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Developing Design Criterias of Glass Design for Romatoid Artrit Patients by Mind Mapping

İffet PALA ERCAN[1*]

[1]*Erciyes University, Department of Industrial Design Engineering, Kayseri, Turkey*

Keywords:

Industrial design, Rheumatoid arthritis, Mind mapping, Design criteria, Design methods

Abstract

Rheumatoid arthritis, which is primarily seen in small joints (hand joints, wrist and foot joints) and elbows, causes chronic (more than 6 weeks) joint damage. It is an autoimmune inflammatory joint disease that can occur in many organs and systems. When we look at the female / male ratio of this disease, which is seen at a rate of 1% in the society, it appears as 3/1. Although the reason for its emergence is unknown; it is stated that biological and hereditary factors are the main cause. In addition, it is claimed that psychological and social factors also play a role in the onset and course of the disease. RA causes negative situations in both physical and psychosocial life of the person. Symptoms can result in restriction of daily activities, decreased effectiveness in work life, problems in sexual life, social isolation, dependence on others. As a result of these, a decrease in the self-esteem of the individual, changes in body image, depression, anxiety and anger feelings may develop. One of the situations in which daily activities are restricted in people with RA is the restriction or complete termination of the use of daily products. Rheumatoid arthritis patients with the daily products were investigated and it was determined that one of the most problematic products to use was glasses. It was aimed to solve the problems identified in glass designs with industrial design methods. In this direction, the design criteria and mind maps presented by 50 students who successfully completed the 'Design Theory and Methods' course at Erciyes University, Department of Industrial Design Engineering were examined. This study, which is presented at the intersection of medical and industrial design, is important in terms of creating an interdisciplinary study area.

*e-posta: iffetpalaercan@gmail.com

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1 INTRODUCTION

Rheumatoid arthritis (RA) is a systemic and inflammatory autoimmune disease that primarily affects the joints, has a chronic course, and has an unknown etiology [1]. Among the most frequently complained symptoms by patients with rheumatoid arthritis; are pain and swelling in the joints, morning stiffness, fatigue, weakness, loss of appetite, and sleep disorders [2,3]. In a typical case, stiffness and pain develop in the middle part of the fingers called PIP, MCP, and in the joints of the hand bones and fingers, wrists, elbows, pain, swelling, and difficulty in using the hands when waking up in the morning. It can potentially affect all joints. However, it frequently affects the hand joints, elbows, foot joints, ankles, knees, jaw joints, and less commonly the neck joint [4].

The disease is not only limited to the musculoskeletal system but also affects vital systems such as the lungs, cardiovascular system, immune system, and nervous system, thus shortening the life span of patients [5].

It is a disease that can be seen all over the world and in all races. However, this disease began to be encountered in Europe and Turkey after the 15th century. The first information about the disease is found in the paintings of classical period painters such as Botticelli and Da Vinci in the early 1500s, which coincides with the period when America was first discovered. While RA was not a common disease in Europe until that time, it has been suggested that this disease was triggered in genetically predisposed individuals by bringing tobacco to Europe with the discovery of America or by the transfer of some infections from America to Europe. Since the disease is more severe in industrialized countries, it has been claimed that industrialization may also play a role in the formation of this disease (URL-1).

RA causes deterioration in both the physical and psychosocial life of the person; Symptoms can result in restriction of daily activities, decreased effectiveness in work life, problems in sexual life, social isolation, and dependence on others. As a result of these losses, a decrease in self-esteem, changes in body perception, and feelings of depression, anxiety and anger may develop [6].

As all organs and systems are negatively affected as well as joint involvement, RA patients face significant difficulties while performing their daily activities [7]. As a result of functional weakness, disease symptoms, and deterioration of physical well-being in these patients, psychological problems occur along with treatment compliance and self-care problems [8]. Problems caused by disease activity in the joints in rheumatoid arthritis, deformity, and loss of movement can cause functional disabilities, serious deformities, and disabilities that can negatively affect the daily life and quality of life of individuals [1,3,8]. While examining rheumatoid arthritis, as it should be in other chronic diseases, it is necessary to focus not only on the physical problems it may cause but also on the problems related to self-esteem and social relations [9]. The effect of the disease, on family life, and social relations. It can be seen in all areas of life such as business life [10]. Pain, physical disability, and loss of social activities may play a role individually or in combination, leading to mood disorders. In recent years, there has been an increasing interest in studies investigating the psychological state of patients with RA [11].

