

An Ergonomic Evaluation for Historical Seat Designs

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Abstract:

The seat is the most important piece of furniture for the man as it is used for more than half of his life, ranging from the chair of work, dining, living and relaxing, so it should be different in its specifications to matching the various activities of the man and achieving comfortable sitting to maintain his physical and psychological aspects. There are many seats for famous designers which gained international fame and used in a wider range than its functional purpose depending on many factors such as design form, designer's name or the fame of the piece itself.

These pieces could be accepted by some people and rejected by others depending on the age, sex, health, social and psychological status, thus this research shows the standards that govern the process of the seat design to achieve both physical and health comfort which come through specialists in the furniture design field.

Keywords:

Seat evaluation, Usability testing, Product testing form, Healthy furniture, Physical comfort, Seat design, Designing safety.

Introduction:

The man in the twenty first century turned to design his essential products in various industries from the environmental and green styles (which are suitable for human health and not harmful to the environment) especially the products that are used most of the time, such as pieces of furniture which are considered to be the most nearby products for humans who depends upon them to work, live and get relaxed.

The seat has an abundant share of different designs, this is not only because it was used for more than half of the man's day but also for the diversity of the activities practiced which depends on the design of the seat itself.

It is known that, when sitting on all furniture, the body should be free of tension, with good support for the lumbar spine, or low back. The seat should be firm and wide enough to support the back of the thighs without digging into the knees and high enough to allow the feet to rest lightly on the floor.

When relaxing, an angle of more than ninety degrees between the hips and the lumbar region of the spine is usually the most comfortable.

Therefore, the chair or sofa back should support the whole length of the spine as well as the head. Filling the voided lumbar area with pillows or blankets resembling a reclined posture can prevent slouching in a chair or sofa. The height of the seat is important. If the seat is too high, the feet are dangling and extra pressure is put on the

posterior thigh region. If the seat is too low, one is forced to cross the legs, which can add tension to the whole body.

Overall, sitting is one of the worst positions for a person with severe low back pain. Lying down or reclining would be more comfortable. A chair designed for office use should support the small of the low back. The height of the seat and backrest should be adjustable, the seat should swivel, and the base should be stable and have castors for movement. A footrest can also help to lift the thighs to a more comfortable position. ANDERSON, 2003 p. 51-52

So it is necessary to make the seat enjoy by characteristics of achieving sitting comfortable and preserve both physical and psychological health of the man.

These properties are governed by many standards determined in:

- 1) The appropriate design with the morphological system of the human body.
- 2) The achievement of comfortable sittings through support placements
- 3) Environmental appropriate to the nature of used materials.
- 4) The achievement of psychological comfort to the user.
- 5) The achievement of the sustainability principles of the product.

We must taking into account the periodic time in which the man uses the seat... also the kind of activity in which the seat will be designed for it.

The current research focuses on questionnaire study which explains and interprets the specialist's evaluation (the opinion of specialists in the designing and manufacturing of furniture) on the best known chairs from famous three designers mentioned as follows:

- § 1st William Morris Sussex group of seats.
- § 2nd Argyle chair designed by Charles Rennie Mackintosh.
- § 3rd Eileen Moray Gray (Art Deco movement).

First: William Morris Sussex group of seats :

Possibly designed by Philip Webb (born in Oxford, 1831, died in Worth, West Sussex, 1915); made by Morris, Marshall, Faulkner & Co., and later by Morris & Co., London.

William Morris and his wife, Jane, used Sussex chairs in their first home, Red House, Bexleyheath, Kent, from 1860 and subsequently in their London house, Kelmscott House, Hammersmith. Morris's great friend, the artist Edward Burne-Jones (1833-1898) had Sussex armchairs in his studio, as did the sculptor, Alfred Gilbert (1854-1934). Robert Edis recommended this chair as 'excellent, comfortable and artistic' in his influential book, 'Decoration and Furnishing of Town Houses in 1881'. Examples from the

Sussex range were supplied for students' rooms at Newnham College, Cambridge, and for galleries in the Fitzwilliam Museum, Cambridge, (Victoria and Albert Museum.)

