, particularly in an online setting after they experienced 3D technology, including both 3D body scans and a 3D virtual try-on. In fact, they wished that the 3D technology could help them make better fit choices, but they also reported their concerns with the 3D technology, including unfamiliarity, losing details, and lack of tactile information. They also expressed a lack of confidence in the ability of virtual fit to show actual fit of the garments.

Finally, this study investigated the issue of fit from the perspectives of consumers and studied consumers' usage of language, which were missed in previous studies. It was found that consumers' understanding of clothing fit could deviate from that of professionals. In addition, the language used by participants to describe fit issues were very limited. These could result in difficulty in communicating clothing fit between professionals and consumers as well as in educating clothing fit.

5.6.1 Future Research

Future research could be built on the current study. First, it is interesting and beneficial to develop fit education programs and fit evaluation tools for consumers. Such programs can (a) help consumers' understand clothing fit and assist them to find a "good fit" that is right for their body type and personal preferences, (b) assist the industry in providing better RTW products by acquiring knowledge of consumers' needs and enhancing communication with target consumers. This would be beneficial for both consumers and the industry. Second, this study could expand to investigate the potential and accuracy of 3D fit evaluation (a) in active postures, instead of in one static standard standing posture, and (b) for a variety of fabrics. This study indicated that lack of tactile information was one of the biggest concerns about 3D virtual try-ons; therefore, how to resolve this issue could be one future research topic. Lastly, this study was based on 34- to 55-year-old women; it would be interesting to see if the same findings apply to other populations.

CHAPTER 6

CONCLUSION

In order to acquire an understanding of 34- to 55-year-old women's body image, physical body, appearance management strategies, two groups of 34- to 55-year-old women, American and Chinese, were recruited in this cross-cultural study. In particular, these two groups of mature women's adoption of clothing as a method of appearance management as well as their thoughts about current ready-to-wear (RTW) products were investigated by examining their wardrobe management practices, experiences with clothing fit evaluation, and fitting practices in both the real and 3D virtual environments. Also examined were the potential utility of 3D virtual try-on technology for assisting fit evaluation, particularly in an online setting, and areas of this technology needing improvement were identified.

This study has six main contributions. First, as a cross-cultural study, it explored the influence of culture on Chinese and American women's ideas of ideal beauty, perceptions of physical body in mind, appearance management strategies and behaviors, and their attitudes toward and experiences with 3D technology.

Second, it examined a less-investigated age group and revealed information on women's experiences of aging and how it affected their physical bodies, their mental self-perceptions of their bodies, and their appearance management strategies, especially in terms of their wardrobe management behaviors and dressing practices.

Third, it explored not only how physical body shape and perceived body in mind (body image) influence consumers' practices of appearance management, particularly their clothing fit and style choices. It also investigated consumers' concerns about currently available ready-to-wear (RTW) products on the market in general.

Fourth, this study proposed a model for understanding consumers' decision-making processes while purchasing clothing. Therefore, this study provides valuable and practical information on understanding and accommodating consumers' need to the apparel industry.

Fifth, it examined consumers' practices of clothing fit evaluation. Knowledge about consumers' fit evaluation practices and their experiences with fit education was obtained and studied. This is an important step because it provides insight for both academia and industry, as well as benefits consumers. At the same time, it studied consumers' usage of language in communicating clothing fit. Therefore, it provides valuable information on how to communicate clothing fit with nonprofessionals and how to improve fit education for the general population.

Last but not least, mature women's experiences with 3D virtual fitting were studied, and the potential usage of 3D virtual fitting for clothing fit evaluation was explored. This part is novel for two reasons: (a) it identified issues and areas in the technology that need improvement by comparing 3D virtual fitting with a real fitting experience and (b) it is based on consumers' firsthand fitting experience in both 3D virtual and real environments.

6.1 Future Work

Future research could be built on the current study. First, it is interesting to see if the same findings would apply to other populations such as, plus-size women, older women, women of different ethnicities, or even males. Second, it was found that there was a disparity between mature women's actual body and her perception of the actual body, however the mechanism and effects of the disparity is still not clear. Third, it was found that the gap between mature women's perception of her actual body and the ideal body in her mind can greatly influence her body satisfaction level, adoption of appearance management strategies as well as her clothing choices. However, further study is required to gain deeper and more detailed understanding. Fourth, it would be interesting to incorporate other formats of information besides self-reported information. For instance, in addition of description of one's wardrobe and recalled past experience of clothing shopping, on-site exam of one's wardrobe and on-site shopping

experience would provide much information that was limited by the format of current study. Fifth, it is beneficial to develop fit education programs and fit evaluation tools for consumers. Doing so can (a) help consumers understand clothing fit and assist them in finding a “good fit” that is right for their body type and their personal preferences and (b) assist the industry in providing better RTW products by acquiring knowledge of consumers’ needs and enhancing communication with target consumers. This would be beneficial for both consumers and the industry. Sixth, this study could expand to investigate the potential and accuracy of 3D fit evaluation in (a) active postures instead of a single static standard standing posture and (b) for a variety of fabrics. This study determined that a lack of tactile information was one of the biggest concerns with 3D virtual try-on; therefore, how to resolve this issue could be a future research topic. Lastly, this study was based on 34- 55-year-old women; it would be interesting to see if the same findings would apply to other populations.

APPENDIX A
STUDY GROUP STATISTICS

Demographics

Table A
Comparison of Population Statistics (2014)

	Registered population	Percentage of female population	Percentage of mature age ¹ group	Percentage of non-agricultural population	Ethnicity (European American for Han Chinese)	Personal income (1 USD = 6.1 CNY)	
						Urban	Rural
U.S.	281,421,906	50.90%	30.59%		63.00%	28184	
Location US ²	30,720	49.62%	27.10%		73.24%	26677	
China	1,354,040,000	48.75%	31.82%	35.33%	91.50%	4027.00	1297.80
Location CH ³	23,710,000	50.27%	41.02%	89.80%	75.00%	6588.2	2852.62

Note. ¹Because of the availability of census data, the age range for Chinese is 35–60 years old, but it is 35–55 years old for the Americans. ²Location US: Ithaca, NY. ³Location CH: Shanghai, China.

