

Participatory ergonomics and design of technical assistance

Claudia Isabel Rojas Rodríguez

*Teacher researcher, Universidad Pedagógica y Tecnológica de Colombia, Industrial Designer , Occupational Health Specialist, Masters in Education , PhD Student in Design and Creation, claudia.rojas@uptc.edu.co
claro777@hotmail.com*

Abstract : This work describes the experience of application of a procedural initiative, which aimed to identify and address technical assistance needs progressively in therapy and rehabilitation activities. The proposal theoretical axes are the basics of participatory ergonomics and interdisciplinary work, was raised with the intention of addressing important issues for the entire design process including: perception, attention, memory and human being comfort, and the interrelationships that create objects in the context in which they are used. This project was done in collaboration with leading institutes for the rehabilitation of Colombia: Cirec and Roosevelt, through two investigative stages: a first ethnographic stage, during which were observed one hundred forty four (144) procedures of rehabilitation and therapy to build a bank of assistive technology needs, justified on the project observation variables. And a second stage of action research in which they were designed elements that facilitate the implementation of rehabilitation procedures efficiently. Currently being developed experiential situations in different hospitals to examine the reliability of the proposed solutions.

Keywords: Execution, Need, Therapy, Rehabilitation, Ergonomics participatory, Design.

1. Introduction

Contemporary Ergonomics, seeks to include the user and interdisciplinary work in the entire design process, understanding that this process involves since the detection of needs to check the proposed solutions. According to Jose Juan Cañadas, some objects generate erroneous behavioral manifestations on users, when they are planning the activities to be carried out with them, they neglect important aspects such as: how the human being perceive, learn, serve, remember, but especially when is not analyzed the interaction generated by the objects designed in the physical and cultural dimension of use.

Particularly the design of support elements for rehabilitation and therapy involves a large number of variables generated by the characteristics of the context, of the processes and the specifics of each patient's disability. Therefore the solution to these needs, as well as identification, require a rigorous monitoring process in order to obtain data that faithfully express the determinant characteristics of activities and users, to design efficiently.

The project develops the idea of necessity according to Christopher Alexander as an "active force" from which solution hypotheses can be formulated. The active force of this project is determined by insufficiency, mismatch or conflict that breaks out during the action of therapy or rehabilitation and can be solved with the intervention of a technical support or element support to facilitate the achievement of the objectives of the activity.

2. Methodological considerations

In order to address the particularities of context, this project was developed through a methodological collaborative process, crossed by a clear participatory intention, which favored the interaction of the disciplines and users to exchange and integrate knowledge. A methodological process completely open, flexible and permanent constructed, which was organized into three stages: The first phase of needs detection of technical aids or support elements for therapy and rehabilitation activities, and a second phase of needs resolution through participatory

ergonomics and design. Since these phases had different objectives, the categories and variables of analysis were also defined in a particular way for each of them. The systematization of experiences carried out during these two phases correspond to the third stage of the project, here is expected to propose and validate procedural contributions, theoretical and methodological approaches to the field of participatory ergonomics and design, for users with disability status.

2.1. Time of detection needs

This time of the investigation, which lasted six (6) months proceeded with a descriptive ethnographic court, with the aim of understanding the intent of the activities within the specific contexts in which objects are used.

Descriptive techniques used were: participant observation, consulted observation, stories and interviews, which due to the timing of routines and permanent rotation of patients on procedures to evaluate, were applied to an emergent sample, obtained under the criterion of saturation. For this, information was collected from various therapy and rehabilitation activities in a systematic manner, even when not able to obtain new information and collected data began to recur. Based on this criterion and with the participation of designers, therapists and patients or their companions, are observed, one hundred forty four (144) procedures in rehabilitation and therapy centers in agreement. Fig. 1 Stage of needs detection Product of the analysis of these observations, a bank of technical assistance needs was consolidated, which were described from the categories and variables set for this stage of the project. The categories from which were interpreted the behaviors and attitudes that accompanied the physical actions of the activity of therapy, and gave meaning to the object-based needs within the context of use were:

- * Situation or action that requires an object to achieve the objectives of the activity of therapy. Its variables: conflict, absence, lack of effectiveness, discomfort, dissatisfaction, discouragement, error rate.
- * Activity, set of operations or tasks performed within a protocol for the purpose of recovery of a patient. Its variables: method, routine, time, limitations of the patient.
- * Expression set of communicative manifestations of the patient and therapist

within the activity, with the variables: emotion, affection, symbolism, pleasure, displeasure.

- * Built environment, places and elements that contain, the activity of the therapy, which included the variables: places, hierarchy, proxemics, scenarios.
- * Interaction, mutual action or behavior between therapist and patient, towards the improvement of the state of disability, this with the variables: knowledge, pathology, attention.
- * Environment treated as the set of social relations in which are embedded people involved in the therapy: personal relationships, conflict management, divergences.

