

# research snapshot

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## Wearable Wrist Monitor for Measuring Functional Hand Use in Children With Hemiplegic CP

### What is this research about?

Individuals with hemiplegic cerebral palsy (CP) experience varied degrees of weakness and a lack of control on one side of their body, with the hand and wrist most severely affected. Children with hemiplegic CP often neglect to use their affected limb regardless of its skill or measured capacity in everyday life. It is essential to train and use one's hemiplegic limb to advance its function and skill. Tools that can measure hand use in daily activities are important as they can help clinicians understand how/if children are using their hemiplegic hand. They can also be used to encourage children to use their hemiplegic limb more in their daily lives. There are few tools that can detect and encourage the use of the hemiplegic limb in everyday activities. The aim of this study was to design a lightweight, portable, wearable, and inexpensive device that could measure wrist extension in children with hemiplegia in their home, play, and school environments. The researchers also wanted to observe if wrist extension is strongly related to functional hand use.

Devices that can detect the use of a hemiplegic limb could encourage children to use that limb in their daily life if linked to a game for example. Some factors that should be considered when developing a device are:

- Is the device portable (lightweight, size)?
- What is the expense of the device?
- How is the device used (can it be worn)?

### What you need to know:

Children with a hemiplegic limb from cerebral palsy often avoid using it in their daily life. Finding tools to measure and encourage the daily use of hemiplegic limbs may improve the lives of children with CP. The researchers designed a low cost, wearable device that monitors wrist extension to help increase use of a hemiplegic arm.

- How is wrist extension measured?
- Can it measure both hemiplegic and non-hemiplegic arm movements?

### What did the researchers do?

15 children, aged 6 to 12 years, completed the Assisting Hand Assessment (AHA). The AHA is a well-established and validated assessment tool for measuring bilateral hand function in children with hemiplegia during play. All children were diagnosed with hemiplegic CP and had weakness in 1 arm. They wore a wrist monitor that noted their wrist extension. Wrist extension was confirmed through video analysis which recorded the wrist movements of each child. Hand movements were monitored to find any connections between wrist activity (as detected by the device) and hand function (as measured by the AHA).

### What did the researchers find?

The researchers observed 3 key findings:

- The number of wrist extensions can be reliably measured with a low cost, portable wrist monitor.
- Wrist extension is a reliable measure for daily life use of a hemiplegic arm.
- Measuring both the number of times the wrist is extended and how much it is extended more closely reflects daily use than either measure alone.

When there is greater wrist mobility, the range of extension of the wrist is the best measure of hand use. On the other hand, for children with a limited range of movement, the extension frequency is a far more important predictor of the AHA functional scores.

### How can you use this research?

Policymakers may find this research useful, as it sheds insight on new health technology. They will learn about a low cost tool that can help measure and potentially increase children's daily use of their hemiplegic limb leading to improved function. They will want to consider how to support the integration of such a tool into healthcare services and available treatments.

Practitioners will also learn about this new tool that can be used in a variety of settings such as the home and school. They may want to consider using wrist extension monitors in their practices when it is appropriate.

### About the Researchers

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### Keywords

Hemiplegic cerebral palsy, Wrist monitor, Extension, Low cost

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