

The Original Vibroacoustic Therapy (Olav Skille Method) as a Support Modality for Caregivers, Parents, Therapists, and Special Needs Schools

Revised edition, including a dedicated section on cerebral palsy

Executive Summary

Original vibroacoustic therapy (VAT) — invented by Norwegian educator and researcher Olav Skille and represented in the Americas by TheSoundWell Vibro-Therapy — delivers pulsed, sinusoidal low-frequency sound between roughly 30 and 120 Hz directly into the body through transducer-equipped recliners, mats, mattresses, pillows, bean bags, and "sonic pets," combined with music listening. Skille's original framing defined VAT as the application of vibration directly to the body as low-frequency sine tones in combination with selected music, producing reduction of sympathetic nervous system activity, improved circulation, and reliably reported states of relaxation and well-being.^{[1][2][3]}

Four things make this modality unusually well-matched to the special needs ecosystem — children, their parents, direct-care staff, and clinical therapists:

1. **It is passive.** No mantra, no posture, no cognitive effort, no verbal instruction is required. A 20–30 minute session works whether the user is nonverbal, cognitively impaired, physically immobile, exhausted, or simply unwilling to "do" a wellness practice.^{[4][5]}
2. **It is bottom-up.** VAT works through mechanoreceptor and vagal pathways rather than through cognitive reappraisal, which matters for trauma, autism, and chronic stress populations where top-down approaches often fail.^[^5]
3. **The same equipment serves everyone.** A single mat or recliner in a school sensory room or a family home can be used by the child during a dysregulation episode, by the paraprofessional on a break, by the therapist between sessions, and by the parent at night.^[^4]
4. **Session length fits real institutional schedules.** Skille's original protocol specified 20–29 minute sessions; contemporary VAT and sensory-room practice converge on the same 10–30 minute window that schools already use for sensory breaks.^{[6][7][^1]}

Cerebral palsy is the strongest single clinical case in the entire VAT literature and is treated as a dedicated section in this edition. Unlike most VAT indications, CP has a published narrative review dedicated to it, two randomized controlled trials, and a 40 Hz protocol that Skille himself specified for spasticity. The largest trial randomized 89 children with spastic CP and found significantly greater reductions in spasticity and significantly greater gross motor gains when 40 Hz sound-wave vibration was added to physiotherapy versus physiotherapy alone.^{[8][9][10][11]}

The honest caveat: the physiological mechanisms (parasympathetic shift, HRV increase, EEG arousal reduction) are the best-evidenced part of the picture; the clinical outcome literature consists largely of small pilot studies, a handful of RCTs, case series, and Skille's own extensive clinical observation. Scoping reviews conclude research remains "too sparse" to identify which VAT properties drive benefit. One influential fibromyalgia RCT in this literature was retracted by PLOS ONE for lacking a true sham control. This report therefore separates well-supported claims from plausible-but-unproven ones.^{[12][13][14]}

Part I: What the Original Skille Method Actually Is

Definition and parameters

Skille conceived VAT in 1968 after observing the effect of low sound vibrations on disabled children while playing bass in front of them, noting reduction of deep tissue tension and stress. His 1989 paper in *Music Therapy* formalized the approach: therapeutic use of equipment emitting low-frequency sound signals in the 30–120 Hz "vibroacoustic area," mixed with music, applied directly to the body so that impulses are received by both acoustic and vibrotactile receptors rather than by the ears alone.^{[3][15][16]}

Skille articulated three "universals" that still govern frequency selection: low pitch induces relaxation while high pitch induces stress; rhythmically neutral music decreases energy while rhythmically strong music increases it; and soft, low-amplitude sound pacifies while loud sound activates. Treatment programs combine these effects with frequencies calibrated to the individual — a fundamentally different logic from generic "sound bath" or ambient-music approaches.^[^3]

By May 1989 Skille reported approximately 900 patients treated across his centers, with documented frequency protocols including 68 Hz for shoulder pain, 52 Hz for low back and menstrual pain, and multi-frequency tapes such as 69–46–52 Hz. Session duration in the original protocol was 20–29 minutes, with practitioners typically treating 20–30 minutes then slowly reducing sound levels and allowing 2–3 minutes of quiet rest. TheSoundWell's current guidance identifies optimal therapeutic windows at 30–50 Hz for general wellness and 40 Hz for neurological optimization, with sessions typically ranging 20 to 45 minutes and hydration of 300–500 mL of water one to two hours before treatment, since sound waves propagate most efficiently through well-hydrated tissues.^{[17][18][19][20][^1]}

Why 40 Hz dominates the modern literature

Of all frequencies in the vibroacoustic band, 40 Hz has become the most studied. It sits at the center of the therapeutic octave (40–80 Hz) where Skille located most of his observed effects, falls squarely within the sensitivity range of Pacinian corpuscle mechanoreceptors, and coincides with gamma-band oscillations implicated in attention, neuroplasticity, and thalamocortical regulation. Documented research effects at 40 Hz include thalamocortical oscillation regulation, pain gating, muscle normalization, and autonomic regulation, with 47–50 Hz associated with endothelial nitric oxide release and increased blood flow, and 60–80 Hz with myofascial and connective-tissue effects.^{[21][22][23][20][^24]}

