The Fit of Men's Dress Shirt Collars

by

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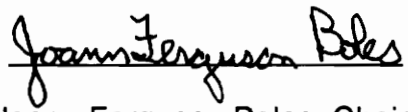

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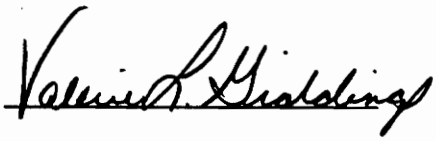

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(ABSTRACT)

The purpose of this research was to investigate the fit of men's dress shirt collars among men 18 years and older and sized small to large. Fit was evaluated by the subject's response to a comfort scale based on physical comfort. Static fit (ease) was determined by subtracting the neck measurement from the collar measurement. Dynamic fit was determined by subtracting the ease for movement from the ease in the collar.

Men from Virginia Tech and the vicinity of Blacksburg, Virginia were asked to participate. One hundred men volunteered for this study.

The data analysis was conducted on 90 of the 100 surveys. Some surveys were eliminated due to incomplete information. Pearson Correlation Coefficient was used to determine if there was a positive correlation between ease and comfort. The data were analyzed with Analysis of Variance to determine if there were significant differences between age groups for perceived comfort or for ease. Analysis of Variance was used to determine if there were significant differences between size groups for perceived comfort, for ease for movement or for ease. Analysis of variance was also used to

determine whether there were significant differences between age groups and size groups for comfort or for ease.

The results of the study showed that 2.2% of the subjects did not have ease in static fit and 4.4% of the subjects did not have ease for movement in dynamic fit. There was a significant positive correlation between ease and comfort. There were significant differences between age groups for perceived comfort but not for ease; there were significant differences between size groups for ease but not for ease for movement or perceived comfort; and there were no significant differences between age groups and size groups for perceived comfort or for ease. Although the median value for ease for movement was 1/4 of an inch, 16 of the 90 men (17.8%) had greater than 1/4 of an inch ease for movement. The results of the present study and Langan's study (1984) indicated that the tie may be the major contributer to neckwear tightness.

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Chapter I

Introduction

Importance of the Study

Many men complain about the pressure caused by dress shirts and ties. Morrow (1978) says "When a man feels ill, the first thing to do is loosen his tie; it is, after all, pressing against the carotid arteries, impeding the flow of blood to the brain" (p. 80). Although the tie and dress shirt may be physically uncomfortable, they are necessities for a man who has to conform to social dress codes for work and social activities.

Society holds strong opinions and preconceived ideas about the shirt and tie. Personal characteristics are even associated with the type of shirt and tie a man wears. Despite complaints, the dress shirt and tie are the standard uniform for men in the business world and other service and professional occupations. Strong acceptance of this social dress code keeps men in shirts and ties (Molloy, 1988).

In order to look neat, the tie requires a shirt that is buttoned snugly at the Adam's Apple (Morrow, 1978). Molloy (1988) states that the collar is the most crucial and problematic area of fit in a shirt. The collar may be too tight if men are wearing the wrong size, if men have gained weight, if men have measured their neck incorrectly, if the shirt has shrunk, or if the neckband styling fits differently.

Langan (1984) determined the incidence of tight neckwear on a group of 94 white-collar working men from law firms and business firms. Sixty-seven

percent of the subjects wore tight neckwear, neckwear that was tighter than their neck circumference. There are over 25 million white-collar working men in the U.S. so tight neckwear may be a great problem .

Neckwear that is not tight has ease, extra length in the neckband and collar. Ease for movement is the amount of ease needed in a garment so that the wearer can move in the garment without restriction. If a collar fits, it should conform to the neck yet allow for freedom of movement. Gioello and Berke (1979) state that 1/4 of an inch is the movement/comfort ease needed in neck girths for men. In actual practice this amount may not be enough for all men.

Comfort is related to ease for movement. If the ease is lacking or insufficient, pressure will be exerted on the neck, and if it is great enough, discomfort will be perceived by the wearer. No studies were found that analyzed the relationship between comfort and ease in dress shirt collars.

Larger and heavier men may have more difficulty finding comfortable fitting shirts because shirt collar ease is not proportional but rather incremental. They may have to compromise comfort. No studies were found that investigated the fit of dress shirt collars among men of different sizes.

The process of aging affects the shape and proportions of the body. With aging, the neck circumference increases and the chest hollows which causes the head to thrust forward (Farmer & Gotwals, 1982). As a result, there is more fullness in the throat. To accommodate the increase in neck circumference, a larger neck size needs to be worn. To accommodate the change in neck shape, the neckline needs to be lowered in the front (Newton & Duffey, 1977) or a larger size needs to be worn. Hogge, Baer, and Kang-Park (1988) studied

clothing for elderly and non-elderly men. More men in the 30-50 years age group than in the over 65 years age group said that dress shirt collars irritated their necks. Whether older men wear shirt collars with more ease to accommodate body changes or older men's perceptions of comfort are different has not been investigated.

Statement of Purpose

The purpose of this study was to investigate the fit of men's dress shirt collars among men 18 years and older and sized small to large. Collar ease, ease for movement, and perceived comfort were measured. This study used objective and subjective methods to assess comfort. Static and dynamic fit were assessed.

Objectives

1. To determine if there was a positive relationship between ease and comfort.
2. To determine if there were significant differences between age groups for comfort, age groups for ease, size groups for comfort, size groups for ease for movement, and size groups for ease, and to determine if there were significant differences between age groups and size groups for comfort and for ease.
3. To determine if the ease for movement in neck circumferences for men was greater than 1/4 of an inch.

Operational Definitions

Dynamic fit - the fit of a garment when the wearer is carrying out the activity associated with the garment under study. Dynamic fit was assessed by comparing ease to ease for movement.

Ease - the extra amount of fabric designed into the garment or the difference in the dimension of a garment and the dimension of the wearer. Ease was determined by subtracting the neck circumference from the neckband length measurement. The neck circumference was taken with the head positioned straight forward in the Frankfort Horizontal Plane, with the pupils, the right tragion (approximated by the earhole), and lowest point of the eye socket placed on the same horizontal level.

Ease for movement - the amount of ease needed in a garment to allow the wearer to move in the garment without restriction. Ease for movement was determined by calculating the difference in neck circumferences: when the head was positioned straight forward in the Frankfort Horizontal Plane and when the head was turned to the right side.

Fit - the relationship between the garment and the body. It is how a garment conforms or differs from the body (Glock & Kunz, 1990).

Grading - process of increasing or decreasing the size of a pattern according to incremental changes taken from a standard sizing system.

Neck measurement - obtained by measuring the neck circumference with the tape measure placed just below the larynx and perpendicular to the long axis of the neck. One neck measurement was taken when the head was positioned in the Frankfort Horizontal Plane and another neck measurement was taken when the head was turned to the side.

Perceived comfort - the fulfillment of physical needs from a garment. A physically comfortable fitting garment is one that has ease for movement and is appropriate for the activity and the environment. Perceived comfort was determined by the subject's answer to the question about the comfort of the dress shirt collar.

Size - was determined by the neck measurement. Sizing is a series of graduated categories of dimensions for a body type whereby clothes are classified. In men's dress shirts, size indicates neck circumference and sleeve length. The sizes were arranged into general body sizes such as small, medium, and large according to neck sizes.

Static fit - the fit of a garment when the wearer is in a stationary stance. Static fit was determined by the amount of ease.

Chapter II

Review of Literature

Historical Development of Men's Neckwear

The practice of wearing ties and collars originated in the seventeenth century when the cravat and stock were introduced (Colle, 1972). Cravats were scarves that were tied around the neck. Stocks were wide neckbands which were often worn over collars (Colle, 1972). Combinations of the collar, stock, and cravat were worn in the mid-seventeenth century. Many layers and wide bands were common.

Collars were worn high and tight until the early twentieth century. They were placed just underneath the chin, partially covering the jaws. Due to the tightness of the stocks, there were cases where soldiers in fighting lost their breath and even died (Renbourn, 1972). Soldiers had frequent illnesses and fainting due to over tightened stocks (Kunzle, 1982). Elderly apostolic gentlemen have fainted and have had epileptic attacks due to the stiff, high collars they wore (Renbourn, 1972). In order to be a white-collar gentleman, one who used brain power instead of muscle, one had to wear dress shirts with stiff collars (Schoeffler, 1973).

The popularity of the high starched, tight collar had diminished by the early 1900's (Kunzle, 1982). The detachable collar was invented in 1827 and was popular until after World War I (Flusser, 1985). Men returned to wearing attached collars because of greater comfort. There has been a greater emphasis on comfort in clothing including dress shirts in the last 50 years.

In 1931 there were only three sizes of neckbands and one single size for sleeve length. Today shirt manufacturers are offering a much wider range of sizes in both neckband and sleeve lengths. With the availability of sizes it seems that men should be able to find well fitting dress shirts.

Tight Neckwear

John Molloy (1988) points out that the collar is the most crucial and problematic area of fit in a shirt. Shirt collar tightness can be due to the wearer or the shirt. Weight gain, incorrectly chosen collar size, inaccurate neck measurements, laundry shrinkage, production shrinkage, and the design of collar and neckband can all result in a tight collar. "Unlike suit size, which changes slowly over time, if at all, a man's shirt size can change rapidly with exercise, weight loss, or overindulgence" (Wilson, 1985, p. 74).

People do not like to admit to gaining weight and having to increase their size. Many people do not change sizes which results in the wearing of tight clothing. A periodic size check has been recommended (Molloy, 1988).

The design of a shirt neckband and collar may contribute to neckwear tightness and pressure on the neck. The number of fabric and interlining layers and how they are cut can affect shirt neckband and collar tightness. The differential shrinkage of the many fabric layers can cause the outer edges of the band to curve in towards the center exerting pressure on the neck. The shape of the band can be straight or curved. The front height, curve of the band at center front, and the center back height can vary. The closer the relationship between the contour of the neck and the shape of the band, the better the band

and collar will fit. The wearer's neck shape can affect the fit of the neckband. The thickness, cut, quality, and weight of the collar can affect shirt neckband pressure (Langan, 1984). A collar should have a cape, the part of the collar that falls over the band seamline. If the shirt does not have a collar cape it will not allow enough room for a tie to fit neatly, and may cause pressure on the neck.

The amount of ease is one of the most crucial aspects of the collar and neckband design. Ease provides room for movement. Sylvia Payton, senior pattern designer at the Arrow Shirt Company stated that in general, the shirt manufacturing industry designs collar bands with 1/2 of an inch ease, but this value varies and depends on the residual shrinkage (personal communication, March 31, 1993).

The ease is supposed to provide the wearer with room for moving and breathing, but by the time the shirt has been manufactured, not much ease is left due to production and laundry shrinkage. Furthermore, by the time the consumer has worn the shirt and washed it, there may not be any ease left, and the neckband may be tight. At the Arrow Shirt Company, the cut-off point for acceptance is plus or minus 1/8 of an inch for the neckband measurement (S. Payton, personal communication, March 31, 1993).

The United States Department of Commerce (1952) has a voluntary commercial standard (187-52) for minimum measurements. For collarband length, the measurement should be at least the length on the label. The minimum measurements are applicable to fabrics having no more than 1 percent residual shrinkage as tested with the Commercial Standard CS59-44, Textiles-Testing and Reporting shrinkage test method issued by the U.S. Department of Commerce (1944). If the fabric has more than 1 percent residual

shrinkage, the manufacturer should make proper shrinkage allowances.

There are many factors that cause shirt shrinkage. Differential shrinkage is due to the a variety of fabrics used together and shrinking in different amounts. Manufacturers try to prevent this differential shrinkage. Another type of differential shrinkage occurs when the thread shrinks at a different rate than the fabric. Whether tight neckwear is caused by shrinkage, the wearing of incorrect size, or any of the other forementioned problems, harmful physiological results may occur.

