

# “Multisensorial stimulation in a vertical standing for visually impaired kids with CP”

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I've been working as Pediatric Therapist for 13 years. Initially, I worked in some private Centres and at Clinical Nemo Center with children with CP and neuromuscular diseases. Since 2014 I've been working in *Robert Hollman Fondation* with children with visual impairment, focused on motor and visual rehabilitation.

Martino Avellis PT



I worked for 17 years in two different hospitals (one focused on children with CP, the other one focused on adult patients with TBI as well as Stroke and Post Coma Vegetative State). Since 2005 I've been working in the Assistive Technology field and since 2016 have been working in Ormesa srl as Education Manager (this is for the conflict of interest).

The children with multiple disabilities and visual impairment have special needs because:

- they often undergo sensory stimuli from the outside world;
- it is difficult for them to adapt themselves to the stimuli and when they can, they can do it with inadequate modulation;
- the repertoire of movements is poor and not very functional;
- often closeness and repetitiveness are reinforced.

Main features are:

- Inability to carry out an operation of adaptation and modulation of responses based on external requests
- Difficulty interacting considering the external sensory stimuli interacts with the external environment having a limited repertoire of movements, by listening and responding to reduced information

**Importance of care and postural choice**

The PTs have to verify the most suitable posture for the children, even proposing several personalized technical aids.

- Supine posture
- Side posture and/or sitting position
- Temporary aids

### **Purposes of proper posture**

- Facilitation of the right positioning and postural control, that could be conditioned by pathological reflex and/or patterns
- Facilitation of postures which enhance the use of the visual sense
- Facilitation which allows a visuo-motor integration

The children's environment must be adapted to their needs.

Therefore, pay attention to multisensoriality. Multi-sensoriality must be an added value, and not an insertion of stimuli, therefore attention to all the senses, but not necessarily the inclusion of everyone!

**Try to modulate and understand sensory stimuli**



A group of 10 kids affected from CP and visual impairments was involved in the Robert Hollman Foundation, an Italian and Dutch non-profit Foundation for caring kids with blindness as well as visual impairment in Cerebral Palsy.



For the mentioned reasons about sensorial stimulation, we decided to use the **Multisensorial Standing APP** for this data collection to check whether the introduction of a sound stimulus combined with a vibration could result in a greater availability of the child both in quantitative and qualitative terms.



APP Multisensorial Standing is a vertical stabilizer that **provides a sensory stimulation while the subjects keep the standing position.**



The multisensorial standing can be connected to an electronic device (e.g., tablet, smartphone, PC, radio...) which provides to the kid audio and visual stimulation, while spreading the vibrations produced by the sound in the whole frame thanks to an electronic hardware placed under the footplate.





Improvement of coordination  
and ocular-manual abilities



Facilitation of the peristalsis,  
digestion and intestinal functions



More effective blood circulation  
due to the orthostatic position



Anti-gravity muscle training for  
effective rebalancing



Increased ventilation and  
reduced obstructive  
phenomena



Increased bone density in the  
parts subjected to the **load**  
(column, pelvis, lower limbs,  
feet)

**Advantages from standing position (universally recognized)**



Keeping the standing position  
gets lots of benefits, but it  
requires an active involvement  
by the users: that means  
COMPLIANCE



