SLEEPING APPAREL WORN FOR TWO SEASONS IN KANSAS AS INFLUENCED BY THERMAL COMFORT

by

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B. S., Northwest Missouri State College, 1964

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Clothing and Textiles

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1966

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CHAPTER I

INTRODUCTION

All individuals have at least two things in common; they require a period of sleep and a period of wakefulness. Some studies have been concerned with women's apparel that is worn for thermal comfort during the waking hours, less has been concerned with the clothing worn for sleep. This study was an investigation of the consideration given to thermal comfort in the type of sleeping apparel worn for two seasons in Kansas.

Several theories have been devised for the reasons man wears clothes, but none of these are entirely satisfactory explanations. The modesty, immodesty, magic, and protection theories are the usual explanations given to the origin of dress. According to Dunlap (26), the modesty theory may have been derived from the idea of a sense of shame and embarrassment at having the sexual organs uncovered. The immodesty theory is the opposite. Hurlock (8) stated that the immodesty theory was developed from the idea that clothing was first worn to call attention to the parts of the body that would otherwise go unnoticed, and that the magic theory advocates the idea that clothing was first worn as a means to shield the wearer from evil influences. Protection as a theory for the development of clothing involves the idea of protection from insects as well as protection from the temperature of the environment.

However, Flugel (4) reported that the most obvious form of protection is from the cold, and that this function influenced the protection theory for the development of dress more than any other protective function. On the other hand, it was recognized that primitive people, not wearing clothes, have been found in both extremely cold and hot climates.

The clothing of modern man appears to rely on the idea of protection from cold in some respects and disregard it in others. It is assumed that in Kansas a different type of clothing usually is worn inside the home during the winter season than is worn for the summer season. However, in many cases, the same temperature is maintained inside the home during the two seasons. One source (40) stated that American houses and hotels are kept at near tropical conditions during the cold winter months. Therefore, it seems that the distinction between winter and summer clothing worn only inside the home is not dependent on the environmental temperature.

Sleeping apparel is available in many different styles and designs. Some of these are constructed to help preserve the body heat, while others are constructed to transmit the body heat into the surrounding air. Gagge and others (27) stated that the final analysis of comfort is dependent largely on the skin temperature. When there is any appreciable change from the constant skin temperature there is a feeling of discomfort. However, the average constant temperature may be maintained in spite of exposure to cold if clothing is

properly chosen in relation to the activity of the body.

During sleep when a person is at rest the body processes are slowed down. Blankenhorn and Campbell (20) found that a fall in blood pressure occurred with the onset of sleep. Bard (1) stated that the heart rate decreases and that on the whole the circulatory changes that accompany sleep may be regarded as the result of prolonged physical rest. It was also in general agreement that the excitability of many reflexes and responses is diminished during sleep. These changes in the body processes result in a decrease in the constant production of heat. When remaining in the same temperature as during the waking hours, the loss of body heat will not be in balance with that being produced. Therefore more clothing insulation is necessary to maintain thermal comfort.

When studying sleeping apparel the bed covering also must be taken into consideration because the two act as an insulative unit. Several types of bed covering are available on the market and combinations of these are used at the same time to provide the desired amount of insulation. Several studies have been conducted to test the thermal comfort of different fabrics, garments, and bed coverings. However, these studies have not investigated whether garments are being worn for the thermal comfort they provide.

The question arises as to the importance of thermal comfort as a factor for the individual wearing sleeping

apparel. In some homes with controlled heating and air conditioning it seems unlikely that the thermal comfort of the sleeping apparel worn would be given as much consideration as in homes where the temperature of the bedroom varies with the season. Therefore an exploratory study that could serve as a basis for further work on thermal comfort of clothing was undertaken to determine the kind of sleeping apparel worn during the summer and winter seasons by a group of undergraduate college women living in a dormitory at Kansas State University. A questionnaire was devised for the study to ascertain information to investigate whether the sleeping apparel worn was for apparent thermal comfort or for reasons unrelated to thermal comfort.

Below is a list of definitions that are used in this paper.

> Thermal Insulation: The amount of warmth an individual believes a garment provides by preserving the body heat.
>
> Thermal Comfort: The comfort that a garment provides for an individual by keeping his body warm or cool.
>
> Thermal Character: The apparent warmth or coolness that fabrics seem to have to the observer's touch.
>
> Summer Season: The warmest months of the year in Kansas as expressed by each individual member of the sample.
>
> Winter Season: The coldest months of the year in Kansas as expressed by each individual member of the sample.

CHAPTER II

REVIEW OF THE LITERATURE

Much has been written in regard to women's apparel worn for the waking hours but little research has been undertaken concerning clothing worn for sleep. Although thermal comfort has been the topic of several investigations, these have been in regard to the amount of insulation the garment would yield to the individual. These studies have not attempted to investigate whether garments are being worn for the thermal insulation provided.

Literature on Maintenance of the Skin Temperature

The thermal comfort of a garment in any environment is dependent on many variables. It was stated by Gagge and others (27) that the final analysis of comfort is dependent largely upon the skin temperature. Although there is a seasonal variation in the skin temperature and a daily variation of a few degrees, according to Black (18), the average constant temperature of the body is approximately 37°C (98.6°F), and that of the skin approximately 33°C (91.4°F). When there is any departure from this temperature a feeling of discomfort results.

Three factors were found to be concerned with maintaining an optimum skin temperature. These are, according to Moncrieff (33), the rate of heat production of the body, the

insulating value of the clothing, and the temperature of the environment.

Under most conditions the body temperature represents a balance between the production of heat and the heat lost from the body. The production of heat takes place through the agencies of the combustion of carbohydrate, fat, and protein substances in the body, as stated by Bard (1).

The body, according to Hardy (29), maintains a regulation of the skin temperature by dilating or constricting the capillary blood vessels near the surface and by varying the amount of perspiration on the skin. Bard (1) found when an unclothed normal person at rest is exposed to an environmental temperature of 29°C (84°F) he is comfortable and feels neither too warm nor too cold, but when the environmental temperature is 23°C (73°F) the subject feels very cold and when the surrounding air is 34°C (93°F) uncomfortably hot. Newburgh (10) stated that in a warm environment the skin temperature is very uniform throughout but under colder conditions, there is a decrement in temperature from the central portions of the body to the peripheral portions of the extremities. In other words, the toes and fingers are colder than the other parts of the body and the forehead is the warmest.

Heat can be dissipated from the surface of the skin into the surrounding air only if there is some driving force to cause it to flow. Hardy (29) maintained that four such

driving forces were: (1) a difference between the temperature of the skin and that of some other body in direct contact or separated only by clothing, (2) a difference between the temperature of the skin and the ambient air, (3) a difference between the temperature of the skin and the surrounding walls or other radiative environment, (4) a difference between the vapor pressure of the perspiration on the skin and that of the water in the ambient air.

According to Peirce and others (35), when the surrounding temperature is lower than the body temperature these forces result in a loss of heat by conduction, by radiation, by convection, and by the evaporation of body moisture. Newburgh (10) stated that about 90 per cent of the heat produced by the body is dissipated from the surface of the skin by conduction, radiation, and convection, while 10 per cent is carried away in the warmed, exhaled breath and other body secretions such as perspiration. When the temperature of the surrounding air rises, according to Peirce and others (35), the amount of heat lost by radiation and convection decreases, and the body becomes more dependent upon the evaporation of perspiration to maintain its constant temperature.

Whelan and others (43) stated that under normal conditions with a resting subject, insensible perspiration amounts to about 15 grams per square meter per hour, and under conditions of exertion or in a hot environment, the perspiration

increases to a value which may exceed 100 grams per square meter per hour. When perspiration ceases to be insensible, then the sweat glands begin to function and liquid sweat appears, as was believed by Peirce and others (35). Sweating therefore acts as a safety measure for the removal of excess heat.

Newburgh (10) maintained that when the temperature of the surrounding air lowers convection plays the greatest role in the amount of heat lost. When the skin is exposed to an ambient temperature below the skin temperature, heat is dissipated away from the body to the surrounding air. This response to cold, according to Bard (1), results in piloerection on the skin. Because man is relatively lacking in hair on his skin this thermal response is ineffective to aid in the prevention of heat loss.

Literature on Sleep

It has been found that the body temperature varies with the amount of activity in which the individual is engaged. Kleitman (9) stated that there is no simple definition of sleep, but it is sometimes commonly looked upon as a periodic temporary cessation, or interruption, of the waking state which is the prevalent mode of existence for the human adult. Several theories have been devised to give an explanation of sleep but none of these have proved totally satisfactory.

Sleep and wakefulness have been accepted as a learned 24-hour rhythm process. Cohen (23) found in a study of young college women's sleeping habits, in 1944, that the average length of sleep was eight hours. Garvey (5), in a study of young children during sleep, reported that when the age was held constant more sleep was obtained in the winter than in the summer. However, many individual differences make it impossible for general conclusions to be drawn.

