

# **Take Advantage of Ergonomics in Clothing Design to Improve Quality of life of Parkinson's Disease Patients**

## **Nagda Ibrahim Mady**

Professor Of Clothing And Textiles Assistant  
Department Of Home Economics  
Faculty Of Specific Education  
University of Alexandria  
[Nagda\\_mady@yahoo.com](mailto:Nagda_mady@yahoo.com)

## **Shimaa Mohamed Atiha**

Lecturer Of Clothing And Textiles  
Department Of Home Economics  
Faculty Of Specific Education  
University of Alexandria  
[shimaaatiha@yahoo.com](mailto:shimaaatiha@yahoo.com)

### **Abstract**

Parkinson's disease presents a variety of difficulties in dressing, but the more common problems are a result of issues with balance, tremors and finger dexterity. The lack of ability to fasten buttons because of tremors or muscle rigidity can be very frustrating. Fashion designer needs to combine between fashion designing and Ergonomics because Ergonomics in designing the garments will satisfy PD patients' needs. People who are incapable of executing normal dressing movements. From this point of view the researchers designed the garments for PD patients considering comfort and ease of movement in addition to the better appearance that can make the PD patient feel worth in the sight of the society members and in their own view of themselves. This achieves for them the improvement of Quality of Life and maintains their dignity as well as maintaining them a fashionable look. The researchers designed 18 ergonomic design, 8 of them were implemented according to the high percentages given by both specialists and patients. These designs are the 6<sup>th</sup>, 3<sup>rd</sup>, 12<sup>th</sup>, 1<sup>st</sup>, 4<sup>th</sup>, 17<sup>th</sup>, 16<sup>th</sup>, and the 18<sup>th</sup>. Then a QoL scale was made to estimate the degree of improvement in the targeted Quality of life in the dressing activity. And the results showed that the proposed designs by the researchers were capable to offer ideas and solutions for the PD patients combining fashion and function and improved the QoL.

**key Words:** Design, Ergonomics, Quality of Life (QoL), Parkinson's Disease (PD).

\*\*\*\*\*

Parkinson's disease has a major negative impact on Quality of life. Work has been done to assess the differential contribution of the specific symptoms of Parkinson's disease to the quality of life. Patients with Parkinson's completed a booklet of questionnaire to measure the quality of life. The results indicated that the contribution of Physical, medication related and Cognitive, psychiatric symptoms to the QoL can be significant in the difficulty of dressing, walking, falls, depressions and confusion were PD symptoms significant influenced QoL scores (Rahman, Griffin, Quinn, & Jahanshahi, 2008).

Parkinson's disease symptoms vary from person to person, but can include tremor, slowness and stopping of movements (bradykinesia and akinesia), limb stiffness or rigidity, and difficulties with gait and balance. The cause of the disease is unknown. Physical weakness, limitations in movement or impaired cognition in Parkinson's patients don't necessarily mean that the patient will be unable to self – dress. (Banks, 2001).

Individuals with Parkinson disease (PD) experience a range of deficits of body systems and activities. Including dressing and fine motor movement performance. Donning jackets, dress, shirts, or socks. Patients need to modify their approach for getting on pants/slacks. Facing problems with buttons/zippers. Closing and opening buttons, clasps, zippers, putting on earrings. The PROFILE PD is a reliable and valid scale that can be used to quantify alterations in body systems and activity of individuals in early and mild-stages of PD (Schenkman, McFann, & Barón, 2010).

Since balance disorders and dizziness are common problems in old age, it is necessary to design a garment which can be put on easily in a sitting position and where the back part, sleeves and sleeve hole are wide (Çivitci, 2004). A gradual change of clothing style is advisable. Avoiding small fastenings and tight garments. Better use Front-fastening loose garments, with raglan sleeves, large buttons, zips with large pulls and Velcro are easier to put on and remove. Scarves or a cravat can help if drooling is severe. Natural fibers are more comfortable to wear (Swann, 2005).

Most patients feel more comfortable dressing themselves, even though it may take them longer to do so. They can compensate for their loss of fine motor skills by simplifying clothing fasteners in a variety of ways. Velcro closures make an excellent substitute for buttons and zippers. Large, easily grasped zipper pulls make opening or closing trouser flies, jackets and coats less difficult. Secure shirt cuffs with firm elastic bands are preferable. This method eliminates buttoning and the result is unnoticeable. Using a buttonhook or Button Aid. The handles of these tools are more easily grasped than a small button when fine hand coordination is impaired (Banks, 2001).

Pants with elastic waistbands are easier to put on than zipper or button pants. Avoiding pants with elastic ankle bands. Grab loops attached to zippers and zippers that replace buttons are helpful for patients with arthritis in the hands with Parkinson's disease or Multiple Sclerosis (Swann, 2005).

Ergonomics garments relates generally to Wearing apparel and more particularly to clothing constructed to accommodate the curvature and movement of the human body. Ergonomic garments constructed from a plurality of work pieces of predetermined dimensions sewn together to form seams, in Which at least one seam is curved towards a Wearer's plane of movement. The sleeves and legs include seams that are curved to twist the garment material (Korff, 2002).

Ergonomics were applied on the parts of designing clothing articles. Like a pocket that can be applied on an article of clothing in a position which, when the article is worn by a person to be superposed on a buttock of

the person Wearing the trousers, or on a front portion of a jacket, blouse or gilet such as to be superposed on a breast. This enables an increase in user comfort, as the article of clothing is highly wearable even at the pocket position, thus the user feels no crushing sensation as is sometimes the case with pockets of known type. The pocket of the invention enables emphasizing the curves of the user's body, making the article of clothing to which the pocket is applied particularly appreciable from the aesthetic point of view. Loose fitting clothing made of stretchy fabric is easy to put on and wear.(Alaniz & Alaniz III, 2013).

Bibs are also useful when feeding invalid individual of any age .For example invalid adults of virtually any age may suffer of Parkinson's disease which is a progressive neurodegenerative disease characterized by death of human brain neurons .Parkinson's disease adversely affects an individual's coordination and motor skills, thus an individual suffering from Parkinson's disease will eventually require feeding assistance by a caregiver. This Bib was designed so it cannot be removed by the wearer due at least in part to the location of patented straps below the rib cage (Maramotti, 2011).