Trading The Sussex range of modest seat furniture, which started with this armchair and a single chair, expanded as a result of the commercial success of the design. Eventually it included corner chairs, children's chairs, and settles.



Figure (1)

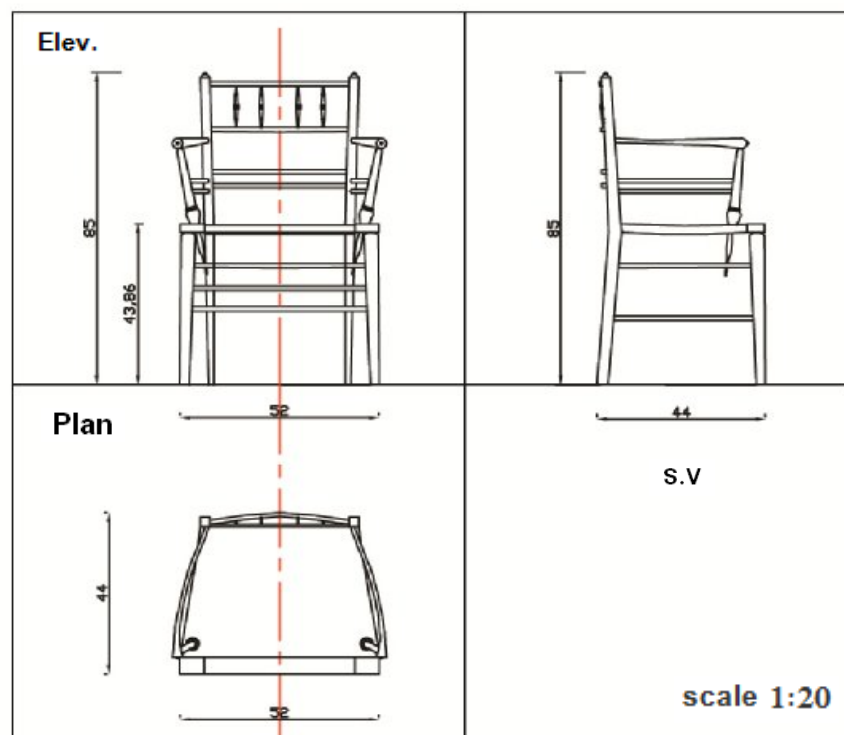


Figure (1) Image (a) an Armchair designed by William Morris Sussex group of seats.

Source: <http://www.tribu-design.com>

General description: chair with a daily of furniture light and simple shape, was cushioned | from straw, has been adopted in full simplicity in design and implementation of lines, although he

factory manually, but easy quantitative production. The chairs material is Ebonised beech, with a rush seat.

1) The appropriate design with the morphological system of the human body.

Figure 3 shows that most of the elders agreed that the armrest does not fit with the morphological system of the body by up to 60%, while the youth believed that it is relatively commensurate with the system by up to 60%.

2) The achievement of comfortable sittings through support positions.

Figure (4) shows that elders believed that the support positions achieved in the area of lumbar & scapula, while it cannot be achieved in the area of the bottom of the thigh and upper arm (humerus).

3) Environmental appropriate to the nature of used materials.

Figure (5) shows that both of elders and youth agreed that the chamber and back materials are not suitable for the comfort of sitting, in contrast the porous upholstery and seat material are suitable for that purpose.

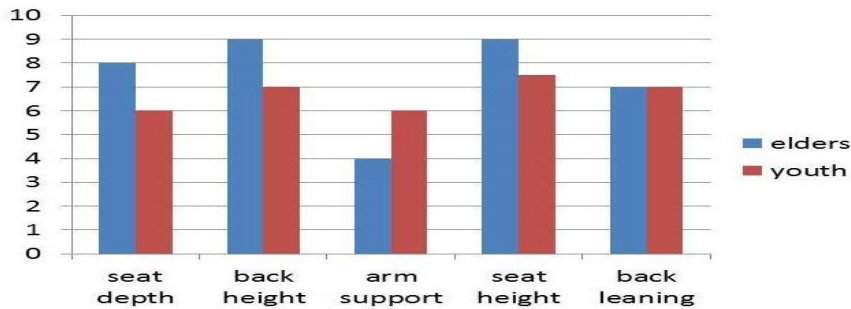


Figure (3)

