Supplementary methods

Innowalk

The device was individually adjusted to the size of the user in accordance to sitting height, sitting depth, leg length, chest support height, optimal weight-bearing and correct axial alignment by trained personnel from Made for Movement (Langenhagen, Germany) according to manufacturer's instructions. Depending on the individual body height of the patient, 3 different models in 2 sizes were available to cover body heights between 80 and 190 cm with a maximum weight of 95 kg. Usage of the Innowalk has to be supervised by a trained responsible adult at all times.

Before the start, the device is connected to the power and a pre-check is performed on the seat and upright function. The device is in the sitting position when the user is transferred into the seat. The chest belt is secured first, following the guide-string attachment to the calf bow. Finally, the feet are secured with straps on the foot plate. The user is then moved from sitting to standing position. When standing, the hip belt is secured and the movement of the legs can be turned on. Accessories can be added and attached if needed: table, anti-overstretch, shoulder straps and handles for arm motion. The handles for the arm movement can be used by those individuals who have some ability to grip the handles and hold on to them, or to tolerate gloves for fixation of the hands, and who had the range of motion (ROM) in their shoulders needed to perform the movement.

Positioning of foot plates is regulated in accordance with PROM in ankles, knees and hips. Hip support was adjusted to the height of trochanter major in the standing position. Head support was adjusted while standing. The angle of the seat (between sitting and full standing) was decided in relation to PROM or other deformities. The adaptation of above-mentioned points was performed at the first tryout. Smaller adjustments were performed subsequently once or twice a year, depending on age, growth curve, and functional changes.

The speed of the pedal was started with approximately 10 rounds per minute (rpm) and increased depending on the patients' individual tolerance to maximally 85 rpm via remote control. This can be adjusted within 4 s. The emergency stop can be used if the remote control is not working, in case of acute pain, discomfort, and epileptic seizure.

For security reasons, anti-spasticity control is included and can be adjusted according to the patients' individual demands. Patients with skin abrasions, clinically relevant infectious disease, severe congenital disorders (i.e. congenital heart disease) should not use the Innowalk for safety reasons. In addition, uncontrolled epilepsy, major deformities, severely fixed contractures, osteoporosis, bone or joint instability had been considered before prescribing the Innowalk.

A recommendation for the duration of training is to be determined by a trained person, and should be re-evaluated together with the physician or a therapist in case the patient shows repeated signs of discomfort, change of mood and/or motivation. Duration of usage was documented by patient's caregivers and has been made available for this study. The adaptation of the training period might occur due to tiredness on the one hand, but also because of increase in physical fitness.

The Innowalk device was designed for home use as well as for more extensive use in institutions and clinics. The Innowalk Pro was developed to meet the requirement for use in institutions and clinics. The device is scaled in robustness and can be adjusted to fit different users and their needs. The Pro and the Innowalk individual in sizes S, M and L, which were designed for home use, have the same efficacy principle.

Classifications and questionnaires

In the standardized reports, the results from the GMFM E&R (18, 19) were available for the respective patients to discriminate between different disability levels.

Safety reporting

The following patients will usually not be considered as eligible for dynamic standing exercise with the Innowalk: intracerebral haemorrhage, severe spasticity (Modified Ashworth Scale (MAS) score 4), epilepsy with uncontrollable grand mal fits, seizure disorder that is not controlled by medication, additional severe congenital disorder (e.g. congenital heart disorder), clinical relevant infectious disease, unability to tolerate standing due to cardiovascular problems (fainting), painful hip luxation, hip instability/subluxation with a migration percentage >45%, fixed knee contracture >20°, knee valgus >30° such that the Innowalk will not be adaptable to lower limbs, skin lesions in the contact areas of the padding/contact with the Innowalk or vascular disorder of lower extremities, acetabular dysplasia, osteoporosis with previous or suspected spontaneous fractures of the lower extremities, lack of compliance or of acceptance of dynamic standing on the part of the child not able to co-operate or be positioned adequately within the Innowalk, as shown during the Innowalk fitting/acclimatization session.

Patients' caregivers were advised about potential side-effects and requested to report any technical or adverse event. Usually, in 50% of devices used per year, 1 technical request occurs requiring communication with consequent adjustments. In all cases, due to growth of the patients, fine adjustments by a technician are needed. Negative side-effects were routinely recorded as part of the questionnaire.

Statistical analysis

Continuous variables (age, BMI) were tested for normal distribution with the Kolmogorov–Smirnov test and age was given as median with 25th and 75th percentiles, since they were not normally distributed. All statistical analysis was performed with SPSS 25.0 (IBM Deutschland GmbH, Ehningen).