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Parameters and requirements for artifacts' project to the drawing activities of children with cerebral palsy

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1 Context

The problem that causes the exploration of the topic of this work is the difficulty, or even impossibility, that children with cerebral palsy sequels have to play the graphics, the act of drawing, so important to their development. The drawing experience is important for setting up the subject[4]. It is understood that design is an area that can contribute to the solution of this problem, since it is necessary to evaluate and intervene on the environment and artifacts, as well as other variables, to obtain better usability results.

Cerebral palsy (CP) refers to a heterogeneous array of clinical syndromes, non-progressive etiology that occurs in an immature brain, characterized by postural changes and permanent motor disorders, which may or may not be associated with cognitive changes (1). This condition has a negative impact on the possibility of the child to control their movements.

Movement control is obtained by the cooperative efforts of many brain structures, in the perception and action systems. It is not a simple task, it is a complex activity that involves the whole organism, directed to the performance of a behavioral task, directly related to the function (2).

Therefore, it is understood that the difficulty in controlling movements presented by children with CP interfere negatively on the graphics process, since it is the accuracy of the child's movement on the surface that will determine the drawing that they intends to do. In order to achieve that, they need to manipulate objects such as pencils and crayons, their own finger or digital interface objects. About that, Cazeiro and Lomônaco (2011) point out the difficulty of children with CP in manipulating objects (3).

Several studies have reported the relationship between pencil grip posture and handwriting skills. It is known that there are artifacts designed to facilitate this handle, but still not functional for children with CP who have involuntary movements (5). In this function perspective, is important to define "usability", which is the measurement of a product that should be used by specific users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use (6).

This study is being developed within a doctoral research in design, in which it is intended to establish parameters for the artifacts project for graphics activity of children with cerebral palsy. This study objective, however, was to study artifacts developed to assist the drawing abilities of children with CP and identify the presentations of parameters and requirements in the design of these artifacts. Understanding parameter as an "important factor to be taken into consideration to evaluate a situation or understand the phenomena in detail" and requirement as "condition that must be met in order to reach a certain purpose" (7).

2 Method

As a methodology, a literature review was conducted, in Portuguese and English with the following descriptors: "*paralisia cerebral atetoide*" / "cerebral palsy athetoid" combined with "*desenho*"/ "drawing"; "*escrita*/ "writing"; "*grafismo*/graphism" and pencil adaptation.

In this initial stage of data collection for doctoral research, which led to this study, there were used two search channels: Capes portal of journals and scholar google. However, some articles were found in google scholar, but the complete full version was obtained in portal Capes. In addition, some others articles were founded in Capes portal in Japanese and found on google scholar in the English version.

The initial selection of the articles was determined by the criteria of relation to the research theme, mentioned previously above. Especially in google scholar, most of the pieces found in the search were excluded for dealing with computer use in typing activity, alternative communication and other pathologies, or cerebral palsy without relation to the graphics activity. Six articles were selected for this study, four in English and two in Portuguese. Of the total, five of them used digital resource and only one indicated using low cost material.

3 Results

The articles analyzed approached both digital and physical artifacts; the parameters and requirements were presented in more detail in digital artifacts projects.

To sum up, the parameters identified in the articles (what was considered to project artifacts) were the following:

- Environmental context, product environment, user analysis, user activities, analysis of the product, product model attribute, summary of requirements and design (project), evaluation of usability, analysis of drawing movements (8);
- Anthropometric measures of the hand (8);
- Manual behavior / manual function (8,9);
- The individual disability degree (10);
- Irregularity and variability of the strength of involuntary movements (10);
- Usability of materials to writing and drawing (9);
- Duration of the drawing uptime, speed, acceleration and pen pressure (11);
- User vision (12).

The requirements identified (what was intended to provide with the artifact) were:

- Keep wrists aligned and prevent ulnar and radial deviation, palmar and dorsal flexion (8);
- Increase the activity and stability of the arm, providing arm support and increase the range of the drawing (8);
- Keep the device / artefact in the plan; keep the device hold; ease of re-grasping (10);
- Generate possibility to erase the drawing (10);
- Maximize the movement pressure (12).

4 Conclusions

Through the survey performed it was possible to identify some parameters and requirements set out in articles related to the child's performance with cerebral palsy sequels. Some parameters mentioned were not created by the authors, but already are components of methodologies identified in the articles. The literature here presented was just the beginning of this survey, but it is known that many articles that discuss artifacts for this purpose does not detail the parameters and / or requirements considered in the design of them. However, it is understood the importance of establishing the criteria for the contribution of the projects, because the usability and functionality of each child with cerebral palsy sequel will be very diverse.

5 References

1. GAUZZI, L.D.V.; FONSECA, L.F. Classificação da Paralisia Cerebral. In: LIMA, C.L.F.A.; FONSECA, L.F. (Org.). Paralisia Cerebral: neurologia, ortopedia, reabilitação. Rio de Janeiro: Guanabara Koogan, 2004. p. 37-44.
2. SHUMWAY-COOK, A.; WOOLLACOTT, M.H. Controle motor: teoria e aplicações práticas. São Paulo: Manole, 2003.
3. CAZEIRO, A. P. M.; LOMÔNACO, J. F. B. Formação de conceitos por crianças com paralisia cerebral: um estudo exploratório sobre a influência de atividades lúdicas. Psicologia: reflexão e crítica, v. 24, n. 1, p. 40–50, 2011.
4. SILVA, N. M. V.; VASCONCELOS, A. N. O self dialógico no desenho infantil. Psicologia: reflexão e crítica, v. 26, n. 2, p. 346–356, 2013.
5. KAVAK, S. T.; BUMIN, G. The effects of pencil grip posture and different desk designs on handwriting performance in children with hemiplegic cerebral palsy. Jornal de Pediatria, v. 85, n. 4, p. 346–352, 7 ago. 2009.
6. ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 9241-11: requisitos ergonômicos para trabalho de escritórios com computadores: parte 11- orientações sobre usabilidade. Rio de Janeiro, 2002.
7. DICIO**:** Dicionário Online de Português, definições e significados de mais de 400 mil palavras. Avaiable on: <http://www.dicio.com.br/parametro/>. Acess in: 11 fevereiro 2015.
8. WU, F. et al. Assistive drawing device design for Cerebral Palsy children. Technology and Disability, v. 15, p. 239–246, 2003.
9. PLOTEGHER, C. B.; EMMEL, M. L. G.; CRUZ, D. M. C. DA. Utilização de dispositivos assistivos por alunos com deficiência em escolas públicas. Cadernos de Terapia Ocupacional da UFSCar, v. 21, n. 1, p. 35–42, 2013.
10. NAKAO, T.; SAKAMOTO, R.; YANO, K. Drawing Assist System Considering Nonperiodic Involuntary Movements. 12 th IFAC Symposium on Analysis, Design and Evaluation of Human-Machine Systems, n. 2005, 2013.
11. PIOVEZANNI, M. A. T.; ROCHA, A. N. D. C.; BRACCIALLI, L. M. P. Eficácia de mobiliário escolar adaptado de baixo custo no desempenho funcional de criança com paralisia cerebral. Revista educação especial, v. 27, n. 49, p. 485–498, 2014.
12. ROON, D. V.; STEENBERGEN, B.; MEULENBROEK, R. G. J. Movement-Accuracy Control in Tetraparetic Cerebral Palsy : Effects of Removing Visual Information of the Moving Limb. Motor Control, p. 372–394, 2005.