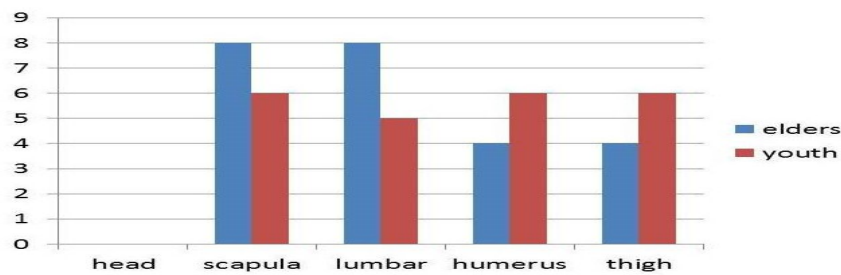


Figure (4)

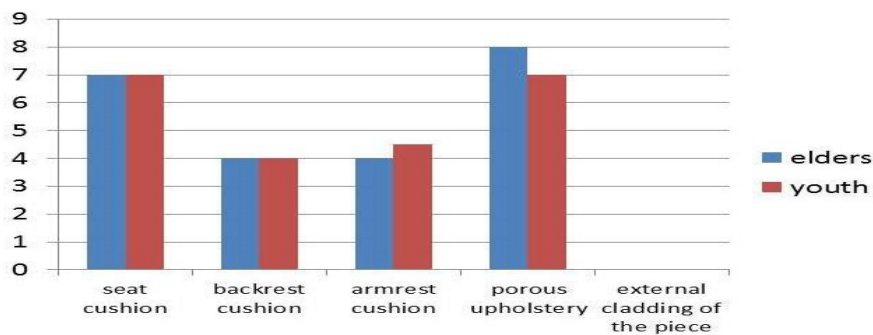


Figure (5)

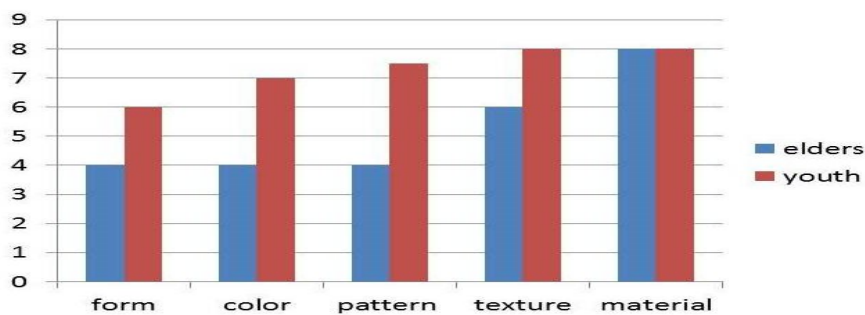


Figure (6)

4) The achievement of psychological comfort to the user.

Figure (6) shows that elders didn't agree on the major role for the color and the shape of the chair in achieving psychological comfort, and this oppose what has been confirmed by the youth as they believed that the psychological comfort achieved through color, shape, texture and material.

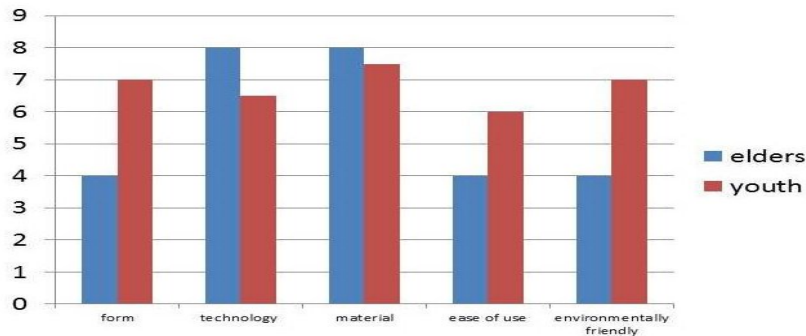


Figure (7)

Second: Argyle chair designed by Charles Rennie Mackintosh:

This iconic design, one of the best known from Mackintosh's *oeuvre*, was created in 1897 for Miss Cranston's Argyle Tea Rooms in Glasgow. Billcliffe (*loc. cit*) has eloquently described the chair's significance: 'It is the first of the high-backed chairs, a motif which became Mackintosh's own ...