Avoid clothing items made from velour, flannel or other materials that increase friction during repositioning. If the patient sweat heavily, cotton or other natural fibers that "breathe" is preferable. Avoid socks with tight elastic bands (Cianci, Cloete, Trail, & Wichmann, 2006) Non-skid socks should replace bedroom slippers, which can slide off the patient's feet. Lightweight, supportive shoes with Velcro closures or elastic shoelaces make it easy to put on and take off shoes (Packo, 2009).

To determine elderly people demands, needs and problems in regard to clothing and to design an ergonomic garment A questionnaire was prepared and given to the sample in order to determine their clothing demands and needs. It was established that most of our subjects need functional garments. An ergonomic garment has been designed. It was found that the design of clothing for the elderly requires attention to bodily changes from aging in order to facilitate and raise the quality of life. (Çivitci, 2004) .Elderly can obtain the Quality of Life , maintain the dignity and make the access to the world a little bit easier by solving the particular clothing problems (Na, 2007).

In the light of the preceded studies in different societies, the researchers were keen to know the demands and needs of elderly Parkinson's patients in Egypt as the main sample of this research.

#### **Research Problem:**

Dressing is a daily goal-directed activity requiring good Balance, bimanual coordination, and both gross and fine motor skills. Difficulties in dressing have been shown to be one of the important factors impacting on Parkinson's patient's quality of life.

#### **In the light of these givens the research problem can be derived into the following questions:**

- 1-What are the problems and difficulties Parkinson's patients' faces during dressing and how to overcome it?
- 2-How we can satisfy Parkinson's patient dressing needs by applying Ergonomics in the field of garments designing?
- 3- What are the Specialists' opinions in the proposed designs?
- 4-What are the Parkinson's consumers' and caregivers opinions in the proposed designs?
- 5- Is there a possibility of implementing the selected designs?
- 6-Did the implemented designs improved the Quality of life for Parkinson's patients?

#### **Research purposes:**

- 1-Recognizing the clothing needs for Parkinson's, and how to overcome it.
- 2-Enriching the field of garments designing through the proposed designs that uses Ergonomics.
- 3-Studying specialists' opinions towards the Ergonomic proposed designs.
- 4-Studying the Parkinson's consumers' and their caregivers' opinions towards the Ergonomic proposed designs.
- 5-Implementing the selected designs according to opinions, specialists and consumers& caregivers. And making adjustments upon some ready-made garments.
- 6- Measuring the standard of improving the Quality of life achieved after wearing the implemented designs.

#### **Research importance:**

According to the changes that accompany the disease whether it is physical, mental, psychological or mobility changes that hinder Parkinson's patients from performing their living tasks. It was important for us to put this category of consumers into concern in order to satisfy their needs taking advantages of Ergonomics in the field of garments designing and implementing some of these designs in order to improve their Quality of life.

#### **Research terminology:**

- 1- **Design:** Design is the thought process comprising the creation of an entity (Miller, 2005).
- 2- **Ergonomics:** ergonomics is the scientific discipline concerned with the interaction between humans and the artifacts and design of systems where people participate. It deals with design of systems that people use at work and in leisure (Helander, 1997).
- 3- **Quality of Life (QoL)** :When patients have chronic illness and need palliative care; treatments are expected to be equivalent in efficacy, but one offers a QOL benefit (Berzon, Staquet, Hays, & Fayers, 2000; Fayers & Machin, 2007).

4- **Parkinson's Disease (PD):** is a common neurodegenerative disorder with a prevalence of 3-4:1000 in the general world-wide population (Zhang & Roman, 1993) . It generally develops in the second half of life and is characterized by body dyskinesias, rigidity, resting tremor and postural instability (Quinn, 1995). The disease results from degeneration of dopaminergic neurons in the substantia nigra located in the midbrain; the degenerative process is progressive and inevitably leads to major disability and morbidity associated with high healthcare expenditure (Schapira, 1999).

#### **Research procedures:**

1- **Methodology:** Descriptive and applied methods.

2- **Research Limits:** Time: 2014/2015. Place: El Hanan Healthcare . EL Saada Healthcare& The assembly of social care.

3- **Research sample:** the sample was composed of 35 persons divided **as follows:**

- 10 faculty members as specialists to give their suggestions in the proposed designs.
- 25 women as Parkinson's consumers to measure their acceptance towards the proposed designs.

#### **Research tools:**

1- A poll was distributed on the Parkinson's elderly consumers to register the most common problems that face them during dressing

2- A poll was distributed on the faculty members as specialists to give their suggestions on the proposed designs.

3- A poll to measure the consumers' opinions & their caregivers towards the proposed designs.

4-Using a scale to measure the QoL for PD patients .

5- Hand drawing tools.

6- Photoshop program, and illustrator program.

#### **Establishing questionnaires steps:**

1- A poll was distributed on the Parkinson's consumers to register the most common problems that face them during dressing.

2- Aims to determine the most common problems they face during dressing and it contains 36 positive statements divided **into three axis:**

**The first axis:** Determining the disease and its impacts on body functions through 8 positive statements.

**The second axis:** The resources where a Parkinson's patient can find her clothing needs through 4 positive statements.

**The third axis:** The Factors of Assessing Clothes Suitable for Parkinson's Patient through 24 positive statements.

#### **Questionnaire's Validity:**

It aims to determine the problems and difficulties that faces Parkinson's patients when dealing with clothes, the questionnaire contains (36) positive statement and consists of a three-way estimating balance of (Yes), (sometimes) and (No). Giving 3 marks for (Yes), 2 marks for (sometimes) and 1 mark to (No) and the data attached is answered by the patient & her caregiver.

Arbitrators' Validity: Viewing it to a group of professors; specialized in the field of clothing and textiles in order to verify the credibility of its content of the form and to give an opinion about its expressive phrases. They approved the application's validity, after making some lingual adjustments on some of the phrases.

#### **Static's Validity:**

The Correlation between internal consistencies is based upon the mark of each phrase and the total score of each axis of the three S1 , S2 & S3 this is statistically significant in the following table.