Men's Tight Neckwear and Relation to Neck Pressure

The neck is one area of the body that suffers from pressure of clothing. "Anything tight on the trunk of the body interferes with the movements of deep easy breathing and injures our health. Tight clothing is bad because it also interferes with the proper circulation of the blood through the body" (Denton, 1971, p. 17). Denton states that the pressure the garment places on the body causes the blood pressure of the capillaries near the affected skin surface to be at a similar, elevated pressure.

Tight collars may obstruct respiration and breathing. The pressure of a tight collar on the carotid sinus may produce a decline in the blood pressure and cause fainting (Renbourn, 1972). Morrow (1978) believes that the shirt and tie impede blood flow to the brain by pressing against the carotid arteries. From his clinical experiences, Lutz (1981) hypothesized that tight neckwear produced compressive atherosclerotic angiopathy of the carotid arteries. Lutz found "a much higher prevalence of atherosclerotic carotid artery disease in men than in

women" (p. 326). In a self diagnosed case study, a hypertension patient found that a tight turtleneck shirt caused faintness and hissing tinnitus, and that unzipping the turtleneck relieved the dizziness (Gott, 1985).

In Langan's study (1984), the potential for tight neckwear to affect blood flow to the eyes was explored. An ophthalmologist observed the retinal vein of a single subject using an ophthalmoscope, while tightness of a shirt collar band was increased. Pulsation of the retinal vein ceased completely when the collar band was tightened 5/8 of an inch less than the neck measurement, and pulsation returned immediately when the band was released. The cessation in blood flow indicates the potential for long term visual damage (Langan, 1984). The amount of 5/8 of an inch was thought to be a critical value for the neck tightness that could inhibit blood flow to the eyes. Also in Langan's study, the incidence of tight neckwear (collar and tie) was determined on a group of 94 white-collar working men. Sixty-seven percent of the men were found to wear tight neckwear. Greater than half of the neckwear tightness was due to the tie. The average tightness measured was 3/16 of an inch, and 12% of the subjects had greater than 1/2 of an inch of tightness.

The final part of Langan's study (1984) involved measuring visual discrimination using the Critical Flicker Frequency visual test on a group of 22 white-collar working men. Results of the visual test showed that tight neckwear significantly decreased the visual discrimination of subjects, and visual discrimination did not improve immediately following the removal of tight neckwear. The results of Langan's study suggest that there is a problem with the design and fit of the dress shirt collar and tie which may be harming a

considerable number of men.

The pressure that tight neckwear exerts on the wearer may affect his respiratory, circulatory, and visual functioning in addition to his assessment of comfort/discomfort. Comfort will be discussed in the following section.

Comfort

Slater (1986) states that humans constantly try to maintain or improve their level of comfort. Comfort is difficult to quantitatively define because it is so subjective. One qualitative definition of comfort is "a pleasant state of physiological, psychological, and physical harmony between a human being and the environment" (Slater, 1986, p. 158).

"Comfort's Gestalt" is a concept that explains the comfort/discomfort response (Pontrelli, 1977, p. 71). The interaction between physical, physiological, and psychological stimuli, and stored modifiers yields the comfort/discomfort response. Physical variables include environment, transport properties, level of activity, and garment. Examples of garment properties are fit/stretch, fabric construction, and fiber content. Psycho-physiological variables include state of being, end-use, occasion of wear, style, fit, and tactile aesthetics. Stored modifiers include past experiences, expectation, and life style.

Slater (1986) discusses objective and subjective measurements of comfort. An objective measure involves use of instruments and does not require opinions of subjects. A subjective measure involves only the opinion of the subject. Objective measures are generally simpler to perform and yield

more accurate and precise results than subjective measures. A decision needs to be made whether a subjective or an objective method of assessment would be most suitable for the particular situation.

Fit is an aspect of physical and psycho-physiological comfort. Closeness of fit can be achieved by shaping the fabric to conform to curved surfaces. If the fabric on a close fitting garment is nonextensible, it will be uncomfortable if ease for movement is not provided. Close fitting garments made of nonextensible fabrics without ease for movement may be comfortable in one position, but once the wearer moves, the fabric will pull and buckle to accommodate movement and exert pressure on the body. If the pressure is great enough, the wearer will perceive discomfort. Adequate ease or stretch fabric can be included in the design of a garment to allow for ease for movement. Although the collar of the dress shirt conforms to the curved surface of the neck, there must be enough ease to allow for movement in order to be comfortable.

Body Movement

Body movement is described in reference to planes, axis of rotation, and the anatomical position (Watkins, 1984). The changes in body measurements that result from movement need to be incorporated into garment ease. It is necessary for the collar to have enough ease to allow the wearer full range of neck motion.

Kirk and Ibrahim (1966) studied the relationship between garment fit and skin extensibility during body movement. The actual amount of skin extension was measured to determine the amount of strain that would be put on fabric.

The critical areas identified were the knee, seat, back,and elbows.

If a garment does not adapt to body movement, pressure will be exerted against the body and the garment will not fit the wearer. Fit will be discussed in the following section.

Fit

All people want good fit in their clothing. Fit is the relationship between the garment and the body. It is how a garment conforms to or differs from the body. The definition of good fit may change, but comfort is always desired (Farmer & Gotwals, 1982). People want their clothes to provide an attractive appearance, freedom of movement, and fashion. Individuals have opinions about what is comfortable, what looks good, and what is right for them. Good fit is achieved when the garment is comfortable and flattering. Farmer and Gotwals state that good fit should be considered a "process that meets the clothing needs of people" rather than a product (Farmer & Gotwals, 1982, p. 5). Korda (1977) states that the fit of a suit is more important than the cost. Farmer and Gotwals hypothesize that proper fit in clothing is related to success in the professional world.

Garment fit can be assessed objectively or subjectively, in terms of functional ease or ease for movement, garment ease, comfort, and appearance (Prevatt, 1991). Garment fit is the relationship between the size and shape of the garment and the size and shape of the body. Garment fit can be divided into static and dynamic fit. Static fit is assessed with the wearer in a stationary stance and dynamic fit is assessed with the wearer carrying out the activity

associated with the garment under study. A comparison of subjective and objective measurements of both static and dynamic fit are used to develop sizing scales and specification tables (Prevatt, 1991).

Flusser (1985) states that comfort should be considered first in fitting a shirt. "The neckband should fit snugly so that the collar doesn't fall down the neck, with an air space of one-quarter inch in front, allowing the head to turn without chafing the neck" (Flusser, 1985, p. 79). Flusser states that 80 percent of men are wearing dress shirts with tight neckbands. If the neckband is too tight, the collar spreads, creating a larger space in the center.

Good fit is achieved with adequate ease for comfort but not too much so that the fabric wrinkles, folds, or bulges. The difference in the dimension of a garment and the dimension of the wearer is the amount of ease, comfort ease and or styling ease. The amount of ease desired depends on the size, age of the wearer, style of the garment, and fashion (Farmer & Gotwals, 1982). Race and ethnicity can also affect the concept of fit. Farmer and Gotwals hypothesize that the more an individual identifies with one's race or ethnic group, the more one adopts the group's standards of fit.

Comfort ease is the additional dimensions added to a garment which is needed for mobility and is determined by the patternmaker and the grader who are influenced by the fabric properties, the structure and design, the end use, and traditions. Each manufacturer has it's own standards for fit. The amount of ease necessary for the wearer to feel comfortable depends upon mobility requirements, style of garment, and fabric. Rigid fabrics require more comfort ease than stretch fabrics (Glock & Kunz, 1990).

Gioello & Berke (1979) give the movement/comfort ease for body measurements in males and females. They state that 1/4 of an inch is the movement/comfort ease in neck girth for men. However, the movement/comfort ease in neck girth for women is 1/4 -1/2 of an inch. Movement/comfort ease for children is 1/4 of an inch. Farmer & Gotwals (1982) indicate that the amount of ease needed in the neck for men and boys is 1/2 of an inch. No mention of the variability of movement ease is given in either reference. Farmer and Gotwals state that no ease is needed in the shirt sleeve length because the elbow is slightly bent when measuring.

Styling ease or design ease, in addition to wearing ease, provides the look the designer wants. It is the amount of extra fabric needed to achieve the design of the garment. In a dress shirt neckband and collar, not much styling ease is needed or desired, but there should be movement/comfort ease. Designers and patternmakers make allowances in the garment for comfort ease, styling ease, fabric type, and garment use (Glock & Kunz, 1990).

The label with sizing information and garment structure are indicators of how a garment will fit. "Examination of garment structures reveals the general silhouette of a garment, number and placement of limited fit point, and amount, placement, and control of fullness" (Glock & Kunz, 1990, p. 107). Generally, the closer the silhouette contours the body, the more limited the garment will be in accommodating different body proportions (Glock & Kunz, 1990). Areas of the garment that are rigid and do not expand or contract to accommodate body shapes will limit the body types and proportions that it will fit. One of those rigid areas in a man's dress shirt is the collar and neckband.

Fit can be evaluated subjectively by the wearer as the ability to move in

the garment without restriction. Garments that bind and those that are too large or loose affect the quality of fit. Fit can be evaluated objectively by having the wearer go through specified movements and determining the differences in the dimensions of the garment and the dimensions of the body.

During the production of the garment, there may be changes in the dimensions of the garment. The causes of variation could be: fabric distortion in spreading, sewing, or pressing; inaccurate cutting and sewing; and shrinkage from heat, steam, or fusing. Product tolerance is the minimum and maximum acceptable variation in the dimensions of the garment. Specifications for fit are sets of measurements determined by the manufacturer for each size and style that the garment must meet in order to pass inspection. The labels are guides for consumers in the selection of proper fitting garments (Gioello & Berke, 1979). The garment label should have the correct size or else the garment may not fit the wearer. The shrinkage should be slight but can be potentially significant when the shirt is laundered the first time (Wilson, 1985). Allowances for shrinkage should be made by the manufacturer.

Sizing

Sizing is a series of graduated categories of dimensions for a body type whereby clothes are classified (Glock & Kunz, 1990). Body type is the basis of the sizing systems and are classified by proportional relationships between body parts. The sizing systems are classified by age and gender. Examples are: infants, toddlers, boys, girls, juniors, women's, and men's. Some additional body types are petite, tall, and large. There are differences in body

measurements, shapes, and contours between people. Apparel sizing is based on average measurements to provide good fit for the greatest number of people. Therefore, ready-to-wear apparel does not provide good fit for everyone.

Size is indicated by a word, letter, or number (Glock & Kunz, 1990). Size can indicate general body sizes such as small, medium, and large. Proportional relationships among body parts, age to height to weight, height to weight, and dimensional sizes of body parts are other sizing systems. Dimensional sizing of body parts is used in men's dress shirts. Shirts are sized with two body measurements, neck circumference and arm length. For long sleeve shirts, arm length and neck circumference are used, but for short sleeve shirts, only neck circumference is used. European dress shirts are also sized by only the neck circumference.

Grading is the process of increasing or decreasing the size of a pattern according to incremental changes taken from a standard sizing system. Collars come in increments of 1/2 of an inch, and sleeve lengths come in increments of 1 inch. The only measurement that is graded in the collar is the length. There is an incremental 1/2 inch grade difference between shirt collar sizes: 14, 14 1/2, 15, 15 1/2, 16, 16 1/2, 17, 17 1/2 (Handford, 1980).

Generally for each collar size, three sleeve length sizes are available. For regular size dress shirts, neck sizes range from 14 to 17 1/2 and sleeve sizes range from 32-36. Gioello & Berke (1979) separate men's sport shirt sizes by XS, S, M, L, and XL according to neck circumferences. Neck measurements of 13-13 1/2 inches fit into XS; 14-14 1/2 inches fit into S; 15-15 1/2 inches fit into M; 16-16 1/2 inches fit into L; 17-17 1/2 inches fit into XL. Men's patterns

are made for the average built 5' 10" man and sized according to chest size. Each size has a corresponding neckband measurement: size 34 has a 14 inch neckband; size 36 has a 14 1/2 inch neckband; size 38 has a 15 inch neckband; size 40 has a 15 1/2 inch neckband; size 42 has a 16 inch neckband; size 44 has a 16 1/2 inch neckband; size 46 has a 17 inch neckband; and size 48 has a 17 1/2 inch neckband.