Figure (8)

5) The achievement of the sustainability principles of the product.

Figure (7) shows that the youth achieved the principles of sustainability and this was confirmed by (60%-75%) of the youth, whereas the opinion of the elders were that the principles of sustainability cannot be achieved in terms of form, friendly environment and the ease of use.

The high backs have no practical function, other than in the context of the whole room [where, when it] was empty of people the chairs stood like sentinels at the tables ...'. Mackintosh's designs for the Argyle Tea Room chair are in the collection of Glasgow University (Blairman, H. 2006 ,p.17).

THE General Description: High backed chair of dark stained oak with a rush seat. The top rail is elliptical in shape and extends between and beyond the stiles. It is decorated with a stylized bird motif pierced in an arch across the center top. The plain double back splats extend from the bottom curve of the top rail to the stretcher halfway down the length of the legs. Long narrow stiles commence from a tapered top, level with the top of the top rail and extend down and widen to form the back legs. The front legs are slightly tapering. The stretcher between the back legs consists of a wide, plain, panel with an arch cut from the bottom, and extends down almost to the base of the legs. There are also double rod stretchers between the front legs and between the front and back legs. The drop-in rush seat is shaped and set above arched seat rails. Stamped on the left front seat block is "23" (power house museum). Argyle is included in the design collection of the Museum of Modern Art. ^{Mackintosh} Works, (2006). In his style, we can see simplicity of forms and nobility of materials so characteristic for the whole movement.

Image (c) Source (Victoria and Albert Museum)



Figure (9)

The Mackintosh's dining room at their house reconstructed at the Hunterian Museum, Glasgow Mackintosh's career was a relatively short one, but of significant quality and impact. (Charles Rennie Mackintosh Interiors, 2010)

1) The appropriate design with the

morphological system of the human body:

Figure 11 shows that elders agreed that the Holy is compatible with different types of the body rather than the back leaning which does not comply with the different types of the body, while on the other side the youth believed that the Holy is relatively commensurate with the morphological system of the body.

2) The achievement of comfortable sittings through support positions:

Figure 12 illustrates the regarding to the achievement of comfortable sitting through the support positions of the chair in the back, the diagram shows that most of the youth believed in achieving that, whereas the elders oppose it as they believed that the back support of the chair did not leads to comfortable sitting

