



6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the
Affiliated Conferences, AHFE 2015

Ergonomics design research on writing tools for children

Long Liu^{a,*}, Xiaochen Cui^a, Hua Dong^a

^aTongji University, College of Design and Innovation, Fuxin Road 281, 200092 Shanghai, China

Abstract

Design of writing tools for children should well consider ergonomics factors. However, design guides provided should leave designers freedom to handle design without strict limitation. This paper described a study in 2014 with Chinese children aged from 3 to 10, in order to find out key factors in design features which have large influence on hand grasp development. The study is highly application oriented. Methods like observation, questionnaire, and experiment are applied to achieve the study objective. Two key factors in design, i.e. clear positioning of grasp point and balanced distribution of grasp forces among fingers, are found to have high relevance to children's grasp development. More specific design guides are formulated, and initial design concepts based on these guides are proposed and presented in the paper.

© 2015 Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of AHFE Conference

Keywords: Writing tool, hand grasp, children development, ergonomics design

1. Introduction

Handwriting is an important skill for school-aged children. Most kindergartens and primary schools both in China and in other countries have training programs for suitable age children for handwriting. Different researches have been conducted with the viewpoints from medicine, graphonomics, psychology, occupational therapy, and education. Many researches have shown that a better handwriting has implications for a child's overall development, e.g. more actively participated in school learning and playing activities, which potentially leads to high academic performance and self-esteem[1]. A number of correlative studies have identified the performance components that are associated with handwriting, namely, motor planning, eye-hand coordination, visual perception, visual motor integration,

* Corresponding author. Tel.: +86 21 65983432; fax: +86 21 65983432.

E-mail address: liulong@tongji.edu.cn

kinesthetic perception and in-hand manipulation[2][3]. The difference among age groups, different sex, and handwriting for special children are also studied by many researchers[4].

As handwriting is important not only for school-aged children's overall development, but also for later education or social communication and integration of adults[5], handwriting patterns as well as their influencing factors should be well studied in order to provide evidences for design of suitable handwriting tools. By now, one particular hand grasp pattern is frequently seen and recommended, which is well known as the 'dynamic tripod', referring to use the thumb, index and middle fingers to fix the pencil to perform well co-ordinated movements[6]. Many teacher and therapists recommend this pattern, and many commercialized writing tools are designed based on this pattern[7]. However, the basis for recommending the dynamic tripod pencil grip and for excluding other grips is subjective and lacks scientific underpinning. Researches have shown little is known about the possible detrimental effects on writing caused by deviation from this recommended grip[9]. Therefore, it is still necessary to research on design features influencing handwriting patterns other than 'dynamic tripod'.

In China, the problem with writing tools is more serious. Under the pressure of promoting school performance, the Chinese children are requested to perform a lot of writing tasks both in school and at home every day. Children are likely to form a faulty writing pattern, which will influence children's overall development in many aspects, such as short sight as well as children's body posture development. Many researches emphasize that well-designed writing tools should be used to help children forming correct writing patterns, however, they have not clearly revealed which factors in writing tools design in which form could influence the forming of final grasp pattern in which ways[10]. The writing tool designs in China have almost no intension to ensure better writing patterns among children.

2. Research plan and methods

Recently, in the D&I (College of Design and Innovation) of Tongji University, researchers have conducted an extensive study, to research on the handwriting grasps of children in the sensitive stage of writing pattern development, to find out factors in grip design which would significantly influence the writing patterns as well as overall postures of the children. The objectives of the study include:

- to reveal how serious the writing pattern problem among the Chinese children is;
- to identify which factors in writing tools design contribute to the development of writing patterns among different age groups of children;
- to transfer the research findings into practical writing tools design in realistic reasonable and attractive form instead of dominated 'ergonomics' appearance.

The study is highly application oriented without intensive research on the handwriting anatomy, movement, or cognitive process. Main purpose of the study is to find out factors in design which could influence the children's writing patterns as well as their overall development such as sitting posture and sight, in order to provide designers with effective guide or applicable principles for design.

2.1. General research plan

The study is planned to be conducted in 2 phases: the first phase is to use methods of observation and questionnaire to investigate the overall problems of Chinese children with writing tools. Parents are invited to fill out questionnaires on their opinion on the children's hand writing issue. Then observation is conducted with support of some schools to record Children's writing grasps; the second phase is to research on the design factors influencing grasp patterns of children, by analyzing children's grasps of writing tools with different design features (both commercialized and designed by researchers) using systematic analysis methods such as Grey Relational Analysis (GRA).

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات