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Optimising pen gripping in children to reduce muscle strain

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50% - 70% of children learning to write finish the development process using a dynamic grip style (Henderson & Pehoski, 2006). The rest learn non-optimal grips, known as compensatory grips. These occur due to weakness in the wrist and shoulder muscles (OT Mom Learning Activities, 2012). Long term effects caused by these grips include rapid fatigue and muscle strain occurring due to the user grasping the pencil tightly (Tseng & Cermak, 1993).

This project aimed to encourage children to use the optimal writing grips. The idea was to provide feedback about their finger positioning, allowing improvements to be made. By detecting unsuitable grips earlier in the development process they could be actively addressed, avoiding the negative health implications.

The research included understanding the theory behind children's grip development and hand positioning. A focus group was run testing 4 key types of writing instruments aimed at improving grip. Children were asked to complete a standard writing task using the different instruments and the grips observed were matched against standard grip classifications, shown in Figure 1.

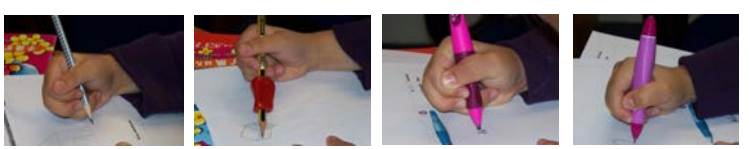

Figure 1: Child's grasp with the 4 key types of writing instrument for improving grip

It was found that symmetrical integrated grip solutions were most suitable, producing the best versions of the children's grip style. The symmetrical form allows the instruments to be used in the initial orientation, maintaining the optimal linear wrist position (Pheasant, 1996). By using Jones' methods of fitting trials within focus groups, it was possible to calculate optimal ranges for width, length and lead thickness for the writing instrument.

The suitable width range found was relatively large compared to a standard pencil. The added thickness will help reduce the occurrence of compensatory grips by aiding the development of finger strength, decreasing muscle load and strain (Oehler et al., 2000; Goonetilleke et al., 2008). A new pencil design was proposed and prototyped to achieve optimal griping.

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