



CONCEPTUAL DESIGN OF A STATIC WRIST ORTHOSES WITH UNIVERSAL ACCESSORY TO SUPPORT DAILY ACTIVITIES

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Introduction

Writing is a task that is learned in childhood, and that it is fundamental to academic life. The process includes elaboration of drawing for different purposes from the compositions of essays, to the learning of symbols for solving equations (ZIVIANI; WALLIN, 2006). In this context, the development of multidisciplinary design, in this study, occupational therapist and mechanical engineering is essential for the development of products that satisfy the demands. The first step is called informational design and its systematic development is fundamental in products or services that require a high degree of customization. The development of an orthosis with universal accessory to link different tools and materials used daily, such as a pencil or a spoon, can significantly improve the autonomy of people with limitations imposed by neurological diseases or motor difficulties to perform daily activities. This paper presents a study on technical feasibility of an orthosis with adaptation for cutlery, pencil/pen and toothbrush, applying the concept of universal design. The focus is obtain a better concept of manual function stabilizing the wrist for people with Cerebral Palsy.

Method

The development of the technical feasibility of this orthosis was made through two macro steps: the first step was based on collecting more information that is refined from occupational therapists using a list of users' requirement elaborated by the engineering team based on technical literature data and patent databases. The refining process of this list was made iteratively and interactively between the two teams over 3 months (Ethics Project num. 2742/2013). The main techniques of design methodology used in this phase (informational) were: brainstorming and elaboration of the first QFD (Quality Function Deployment) matrix. The correlation matrix and the contradiction matrix are presented in Figure 1. With this systematic process, the following technical characteristics were identified as essential: Do not cause injury; Be comfortable and Allow the use of cutlery and pencil/pen. There were identified as contradiction relations: Minimum volume / Total weight; Operating angle / Number of using options and Number of using options / Costs. These data led the search for conceptual solutions, the second macro step, to develop the orthosis and the techniques applied were Signal-Energy-Material System, Morphological Analysis and a new search on patent databases.

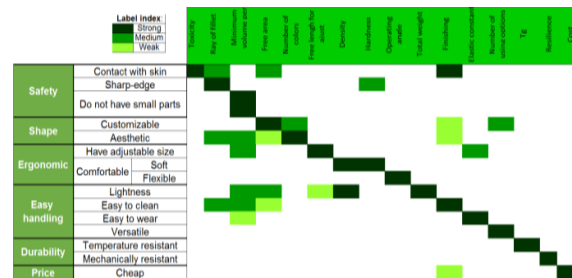


Figure 1: House of quality (QFD).

The application of these techniques allowed a more refined visualization of the problem and a multidisciplinary learning to find possible physical and technical solutions. The mock-up of the preliminary solution is presented in Figure 2.

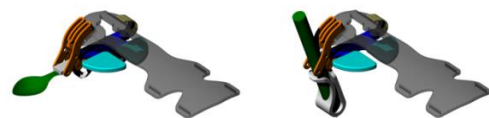


Figure 2: Mock-up of preliminary technical solution.

Discussion

The development of technical solutions and products, with a high degree of customization, mainly intended for devices applied in health area requires the interface between professionals of engineering and health fields. Combining the knowledge of both areas, the user should be benefited with solutions that meet most of their needs. The use of design methodology and new technologies techniques as additive manufacturing for the generation of prototypes will be fundamental to ensure the incorporation of real needs for this category of products.

References

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