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Gait development using Multilivello© orthoses in a little girl with ataxia.

Introduction: Although the use of leg - foot orthoses in walking children with cerebral palsy (CP) has been part of current re-educational practice for some time now, orthopaedic technicians are never told by doctors what mechanical characteristics are expected and very rarely have the chance to precisely evaluate the functional needs of the individual the brace will be worn by. As a result, the appliance is prepared without being familiar with the characteristics required, according to the technician's orthopaedic experience alone. Although this experience is used, more or less unconsciously, to satisfy the patient's need to move, it often results in the introduction of external moments that prove, on the contrary, to be a further hindrance to balance. Conversely, when suitably customised, leg- foot orthoses have been seen to improve step length, speed, frequency and the physiological cost index when walking in patients with CP. In addition, there are certain conditions, such as flexum of the knee in which, to date, it has only been possible to obtain control using botulinum toxin or a surgical approach. The orthotic solutions proposed thus far have a number of drawbacks: the braces are heavy and cumbersome and restrict the wearer's autonomy and movement potential, thereby reducing the spontaneous functional exercise of walking.

Purpose: Conversely, we propose a lower limb brace in which the connection between the thigh strap and leg strap is constituted by flexible sheets that work in extension. A system of elastic bands connects the hip strap to the thigh strap. This produces a brace that connects the whole of the lower limb and that provides the child with customised compensations that limit deforming thrusts and/or allows the exercising of postural adjustments in a condition of alignment.

Materials and methods: These braces, named Multilivello, were used from six years of age by a little girl, F, with normal cognitive and social abilities, diagnosed with ataxia of unknown origin. Before using the braces, F.'s gait was characterised by great instability and the presence of heightened compensations of little functional use when walking: the use of outspread arms to balance, a widened stance and, above all, flexion of the hips, all of which contributed to excessive variability in the configuration of the relationship between mobility and stability at almost every step. The impression given was that F. had to invent walking each time, which made it impossible to make it automatic.

Results: In just 2 months using the Multilivello hip-thigh-leg-foot brace, a significant change in gait was observed (figure 2): the dynamic alignment of the various components is better and, consequently, there is an overall, finer and more adaptable dynamic stabilisation of the various bodily parts.



Figure 1: 5 years and 10 months



Figure 2: 6 years and 9 months

Discussion and conclusions: The progress achieved in learning motor control can be attributed to the fact that the functional exercise of the changes in position and gait, in the child's natural life, take place thanks to the significant kinetic personalisation of the Multilivello brace, which keeps the tibiotarsal joint and knee dynamically aligned. This allows the wearer to learn an intersegmental, internal stabilisation that is functionally configured, static and dynamic, initially reactive and subsequently anticipatory. The Multilivello brace would appear to have the qualities required to make it a successful alternative to the types of brace currently available.

References:

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