Data Sources:

1. UNdata (US and China general information: demographic data)
<http://data.un.org/Default.aspx>
2. US Census Bureau
<http://www.census.gov/>
3. Ithaca & NYC facts
<http://quickfacts.census.gov/qfd/states/36/3638077.html>
<http://censusviewer.com/city/NY/Ithaca>
<http://www.deptofnumbers.com/income/new-york/ithaca/>
4. China Data Online
<http://chinadataonline.org/>
5. National Bureau of Statistics of the People's Republic of China
<http://www.stats.gov.cn/>
6. Shanghai Bureau of Statistics
<http://www.stats-sh.gov.cn/>
Shanghai Statistical Yearbook 2013: <http://www.stats-sh.gov.cn/data/toTjnj.xhtml?y=2013e>

APPENDIX B
SIZE CHARTS

	XS	S	M	L	XL
US	0-2	4-6	8-10	12	14
EU	32-34	36-38	40-42	44	46
UK/AU	4-6	8-10	12-14	16	18
China	160-165/84-86	165-170/88-90	167-172/92-96	168-173/98-102	170-176/106-110
Japan	3-5	7-9	11-13	15-17	19-21
Bust	32-34	35-36	37-38	39	40
Natural Waist	24-26	27-28	29-30	31	32
Drop Waist	28-29	30-31	32-33	34	35
Hip	35-36	37-38	39-40	41	42

Figure A. From “Size Chart,” by Free People, LLC, 2016 (<http://www.freepeople.com/size-chart/>). Copyright 2016 by Free People, LLC.

APPENDIX C

INSTRUMENT – SURVEY (ENGLISH)

SURVEY

Please follow instructions to complete them step by step. It will take approximately 10 minutes to complete.

The following survey is for college women.

Your response will not be linked to your name. Please answer each question honestly.

If you feel uncomfortable answering a question, you do not have to answer it.

Your participation in this survey will not affect your relationship with your university.

Thank you for your participation!

Participant Number:

Part 1 – Background information

Please answer following questions.

1. Age:
2. Occupation:
3. Household annual income:
Personal annual income:
4. Education level:
5. Weight (if it is possible, weight yourself) (pounds):
6. Height:
7. Waist circumference:
8. Do you diet (consciously control food intake)? Check a choice most close to you condition.
 1=not at all;
 2=rare;
 3=sometimes;
 4=often;

5=always diet

9. How physically active you are? Check a choice most close to you condition.

1=not active at all;

2=only daily activities;

3=sometimes active;

4=exercise regularly (exercise 2-3 times per week)

5=always very active (exercise more than 3 times per week)

Part 2 – Body image

Please answer following questions

1. What's your favorite body part?

2. What's your least favorite body part?

How much do you agree with following questions (Indicate a number between 1-5: 1=not at all, 2= a little bit disagree; 3=neutral, 4= a little bit agree, 5= agree)

3. I am satisfied with my physical appearance:

4. In most ways my actual physical appearance is close to my ideal physical appearance:

5. There is nothing about my physical appearance that I would like to change:

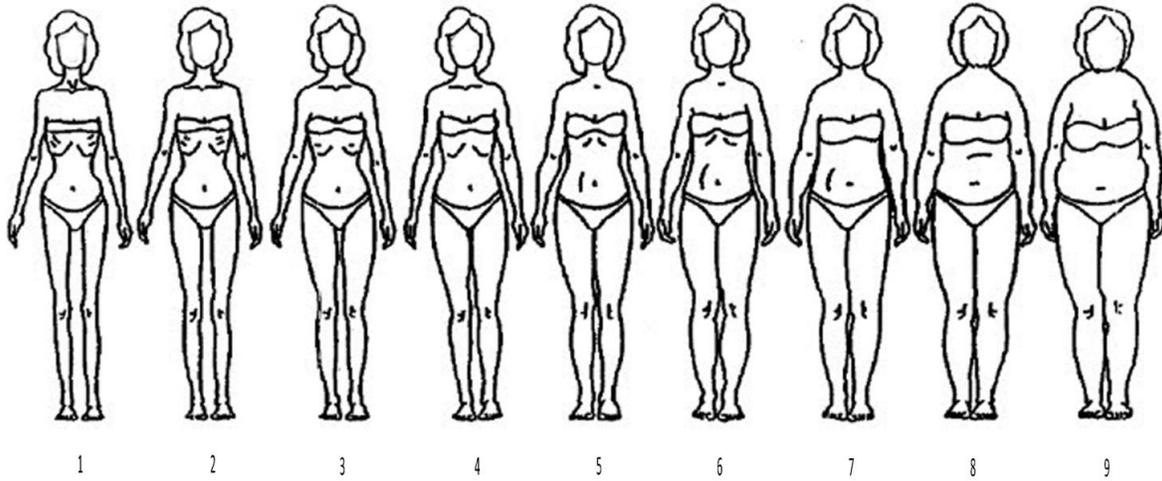
6. I think it is very important for me to have ideal body shape:

7. I think it is very important to for me to have ideal appearance:

8. I think my body/appearance decides who I am:

9. I am trying my best to pursue/maintain good body and appearance:

Body Image Scale



Which one of the above images best represents your current body size?

Which one of the above images best represents your IDEAL body size?