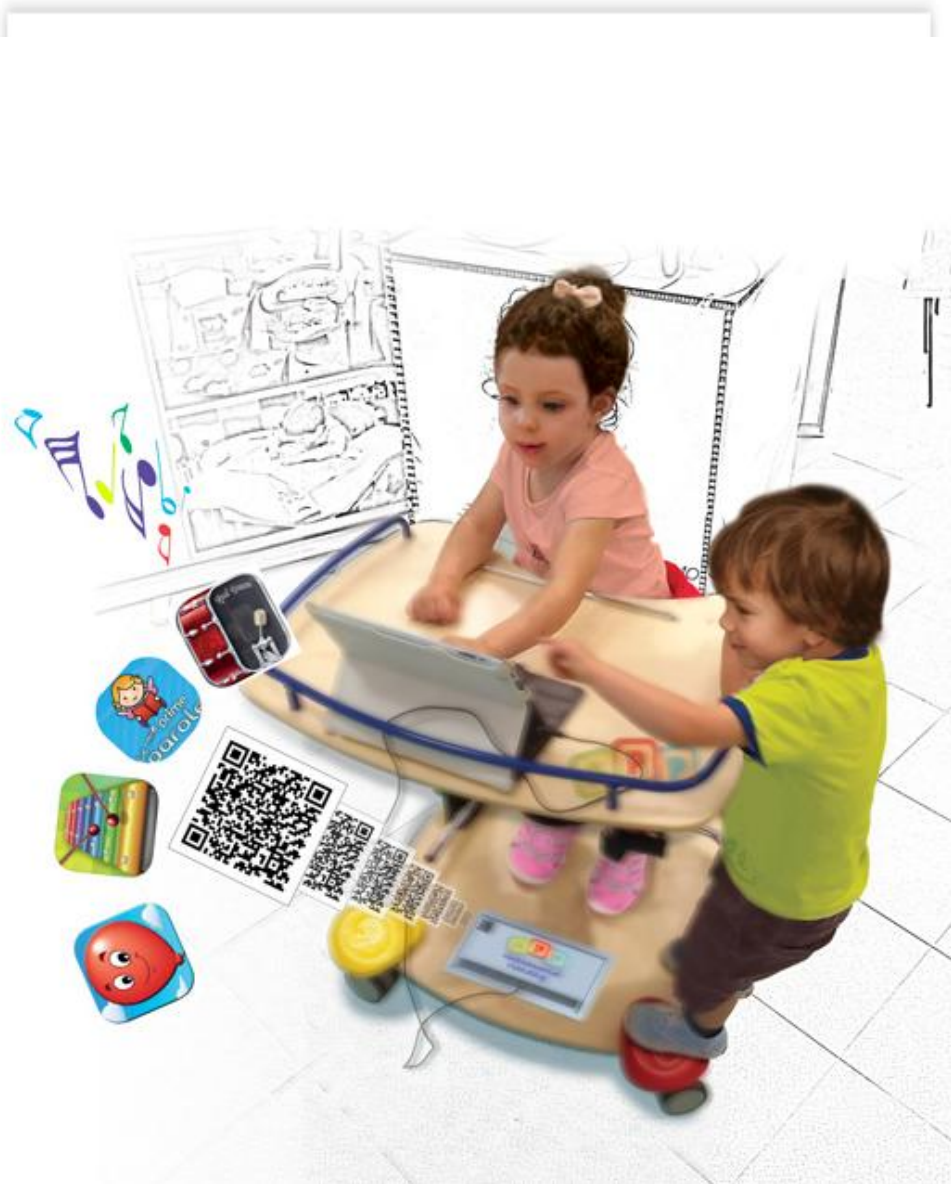


APP allows a multisensorial experience forwarding multiple stimuli:

- Sound
- Visual
- Pallestesic (Vibrations)



# Multisensorial Standing



Upright position can turn  
into a new sensory  
experience and can be  
more effective for the  
kids





Connecting the hardware under  
the footplate to a device, it can  
amplify the sound produced:  
a deep experience

Sound



The kids can be visually stimulated using tablets, smartphones or PCs.