**Table (1): Questioner Validity**

S1		S2		S3					
No.	Corre.	No.	Corre.	No.	Corre.	No.	Corre.	No.	Corre.
1	0.536**	1	0.713**	1	0.724**	9	0.673**	17	0.883**
2	0.796**	2	0.748**	2	0.822**	10	0.662**	18	0.445**
3	0.610**	3	0.682**	3	0.605**	11	0.643**	19	0.716**
4	0.493*	4	0.684**	4	0.747**	12	0.614**	20	0.773**
5	0.528**			5	0.793**	13	0.651**	21	0.547**
6	0.530**			6	0.812**	14	0.451**	22	0.848**
7	0.710**			7	0.459**	15	0.538**	23	0.639**
8	0.796**			8	0.477**	16	0.510**	24	0.841**

**It is significant from the previous table that** most statements are significant at (0.01) and some of it are significant at (0.05) and this approves the statements credibility and its validity.

#### **Reliability of the questionnaire:**

To assure the Reliability of the application form Cranach's Alpha value was calculated and it showed high values for the three axis which reached ( 0.812) for the first axis S1 . For the second axis S2 (0.985) and for the third axis S3 (0.781) , which is significant to the Reliability of the application form.

**sTable 2: Questionnaire Reliability**

ITME	No. of items	Cronbach's Alpha
S1	8	0.812
S2	4	0.985
S3	24	0.781

**Discussion and results:**  
**research sample:**

The research sample ages varied between 40 and 60 as shown in the following Table

**Table (3): Distribution of studied sample according to age (n = 25)**

ITEM	No.	%
Age		
40 – 50	7	28.0
50 – 60	14	56.0
>60	4	16.0

**1- Answering the first question, “What are the problems and difficulties Parkinson's patients face during dressing and how to overcome it? ”**

A questionnaire composed of three axis was made as follows:

The most common symptoms of the disease were recorded using a questionnaire that gave the results recorded as in table below.

**Table (4): Determining the disease and its impacts on body functions (n = 25).**

ITEM	Strong		Moderate		Weak	
	No.	%	No.	%	No.	%
1- Hands' Tremors	13	52.0	10	40.0	2	8.0
2- Legs' Tremors	7	28.0	17	68.0	1	4.0
3-Slowliness in body movement	17	68.0	8	32.0	0	0.0
4-Ability to raise your hands above your head	1	4.0	14	56.0	10	40.0
5-Ability to reach your feet easily	1	4.0	7	28.0	17	68.0
6- Balance disorders	12	48.0	13	52.0	0	0.0
7- The need for repetitive urination	3	12.0	17	68.0	5	20.0
8- Depression	13	52.0	8	32.0	4	16.0
Scale:						
Week	1 (4.0%)					
Moderate	16 (64.0%)					
Strong	8 (32.0%)					
Mean % score						
Min. – Max.	31.25 – 75.0					
Mean ± SD	59.0 ± 12.11					

From the previous table we observe that 4% of the sample have weak impacts of the PD on body functions, 64% have moderate impacts on body functions .which is the majority. 32% the disease was very strong impact on their body functions.

**Table (5): The resources where a Parkinson's patient can find her clothing needs (n = 25)**

ITEM	Yes		Sometimes		No	
	No.	%	No.	%	No.	%
1-Is it available to find your clothing needs in ready-made garments of the Egyptian market, which can Satisfy you as a Parkinson's patient	0	0.0	0	0.0	25	100.0
2-Do you apply some adjustments on the ready-made garments to satisfy you	3	12.0	11	44.0	11	44.0
3-You design your clothes as an individual operation ,and every Parkinson's patient design his/her clothes separately	4	16.0	9	36.0	12	48.0
4-Sewing your clothes as a Parkinson's Patient is carried out by using certain especial models designed by a specialist's support	0	0.0	8	32.0	17	68.0

The availability of finding the clothing needs for the PD patient was recorded using a questionnaire and its results were recorded as in the above table. 100% of the sample agreed that they don't find their clothing needs in ready-made garments in the Egyptian markets . 44% make adjustments to the ready-made garments, 48% design their clothes individually for their stage, 68% sew certain special models by specialist support.

**Table (6): The Factors of Assessing Clothes Suitable for Parkinson's Patient Distribution of studied sample according to Scale 2 (n = 25)**

ITEM	Yes		Sometimes		No	
	No.	%	No.	%	No.	%
1-Do you Prefer Cotton Fabrics	25	100.0	0	0.0	0	0.0
2- Do you Prefer Wool	24	96.0	0	0.0	1	4.0
3- Do you Prefer blinded Fabrics	10	40.0	8	32.0	7	28.0
4- Do you Prefer Industrial Fabrics	2	8.0	5	20.0	18	72.0
5- Do you Prefer these fabrics with light colors	3	12.0	18	72.0	4	16.0
6- Do you Prefer these Fabrics with dark colors	9	36.0	15	60.0	1	4.0
7- Do you Prefer these textiles as plain	12	48.0	13	52.0	0	0.0
8- Do you Prefer these textiles with mixed colors	14	56.0	8	32.0	3	12.0
9- Do you Prefer Bottoms	5	20.0	4	16.0	16	64.0
10- Do you Prefer Pins	6	24.0	6	24.0	13	52.0
11- Do you Prefer Zippers with small Grape loops	3	12.0	3	12.0	19	76.0
12- Do you Prefer Zippers with Large Grape Loops	21	84.0	3	12.0	1	4.0
13- Do you Prefer Velcro Strips	22	88.0	2	8.0	1	4.0
14- Do you Prefer Small Buttons	4	16.0	1	4.0	20	80.0
15- Do you Prefer Medium Buttons	7	28.0	5	20.0	13	52.0
16- Do you Prefer Large Buttons	18	72.0	3	12.0	4	16.0
17- Do you Prefer Large Pockets	24	96.0	1	4.0	0	0.0
18- Do you Prefer Medium Pockets	13	52.0	4	16.0	8	32.0
19- Do you Prefer Small Pockets	2	8.0	5	20.0	18	72.0
20- Do you Prefer garments without [pockets	2	8.0	6	24.0	17	68.0
21- Do you Prefer The Skirt and trousers with a waist	4	16.0	11	44.0	10	40.0
22- Do you Prefer the them with elastic band	23	92.0	2	8.0	0	0.0
23- Do you Prefer Sleeves with bracelets	12	48.0	3	12.0	10	40.0
24- Do you Prefer Sleeves without bracelets	22	88.0	1	4.0	2	8.0

As shown from the table no(6) that the majority prefer natural fabrics clothes, at the top cotton, The percentages are approximate between the choice of plain coloured textile and mixed colours textiles. As for the fastenings the majority prefer large zippers , Velcro and large buttons. In addition to preferred large pockets , elastic bands' pants, sleeves with no bracelets.