Part 3 – Clothing as an appearance management strategy

1. How do you manage your body/appearance (select every strategy used)?
 - 1=clothing;
 - 2=Make up;
 - 3=exercise;
 - 4=diet;
 - 5=surgery;
 - 6=others; Please specify it here:

2. What is your prime body/appearance management strategy (choose the **ONE** you rely on the most)?
 - 1=clothing;
 - 2=Make up;
 - 3=exercise;
 - 4=diet;
 - 5=surgery;
 - 6=others; Please specify it here:

3. What strategy do you think is the **most useful** body/appearance management strategy (choose only **ONE**)?
 - 1=clothing;
 - 2=Make up;
 - 3=exercise;
 - 4=diet;
 - 5=surgery;
 - 6=others; Please specify it here:

Part 4 – Clothing buying behavior and concerns over clothing

1. What's your pant size?
2. What's your top size?
3. How much do you spend on clothing per season (on average) last year? (Unit: USD)
 - 1= 0-115;
 - 2= 116-330;
 - 3= 331-575;
 - 4= 576-1150;
 - 5= over 1150;
4. Where do you buy your clothes?
 - 1= Department store;
 - 2= Brand's own store.
 - 3= Boutique;
 - 4= Online shopping;
 - 5= Outlets;
 - 6= Tailor;
 - 7= Other. Please specify it here:

How much do you agree with following questions (Indicate a number between 1-5: 1=not at all, 2= a little bit disagree; 3=neutral, 4= a little bit agree, 5= agree):

Group 1

1. I could easily buy styles I like in current Ready-to-Wear market:
2. I could easily buy garments fit me well in current Ready-to-Wear market:
3. Most of my clothes are Ready-to-Wear:
4. I prefer tailor-made clothing more than Ready-to-Wear:

Group 2

1. When I am making a buying choice of clothing, I think style is very important:
2. When I am making a buying choice of clothing, I think the quality of fabric is very important:

3. When I am making a buying choice of clothing, I think fit is very important:
4. When I am making a buying choice of clothing, I think function (room to move/work) is very important:
5. When I am making a buying choice of clothing, I think fashion trends are very important:
6. When I am making a buying choice of clothing, I think price is very important:

Group 3

1. My friends' opinions have great influence on my clothing choice.
2. My spouse/partner' opinion has great influence on my clothing choice.
3. My other close family members' opinions have great influence on my clothing choice.
4. Current fashion trends (Designers/Celebrities/Models) have great influence on my clothing choice.
5. Mass media have great influence on my clothing choice.
6. My style choices are very similar to women at my age.

Group 4

1. I am very confident that I know what kind of style looks good on me.
2. I am very confident that I know how to do fit evaluation.

Part 5 – Identifications of culture

1. Were you born in the U.S.?

- Yes
 No

2. A: Do you have close family members or friends living in other countries?

- Yes
 No

B: Do you have close family members or friends living in China?

- Yes
 No

3. How American do you consider yourself to be?

- 1= heavily influenced by the other culture;
 2= influenced by the other culture to a certain extent;
 3= neutral;
 4= influenced by the other culture just a little bit;
 5= Not at all. I am very bonded with my own culture;

Chinese culture's influence on you:

A: In general, does Chinese culture have influence on you? (0 – 100 points, how many points do you assign to it?)

- Heavily influenced (75 – 100).
 To certain extent (51 -74).
 Neutral (50).
 A little (25 – 49).
 Not at all (0 – 24).

B: Does Chinese culture have influence on your clothing choices? (0 – 100 points, how many points do you assign to it?)

- Heavily influenced (75 – 100).
 To certain extent (51 -74).
 Neutral (50).
 A little (25 – 49).
 Not at all (0 – 24).

C: Other than your original culture and Chinese culture, in general, what culture do you think has influence on your clothing choices? Please specify it here.

D: How much do you think the above mentioned culture influenced your clothing choices, (0 – 100 points)?

- Heavily influenced (75 – 100).
- To certain extent (51 -74).
- Neutral (50).
- A little (25 – 49).
- Not at all (0 – 24).

4. Have you ever been living outside of your country (total time period being outside of your country)?

- 1= not at all;
- 2= less than 1 year;
- 3= 1-3 years;
- 4= more than 3 years;
- 5= my whole life;

5. How often do you travel to other countries (choose the one most close to your situation)?

- 1= never;
- 2= have travelled internationally, but not regular
- 3= once to twice a year;
- 4= three to six times a year;
- 5= more than six times a year;

6. On average, how much time do you spend watching fashion and beauty related TV programs or videos, such as Make-up tutorials, fashion shows, styling programs daily?

- 1= never;
- 2= about 1 hour per day
- 3= 2 to 3 hours per day
- 4= 4 to 5 hours per day
- 5= more than 5 hours per day
- 6= Not regular, just occasionally.

Examples of most regularly watched programs/shows?

7. In general, how much time do you spent on fashion and beauty related reading (makeup, hair style, clothing, etc.), including both printed and online versions **every day**?

- 1= never;
 - 2= about 1 hour per day
 - 3= 2 to 3 hours per day
 - 4= 4 to 5 hours per day
 - 5= more than 5 hours per day
 - 6= Not regular, just occasionally
- Examples of most regularly read sources.

8. In terms of **beauty standard**, how much differences do you think there are between American culture and Chinese culture?

- 1= no difference at all;
- 2= a little bit of differences;
- 3= some differences;
- 4= a lot of differences;
- 5= completely different;

What kind of differences have you perceived? Examples?

9. In terms of **beauty standard**, how much do you agree with your original culture?

- 1= completely disagree;
- 2= very disagree;
- 3= neutral;
- 4= kind of agree;
- 5= totally agree;

10. In terms of **idealized body shape**, how much differences do you think there are between American culture and Chinese culture?

- 1= no difference at all;
- 2= a little bit of differences;
- 3= some differences;
- 4= a lot of differences;
- 5= completely different;

What kind of differences have you perceived? Examples?