It is agreed that certain changes in the body result during sleep. According to Kleitman (9), the body temperature falls during the night but it is not agreed that sleep is responsible for the low night temperature. Kleitman (9) stated that most of the temperature changes occurring during sleep may be due to muscular relaxation, vasomotor adjustments following the assumption of the horizontal position, and the 24-hour body-temperature curve. These things result in less heat being produced by the body and a lower skin temperature being maintained than during the waking hours. Therefore under the same temperature as when awake, more insulation is needed to sustain thermal comfort during sleep.

Under different temperatures animals and human beings have been found to vary their posture to help regulate the heat lost from their body. It was stated by Bard (1) that when lying in a cold place human beings as well as animals

tend to curl up, but when exposed to warmth they extend the trunk and the extremities to increase the loss of heat. These changes in posture affect the amount of heat that is received or yielded to another part of the body by radiation as well as affecting the amount of heat lost by convection and vaporization.

There is some evidence that the amount of movement during sleep is not directly related to the body temperature. According to a study by Kleitmann (9) there were fewer movements during the downward course of the temperature curve than during its upward swing. It was suggested by Garvey (5) that the temperature of the immediate surroundings of the subject is more important than the temperature in the room and that the bed temperature is a function of the body temperature and the room temperature rather than the amount of bedclothes.

Literature on Clothing

Gagge and others (27) stated that the unit for thermal insulation of clothing is the amount of insulation necessary to maintain in comfort, a sitting-resting subject in a normally ventilated room with the air movement at 20 feet per minute, at a temperature of 21°C (70°F) and a relative humidity of less than 50 per cent. This unit of insulation is called one clo and can be used to describe the actual insulation of a garment.

Woodcock (45) suggested that a shift should be made from the concept of the purpose of clothing to keep man as warm as possible, to one in which the purpose is to keep him in thermal equilibrium. It was stated by Bard (1) that we voluntarily reduce the heat loss by wearing clothes that are poor conductors in the winter. According to Hardy (29), the influence of the fabric on the semistill layers of air around the body depends to a large extent on such factors as the style and fit of the garment and the kind of weather it will be worn.

In preventing the loss of heat, as stated by Bard (1), clothing is most effective when it is made of material that is a good insulator and has a texture or design that traps air within it. According to Rees (36), textile fibers are better conductors than air, and the greater amount of air entrapped by a fabric the more effective it will be as an insulator. Therefore on the basis of equal thickness, the fabric with the most open construction is the least warm, but on the basis of equal weight it is the warmest when the moving air is prevented from penetrating the fabric structure.

Upon examination of the thermal conductivity of fabrics in terms of the fiber conductance the fabric density shows that the fabric insulation is determined by the fabric arrangement as well as the fabric thickness as stated by Bogaty and others (22). Consumer Reports (21) states that contrary

to a widely held belief, the weight of a fabric does not necessarily contribute to the warmth.

Not only should clothing be a good insulator but Whelan and others (43) maintained that the transfer of moisture from the skin through clothing is also an important factor in human comfort. This is true not only in connection with hot atmospheric conditions and the effects of high physical activity but also in relation to cold-weather clothing.

Hoffman (30) stated that the human hand is a sensitive instrument, capable of detecting small difference in fabric quality. However, according to a report in CIBA Review, (40), there is no good relationship between the transitory "cool" or "warm" feel of the surface of a fabric and the thermal insulation it provides. The fact that fabrics differ from each other in character of the surface results both from the structural factors introduced in weaving or knitting, and from the choice of fibers in the yarns, Newburgh (10). Hoffman (30) stated that this phenomenon is due to the momentary persistence of a temperature differential between the area of contact between the fingers and the fabrics.

Newburgh (10) maintained that the use of continuous filament yarns such as silk, nylon, or rayon results in the thinnest possible fabrics since the long straight filaments lie closely together in compact yarns, while in spun yarns of staple fibers such as rayon, nylon, silk, or the natural

staple fibers the yarns are more bulky and hairy resulting in a more bulky fabric. Wool and Orlon acrylic fiber both have especially good bulking properties and can result in a lofty fabric.

In a study conducted by Werden and others (4) on a comparison of fabrics made of natural and man-made fibers, namely nylon, cotton, acetate, and Arnel triacetate, no differences in the thermal comfort of the clothing could be related to the fiber content. Newburgh (10) stated that since fibers do not differ greatly in their specific heats nor in their thermal conductivity this effect depends on the fraction of the gross surface which is in actual contact, and the mass of fiber back of it. For this reason fabrics woven of filament yarns, and linen, with its long straight fibers, tend to feel cooler than the more hairy cotton fabrics, and wool, with its springy, hairy surface.

Andreen and others (17) reported that the marked chill sensations experienced in wearing the continuous filament nylon fabric is undoubtedly associated with the intimate skin contact made by the smooth, flat surface. Also, as a result of the fabric standing next to the skin, more heat flows from the body surface to the fabric than would have been the case if the fabric had been standing away from the body surface on the ends of the staple filaments of the fabric.

In a study by Bogaty and others (22), it was found that with applied pressure on smooth flat fabrics there is an

increase in the fabric density that results in an increase in the specific conductivity of the fabric. In fuzzy surfaced fabrics of wool or blends containing wool, with applied pressure, the fabric conducts less effectively than when without applied pressure because of the air layers between each fiber along the conducting path. The specific conductivity of wool and wool-type fabrics is relatively insensitive to changes in applied pressure and this appears to be a direct result of the random arrangement of the fibers in these fabrics.

In a study of blends and fabrics containing only one fiber, it was found that blending a hydrophilic fiber with a hydrophobic fiber produced a fabric that was more comfortable than either fiber used alone. Hoffman (31), in a comparison of knit polo shirts of Orlon acrylic fiber blended with rayon or cotton, found the blends were more comfortable than either the 100 per cent cotton or 100 per cent Orlon acrylic fibers.

According to Hoffman (31), the increased comfort of blended fabrics over the 100 per cent fiber of Orlon acrylic fiber and cotton is the result of both fibers offering outstanding wickability, which leads to rapid pick-up of moisture from the skin. Also Orlon acrylic fiber, the major component of the blend, holds little water within the fibers, thereby allowing rapid drying and avoiding the hot sticky feeling associated with high-moisture-regain fibers in hot, humid environments. The cellulosic fiber provides sufficient

moisture regain to avoid cling due to the static electricity in dry environments. The looser denier filaments provided improved comfort, presumably, because being less stiff, they are less scratchy.

In research conducted by Galbraith and others (28), on the effect of wearing suits made of cotton, water-repellent cotton, and Orlon acrylic fabrics of similar construction, in no case did either the fiber content or the water-repellent treatment have any effect on the physiological measures of thermal comfort. The subjects subjectively rated the untreated cotton suit as the most comfortable to wear, followed by the Orlon acrylic and the water-repellent cotton suits in that order.

The fit of a garment has been found to play an important part in thermal comfort as well as the fabric. According to Black (19) the amount of ventilation allowed by a particular garment will depend partly on the looseness of its fit and partly upon its permeability to air. Hardy (29) stated that it is impossible to draw accurate general conclusions about the relative comfort ratings of several fabrics on the basis of the tests made with only one type of garment in only one kind of environment. Actually, the relative warmth rating of two fabrics under a given set of conditions may actually be reversed under another set of conditions.

Newburgh (10) stated that the flexibility of the fabric also affects the effective thickness of the layers of clothing

and its relations with the surrounding air, since with stiff fabrics there can be a bellows action or pumping action out of the interlayer spaces during movement. Therefore, with limp flexible fabrics, the cloth clings to the skin, the bellows action is negligible, and the air spaces inside the clothing are minimized. However, it must be remembered that the degree of stiffness required to give good bellows action is considerable, and the extent of this effect is highly dependent on the garment design.

Flugel (4) in his discussion of clothing as a means of protection, stated that more tight-fitting and form-following costumes would never have been worn in warm climates and that this clothing owes its existence to the migration of certain portions of the human race from southerly into more northerly regions. Newburgh (10) explained the principle behind this statement by stating that clothing which lies close to the skin can lie within the still air zone which would be present even without clothing. The clothing usually adds to the still layer around the body by additional air spaces between layers and where the fabric stands away from the skin, and by presenting a new surface farther out, from which the outer diffusion layer can begin.

Woodcock (45) stated that since man's metabolic heat production varies by a factor of about five to six times, depending on his activity, the required insulation value of his clothing should vary by this factor. Different kinds of

apparel are necessary for different activities, and sleeping garments do not need to be of the same insulative value as the apparel worn during the hours while awake. Therefore it is common practice to have different garments for sleeping and for daytime wear.