Visual



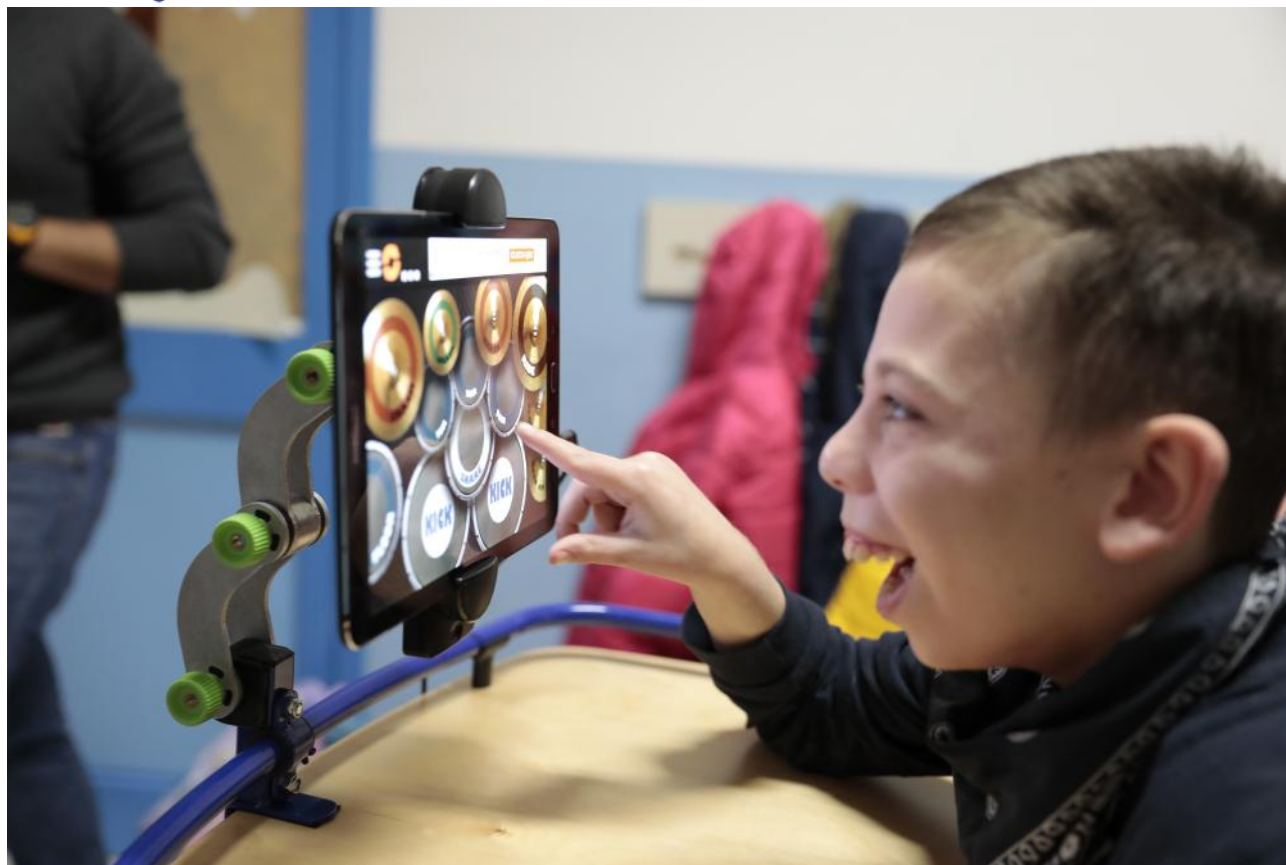


The loudspeaker under the footplate spreads the vibrations produced by the sound along the whole frame

Vibration







APP is an incredible «feedback provider»: during the eye-hand coordination exercises the kid has to touch the screen reaching the aimed target. In that moment he/her gets a three way feedback: by sound, by visual and by vibrations!

**Group #1:**

- ) **Subject #1:** female, 36 months: , affected by Methabolic Encephalopathy with CVI (Cerebral Visual Impairment), focal Epilepsy and retarded postural-motor development - GMFMCS I
- ) **Subject #2:** male, 43 months, affected by CP for Bilateral Multicystic Periventricular Leukomalacia with CVI (Cerebral Visual Impairment), born premature - GMFMCS V
- ) **Subject #3:** female, 21 months, affected by CP with visual impairment for ROP (Retinopathy of Prematurity) - GMFMCS IV
- ) **Subject #4:** male, 38 months, affected by CP for Left Periventricular Leukomalacia, Intraventricular Hemorrhage in IV° Ventriculus Right, born premature - GMFMCS IV
- ) **Subject #5:** female, 46 months, affected by Microcephalia with retarded postural-motor development and visual impairment - GMFMCS V

**Group #2:**

- ) **Subject #1:** male, 48 months: affected by CP and CVI (Cerebral Visual Impairment) – GMFMCS V
- ) **Subject #2:** male, 45 months: affected by Corpus Callosum Hypoplasia, Ventriculomegaly with convulsive crisis and visual impairment – GMFMCS II
- ) **Subject #3:** female, 36 months: affected by CP and CVI (Cerebral Visual Impairment) – GMFMCS V
- ) **Subject #4:** male, 40 months: affected by retarded postural-motor development, with visual impairment for Enophtalmos and Microphthalmos – GMFMCS III
- ) **Subject #5:** male, 46 months: affected by visual impairment, born premature with Blepharophimosis and right eye Microphthalmia, with right optic nerve Atrophy and Transient Hypocalcemia – GMFMCS II

**Total population: 10 children, 5 males (50%),  
5 females (50%), age range 21-48 months,  
average 39,9 (standard deviation 7,9)**