11. In terms of **idealized body shape**, how much do you agree with your original culture?

- 1= completely disagree;
- 2= very disagree;
- 3= neutral;
- 4= kind of agree;

5= totally agree;

12. In terms of **clothing styles** (typical styles in your culture), how much differences do you think there are between American culture and Chinese culture?

- 1= no difference at all;
- 2= a little bit of differences;
- 3= some differences;
- 4= a lot of differences;
- 5= completely different;

What kind of differences have you perceived? Examples?

13. In terms of **clothing styles**, how much do you agree with your original culture?

- 1= completely disagree;
- 2= very disagree;
- 3= neutral;
- 4= kind of agree;
- 5= totally agree;

Part 6 – Acceptance of technology

1. Have you ever heard of 3D body scanning technology?

- Yes
- No

2. Have you ever been 3D scanned?

- Yes
- No

3. If you could have a trial of 3D body scan technology, what part are you interested in the most? If you don't want to be scanned, what is your main concern?

4. Have you heard of eye-tracking technology?

- Yes
- No

5. Have you ever tried eye tracker?

- Yes
- No

6. If you could have a trial of eye tracking technology, what part are you interested in the most? If you don't want to participate, what is your main concern?

7. Have you heard of virtual try on technology?

- Yes
- No

8. Have you ever tried virtual try on technology?

- Yes
- No

9. If you could have a trial of virtual try on technology, what part are you interested in the most? If you don't want to participate, what is your main concern?

APPENDIX D

INSTRUMENT – SURVEY (CHINESE)

调查问卷

调查员填写：编号：_____ 日期：_____

问卷说明

本问卷适用于中国女性。预计您将花费十五分钟完成本问卷。您的回答将不会与您的姓名挂钩，您的身份会被严格保密。您对本问卷的回答不会影响您与您所属单位的任何关系。如果您对任何一个问题有疑问请向调查员咨询。如果您不愿回答某一问题，您有权利不回答。因此，请按照说明如实回答每个问题。

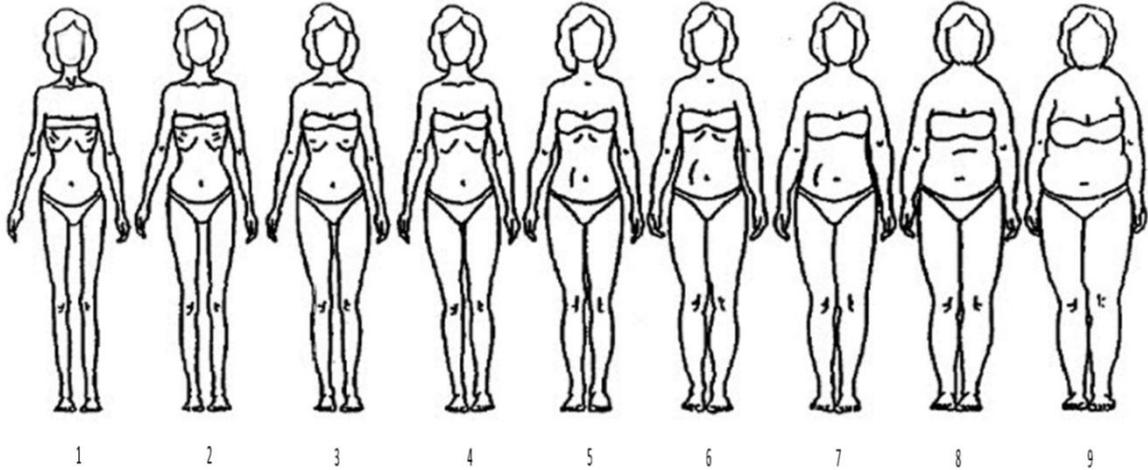
谢谢您的积极参与！

A 背景资料

10. 1) 出生年份：_____； 2) 职业：_____； 3) 教育程度：_____；
4) 民族：_____；
11. 年收入： 1) 家庭年收入：_____； 2) 个人可支配年收入：_____
12. 1) 体重（公斤）：_____； 2) 身高（厘米）：_____； 3) 腰围（厘米）：_____
13. 请问平时您节食（注意饮食质量和数量）吗？请勾选最符合您情况的一项描述。
1. 从不； 2. 很少； 3. 有时； 4. 经常； 5. 几乎每天；
14. 您平时参加体育锻炼吗？请选择最符合您情况的一项描述。
1. 很少活动； 2. 仅有日常活动； 3. 偶尔锻炼，不规律； 4. 每周 2-3 次锻炼； 5. 每周锻炼 4 次以上

B 身体意象

10. 请问您**最满意**您身体的哪一部分（仅一个部位）？
为什么？
11. 相对而言，请问您**最不满意**您身体地方哪一部分？（仅一个部位）？
为什么？
12. 请用 1-5 表示您**同意**该说法的**程度**：1. 完全不同意，2. 有些不同意，3. 中立，4. 有些同意，5. 完全同意。
 - 1) 我满意我的外形（包括外表和身体）：
 - 2) 基本上，我的外形接近我理想中的外形：
 - 3) 我不想改变我的外形：
 - 4) 我认为，拥有理想体型是非常重要的：
 - 5) 我认为，拥有理想外表是非常重要的：
 - 6) 我认为，我的外形（包括体型和外表）很大程度上决定了我是谁：
 - 7) 我尽最大努力追求/保持良好的外形（包括体型和外表）：
13. 请仔细观察下方图片，然后回答以下问题：
 - 1) 您认为，以下哪幅图像代表了您**现在**的体型？
 - 2) 您认为，以下哪幅图像代表了您**理想中**的体型？