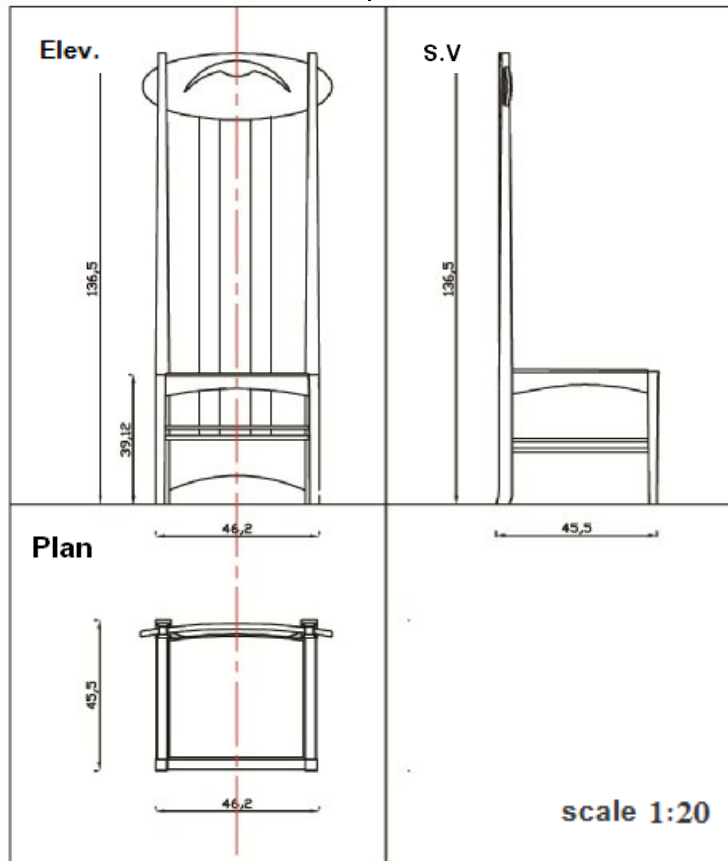


Figure (10)

Height: 136.5 cm, Width 46.2 cm, Depth: 45.5 cm Source (<http://collections.vam.ac.uk/item/O11281/chair-mackintosh-charles-rennie/>)

3) Environmental appropriate to the nature of used materials.

Figure 13 illustrates the regarding to the feeling of comfortable in back sitting of the chair, 60% of the elders accepted the materials of seat back, while 80% of the youth did not feel comfort with

sitting.

4) The achievement of psychological comfort to the user.

Figure 14 shows that both of the elders and the youth are agreed that the seat design achieves a psychological comfort by a range between (60-

70%), Besides, 80% of elders feel psychological comfort towards the piece colour

5) The achievement of the sustainability principles of the product.

Figure 15 shows that (70:80%) of the youth

believed that the chair achieves the principles of sustainability, while the elders agreed that the principles of sustainability cannot be achieved in terms of environmental friendly.

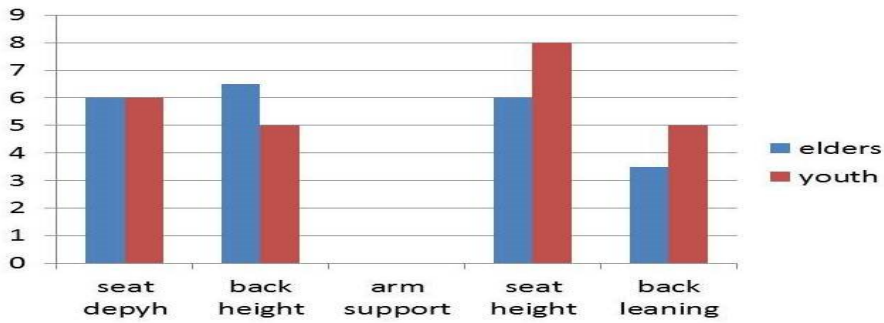


Figure (11)

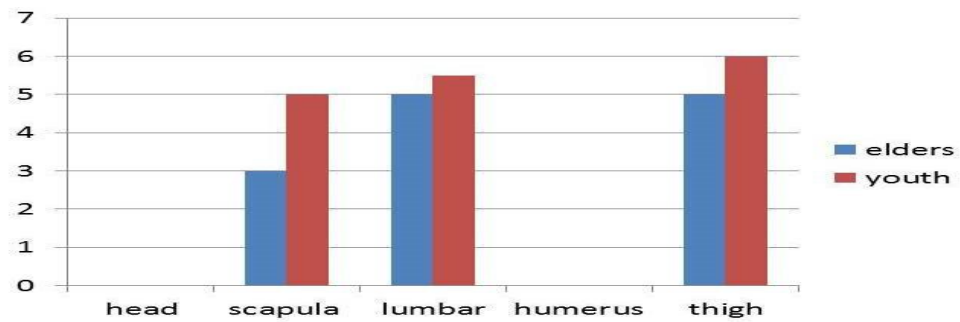


Figure (12)