Some shirt manufacturers offer "big man sizes" and "tall man sizes". The sizing system is the same as "regular sizes" and uses neck and sleeve measurements. The chest measurements are larger but usually not stated on the label. Neck sizes up to 28 1/2 inches are available.

The United States Department of Commerce (1952) has a voluntary commodity standard (187-52) for men's work shirt sizes which is used today. The purpose of this standard is to provide standard size specifications, methods of measuring, and standard minimum measurements for men's dress shirts. This standard aims to eliminate confusion among manufacturers, retailers, and consumers. Standard methods of measuring are given for chest, front and back length, armhole, side length, sleeve, sleeve length, and cuff length. The garment should be laid out flat without tension. Measurements are taken to the nearest 1/4 of an inch except for the collarband which is taken to the nearest 1/8 of an inch. To measure the collarband length, lay the collar flat, measure from the outside end of the buttonhole on the inside of the bar to the center of the button (see Figure 1).

The minimum measurement for the collarband is the neck size stated on the shirt label (United States Department of Commerce, 1952). This

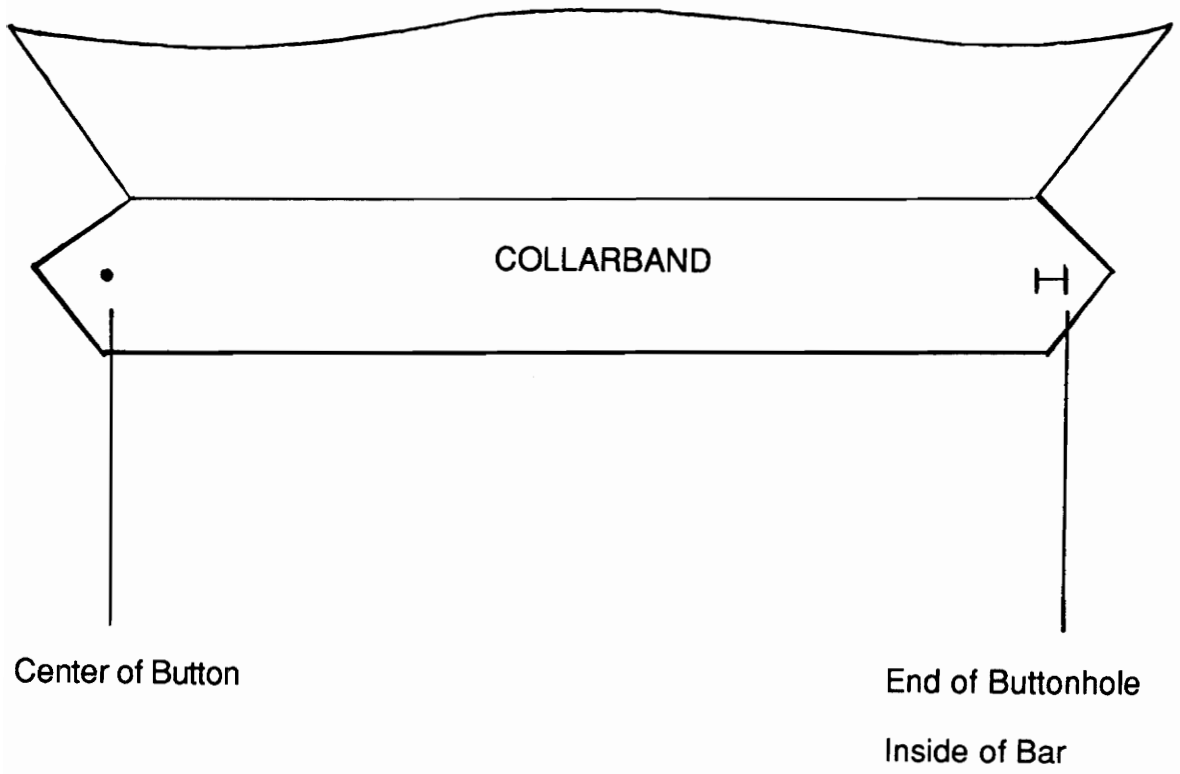

Figure 1.

Collarband Measurement

measurement is applicable to fabrics with 1 percent or less residual shrinkage using the test method in Commercial Standard CS59-44, Textiles-Testing and Reporting (United States Department of Commerce, 1944). For fabrics with greater than 1 percent residual shrinkage, manufacturers are recommended to make proper shrinkage allowances.

The apparel industry does not have mandated sizing standards, standards of fit, or sets of dimensions specifying garment sizes (Glock & Kunz, 1990). It is up to the manufacturer to determine sizing and fit standards with tolerances for variation. There are U.S. standards available for some body types based on a 1940 anthropometric survey. Since 1940, there have been changes in nutritional and exercise behavior that have affected changes in sizes and shapes of Americans (Glock & Kunz, 1990). Patterson and Warden (1983) studied selected body measurements of women sixty-five and older. The study was based on O'Brien and Shelton's (1941) study which is the basis for the present voluntary women's garment sizing system. The results showed that 25 of the 33 body measurements differed from those of the 1941 study. Differences included all of the trunk girths: bust, waist, abdominal extension, and hip girth measurements. There is a need for anthropometric studies of different ages and ethnic backgrounds in order to come up with up-to-date industry sizing standards (Glock & Kunz, 1990).

Chowdhary & Beale (1988) found that the greatest problems in ready-to-wear for plus size women were size and fit. The smallest sized women and youngest aged women investigated in their study were most satisfied.

Farmer and Gotwals (1982) state that there is much dissatisfaction with

the fit of mass produced garments. In the past custom-made garments were common, but today they are too expensive for most people. Technology has not yet customized clothing at affordable prices, but the potential for affordable customized design via computer aided design is being researched.

Neck Measurement

"Circumferences should be recorded with the zero end of the tape held in the left hand above the remaining part of the tape held by the right hand" (Callaway et al., 1988, p. 39). The differences within and between observers in positioning of the zero on the measuring tape can affect the reliability. The amount of tension on the tape also affects the reliability and validity of the measurements. The authors stated that the tape should be held snugly around the body part to be measured, but not so tightly as to compress the subcutaneous adipose tissue. The recorder and measurer should observe to see that the tape is not indenting the skin. To control intra and inter-measurer reliability, the tape should be properly positioned and the tension applied should be consistent. Callaway et al. recommended the minimal neck circumference technique. The subject's head is in the Frankfort Horizontal Plane: "The pupils on the same horizontal level, the right tragion (approximated by the ear hole) and the lowest point of the right orbit (eye socket) are also placed on the same horizontal plane" (Kroemer, Kroemer, & Kroemer-Elbert, 1990). The measurer stands on the left side of the subject. "A self-retracting inelastic tape is applied around the neck just below the larynegeal prominence (Adam's Apple)," (Callaway et al., 1988, p. 41). The tape measure should be

placed at "right angles to the long axis of the neck" (Callaway et al., 1988, p. 42). The measurement is made to the nearest 1/8 of an inch and should be done in less than 5 seconds to avoid discomfort to the subject. Farmer and Gotwals (1982) stated that the neck is measured at the Adam's Apple.

In Langan's study (1984) a flexible stay measuring device was used to take neck measurements. The measuring device was placed between the neck and the rim of the collar to measure the neck circumference when the shirt collar was buttoned and tie knotted. While the researcher held the tape in place, the subject unknotted his tie. The neck measurement with the shirt collar buttoned and tie unknotted was then taken. While the researcher held the tape in place, the subject unbuttoned the top two buttons and removed his tie. The neck measurement with shirt collar unbuttoned and tie removed was then taken.

There is some discrepancy in the methods of neck measurement. There are various methods tailors use to measure neck size. Tailors will add roughly half an inch to a neck measurement to come up with the neck size.

Anthropometric Variation

Variability in anthropometric data can result from inter-individual variations, intra-individual variations, and secular changes (Kroemer, Kroemer, & Kroemer-Elbert, 1990). Inter-individual variations are determined by genetics. An individual's genes determine his or her physical characteristics. There are statistically significant anthropometric differences between ethnic groups (Kroemer, Kroemer, & Kroemer-Elbert, 1990). Intra-individual variations or an individual's body size is influenced also by the environment and nutrition.

Secular changes are the changes in anthropometric data that occur with time. Factors that contribute to secular changes are living conditions, hygiene, and nutrition.

Body changes with aging is intra-individual anthropometric variation. The body changes as it progresses throughout life, and the natural changes that occur after adolescence are gradual. Pre-adolescents and adolescents grow so rapidly that fit is a continuing challenge. Different age groups have different fitting problems. Fit can be a problem with adults who are obese or disabled (Farmer & Gotwals, 1982). Body changes can affect size, shape of the body, and proportion of the body (Farmer & Gotwals, 1982).

There are body changes in the middle years such as weight gain; hair graying, balding (mostly on men) ; wrinkles developing; bust, waist, hips, and thighs enlarging in women; bustline sagging in women; abdomen and hips enlarging in men; shoulders rounding; body fat migrating downward; buttocks flattening, especially in women (Farmer & Gotwals, 1982). Farmer and Gowals (1982) state that these changes are affected by heredity and environment, and the changes due to heredity may be delayed by good nutrition, attitude, and exercise.

In the later years there is much more physical, social, and psychological variation among people (Farmer & Gotwals, 1982). The body changes that began to occur in the middle years continue on in the later years. In addition the body thins as muscle tone decreases. This causes legs and arms to become less shapely. The skin becomes dry, thin, inelastic, and more sensitive (Rosenblad-Wallin & Karlsson, 1986). The skin becomes more yellow in tone. Due to the thinning skin, blood vessels are more visible through the skin. Blood

pressure increases and blood flow decreases (Rosenblad-Wallin & Karlsson, 1986). The joints begin to stiffen, reducing the mobility in arms and fingers. The posture slouches further which thrusts the head forward, increases neck circumference, and hollows the chest (Farmer & Gotwals, 1982). The length of the back increases as the spine bends (Rosenblad-Wallin & Karlsson, 1986). When the head is thrust forward, there is more fullness in the front of the throat, and to accommodate this change, the neckline needs to be lowered in the front of the neck (Newton & Duffey, 1977). Height is reduced (up to 5 inches) due to slouching posture and reduction of cartilage in the spinal column (Goodrick & Meadors, 1977). The body also becomes more susceptible to extreme hot and cold (Farmer & Gotwals, 1982).

Rosenblad-Wallin & Karlsson (1986) state that the body circumferences and weight increase with age. Khoury, Morrison, Mellies, and Glueck (1983) studied the weight changes since 18 years of 30-55 year old black and white men and women and found that weight gain is associated with aging, and the amount of weight gain is related to race and gender (Khoury et al, 1983). The mean weight gain was greater for men than for women. Black women had greater weight gain than black men and almost twice the weight gain of white women. Black men had slightly greater weight gain than white men.

Physiological changes affect size, fit, style, and needs of clothing. Reich & Otten (1991) state that the skin becomes thinner, drier, and more susceptible to irritants as the skin ages. Fabric abrasion can be caused by tight clothing and rough textures. Physiological changes due to aging influence the fit of clothing and the selection of design and fabric (Reich & Otten, 1991).

Arthritis mostly affects people over 50 years of age (Grazier, Holbrook, Kelsey, and Stauffer, 1984). People with arthritis need to assess clothing fit, garment style, and fastening system to facilitate dressing and provide comfort (Reich & Otten, 1991).

Many studies have been conducted on the clothing problems of elderly women, but few studies have focused on elderly men's clothing needs. Tate and Glisson (1963) stated that elderly men, due to physical changes of the body, have difficulty wearing the same sizes as younger men. The older men said that collars were uncomfortable to wear. The authors reasoned that it was due to the network of wrinkles formed at the base of the neck.

Margerum, Walker, and Kernaleguen (1977) interviewed men 19 to 76 years old about their clothing. They found that men were dissatisfied with the sizing and fit of their shirts. The men did not like the nonstandard sizes and complained about inadequate shirttail lengths.