C 外形管理策略

1. 请勾选您日常使用的外形管理策略（可多选）：
1. 服装； 2. 化妆； 3. 运动； 4. 节食； 5. 手术； 6. 其他（如有请注明：_____）
2. 请勾选您**最经常使用**的外形管理策略（仅一项）：
1. 服装； 2. 化妆； 3. 运动； 4. 节食； 5. 手术； 6. 其他（如有请注明：_____）
为什么您**最经常使用**该项策略？
3. 请勾选您认为**最有效**的外形管理策略（仅一项）：
1. 服装； 2. 化妆； 3. 运动； 4. 节食； 5. 手术； 6. 其他（如有请注明：_____）
为什么您认为该项策略**最有效**？

D 服装购买行为及相关顾虑

5. 请问您裤子的尺码（号型）？
6. 请问您上衣的尺码（号型）？
7. 请勾选。请问您个人在最近几年中，平均**每季度**的服装相关开销是多少？（单位：人民币）
1. 0-700； 2. 700-2000； 3. 2000-3500； 4. 3500-7000； 5. 超过 7000；
4. 请勾选。请问您平时主要会在什么地方购买服装（可多选）？
1. 百货商场； 2. 品牌专卖店； 3. 街边小店； 4. 网购； 5. 折扣店； 6. 订做服装； 7. 其他途径
（请注明：_____）
5. 请用 1-5 表示您**同意**该说法的**程度**：1. 完全不同意， 2. 有一些不同意， 3. 中立， 4. 有一些同意， 5. 完全同意。
 - 1) **第一组问题**
 - a. 我能在现在的成衣市场上轻松找到**我喜欢的**款式：
 - b. 我能在现在的成衣市场上轻松找到**合体的**服装：
 - c. 我的服装绝大多数是**直接购买**的成衣：
 - d. 相对于成衣，我更偏好**定做服装**：
 - 2) **第二组问题**
 - a. 在我选择服装的时候，我认为服装的**款式**很重要：
 - b. 在我选择服装的时候，我认为服装**面料的质量**很重要：
 - c. 在我选择服装的时候，我认为服装是否**合体**很重要：
 - d. 在我选择服装的时候，我认为服装的**功能性**很重要：
 - e. 在我选择服装的时候，我认为服装是否符合**潮流**很重要：
 - f. 在我选择服装的时候，我认为服装的**价格**很重要：

- 3) **第三组问题:**
- 我选择服装时, **朋友的意见**很大程度上影响我的决定:
 - 我选择服装时, **我男友/丈夫**的意见很大程度上影响我的决定(如单身, 请参照您在意的某一异性的观点):
 - 我选择服装时, **其他家庭成员**的意见很大程度上影响我的决定:
 - 我选择服装时, 当今**服装潮流**(包括设计师/名人/模特的服装选择)很大程度上影响我的决定:
 - 我选择服装时, **媒体宣传**(包括服装广告, 杂志、电视上的服装款式推荐)很大程度上影响我的决定:
 - 我选择的服装和其他同年龄段的女性选择的服装十分相似:
- 4) **第四组问题**
- 我非常自信自己选择的服装**款式**是适合我的, 能提升我的形象:
 - 我相信自己知道如何选择**合体**的服装:

E 文化认同度

14. 1) 请问您是否出生于中国? 1. 是; 2. 否;
2) 请问您的出生地是:
15. 1) 请问您是否有**近亲**现在**海外**生活(包括港澳台地区)? 1. 是; 2. 否;
2) 请问您是否有**近亲**现在**美国**生活? 1. 是; 2. 否;
16. 请勾选。请问您认为自己受到除中国文化以外的文化影响吗?
1. 很大程度上受其他文化的影响; 2. 一定程度上受其他文化的影响; 3. 中立; 4. 很小程度上受其他文化的影响; 5. 几乎不受影响;
外来文化对您的服装选择和审美标准的影响:
- A. 您认为美国文化对您的服装选择和审美标准有影响吗?
1. 很大程度; 2. 一定程度; 3. 中立; 4. 很小程度; 5. 几乎不受影响;
- B. 您的服装选择和审美标准还受到除了本国文化和美国文化以外的其他文化的影响吗?
1. 很大程度; 2. 一定程度; 3. 中立; 4. 很小程度; 5. 几乎不受影响;
请指出是哪种文化:
17. 请问您曾在中国以外的国家居住过(不包括短期旅行)吗? 总共生活过多少时间?
1. 从未; 2. 少于一年; 3. 一至三年; 4. 三年至十年; 5. 多于十年;
请问是哪个国家:
18. 请选择您**出国旅游**的频率(请选择最接近您真实情况的描述)?
1. 从未; 2. 会去, 但不规律; 3. 每年一到两次; 4. 每年三到六次; 5. 每年六次以上;
19. 您**每天**用多少时间观看与服饰、美容、美体相关的**视频**(包括电视节目和网络资源)?
1. 从不; 2. 少于半小时; 3. 半小时到一小时; 4. 约一到两小时; 5. 超过两小时; 6. 不规律, 偶尔看看;
如果有, 请例举您最经常观看的节目:
20. 您**每天**用多少时间阅读与服饰、美容、美体相关的**图片文字**(包括印刷品和网络资源)?
1. 从不; 2. 少于半小时; 3. 半小时到一小时; 4. 约一到两小时; 5. 超过两小时; 6. 不规律, 偶尔看看;
如果有, 请例举您最经常阅读的资料:
21. 您认为美国和中国的**审美标准**有差异吗?
1. 完全没差别; 2. 有微小差别; 3. 有一定程度的差别; 4. 有很多差别; 5. 完全不同;
请举例说明差异:
22. 您有多认同中国文化定义的**审美标准**, 尤其是对于个人外形的美的定义?
1. 完全不同意; 2. 非常不同意; 3. 中立; 4. 有点同意; 5. 完全同意;
23. 您认为美国和中国定义的理想**体型**有差异吗?
1. 完全没差别; 2. 有微小差别; 3. 有一定程度的差别; 4. 有很多差别; 5. 完全不同;
请举例说明差异:
24. 您有多认同中国文化中的理想**体型**?