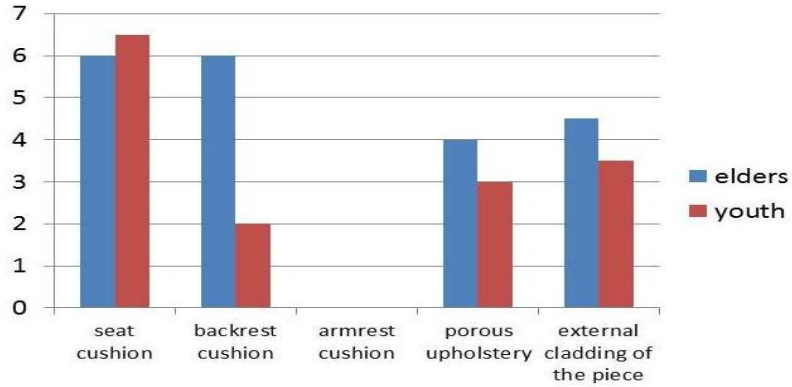


Figure (13)

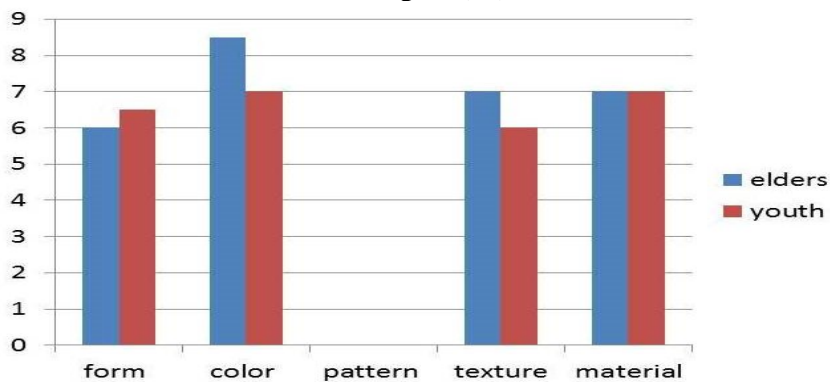


Figure (14)

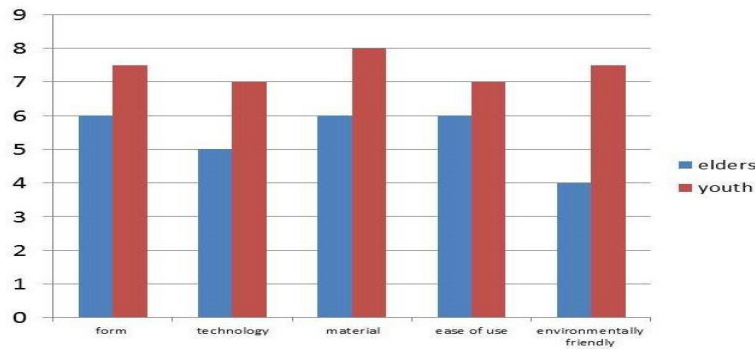


Figure (15)

Third: Eileen Moray Gray (Art Deco movement):

General descriptions: The Transat chair was designed for the Villa E 1027 in Roquebrune on the Cote d'Azur. First drawings of the chair date back to 1924; it was patented in 1927. Eileen Gray was inspired to this design by the desk chairs used on the transatlantic passenger ships.

Figure (16) shows an image (d) Chair Transat "chair designed in 1925-1930 by Eileen it was- So-called chair transat It is transatlantic word by which means across the Atlantic proportion to the place in southern France, which is located on the shore of the Atlas. The Materials of chair is Chromed metal mounted lacquered wood and adjustable back cushion upholstered in leather. The Dimensions is Height: 790 mm, Width: 550 mm, Depth: 983 mm (Smogallery 2011)

1) The morphological system of the human body.