Critically for the CP discussion, Skille specifically associated 40 Hz and 60 Hz frequencies with the treatment of spasticity, and both frequencies were subsequently adopted in independent CP trials on his recommendation.[¹⁰]

Distinguishing VAT from whole-body vibration

This distinction matters when talking to school occupational therapists and physical therapists, who often already know vibration plates. Whole-body vibration typically uses frequencies below 30 Hz delivered mechanically through a platform; VAT uses 30–120 Hz delivered as sound through transducers, combined with music. A 2025 review notes VAT "uniquely integrates mechanical oscillations with music, distinguishing it from conventional vibration therapies". Vibration therapy generally has been applied at 5–50 Hz for WBV with focal vibration reaching 60–200 Hz.[²⁵][¹²][²¹]

The practical difference for special needs settings is decisive: VAT is delivered lying or reclining, requires no weight-bearing or standing balance, and is therefore accessible to children and adults with limited mobility, high tone, or poor postural control — including GMFCS level IV and V children who cannot use a vibration plate at all. VAT is also described as gentler and softer than WBV plates, which use mechanical vibrations at high volume.[²⁶]

TheSoundWell's role and product formats

TheSoundWell represents and preserves the original Skille lineage in the Americas, positioning itself as maintaining methodological fidelity rather than diluting VAT into generic "sound plus vibration" experiences. Its product line — sonic ergonomic recliners, mats and mattresses, massage tables, vibroacoustic pillows, sound-bath weighted bags and blankets, vibration bean bags, and "sonic pets" — spans institutional and home formats. Published pricing indicates the vibroacoustic mat starts around \$2,882.80 with accessory items from roughly \$333–\$350 and a sonic support bolster at approximately \$1,989.25, situating a starter school or clinic installation in the low-to-mid four figures rather than the tens of thousands typical of full multisensory room builds. For CP specifically, the recommended equipment formats are sonic ergonomic recliners, mats, and pillows.[²⁷][²⁸][²⁹][¹⁶][²⁶][⁵]

The company also packages VAT into a "4 Senses Chill-Out Space" concept combining vibroacoustic furniture with chromatherapy lighting, nature scenes, ambient harmonic music, and aromatherapy, designed for deployment in schools, academia, libraries, clinics, spas, municipalities, corporate recovery suites, and fitness recovery lounges.[⁷][³⁰][²]

Part II: Mechanisms — Why This Should Work

Autonomic regulation is the best-evidenced mechanism

The strongest and most reproducible finding across the vibroacoustic literature is an acute shift toward parasympathetic dominance.

A 2024 study in *Sensors* assessed a Vibroacoustic Sound Massage against psychological, physiological, and cognitive stress using PSS-10, ECG, and EEG. Results showed increased

parasympathetic activity for all participants, with EEG indicating increased concentration, reduced arousal, and increased relaxation; the authors concluded VSM is validated as an effective support tool for stress management. The same paper summarizes a separate 20-minute low-frequency-sound exposure study in university students in which HRV showed statistically increased parasympathetic activity, supporting VAT as a stress management tool in educational environments.[³¹]

A pilot double-blinded RCT in *Frontiers in Psychology* randomized 54 international university students to low-frequency sound vibration or control. Between-group differences occurred for HRV, with statistically significant improvement in the experimental group on LF/HF and pNN50; the authors concluded low-frequency sound has demonstrable effect on the parasympathetic nervous system. A subsequent larger RCT protocol planned 420 students with salivary cortisol, galvanic skin response, HRV, and PSS-10 endpoints.[³²][³³][³⁴]

A 2025 randomized crossover trial of 36 participants compared vibration-plus-music, music-only, and control conditions. The combination significantly reduced stress and annoyance VAS scores and increased relaxation and mood versus control, and salivary cortisol showed a significantly greater decrease in the combined condition — while the music-only condition did not produce a significant cortisol difference. This is the most important finding for the "why not just play calming music?" objection: the tactile vibration component appears to add measurable physiological value beyond audio alone. Skille's own 1989 framing anticipated exactly this, noting the vibrotactile channel is the most effective element of the method.[³⁵][³]

Broader HRV meta-analytic work supports the surrounding logic: 24 RCTs with 1,295 participants found music interventions significantly increased HFnu and decreased LFnu, with the largest benefits in patients with stress, anxiety, fear, or sleep disorders, and with short interventions of 30 minutes or less particularly effective.[³⁶]

Vagal pathway and interoception

TheSoundWell's mechanism synthesis frames VAT as a vagal regulation modality, arguing that by influencing vagal pathways VAT may improve emotional self-regulation, stress resilience, and interoceptive awareness — the felt sense of safety within the body — and that because it works bottom-up it is especially relevant for trauma, autism, and chronic stress. This is mechanistically coherent and well aligned with the measured HRV findings, though the specific interoception claim has not been directly tested in controlled VAT trials.[⁵]