- 1= 完全不同意； 2= 非常不同意； 3= 中立； 4= 有点同意； 5= 完全同意；
25. 您认为中美两国的**服装选择**（包括受欢迎的服装款式和服装的合体度）有差异吗？
1= 完全没差别； 2= 有微小差别； 3= 有一定程度上的差别； 4= 有很多差别； 5= 完全不同；
请举例说明差异：
26. 您有多认同中国文化中的**服装选择**（包括受欢迎的服装款式和服装的合体度）？
1= 完全不同意； 2= 非常不同意； 3= 中立； 4= 有点同意； 5= 完全同意；

F 新技术接纳度

10. 请问您听说过三维人体扫描技术吗？ 1. 是 2. 否
11. 请问你是否尝试过三维人体扫描？ 1. 是 2. 否
12. 如果有机会让您尝试三维人体扫描，你是否感兴趣？如果是，请问您对什么部分感兴趣？如果不是，请问你有什么顾虑？
13. 请问你听说过三维虚拟服装技术吗？ 1. 是 2. 否
14. 请问您是否尝试过三维虚拟服装？ 1. 是 2. 否
15. 如果有机会让您尝试三维虚拟服装，你是否感兴趣？如果是，请问您对什么部分感兴趣？如果不是，请问你有什么顾虑？

问卷已完成，非常感谢您的参与！

如果您愿意参与后续的访谈、三维人体扫描和三维虚拟服装试穿实验，请填写您的联系方式：

姓名：_____ 电话：_____ 邮箱（选填）：

APPENDIX E

WARDROBE STUDY PROTOCOL (ENGLISH)

Topic 1 – Background information

1. Years of working
 - Total
 - at Cornell
2. Years living in this city/area;

Topic 2 – Favorite outfits

1. Describe your favorites
 - What are they? What do they look like?
2. What do you like about them (why do you like them) – details?
 - Color? Pattern? Style? Fit? Fashion? Price? Protection? Comfort? Meanings? Fabric?
3. Where and when did you get them (shopping scenario)?
4. How do you feel when you are wearing them?
5. Is there anything you don't like about them?

Topic 3 – Dress codes & Current Wardrobe

1. Dress codes
 - Working environment;
 - Casual settings;
2. Current wardrobe
 - What are some things you like about your current wardrobe?
 - What are some things you don't like about your current wardrobe?
 - During your life time, is there any specific time period that you change your attitudes toward clothing? How and why?

Topic 4 – Clothing buying behavior and concerns over clothing

1. What do you look for in a garment?
2. What do you think is the most important thing when you are making a buying choice?
3. How much do you spend on clothing?
4. How frequently do you go clothing shopping?
5. Where do you buy your clothing? Do you have preferred brand? If so, why do you prefer it?
6. Who do you go shopping with? Do you get opinions from them? Do you take other opinions?
7. How do you interact with sales or fitting experts?
8. Recall the most vivid memory of clothing shopping. Why?

Topic 5 – Appearance management strategy

1. What's your strategy for appearance management? How and Why?

2. Do you use clothing as an appearance management strategy? If so, how? If not, what's your concern?
3. Your practice of using clothing as an appearance enhancement tool? How and Why?

Topic 6 – Clothing size and fit

1. What do you think about clothing fit? Do you think it is important when you are buying clothing?
2. What do you think about the fit choices on current Ready-to-Wear market?
 - Current sizing system?
3. How do you make fit/size choices (store & online shopping)

Topic 7 – Body image

1. Satisfaction of body (body parts) and appearance: do you like your body? Do you like your appearance? How and why?
2. Importance placed on body/appearance: what kind of role do you think body/appearance plays in your life? Is it important to you? Why and how?
3. Recall memories – your story of your body/appearance and you as (an intelligent working women, young girl, young adult, etc.)
 - Meanings of great body/appearance.
4. Your practice of pursuing and/or maintaining ideal body/appearance.
5. Any significant changes of body/appearance?

Topic 8 – Culture

1. What does “ideal beauty (body and appearance)” mean to you? Do you think it is close to the standard beauty encouraged/promoted by the mainstream American Culture?
2. How do you feel about this? How much do you think you are bond with the culture you are grown with?
3. Do you think culture influence your standards of beauty, your own body image, attitudes towards clothing and technology? How?
4. Do you think have been influenced by other cultures? What do you think of it? Do you think this culture also influence your clothing choices? If so, how much influence does it have? How?

Topic 9 – Social Comparison

1. Do you compare yourself (clothing, body, and appearance) to others? If so, who do you compare to?
 - Why do you compare yourself to them? How do you feel about the comparison? What do you do about the comparison?
2. Comparing you women at your age who are doing similar job, do you think your style and daily practice of dressing is close or different from them?