The needs identified during this process were then evaluated and validated by the medical staff of each of the institutes, who assigned importance levels of high, medium and low priority to thirty (30) of them. The interaction between the social actors of the activity of therapy and the designer at this stage revealed technical support if implemented will support the achievement of the goals of therapy.

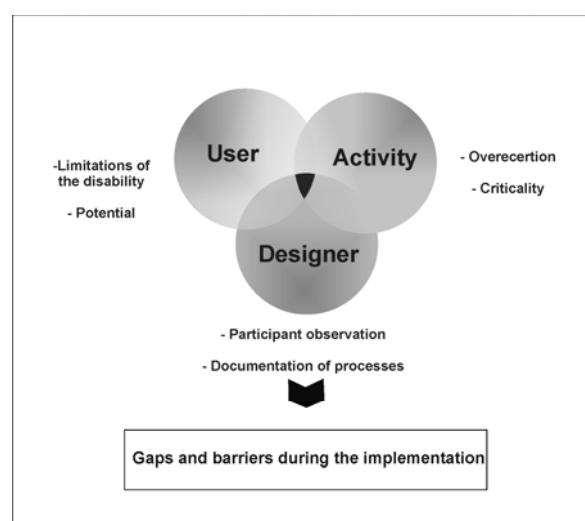


Figure 1 Stage of needs detection.

2.2. Needs resolution stage

Once prioritized needs were described in detail with the support of other ethnographic techniques, began the resolution stage which lasted twenty months (20) and was developed through an action research model, in which proposed and validated participatory experiences involving users: patients and therapists during the development of proposals. These experiences range from the formulation of design requirements stage for technical support, to the participatory assessment of alternatives projected to solve each specific need.

Here the criterion for selecting the sample was determined by the "representativeness". This criterion highlights the need to select for the analysis sample, some critical cases that meet the most significant and relevant characters established in the methodological categories, which in this case were defined by the physical limitations that create the different pathologies, according to International Classification of functioning of disability and Health ICF. Thus the data take the representative sense when interacting with other scenarios in which appear the same circumstances and physical conditions, as outlined in the theoretical perspective from which the data were analyzed.

At this stage designed objects fulfilled the role of research tools and data collection, on these objects the variables were evaluated related to the level of satisfaction and wellbeing of users:

- Efficiency
- Obvious functionality
- Ease of use
- Security
- Postural comfort and Handling
- Objective and subjective satisfaction
- Communication and Signaling

For this stage the researcher's role was to develop strategies and experiences aimed at sharing and promoting the construction of theoretical, methodological and technological knowledge, it was considered appropriate to address each need as a subproject in order to consider the particular requirements of each technical assistances, independently. Although researchers have not manipulated any risk factors for patients, it was essential to meet the principle of "informed consent", which establishes the obligation to obtain approval,

preferably signed, from patients participating in the project for development of activities.

During the development of this stage five teams were designed to support the development of therapy protocols, addressing first needs that met a double purpose from the ergonomics: first to achieve physical and psychological comfort and well-being of people in condition of disability who come to these processes of rehabilitation, and secondly, those related to lightening the load management for therapists, caused by patient body weight, these were:

2.2.1. Modular system for the exercise with prosthetic walking

The objective of this system is to exercise and train on the fly, with prosthetic on safe places for patients. This technical assistance consists of six modules designed to simulate surface textures and dimensions in different terrains and obstacles present on a daily basis, both in public places and in transportation and interior spaces, stairs, ramps, rocks, grass, carpet, countertops heavy and light traffic. Modules can be attached giving the possibility of organizing different circuits in accordance with developments in the rehabilitation of gait in people who have required adaptation of prosthetic inferior limbs. The contribution to the investigation of the macro project given by this particular job was to evaluate the procedural and methodological framework for participatory ergonomics planned by the project.

2.2.2. Body support for the rehabilitation of walking on parallel bars

This proposal's main objective was to meet the objective and subjective variables related to safety and comfort during the use of structures for rehabilitation in people whom surgery has been performed or are in rehabilitation for various conditions that restrict natural motion. The equipment is a mechanical structure that supports the patient's body while allows comfortable displacement during his tour of the modules of rehabilitation, quite irrespective of the manipulation required by therapists and support staff, and eliminating problems associated with managing occupational load associated with bad posture.

2.2.3. Support System for the therapy of upper limb exercise

Technical assistance is a station designed for the interaction of two patients or a patient with the therapist, through a game that offers tracking the path of a sphere, which fits through controls operated by

the patients. The maneuvers required to operate the game, exercise pronation and supination of the wrist and rotation, adduction and abduction of the shoulder.

