

# Childrens habitual toe-walk – Frequency, causes and treatment with sensomotoric orthotics

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# Zehengang bei Kindern – Häufigkeit, Ursachen und Behandlung mit propriozeptiven Einlagen

Inaugural-Dissertation  
zur Erlangung des Grades eines Doktors der Medizin  
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## Summary: Therapy Success with Proprioceptive Orthoses

In the second part of this thesis we attempted to find out whether it is possible to improve the gait pattern of children with cerebral paretic equinus foot and of habitual toe-walkers with the aid of sensomotorically functioning orthoses.

The orthoses were developed based on Vojta's body of thought: the aim is to allow children to learn new motoric patterns by means of a proprioceptive stimulation of specific areas of the foot's sole.

The therapy success was determined in retrospect by questionnaires for all the children who have been treated with these orthoses by the orthopaedic shoe technician Jahrling in Gießen between 1996 and 1997. The results are the following:

A total of 119 patients were treated with sensomotoric orthoses. 70 children had cerebral palsy, 8 were habitual toe-walkers and 36 had other mal-alignments of the foot. 5 other children had neurological or orthopaedic disorders.

The gait pattern of 79 % of the patients was permanently improved. Furthermore 5.9 % had a temporary improvement.

79.8 % of the children tolerated the orthoses well.

Reasons for non completion of therapy resulted in diminishing interest or a lack of therapy success, foot ache, or unsuitable summer shoes.

### Therapy success for infantile cerebral palsy

The gait pattern improved in 81.4 % of patients. The equinus gait was reduced in 60 % of cases. On average 2.7 out of 7 individually queried factors of the gait pattern improved.

The therapy success correlated negatively with the severity of the functional disorder.

When the children were able to walk independently, the equinus gait and the gait pattern itself improved significantly more often. Similar tendencies could not be statistically established for children with lower motoric retardation and a one-sided malposition.

The therapy success rate correlated with the duration of the treatment. The earlier the therapy was started, the higher improvement rate of the equinus gait.

61.4 % of the children had success in their treatment although it remained as such as long as they were wearing their orthoses.

Physiotherapy treatment had no influence of the success.

The success gradually decreased over time for 50.9 % of the children.

45.6 % were then supplied with new orthoses, however for 5.7 % it was only temporary success.

## Therapy success for habitual toe walkers

The gait pattern improved in 100 % of the cases as well as with regard to toe walking. On average 2.9 out of 7 individually queried factors of the gait pattern improved. All children were able to walk independently and developed in a normal way.

Success was of a higher level for unilateral toe walking patients with longer treatment and additional physiotherapy.

The success persisted for 75 % of the children, even without wearing the insoles.

For 25 % the success gradually decreased. 12.5 % were given new insoles, however with temporary success.

## Therapy success for other malpositions of the foot

The gait pattern improved in 88.9 % of the cases, on average 3/4 out of 7 individually queried factors improved.

In the case of children who were able to walk independently and only had one-sided malposition, greater success was achieved. However this was not statistically proven.

In cases of moderate motoric retardation, the success was significantly greater than in cases without any retardation.

The therapy success did not correlate with the duration or beginning of the treatment and additional physiotherapy.

The success persisted for 50 % of the children, even without wearing the orthoses.

For 34.4 % the success gradually decreased. 31.3 % were given new orthoses, but for 3.1 % the success was still only temporary.

## Conclusion for the Therapy Success with Proprioceptive orthoses

We concluded that cerebral palsy related equinus gait as well as habitual toe walking can be treated successfully with the aid of sensomotorically functioning orthoses.

The results indicate that the success of proprioceptive orthoses is far greater in cases where a higher functionality level of the neurological information system exists.

In the case of children without or with only moderate neurological disorders, the therapy success rate was higher. They are likely to permanently integrate the new movement patterns early on and thus the gait pattern probably improves permanently.

In cases of children with neurological disorders they require permanent proprioceptive stimulation. Apart from the gait pattern, the orthoses also have a positive impact on co-ordination and muscle tone due to the increased proprioceptive input. As the orthoses were accepted by the majority of the children, a higher degree of compliance of the treatment is likely.

Consequently the sensomotoric orthoses are an alternative to common treatments, in particular for habitual toe walkers and moderate forms of cerebral palsy. For severe forms of cerebral palsy and in case of insufficient success, a combination of alternative therapy must be taken into consideration. Furthermore our findings also indicate that in cases of other malpositions of the foot, such as the flatfoot, significant success is achievable.

### Forecast for the Therapy Evaluation

In order to be able to optimise the therapy with sensomotoric orthoses, the results of this study shall be examined and proven by prospective research and a larger number of patients. In particular the number of habitual toe walkers was insufficient in order to provide clear and statistically verifiable results.

The therapy success must be objectivised within the scope of prospective research by means of repeatedly measuring the range of motion in the ankle joint. In order to record functional modifications, Grant et al. [1996], for example, developed a simple and cost-effective technique: the number of heel contacts while walking are measured with the aid of pressure sensors in the orthoses area of the heel.

In order to examine the modifications of the whole gait pattern and the co-ordination, computer assisted gait patterns analysis could provide clearer data. Unfortunately due to the high technical efforts, these methods could not be realised in this study.