Inclusive design clothing - Conceptual model of approach between autonomy and sustainability

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Keywords: clothing, inclusive design, sustainability.

In the 21st century, population ageing is a reality increasingly common. The act of dressing / undressing is one of the activities of daily living that associated with the critical points of clothing affects the autonomy of people with functional limitations, such as the elderly. However, the inclusion of users before and during the design process, through the participatory design provides greater interaction in the whole process increasing the chances of success of the product. This study is part of a PhD research to design clothing for women with musculoskeletal limitations, in order to achieve the guidelines used in the development of inclusive clothing. In this context we observed a group of elderly, checking the inadequacy of clothing to their difficulties and limitations, and the need to adapt and redesign it. We propose a conceptual model that inter-relates the concepts of autonomy and sustainability in order to increase the ecological, economic, and social benefits as well as the personal well-being, in terms of adding value / quality of clothes by the reduction and better disposal of these. We expect to achieve as main results the reformulation of the common creation process of clothing through the use of the proposed model that we aim to be applicable to other areas.

Introduction

Aging, a constant term use in our society, is a gradual and irreversible treated individually or collectively and with different specific features from the physiological to the cultural field. For a definition statement is not necessary to understand aging as an individual and isolated process but rather as a set of sociological, philosophical, biological and cultural, that go far beyond the chronological aspects of an individual.

Simultaneously, due to declining birth rates, Palm (2005:25) states that there is a family reorganization and the emergence of a new concern on economic and social issues: "the traditional family gives way to the nuclear family or recomposed which is reflected in the reduction of economic resources available for the elderly", the WHO has also warned "the rapid population growth around the world are presenting challenges for developed and developing countries". Actually realize that this change in the demographic profile does not come only generate economic or social concerns, but also to promote an entire structural readjustment of the built environment we live in and understanding of new social roles. Society is affected at all levels, whether economic, social, cultural and medical, "implying a constant adaptation and modification of the deep structures of society" (Palm, 2005:27).

On one hand, we have an aging population and this growing social concern, on the other we have the Aging Individual, which is a natural process of living things, and that is becoming increasingly common due to increased life expectancy and longevity individual (Maciel, 2010; ANDRADE, 2009). Such aging is divided into primary, which is the natural process that develops over the years and aging secondary, derived from pathological lesions.

When an individual has a handicap that prevents him/her of executing a daily task a decrease in his/her social condition and involvement in milieu is declared. In the so called third age the situation is more critical since the functional performance and social involvement normally have a quick decline. Being so the old person tends to exclude himself from society (Robert, 1994). The personal
sustainability therefore also falls down since it presupposes to achieve a balanced happiness and prosperity in all the areas of human interaction (Bueno et al., 2012).

Meanwhile, products and services offered to this target are not prepared to answer the needs and aspirations of this population since as time goes by, functional limitations and body changes occur that added to psychological factors (losing friend and the loved ones) determine somehow a reality of dependence of these individuals. This reality limits the life quality of old people and conducts them to a ‘marginal’ life, to social isolation, thus diminishing their autonomy. (Robert, 1994).

As stated by GDLAM (apud Bueno et al., 2012) autonomy refers to i) action (physical independence), ii) will (self-determination) and iii) thoughts. On the other hand independence is the ability of performing a task without any kind of help. This way autonomy and independence are related not only to physical aspects but also to psychological ones (WHO; Guedes et al., 2007; Almeida, 2009; Garcia, 2009; Andrade, 2009). Both depend on the body which is the vehicle that allows people to express themselves either through movement or as a support (Lessa et al., 1994; Falcão, 2011).

Clothing that we can find in the market is a good example of how the clothing industry neglects the basic need of elderly since they don’t take into consideration the body changes, the functional limitations or even self sufficient aspects such as the ones related with wear ability. Besides that fashion products market research addressing the preferences of persons over sixty years are still irrelevant and insipid. Furthermore, the products developed for people with special needs usually do not take into account aesthetical patterns as well as psychological wellbeing factors. Also to assume that the technical development of such products contribute to the decrease of the autonomy and independence of elderly.

Being so this research has the goal of considering sustainable means of keeping the autonomy and independence of elderly in what concerns clothing and wear ability. The functional limitations we associate with elderly in our study are the ones related with the muscle skeleton pathologies, i.e. the ones that give respect to the bone, muscle and joints ageing that result in movements’ limitations – reduction in angle extensions, flexibility and strength – and consequently in an increase of fatigue.