Hogge, Baer, and Kang-Park (1988) studied clothing for elderly and non-elderly men. More men in the 30-50 year old age group than in the over 65 year old age group said that dress shirt collars irritated their necks. The researchers pointed out that the findings contradicted Tate and Glisson's (1963) statement that some older men find dress shirt collars uncomfortable to wear because of the network of wrinkles formed at the base of the neck. This finding was unexpected since older men had experienced some physical changes. The researchers explained their findings by saying "perhaps older men have fewer comfort problems than expected or can more easily avoid uncomfortable clothing now they are retired. They may no longer have to wear a buttoned shirt

collar and tie daily" (Hogge, Baer, & Kang-Park, 1988, p. 51). Hogge and Baer (1986) found similar results on clothing fit for a group of elderly women. It may be that the older men and women wore looser fitting clothes or they did not perceive fitting problems even though they existed. This finding may indicate that the concept of fit differs among people of different ages. Hogge, Baer, & Kang-Park (1988) also found a correlation between age groups and fitting problems in ready to wear dress shirts. The older men reported problems with sleeves being too long or short and shirt tail length being too short. The younger men had problems with the sleeves being too long or short, shirt tail length being too short, and waistline being too large. Problems in the waistline, hipline, and length of shirts were reported more often by the younger men. Regardless of age, both groups wanted correct fit.

Hogge, Baer, and Kang-Park (1988) also found that fit was the most important garment characteristic among younger and older men. The younger men in this study ranked fit, design/style, and color as the most important garment properties while older men ranked design/style as eighth most important. The researchers stated that the older men in this study were retired and living on a restricted income. The younger men were working in a competitive business world so they were more concerned with the design/style of their garments. In Grey's study (1966), poor fit was identified by men 65 years and older as the most important reason for disliking a garment. The most frequent reasons for liking clothes were fit, appearance, comfort, and warmth/coolness. Further studies are needed to identify clothing preferences and needs of elderly men and how well these needs are being met.

Chapter III

Statement of the Problem

Purpose

The purpose of this study was to investigate the fit of men's dress shirt collars among men 18 years and older and sized small to large. Collar ease, ease for movement, and perceived comfort were measured. This study used objective and subjective methods to assess comfort. Static and dynamic fit were assessed.

Conceptual Framework

The ease in a dress shirt neckband is necessary to allow freedom of movement. Movement of the head and neck causes the neck circumference to expand. If there is no ease, the collar will put pressure on the neck and be uncomfortable. The greater the ease, the less pressure thus the greater the physical comfort should be.

Comfort is comprised of three components: physiological, psychological, and physical. Mental prioritizing of the aspects of comfort varies among people and may also vary among men of different ages.

Younger men may be more interested in appearances thus wearing shirts with little ease. They may not consider a shirt with a great deal of ease comfortable because it does not look neat.

As people age, their neck circumference increases and their neck shape changes. The skin in the neck area becomes more sensitive. Older men may

have to wear larger sizes to accommodate changes in neck size and shape and sensitive skin. Therefore, they may find collars more comfortable than younger men. Older men may have to compensate and give up some psychological comfort for physical and physiological comfort.

Larger sized men need more ease for movement then smaller sized men. Sizes are graded incrementally and not proportionally so there may not be adequate ease for certain sizes, especially the extremes. Larger sized men may have difficulty finding a large enough size causing comfort problems related to ease in their collars. This concept is reversed for smaller sized men.

Following this conceptual framework, older and smaller sized men may have less comfort problems and more ease in their collars than younger and larger sized men. The younger and larger sized men may have more comfort problems and less ease in their collars than older and smaller sized men.

Objectives

1. To determine if there was a positive relationship between ease and comfort.
2. To determine if there were significant differences between age groups for comfort, age groups for ease, size groups for comfort, size groups for ease for movement, and size groups for ease, and to determine if there were significant differences between age groups and size groups for comfort and for ease.
3. To determine if the ease for movement in neck circumferences for men was greater than 1/4 of an inch.

Hypotheses

1. There will be a siginifcant positive relationship between ease and comfort. The greater the ease, the more physically comfortable the dress shirt collars will be.

2A. There will be significant differences between age groups for comfort. Men of the oldest age group will perceive their dress shirt collars more comfortable than men of the youngest age group.

2B. There will be significant differences between age groups for ease. Men of the oldest age group will have more ease in their dress shirt collars than men of the youngest age group.

2C. There will be significant differences between size groups for comfort. Men of the largest size group will rate their dress shirt collars less comfortable than men of the smallest size group.

2D. There will be significant differences between size groups for ease for movement. Men of the largest size group will have greater ease for movement than men of the smallest size group.

2E. There will be significant differences between size groups for ease. Men of the largest size group will have less ease in their dress shirt collars than men of the smallest size group.

2F. There will be significant differences between age groups and size groups for comfort. Men of the largest size group and of the youngest age group will find their dress shirt collars to be less comfortable than men of the smallest size group and of the oldest age group.

2G. There will be significant differences between age groups and size groups

for ease. Men of the smallest size group and of the oldest age group will have more ease in their dress shirt collars than men of the largest size group and of the youngest age group .

Assumptions and Limitations

Assumptions.

1. Measurer differences were eliminated by having only one measurer.
2. Subjects stated their actual age.
3. The question on comfort was a good measure of the fit aspect of physical comfort.
4. Subjects were able to recall the fit of their dress shirt collars.

Limitations.

1. The sample was a volunteer sample.
2. The number of age and size groupings were limited by sample size. Cells for age and size were at times uneven and at other times collapsed.
3. Subjects rated comfort from memory rather than trial.

Chapter IV

Methods and Procedures

The purpose of this study was to investigate the fit of men's dress shirt collars among men 18 years and older and sized small to large. Collar ease, ease for movement, and perceived comfort were measured. This study used objective and subjective methods to assess comfort. Static and dynamic fit were assessed. Data were collected in the forms of a questionnaire and measurements of the neck and shirt collar. The sample consisted of male volunteers.

Pretest

Pretests were conducted to develop the shirt and neck measuring methods, comfort scale, and questionnaire. The pretest subjects were volunteers from Virginia Tech.

Neck measurement pretest.

Neck movement and circumference measurements were carried out on 4 volunteer male subjects to determine the movement that created the maximum neck circumference. The neck circumference was measured in several different neck positions: head tilted forward, head tilted back, head tilted to the side, and head turned to the side. The turn to the side resulted in the largest ease for movement so that movement was used for the study. In this position some men had greater than 1/4 inch ease for movement and maximum neck

circumference. Thus, the head turned to the side became the position measured for ease for movement.

Comfort scale pretest.

A questionnaire including a comfort scale was developed. The comfort scale was developed from a response to "What do you consider comfortable fit in dress shirt collars?" The resulting comfort scale was based on responses to this question. This initial scale was tested on 5 volunteers. This comfort scale was adopted when results indicated that it discriminated. The remainder of the questionnaire was given only to group 1 (8 volunteers). The results led to the elimination of questions not pertinent to the objectives of the study.

Final pretest.

Before starting the data collection, a final pretest was done. This was to detect any problems or deficiencies that might exist with the procedures. The questionnaire was given to 15 men. Neck measurements were made on these men and neckband measurements were made on their shirts. This allowed the researcher to practice and expedite the data gathering process. The results showed no further problems with the procedures.

Human Subjects Approval

Exempted approval for the research was granted by the Virginia Tech Institutional Review Board on Research Involving Human Subjects. An informed consent form was developed and given to each subject to read and

sign (see Appendix A).

Sample Selection

The population was men aged 18-65 plus years old who wore dress shirts. The sampling method was non-probability . A convenience sample was used.

The volunteer subjects were from Virginia Tech and the vicinity of Blacksburg, Virginia. For the analysis, there were five age groups: 18-24 years; 25-34 years; 35-44 years; 45-54 years; and 55-65 plus years. Except for the last age group, the breakdown of the labor force by age was patterned after the Bureau of the Census (1990). Sixty-five years was changed to 65 plus years to allow men older than 65 years to participate. All five age groups were kept for the analysis however, when the two way Analysis of Variance was carried out, age groups 4 (45-54) and 5 (55-65+) were combined because an empty cell was found. In order to statistically analyze size, the five size groups adopted from Gioello and Berke (1979) were collapsed to 3 size groups, small, medium, and large, eliminating extra small and extra large.

Members of the Cadet Corp who had a dress shirt as part of their uniform became the sample of men aged 18-24 years. Permission to involve the Cadet Corp in the study was granted by the Commandant. Men 60 years and older were solicited from the membership of the American Association for Retired Persons (AARP) and residents of Warm Hearth Village for retired persons.

Each subject was asked to make an appointment. Most of these initial contacts were made in person. The subjects were informed that they would

have to bring in one of their most frequently worn dress shirts, fill out a survey, and have a neck measurement taken.

Nearly 100% of the men who were asked to be in the study participated. The high response rate was attributed to making contacts in person as opposed to phoning. Each subject was asked to provide names of other men who might participate. Some subjects made personal introductions to potential subjects. Data collection from the Cadet Corp was organized and facilitated by a student commander.

One hundred men participated. Ten of the surveys were not used. Unusable questionnaires belonged to subjects who brought in sport shirts instead of dress shirts (4), subjects who had worn their dress shirt less than once a month (2), and subjects who brought in dress shirts in European and Boys sizing systems (4).

Administration

Another researcher was present at the appointments to record shirt content information and to act as a witness. While the subject was completing the informed consent form (see Appendix A) and questionnaire (see Appendix B), the assistant recorded the neck size and brand of the shirt (see Appendix C). The investigator measured the shirt neckband length. The shirt neckband and collar were layed out flat, the zero of the *Lafayette* measuring tape was placed on the center of the button on the inside of the shirt, and the tape was pulled along the bottom of the neckband to the far side of the buttonhole, within the bar (see Figure 1).

Next the subject's neck measurement was taken. It was measured with

the subject's head facing straight forward in the Frankfort Horizontal Plane and then facing to the right side. The neck circumference was measured with a *Lafayette* measuring tape and was recorded in inches to the nearest 1/8 of an inch. The tape was placed around the neck, perpendicular to the long axis of the neck, just below the Adam's Apple. The tape was held snugly around the neck but not tight enough to compress the skin. The researcher attempted to keep the tension the same between subjects. The measurement was done in less than approximately 5 seconds to avoid discomfort.

Data Analysis

Variables.

Age and size were the independent variables. Ease, perceived comfort, and ease for movement were the dependent variables (see Table 1). The type of statistics used to analyze the data were Pearson's Correlation and Analysis of Variance. The statistical computer program used was Number Cruncher Statistical System, Version 5.03 (Hintze, 1990).

Scale of measurement.

Age was categorized on an ordinal level: 18-24 years, 25-34 years, 35-44 years, 45-54 years, 55-65 plus years.

Ease was measured on a ratio level.

Ease for movement was measured on a ratio level.

Perception of comfort was measured on an ordinal level of quantification: 1 (least comfortable), 2, 3, 4, 5 (most comfortable).

Size was measured on an ordinal level: small (13-14+ inches neck circumference); medium (5-15+ inches neck circumference); large (16-17+ inches neck circumference).

Analysis of related objectives & variables.

1. To determine if there was a positive relationship between ease and comfort. Ease was calculated using the following formula: ease = neckband length - neck circumference (head positioned straight forward in the Frankfort Horizontal Plane). Comfort was determined by the wearer's response to the question of perceived comfort. Ease was correlated with comfort using Pearson Correlation Coefficient.
2. To determine if there were differences between age groups for comfort, age groups for ease, size groups for comfort, size groups for ease for movement, and size groups for ease, and to determine if there were significant differences between age groups and size groups for comfort and for ease. Information on age and size were taken from the questionnaire and data sheet. The statistical procedure used was Analysis of Variance.
3. To determine if the ease for movement in neck circumferences for men was greater than 1/4 of an inch. The percentage of men with greater than 1/4 of an inch ease for movement was determined.