APPENDIX F

WARDROBE STUDY PROTOCOL (CHINESE)

关于体型和外貌

- 1) 身体满意度。0-100 分
您对自己的体型和样貌是如何看待的？您满意吗？请描述您的体型。
最满意的部分？为什么？
最不满意的部位？为什么？
- 2) 您觉得有良好的体型和样貌重要吗？重要性又是如何体现的？请具体说明。0-100 分
- 3) 您平时是如何管理自己的体型和外貌的？请具体说明方法和原因。
您会用服装修饰自己的体型吗？如果是，请具体说明策略。如果不是，请问原因和您偏好的策略是什么？

个人服装风格和偏好

- 1) 请分别描述您最偏爱（满意）的一套春夏季和秋冬季的服装。您偏爱这两套服装的原因？
请简单介绍您获得这两套服装的情况（何时何地，如何找到和搭配的）。
穿着偏爱的服装时您的感受是？
- 2) 您有买过不满意的服装吗？请举例。
为什么会买其实并不满意的服装？什么样的服装是您不满意的？
请问您是怎么处理和对待这样令您不满意的服装是？
请问您在穿着不那么满意的服装的时候的心理感受。
- 3) 请介绍一下您的衣橱管理策略。比如，现在您的衣橱中主要服装款式类型和特征、数量、合体程度和材质；如果不受外部条件限制，您还会购买那些服饰配件？如果您要清理您的衣橱，您会首先清除哪些？
- 4) 请简单介绍您的着装风格和您如此穿着的原因。
- 5) 举例说明您的服装风格——哪些名人（模特，演员，明星等）的着装风格和您类似？
- 6) 您认为您的服装风格受到哪些方面的影响？
- 7) 您通常在哪里购买服装？您有偏爱的品牌吗？如果有的话，为什么？
- 8) 在您记忆中，针对服装选择，您是否有过态度或者偏好的转变或者突然“开窍”的时刻？如果有的话，请详细描述这种转变是如何发生的以及原因。

服装合体度评价

- 1) 在您购买服装时候首先考虑的因素什么？您平时是如何购买服装的（频率，地点，品牌，单独或有人陪同，如何挑选款式、合体度、颜色等等）。您平时穿什么号型的衣服？您在现在的成衣市场上如何找到适合自己体型的衣服？
- 2) 平均来说，您服装消费的金额和频率是怎么的？您认为服装“合体”意味着什么？您是如何

判断一件服装是否适合您的体型的？

- 3) 您是如何试穿和评价服装的？您是从哪里/什么时候学到这些服装相关知识的（款式挑选，适合体型的服装）？
- 4) 服装信息来源：杂志？网络？亲戚朋友？老师？其他？
- 5) 请问您平时阅读服装杂志吗？主要有哪些杂志（那个地域出版？倾向于哪种风格）？阅读频率如何？为什么倾向于这些杂志？
- 6) 请详细介绍您是如何判断一件服装是否适合您自己的体型的？请举例说明。请介绍评价的详细流程和标准（包括上衣和裤子）。
 - 您重点查看那些部位？如何查看和评价？
 - 您采用哪些姿势检查服装是否合身？
- 7) 您在购买服装时会听取他人意见吗？谁？为什么？他人的意见对您重要吗？
- 8) 您在购买服装时会和销售人员进行互动吗？原因？如何互动？

文化对审美和服装选择的影响

- 1) 请问您认为自己受传统中国文化的影响大吗？
- 2) 您认为中国文化中的“美”主要体现在哪些方面？请举例说明。
- 3) 您认为中国文化中推崇的理想体型是什么样的？描述加举例说明（公众人物）。
- 4) 您认为代表**中国时尚**风格的款式应该具有怎样的特征？
- 5) 普遍而言，您认为当今中国女性服装选择（包括受成衣市场上受欢迎的款式和偏好的服装合体程度）是什么样的？描述加举例说明（公众人物）。
- 6) 请问您认同中国传统文化中的审美标准、标准体型和外貌吗？您现在持有的与此相关的标准在多大程度上和传统中国文化中的标准相符合？
- 7) 您认为美国文化中的“美”主要体现在哪些方面？请举例说明。
- 8) 您认为美国文化中推崇的理想体型是什么样的？描述加举例说明（公众人物）。
- 9) 普遍而言，您认为当今美国女性服装选择（包括受成衣市场上受欢迎的款式和偏好的服装合体程度）是什么样的？描述加举例说明（公众人物）。
- 10) 您认为代表**美国时尚**风格的款式应该具有怎样的特征？
- 11) 请问美国的审美标准和服装潮流对您有影响吗？?如果有的话，影响有多大？这种影响主要体现在哪些方面？
- 12) 如果您认为中美文化中的审美标准有差异，这些差异主要体现在什么方面？请举例说明。
- 13) 如果您认为中美文化中理想体型有差异，这些差异主要体现在什么方面？请举例说明。
- 14) 如果您认为两种文化中服装选择有差异，这些差异主要体现在什么方面？请举例说明。
- 15) 请问您的审美观主要来源哪里？
- 16) 请问您受到本国文化中的审美观影响吗（0-100）？
- 17) 就审美标准和服装潮流而言，请问您认为自己受其他外国文化的影响吗（1-100）？主要有哪些影响？

APPENDIX G

FITTING ROOM STUDY AND 3D VIRTUAL FITTING STUDY PROTOCOL (ENGLISH)

Step 1 – Experience and Practice of Fit Evaluation

1. Do you know how to do fit evaluation? If so, how do you do that? where did you learn it?
2. What do you usually do when you are doing fittings? Procedure and criteria
 - What parts do they exam? How to exam them?
 - What poses do you use to exam fit?
 - What are your standards/ Preferences?
 - Other requirements? Patterns? Habits?
3. General fit and style preferences for
 - Pants
 - o What type of waistline do you like more?
 - 1) Hip hugger
 - 2) Low rise
 - 3) Normal rise
 - 4) High waist
 - o What style of pant leg do you prefer?
 - 1) Wide leg
 - 2) Flared or bell-bottom
 - 3) Boot cut
 - 4) Straight leg
 - 5) Skinny leg
 - Shirts
 - o Shirt length
 - o Collar
 - o Sleeve length and types

Step 2 – Independent fit evaluation (Real shirts and pants)

Step 3 – 3D body scan feedback

1. What's your past experience of 3D body scanning? What do you think it is (before the researcher introduces it)?
2. What's your first and overall impression of 3D body scanning (after I introduce the technology and you experienced it)?
3. What's your first and overall impression of your own 3D body?