Chronic diseases both negatively affect the life of the individual and oblige the individual to follow certain rules and develop a certain lifestyle [12]. The aim of treatment in chronic diseases; is not to restore or heal the patient, but to ensure that the individual leads a quality life by increasing their compliance with the disease and the treatment program [12,13]. For this purpose; While the protection, maintenance, and improvement of health came to the fore, the role of nurses in health care changed and the concept of self-care gained importance [13].
The purpose of RA treatment; is to reduce pain and inflammation, stop joint damage, prevent disability, protect and improve the patient's functions, increase treatment adherence, ensure that activities of daily living can be fulfilled, and increase the quality of life [14]. To achieve all these goals, a multidisciplinary team understanding is required.

The starting point of this study is to eliminate the problems experienced by RA patients in daily use products and to make their daily lives more comfortable. This study, which is based on the interdisciplinary and multidisciplinary nature of the design, is based on the experience of using glasses, one of the most frequently used products in daily basis.

In the study, 45 industrial design engineering students, who completed the design theory and methods course, determined the problems of RA patients encounter in their daily life and product use experiences by using literature review methods. They have created various design criteria that can propose a solution to the identified problems. While deciding on the design criteria, students used the 'Mind Mapping' method, which is frequently used in the field of industrial design, especially in the idea development phase. In the study, mind maps created by 50 different students were examined and the design criteria of these mind maps and the areas where their branches were

concentrated were analyzed By creating separate visual analyzes for these areas, it was determined in which parts of the glasses to be designed for RA patients that the experience should be improved and the research results were shared.

This study, which is presented at the intersection of medical and industrial design, is important in terms of creating an interdisciplinary field of study. In this study, the planning and concept development stages of new product development processes are discussed. Within the scope of the planning phase, the steps of literature review, definition of the problem and creation of design criteria, analysis of the design criteria with the mind mapping and product ideas are applied.

2 MATERIALS AND METHODS

In this study, it is aimed to determine the problems experienced in the experience of using glasses in rheumatoid arthritis patients with industrial design methods, To establish design criteria for solving problems of these patients. A common mind mapping was prepared by analyzing the mind maps prepared by 50 industrial design engineering students and the relationships between the criteria were revealed.

A mind map is a graphical representation of ideas and directions around a central theme and reveals how these ideas or directions relate to each other. By using the mind map method, all relevant aspects around the central theme can be mapped. Ideas around the theme bring structure, overview and clarity to a problem. With this method, abstract ideas and concepts are systematically detailed. The tree analogy can be used by making the branches that are important in the mind map, which resembles the branches of a tree, thicker than the others. It is also one of the most important methods of increasing intuitive capacity. This method can also be used to identify all the main and sub-topics that make up the theme, to produce a solution to a problem and to map the advantages-disadvantages, and to realize the pros and cons of each of the sub-branches. Analyzing the Mind Map helps you find priorities and courses of action.

A Mind Map can be used in different stages of the design process, but is often used in the beginning of idea generation. Setting up a Mind Map helps designers to structure thoughts and ideas about the problem, and connect these to each other. However, a Mind Map can also be used in the problem analysis phase of a design project. Mind Maps also work well for outlining presentations and reports. In fact, Mind Mapping can be used in a wide variety of situations [15].

3 RESULTS

Problem definition determined by Literature Review;

1. Since rheumatoid arthritis is a chronic disease that lasts for years, it lasts for many years, affects many different joints in the body and damages cartilage, bone and joint structures.

2. Causes loss of quality of life and economic loss of the patient. Approximately 30% of patients become incapacitated and dependent on other people within 10 years of the onset of RA.

3. RA disease causes deterioration in both physical and psychosocial life of the person, the symptoms limit the daily activities of the person, decrease in efficiency in work life, social isolation

As a result of the literature research, it was concluded that it is necessary to redesign the daily objects according to the needs of these users in order to facilitate the daily life of those with rheumatoid arthritis disease.

138 design criteria were obtained by 50 students. All of these determined criteria are not different criteria, but repetitive answers were determined. The material criterion was determined as the most important criterion recommended for the elimination of problems with a ratio of 0.28 (f:38). Handle is in the second place and it is 0.26 (f:35). Other criterias are Usage:0.15 (f:21), Design:0.13 (f:18), Body / Outer Coating:0.07 (f:10), Cover: 0.05 (f:7), Base: 0.02 (f:4), Nozzle. :0.01 (f:2) (Table 1). It is seen that the design criterias obtained in order to obtain the cup use experiences of RA patients are presented with a design approach from the product part to the whole. It has been determined that criteria such as usage area, material and design play an important role in developing the experience in the design of the glass, which is divided into parts as handle, body, nozzle,cover, base.

Table 1. Criteria, frequency and ratio of datas obtained students

CRITERIA	FREQUENCY	RATIO	CRITERIA	FREQUAENCY	RATIO
Material	f: 38	0.28	**Body / Outer Coating**	f: 10	0.07
Handle	f: 35	0.26	**Cover**	f:7	0.05
Usage	f: 21	0.15	**Base**	f:4	0.02
Design	f:8	0.13	**Nozzle**	f:2	0.01

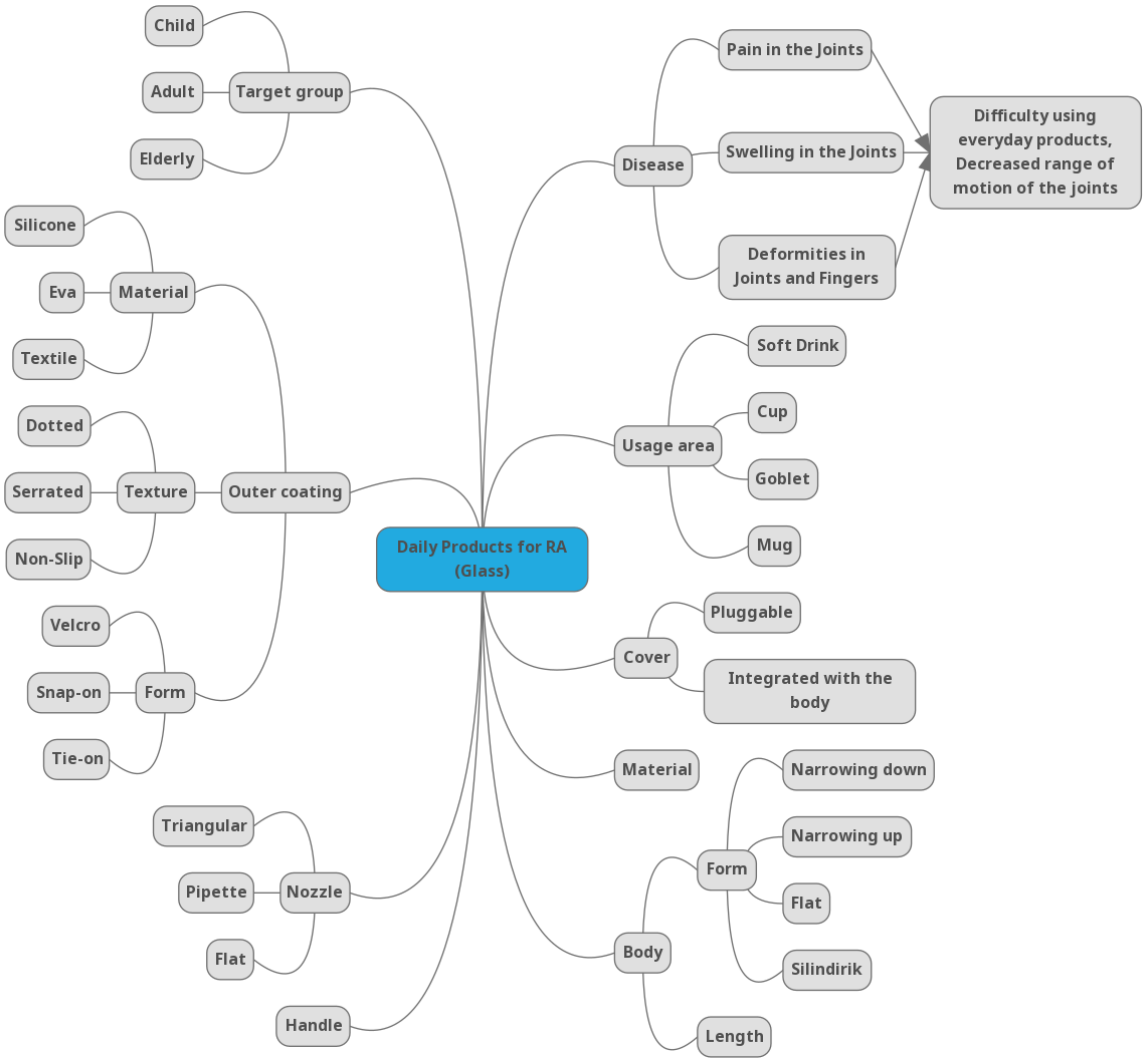

Figure 1. Mind Mapping- Daily Products for RA Patients

In the second step of the study, when the mind mappings prepared for the elaboration of the design criteria and literature review were examined and analyzed (Figure 1).