Figure 18 shows that elders believed that the chair is hardly compatible with different types of the body, while youth believed that the dimensions of the seat is relatively commensurate with the morphological system of the body



Figure (16) Source:

http://www.1stdibs.com/furniture/seating/lounge-chairs/eileen-gray-transat-chair/id-f_658287

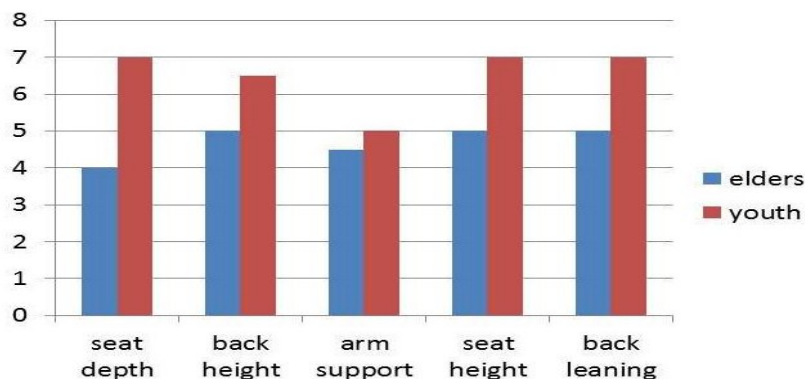


Figure (18)

2) Comfortable sittings through support positions.

Figure 19 shows that both of the elders and the

youth agreed that the chair does not support positions for sitting comfort, especially in the upper back (scapula) and upper arm (humerus).

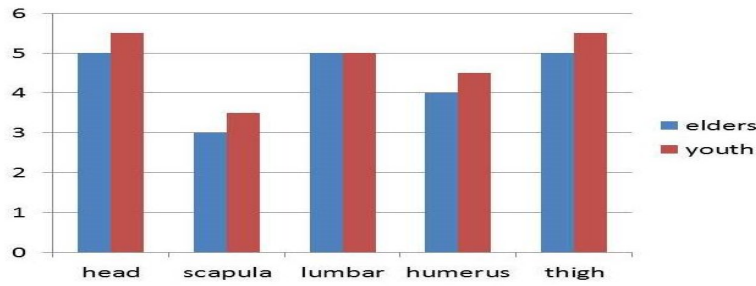


Figure (19)

3) Environmental appropriate to the nature of used materials.

Figure 20 clarifies the agreement between the elders and the youth about the materials of the

chamber which did not achieve comfort sitting, on the contrary side materials of the back and external cladding were achieving the comfort sitting.

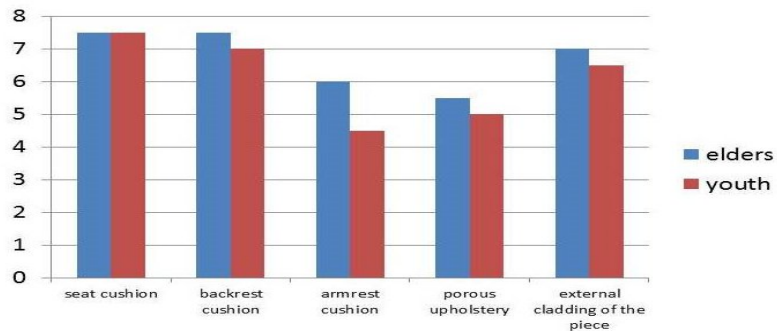


Figure (20)

4) Psychological comfort to the user

Figure 21 clarifies the agreement between the

elders and the youth that the seat design achieves a psychological comfort.

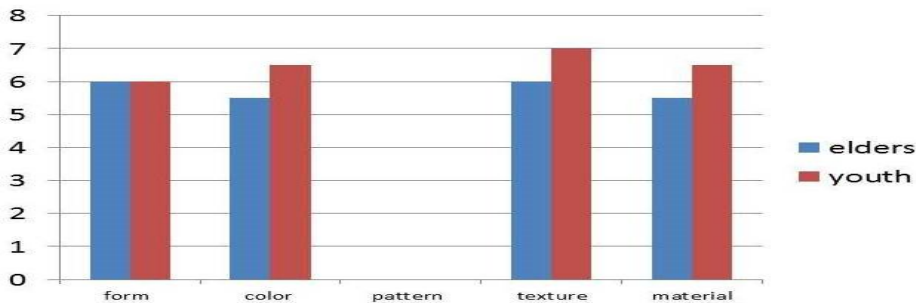


Figure (21)

5) The achievement of the sustainability principles of the product.

