

RESUMEN

Ergonomically adapting the braille writing stylus through a User-Centered Design approach

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INTRODUCTION

From a global perspective, the World Health Organization (WHO) estimates that there are 285 million people in the world with visual impairments, of which 39 million are totally blind and 246 million have low vision. In Brazil, 23.9% of the population declare that they have some kind of disability, representing 45.6 million people, of which 3.5% of the total declared having visual impairment. Conceiving the significant prevalence of people with visual impairments, it is also necessary to understand the importance of Assistive Technologies for this group, which are resources and services that work to provide or expand the functional abilities of people with disabilities, which can lead to a life of greater independence and inclusion (Bersch & Tonolli, 2006).

An example of that can be found on the braille slate set, consisting of the slate and stylus, which is used for manual braille writing. These objects were flagged in a mapping carried out by Occupational Therapists, who are part of an extension project called Projeto Incluir UFPE (The Inclusivity Project of the Federal University of Pernambuco – Maranhão, Brasil), because they showed the need of an redesign. This is because, according to visually impaired students that took part in the aforementioned research, the tools are uncomfortable for continuous, everyday use. Nonetheless, for the scope of the present article, only issues relating the stylus will be studied, device responsible for mediating the interaction between the slate and the user.

OBJECTIVE

To develop a ergonomic design for the braille writing stylus.

METHODOLOGY

For the discussion of this article, the methodology adopted was the GODP - Orientational Guide for Project Development – that targets the User-Centered Design approach, proposed by MERINO (2016). The methodology is structured by three moments and eight phases, considering the process that takes place from the foundation to the execution of the project itself (MERINO, 2016). For this development, in view of its practical purpose, the Ideation Moment (phases 2 and 3) is highlighted. In addition, the Ideation Moment is made by the phases Organization and Analysis (2) and Creation (3). Therefore, Stage 2 was dedicated to verifying, through direct dialog with the target public and professionals of the assistive area, counting with field interviews, what where the main ergonomic problems in the product-user interaction. That was followed by Stage 3, which aimed to develop possible enhancements for the tool, subsequently verified in usability tests.

RESULTS

Phase 2 – Organization and Analysis: The process of gathering information was carried out through virtual meetings with the Projeto Incluir UFPE, which included the participation of visually impaired students, as well as Occupational Therapists and a brailist teacher. The



context in which the object was used was presented, showcasing a lack of good ergonomics. Then, a partnership was signed with the Santa Catarina's Association for the Integration of the Blind (ACIC - Santa Catarina, Brazil), which allowed semi-structured interviews and a field research with pedagogical professionals of the assistive area, adding to the previous investigation. Based on these contacts, it was noted that the stylus has a relative small size, usually varying between 50x55mm and 60x25mm. Because of this, writing requires precision grip on the part of the user, meaning that the work performed requires force with the fingertips (GALVÃO, 2016). This factor ends up generating relative fatigue and pain in everyday use, as was found within the interviews given by professionals from the Association mentioned before.

Consequently, it was understood that there was a need to develop a new shape that provides greater comfort, with a design that transfers the force to the user's palm, an occasion referred to as power grip (GALVÃO, 2016). Thus, the fingers only have the function of establishing a certain precision, remaining relatively static, while the movements are carried out by the wrist and arms (GALVÃO, 2016).

Phase 3 – Creation: For the Creation phase, it was clear that the common "pear" shape needed to change, which is quite traditional in the market for stylus. To this end, a spherical shape was developed for the handle, expanding the previous size and allowing the user to have a power grip. In addition, a finger support piece was made to ensure precision. Thus, a thin layer of silicone was designed for the contact between the palm of the hand and the object, ensuring greater comfort for prolonged use. Furthermore, three sizes have been developed for the tool (S, M and L), covering a wider range of people. Because of this, it is possible to offer the individual a freedom of choice, while also bringing plurality to an Assistive Technology that is normally presented in an "universal" size. The products were then produced using 3D printing and taken for usability tests at the ACIC, taken with three professionals from the assistive field.

The feedback collected was positive, presenting no need for adjustments.

CONCLUSION

In the development of this article, the objective was to develop an ergonomic design for the braille writing stylus. Therefore, the contribution is considered satisfactory, since a new proposal for the tool was developed, which led to positive feedback during the usability tests that were carried out. The next steps involve expanding the scope of users in the tests, with the aim of perfecting the models and arriving at a product that can be commercialized.

Keywords: stylus, user-centered design, assistive technology, visual impairment; braille

Palabras Clave: lápiz capacitivo, diseño centrado en el usuario, tecnología de apoyo, discapacidad visual, braille

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