Mechanoreceptor and pain-gating pathways

VAT's therapeutic range is selected because 30–120 Hz frequencies are detectable by human mechanoreceptors such as Pacinian corpuscles and are associated with calming effects. Stimulating these receptors is proposed to engage gate-control pain modulation, providing non-pharmacological pain relief, while long wavelengths permit deep penetration through the body's largely water-based tissues — the basis of the "inner body massage" description, with a wavelength of roughly 37.5 m at 40 Hz. A narrative review mapping mechanisms of sound vibration in humans documents hemodynamic, neurological, and musculoskeletal pathways across the vibroacoustic band.[³⁷][²³][²⁰][²¹]

The competing-input hypothesis

A double-blind, sham-controlled crossover trial in *Arthritis Research & Therapy* tested gentle vibrotactile stimulation in fibromyalgia on the premise that imbalance in the competition between painful input and non-painful sensory activity accounts substantially for augmented subjective symptoms. Vibrotactile stimulation was significantly superior to sham globally, with benefits on unpleasant somatic sensations such as generalized pain and fatigue but not on cognition, anxiety, or depression; it was notably well tolerated and sleep quality significantly improved. This "competing sensory input" logic transfers directly to sensory overload in autism, where predictable vibrotactile input may occupy sensory bandwidth otherwise consumed by aversive environmental stimuli.^[38]

Part III: Cerebral Palsy — A Dedicated Analysis

Cerebral palsy warrants separate treatment for three reasons. It is the most common physical disability of childhood and therefore the largest single diagnostic group in most special needs schools; it is the indication with the deepest and most methodologically robust VAT evidence base, including a dedicated narrative review and two RCTs; and it is the diagnosis where VAT's mechanism, protocol, and delivery format align most precisely with an established clinical need — spasticity reduction in a population that cannot use standing vibration platforms.

3.1 Scale and burden of the condition

Recent population-based studies worldwide report CP prevalence estimates ranging from 1 to nearly 4 per 1,000 live births or per 1,000 children, with CDC's ADDM Network estimating about 1 in 345 children (3 per 1,000 8-year-olds) in the United States identified with CP. CP is a group of developmental disorders affecting movement and coordination resulting from brain damage occurring before or shortly after birth, causing muscle stiffness, weakness, and difficulty with walking, talking, and eating, and there is no cure — therapy, medication, and assistive devices manage symptoms and improve quality of life.^{[39][26]}

Pain is the most under-recognized dimension. A systematic review of 57 studies (106 publications) found pain prevalence varying widely from 14% to 76%, higher in females, older age groups, and those classified at GMFCS level V, most frequent in the lower limbs, back, and abdomen, and associated with reduced quality of life or health status. A Swedish national follow-up study of 3,545 children and adolescents found overall pain prevalence of 44%, rising with age from 32.8% at 4–5 years to 57.3% at 18 years. In children with CP and dyskinesia, pain was prevalent in 85% and chronic in 77%; across 280 children, acute pain was reported in 67% and chronic pain in 31%. A pooled analysis of three Phase 3 studies found spasticity-related pain during at least one activity self-reported by 81.9% of children/adolescents for lower limbs and 69.7% for upper limbs, with parents and caregivers observing lower-limb and upper-limb spasticity-related pain behaviors in 85.9% and 77.7% of their children respectively. Pain in CP has often been described as underdiagnosed and undertreated, largely because of complex clinical pain problems and communication difficulties that complicate diagnosis, and 23% of participants with pain in one cross-sectional survey received no treatment at all.^{[40][41][42][43][44][45]}

For a nonverbal child at GMFCS IV–V, this creates a specific therapeutic vacuum: high probability of significant spasticity-related pain, low probability of accurate assessment, and limited pharmacological options. A passive, well-tolerated, non-pharmacological modality with pain-gating and tone-reduction mechanisms addresses precisely this vacuum.

3.2 The core VAT evidence base in cerebral palsy

The dedicated narrative review. Kantor, Kantorová, Marečková, Peng, and Vilímek published *Potential of Vibroacoustic Therapy in Persons with Cerebral Palsy: An Advanced Narrative Review* in the *International Journal of Environmental Research and Public Health* in 2019. Out of 823 results across 13 scholarly databases and 2 grey literature sources, 7 papers were relevant. Most relevant studies in children and adults presented significant improvement of motor function; only five experimental studies and two RCTs were available. The authors recommended continuing research on VAT effects on motor function and spasticity in adolescents and young adults with spastic CP.^{[46][8]}

The review's detailed findings are the most useful evidence summary available for this indication:

- All seven studies presented improvement of motor function in participants, six of them with statistical significance.^[46]
- Three of these studies found VAT reduced spasticity in people with spastic CP.^{[10][46]}
- All four studies applying VAT in children with CP aged 1–8, including one RCT, stated a statistically significant improvement in children's range of motion.^[46]
- One study found statistically significant differences in GMFCS classification levels of children before and after intervention.^[10]
- Frequencies used across studies were 40 Hz (two studies), 44 Hz (two studies), 60 Hz (one), an unspecified 40–80 Hz range (one), and a broad 16–150 Hz range (one) — findings the authors noted correlate with Skille's conclusions, since he associated 40 and 60 Hz frequencies with the treatment of spasticity.^[10]
- VAT is traditionally indicated for use in spastic CP and other brain problems as it helps enhance physiotherapeutic intervention and improves motor and brain functions, potentially through circuit connectivity via oscillatory coherence.^{[46][10]}
- Findings were consistent with systematic reviews on whole-body vibration, proving that low vibrations can improve movement and spasticity in people with CP.^[46]

The authors' own limitation statement is essential for honest communication: while the conclusion that VAT could potentially improve motor function in children and adults with spastic CP has been confirmed by most found studies, primary studies with highly robust evidence (RCT) are few, and evidence at the level of secondary research (systematic review) is completely lacking.^[46]

The largest RCT. Katušić, Alimović, and Mejaški-Bošnjak published *The effect of vibration therapy on spasticity and motor function in children with cerebral palsy: a randomized controlled trial* in *NeuroRehabilitation* in 2013. In this 3-month trial, 89 children with spastic CP were randomized either to continue their physiotherapy treatment or to receive vibration therapy twice a week

in addition to their physiotherapy program, with randomization stratified according to GMFCS level to ensure similar functional ability. Outcomes were spasticity level assessed by the Modified Modified Ashworth Scale (MMAS) in upper and lower limb, and gross motor function assessed by the Gross Motor Function Measure (GMFM-88), with subgroup analysis performed for GMFCS.^[9]^[47]^[^11]

Significant differences between groups were detected for changes in both spasticity level and gross motor function after the three-month intervention, and there was a clear and statistically significant association between changes in spasticity and motor outcome. The authors concluded vibration therapy may decrease spasticity and improve motor performance in children with CP, and that results serve as valuable input for evidence-based treatments in pediatric neurorehabilitation. The intervention specifically used 40 Hz sound wave vibration, and the underlying doctoral dissertation concluded that significantly greater improvement in gross motor function per GMFM was found in the group exposed to 40 Hz sound vibrations compared with children treated with neurodevelopmental Bobath therapy alone, and that 40 Hz sound vibrations have a positive effect on spasticity level; subgroup analysis showed no differences in effectiveness across GMFCS levels.^[48]^[11]^[^9]

Extracted effect data from the narrative review show the 12-week change in MMAS total score decreased more in the VAT group ($p < 0.001$) and GMFM-88 significantly improved more in the VAT group ($p < 0.001$).^[^10]

Methodological quality. The Physiotherapy Evidence Database rates this trial 6/10, with eligibility criteria specified, random allocation, baseline comparability, blind assessors, adequate follow-up, between-group comparisons, and point estimates and variability all met — but concealed allocation, blinded subjects, blinded therapists, and intention-to-treat analysis not met. A 6/10 PEDro score represents fair-to-good methodological quality for a rehabilitation trial and should be presented as such rather than overstated.^[^49]

The three-arm placebo-controlled study. A separate study randomized 89 children aged 4–6 with spastic CP from a day-care center for rehabilitation into conventional therapy or conventional therapy plus VAT. There was no statistically significant difference for the conventional group after 20 days of treatment; the listening (placebo) group had a decrease in muscle tone ($p < 0.05$); and in the VAT group the range of motion of hips, knees, and ankles improved and muscle tone decreased ($p < 0.05$). The design is notable because it included a music-listening placebo arm — and the placebo arm did produce a tone reduction, meaning part of the effect is attributable to music and relaxation rather than vibration alone. This is the honest nuance, and it is the same nuance the 2025 crossover cortisol trial resolves in VAT's favor by showing vibration-plus-music outperforms music-only on a physiological endpoint.^[35]^[10]

Joint-angle outcomes. Another study in the review reported that after VAT the adductor angle, popliteal fossa angle, foot dorsiflexion angle, and muscle tone all improved ($p < 0.05$). These are exactly the goniometric measures a school physical therapist already documents for IEP goals and orthotic fitting.^[^10]

The 13-child vibrotactile study. Katušić and Mejaški-Bošnjak stimulated 13 children developing the classification of spastic cerebral palsy with 40 Hz vibrotactile stimuli for 20 minutes weekly

over three months in order to reduce spasticity. There was significant improvement in total GMFM score ($z = 3.17$, $p = 0.00$), as well as on dimension A (lying and rolling, $z = 3.05$, $p = 0.00$) and dimension B (sitting, $z = 2.80$, $p = 0.00$), alongside facilitation of rotations, better postural trunk stability and head control, and greater selectivity of movements. The authors explicitly called for further randomized controlled investigations with a bigger sample and an included spasm scale.^[50]

The GMFM dimension A and B improvements matter more than they might appear. Dimensions A and B — lying, rolling, and sitting — are the functional domains that determine positioning, transfers, feeding posture, and respiratory mechanics for the most severely affected children. Improvements here translate into caregiver workload reduction even when walking is not a realistic goal.

Wigram's placebo-controlled work on muscle tone. Wigram's doctoral research directly compared pulsed sinusoidal low-frequency sound combined with relaxing music against relaxing music alone in spastic subjects. A significantly greater range of movement was recorded after VA therapy than after relaxing music, and the outcome indicated that pulsed sinusoidal low frequency sound combined with relaxing music is significantly more effective in reducing muscle tone and improving range of movement in spastic subjects than music alone. The largest improvement in movement in the mean scores of any one subject was +27.65%. The value of VA therapy compared with a placebo supports the theory that this form of intervention is helpful with patients who have high muscle tone caused by spasticity, and the work provides clear evidence that a pulsed sinusoidal low frequency tone of 40 Hz has significant influence in facilitating improvements. Wigram also noted that Skille proposed, from his own experiences and from patient reports, that frequencies between 40 Hz and 50 Hz would affect muscle activity and were felt in the lower parts of the body, while frequencies around 60 Hz would be felt in the chest.^[51]

The founding clinical observations. Skille, Wigram, and Weekes published *Vibroacoustic Therapy: The Therapeutic Effect of Low Frequency Sound on Specific Physical Disorders and Disabilities* in the *Journal of British Music Therapy* in 1989, alongside a project evaluating the difference in therapeutic treatment between low frequency sound and music alone in reducing high muscle tone in multiply handicapped people. In it, cerebral palsy patients in Norway, Germany, and England all showed signs of relaxation and experienced reduced muscle spasms in response to VibroAcoustics; later research provided evidence that compared to using music alone, VibroAcoustics produced a greater reduction in muscle tone and greater improvement in range of movement. Individual case studies and work with Rett syndrome offered further evidence of relaxed muscle tone and improved muscle control following VibroAcoustics. Skille reported that in spastic conditions due to cerebral palsy, VA therapy demonstrated considerable effect alone or combined with physiotherapy, and his case logs document repeated treatment of high-tone CP with fixed flexion deformities using specific multi-frequency programs.^{[52][53][19][1]}

Current synthesis. A 2025 narrative review on VAT in neurorehabilitation concluded that evidence supports VAT benefits in reducing spasticity, enhancing motor recovery, and improving sensory function in both pediatric and adult populations, that VAT also shows promise in respiratory conditions and home-based care using wearable technology, and that VAT holds promise as a safe non-invasive adjunct to conventional rehabilitation particularly for

CP and stroke – while stating plainly that VAT research remains limited, underfunded, and hindered by lack of standardized treatment protocols, and that standardization and large-scale clinical trials are required before widespread clinical adoption can be recommended.[¹²]

3.3 Evidence summary table – VAT in cerebral palsy

Study	Design & sample	Protocol	Key result
Kantor et al. 2019 narrative review	7 relevant papers from 823 screened; 5 experimental + 2 RCTs	40, 44, 60, 40–80, 16–150 Hz across studies	6 of 7 studies showed statistically significant motor function improvement; 3 showed spasticity reduction[⁸][⁴⁶][¹⁰]
Katušić, Alimović & Mejaški-Bošnjak 2013 (RCT)	89 children, spastic CP, GMFCS-stratified randomization, 3 months	40 Hz vibration 2x/week added to physiotherapy	Significant between-group differences in both MMAS spasticity and GMFM-88; MMAS $p < 0.001$, GMFM-88 $p < 0.001$; spasticity and motor change statistically associated; PEDro 6/10[⁹][¹¹][¹⁰][⁴⁹]
Three-arm day-care study	89 children aged 4–6, spastic CP; conventional vs. conventional + VAT vs. listening placebo	20 days	VAT group: hip, knee, ankle ROM improved and muscle tone decreased ($p < 0.05$); placebo listening group also showed tone decrease ($p < 0.05$); conventional group no significant change[¹⁰]
Katušić & Mejaški-Bošnjak (13-child study)	13 children with spastic cerebral injury, 3 months	40 Hz, 20 min weekly	Total GMFM $z = 3.17$, $p = 0.00$; dimension A (lying/rolling) $z = 3.05$; dimension B (sitting) $z = 2.80$; improved trunk stability, head control, movement selectivity[⁵⁰]
Joint-angle study	Within-review experimental study	VAT	Adductor angle, popliteal fossa angle, foot dorsiflexion angle, and muscle tone all improved ($p < 0.05$)[¹⁰]
Wigram (placebo-controlled)	Spastic subjects; VA therapy vs. relaxing music alone	40 Hz pulsed sinusoidal + music	Significantly greater ROM after VA therapy than music alone; LFS + music significantly more effective at reducing muscle tone than music alone; max individual gain +27.65%[⁵¹]
Skille, Wigram & Weekes 1989	Multi-site clinical observation, Norway/Germany/England	Original Skille protocols	CP patients showed relaxation and reduced muscle spasms; later work showed greater tone reduction and ROM improvement vs. music alone[⁵²][⁵³]

3.4 The comparison case: what the wider vibration literature says

Schools and clinicians will inevitably ask how this compares to vibration plates they may already own or have read about. The wider vibration-therapy evidence in CP is genuinely mixed, and presenting it accurately strengthens rather than weakens the VAT case, because VAT's differentiator is the music component and the reclined delivery format.