When the details of the obtained design criteria are examined, it is seen that each theme has different components. Disease, target group, outer coating, body, usage area, cover, nozzle, base, handle and material are the main themes. When the sub-themes of these themes are examined, the outer coating criterion, which is not included in the standard glass design, draws attention. Details such as preventing slipping, increasing the relationship of the product with the hand, the development of hand assist apparatuses, and the customization of the products of RA patients and their ease of use, with this criterion, came to the fore.

When the design criteria were analyzed, a separate mind mapping was created for the material and handle themes, which were determined as the most preferred criteria and the criteria that should be emphasized in order to improve the glass experience, and the connection between them was examined.

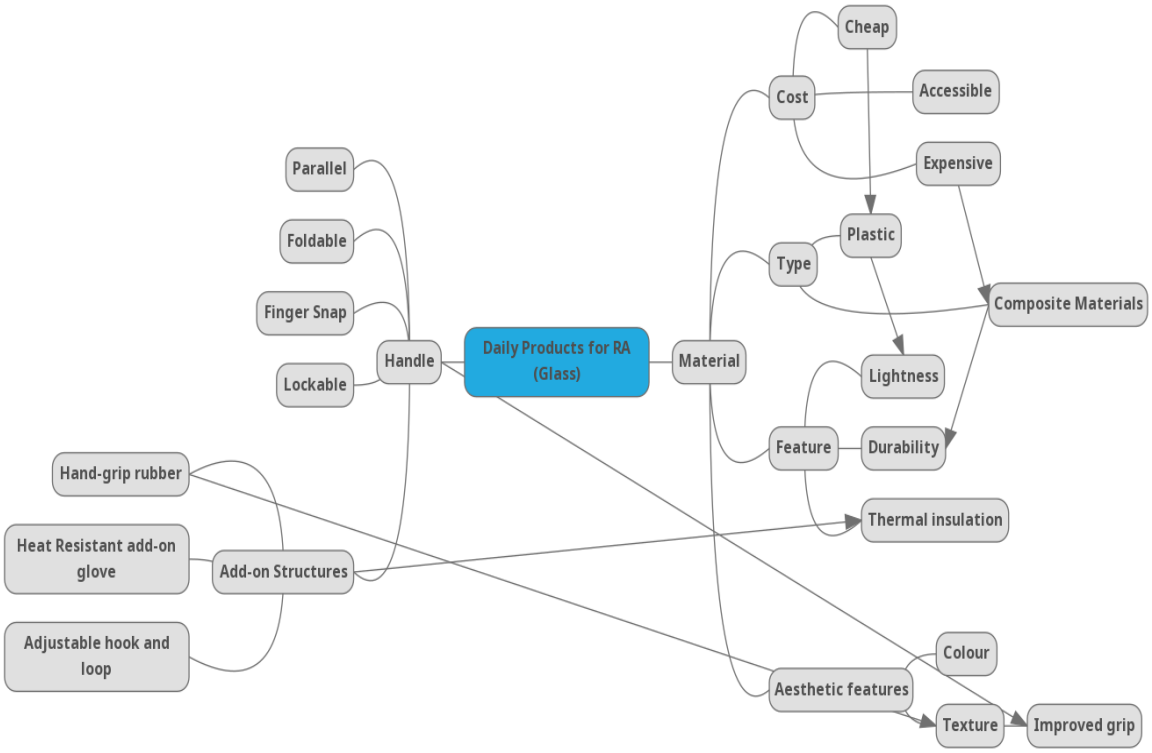

Figure 2. Mind Mapping – Relationship Material and Handle

The most preferred criterion in the design criteria was the material. When the specified sub-themes of the material were examined, the students participating in the study determined 4 themes related to the material. these; Cost, Type, Feature and Aesthetic features. When we examine the cost theme, the cost difference factor, which is one of the important components of industrial design, is divided into three parts. It is one of the most preferred cheap and accessible components, which are determined as cheap, accessible and expensive. Desiring everyone to have easy access to the product is one of the important reasons that bring these criteria to the fore. Plastic and composite materials are the most preferred material types in the glass design that is desired to be developed. Especially the lightness and durability properties of plastic and composite materials have played an important role in the preference of these materials. Materials that are frequently used in glass designs, such as glass and ceramics, remained in the background for this study. The thermal insulation feature is important in the design of the glasses that will be preferred for the transport of hot drinks. When we examine the aesthetic features, coloring is especially important in personalizing and differentiating the product, and the texture feature is one of the preferred features for this disease in which grip and grip are important.

