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BESPOKE RESEARCH AND CONSULTANCY FROM HSE

Independent ergonomics evaluation of the iTip handle

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Report number: Interim Summary Report

Introduction:

The iTip® handle is a low cost, additional handle which can replace the existing hand grips on manual handling aids, such as sack and wheel barrows. The design of the handle provides a neutral hand and wrist posture, irrespective of the position of the load it is attached to. This enables “better biomechanical efficiency in the arms and hands, making it easier on the joints of the shoulders, elbows and wrists.”

In order to explore effectiveness of the iTip handle design, HSE’s Science Division independently tested the use of the handles on different manual handling devices.

Aims/Objectives:

The aim of the project was to provide an independent ergonomics laboratory study of the iTip handle by comparing its use with the use of standard handles on a number of aids used in manual handling operations.

Handling aids studied:

Four types of handling aids were chosen for study:


Sack barrow


Wheel barrow


A wheel chair


A stretcher

Measurement techniques:

Use of the iTip modified handling aids was compared to unmodified examples using measurements of wrist angle using a Biometrics electrogoniometer and data logger and psychophysical assessments of perceived force exertions and discomfort.

Task:

The study was carried out in the Biomechanics laboratory at the HSE Science and Research Centre in Buxton.

For each handling aid, participants repeated physical tasks including pushing or carrying the handling aids for 10 m, turning and delivering the aid back to the start and repeating. At this point, participants tipped out the contents of the wheel barrow.

Summary of the findings:

Exertion and discomfort data

The ratings of whole body exertion showed that the levels of exertion reported by the participants were relatively low and consistent between the two handle designs. This was to be expected and confirms that using the iTip handle does not increase the physical effort required to manoeuvre the handling aids.

Goniometer data

It was clear from observing the trials that the differences between wrist angles when using the sack barrow and wheelbarrow were clearly visible and beneficial.

The measurements show a beneficial reduction in mean wrist ulnar deviation when tilting the sack barrow upright using the iTip handle.

Using the iTip handles on the sack barrow significantly reduces the average angles of the wrist during use, bringing it closer to the resting and grasping posture of about 20° extension and therefore reducing exposure to extreme wrist postures that are potentially harmful when combined with heavy and repetitive exertions. This therefore will, in the long term, decrease the risk of musculoskeletal symptoms and disorders developing in the wrist.

Using the iTip handle shows large and significant reductions in the range of wrist flexion and extension, by 43.0° and 49.8° respectively, when tilting the sack barrow backwards and upright.

Using the iTip handle brought the wrist into the neutral (0°) posture when pushing and significantly reduced the amount of ulnar deviation when turning the wheelbarrow.

There was a significant reduction of 12.9° in ulnar deviation when emptying the wheelbarrow. It was clear from observing the volunteers that using the iTip handles permitted participants to empty the wheelbarrow while keeping hold of both handles. In contrast, participants were observed to have to remove their hands from the normal handles in order to change grip to tip the contents of the barrow out of its front. This process of taking one or both hands off the barrow decreases control of the barrow and increases the risk of it being dropped, with potentially serious consequences if the contents are heavy and/or hazardous. It can be concluded that use of iTip handles increases the safety of emptying wheelbarrows in this manner.

When using the wheelbarrow, the iTip handles reduced the range of wrist flexion/extension by 41.9° in the emptying phase of the task.

Key Benefits:

The measured reductions in the wrist angles when using the sack barrow and wheelbarrow will, in the long term, decrease the risk of musculoskeletal symptoms and disorders developing in the wrist.

Eliminating the need to take one or both hands off the wheelbarrow during tipping increases the safety of emptying wheelbarrows.
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