## **2-Answering the Second question, "how we can satisfy Parkinson's patient dressing needs by applying Ergonomics in the field of garments designing?**

The researchers designed a group of proposed designs formed of 18 models taking advantages of Ergonomics in designing the garments in order to satisfy PD patients' needs. Elderly people who are incapable of executing normal dressing movements. These designs are to offer ideas and solutions for the PD patients combining fashion and function.

### **Design No (1):**

It is an ergonomic Beige Jeans trouser that includes straight and curved seams with curve cuts at both sides and beneath the crutch depth line towards plane of movement of the limbs of the wearer offering the patients comfort without any itch. Our side-zip pants long zippers down both side seams till the hip line the long zippers make dressing and toileting easier, Four darts at the knees line to facilitate the plane of movement. In addition to 2 Big Zippers attached to the out seam of the trousers from the bottom in order to facilitate putting it easily and taking it off easily

### **Design No (2):**

A Grey Gabardine trouser with straight lines, 2 overlapping front panels that close into the middle. with wide legs .It achieved the ergonomics through front crossed Velcro flaps decorated with bottoms to give the atheistic normal view to facilitate Patient's self-dress, and caregivers work.

### **Design No (3):**

A wide light Coffee Shawl from Single Jersey Fabric with Curved and circular seams and two openings for the arms. Arm openings with Velcro closures that close the front side with the back side to facilitate its putting on and taking off. Ergonomically it plane for the body movements.

### **Design No (4):**

A blue elastic Jeans trousers with Straight and curved lines and a cummer band opened from the pockets inclination with two zippers till the crotch line with two pockets to facilitate self - dress. There is a seamless

crotch piece constructed from the same material of the garment .the seamless crotch constructed piece significantly increases the comfort of the wearer.

**Design No (5):**

It is a grey-coffee long Jacket made of coating fabric with Straight and curved lines that reaches the hip line with long sleeves with atheistic unused buttons, Raglan sleeves where two zippers go with the raglan seams passing beneath the armpit curves then it is hidden zippers downwards the jacket's side seam. Two back flaps at the two sides of the jacket to overlap the zippers to give an atheistic view

**Design No (6):**

A long brown wide dress from Industrial silk with Straight and curved lines long sleeves with overlapping cross wrap Velcro at the front side. The back side is opened with Velcro overlapping wrap back design till the waist line to facilitate the individual's arms to be inserted easily into the sleeves and the garment is drawn up to the shoulders to Improve the Quality of life of daily activities of Parkinson's patient .

**Design No (7):**

Short pink Blouse with Straight and curved lines reaches the hip line with Raglan sleeves. Velcro closure criss-cross front. To express an atheistic view to overcome the severe depression that Parkinson's patients suffer

**Design No (8):**

A long Coffee jacket using, near the knee line it has long sleeves and a cross open collar , cross wrap front design with two columns of un functional buttons .It has belt to give an atheistic view .wrap open back design Velcro closure. Overlap from the back yoke seam from the central back seam along the back line .the Velcro closure starts from beneath the jacket collar till it reaches the hip line ,then it is left open to facilitate toileting

**Design No (9):**

A Crepe Beige blouse with Straight and curved lines and a Japanese sleeves. opened from the front side with a wide curved neckline . A front snap closed with a big zipper towards the left. the zipper has a large gasp to facilitate the patient's control of the zipper due to the common tremors in fine motor hand movement .

**Design No (10):**

An arboretum Short dress (Beige & brown)with long sleeves with Straight and curved lines elasticized cuffs .with a wide neckline opened from the front side . The chest part is a front overlap flap attached to the raglan sleeves by Velcro strips. Is very easy to be used independently and therefore it can support the patient's psychology and keeps her dignity with comfortable self-dress.

**Design No (11):**

A short rose overcoat from Coating fabric with Straight and curved lines . Overlap from the back yoke seam. long wide sleeves with an open collar and 3 big button loops ,with ergonomic internal inclined patched pocket to facilitate the patients' usage .

**Design No (12):**

A long arboretum(black and red) Crep Shifon evening dress with straight and curved seams wide at the bottom with long sleeves

The ergonomic functional aspect is represented in the sleeves and the left side seam which is replaced by a hidden zip .The right sleeve is seamed to the dress while the left one is mobile during dressing with Velcro strips.

**Design No (13):**

A soft poly Microfiber rose Poncho with straight and curved lines with shawl collared top has slight V-neck that lies nicely and gives great coverage. Made with an overlapping wrap designed with a Velcro strip along the center line of the back. The individual's arms are inserted easily into the sleeves and the garment is drawn up to the shoulders. The caregiver simply wraps the generous overlap back and snaps the shoulder domes into place. The person is being dressed easily. This helps the care givers to dress without suffering stress

**Design No (14):**

A Plush (brown and beige) Jacket with Straight lines that reaches the Knee line .Overlapping wrap front design with four decorative buttons beneath it Velcro strips . Long raglan sleeves that give comfort and protect fragile skin. An ergonomic pocket that is inclines with an angle towards the jacket out seam. The pocket is mounted which also inclines the pocket opening towards the arm of the hand which is most likely to access that pocket at the front center of the jacket to give an aesthetic quality besides functional ergonomic aspect

**Design No (15):**

Black Overall Jeans and a white Blouse under it, The overall has Velcro strips to close the Strips an ergonomic trouser that includes curved seams to move the seams of the pair of trousers from the inside and outside edges

of the legs as close as possible to the central front longitudinal axis of the legs so that they are near or in the plane of movement of the legs. Watch the ergonomic pocket can be dramatically increased in size from its conventional size so that its Width extends across substantially the entire width of the pocket opening, allowing the hand to be easily inserted through the Watch pocket opening.