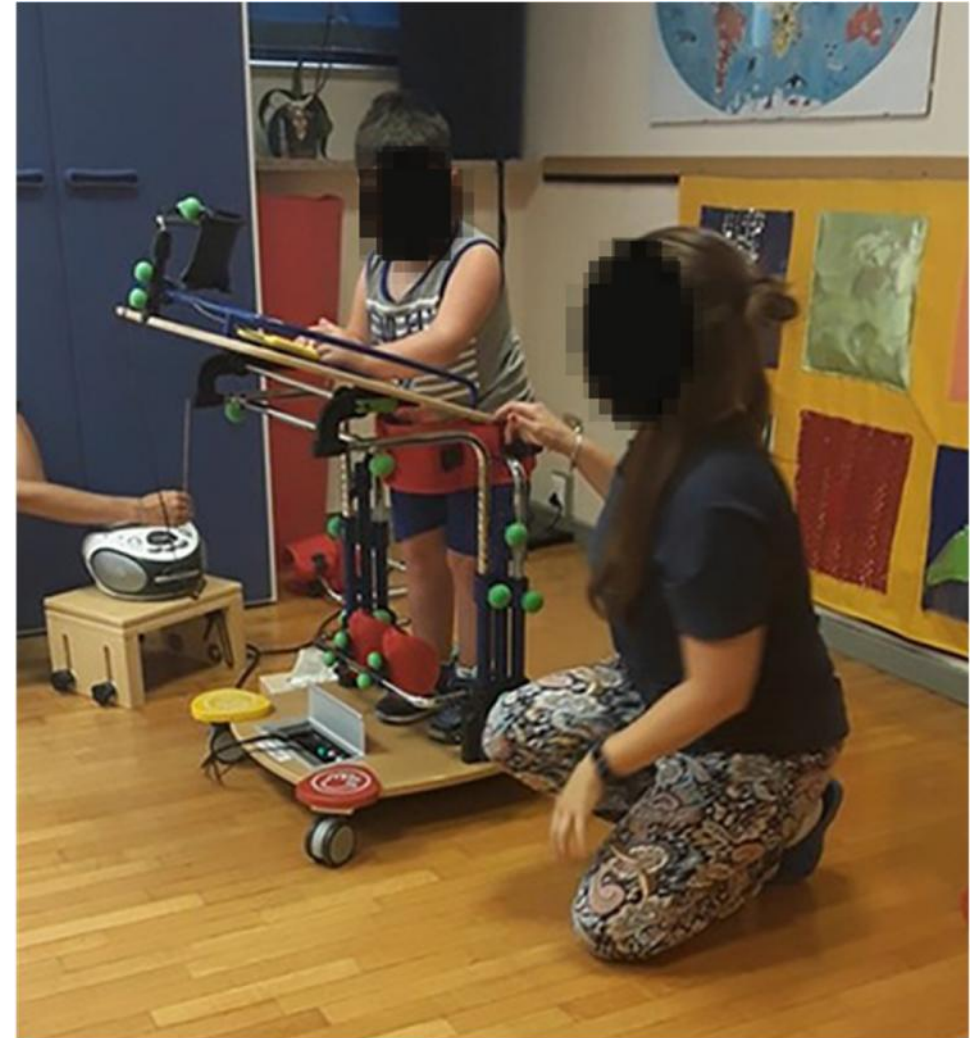
Our aim was to analyze the differences in compliance, attention, motivation, gratification and performances between the two configurations (just with audio and with audio/pallestesic stimuli).



Each kid could handle a big switch (on/off) put on the standing's tray for six minutes



The kids were asked to push the big switch (on/off) to turn on/off a radio; later, the radio was connected to the multisensorial standing in order to spread the vibrations produced by the sound.





## Observation

- Switch use time (secs)
- Switch using times numbers (n°)
- Subjective satisfaction feedback;





The proposed stimuli have been administered for two consecutive days and reversed, that is first with music and vibrations and after that with just music. This method administration has been thought to have 4 different groups of children which have been subjected to the stimuli in different way and time.