Table 1

Relations among Objectives, Hypotheses, & Variables

	Variables
Objective #1 & Hypothesis #1	ease, perceived comfort
Objective #2 & Hypothesis #2	age, size, ease, ease for movement, and perceived comfort
Objective #3	ease for movement

Chapter V

Findings

The purpose of this study was to investigate the fit of men's dress shirt collars among men 18 years and older and sized small to large. Collar ease, ease for movement, and perceived comfort were measured. This study used objective and subjective methods to assess comfort. Static and dynamic fit were assessed. Men from Virginia Tech, AARP, and Warm Hearth Village were asked to participate. Questionnaires were given to, and neck and shirt measurements were taken on, 100 men from the Blacksburg, Virginia area. Almost 100 percent of the men asked to participate cooperated. Ninety of the 100 surveys were suitable for the statistical analysis using Number Cruncher Statistical System, Version 5.03 by Hintze (1990).

Factor Variables

Age.

The male subjects ranged in age from 18 to 89. The ages were divided into the following groups: 18 to 24 (group 1), 25-34 (group 2), 35-44 (group 3), 45-54 (group 4), and 55-65 plus (group 5). The largest percentage (37%) was in the 18 to 24 age group (see Table 2). The 25-34 age group contained 18% of the sample. The 55-65 plus age group contained 17% of the sample. The 35-44 age group and 45-54 age group both contained 14% of the sample.

Table 2

Age Characteristics of the Sample

Age	Frequency	Percentage
(1) 18-24	33	37%
(2) 25-34	16	18%
(3) 35-44	13	14%
(4) 45-54	13	14%
(5) 55-65+	15	17%
Total	90	100%

Size.

The neck measurement was used as the indicator of size. The neck measurement was a better indicator of neck size than the shirt neckband measurement because the shirt neckband measurement depended on the neck measurement and the amount of ease. The amount of ease in the neckband was not consistent but different between men and shirts. The neck measurement was a better indicator of neck size than the neck size indicated on the label because in most cases, the neckband measurement was not the same as the neck size indicated on the label.

In order to statistically analyze size, the five size groups adopted from Gioello and Berke (1979) were collapsed to three size groups, small, medium, and large, eliminating extra small and extra large. They were (1) small, 13-14+ inches, (2) medium, 15-15+ inches, and (3) large, 16-17+ inches.

Size characteristics of the sample are given in Table 3. The size medium group contained the largest number of men, 44% of the sample. The small size group was the next largest with 40% of the sample. The large size group contained 16% of the sample.

Table 3

Size Characteristics of the Sample

Size	Frequency	Percentage
(1) Small	36	40%
(2) Medium	40	44%
(3) Large	14	16%
Total	90	100%

Response Variables

Comfort.

Comfort was determined by the response to the comfort scale on the questionnaire. Each subject was asked to rate the comfort of the collar on the dress shirt he had brought in. Comfort was categorized as such: feel a lot of tightness, restricts some movement (choice 1), feel some tightness when still, some tightness when turning or bending the head (choice 2), feel a little tightness when still, a little tightness when turning or bending the head (choice 3), do not feel tightness when still but feel a little tightness when turning or bending the head (choice 4), and do not feel tightness, allows total freedom of movement (choice 5), (see Table 4). Choice 5 was selected by 35.6% of the sample, choice 4 was selected by 36.7% of the sample, choice 3 was selected by 18.9% of the sample, choice 2 was selected by 5.6% of the sample, and choice 1 was selected by 3.3% of the sample (see Table 4). As shown in the table, the majority of the sample either felt tightness only when turning or bending the head or felt no tightness at all.

Table 4

Perceived Comfort Responses

Comfort	Count	Percentage
1	3	3.3%
2	5	5.6%
3	17	18.9%
4	33	36.7%
5	32	35.6%
Total	90	100%

Note. The comfort values represent the comfort scale ratings designated below.

1. Feel a lot of tightness, restricts some movement.
2. Feel some tightness when still, some tightness when turning or bending the head
3. Feel a little tightness when still, a little tightness when turning or bending the head
4. Do not feel tightness when still but feel a little tightness when turning or bending the head
5. Do not feel tightness, allows total freedom of movement

Ease for movement

Ease for movement is the maximum amount the neck expands with movement. In this study it was determined by subtracting the neck measurement when the head was positioned straight forward from the neck measurement when the head was positioned to the right side. Ease for movement ranged from 0 inch to 1/2 of an inch. The median value was 1/4 of an inch. Sixteen out of the 90 subjects or 18% of the sample had greater than 1/4 of an inch ease for movement (see Figure 2).

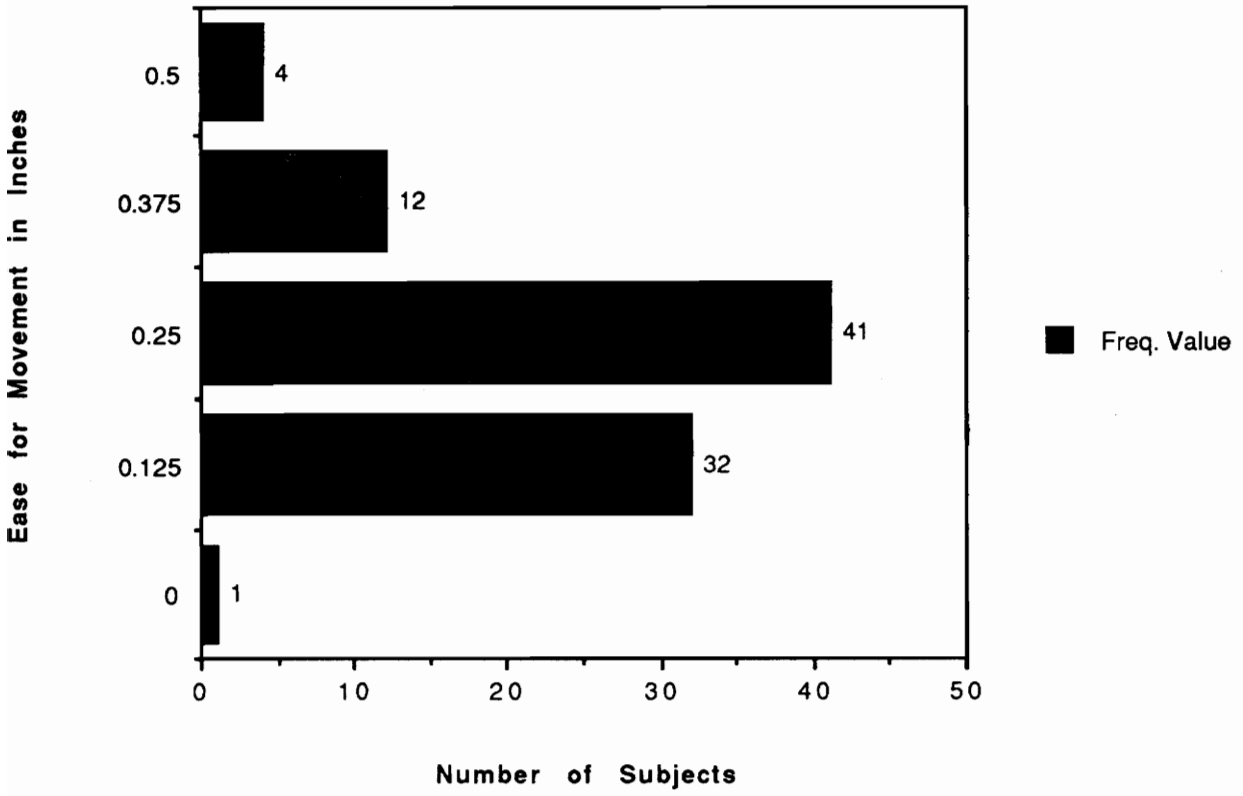

Figure 2.

Ease for Movement

N=90

Ease

Static fit was defined as the fit of a garment when the wearer was in a stationary stance. Static fit was assessed by ease which was determined by subtracting the neck circumference from the neckband length measurement. The values were evenly distributed about the mean which was 1.035 inches (see Figure 3). The maximum value was 2.375 inches, and the minimum value was negative 0.5 inch. Only 2.2% or 2 of the 90 men had less than zero ease. The two subjects that had less than zero ease were both in age group 1 (18-24) and in size group 2 (medium).

Dynamic fit was defined as the fit of a garment when the wearer was carrying out the activity associated with the garment under study. Dynamic fit was assessed by comparing ease to ease for movement. Subjects with a dynamic assessment of zero or less were selected for the analysis, which showed that only 4.4% or 4 of the 90 men did not have enough ease in their neckbands to accommodate ease for movement (see Figure 4). The values of tightness were -0.625 inch, -0.5 inch, -0.25 inch, and -0.25 inch. The age and size characteristics of the four subjects who had dynamic fit of zero or less were as follows: 18-24 and medium; 18-24 and medium; 45-54 and large; 45-54 and medium.

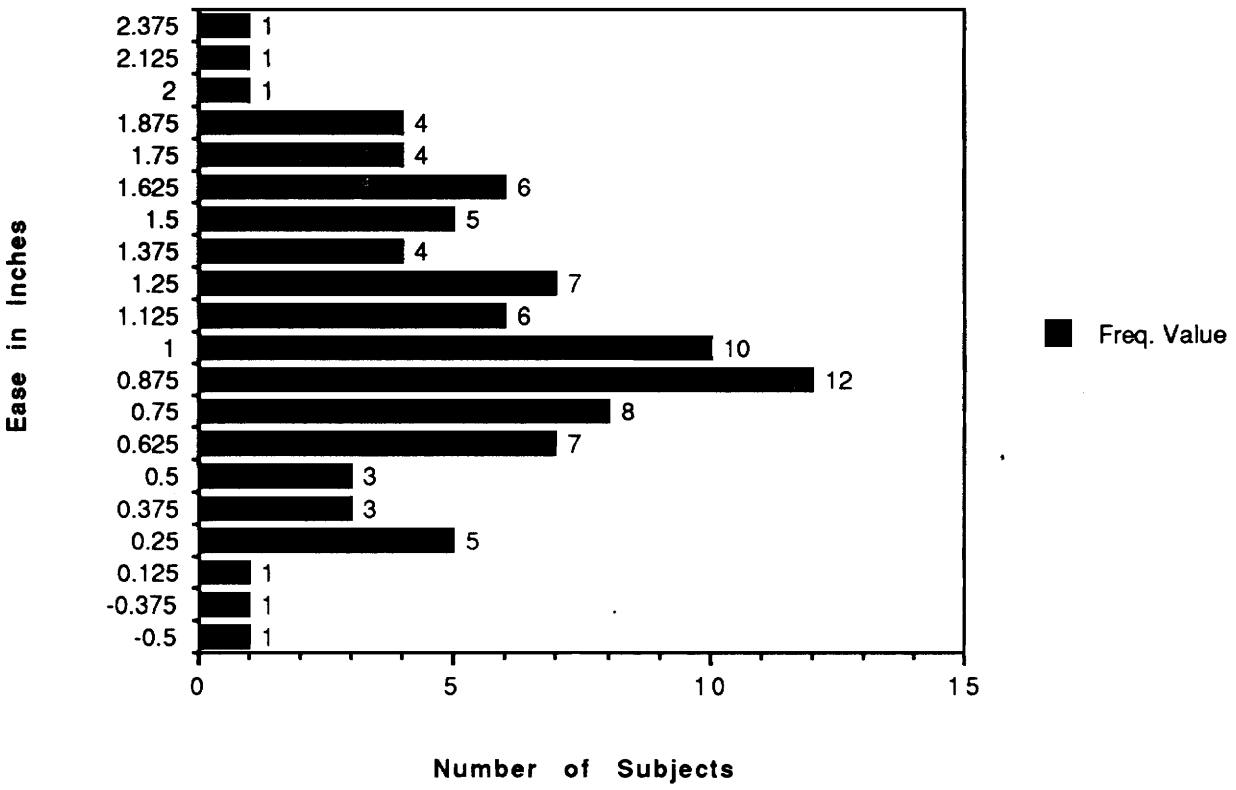

Figure 3.

