

RESEARCH ON KITCHEN PRODUCTS FOR PEOPLE WITH DISABILITIES

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Abstract: *The problem of designing objects for people having some kinds of disability represents a challenging subject for designers. The sources of people's disabilities may vary from accidents, to diverse diseases, or genetically ones. The paper studies the situation when people cannot use both of their limbs stressing on arthritis as the main cause of this fact. In order to give these people the opportunity of managing themselves without the help from other people, the research was driven towards the kitchen activities. A set of kitchen objects was designed to help people prepare food by themselves.*

Key words: *arthritis, design, disability, ergonomics, kitchen.*

1. Introduction

The main goal of the design activity is to fulfil human needs. Sometimes, these needs can be communicated by the customers, other times they should be identified as a result of a research activity performed over a user group.

The aim of the paper is to present the process of designing products for categories of people who cannot express their needs for the 'simple' reason that they are ill and, most of the cases, old.

The study idea came from a research performed in the area of kitchen products, and how the existing ones can fulfil the people needs, either they have all abilities, or not. Consequently, it occurred that usual products couldn't be properly used by people with disabilities. Therefore, considering the large incidence of people who cannot use both their hands, this subject becomes an input for the process of designing kitchen utensils.

Among the people who are not able to use normal kitchen devices, we identified people who lost one of the limbs, and people who suffer of some disease, like all types of arthritis. This is why the goal was to create a kitchen product to aid *Arthritis* and *Fibromyalgia* sufferers and elderly rheumatic people also [6].

The research presented in this paper was started in the UK while being an Erasmus student at University of Plymouth and developed as a graduating paper at University *Transilvania* of Braşov [4].

2. User Group

The main user group is people with rheumatoid arthritis. For this people the pain or even the fact that they cannot use their hand properly interferes with daily living. Normal activities such as walking, dressing and cooking can be very painful for them. Rheumatoid arthritis (RA) is a chronic, systemic inflammatory disorder

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that may affect many tissues and organs, but principally attacks synovial joints [5]. The pathology of the disease process often leads to joint stiffness and, in time, the destruction of the joint cartilage.



Fig. 1. *Problems of people with arthritis in using kitchen devices*

About 1% of the world's population is afflicted by rheumatoid arthritis, women three times more often than men. Onset is most frequent between the ages of 40 and 60, but people of any age can be affected. It can be a disabling and painful condition, which can lead to substantial loss of functioning and mobility if not adequately treated. Diagnosis and long-term management are typically performed by a rheumatologist, an expert in autoimmune diseases. A cure for rheumatoid arthritis is not known yet, but many different types of

treatment can alleviate symptoms and/or modify the disease process [6].

Arthritis can make it very difficult for an individual to remain physically active, contributing to an increased risk of obesity, high cholesterol or vulnerability to heart disease. Individuals with arthritis are also at increased risk of depression, which may be related to fear of worsening symptoms.

The adjacent pictures show how arthritis sufferers are managing kitchen products because of the pain (Figure 1). From user observation, we saw that arthritis sufferers are struggling with kitchen products. Even slicing bread became very difficult for them. On the other hand, the existing kitchen products are massive becoming really hard to manipulate, clean and store.

The results show that a majority of the surveyed stopped cooking because of the pain, they don't have objects designed for their needs and their interest to buy products which are helpful in relieving the pain is high.

3. Searching for Ideas

In finding ideas for the new product, designers are starting from the requirements using creative methods, and basing on their *expertise* and *intuition*. As for this category of products, the Requirements list should have a very strong content in the domain of ergonomics. Ergonomics studies the human-product-environment relationships. Therefore, any product, which requires a physical or mental relation with the humans, should be carefully evaluated towards the ergonomic principles.

Knowing that this relationship is more difficult considering the users situation, designers should create the kitchen set having in mind key words like simple, accessible, light, safe, clear.

The user group for these products are mainly elderly people, who, besides the usual problems connected to this stage of

their life, have a severe disability. As previously presented, the physical disability has strong influence upon these people mental reactions. Simplicity and accessibility are the necessary qualities for helping people to understand how the products work and can be used easily. Also they should be confident in the strong construction and product total safety. A clear project and a simple construction ensure the users about the low maintenance and ease of storage.