When the sub-themes of the handle design, which is the second most preferred criterion in design criteria, are examined, there are parallel structures, foldable, finger snap, lockable and add-on structures. Considering the relationship of the handle design with the body, especially the foldable and lockable features are also closely related to the body design. Considering the relationship between the material and the handle criteria, it has been encountered that the texture feature is transferred to the handle section, preventing slippage, and the contact of add-on structures plays an important role in improving the grip. Even when examining the design from the part to the whole, it has been observed that all the themes that make up the mind mapping are in close relationship with each other.

As a result of these results, it has been revealed that companies / designers should pay special attention to product material and product comprehension issues, especially in cup designs to be made with the aim of facilitating the daily life of RA patients. The glasses to be designed must be light and unbreakable due to conditions such as damage to the joints and weakening of the joints as a result of the disease. In addition, the glass must be well grasped by the user in order to prevent accidents that may occur due to power losses over time. This requires additional products such as a well-designed handle or gloves.

4 CONCLUSION

Rheumatoid Arthritis (RA) is a systemic autoimmune disease characterized by widespread and symmetric chronic inflammation in the joints [16]. One of the chronic inflammatory joint diseases Rheumatoid arthritis (RA), which can involve many joints, chronic course, etiology unknown, systemic, inflammatory. It is an autoimmune disease. Joint involvement, shape severe deformity over time and can lead to injuries. with frequent exacerbations progresses and becomes chronic despite treatment. mortality and high morbidity, function the loss of the patient's quality of life due to the loss of [17]. In individuals with chronic disease, emotional reactions to the disease, adaptation difficulties, symptoms of the disease, complications, mental distress due to the treatments applied, as well as anxiety about the future, loss of competence / becoming dependent on others and physical problems. Fears of deterioration in the image negatively affect the physical, cognitive, emotional functions, daily and social life, self-care and quality of life of the patient [18].

The aim of the treatment of RA, which is a chronic disease; to reduce pain and inflammation, to stop joint damage, to prevent disability, to protect and improve the patient's functions, to increase compliance with treatment, to ensure that activities of daily living can be performed and to increase quality of life [14]. To achieve all these goals, a multidisciplinary team understanding is required.

This study, which is carried out with mind mapping, is important in terms of improving the daily product use experiences of RA patients, who also have an important place in the field of medicine. The design criteria determined by this interdisciplinary study form the basis for future studies and product designs. The planning phase (literature review, market research, identification of the problem and creation of design criteria), which is one of the steps of new product development processes, was carried out in this study. By using these data, the other stages of new product development processes, such as concept creation and selection, and detailing, can be completed more quickly and effectively by using the data obtained from this study.

In future studies, interdisciplinary teams can be formed and steps such as completing the concept drawings of these designs, making engineering designs, testing and commercializing them can be followed. In addition, the use of the same products in different areas can be investigated and the steps followed in the study can be used to ensure their adaptation to these areas.

When the contribution of this study to different disciplines is examined;

Contribution to the design discipline; the contribution of the research to the design discipline was to reveal the relationship between design and products for RA disease, which has a limited number of studies in the literature. This study, which creates an interdisciplinary working environment for designers, also increases the awareness of designers about the problems and products in this field. Elimination of negative prejudices towards medical-based products creates an added value for designers.

Contribution to the medical discipline is that this discipline, which specializes in diagnosis and treatment, will create more accurate and effective products by creating joint workspaces with designers to produce products for daily use that increase the quality of life of patients, and will allow the perspective of individuals in this discipline to expand.

Author Contributions

İffet PALA ERCAN: Conceptualization, Methodology, Software, Validation, Data analysis, Research, Materials / Resources, Data Refinement, Writing- Original Draft, Writing- Evaluation & Editing, Visualization, Supervision, Project management, Funding

The authors have read and approved the final version of the article.

Conflict of interest

No conflict of interest was declared by the author.

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