Ease

N=90

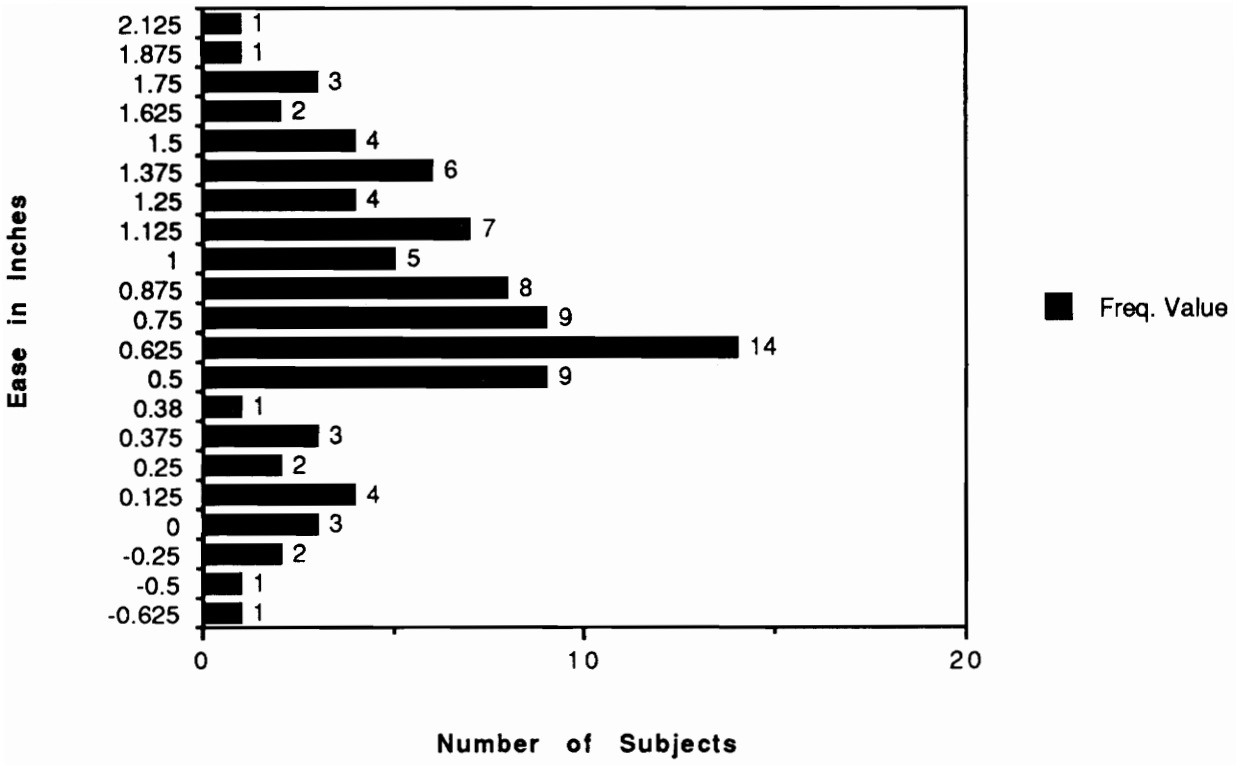

Figure 4.

Dynamic Fit

N=90

Analysis of Ease and Comfort

Hypothesis 1: There will be a significant positive correlation between ease and perceived comfort. The greater the ease, the more physically comfortable the dress shirt collars will be.

Level of acceptance: If there is a significant positive correlation using Pearson Correlation Coefficient at the 0.05 alpha level, then the hypothesis will be accepted.

Hypothesis 1 was accepted. The null hypothesis was rejected. The r value was 0.3174. Since N=90, and r was greater than 0.205, the relationship was significant at the 0.05 alpha level. There was a significant positive relationship between ease in a dress shirt collar and perceived comfort. The greater the ease, the greater the perceived comfort.

Age Effects on Comfort and Ease

Age effect on comfort

Hypothesis 2A: There will be significant differences between age groups for comfort. Men of the oldest age group will perceive their dress shirt collars more comfortable than men of the youngest age groups.

Level of acceptance: If there are significant differences between age groups for comfort using Analysis of Variance (ANOVA) at the 0.05 alpha level, then the hypothesis will be accepted.

Hypothesis 2A was accepted. The null hypothesis was rejected. The F value was 3.56 and the probability was 0.0098 (see Table 5) which indicated that age affects the rating of perceived comfort of dress shirt collars.

Since the probability was less than 0.05, there was significance. The Newman-Keuls test was conducted to determine which groups were significantly different (see Table 5). Men 55-65 plus (group 5) rated their shirt collars more comfortable than men 45-54 (group 4). Men 55-65 plus (group 5) rated their shirt collars more comfortable than men 18-24 (group 1).

Age effect on ease

Hypothesis 2B: There will be significant differences between age groups for ease. Men of the oldest age group will have more ease in their dress shirt collars than men of the youngest age group.

Level of Acceptance: If there are significant differences between age groups for ease using Analysis of Variance (ANOVA) at the .05 alpha level, then the hypothesis will be accepted.

Hypothesis 2B was rejected. The null hypothesis failed to be rejected. The F value was 1.37 and the probability was 0.2521 (see Table 6). Age did not affect the amount of ease in the dress shirt collar.

Table 5

ANOVA Report for Age (factor variable) vs Comfort (response variable)

Source	DF	Sum-Squares	Mean Square	F-Ratio	Prob>F
Age group	4	13.7577	3.439424	3.56	0.0098
Error	85	82.06454	0.9654651		
Total	89	95.82224			

Age group	Count	Mean
(1) 18-24	33	3.818182 *
(2) 25-34	16	3.8125
(3) 35-44	13	4.230769
(4) 45-54	13	3.384615 *
(5) 55-65+	15	4.666667 *
Total	90	3.955555

Newman-Keuls Comparison Report a=0.05

*Group 1 was significantly different from group 5.

*Group 4 was significantly different from group 5.

*Group 5 was significantly different from groups 1 and 4.

Table 6

ANOVA Report for Age (factor variable) vs Ease (response variable)

Source	DF	Sum-Square	Mean Square	F-Ratio	Prob>F
Age group	4	1.532672	.383168	1.37	0.2521
Error	85	23.81872	.2802202		
Total	89	25.35139			

Age group	Count	Mean
(1) 18-24	33	.9356061
(2) 25-34	16	1.039063
(3) 35-44	13	1.230769
(4) 45-54	13	.8942308
(5) 55-65+	15	1.208333
Total	90	1.036111

Size Effects on Comfort, Ease for Movement, and Ease

Size effect on comfort

Hypothesis 2C: There will be significant differences between size groups for comfort. Men of the largest size group will rate their collars less comfortable than the men of the smallest size group.

Level of Acceptance: If there are significant differences between size groups for comfort using ANOVA at the 0.05 alpha level, then the hypothesis will be accepted.

Hypothesis 2C was rejected. The null hypothesis failed to be rejected. The F value was 1.81 and the probability was 0.1698 (see Table 7). There were no significant differences between size groups for comfort.

Size effect on ease for movement

Hypothesis 2D: There will be significant differences between size groups for ease for movement. Men of the largest size group will have greater ease for movement than men of the smallest size group.

Level of Acceptance: If there are significant differences between size groups for ease for movement using ANOVA at the .05 alpha level, then the hypothesis will be accepted.

Hypothesis 2D was rejected. The null hypothesis failed to be rejected. The F value was 0.20 and the probability was 0.8175 (see Table 8). There were no significant differences between size groups for ease for movement.

Size effect on ease

Hypothesis 2E: There will be significant differences between size groups for ease. Men of the largest size group will have less ease in their dress shirt collars than the men of the smallest size group.

Level of acceptance: If there are significant differences between size groups for ease using ANOVA at the 0.05 alpha level, then the hypothesis will be accepted.

Hypothesis 2E was accepted. The null hypothesis was rejected. Both the large men and medium sized men had significantly less ease than the small sized men. The F value was 5.18 and the probability was 0.0075 (see Table 9). Since the probability was less than 0.05, there was significance. The Newman-Keuls test determined which groups were significantly different (see Table 9). The amount of ease for the small group was significantly more than the amounts of ease for the medium group and the large group. Large and medium sized men had significantly less ease in their dress shirt collars than small sized men.

Table 7

ANOVA Report for Size (factor variable) vs Comfort (response variable)

Source	DF	Sum-Squares	Mean Squares	F-Ratio	Prob>F
Size group	2	3.82739	1.913695	1.81	0.1698
Error	87	91.99484	1.057412		
Total	89	95.82224			

Size group	Count	Mean
(1) Small	36	4.138889
(2) Medium	40	3.725
(3) Large	14	4.142857
Total	90	3.955555

Table 8

ANOVA Report for Size (factor variable) vs

Ease for Movement (response variable)

Source	DF	Sum-Squares	Mean Square	F-Ratio	Prob>F
Size group	2	4.464E-03	3.232E-03	0.20	0.8175
Error	87	.961508	1.105E-02		
Total	89	.9659721			

Size group	Count	Mean
(1) Small	36	.2222222
(2) Medium	40	.2375
(3) Large	14	.2321429
Total	90	.2305555

Table 9

ANOVA for Size (factor variable) vs Ease (reponse variable)

Source	DF	Sum-Squares	Mean Square	F-Ratio	Prob>F
Size group	2	2.699367	1.349683	5.18	0.0075
Error	87	22.65202	.2603681		
Total	89	25.35139			

Size group	Count	Mean
(1) Small	36	1.246528
(2) Medium	40	.9125
(3) Large	14	.8482143

Newman-Keuls Comparison Report a=0.05

*Group 3 was significantly different from group 1.

*Group 2 was significantly different from group 1.

*Group 1 was significantly different from groups 2 and 3.

Interaction Effects of Age and Size on Comfort and Ease

For these two analyses, the number of age groups had to be reduced from five groups to four groups because an empty cell was found when age was grouped with size (see Table 10). The two oldest age groups (4 and 5) were combined to form one group with ages 45-65+.

Interaction effect of age and size on comfort

Hypothesis 2F: There will be significant differences between age groups and size groups for comfort. Men of the largest size group and of the youngest age group will find their dress shirt collars to be less comfortable than men of the smallest size group and of the oldest age group.

Level of acceptance: If there are significant differences between size groups and age groups for comfort using ANOVA at the 0.05 alpha level, then the hypothesis will be accepted.

Hypothesis 2F was rejected. The null hypothesis failed to be rejected. There were no significant differences between size groups and age groups for comfort. The F value was 0.44 and the probability was 0.8503 (see Table 11).

Interaction effect of age and size on ease

Hypothesis 2G: There will be significant differences between age groups and size groups for ease. Men of the smallest size group and of the oldest age group will have more ease in their dress shirt collars than men of the largest size group and of the youngest age group.

Level of acceptance: If there are significant differences between size groups

and age groups for ease using ANOVA at the 0.05 alpha level, then the hypothesis will be accepted.

Hypothesis 2G was rejected. The null hypothesis failed to be rejected. There were no significant differences between size groups and age groups for ease. The F value was 1.02 and the probability was 0.4161 (see Table 12).

Ease for Movement

Eighteen percent of the subjects had greater than 1/4 of an inch ease for movement, and when the subjects with 1/4 of an inch were added, 63% had 1/4 of an inch or greater ease for movement (see Figure 5). The ease for movement ranged from zero to 1/2 of an inch. The mean value was 0.24 inch and median value was 1/4 inch.

The findings of the study showed that 2.2% of the subjects did not have ease in static fit, and 4.4% of the subjects did not have ease for movement in dynamic fit. There was a significant positive correlation between ease and comfort. There were significant differences between age groups for perceived comfort but not for ease; there were significant differences between size groups for ease but not for ease for movement or perceived comfort; and there were no significant differences between age groups and size groups for perceived comfort or for ease. Although the median value for ease for movement was 1/4 of an inch, 16 of the 90 men (17.8%) had greater than 1/4 of an inch ease for movement.