The necessary operations for which people are encountering difficulties are peeling and grating vegetables and fruits, slicing meat and vegetables; slicing the bread is problematic, too [3].

The products should be modular, each of them permitting an increased number of kitchen operations. This will reduce the number of objects in the kitchen and will reduce human effort in preparing their meal. Less components means less material and natural resources used thus the designer solution leads to an Ecoproduct responding to other requirements as well.

3. Concept Development

The concept development involves the identifying of all the functions the product should fulfil. Globally, the functions are the same as all classic kitchen utensils, also the physical effects for peeling or slicing the fruits, vegetables, meat, bread etc.

The element that should be changed is the form design, meaning the geometry and maybe the material used because of the differences of properties between them. The geometry of the objects should be subordinated to the dynamics of using these products, because the disability induces restrictions in using hands and fingers and in applying the necessary forces for fulfilling the various tasks.

Therefore, the designer should assess the working principles of the existing objects and confront them with the disabled people's biomechanics. For example, for cutting a slice of bread the hand manipulating the knife need to apply a normal force towards the bread and, at

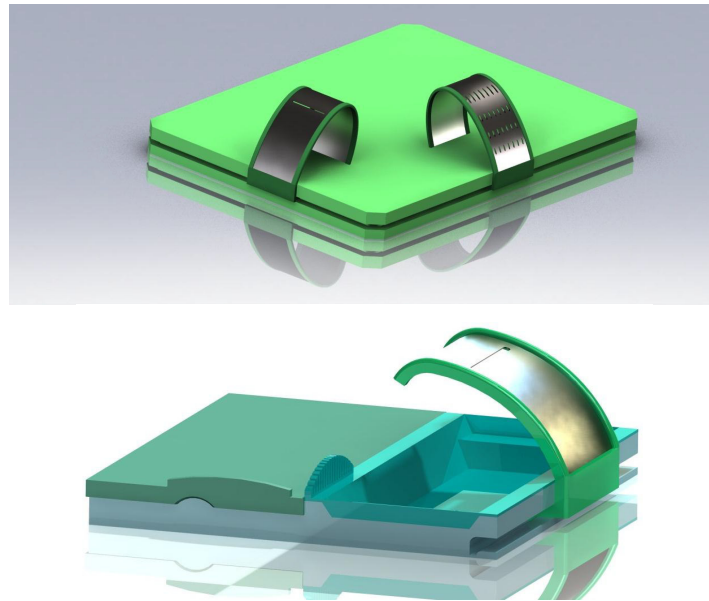


Fig. 2. *Developing the 3D modelling of the concepts*

the same time, to apply an alternating transversal force.

A person suffering from arthritis is not able to apply the vertical force with such intensity, and definitely is not able to produce the alternating movement of the knife. They also have only one valid limb; therefore, they cannot grab the bread, or the apple, or the carrot.

Consequently, the objects' appearance should be different from those we are using because *they are differently used* [2].

Having the necessary functions, the working principles can be established by combining the optimal physical effects with the most suitable geometry. Some conceptual variants are created and the next step is to make sketches and create 3D models for each of them (Figure 2). From the variants, the optimal one is chosen to become the final concept.

4. The Products

The variants converged to a product consisting in a single board (base) on which different components, carriers of the identified functions, should be assembled.

The components are the chopping board, three graters, for different sizes of the slices, and a smaller board with 3-4 spikes on which the vegetables and fruits can be fixed for cutting in different forms and dimensions. All the components should be modules, easy and fast to assembly/disassembly on/from the base.

The board itself should be made of two

layers, the base, and the chopping board, which is easy to remove and clean.

The product should have a handle for an easy manipulation in use and for transportation. All the above solutions fulfil the need to perform all these operations using one hand only [4].