**Clothing and sustainability**

According to Edwards (2005) the lack of energy is perceived around the seventies. This is the same historical moment that gives raise to the ‘invention’ of elderly (Magalhães, 1989). A decade after the sustainability concept was created by Lester Brown that has defined the sustainable society as the one that is capable of satisfying its need without compromising the survival chances of future generations (Bueno et al., 2012).

In the design area sustainability according to Vezzoli (2008) focuses on designing products, services and systems that have low environmental impact and a high social quality. The author also mentions the life cycle design (LCD) that integrates pre-production, production, distribution use and disposal. At a personal level sustainability correlates internal and external strengths: i) physical body; ii) personal development; iii) socio-environmental development e iv) social interactions, relating the individual with the world, with himself and his essence with the aim of achieving the physical excellence, the self-realization, the socio-environmental participation and the cultural communion (Bueno et al., 2012).

Hundertwasser decodes society and the milieu creating a system of five skins: the first one is the epidermis, the second the clothes. The house, the social surroundings and the environment are respectively the third, the forth and the fifth ones (Martins, 2008).

While developing a product the human body is the departure point to clothing’s design and this ‘skin’ must adequate itself to the first skin taking into account factor such as: security, easiness of use, of maintenance, security at the physical, psychological and psycho physiological and hygienic levels (Martins, 2008). Concerning the adequacy to social patterns it is important to address the issues of
insertion and acceptance that are extremely important along life and that are more intense in the later life (Twigg, 2011).

The same way in socio-environmental terms the other 'skins' tend to relate themselves to each other thus reflecting the system described by Bueno et. al. (2012). This circumstance reinforces the view that in order to promote the change to a sustainable social behavior one must first promote the change of minds.

Aligned with the previously said we have chosen to work in special the areas of sustainability that are linked with the personal sustainability related with life cycle design. Moreover, we believe that the inclusion of the final consumer since the beginning of the design process is the basis of a correct development to sustainable products.

Kalil (2008) states that the designer is the engine of a new consumption behavior since he creates products and services that awake in people the desire of keeping it longer. Vezzoli (2008) for instance, suggests that smart textiles add functionalities to clothes thus increasing its value and also the desire of keeping the object so one can use it longer. Under this perspective one considers that one of the ways of developing more sustainable solutions in clothing is exactly one that proposes the extension of its useful life (that also depends on a socio-cultural behavior change).

In this paper we address sustainability having as a departure point the person Bueno et. al. (2012) say that 'sustainable development involves moving from the mechanistic thought to the systemic one where the essential aspect of change is that the perception of the world as a machine gives place to the world as a living organism'. Here we are focused on the perception of the person and his multiple skins including the ones that relate himself with society hoping that through this approach one can understand the overall global system.

Dressing and undressing – the observation

Dressing and undressing are of fundamental importance to the maintenance of the person’s autonomy. The dressing difficulties are not only related with ageing. Any person of any age at some point of his/her life can experience a limitation of movements. Dressing is one of the five criteria in the Katz functional scale that addresses daily activities that are basic to the independence maintenance. Other criteria are: get up from bed; feed; have continence; shower and use the toilet (Lessa et al., 1994).

Bueno et. al. (2012) underlines the importance of performing daily tasks with less effort as a way of extending functional autonomy. They also refer those tasks has being sinonomious of self-sufficiency and dignity.

Robert (1994) and Fiedler and Peres (2008) define aging as the progressive and irreversible loss of the capacity of adaptation of the body. Robert (1994:31) also relates this ability "to changing conditions of the environment", and explains the losses as much as the "movement of life every day" as "the mental capacity necessary to perform everyday tasks." Marin et al. (2004:560) adds citing people aged "to gradually weaken due to physiological changes that occur with advancing age and limit the functions of the body." In fact the physical changes and the incidence of dysfunction does not have to appear old, but both authors agree that the aging process is a gradual process and involves a series of physiological changes: anatomical and functional, for these authors occurs from 40. Being the hands strength reduction, according to Bestetti (2006) between 16 and 40% and the one of arms and legs around 50% the dressing and undressing tasks need to be considered at the level of usability combining easiness of use with the physical ergonomic index that evaluates anatomic, anthropometric and biomechanical aspects (Martins, 2008:323).

The participatory design (PD) is a set of theories, practices, and studies related to end users as full participants in activities leading to products (Muller, s.d.). Participatory design tries to, conjointly with
users, learn with people what they say, think, do, use, know, feel and dream relating that information with the design creation (Sanders, 2002), as it can be seen in Figure 1.

Figure 1: Ways we can learn from people (Sanders, 2002)

In order to understand the needs and difficulties impeding the autonomy of women with musculoskeletal pathologies, we notice a group of sixteen ladies. Nine of these seven semi-dependent and independent with respect to the dressing and undressing. The inclusion of independent ladies is due not only to the fact that, despite not needing assistance, many already have some limitation, but also the need for the participation of people with different perspectives on a given problem.

Initially the movements identified for evaluation pertaining to the mobility of upper limbs and trunk, comprising i) flexing the neck ii) the forearm flexion iii) extension of the forearm, iv) extension and flexion of the arms alternately; v) bending of the arms with flexion of the forearms; vi) bending an arm extending from the forearm vii) extension arm with forearm flexion (behind his back); viii) mobilization of the shoulder (rotation / elevation); ix) rotation pulse, and for fine motor, x) pincer grip (Falcon, 2011). Such movements refer to movements used in dress and studied by kinesiology (Rasch, Burke, 1977).

To evaluate these, appropriating Foddy (1994) definitions, using a numerical scale from 1 to 5, 1 being set to perform the task very difficult and 5 to perform without difficulty. With the aid of the analysis of these movements, we can observe and define the difficulties in dressing and undressing of a top (upper body).

As for the choice of their own clothes to wear, we can observe that the ladies do not have, in most cases, big problems. Since 75% of them were found to have full autonomy regarding the choice of what to wear, 19% have little difficulty and 6% perform the task quite difficult. Here we highlight a good level of cognitive ability of the participants.
For obtaining clothing, and here we analyze grab the piece from start to wear it, we note that 69% have little or no difficulty. Importantly, the difficulty observed by the other 31% is focused on pinching and understand the garment before placing.

Figure 3: Catch clothes (autor)

In dressing, we note that 25% of women have little difficulty, 37% have some difficulty and 19% have much trouble, needing help at certain stages. Only 13% of women had no sort of difficulty.

Figure 4: Dressing (autor)

With regard to the pinching the clothes (buttons, fasteners), we identified that the difficulties have relatively low compared to the wear on the ratings much difficulty (6%) and very difficult (19%), with the points: medium difficulty, and little without difficulty, maintained is the same.
However, when evaluated as packing after the play dressed, all presented difficulties. And 62% have a very difficult medium to fix the piece to the body - especially the tops, back and sleeves.

Undressing, in this study proved to be more complicated than dressing parts. Although 50% of the ladies present little difficulty for such, the study shows that 19% of them have a lot of difficulty, while another 19% have a degree of difficulty intermediate and 12% do not present major difficulties.
Discussion and conclusion

With the evaluation result of the observation, we can realize the inadequacy of clothing to the difficulties and limitations of people who have musculoskeletal limitations. With aging body movements, their amplitudes decaying forces will (Falcon, 2011; Rasch and Burke, 1977; Snider, 2000). Thus, there is a need for adaptation and reprojection of the machine, through a study focused on specific issues body.

Santos, Broega (2011) proposes the slow fashion cycles with different parts, durable, timeless, with identity. Accordingly, to identify real problems and design to solve them can be a principle for the reduction in disposal by inadequate parts. Slow the LCD from the end consumer participation in the development process of the product can also contribute to this.

We believe that the inclusion of the end user, through the participatory design supports to increase the chances of success of the development of inclusive and sustainable clothing. By bringing the end user into the process of product design, achieved greater identification of the final good, like Figure 8.

Figure 8: conceptual model of approach (autor)

Sustainability, this case is to increase the life cycle of the product, since the behavior of that customer alone already provides more timely purchases and a more intensive use of the products. If we provide the autonomy of the user in the process of dressing and undressing, add to the play value, quality, reduced disposal and also we enable the reduction of human resources, to be institutionalized elderly or those who live in their own homes. We also increased the perspectives of those who live alone and have no support for the implementation of this activity, which may be a factor in more time spent in her own home, of fundamental importance in this stage of life (Marcoux, 2001).

The identification and the ability to dress and undress alone for a longer period results in a high quality social, not just the product but the satisfaction afforded by the same, while the individual provides personal wellness, directly reflecting the quality of life. Already the economic and ecological benefits can be seen in the reduction of waste by inadequate part.
It is necessary to improve the social perception of clothing and revamp the design process, thinking about this and according to the new social patterns, cultural pre-established, and by adding value and perception of quality, to ensure the maintenance of autonomy and consequently their own sustainability.

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Acknowledgement

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