Literature on Sleeping Apparel and Bedcovering

As shown by the following statistical data, there is good consumer demand for sleeping apparel in this country. In 1962, according to Hansen (6), the United States population for all classes of females between the age of 14 years and over totaled 67,627,000. Then in 1963, as reported by Hansen (7), the United States population for this female group was a total of 68,773,000 people. This represents an increase of 1,146,000 people in this age group for the one-year period.

In 1962 there was a total of 6,844 thousands of dozens of woven nightwear cut in the United States for women's, misses, and junior sizes. In 1963, according to the Current Industrial Reports (16), there was a total of 7,170 thousands of dozens of woven nightwear cut in the United States for the same group. Of this total, 3,930 thousands of dozens were nightgowns, 2,985 thousands of dozens were pajamas, and 255 thousands of dozens were bedjackets and negligees.

In 1962 the Current Industrial Reports (16) showed that there was a total of 2,838 thousands of dozens of knitted

nightwear cut in the United States for women's, misses, and junior sizes, while in 1963 there was a total of 2,870 thousands of dozens of knitted nightwear cut for the same age group.

For both the knit and woven garments, more cotton was used than the man-made fibers. As can be seen from these statistics, the amount of nightwear being produced per year for this selected age group is more than the total population of this group, and woven garments are being produced in larger quantities than the knitted garments.

Chambers and Moulton (2) stated that nightwear is selected only for comfort and ease of care by some, or is chosen for luxury, color, and decoration by others. In a study by Ditty (46), the participants indicated no preference for certain types of sleepwear and slips because of their social interaction, but their choices for these items were significantly related to the personality characteristics of masculinity and femininity. Treves (14) stated that while in bed, the body depends for its warmth upon the bedclothes and that the night-dress fulfills the requirements of cleanliness and personal comfort rather than the primary needs of dress.

In a study of sleeping apparel the total assembly of bedclothes should not be overlooked. Therefore the over-all rate of heat and moisture transfer from the subject through the bedclothes to the surrounding atmosphere must be considered, according to Rowlands (37).

There have been several studies done to predict the thermal comfort that bedcovering will give but these tests did not take into full consideration the characteristics of the air layer between a blanket and the human body beneath it. Studies by Rowlands (37) showed that there are large differences between blankets and also that all blankets are better insulators at low values of relative humidity than at high ones. Blankets are available on the market in many different types. These include woven, and tufted, and "thermal" blankets. Sometimes quilts, comforters, and afghans may be used as a substitute or in place of a blanket to provide the insulation desired, as well as electric blankets. At any rate, the whole assembly of bedcovering must be taken into consideration to investigate the factors influencing nightclothing as a garment for thermal comfort.

CHAPTER III

PROCEDURE

Development of the Questionnaire

A questionnaire was developed to ascertain information about thermal comfort as a factor in the types of sleeping apparel worn during the summer and winter seasons by undergraduate college women at Kansas State University. The form included questions concerning socio-economic factors, physiological factors, and factors related to the type of garment that could influence thermal comfort as a reason for the sleeping apparel that was worn.

The sleeping apparel was depicted by relating questions to the style of the garment, the sleeve length, the neckline, the fit, and the fabric. Illustrated drawings, objective questions, and fabric swatches all contributed to the description of the garments. These factors were grouped in order to obtain an idea of the most representative garment that was usually worn (Appendix A, page 58).

It was recognized that the fiber content and the color of the garment might be determining factors for the type of sleeping apparel worn. However, when comparing natural and man-made fibers Werden and others (4) found no differences in the thermal comfort of clothing that was related to the fiber content. Also the pretest of the questionnaire, used for the present study, indicated that participants did not know the

fiber content of their garments and the information given relative to fiber content was not valid. Therefore, because of the multiplicity of problems involved in a study of color and fiber content, these factors were not included in this research.

The Pretest

In order to test the clarity of the questionnaire, three students ineligible to participate in the study but living under conditions similar to those students selected for the sample, were asked to complete the first draft of the questionnaire. Later a group of ten students, who also were ineligible to participate in the final study, were administered the questionnaire.

Both of these pretests provided experience for presenting the questionnaire and helped determine the clarity of the questions. After both pretests, revisions and additions were made in the questionnaire. The results of the second pretest were tabulated and served as a guide for planning the final study.

The Sample

A total of 140 unmarried undergraduate college women living in Goodnow Hall, a dormitory, at Kansas State University during summer school were selected as the sample. Because of incomplete answers, twenty questionnaires were eliminated from the study. All the participants were living under similar

conditions at the time of the study. Two girls shared an air-conditioned room that allowed personal adjustment of the conditioning unit to low, medium, high, or off positions. The total sample had separate beds, similar mattresses, mattress pads, sheets, and pillow cases. Other bed covering was provided by the students. The furniture and the arrangement of the rooms were consistent throughout the dormitory.

The individuals were in a similar age group (17-23 years) and slept under relatively consistent conditions during the winter preceding this study.

Administration of the Questionnaire

During the month of July, the questionnaire was administered in separate rooms to two roommates at the same time and collected when completed.

Statistical Analysis

The questionnaire responses were coded for I.B.M. cards. The Two-way Classification of Occupations given by Roe (12) was used to classify the occupational status of the participant's parents, and a chart for the "Desirable Weights of Women" given by Wessel (15) was used to categorize the participant's height and weight proportions. A panel of eight graduate students helped categorize possible responses for the analysis of the amount of bedcovering used and the type of neckline worn. The data were transferred onto Port-A-Punch I.B.M. cards, sorted, and arranged into frequency distributions.

Chi-square was employed to test the null hypotheses developed for the study (Appendix B, page 70). The table of Accumulative Distribution of Chi-square, as presented by Snedecor (13) was used to determine the probability of the number of times in a hundred that the distribution would be due to chance. Probabilities of 0.05 were set as being significant for this study.

CHAPTER IV

FINDINGS

To gain an understanding of the participant's wardrobes, one question was asked concerning the kind and the amount of sleeping apparel owned for both summer and winter (Tables I and II, pages 25 and 26). The wardrobes of the majority of girls contained two garments for each season; however, one and three garments were also usual numbers.

For all students there was a total of twenty-nine more garments in the summer wardrobes than in the winter wardrobes. More pajamas were included in the summer wardrobes than in the winter wardrobes, while more gowns were included in the winter wardrobes than the summer wardrobes. Seven respondents indicated they wore the same sleeping apparel in both the summer and winter, and seven respondents indicated they wore some of the same sleeping apparel both seasons.

To determine some of the factors that influenced the type of sleeping apparel worn by the participants forty-one null hypotheses were developed and analyzed by the chi-square test at the 0.05 level of significance (Appendix B, page 70).

The heated or cooled conditions of the participants' bedrooms determined whether the windows were opened or closed during the winter or summer. There was a significant difference between whether the windows were opened or closed during

TABLE I

NUMBER AND TYPE OF SLEEPING GARMENTS IN WARDROBES FOR WINTER SEASON

Pajamas and Gowns			Pajamas only			Gowns only		
Number of students	Garments per person	Total number garments	Number of students	Pajamas per person	Total number pajamas	Number of students	Gowns per person	Total number gowns
2	0	0	23	0	0	31	0	0
28	1	28	55	1	55	39	1	39
42	2	84	28	2	56	35	2	70
19	3	57	9	3	27	6	3	18
13	4	52	2	4	8	6	4	24
5	5	25	1	5	5	1	5	5
3	6	18	1	8	8	1	6	6
4	7	28				1	12	12
1	8	8						
1	9	9						
2	12	24						
Total 120		333	120		159	120		174

TABLE II

NUMBER AND TYPE OF SLEEPING GARMENTS IN WARDROBES FOR SUMMER SEASON

Pajamas and gowns			Pajamas only			Gowns only		
Number of students	Garments per person	Total number garments	Number of students	Pajamas per person	Total number pajamas	Number of students	Gowns per person	Total number gowns
1	0	0	9	0	0	41	0	0
22	1	22	46	1	46	53	1	53
44	2	88	41	2	82	14	2	28
24	3	72	7	3	21	5	3	15
9	4	36	8	4	32	3	4	12
5	5	25	5	5	25	3	5	15
5	6	30	3	6	18	1	7	7
3	7	21	1	8	8			
2	8	16						
2	9	18						
1	10	10						
2	12	24						
Total 120		362	120		232	120		130

the winter and whether the participants were sleeping in heated or unheated bedrooms at home or school. Also a significant difference was found between whether the windows were opened or closed during the summer and whether the participants were sleeping in an air-conditioned or non-air-conditioned bedroom at home or school.

In a comparison of the location of the participants' homes and the type of sleeping apparel worn, a significant difference was found for the winter season but no significant difference was found for the summer season (Table III and Table IV, pages 28 and 29). The most usual garments worn for the summer season regardless of the location of the participants' homes were short pajamas with short sleeves; however, for the winter season the sleeping garments varied with the location of the homes.