Figure 22 shows that the (50-65%) of youth believed that the Holy achieves the principles of

sustainability, In contrast, the elders believe that the principles of sustainability cannot achieve in terms of friendly environment and the ease of use.

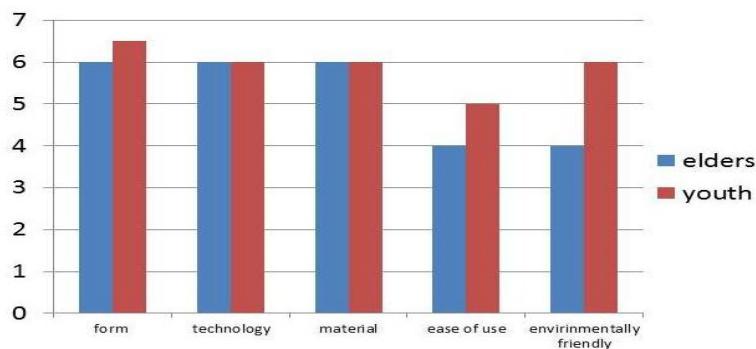


Figure (22)

Results:

1) For testing the adapting of the physical & psychological health, we need to check some elements like:

- The commensurate with the different patterns of morphological construction of the body.
- The Comfortable sitting with support positions of the body.
- Using echo-materials for health.
- Achieving psychological comfort to the user.
- Achieving the principles of sustainability.

2)- The most important results for the questionnaire study of the research are displayed as follows:

- The elders are more care than youth in ergonomic fitting with different patterns of the morphological construction of the body.
- The elders cares about the support positions of the body using in the pieces of furniture to feel more comfortable.
- The psychological comfort to the user is different and depends on the age, sex, psychological status, health, cultural & social mentality.
- The elders prefer natural materials more than the youth.
- The elders are more care than the youth in achieving the principles of sustainability.

References:

1. Modern History of the chair (From the end of XVIII century to First World War): ART-Design News, Friday, July 22, 2011.
2. 1000 chairs : by Charlotte & Peter Fiell
3. TIU POLDMA, FRANCES WILKINSON: Adapting the Interior Environment for Life: Universally Speaking, Université de Montréal
4. Alan Hedge: CORNELL ERGONOMIC SEATING EVALUATION ADMINISTRATION INSTRUCTIONS, Cornell University, July 2003
5. Alan Hedge: CORNELL How to Choose Ergonomic Product Checklist , Human Factors and Ergonomics Group Cornell University, 1999
6. Blairman, H. (2006) Furniture And Works of Art : H. Blairman & Sons Ltd, London , 2006,p.17
www.blairman.co.uk/pdf/Blairman_Cat_06.pdf
7. Steven Reed Anderson: Health and design , Texas Tech University , Master of science , December, 2003
8. Beverley Norris and John R. Wilson :

Designing safety into products ,Making ergonomics evaluation a part of the design process, University of Nottingham , Product Safety and Testing Group Institute for Occupational Ergonomics.

Web sites :

9. Victoria and Albert Museum The world's greatest museum of art and design: <http://collections.vam.ac.uk/item/O7883/suss-ex-chair-armchair-webb-philip-speakman/>
10. Powerhouse Museum Collection Sydney Australia: <http://www.powerhousemuseum.com/collection/database/?irn=168257&search=mackintosh&images=&c=&s=>
11. Charles Rennie Mackintosh Interiors : <http://pinterest.com/angelinegong/charles-rennie-mackintosh-interiors/>
12. Smogallart art & design: <http://www.smogallery.com/navigation/designers-artists/kathleen-eileen-moray-gray#/>
13. Tribu-Design / Déclaration: <http://www.tribu-design.com>
14. <http://daithaic.blogspot.com/2008/07/charles-rennie-mackintosh.html>
15. http://www.1stdibs.com/furniture/seating/lounge-chairs/eileen-gray-transat-chair/id-f_658287
16. Mackintosh Works, (2006), Sources http://www.olc152.com/furniture_chairs/2006/08/argyle.php