#### **Design No (16):**

A beige low waist wool dress, with curved and straight lines a cut away from the back ,closed with a hidden zipper starts from the hip line upwards to the neckline . A left side hidden zipper .The lower back part is an overlapping back wrap opened from the hip line till the knee line. Can be slipped in the seated position Ergonomically it facilitates repetitive toileting.

#### **Design No (17):**

A Gabardine black sweater is having straight and curved lines . A zipper under the left armpit .The two raglan sleeves contains two front zippers as the seam of the sleeves with the chest line .Central decorative buttons. To keep the patient warm and look fashionable to give the patient self-confidence.

#### **Design No (18):**

An arboretum evening blouse ( rose and golden color) from Embroidered fabric with straight and curved lines with a front cross overlapping wrap zipped with a large hidden zipper. Long sleeves. Intended to achieve the aesthetic aspect to raise the psychological state of the Parkinson's patient in order to improve the QoL of the patients.

#### **The Designs:**

As shown in Appendix part ( 1,2,3)

### **3- Answering the third question about the Specialists' opinions in the proposed designs:**

**Table (7):The percentage and ranking of the designs for specialists**

Design No.	Percentage	Rank	Design No.	Percentage	Rank
1	96.5	4	10	90.5	16
2	89.5	18	11	91.0	14
3	98.25	2	12	97.5	3
4	96.0	5	13	92.0	12
5	91.5	13	14	92.8	11
6	98.8	1	15	90.25	17
7	93.5	9	16	94.5	7
8	90.8	15	17	95.75	6
9	93.25	10	18	94.2	8

After viewing these designs to the specialists. They gave the average percentages to the ranking proposed designs that is significantly positive ranks varying between (98.8% -89.5 %) as shown in Table no. (7). Designs were presented to specialized faculty members. Resulted percentages of the proposed designs in the previous table illustrate this .

After surveying specialists" opinions about the proposed designs . The best designs were respectively the 6th design (98.8%) , 3rd( 98.25 % ) ,12th design (97.5%) , 1st (96.5%) , 4th,17th ,16th and the 18th which came into the 8th rank .While the 2<sup>nd</sup> design came in the last rank with 89.5%.

### **4-Answering the fourth question about the Parkinson's consumers' and caregivers opinions in the proposed designs:**

Eighteen designs were offered to Parkinson's patients and their care givers to express their opinions and they arranged them according to the most suitable design to the lowest suitable for them as shown in the table below

**Table (8): The percentage and ranking of the designs for Patients and caregivers**

Design No.	Percentage	Rank	Design No.	Percentage	Rank
1	96.0	5	10	90.0	18
2	90.5	16	11	92.8	11
3	98.5	2	12	98.75	1
4	97.0	4	13	90.25	17
5	91.75	13	14	91.5	14
6	95.75	6	15	92.5	12
7	93.5	10	16	94.0	8
8	91.0	15	17	98.0	3
9	93.75	9	18	95.5	7

According to above table the percentages given by patients' opinion and their care givers to express their opinions about the proposed which varied between 98.75% and 90% .



The results are significant towards the positive ranking with high approximate percentages. The patient's and their care givers appreciated the designs according to their ergonomic designing and functional aesthetic aspects in raising their Quality of life and improving their life activities as in the previous table. The best designs were arranged from the highest to the lowest ranking design as follows, the 12<sup>th</sup> with 98.75% ,the 3<sup>rd</sup> by 98.5% ,the 17<sup>th</sup> by 98% , the 4<sup>th</sup> by 97% , the 1<sup>st</sup> by 96% the 6<sup>th</sup> 95.75% the 18<sup>th</sup> came in the seventh ranking and the 16<sup>th</sup> came in the eighth rank and respectively arranged till it reaches the 10<sup>th</sup> design which came in the last ranking by 90%.

##### **5- Answering the fifth question about the possibility of implementing the selected designs:**

After showing the proposed designs to specialists' and Parkinson's consumers and their care givers, Eight designs were selected for implementation or adjustments upon some ready-made garments which had obtained the highest percentages from both specialists and Parkinson's patients. These designs are the 6<sup>th</sup>, 3<sup>rd</sup>, 12<sup>th</sup>, 1<sup>st</sup>, 4<sup>th</sup>, 17<sup>th</sup>, 16<sup>th</sup>, and the 18<sup>th</sup>.

##### **Implementing & Adjustment The Selected Designs:**







#### **6- Answering the sixth question about did the implemented designs improved the Quality of life for Parkinson's patients?**

A scale for the QoL was done to the research sample (PD) Patients and it was applied upon the patients by the help of their caregivers before and after wearing the implemented designs. Which agrees with **Margaret Schenkman** et al, who used the PROFILE PD scale in dressing activity to measure the degree of QoL achieved. Scale degree of as shown in table no (9) to estimate the degree of improvement in the targeted Quality of life in the dressing activity.

The table below illustrates the scale.

**Table no (9) scale for Measuring Quality of life for dressing activity of PD patients  
(Before implementing the designs) (n = 25)**

Scale items	scale degree				
	0	1	2	3	4
1-You feel annoyed towards facing dressing difficulties					
2-The degree of your independency in the dressing activity					
3-You can dress yourself but slightly slower than usual and you need more effort					
4-You face problems with usual fastenings ( zippers – buttons )					
5-Do you need to make any adjustments to your current designed clothes to facilitate dressing?					
4 = Normal					
3 = Dresses independently; slightly slower, more effort, or both					
2 = Requires minimal assistance (another person) with buttons, sleeves, and/or ties/ collars					
1 = Requires moderate assistance (another person) with half of dressing activities (lower body dressing, shoes and socks)					
0 = Requires maximal assistance (another person); may be able to help with bodily					

#### **Validity of Quality of Life Scale:**

##### **Factorial Validity:-**

Factorial Validity Depends on Method of factorial analysis, a method of testing reveal the extent of saturation of the factors that make up the.

The below Table indicates The Results of factorial analysis to the Quality of Life Scale.

**Table (10) The Results of factorial analysis to the Quality of Life Scale (N=12)**

factors	Roots of the underlying primary		Radicals derived from the analysis	
	Value	interpreter Contrast Ratio	Value	interpreter Contrast Ratio
1	1.46	58.07	1.46	58.07

The underlying value of the root, which could explain the total variance, should not be less than one. The Above Table Shows that there is just one factor explains (58.07%) of the variance in performance on Quality of Life scale and all the Questions of scale was saturated by substantially; so it can be called a factor of Quality of Life, and it has a standard high degree of Validity, which refers to the possibility of use in the current research, and to trust the results.