When asked if during the winter more bedding was preferred when the sleeping apparel was sheer than when it was a heavier garment, no significant difference was found when compared to whether the participants were sleeping in a heated or unheated room. However, when the participants were asked the same question only for the summer season and these data were compared to whether they were sleeping in air-conditioned or non-air-conditioned bedrooms, a significant difference was found. Table V and Table VI (page 30) illustrate the tabulation of findings.

TABLE III

TYPE OF SLEEPING APPAREL WORN DURING THE WINTER BY THE SIZE OF HOME COMMUNITY AND NUMBER OF STUDENTS

Sleeping apparel worn	Size of home community				
	Rural area or town under 1,999	2,000-4,999	5,000-14,999	15,000-19,999	Over 20,000
Long pajamas and gowns					
Sleeve length:					
Long	57	8	9	11	19
Short	4	3	2	1	3
Sleeveless	2	0	0	0	0
Medium length pajamas and gowns					
Sleeve length:					
Long	6	1	0	1	2
Short	10	1	0	1	1
Sleeveless	3	1	0	0	1
Short pajamas and gowns					
Sleeve length:					
Long	7	1	0	0	3
Short	5	2	1	0	1
Sleeveless	13	2	0	0	2
No preference	3	0	2	0	1
None of these	32	5	4	4	5
Total	142	24	18	18	38

TABLE IV

TYPE OF SLEEPING APPAREL WORN DURING THE SUMMER BY THE SIZE OF HOME COMMUNITY AND NUMBER OF STUDENTS

Sleeping apparel worn	Size of home community				
	Rural area or town under 1,999	2,000-4,999	5,000-14,999	15,000-19,999	Over 20,000
Long pajamas and gowns					
Sleeve length:					
Long	1	0	0	0	0
Short	0	0	0	1	0
Sleeveless	2	0	0	2	0
Medium length pajamas and gowns					
Sleeve length:					
Long	1	0	0	0	0
Short	0	1	3	0	1
Sleeveless	13	2	2	2	2
Short pajamas and gowns					
Sleeve length:					
Long	1	0	0	0	0
Short	13	1	1	1	7
Sleeveless	75	14	8	8	22
No preference	1	0	0	0	0
None of these	35	6	4	4	6
Total	142	24	18	18	38

TABLE V

BEDCOVERING PREFERRED UNDER DIFFERENT ROOM CONDITIONS IN WINTER BY NUMBER OF STUDENTS

Room condition	Bedcovering preferred	
	More bedding when garments worn are sheer	Less bedding when garments worn are sheer
Heated	67	31
Unheated	12	10

TABLE VI

BEDCOVERING PREFERRED UNDER DIFFERENT ROOM CONDITIONS IN SUMMER BY NUMBER OF STUDENTS

Room condition	Bedcovering preferred	
	More bedding when garments worn are sheer	Less bedding when garments worn are sheer
Air-conditioned	19	81
Not air-conditioned	8	12

After indicating the type of pajamas and gowns usually worn during the winter and summer, the participants were asked if these were worn for warmth during the winter and coolness during the summer. Significant differences were found for all cases and the four null hypotheses developed

for these questions were rejected (Appendix B, page 74; hypotheses 26, 27, 28, and 29). Tables VII, VIII, IX, and X, (pages 32, 33, 34, and 35) indicate the type of apparel worn and the reasons it was worn.

The fact that heating and air conditioning make available different temperatures inside the home than the outside temperatures, and these are assumed to produce similar temperatures inside the home regardless of the season, was not found to be a factor in the combination of bedcovering used and sleeping apparel worn during the summer and winter seasons. The kind and amount of bedcovering used by the respondents was classified according to its distribution into categories indicating its assumed thermal insulation. This was studied along with the condition of the room and the sleeping apparel worn for winter and summer.

The actual bedcovering used by the respondents was checked (Appendix A, question 1, page 60) and then classified into categories of light, medium, and medium-heavy. A panel of eight graduate students helped categorize the responses according to the combination believed to give the least, average, and most thermal insulation. A significant difference was found between the combination of sleeping apparel worn and the bedcovering used in a heated bedroom in the winter and the combination of sleeping apparel worn and the bedcovering used in an air-conditioned bedroom in the summer at school (Table XI, page 36).

TABLE VII

TYPE OF PAJAMAS WORN DURING WINTER BY REASONS WORN AND NUMBER OF STUDENTS

Pajamas worn	Reasons worn	
	For warmth	Not for warmth
Long pajamas		
Sleeve length:		
Long	53	3
Short	8	3
Sleeveless	0	0
Medium length pajamas		
Sleeve length:		
Long	3	1
Short	3	1
Sleeveless	1	1
Short pajamas		
Sleeve length:		
Long	4	4
Short	0	4
Sleeveless	0	10
No preference	1	4
None of these	0	2
Total	73	33

TABLE VIII

TYPE OF PAJAMAS WORN DURING SUMMER BY REASONS WORN AND NUMBER OF STUDENTS

Pajamas worn	Reasons worn	
	For coolness	Not for coolness
Long pajamas		
Sleeve length:		
Long	0	0
Short	0	1
Sleeveless	0	0
Medium length pajamas		
Sleeve length:		
Long	0	0
Short	1	1
Sleeveless	2	1
Short pajamas		
Sleeve length:		
Long	1	0
Short	13	1
Sleeveless	78	8
No preference	1	0
None of these	1	0
Total	97	12

TABLE IX

TYPE OF GOWNS WORN DURING WINTER BY REASONS WORN AND NUMBER OF STUDENTS

Gowns worn	Reasons worn	
	For warmth	Not for warmth
Long gowns		
Sleeve length:		
Long	46	2
Short	2	0
Sleeveless	1	1
Medium length gowns		
Sleeve length:		
Long	4	2
Short	4	5
Sleeveless	0	3
Short gowns		
Sleeve length:		
Long	1	2
Short	2	3
Sleeveless	1	5
No preference	0	1
None of these	0	1
Total	61	25

TABLE X

TYPE OF GOWNS WORN DURING SUMMER BY REASONS WORN AND NUMBER OF STUDENTS

Gowns worn	Reasons worn	
	For coolness	Not for coolness
Long gowns		
Sleeve length:		
Long	0	1
Short	0	0
Sleeveless	2	2
Medium length gowns		
Sleeve length:		
Long	0	1
Short	3	0
Sleeveless	14	4
Short gowns		
Sleeve length:		
Long	0	0
Short	6	2
Sleeveless	37	4
No preference	0	0
None of these	1	4
Total	63	18

TABLE XI

SLEEPING APPAREL WORN AND BEDCOVERING USED IN AIR-CONDITIONED AND NON-AIR-CONDITIONED BEDROOMS AND HEATED AND UNHEATED BEDROOMS FOR TWO SEASONS BY NUMBER OF STUDENTS

Sleeping apparel worn	Winter						Summer					
	Heated room			Unheated room			Air-conditioned room			Non-air-conditioned room		
	Amount bedcovering			Amount bedcovering			Amount bedcovering			Amount bedcovering		
	Light	Med.	Med.-heavy	Light	Med.	Med.-heavy	Light	Med.	Med.-heavy	Light	Med.	Med.-heavy
Long pajamas and gowns												
Sleeve length:												
Long	22	52	10	3	14	3	1	0	0	0	0	0
Short	2	6	2	2	1	0	0	1	0	0	0	0
Sleeveless	1	0	1	0	0	0	2	2	0	0	0	0
Medium pajamas and gowns												
Sleeve length:												
Long	3	4	0	1	2	0	0	0	0	0	1	0
Short	4	7	0	1	1	0	1	4	0	0	0	0
Sleeveless	2	3	0	0	0	0	3	14	1	2	1	0
Short pajamas and gowns												
Sleeve length:												
Long	2	8	1	0	0	0	0	1	0	0	0	0
Short	2	4	0	0	1	2	3	11	2	2	4	0
Sleeveless	2	10	3	0	1	0	29	66	12	4	14	2
No preference	1	5	0	0	0	0	0	1	0	0	0	0
None of these	15	25	3	2	4	1	16	24	5	1	6	2

Several types of necklines were checked by the respondents as being the type usually worn (Appendix A, question 34, page 65). These were rated into categories of high, medium, and low by a panel of eight graduate students, and analyzed for the reason worn. There was found to be a significant difference between the types of necklines worn and whether they were chosen for warmth during the winter and coolness during the summer (Tables XII and XIII, page 38). Each student was asked to check a preference for pairs of unlike fabric properties for summer and for winter. A significant difference was found between the properties of the fabric usually worn for sleeping apparel during the summer season and those worn for the winter season (Table XIV, page 39).

The conditions of the rooms were influencing factors in the items other than sleeping apparel worn for thermal comfort and/or other reasons. There was found to be a significant difference between the items, other than sleeping apparel, that were worn for warmth or other reasons and the fact that the participants slept in a heated or unheated bedrooms during the winter and in air-conditioned or non-air-conditioned bedrooms during the summer at school (Tables XV and XVI, pages 40 and 41).