Supportive findings. A systematic review of 28 studies found that one acute session of vibration therapy reduces reflex excitability, spasticity, and coordination deficits, with positive effect on ability to move manifested for gross motor function, strength, gait, and mobility, and effects persisting up to 30 minutes after treatment. Long-term effects manifest as reduced muscle tone

and spasticity occurring concomitantly with improved movement ability, as well as increased muscle mass and bone-mineral density; posture control remained unaffected. The authors concluded acute and chronic application has the potential to ameliorate CP symptoms, achieving functional and structural adaptations associated with significant improvements in daily living, and that goals for patients and their caregivers referring to greater independence and improved safety may be achieved more easily and time efficiently. A crossover-design study found significant improvements in active range of motion, relaxation index, Modified Ashworth Scale, Timed Up and Go, and Six Minute Walk Test. A meta-analysis of 13 RCTs with 451 participants found WBV effectively improved GMFM-88 dimensions D and E, Timed Up and Go, Berg Balance Scale, and ankle range of motion. A separate meta-analysis found an overall effect size of 0.474 with dependent variables ordered balance, muscle strength, spasticity, bone density, joint range of motion, gait function, and motor function, concluding systemic vibration is the most effective intervention to improve balance and gait and to improve body structure and function per ICF classification. Park et al. found spasticity decreased immediately after a single WBV session with improvement lasting one to two hours, suggesting WBV prior to physical or occupational therapy sessions may help prepare children with spasticity to learn motor skills by temporarily decreasing plantarflexor spasticity.^{[54][55][56][57][58][25]}

Contrary findings. A meta-analysis of 10 trials with 206 CP patients found standard physical therapy alone statistically better than physical therapy plus WBV on GMFM-88 dimension D ($z = 2.39$, $p = 0.02$) and dimension E ($z = 3.04$, $p = 0.002$), concluding adding WBV to standard physical therapy was not superior for gross motor function. A 2025 RCT of 30 children found that adding daily WBV to a 4-week intensive therapeutic exercise and functional training program produced no significant between-group differences on GMFM-88 D ($p = 0.80$) or E ($p = 0.91$), or on muscle tone, strength, gait, or balance, at 1, 2, and 6 months post-treatment — with improvements attributable to the intensive physiotherapy itself. A 16-study meta-analysis of 414 patients found statistically significant improvement only in walking speed and step length. A 3-week trial of 20 children with spastic diplegic CP found both conventional therapy and conventional plus 15 Hz vibration significantly increased range of motion, decreased leg spasticity, and improved standing and mobility, with no statistical differences between groups.^{[59][60][61][62]}

What this means. The conflict is real and should be stated. However, it is important to note what it is a conflict *about*: whether vibration adds incremental gross motor gains on top of already-intensive physiotherapy. It is not a conflict about whether vibration acutely reduces tone — that finding is consistent across the literature, including in the negative trials. And several of the negative trials used low frequencies (15 Hz) or standing platforms, which fall outside the Skille vibroacoustic band and cannot deliver the music-plus-vibration combination.

The defensible position for school and clinic communication is therefore that VAT at 40 Hz has a demonstrated acute tone-reduction effect and a fair-quality RCT showing added benefit over physiotherapy alone in spasticity and gross motor function, and is best positioned as a *preparatory and comfort* intervention — reducing tone before a therapy block, easing positioning and handling, and addressing spasticity-related pain — rather than as a standalone motor-function treatment or a replacement for physiotherapy.

3.5 Mechanism in cerebral palsy specifically

Four mechanistic pathways are proposed and each maps to a documented CP problem.

Deep sensory stimulation of a motor system that depends on it. Katušić's rationale is that the motor system relies heavily on deep sensory stimulation, which is why vibration stimuli were investigated in the first place. In CP the descending motor pathway is damaged but the afferent sensory pathway is often comparatively intact – making sensory-route interventions mechanistically sensible.^[9]

Reflex excitability and tone. Acute vibration reduces reflex excitability and spasticity. VAT is proposed to enhance physiotherapeutic intervention and improve motor and brain function through circuit connectivity via oscillatory coherence.^{[54][46]}

Lymphatic and circulatory decompression. In children and adults with spastic CP, constant skeletal muscle hypertonicity compresses deep collecting lymphatics and restricts joint range of motion; single-tone sinusoidal vibrations between 52 Hz and 68 Hz are described as reducing lower-extremity spasticity, lowering Modified Ashworth Scale scores, and improving gross motor function, with the clinical cascade beginning as these vibrations stimulate Pacinian corpuscles.^[18]

Pain gating. Stimulation of Pacinian corpuscles engages gate-control pain modulation, offering non-pharmacological pain relief – directly relevant given spasticity-related pain observed by caregivers in 85.9% of children with lower-limb spasticity.^{[44][23][37]}

3.6 The respiratory dimension – an underused argument

This is the most overlooked and potentially most consequential application in severe CP.