Table 10

Age Group as a Function of Size Group

	Age Group				
Size Group	**1**	**2**	**3**	**4**	**5**
1	15	6	6	3	6
2	15	7	3	6	9
3	3	3	4	4	0

Note. N=90

Table 11

ANOVA Report for Size and Age (factor variables) vs Comfort (response variable)

Source	DF	Sum-Squares	Mean Square	F-Ratio	Prob>F
A (Age)	3	2.017757	.6725855	0.60	0.6152
B (Size)	2	1.105954	.5529769	0.50	0.6112
AB	6	2.942937	.4904896	0.44	0.8503
Error	78	87.0508	1.116036		
Total	89	95.8224			

Table 12

ANOVA Report for Size and Age (factor variables) vs Ease (response variable)

Source	DF	Sum-Squares	Mean Square	F-Ratio	Prob>F
A (Age)	3	1.316199	.438733	1.81	.1520
B (Size)	2	1.620351	.8101754	3.34	.0404
AB	6	1.488317	.2480528	1.02	.4161
Error	78	18.89334	.2422223		
Total	89	25.35139			

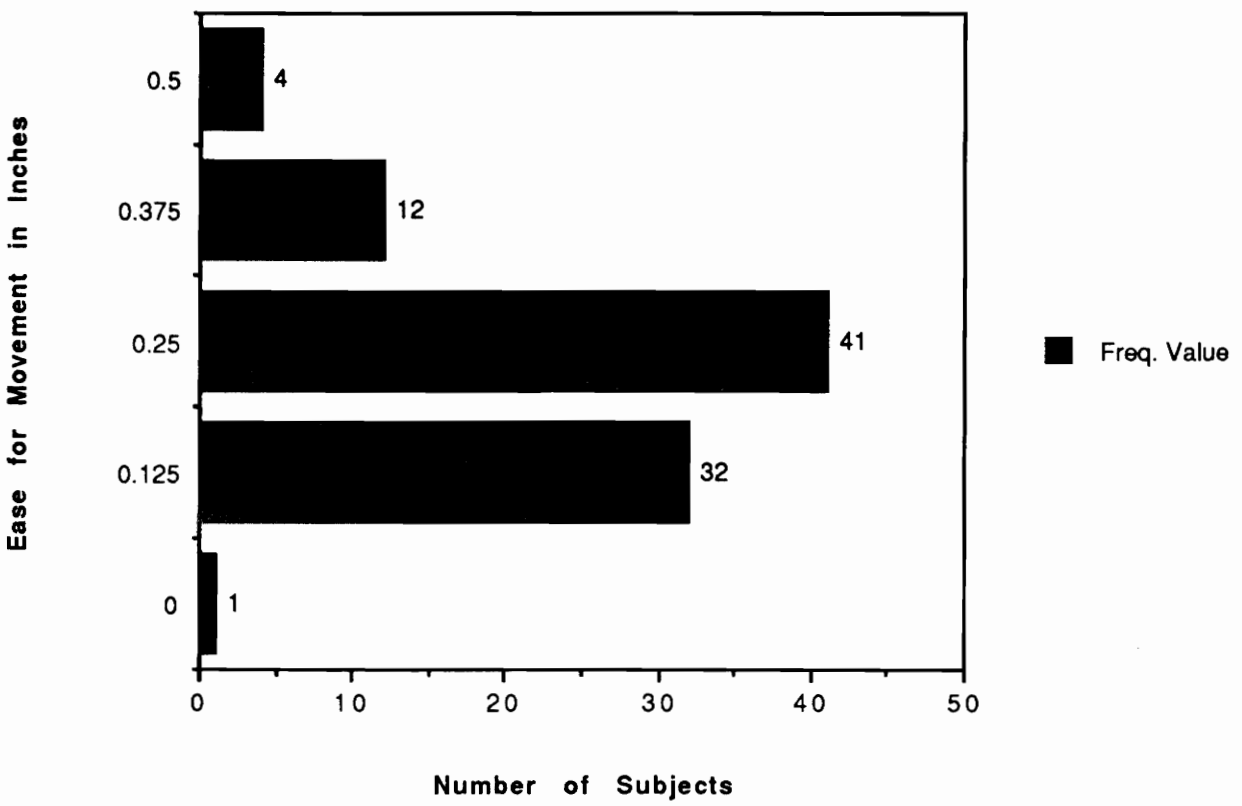

Figure 5.

Ease for Movement

N=90

Chapter VI

Discussion

The following chapter includes the findings and interpretations of them. The purpose of this study was to investigate the fit of men's dress shirt collars among men 18 years and older and sized small to large. Collar ease, ease for movement, and perceived comfort were measured. This study used objective and subjective methods to assess comfort. Static and dynamic fit were described.

The sample consisted of men aged 18-89 years. The age groups were as follows: 18-24, 25-34, 35-44 , 45-54 , and 55-65 plus. The neck size of the sample was termed small, medium, or large. The neck measurement was used as the indicator of size in this study. The method of obtaining neck measurements was consistent among subjects. The neckband measurement was not used as the indicator of size because the neckband measurement included ease. The neck size stated on the label was not used as the indicator of size because it was affected by laundry and sewing variables outside the purview of this study. Small included the subjects whose necks measured 13-14+ inches, medium included the subjects whose necks measured 15-15+ inches, and large included the subjects whose necks measured 16-17+ inches.

Perceived comfort of the dress shirt collar was measured with a comfort scale from 1 (feel a lot of tightness, restrict some movement) to 5 (do not feel tightness, allows total freedom of movement). The results showed that more men selected choices 4 and 5 rather than 1, 2, and 3 (see Table 4). The

uneven distribution indicated that most men brought dress shirts which were perceived to be physically comfortable rather than uncomfortable. One reason for this outcome could be that most of the subjects did perceive their collars to be physically comfortable. Another reason for the outcome could be that the subjects may not have recalled exactly how the collar felt since they were not asked to try on the shirts. They may have incorrectly recalled them to be more comfortable than they really were. Since the men were asked to bring in one shirt, the one they wore the most often, it may have been the most comfortable shirt.

Ease was the difference in the neckband length and the neck circumference. Ease was determined by subtracting the neck measurement from the neckband length measurement. The values were evenly distributed around the mean of 1.035 inches. The minimum value was -0.5 inch and the maximum value was 2.375 inches. Only 2.2% of the 90 men had less than zero ease. Static fit, the fit of a garment when the wearer was in a stationary stance, was analyzed. Static fit was described by ease. Since only 2.2% of the men did not have ease in their shirts, generally in static fit there was ease. The two subjects that had no ease in static fit were in age group 1 (18-24) and in size group 2 (medium).

Dynamic fit was also described. It was defined as the fit of a garment when the wearer was carrying out the activity associated with the garment under study. Dynamic fit was assessed by comparing ease to ease for movement. Subjects that had greater ease for movement than ease were selected for the analysis which showed that 4 of the 90 men or 4.4% did not

have enough ease in their neckbands to accommodate ease for movement. The subjects that had no ease for movement in dynamic fit were in age groups 1 (18-24) and 4 (45-54) and in size groups 2 (medium) and 3 (large). Generally there was ease for movement in dynamic fit.

Based on Langan's findings, a greater percentage of the subjects were expected to have tight collars, neckband lengths smaller than neck circumferences. The percentage of men in the present study who had tight collars was 2.2% and differed significantly from the 67% of the subjects who had tight neckwear in Langan's study. The reason for the difference could be that the tie was not included in the present study. Langan stated that greater than half of the tightness was due to the tie. If the subjects could be compared across time and sample, an additional 64.8% of the subjects in the present study would be expected to have tight neckwear once the tie was taken into account. If this were the case, over 90% of the incidents of tightness would be caused by the tie. The only data presented by Langan about tie tightness was the mean value for tie tightness which was 1/8 of an inch. By subtracting 1/8 of an inch from the values of ease from the present study and calculating the percentage, the percentage of the sample having tight neckwear was found still to be 2.2%. To further explain this divergence, we need to look at the similarities and differences in the measuring methods and the samples between the studies.

Measuring methods were different between studies. In Langan's study, the neck was measured in three different situations: with the shirt collar buttoned and tie knotted; with the shirt collar buttoned and tie unknotted; with the shirt collar unbuttoned and tie removed. The neckwear was tight if the

subject's neck measurement with his shirt collar buttoned and tie knotted was smaller than his neck mesaurement with his shirt collar unbuttoned and tie removed. In the present study the neck circumference measurement and a shirt neckband measurement were taken. The collar was tight if the neckband measurement was smaller than the neck circumference.

There were differences in the samples between Langan's and the present study. Size demographics were not stated in Langan's study. Size distribution should be compared because in this study, it was found that there were significant differences between size groups for ease. The nine year lapse in time between the studies may explain the disparity in results. Men in the 1993 study may have a more casual attitude and wear looser fitting clothes than men in 1984 study. The subjects in Langan's study were from business and law firms while most of the subjects in the present study were faculty and students from Virginia Tech.

There were some similarities between the two studies. Subjects for both studies were men who wore dress shirts. The age distribution was similar. Langan included men 20-60+ years, and the present study included men 18-65+ years. Both distributions were uneven, with more men in the younger age groups. In both studies, age did not have an influence on the incidence of tight neckwear or amount of ease in collars.

Ease for movement is the maximum amount the neck expands with movement. In this study it was determined by subtracting the neck measurement with the head positioned straight forward from the neck measurement with the head turned to the right side. The median value was 1/4

of an inch. This finding supports Gioello and Berke's (1979) statement that 1/4 inch is the movement ease in neck girth for men. Variability of ease for movement was not given by Gioello and Berke but was determined in the present study. Ease for movement ranged from zero to 1/2 of an inch. Eighteen percent of the subjects had greater than 1/4 of an inch ease for movement, and when the subjects with 1/4 of an inch were added, 63% had 1/4 of an inch or greater, ease for movement.

There was a significant positive relationship between ease and perceived comfort, indicating that collars with more ease were perceived as more comfortable. The relationship was a significant positive correlation.

The men in the oldest age group, 55-65+ rated their shirt collars more comfortable than men in the 45-54 age group and men in the 18-24 age group. To explain this finding, the relationship between age and ease was considered. Results of the analysis showed that there were no significant differences between age groups for ease.

Older men (55-65+) had fewer comfort problems than younger men (18-24 and 45-54) but had similar amounts of ease to that of younger men (18-54). The men in the youngest group, 18-24 years may have perceived collars to be less comfortable because they did not wear dress shirts as often. Another reason for this outcome could be that most of the 18-24 year old subjects in this study were Cadets who selected the uniform dress shirt as the shirt they wore most often. They may not have perceived their uniform dress shirt as comfortable as other dress shirts that they owned. In general, younger men had a more casual attitude and preferred casual and looser fitting clothing. The

men aged 45-54 may be less tolerant of fitted collars because they are likely to be in higher positions with more attached stress. The men in the oldest age group, 55-65+ may be more tolerant, less stressed, and able to cope better consequently, they perceive their collars to be rather comfortable. Hogge, Baer, & Kang-Park (1988) found similar results: more men in the 30-50 years age group than in the over 65 years age group said that dress shirt collars irritated their necks.

There were no significant differences between size groups for comfort. This indicates that, in general, the men in the sample owned comfortable shirts regardless of their size. Significance may have been found if enough subjects had occupied extra small and extra large cells because proportional ease needs are more likely to become apparent in extreme sizes.

There were no significant differences in size groups for ease for movement. It was expected that the larger the size, the greater the ease for movement. The analysis did not show this. Size had no effect on the amount of ease for movement. There actually may not be a difference in ease for movement among sizes. Again there were not enough subjects in extreme sizes to determine the true difference.

There were significant differences between size groups for ease. Small sized men had significantly more ease in their collars than medium and large sized men. Even though there were no effects of size on perceived comfort there were effects of size on ease. This could mean that the small sized men were accustomed to having more ease in their clothing consequently, they did not perceive any difference in comfort from the large and medium sized men. Another explanation is, as the neck becomes larger, more of the ease is used

for size and fit.