There was found to be a significant difference between the responses to the question which asked if different sleeping apparel was worn at home than was worn at school and the

TABLE XII

TYPE OF NECKLINES WORN AND WHETHER WORN FOR WARMTH DURING WINTER BY NUMBER OF STUDENTS

Reason worn	Neckline types			
	Low	Medium	High	No preference
Warmth	1	0	59	1
Not warmth	9	15	32	3

TABLE XIII

TYPE OF NECKLINES WORN AND WHETHER WORN FOR COOLNESS DURING SUMMER BY NUMBER OF STUDENTS

Reason work	Neckline types			
	Low	Medium	High	No preference
Coolness	43	32	1	2
Not coolness	22	11	5	4

TABLE XIV

FABRIC PROPERTIES OF SLEEPING APPAREL USUALLY WORN IN TWO SEASONS BY NUMBER OF STUDENTS

Properties of fabric	Winter	Summer
Fuzzy	72	2
Smooth	48	118
Silky	91	118
Harsh	29	2
Fine	93	119
Coarse	28	1
Soft	116	115
Crisp	4	5
Cool to touch	21	117
Warm to touch	99	3
Light weight	66	120
Heavy weight	54	0

fact the individuals were sleeping in different conditions at home and school or the same conditions in both places. The sleeping apparel worn was compared to whether the respondents were sleeping in unheated bedrooms at home and at school or heated bedrooms at one place and unheated bedrooms at the other (Table XVII, page 42).

No significant differences were found between the types of sleeping apparel worn for summer and winter and the undergraduate classifications, the chosen college curriculums, the height and weight proportions, the individuals' residence last

TABLE XV

ADDITIONAL CLOTHING ITEMS WORN DURING SLEEPING HOURS FOR COMFORT IN HEATED OR UNHEATED ROOMS IN WINTER BY NUMBER OF STUDENTS

Items worn	Reasons worn	
	For comfort and warmth	For comfort other than warmth
Heated rooms		
Socks	18	0
Hair net	0	42
Panties	5	50
Other	0	3
None of these	0	1
Unheated rooms		
Socks	6	0
Hair net	0	9
Panties	1	7
Other	0	0
None of these	0	0

TABLE XVI

ADDITIONAL CLOTHING ITEMS WORN DURING SLEEPING HOURS FOR COMFORT IN AIR-CONDITIONED OR NON-AIR-CONDITIONED ROOMS IN THE SUMMER BY NUMBER OF STUDENTS

Items worn	Reasons worn	
	For comfort and warmth	For comfort other than warmth
Air-conditioned rooms		
Socks	0	2
Hair net	0	39
Panties	6	46
Other	0	2
None of these	0	2
Non-air-conditioned rooms		
Socks	0	0
Hair net	0	10
Panties	0	11
Other	0	0
None of these	0	0

TABLE XVII

SLEEPING APPAREL WORN AT HOME AND AT SCHOOL DURING WINTER BY ROOM CONDITIONS AND NUMBER OF STUDENTS

Room conditions	Different sleeping apparel worn at home than at school	Same sleeping apparel worn at home and at school
Heated rooms at home	9	71
Unheated rooms at home	6	34
Heated rooms at school	34	71
Unheated rooms at school	4	11

winter, the occupational status of the parents, the number of hours of sleep received per week night, and whether a bedroom or bed was shared with another person. Also no significant differences were found between the fact that an individual sleeps in the nude and the apparent temperature of the bedroom; between the fit of the sleeping apparel worn and whether they were worn for warmth or coolness during the winter or summer; between the type of fabrics that were believed to feel warmest to the touch and that usually worn

during the winter; and between the type of fabrics that were believed to feel coolest to the touch and that usually worn during the summer.

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

Clothing worn by modern man relies on the idea of protection from cold in some respects but disregards it in others. This study was conducted to investigate thermal comfort as a factor in the sleeping apparel worn by undergraduate college women for two seasons in Kansas.

Wardrobes of the respondents contained different sleeping apparel for both the summer and winter seasons. The majority of respondents owned between one and three sleeping garments for both seasons but most of them owned two garments for each season. This was consistent with the average amount of sleep wear cut in the United States when compared with the population for 1962 and 1963 (6, 7, 13).

The findings of this research apply only to the particular sample studied. From the data collected in this study, the findings could provide a basis for more extensive research in the area of thermal comfort. It is evident from this study that the protection theory as a basis for wearing clothing cannot be completely disregarded. It was found that sleeping in a heated or unheated, or an air-conditioned or non-air-conditioned room influenced whether the windows were opened or closed during the winter and summer. Sleeping in an air-conditioned or non-air-conditioned bedroom affected whether the respondent preferred more bedding or less bedding

when a sheer garment was worn.

Longer sleeping apparel with long sleeves was most frequently worn during the winter and shorter sleeping apparel with short or no sleeves was most frequently worn during the summer. Also high necklines were most frequently worn during the winter and low necklines were most frequently worn during the summer. Therefore it appears that the type of clothing worn during the two seasons was influenced by the fact that summer is warm and that winter is cold in Kansas. The bed-covering varied with the sleeping apparel worn and the heated or cooled condition of the room; and different sleeping apparel was worn at home than at school when the room conditions changed. Also the items, other than sleeping apparel, worn for comfort, appeared to vary according to the heated or cooled condition of the room. These data appear to show that the theory of protection cannot be disregarded.

Different fabrics were indicated as being preferred for the two seasons according to the character of the surface. The properties that suggested warmth were chosen for winter and those suggesting coolness were chosen for summer. However, the fabric believed to feel warmest was not significant by test of chi-square with that usually worn in the winter and the fabric believed to feel coolest was not significant with that usually worn in the summer. This suggests some inconsistency in the findings of the research.

Further research needs to be done to investigate whether the warm or cool character of the fabric is a determining factor in the fabric worn for winter and summer. Also research could be done to investigate whether the character of the fabric is important in the thermal comfort of the garment.

Even though the majority of participants were sleeping in heated bedrooms during the winter and air-conditioned bedrooms during the summer, the results of this study indicate that different sleeping apparel was usually worn for the two seasons. This connotes that the sleeping apparel was worn for the season of the year rather than for the bedroom's actual temperature. Therefore it could be concluded that thermal insulation might not be a physiological but more of a psychological consideration. However, more research needs to be done in the area of thermal comfort before accurate conclusions can be drawn.

A repetition of the study should be done during another season of the year. The actual temperatures of the rooms might be checked over a period of time and compared with the type of sleeping apparel worn to give a more accurate investigation of the reason different apparel was worn.

The same type of research might be conducted using married women as the sample and using a larger group of respondents. Married women could be expected to alter the results of a study of this type because the participants

probably would be sharing beds with their husbands, and they might be wearing sleeping apparel for personal reasons other than for thermal comfort. A larger group of respondents would give a better representation of the reasons clothing is worn. This would allow more accurate conclusions to be drawn regarding the importance of thermal comfort.

Administration of the study in other areas of the country could be of value to determine if the results are of particular interest to one section of the country. Manufacturers of night clothing might find the type of garments worn or preferred by women useful in determining the type of garments to produce for each season. If night clothing was found to be worn not for thermal insulation, then garments would be made that would appeal to the consumer for fashionable or other psychological reasons. There would be no reason to produce garments that would provide warmth during one season and coolness during another. The retailer could promote the sale of night clothing by establishing a color or a style for the season rather than promoting garments for warmth or coolness.

CHAPTER VI

SUMMARY

A questionnaire was devised to determine the kind of sleeping apparel worn during the summer and winter seasons by a group of undergraduate college women at Kansas State University, and to investigate if the apparel was worn for thermal comfort or for reasons unrelated to thermal comfort.

Hypotheses were developed and analyzed by the chi-square test for significance at the 0.05 level. During the month of July a sample of 140 participants was administered the questionnaire. Because of incomplete answers twenty questionnaires were eliminated from the study. Significant differences were found between whether the windows were opened or closed during the winter and summer and the condition of the room; and between the location of the individuals' home communities and the type sleeping apparel worn during the winter. Significant differences were found between the amount of bedcovering preferred and the sheerness of the sleeping apparel worn during the summer; and between the type gowns and pajamas worn and whether worn for warmth during the winter and coolness during the summer.

Also, significant differences were found between the condition of the room for summer and winter, and the bedcovering used and sleeping apparel worn; between the type neckline

worn and whether worn for warmth during winter and coolness during summer; and between the fabric properties worn for winter and summer. Significant differences were found between the items other than sleeping apparel worn, and the condition of the room during the winter and during the summer; and between the fact that different sleeping apparel was worn at home than at school, and the condition of the room during the winter.