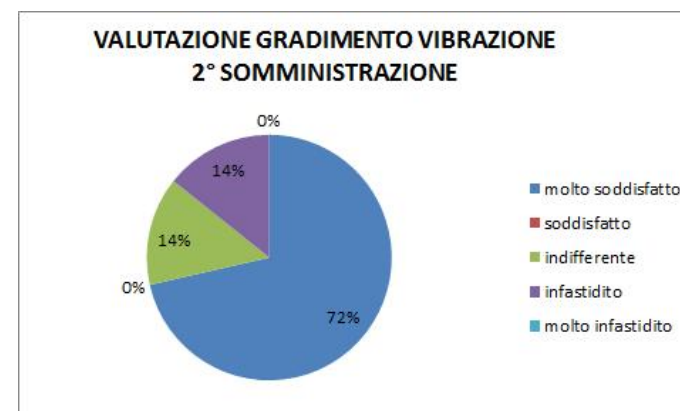
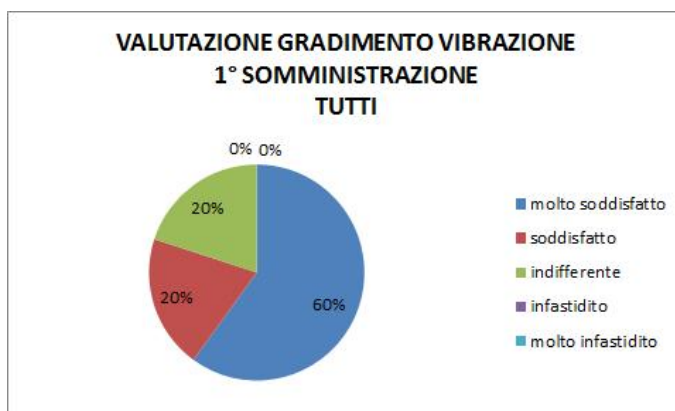
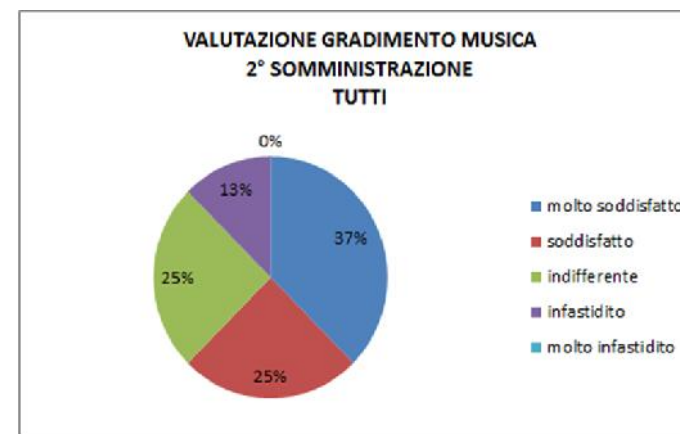
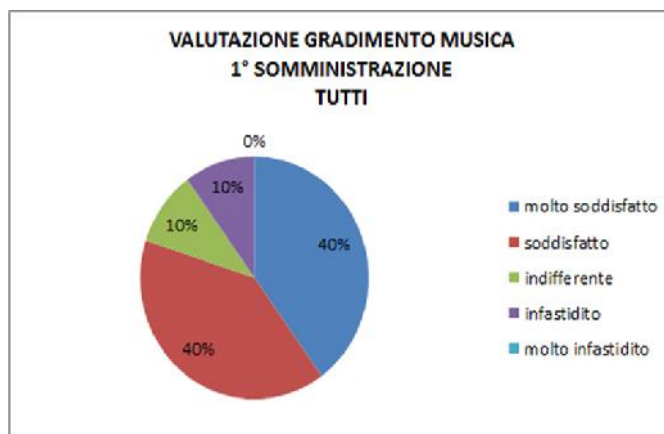
The data obtained showed that during the second administration (with music AND vibrations), the subjects decreased the *numbers* of switch activations, leaving for a longer time the switch enabled.

	MUSIC		MUSIC AND VIBRATION	
Group 1	SECS WITH HELP	SECS SELF	SECS WITH HELP	SECS SELF
B1	95	0	115	0
B2	14	22	36	29
B3	0	169	0	151
B4	0	114	0	197
B5	24	130	44	124
Group 2	SECS WITH HELP	SECS SELF	SECS WITH HELP	SECS SELF
B1	0	123	30	155
B2	0	319	26	215
B3	0	255	0	264
B4	0	30	0	158
B5	60	156	0	96
Average per secs	19,3	131,8	25,1	138,9
Delta%			30%	5%



Most of the children improved:

- **Awareness**
- **Alertness**
- **Tolerance**







Almost all of the visual impaired kids showed a better compliance holding the upright position for a longer time and with better awareness.

### **CLINICAL RELEVANCE:**

This kind of stimulation during the upright position can improve the sensory perception, besides enhancing their motor skills (head control and handling tasks).

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2. [Wang TH](#), [Peng YC](#), [Chen YL](#), [Lu TW](#), [Liao HF](#), [Tang PF](#), [Shieh JY](#). (2013) A home-based program using patterned sensory enhancement improves resistance exercise effects for children with cerebral palsy: a randomized controlled trial. [Neurorehabil Neural Repair](#). Oct;27(8):684-94. doi: 10.1177/1545968313491001. Epub 2013 Jun 10
3. Ego A, Lidzba K, Brovedani P, Belmonti V, Gonzalez-Monge S, Boudia B, Ritz A, Cans C. Visual-perceptual impairment in children with cerebral palsy: a systematic review. Dev Med Child Neurol. 2015 Apr;57 Suppl 2:46-51. doi: 10.1111/dmcn.12687. PMID: 25690117 Review.

Thanks to the Robert Hollman Foundation and all the other people of the team involved in the study:

- Elisa Da Riva
- Giovanna Tono
- Vittorina Schoch
- M.E. Reffo





**Thank you for your attention!**

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