2.2.4. Equipment for internal transfer of patients in therapy activities

It consists of a structure that has a hydraulic piston that accommodates the different heights and areas in which to perform therapies, and a harness specifically designed to be accommodated in the body of patients who have little or no mobility. The flexible component of the harness is designed so that when stressed by the structure involves the patient keeping him in a comfortable and secure position, completely eliminating the manipulation and abuse of people in disability status.

According to the methodological process established, the three aids described above had two goals for the project, first to design, validate and evaluate participatory experiences with all actors involved in therapy and rehabilitation activities, and on the other hand, assess categories and variables provided for the resolution stage needs. Fig.2 Stage resolution of needs

2.2.5. Rehabilitation support system Hydrokinesitherapy with children with psychomotor retardation:

The team designed, comprising a series of modules that help support the patient in different positions and independently in the pool, favoring mobilization exercises, rehabilitation, motor and gait training in the aquatic environment, which allows to benefit indeed the effects of buoyancy and improve range muscle these benefits are usually limited when the patient is supported by the therapists. The contribution of this research work was to establish the internal and external validity of the instruments, procedures and indicators set for the project, as well as experiential situations, designed to test the degree of improvement that is generated in use situations when introduce technical support.

They are currently in use in institutes who served with the project agreement, elements designed to facilitate the implementation of medical procedures efficiently and experiential situations are developed to verify the efficiency of the suitability of the proposed solutions

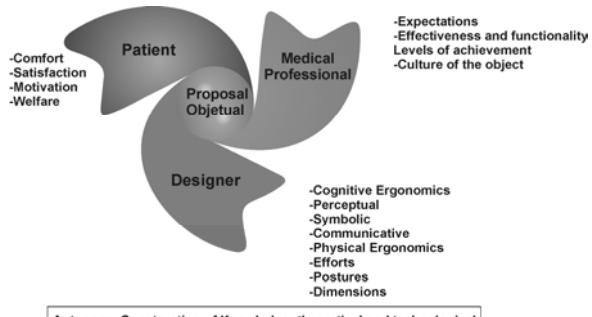


Figure 2. Stage resolution of needs

3. Stage Systematization of experiences

The project is currently developing this stage, which is oriented to the realization of the comparative analysis of participatory experiences made, based on the construction of instruments for processing and systematization of each of the cases, by new categories and variables that will describe each case and its context of application. The categories were determined and defined in such a way that contributes to the theoretical and methodological construction of participatory ergonomics in rehabilitation facilities and therapies as follows::

3.1. Multidisciplinarity

The multidisciplinary, established as a need within the processes of participatory ergonomics and not as an option, because although the conditions for its effective implementation are not given yet, particularly in these environments, non participation of professionals directly related to the medical field and rehabilitation in the process of detection and development of technical aids, leaves without scientific and operational support any design proposal suggested.

3.2. Active participation

From the concept of taking or have a part in something. Traditionally, users and disciplines related to the use of assistive devices are passive agents in these processes, active participation refers not only to speak but to intervene in decision-making. Participation in this type of ergonomic research is the central tenet of the process, effective obtaining of participation helps to efficiently meet the expectations of the users only when they make explicit their satisfiers. For the participatory

ergonomics, participation means to intervene from the self-determination and awareness of needs to the assessment and selection of possible solutions.

3.3 Distribution of functions

The division of labor is a dominant factor in participatory processes, this way establishes the rules of action, and the role of each actor during the study. For the purpose of the role of each of the actors involved in participatory activities encourages contributions and continuous exchange of knowledge and experiences of each participant collectivity, determining the categories and variables from which their interventions will be valid for the process.

3.4. User Role

Within this category, the user is defined as the set of people that somehow establishes a relationship of use with either the activities themselves or the objects in it that are used. Match the different subjects who later benefit from a service or product: medical personnel and disability status in patients.

3.5. The Context

The concept of context contains all those components of the environment and surroundings that generate interaction with user and activity. This project considers the built environment that space in which activities are carried, therapy and rehabilitation also involving aspects related to the environment, from social and cultural factors that influence the development of these activities to variables related to the actions or expressions of affection or disagreement, expressed within the framework of action of therapy activity.

3.5. The activity

The activity has been considered the primary unit of analysis in the ergonomic studies. The activity involves all the actions, movements, postures and efforts of the user to achieve some goal. For the project activity was defined as the set of operations or tasks performed within a protocol of therapy, and whose purpose is the recovery of a patient. Include the method used for the development of the action, identifiable skills and habits in the same process, as well as time and how the activity is recorded for tracking patient.

In addition to the categories described above which were defined to contribute to the theoretical and methodological construction of participatory ergonomics and validation of instruments designed for each stage is expected to detect differences and similarities in the same aspects of the implementation of the methodology, development of activities and relationships between actors involved, to establish the key moments and the most appropriate ways in which participatory ergonomics can contribute to understand and effectively address the multiple problems and needs that arise during the design of assistive techniques.

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