#### **Face Validity:**

the scale has been Shown in his initial image on the number (10) of the professors of Home Economics at Egyptian universities, accompanied by an introduction included an explanation of the research, the goal of it, and the definition of procedural terminology, in order to ensure its validity and sincerity to measure quality of life, and to comment on it.

The two researchers calculate ratios specialist's agreement at every single of the vocabulary of the scale in terms of the representation of the vocal scale to measure to the quality of life, the following table shows the ratios of specialist's agreement for every single statement of the scale of Quality of Life.

**Table (11) The Ratios of specialist's agreement for every single statement of the scale for the Quality of Life (N=10)**

Number	Number of agreement	Number of difference	Rate agreement %
1	7	3	70%
2	10	--	100%
3	7	3	70%
4	8	2	80%
5	10	--	100%
Scale a whole		84%	

The above table shows that specialists agreement rate on the statements of all Quality of Life scale ranging from (70-100%), and that the average percentage of agreement a whole is on the scale (84%).

#### **Reliability of Quality of Life Scale:**

The researcher calculates the Reliability of Quality of Life Scale in two ways: -

#### **Calculation of Reliability in a Cronbach's alpha:**

The following table shows the values of reliability coefficients in a "Cronbach Alpha" for each Question, and the reliability coefficient for the scale of Quality of Life as a whole.

**Table (12) The values of Reliability coefficients in a "Cronbach Alpha" for each Question and Reliability coefficient of the scale as a whole (N=12)**

Q Number	Reliability coefficient
1	0.759**
2	0.742**
3	0.715**
4	0.743**
5	0.756**
Scale a whole	0.833 **

If the reliability coefficient alpha for each question of the test questions less than the value of alpha for the total test questions as a whole as shown at bottom of the table, it means that the question is important and his absence from the test adversely affects it, but if the reliability coefficient alpha for each question is greater than or equal to the value of alpha for the test as a whole as shown at the bottom of the table, it means that there is the question reduces or weakens the stability of the test.

The above table shows that Questions of the Quality of Life Scale least coefficient of Reliability for the value of coefficient stability of the scale as a whole it amounted to (0.833\*\*).

#### **- Calculation of Reliability in a Spilt Half Method: -**

The researcher calculates the Reliability of Quality of Life Scale using the Spilt Half Method, and the following table shows the values of coefficient of Reliability in a Spilt Half Method to the Quality of Life Scale

**Table (13) Reliability coefficient values in a Spilt Half Method to the Quality of Life Scale (N=12)**

	Reliability coefficient	Reliability coefficient after correction
the reliability coefficient for the scale a whole	0.779	0.876 **

Above table show that Reliability coefficient values in a Split Half Method to the Quality of Life Scale is (0.876\*\*) and the Scale has a high degree of Reliability, suggesting the possibility of use in the current research, and to trust the results.

#### **Establishing the Scale steps:**

- 1-The patients were asked to answer the scale questions before wearing the implemented designed garments.
- 2-The patients wore the implemented designs to give an experimental actual judgment to the designs. Notes were taken and recorded about their comfort by the researchers.

**This was achieved by the researchers using statically tests for testing the validity of Research.**

-Wilcoxon signed-rank test.

-Effect Size (Eta-squared  $\eta^2$ ) to determine the Effect size of the Ergonomic clothing design in improving the quality of life for patients with Parkinson's disease.

#### **This was achieved in two steps:**

**Firstly:** Measuring the significant differences between in the pretest and post test of quality of life .

There are statistically significant differences between the Mean Rank degrees of patients with Parkinson's disease in the pretest and post test of quality of life for the post test.

The following table shows the results of the Wilcoxon test and the value of (Z) and Eta-squared to the differences between the Mean Rank degrees of patients with Parkinson's disease in the pretest and post test of quality of life.

**Table (14) The results of the Wilcoxon test and the value of (Z) and Eta-squared to the differences between the Mean Rank degrees of patients with Parkinson's disease in the pretest and post test of quality of life (N=13)**

Variable	Test type	Mean	Std. Deviation	Ranks Distribution	N	Mean Rank	Sum of Ranks	"Z"	Significance Level	Eta-squared ( $\eta^2$ )
Quality of life	Pre	6.92	1.32	Negative Ranks	0	0	0	3.190	0.01	0.626
	Post	13.85	1.77	Positive Ranks	13	7	91			
				Ties	0					

The above Table shows that there are significant differences between the Mean Rank degrees of patients with Parkinson's disease in the pretest and post test of quality of life for the post test, where the value of (Z) calculated (3.190) is statistically significant at the level of significance (0.01).

While the effect size (0.626) which is high effect size, which indicates that the contrast ratio in quality of life which returns to Ergonomic clothing design is (62.6%) and it A high contrast ratio.

**Secondly:** Determining the continuous impact of experimental treatment.

There are no statistically significant differences between the Mean Rank degrees of patients with Parkinson's disease in the post test and Follow-up test of quality of life.

After the patients answered the post test, the researchers made a periodical follow up to the QoL improved degree and the results were as follows:

The following table shows the results of the Wilcoxon test and the value of (Z) to the differences between the Mean Rank degrees of patients with Parkinson's disease in the post test and Follow-up test of quality of life.