No significant differences were found between the types of sleeping apparel worn for summer and winter and the undergraduate classifications, the chosen college curriculums, the height and weight proportions, the individual's residence last winter, the occupational status of the parents, the number of hours of sleep received per week night, and whether a bedroom or bed was shared with another person. No significant differences were found between the fact that an individual sleeps in the nude and the heated or cooled condition of the bedroom; and between the fit of the sleeping apparel worn and whether it was worn for warmth or coolness during the winter or summer. No significant differences were found between the type fabric that was believed to feel coolest to the touch and that usually worn during the summer; and between the type fabric that was believed to feel warmest to the touch and that usually worn during the winter.

The majority of the respondents were sleeping in heated

bedrooms during the winter and air-conditioned bedrooms during the summer. However, the results of this study indicate that different sleeping apparel usually was worn for the two seasons. This connotes that the sleeping apparel was worn for the season of the year rather than for the bedroom's actual temperature. Therefore it could be concluded that thermal insulation might not be a physiological but more of a psychological consideration. However, more research needs to be done in the area of thermal comfort before accurate conclusions can be drawn.

ACKNOWLEDGMENTS

The writer wishes to express sincere appreciation to her advisor, Dr. Jessie A. Warden, Head of the Clothing and Textiles Department, for her assistance and guidance during the writing of this thesis.

Grateful acknowledgment also is expressed to Dr. Dorothy L. Harrison, Professor of Foods and Nutrition, and Miss Gertrude Lienkaemper, Associate Professor of Clothing and Textiles, for their valuable suggestions while serving on the writer's committee.

The writer is indebted to Dr. Holly C. Fryer, Head of the Statistics Department, and to Mr. Earnest Hilderbrant for their recommendations concerning the analysis of the data.

Without the cooperation of the directors and undergraduate women who lived in Goodnow Hall during the time of the study, the research could not have been conducted. Sincere appreciation is expressed for their participation.

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APPENDIX A

Directions

Read all the instructions carefully and answer each question.
Do not leave any blank questions unless directed.
All answers are confidential.

Name _____ Home Address _____
Undergraduate classification: Fr., Soph., Jr., Sr.
Major_____ Age _____ Weight _____ Height ____

Check the answer that describes where your home is located.
____ In a rural area
____ In a town under 1,999 Population
____ In a town 2,000-4,999 Population
____ In a town 5,000-14,999 Population
____ In a town 15,000-19,999 Population
____ In a city over 20,000 Population

Check where you lived last winter:
____ University dormitory
____ Apartment
____ Rooming house
____ Sorority house
____ Parents' home
____ Own home
____ Other, specify _____

List your father's occupation _____
Describe his duties in this occupation _____

List your mother's occupation _____
Describe her duties in this occupation (if other than a full-time homemaker)_____

1. Check below the type and numbers of bed covering that you usually sleep under during the winter and summer.

Winter (coldest part of the year)	Summer (warmest part of the year)
____ Sheet	____ Sheet
____ Sheet blanket (single)	____ Sheet blanket (single)
____ Sheet blanket (double)	____ Sheet blanket (double)
____ Blanket (heavy weight)	____ Blanket (heavy weight)
____ Blanket (medium weight)	____ Blanket (medium weight)
____ Blanket (light weight)	____ Blanket (light weight)
____ Thermal blanket	____ Thermal blanket
____ Electric sheet or blanket	____ Electric sheet or blanket
____ Comforter (Circle type: Wool, cotton, dacron filled or other_____)	____ Comforter (Circle type: Wool, cotton, dacron filled or other____)
____ Quilt	____ Quilt
____ Afghan	____ Afghan
____ Bedspread	____ Bedspread
____ Other, list _____	____ Other, list _____

Winter Summer

_____ _____

2. List the approximate number of hours of sleep per week night that you usually get during the winter and summer in the blanks at the left.

3. Describe each kind of sleeping garment in your wardrobe for both winter and summer. Use the headings as a guide for your description.

Season and Garment Style	Sleeve Length Sleeveless, short, long, etc.	Fabric Woven: flannel, broadcloth, batiste, etc. Knit: tricot, jersey, etc.
Example Ski	Long	Knit: jersey
Winter Gowns long		
Gowns short		
Pajamas long		
Pajamas short		
Other		
Summer Gowns long		
Gowns short		
Pajamas long		
Pajamas short		
Other		

Circle either yes or no to answer the following questions.

Yes No 4. Do you usually sleep in a heated bedroom during the winter at home?

Yes No 5. Do you usually sleep in a heated bedroom during the winter at school?

Yes No 6. Do you usually sleep in an air-conditioned bedroom during the summer at home?

Yes No 7. Do you usually sleep in an air-conditioned bedroom during the summer at school?

Yes No 8. Do you usually sleep with a window open during the winter at home?

Yes No 9. Do you usually sleep with a window open during the winter at school?

Yes No 10. Do you usually sleep with a window open during the summer at home?

Yes No 11. Do you usually sleep with a window open during the summer at school?

Yes No 12. Do you share a bedroom with another person at home?

Yes No 13. Do you share a bedroom with another person at school?

Yes No 14. Do you usually share a bed with another person when at home?

Yes No 15. Do you usually share a bed with another person when at school?

Yes No 16. Do you wear different sleeping apparel at home than when at school?

Yes No 17. Do you vary the amount of covering when the room temperature changes during the winter?

Yes No 18. Do you vary the amount of covering when the room temperature changes during the summer?

Yes No 19. Do you ever sleep without any bedcovering when the room temperature is very hot?

Yes No 20. During the winter, do you prefer more bedding when your sleeping apparel is sheer than when it is a heavier garment?

Yes No 21. During the summer, do you prefer more bedding when your sleeping apparel is sheer than when it is a heavier garment?

Yes No 22. Do you sometimes sleep in the nude?

Yes No 23. Do you usually sleep in the nude during the cold winter?

Yes No 24. Do you usually sleep in the nude during the hot summer?

Yes No 25. Do you wear different types of sleeping apparel during the hot summer months than during the cold winter months?

Yes No 26. Do you wear pajamas more often than a gown for sleeping during the cold winter?

Yes No 27. Do you wear a gown more often than pajamas for sleeping during the hot summer?

Winter Summer

_____ _____ 28. (If you do not wear pajamas go on to question 31). Place the number in the blanks at the left that best describes the type pajama trousers you usually wear and the sleeve length you prefer for winter and summer.

1. Long pajamas and long sleeves
2. Long pajamas and short sleeves
3. Long pajamas and no sleeves
4. Medium length pajamas and long sleeves
5. Medium length pajamas and short sleeves
6. Medium length pajamas and no sleeves
7. Short pajamas and long sleeves
8. Short pajamas and short sleeves
9. Short pajamas and no sleeves
10. No preference (would wear any of the above)
11. None of the above (would not wear any of the above)
12. Other, list _____

Circle yes or no to answer the following questions.

Yes No 29. Do you wear the pajamas checked above for the warmth they will provide during the winter?

Yes No 30. Do you wear the pajamas checked above for the coolness they will provide during the summer?

Winter Summer

_____ _____ 31. (If you do not wear gowns go on to question 34.) Place the number in the blanks at the left that best describes the type gown skirt you usually wear and the sleeve length you prefer for winter and summer.

1. Long gown and long sleeves
2. Long gown and short sleeves
3. Long gown and no sleeves
4. Medium length gown and long sleeves
5. Medium length gown and short sleeves
6. Medium length gown and no sleeves
7. Short gown and long sleeves
8. Short gown and short sleeves
9. Short gown and no sleeves
10. No preference (would wear any of the above
11. None of the above (would not wear any of the above)
12. Other, list _____

Circle yes or no to answer the following questions.

Yes No 32. Do you wear the gown checked above for the warmth it will provide during the winter?

Yes No 33. Do you wear the gown checked above for the coolness it will provide during the summer?

Winter Summer

34. Place the letter in the blanks at the left that corresponds to the type of neckline for nightclothing that you usually wear in the winter and summer.

_____ _____

A

B

C

D

(E

F

G

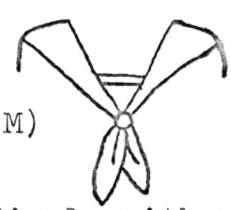
H)

I

J

(K

L



(M)

N) No preference

Circle either yes or no to answer the following questions.

Yes No 35. Do you wear this type neckline for warmth during the winter?

Yes No 36. Do you wear this type neckline for coolness during the summer?

Winter

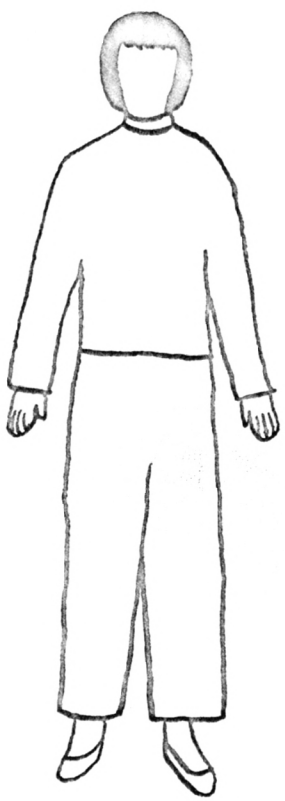
37. Assuming that you wear pajamas, place the letter in the blank at the left that corresponds to the kind of fit you usually wear during the cold winter. Disregard the sleeve length and neckline.