The leading cause of death in children and young people with CP is respiratory illness. For adults with CP, death from respiratory illness is 14 times higher than for peers with no disability. For children and young people with CP, respiratory illness is the most common cause of emergency department presentation and the most common cause of prolonged hospital admissions, and following an initial respiratory-related admission the respiratory re-admission rate over the next year is 70%. GMFCS level V identifies high risk. Care pathway recommendations include optimizing airway clearance with physiotherapist input for assessment, prescription, titration, and safety of targeted airway clearance therapy, including education of the individual, carer, and parents; considering regular chest physiotherapy if frequent wet cough; teaching techniques to optimize cough and manage secretions; and optimizing position and tone.^[63]

The underlying pathology is well described: individuals with CP suffer high incidence of recurrent pneumonia, atelectasis, bronchiectasis, and restrictive lung disease, with illness and premature death occurring most frequently as a result of compromised pulmonary function and associated respiratory infections. Half of those severely affected with CP die before age 20. Aspiration and ineffective cough disrupt normal airway clearance, impair respiratory function, and precipitate lung damage, resulting in increased secretion production and impaired secretion clearance, and consequent impairment of the pulmonary defense system increases susceptibility to serious, progressive, and ultimately life-threatening lung disease.^[64]

There is a physiological rationale for vibration in secretion clearance. In 18 young adults with cystic fibrosis, the mean peak expiratory flow rate of vibration was greater than Flutter, percussion, Acapella, and positive expiratory pressure; the mean frequency of airflow oscillation of vibration was 8.4 ± 0.4 Hz, within the range demonstrated to increase mucus transport. The authors concluded the study provided evidence for the physiological rationale for using vibration to aid secretion clearance. Skille himself associated frequencies around 60 Hz with sensations felt in the chest, and pulmonary drainage was among his original reported applications. The 2025 neurorehabilitation review notes VAT shows promise in respiratory conditions.^{[65][51][^12]}

Important caution. This is the weakest-evidenced of the CP applications and must be framed carefully. The cystic fibrosis data concern manual physiotherapy vibration at approximately 8 Hz, not vibroacoustic sound at 40–120 Hz, and no controlled trial of VAT for airway clearance in CP was located. Furthermore, the care pathway guidance explicitly directs clinicians to cease airway clearance therapy if there is risk of aspiration and to consider risk with airway clearance therapy to ensure safety in individuals with established respiratory illness. Any respiratory application must therefore be physician- and physiotherapist-supervised, never marketed as a substitute for prescribed airway clearance, and never applied to a child at aspiration risk without clinical clearance. The legitimate framing is as a comfort-and-tone modality that may support positioning and respiratory mechanics as an adjunct within a supervised respiratory care plan.^[^63]

3.7 Parents and caregivers of children with cerebral palsy

The caregiver burden literature in CP specifically is more severe than in the general special needs population and constitutes the strongest single argument for a family-wide VAT model.

A 2025 study of 71 mothers caregiving for children with CP found 39.4% reported moderate to severe burden on the Zarit scale, 53.5% were severely fatigued, clinically significant depressive symptoms were present in 63.4%, clinically significant anxiety symptoms in 53.5%, and sleep disturbance prevalence was 74.6%. Poor sleep quality was significantly associated with the child's epilepsy, caregiver age, and the caregiver's own depression and anxiety levels. The authors described an alarmingly high prevalence of health challenges.^[^66]

A systematic review of 16 studies found higher caregiver burden associated with more depressive feelings and worse caregiver quality of life, and with more severe physical disability of the children, with depression of the caregiver and severity of illness in the child rated moderate quality of evidence as contributing factors. Long-term care of children with CP and restricted social activity for the mother caregiver predict psychological conditions including anxiety, depression, and distress, and caregivers who feel depressed experience greater burden of care, thereby affecting the child's quality of life.^[^67]

A cross-sectional study of 190 parents of children with CP in Poland found all caregiver burden measures significantly correlated with both anxiety and depression on the HADS, with anxiety most visibly linked to burden measures of disappointment and environment ($p < 0.0001$) and depression related to emotional involvement and general strain ($p < 0.0001$), and a positive linear relationship between burden and severity of anxiety and depression. A study of 203 primary caregiver mothers found severity of depression significantly negatively correlated

with physical ($r = -0.498$), psychological ($r = -0.486$), social relationship ($r = -0.165$), and environmental ($r = -0.195$) quality-of-life domains, with quality-of-life scores decreasing as the child's motor dysfunction increased, and noted research showing the risk of developing depression is as much as 2.26 times higher in mothers of children with CP. A comparison of 101 mothers of children with CP against 67 controls found significantly higher care burden, depression, poorer sleep quality, and higher total fatigue in the CP group, with lower scores for role physical, role emotional, mental health, and mental component summary. A study of parents of individuals with CP found 38.2% scored ≥ 16 on the CES-D depression scale, and — importantly — that *time pressure* due to support directly predicted depression while total time spent caring did not.^{[68][69][70][71]}