**Table (15) the results of the Wilcoxon test and the value of (Z) to the differences between the Mean Rank degrees of patients with Parkinson's disease in the post test and Follow-up test of quality of life (N=13)**

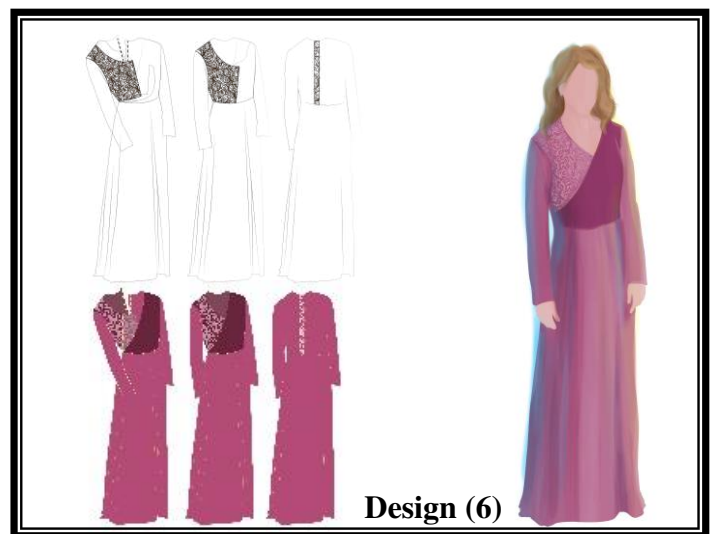
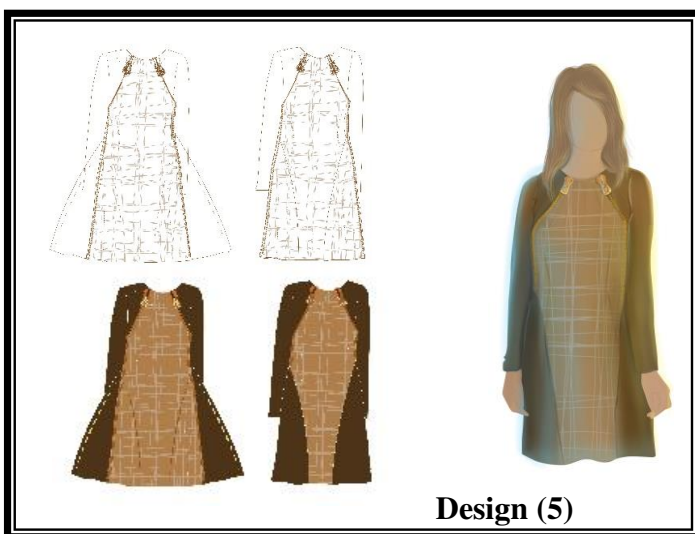
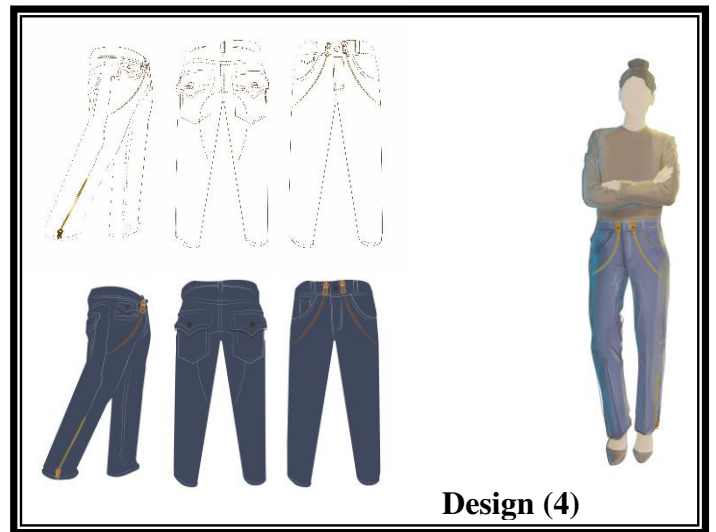
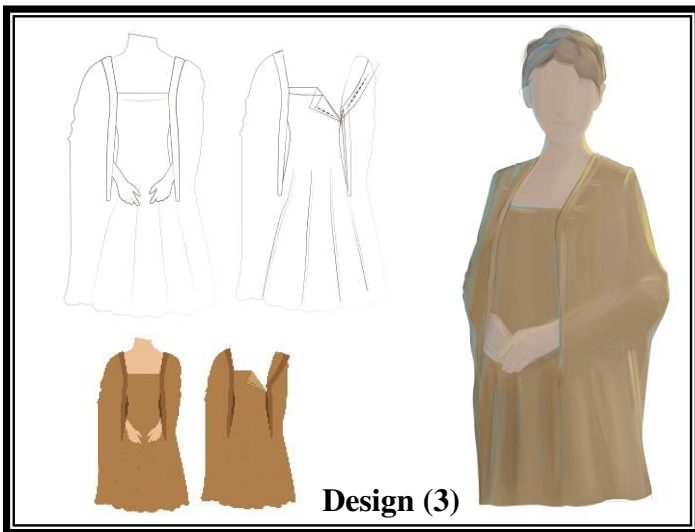
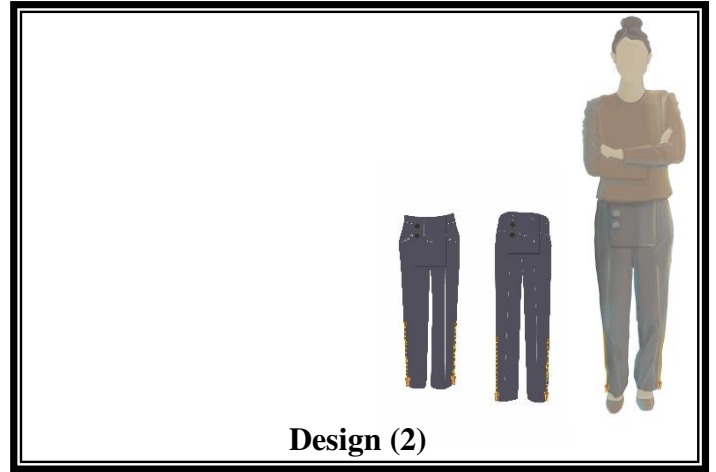
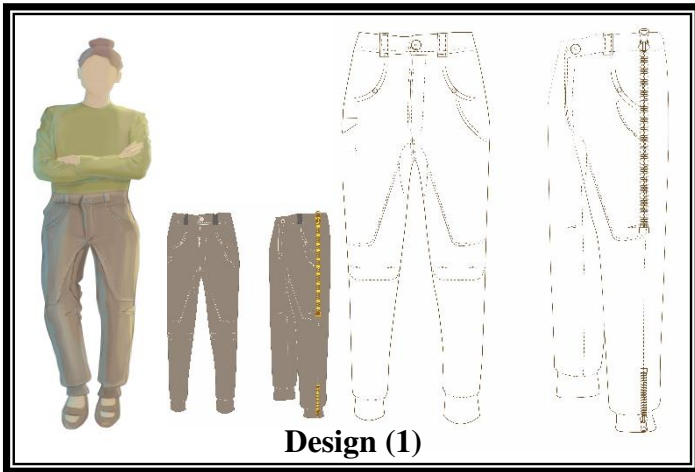
Variable	Test type	Mean	Std. Deviation	Ranks Distribution	N	Mean Rank	Sum of Ranks	"Z"	Significance Level
Quality of life	Post	13.85	1.77	Negative Ranks	6	4.83	29	0.153	Not significant
	Follow-up	13.46	2.33	Positive Ranks	4	6.5	26		
				Ties	3				