Step 4 – Independent fit evaluation (Virtual shirts and pants)

Step 5 – 3D virtual fitting feedback

1. What's your impression of 3D virtual fitting (before the researcher introduces the technology)?
2. What's your first and overall impression of 3D virtual fitting (after I introduce the technology and you experienced it)?
3. What's your first and overall impression of your own 3D virtual avatar?

APPENDIX H

FITTING ROOM STUDY AND 3D VIRTUAL FITTING STUDY PROTOCOL (CHINESE)

第一部分：服装试穿经验和经历分享

1. 您认为自己懂得如何试穿服装和评价服装合体程度吗？如果您认为自己知道的话，能分享一下您的经验吗？此外，您是如何学习和掌握相关知识和技能的呢
2. 通常您是如何试穿服装的（包括程序和评价标准）？
 - 如何试穿裤装？衬衣？
 - 您会采用何种姿势试穿服装？
 - 您有什么标准和偏好吗？
 - 其他要求呢？
3. 服装合体度和款式偏好
 - 裤装
 - 腰线偏好？
 - 裤腿型偏好？
 - 其他要求
 - 衬衣
 - 长度偏好
 - 领型
 - 袖子
 - 装饰
 - 其他

第二部分：裤装和衬衣试穿实验（独立完成，分享经验）

第三部分：3D 人体扫描

4. 请问您有过人体扫描的经历吗？如果有，请问您有什么感想？
5. 请问您对人体扫描的第一感觉是什么？总体感觉如何？
6. 请问您看到自己的人体扫描图像的第一感觉是什么？总体感觉如何？

第四部分：虚拟裤装和虚拟衬衣试穿实验（独立完成，分享经验）

第五部分：3D 虚拟试穿

7. 请问您有过虚拟服装试穿的经历吗？如果有，请问您有什么感想？
8. 请问您对虚拟试穿的第一感觉是什么？总体感觉如何？
9. 请问您看到自己的虚拟数字化身体的第一感觉是什么？总体感觉如何？

APPENDIX I
IRB APPROVAL



Cornell University
Office of
Research Integrity and Assurance

East Hill Office Building, Suite 320
395 Pine Tree Road
Ithaca, NY 14850
p. 607-254-5162
f. 607-255-0758
www.irb.cornell.edu

Institutional Review Board for Human Participants

TRIENNIAL PROTOCOL APPROVAL- NO FEDERAL FUNDS

To: Yingying Wu
From: Carol Devine, IRB Chairperson *Carol M. Devine*
Protocol ID#: 1306003929
Protocol Title: A Cross Cultural Study of 35-50 Year Old Females Attitudes
Towards Body-Image, Adoption of Clothing as a Body and
Appearance Management Strategy, and 3D Body Scan Technology
Approval Date: May 20, 2014
Expiration Date: May 19, 2017

Cornell University's Institutional Review Board for Human Participants (IRB) has reviewed and approved the inclusion of human participants in the research activities described in the protocol referenced above.

Special Conditions for Triennial Approval of this Protocol: This protocol was granted approval for three years until **May 19, 2017** as it does not involve federal funding and is therefore eligible for Triennial review under the IRB policy #21 (www.irb.cornell.edu/policy). As Principal Investigator for this project, you are responsible for informing the IRB and seeking re-review if at any point during the course of this project, Federal funds may be used to support any part of it. Failure to seek timely review and approval could result in an inability to use research data for the purposes of the Federal grant. Please refer to IRB policy #21 (www.irb.cornell.edu/policy) for more information.

The following personnel are approved to perform research activities on this protocol:

- Yingying Wu
- Susan Ashdown

This approval by the IRB means that human participants can be included in this research. However, there may be additional university and local policies that apply before research activities can begin under this protocol. It is the investigator's responsibility to ensure these requirements are also met.

Please note the following important conditions of approval for this study:

1. All consent forms, records of study participation, and other consent materials **must** be held by the investigator for **five years** after the close of the study.
2. Investigators must submit to the IRB any **proposed amendment** to the study protocol, consent forms, interviews, recruiting strategies, and other materials. Investigators may not use these materials with human participants until receipt of written IRB approval for the amendment. For information about study amendment procedures and access to the Amendments application form, please refer to the IRB website: <http://www.irb.cornell.edu/forms>.
3. Investigators must promptly report to the IRB any **unexpected events** involving human participants. The definition of prompt reporting depends upon the seriousness of the unexpected event. For guidance on recognizing, defining, and reporting unexpected events to the IRB, please refer to the IRB website: <http://www.irb.cornell.edu/policy>.

If the use of human participants is to continue beyond the assigned approval period, the protocol must be re-reviewed and receive continuing approval. As the Principal Investigator it is your responsibility to obtain review and continued approval before the expiration date. Applications for renewal of approval must be submitted sufficiently in advance of the expiration date to permit the IRB to conduct its review before the current approval expires. Please allow three weeks for the review.

Any research-related activities -- including recruitment and/or consent of participants, research-related interventions, data collection, and analysis of identifiable data -- conducted during a period of lapsed approval is unapproved research and can never be reported or published as research data. If research-related activities occur during a lapse in the protocol approval, the activities become a research compliance issue and must be reported to the IRB via an unexpected event form (www.irb.cornell.edu/forms).

****If you do not plan to renew your protocol approval in three years, please provide the IRB with a Project Closure form. A link to the Project Closure form can be found at <http://www.irb.cornell.edu/forms/>.**

For questions related to this application or for IRB review procedures, please contact the IRB office at irbhp@cornell.edu or 255-6182. Visit the IRB website at www.irb.cornell.edu for policies, procedures, FAQs, forms, and other helpful information about Cornell's Human Participant Research Program. Please download the latest forms from the IRB website www.irb.cornell.edu/forms/ for each submission.

Cc: Susan Ashdown

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