_____

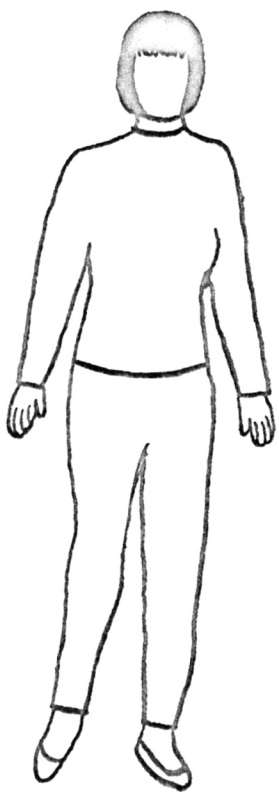
Summer

38. Assuming that you wear pajamas, place the letter in the blank at the left that corresponds to the kind of fit you would usually wear during the hot summer. Disregard the sleeve length and neckline.

Selections on fit:



A



B

Circle either yes or no to answer the following questions.

Yes No 39. Do you wear the nightclothing checked above for warmth during the winter?

Yes No 40. Do you wear the nightclothing checked above for coolness during the summer?

Yes No 41. In the winter, do you believe that a light weight cotton woven fabric as broadcloth) would seem warmer than a similar weight cotton knit fabric?

Yes No 42. In the summer, do you believe that a light weight cotton woven fabric (as broadcloth) would seem cooler than a similar weight cotton knit fabric?

43. Check the words in the blanks at the left that describe the properties of fabrics that you usually wear for sleeping apparel.

Winter		Summer	
1. ____	fuzzy	1. ____	fuzzy
____	smooth	____	smooth
2. ____	silky	2. ____	silky
____	harsh	____	harsh
3. ____	fine	3. ____	fine
____	coarse	____	coarse
4. ____	soft	4. ____	soft
____	crisp	____	crisp
5. ____	cool to your touch	5. ____	cool to your touch
____	warm to your touch	____	warm to your touch
6. ____	light weight	6. ____	light weight
____	heavy weight	____	heavy weight

44. Check the items on the winter and summer lists that you usually wear for sleeping and the reasons that these are worn.

Winter	Comfort for warmth	Comfort for reasons other than warmth
____ Socks	____	____
____ Hair net	____	____
____ Panties	____	____
____ Other, list _____	____	____
____ None of the above	____	____

Summer	Comfort for warmth	Comfort for reasons other than warmth
____ Socks	____	____
____ Hair net	____	____
____ Panties	____	____
____ Other, list _____	____	____
____ None of the above	____	____

Use the folder of fabric samples for answering the following questions.

Summer Winter

45. Place the number in the blanks at the left of the fabric sample that is nearest to the type you usually wear during the winter and summer.

_____ _____

Winter

46. Touch each of the fabric samples in the folder. Place the number in the blank at the left of the fabric that you believe would be the warmest to wear during the winter.

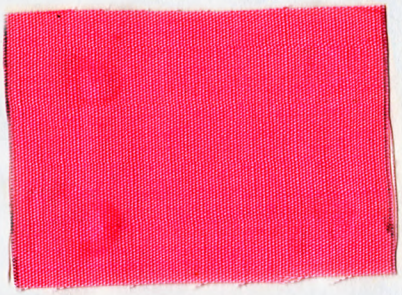
_____

Summer

47. Touch each of the fabric samples in the folder. Place the number in the blank at the left of the fabric that you believe would be the coolest to wear during the summer.

APPENDIX B

(1)



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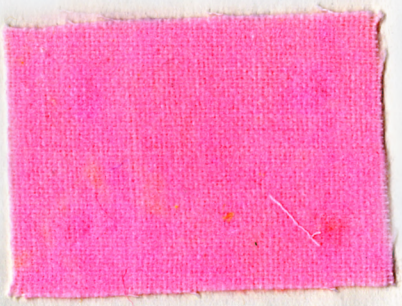
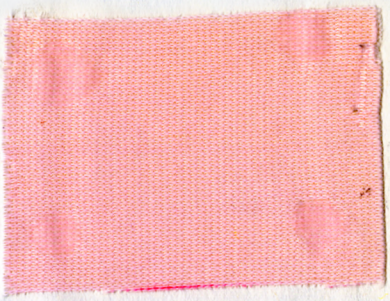
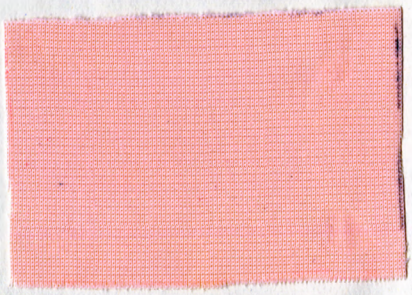


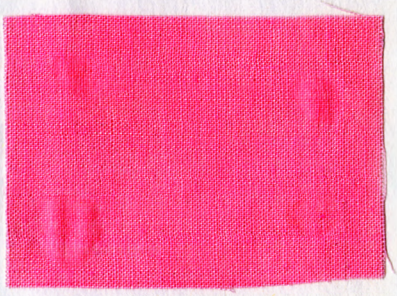
(2)



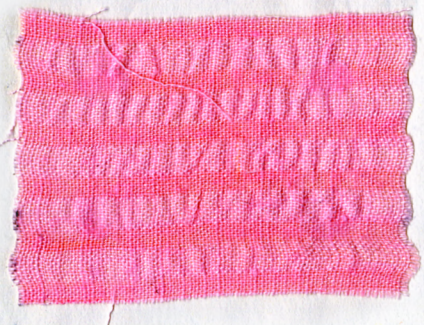
(6)



(3)



(7)



(4)

NULL HYPOTHESES DEVELOPED FOR THE STUDY

1. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the winter and their undergraduate classifications.
   Chi-square 21.76864 D.F. 30 $p \leq 0.900$
   Null hypothesis was accepted at the 0.05 level of significance.

2. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the summer and their undergraduate classifications.
   Chi-square 26.28715 D.F. 30 $p \leq 0.750$
   Null hypothesis was accepted at the 0.05 level of significance.

3. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the winter and their chosen college curriculums.
   Chi-square 27.16513 D.F. 20 $p \leq 0.250$
   Null hypothesis was accepted at the 0.05 level of significance.

4. There is no significant difference between the students' sleeping apparel (pajamas and gowns) worn by students during the summer and their chosen college curriculums.
   Chi-square 17.74857 D.F. 20 $p \leq 0.750$
   Null hypothesis was accepted at the 0.05 level of significance.

5. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students in the winter and their height and weight proportions.
   Chi-square 28.80235 D.F. 20 $p \leq 0.250$
   Null hypothesis was accepted at the 0.05 level of significance.

6. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students in the summer and their height and weight proportions.
   Chi-square 19.21455 D.F. 20 $p \leq 0.500$
   Null hypothesis was accepted at the 0.05 level of significance.

7. There is no significant difference between the students' sleeping apparel (pajamas and gowns) worn during the winter and the location of their home communities.
   Chi-square 55.64623 D.F. 40 $p \leq 0.050$
   Null hypothesis was rejected at the 0.05 level of significance.

8. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the summer and the location of their home communities.
   Chi-square 31.62433 D.F. 40 $p \leq 0.900$
   Null hypothesis was accepted at the 0.05 level of significance.

9. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the winter and their residence last winter.
   Chi-square 43.19202 D.F. 40 $p \leq 0.500$
   Null hypothesis was accepted at the 0.05 level of significance.

10. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the winter and the occupational status of their parents.
   Chi-square 29.14966 D.F. 30 $p \leq 0.750$
   Null hypothesis was accepted at the 0.05 level of significance.

11. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the summer and the occupational status of their parents.
   Chi-square 24.11442 D.F. 30 $p \leq 0.900$
   Null hypothesis was accepted at the 0.05 level of significance.

12. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the winter and the number of hours of sleep received per week night.
   Chi-square 38.12320 D.F. 40 $p \leq 0.750$
   Null hypothesis was accepted at the 0.05 level of significance.

13. There is no significant difference between the sleeping apparel (pajamas and gowns) worn by students during the summer and the number of hours of sleep received per week night.
   Chi-square 48.59180 D.F. 40 $p \leq 0.250$
   Null hypothesis was accepted at the 0.05 level of significance.

14. There is no significant difference between whether the windows were opened or closed during the winter and whether the student was sleeping in a heated or unheated bedroom at home or at school.