The above Table shows that there are no significant differences between the Mean Rank degrees of patients with Parkinson's disease in the post test and Follow-up test of quality of life, where the value of (Z) calculated (0.153) is not significant at the level of significance (0.05). And it means continuity effect of Ergonomic clothing design in improving the quality of life for patients with Parkinson's disease.

## **References**

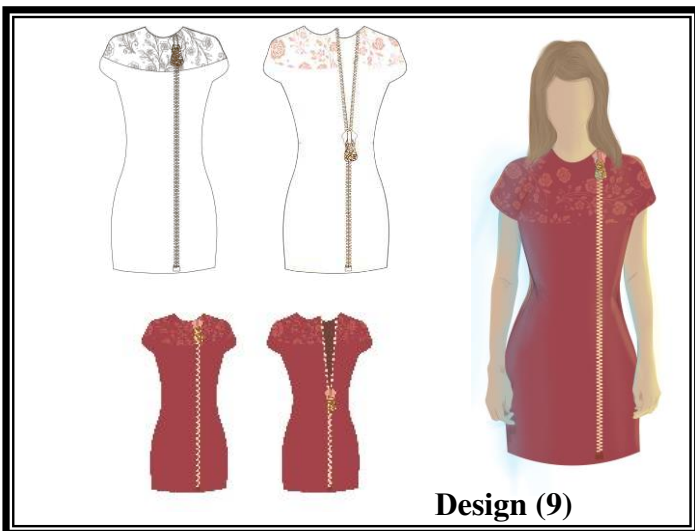
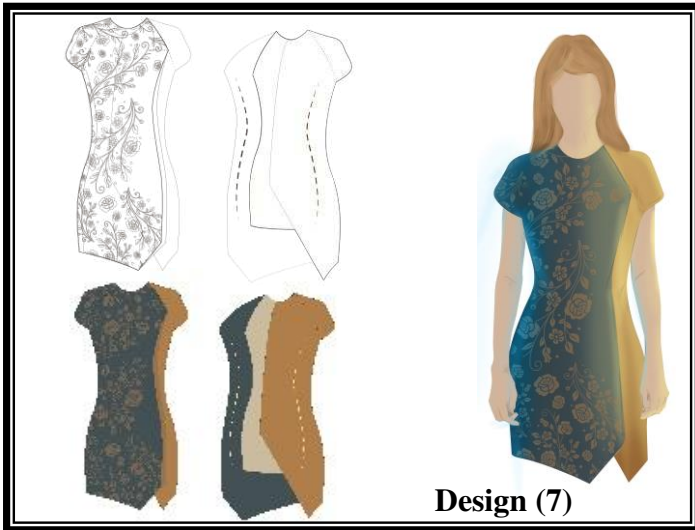
- Alaniz, I. P., & Alaniz III, P. M. (2013). Athletic garment: Google Patents.
- Banks, K. (2001). Adaptive Clothing-Preserves Independence and Assists the Caregiver. *Professional Case Management*, 6(6), 243-245.
- Berzon, R., Staquet, M., Hays, R., & Fayers, P. (2000). Quality of life assessment in clinical trials. *Quality of life assessment in clinical trials*.
- Cianci, H., Cloete, L., Trail, M., & Wichmann, R. (2006). Activities of Daily Living: Practical Pointers for Parkinson's Disease. *Miami, FL: National Parkinson Foundation*.
- Çivitci, Ş. (2004). An ergonomic garment design for elderly Turkish men. *Applied ergonomics*, 35(3), 243-251.
- Fayers, P. M., & Machin, D. (2007). Principles of measurement scales. *Quality of Life: The Assessment, Analysis and Interpretation of Patient-Reported Outcomes, Second edition*, 31-48.
- Helander, M. G. (1997). The human factors profession. *Handbook of human factors and ergonomics*, 3-16.
- Korff, R. (2002). Ergonomic garments: Google Patents.
- Maramotti, L. (2011). Pocket for articles of clothing, a method for realising a pocket and relevant articles of clothing: Google Patents.
- Miller, W. (2005). Definition of design. *Trimtab, Buckminster Fuller Institute*.
- Na, H.-S. (2007). Adaptive clothing designs for the individuals with special needs. *Journal of the Korean Society of Clothing and Textiles*, 31(0), 6.
- Packo, D. D. (2009). The American Parkinson Disease Association's Information and Referral Center Coordinators's Making the Connection.
- Quinn, N. (1995). Parkinsonism--recognition and differential diagnosis. *BMJ: British Medical Journal*, 310(6977), 447.
- Rahman, S., Griffin, H. J., Quinn, N. P., & Jahanshahi, M. (2008). Quality of life in Parkinson's disease: the relative importance of the symptoms. *Movement Disorders*, 23(10), 1428-1434.
- Schapira, A. (1999). Parkinson's disease; science, medicine, and the future. *Br Med J*, 318, 311-314.
- Schenkman, M., McFann, K., & Barón, A. E. (2010). PROFILE PD: Profile Of Function and Impairment Level Experience with Parkinson Disease--Clinimetric Properties of a Rating Scale for Physical Therapist Practice. *Journal of neurologic physical therapy: JNPT*, 34(4), 182.
- Swann, J. (2005). Coping with the symptoms of Parkinson's disease. *Nursing And Residential Care*, 7(6), 269-271.
- Zhang, Z., & Roman, G. (1993). Worldwide occurrence of Parkinson's disease: an updated review. *Neuroepidemiology*, 12(4), 195-208.

## Appendix (1)





## Appendix (2)



### Appendix (3)