There were no significant differences between age groups and size groups for comfort or for ease. For these two analyses, the two oldest age groups (4 and 5) had to be combined because there was an empty cell. When the two way ANOVA was run on age and size vs comfort, no significant differences were found between age groups. However, the one way ANOVA on age vs comfort showed that there were significant differences between age groups. The reason that the two way ANOVA did not show the significance was because age groups 4 and 5 were combined for that analysis, cancelling out the actual differences between groups 4 and 5 as well as groups 1 and 5. The two way ANOVA run on age and size vs ease did show significant differences between size groups for ease, as was found with the one way ANOVA on size vs ease.

Gioello & Berke (1979) stated that 1/4 of an inch was the ease for movement in neck girths for men. Although the median value for ease for movement found in this study was 1/4 of an inch, there were some men with greater than 1/4 of an inch. Variability of ease for movement was not given by Gioello and Berke. The present study found that ease for movement ranged from zero to 1/2 of an inch. While 18% of the subjects had more than 1/4 of an inch ease for movement, when the subjects with 1/4 of an inch were added, the percentage rose to 63% of the subjects.

In conclusion, comparisons to Langan's study, the basis for the present study, were made. While Langan found that 67% of subjects had tight collars and ties, the present study found that 2.2% of subjects had tight collars. She

found that greater than half of the tightness was due to the tie, while the present study projected that as much as 90% of the tightness was due to the tie. The present study focussed on the collar and investigated the effects of size and age on comfort and ease. Size was found to have an effect on ease but not on comfort. Age was found to have an effect on comfort but not on ease. In the present study, ease for movement had a median of 1/4 inch. No significant differences were found between size groups for ease for movement. Langan's study investigated the effects of age, shirt purchaser, shirt fiber content, manufacturer's collar ease allotment, and weight. None of these factors were associated with tight neckwear. Both studies indicated that the tie may be the major contributer to neckwear tightness.

Chapter VII

Recommendations for Further Research

Recommendations for further study are based on the methodology developed and the results of this study.

1. The sample should be expanded to include extra small and extra large sizes.
2. More men aged 55-65+ should be included, and the 55-65+ age group should be broken down in order to determine if there are any differences within this age group.
3. Racial and ethnic variables can be investigated. There may be a relationship between racial/ethnic background and perceived comfort, ease for movement, and ease.
4. Subjects should wear their dress shirts while rating the comfort of the collar to take care of the memory problem.
5. A study that looks at temperature and humidity and their relations to comfort and ease of dress shirt collars can be developed.
6. Movement studies to determine maximum neck extension and related ease for movement can be carried out.
7. Methods for defining direction and angle of movement when measuring for ease for movement can be improved.
8. The contribution of the tie to the tightness of neckwear should be investigated using the methology and the variables in this study.

References

Callaway, C. W., Chumlea, W. C., Bouchar, C., Himes, J. H., Lohman, T. G., Martin, A. D., Mitchell, C. D., Mueller, W. H., Roche, A. F., & Seefeldt, V. D. (1988). Circumferences. In T. G. Lohman, A. F. Roche, & R. Martorell (Eds.), Anthropometric standardization reference manual (pp. 39-42). Champaign, IL: Human Kinetics Books.

Chowdhary, U. & Beale, N. V. (1988). Plus-size women's clothing interest, satisfactions and dissatisfactions with ready-to-wear apparel. Perceptual and Motor Skills, 66, 783-788.

Colle, D. (1972). Collars, stocks, cravats. Pennsylvania: Rodale Press, Inc.

Denton, M. J. (1972). Fit, stretch, and comfort. Textiles, 1, 12-17.

Farmer, B. M. & Gotwals, L. M. (1982). Concepts of fit: An individualized approach to pattern design. New York: Macmillan Publishing Co., Inc.

Flusser, A. (1985). Clothes and the man: The principles of fine men's dress. New York: Villard Books.

Gioello, D. A. & Berke, B. (1979). Figure types and size ranges. New York: Fairchild Publications.

Glock, R. E. & Kunz, G. I. (1990). Apparel manufacturing: Sewn product analysis. New York: Macmillan Publishing Company.

Goodrick, J. & Meadors, C. A. (1977). Designs on Older Women. Cooperative Extension Service, H.E. 454, Purdue University, West Lafayette, Indiana.

Gott, P. H. (1985). Turtleneck turns. Journal of the American Medical Association, 254, 1720.

Grazier, K., Holbrook, T., Kelsey, J., & Stauffer, R. (1984). The frequency of occurrence, impact, and cost of musculoskeletal conditions in the United States. Chicago: American Academy of Orthopedic Surgeons.

Grey, N. C. (1966). Some characteristics associated with the most liked and least liked outer garments in wardrobes of people age 65 and over. Unpublished master's thesis, Kansas State University.

Handford, J. (1980). Professional pattern grading for women's, men's, and children's apparel. Los Angeles: Plycon Press.

Hintze, J. L. (1990). Number cruncher statistical system (Computer program). Kaysville, UT: Jerry L. Hintze. (Version 5.03).

Hogge, V. E. & Baer, M. M. (1986). Elderly women's clothing: Acquisition, fit, and alterations of ready-to-wear garments. Journal of Consumer Studies and Home Economics, 10, 333-341.

Hogge, V. E., Baer, M., & Kang-Park, J. (1988). Clothing for elderly and non-elderly men: A comparison of preferences, perceived availability, and fitting problems. Clothing and Textiles Research Journal, 6(4), 47-53.

Khoury, P., Morrison, J. A., Mellies, M. J., & Glueck, C. J. (1983). Weight changes since age 18 years in 30-55 year old whites and blacks. Journal of the American Medical Association, 250, 3179-3187.

Kirk, W., Jr. & Ibrahim, S. M. (1966). Fundamental relationship of fabric extensibility to anthropometric requirements and garment performance. Textile Research Journal, 36, 37-47.

Korda, M. (1977). Success. New York: Ballantine Books Division, Random House.

Kroemer, K. H. E., Kroemer, H. J., & Kroemer-Elbert, K. E. (1990). Engineering physiology: Bases of human factors/ergonomics (2nd ed.). New York: Van Nostrand Reinhold.

Kunzle, D. (1982). Fashion and fetishism. New Jersey: Rowman and Littlefield.

Langan, L. M. (1984). Pressure of menswear on the neck in relation to visual performance. Unpublished master's thesis, Cornell University, Ithaca, NY.

Lutz, E. (1981). Tight neckwear and atherosclerotic carotid artery disease. Journal of Clinical Psychiatry, 42, 326.

Margerum, B. J., Walker, N. E., & Kernaleguen, A. (1977). Men's clothing practices. Journal of Home Economics, 69(1), 39-40.

Molloy, J. T. (1988). New dress for success. New York: Warner Books, Inc.

Morrow, L. (1978, July 24). The odd practice of neckbinding. Time, p. 80.

Newton, A. & Duffey, V. R. (1977). Pattern alterations for the elderly (Textiles, Clothing and Design Departmental Report No. 4). University of Nebraska-Lincoln, Institute of Agriculture and Natural Resources.

O'Brien, R. & Shelton, W. C. (1941). Women's measurements for garment and pattern construction. (USDA Miscellaneous Publication No. 454). Washington, D.C.: U.S. Government Printing Office.

Patterson, C. A. & Warden, J. (1983). Selected body measurements of women aged sixty-five and older. Clothing and Textiles Research Journal, 2(1), 23-30.

Pontrelli, G. J. (1977). Partial analysis of Comfort's Gestalt. In N. R. Hollies & R. F. Goldman (Ed.), Clothing comfort: Interaction of thermal, ventilation, construction and assessment factors (pp. 71-80). Ann Arbor, MI: Ann Arbor Science Publishers Inc.

Prevatt, M. B. (1991). Fit and sizing evaluation of limited-use protective coveralls. Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Reich, N. & Otten P. (1991). Clothing and dressing needs of people with arthritis. Clothing and Textiles Research Journal, 9(4), 34-40.

Renbourn, E.T. (1972). Materials and clothing in health and disease. London: H.K. Lewis & Company Ltd.

Rosenblad-Wallin, E. & Karlsson, M. (1986). Clothing for the elderly at home and in nursing homes. Journal of Consumer Studies and Home Economics, 10, 343-356.

Schoeffler, O. E. & Gale, W. (1973). Esquire's encyclopedia of 20th century men's fashions. New York: McGraw-Hill Book Company.

Slater, K. (1986). The assessment of comfort. Journal of Textile Institute, 77, 157-170.

Tate, M. T. & Glisson, O. (1963). Family clothing. New York: John Wiley.

United States Department of Commerce. (1952). Men's work shirt sizes (Commercial Standard 187-52). Washington, DC: U.S. Government Printing Office.

United States Department of Commerce. (1944). Textiles-testing and reporting (Commercial Standard 59-44). Washington, DC: U.S. Government Printing Office.

U.S. Bureau of the Census. (1990). Statistical abstract of the United States (One Hundred and tenth edition). Washington, DC: Department of Commerce.

Watkins, S. M. (1984). Clothing: The portable environment. Ames, Iowa: Iowa State University Press.

Wilson, W. (1985). Man at his best: The Esquire guide to style. Reading, MA: Addison-Wesley Publishing Co., Inc.

Appendix A
Informed Consent for Participants of Investigative Projects

Title of Project: The Fit of Men's Dress Shirt Collars
Principal Investigator: Carolyn Y. Kim

You are invited to participate in a study about dress shirt collars. This study is for a master's thesis in Clothing and Textiles. This study involves 100 subjects.

The procedures consist of: questionnaire, shirt content analysis, and neck measurement. The total time for your participation is 5 minutes maximum. An appointment has been made at a time and place that is convenient for you. There are no risks. The neck measurement is quick so there should not be any discomfort.

Information about fit and perceived comfort will be gathered and analyzed in this study. You may receive a summary when the study has been completed. Just put your name and address on the sign-up sheet.

Only the researcher, assistant, and research committee will have access to the questionnaire and data sheet. You are free to withdraw from this study at any time. I know of no reason I cannot participate in this study.

_____
signature

I have read and understand the informed consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give voluntary consent for participation in this project. I also understand that if I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

I understand that should I have any questions about this research and its conduct, I should contact:

Carolyn Kim	552-5289	Dr. Janet Johnson	231-6077
Investigator		Chair, IRB	

Dr. Joann Boles 231-7964
Faculty Advisor

Appendix B

Questionnaire on Men's Dress Shirt Collars

What is your age?_____

What is your occupation?_____

What is your racial/ethnic background? White, Black, Asian or Pacific Islander, Hispanic, Native American, other_____

How many times a week on average do you wear dress shirts(with a tie)? 0, 1, 2, 3, 4, 5, 6, 7

If you answered 0, then how many times a month on average do you wear dress shirts? 0, 1, 2, 3, 4, other_____

What was your shirt size when you were 21 years old (for those 21 and over)? _____

How comfortable is the collar on the dress shirt you have brought in (without a tie)? (Please circle your response)

1 Feel a lot of tightness, restricts some movement.

2 Feel some tightness when still, some tightness when turning or bending the head.

3 Feel a little tightness when still, a little tightness when turning or bending the head.

4 Do not feel tightness when still but feel a little tightness when turning or bending the head.

5 Do not feel tightness, allows total freedom of movement.

Do you unbutton this shirt collar (with a tie)? never, sometimes, always

Appendix C

Data Sheet:

Name _____

Shirt size _____ _____

Brand _____

Band Length _____

Neck Girth _____ _____

straight forward to the side

Ease _____ _____

calculated shirt for movement

Vita

Name: Carolyn Younghui Kim

Date of Birth: April 15, 1969

Place of Birth: Incheon, Korea

Major: Clothing and Textiles

Degree and Date Conferred: Master of Science, May 1993

Educational Institutions Attended:	Dates:	Degree and Date:
Dansville High School	9/84-5/87	H.S. Diploma, 1987
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