Chi-square 34.06 D.F. 3 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

15. There is no significant difference between whether the windows were opened or closed during the summer and whether the student was sleeping in an air-conditioned or non-air-conditioned bedroom at home or at school.
Chi-square 22.43 D.F. 3 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

16. There is no significant difference between the type sleeping apparel worn and whether the participant shares a bedroom with another person at home.
Chi-square 0.00725 D.F. 1 $p \leq 0.900$
Null hypothesis was accepted at the 0.05 level of significance.

17. There is no significant difference between the type sleeping apparel worn and whether the participant shares a bedroom with another person at school.
Chi-square 1.04379 D.F. 1 $p \leq 0.500$
Null hypothesis was accepted at the 0.05 level of significance.

18. There is no significant difference between whether the participant varies the amount of covering when the room temperature changes during the winter, and whether she shares a bed with another person at home or at school.
Chi-square 0.57870 D.F. 2 $p \leq 0.750$
Null hypothesis was accepted at the 0.05 level of significance.

19. There is no significant difference between whether the participant varies the amount of covering when the room temperature changes during the summer and whether she shares a bed with another person at home or at school.
Chi-square 0.41167 D.F. 2 $p \leq 0.900$
Null hypothesis was accepted at the 0.05 level of significance.

20. There is no significant difference between whether the participant sleeps without bedcovering when the temperature is very hot and whether she shares a bedroom with another person at home or at school.
Chi-square 0.21990 D.F. 2 $p \leq 0.900$
Null hypothesis was accepted at the 0.05 level of significance.

21. There is no significant difference between whether more bedding is preferred when the sleeping apparel is sheer than when the apparel is heavier during the winter, and the temperature of the room at school.
Chi-square 1.52599 D.F. 1 $p \leq 0.250$
Null hypothesis was accepted at the 0.05 level of significance.

22. There is no significant difference between whether more bedding is preferred when the sleeping apparel is sheer than when the apparel is heavier during the summer, and the temperature of the room at school.
Chi-square 4.21505 D.F. 1 $p \leq 0.050$
Null hypothesis was rejected at the 0.05 level of significance.

23. There is no significant difference between whether the participant sleeps in the nude and whether she is sleeping in a heated or unheated room during the winter at school and an air-conditioned or non-air-conditioned room during the summer at school.
Chi-square 3.73244 D.F. 3 $p \leq 0.500$
Null hypothesis was accepted at the 0.05 level of significance.

24. There is no significant difference between whether different sleeping apparel is worn for the summer and winter months and whether the participant is sleeping in a heated bedroom during the winter and an air-conditioned bedroom during the summer at school.
Chi-square 1.44490 D.F. 3 $p \leq 0.750$
Null hypothesis was accepted at the 0.05 level of significance.

25. There is no significant difference between the combination of sleeping apparel (pajamas and gowns) worn and the bedcovering used in an air-conditioned bedroom in the summer and the combination of sleeping apparel (pajamas and gowns)worn and the bedcovering used in a heated bedroom in the winter at school.
Chi-square 303.48302 D.F. 110 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

26. There is no significant difference in the type of pajamas worn and whether they are worn for warmth during the winter.
Chi-square 95.70569 D.F. 20 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

27. There is no significant difference in the type of pajamas worn and whether they are worn for coolness during the summer.
Chi-square 121.86337 D.F. 20 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

28. There is no significant difference in the type of gowns worn and whether they are worn for warmth during the winter.
Chi-square 171.68223 D.F. 20 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

29. There is no significant difference in the type of gowns worn and whether they are worn for coolness during the summer.
Chi-square 121.22372 D.F. 20 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

30. There is no significant difference in the type neckline worn and whether the sleeping apparel is worn for warmth during the winter.
Chi-square 30.38609 D.F. 3 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

31. There is no significant difference in the type neckline worn and whether the sleeping apparel is worn for coolness during the summer.
Chi-square 10.52061 D.F. 3 $p \leq 0.025$
Null hypothesis was rejected at the 0.05 level of significance.

32. There is no significant difference in the fit of the sleeping apparel and whether the apparel is worn for warmth during the winter.
Chi-square 1.00545 D.F. 2 $p \leq 0.750$
Null hypothesis was accepted at the 0.05 level of significance.

33. There is no significant difference in the fit of the sleeping apparel and whether the apparel is worn for coolness during the summer.
Chi-square 0.00000 D.F. 2 $p \leq 0.995$
Null hypothesis was accepted at the 0.05 level of significance.

34. There is no significant difference between the fit of the sleeping apparel worn and whether the participant believed a light weight cotton woven fabric would seem warmer than a similar weight cotton knit fabric during the winter.
Chi-square 2.62687 D.F. 2 $p \leq 0.500$
Null hypothesis was accepted at the 0.05 level of significance.

35. There is no significant difference between the fit of the sleeping apparel worn and whether the participant believed a light weight cotton woven fabric would seem cooler than a similar weight cotton knit fabric during the summer.
Chi-square 0.22059 D.F. 2 $p \leq 0.900$
Null hypothesis was accepted at the 0.05 level of significance.

36. There is no significant difference between the properties of fabric usually worn for sleeping apparel during the winter and the properties of fabric usually worn for sleeping apparel during the summer.
Chi-square 755.12957 D.F. 11 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

37. There is no significant difference between the items, other than sleeping apparel, worn for warmth or other reasons and whether the participant was sleeping in a heated or an unheated bedroom during the winter at school.
Chi-square 263.38874 D.F. 18 $p \leq 0.005$

38. There is no significant difference between the items, other than sleeping apparel, worn for warmth or other reasons and whether the participant was sleeping in an air-conditioned or non-air-conditioned room during the summer at school.
Chi-square 347.45580 D.F. 18 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

39. There is no significant difference between whether the participant sleeps in a heated or an unheated bedroom at home and a heated or an unheated bedroom at school and whether she wears different sleeping apparel at home than at school during the winter.
Chi-square 46.56830 D.F. 3 $p \leq 0.005$
Null hypothesis was rejected at the 0.05 level of significance.

40. There is no significant difference between the fabric usually worn and the fabric that was believed to be the warmest to wear during the winter.
Chi-square 10.23915 D.F. 7 $p \leq 0.250$
Null hypothesis was accepted at the 0.05 level of significance.

41. There is no significant difference between the fabric usually worn and the fabric that was believed to be the coolest to wear during the summer.
Chi-square 36.85131 D.F. 28 $p \leq 0.250$
Null hypothesis was accepted at the 0.05 level of significance.

SLEEPING APPAREL WORN FOR TWO SEASONS IN KANSAS AS INFLUENCED BY THERMAL COMFORT

by

GLENDENA KAY TAYLOR

B. S., Northwest Missouri State College, 1964

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Clothing and Textiles

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1966

A questionnaire was devised to determine the kind of sleeping apparel worn during the summer and winter seasons by a group of undergraduate collége women at Kansas State University, and to investigate if the apparel was worn for thermal comfort or for reasons unrelated to thermal comfort.

Hypotheses were developed and analyzed by the chi-square test for significance at the 0.05 level. During the month of July a sample of 140 participants was administered the questionnaire. Because of incomplete answers twenty questionnaires were eliminated from the study. Significant differences were found between whether the windows were opened or closed during the winter and the summer and the condition of the room; and between the location of the individuals' home communities and the type sleeping apparel worn during the winter. Significant differences were found between the amount of bedcovering preferred and the sheerness of the sleeping apparel worn during the summer; and between the type gowns and pajamas worn and whether worn for warmth during the winter and coolness during the summer.

Also, significant differences were found between the condition of the room for summer and winter, and the bedcovering used and sleeping apparel worn; between the type neckline worn and whether worn for warmth during winter and coolness during summer; and between the fabric properties worn for winter and summer. Significant differences were found

between the items other than sleeping apparel worn, and the condition of the room during the winter and during the summer; and between the fact that different sleeping apparel was worn at home than at school, and the condition of the room during the winter.

No significant differences were found between the types of sleeping apparel worn for summer and winter and the undergraduate classifications, the chosen college curriculums, the height and weight proportions, the individual's residence last winter, the occupational status of the parents, the number of hours of sleep received per week night, and whether a bedroom or bed was shared with another person. No significant differences were found between the fact that an individual sleeps in the nude and the heated or cooled condition of the bedroom; and between the fit of the sleeping apparel worn and whether it was worn for warmth or coolness during the winter or summer. No significant differences were found between the type fabric that was believed to feel coolest to the touch and that usually worn during the summer; and between the type fabric that was believed to feel warmest to the touch and that usually worn during the winter.

The majority of the respondents were sleeping in heated bedrooms during the winter and air-conditioned bedrooms during the summer. However, the results of this study indicate that different sleeping apparel usually was worn for the two

seasons. This connotes that the sleeping apparel was worn for the season of the year rather than for the bedroom's actual temperature. Therefore, it could be concluded that thermal insulation might not be a physiological but more of a psychological consideration. However, more research needs to be done in the area of thermal comfort before accurate conclusions can be drawn.