The graters are easy to assembly to the board, which has a groove on the lateral surface (Figure 2). The small board with spikes is blocked by two side backings (Figure 3). The spikes help the users to fix the food they need to chop. The small board can be removed when not necessary. It can be easily cleaned and then reused or stored. The form of the graters permits quick assembly, disassembly and cleaning and most of all, ensures the functionality and is safe for the user.

The second object developed in this design study is a knife for cutting meat and chopping vegetables, differently from the graters (Figure 4).

Obviously, the form of the cutter is different from other products having the same function. This is a consequence of the differences in using the object, identified during the research activity. It can be used with one hand and the function of cutting/chopping is fulfilled only by pushing the knife against the food. The grip of the handle is different; there is no pressure upon the fingers because this will be distributed upon the palm; this solution will reduce the pain during cutting. This device - like the other ones - may be used by left and right-handed persons.

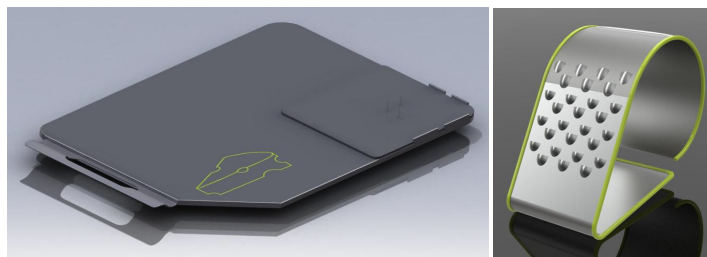


Fig. 3. *The main components of the chopping board - 3D models*

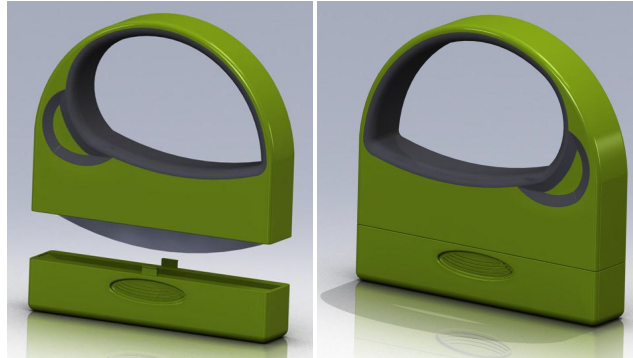


Fig. 4. *The knife - 3D model*

5. Materials and Texture

Choosing the materials is another important challenge for a designer during the design process. For the kitchen utensils, the general requirements lead to materials that should be light, cheap, scratch and impact resistant, organic solvent resistant, durable, recyclable, safe - in their relationships with the humans and the environment, as well - and also technological. They should permit a superior surface quality and be colourful in order being adequate to the kitchen design.

For the specific situation, of the objects designed for differently able people, the objects should be light, durable, colourful, ergonomic and safe [1].

Taking into consideration the above requirements and criteria, proper materials

for the products are polypropylene, synthetic silicon rubber, and stainless steel.

Polypropylene is used for the following parts: base, chopping board, handle, knife handle and cap, and the frame of the grater. The rubber is for the knife cap surface to avoid gliding. The blade of the knife and the grater are made of stainless steel sheet.

The dimensions of all the objects have been calculated according to anthropometric measures and after ergonomic tests of study models on users.

6. Conclusions

The final set contains a base, one chopping board, one cutting board with 3 spikes, two graters and one knife (Figure 5) and represents an innovative kitchen set



Fig. 5. *The main components for the chopping board*

for Arthritis sufferers. The shape of the board intuitively suggests how the objects may be assembled and used. On the chamfered corner the graters should be placed and the slices can be collected in a plate.

The point is that through design, the link between people, what people desire/need, and solutions/products can be built. The aim of this paper is to understand better what designing for the people and in particular, for the people with disabilities, means.

The need was the opportunity to create an innovative concept for kitchen utensils set that would satisfy expected and even unexpected needs of the user group.

All the components were designed to be perfectly functional and to be used with one hand only. In comparison with the existing products, this kitchen set looks modern, is easy to use and has potential market competitiveness. The objects designed reflect the people need for functionality and fulfil their expectations

that the objects they use are friendly with the user and the environment as well [2].

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