A systematic review concluded that caregivers of children with CP tend to have high levels of stress and depression and lower quality of life than parents of healthy children, identifying child behaviour and cognitive problems, low caregiver self-efficacy, and low social support as consistently related factors. A study of 165 parents in China found a mean Caregiver Burden Inventory score of 42.18 ± 18.79 , with fatigue ($r = 0.461$) and depression ($r = 0.630$) both positively correlated with burden, and time-dependent burden the heaviest burden type. Qualitative research documented mothers perceiving aches and pains due to the heavy physical activity of caregiving, guilt about the child's condition, financial burden from difficulty balancing family and work, lack of husband and family support, compromised care of other children, community isolation, and discrimination.^{[72][73][74]}

Why VAT specifically fits this profile. Three findings in this cluster point directly at VAT's design.

First, **sleep disturbance at 74.6% is the single highest-prevalence problem** in CP caregiver mothers, and it is the outcome most consistently improved across the vibroacoustic and acoustic-stimulation literature. A vibrotactile crossover trial found significantly improved sleep quality; a closed-loop vibration study in 27 poor sleepers found significantly reduced wake-after-sleep-onset total time, proportion, and average duration, increased self-reported sleep quality, increased normalized high-frequency HRV, and increased delta power during N3 sleep; and a meta-analysis of 8 acoustic stimulation studies with 419 patients found significant PSQI improvement (MD -2.68) and ISI improvement (MD -2.26), concluding acoustic stimulation is effective, safe, low-cost, and suitable for long-term treatment.^{[75][76][77][66][38]}

Second, **it is time pressure rather than total caregiving hours that predicts depression**. This is the strongest available argument for a 20-minute in-home modality over a scheduled weekly appointment: an intervention that adds travel, coordination, and appointment-keeping adds time pressure even as it attempts to reduce distress. VAT at home subtracts nothing.^[70]

Third, **caregiver depression and child disability severity are bidirectionally entangled** — caregiver depression worsens the child's quality of life, and in the broader autism literature parental cortisol correlates with child cortisol ($r = 0.51$ for mothers, 0.40 for fathers), with parental mental health problems twice as frequent as in the norm population. A single mat used by both the child for tone and pain and the parent for sleep and stress addresses both sides of that loop with one purchase.^{[78][67]}

The general caregiving context reinforces the scale: AARP and the National Alliance for Caregiving's *Caregiving in the US 2025* found 63 million Americans — roughly one in four adults — are family caregivers, a 45% increase over a decade, including 4 million caring for children under 18 with an illness or disability, with nearly two-thirds reporting moderate or high emotional stress, 45% moderate or high physical strain, one in five rating their health fair or poor, 24% feeling alone, and only 22% receiving any training despite over 40% providing high-intensity care.^{[79][80][81]}

3.8 Adults aging with cerebral palsy

Special needs schools serve students to age 21–22, and transition planning is a statutory obligation. The adult CP trajectory is therefore directly relevant to what schools teach families about long-term self-management — and it is where a durable home modality has its longest useful life.

Adults with CP are at increased risk of new neurologic conditions including stroke and myelopathy; the average adult with CP begins experiencing deterioration in walking ability starting by age 35, peak mobility occurs in the mid-to-late teens, and over one-third of adults with CP will worsen by one GMFCS level during adulthood. Two 2020 meta-analyses estimated overall pain prevalence of 65% to 70%, and fatigue prevalence estimates range from 64% to nearly all adults with CP, with chronic fatigue remaining one of the most disruptive and undertreated symptoms. In a 7-year longitudinal cohort study, people with deterioration in gross motor ability reported greater levels of pain and fatigue than those maintaining functional status.^[82]

A systematic review of pain in adults with CP found prevalence ranging from 24% to 89%, higher than in adults without CP, with back, lower limb, and upper limb pain all more prevalent than in matched controls; pain intensity was higher among those reporting deterioration in walking function over 7 years (54.9 vs. 39.9, $p = 0.001$), and fatigue severity was associated with higher prevalence of chronic pain (OR 2.26; and unadjusted OR 4.65, $p < 0.001$ in a 398-person study) and with higher pain intensity ($r = 0.71$). A narrative review found chronic pain and fatigue are the most common causes of walking deterioration in adults with CP, with almost 80% experiencing severe pain and fatigue that worsen over time, back, shoulder, and hip pain most common, and approximately 50% experiencing pain in more than two joints, establishing a downward spiral of functional activities affecting quality of life. A 7-year follow-up found 52% of participants reported deterioration in walking function versus 39% seven years previously, rising to 71% in bilateral CP, with deterioration significantly associated with greater pain frequency, pain intensity, impact of pain on daily activities, physical fatigue, and reduced balance, and daily pain prevalence rising from 23% to 31%. A 10-year study found the percentage of adults with CP worrying about their health increased from 29% to 54% ($p = 0.008$) and those indicating health problems limit their activities increased from 19% to 45% ($p = 0.002$), with pain and severe fatigue the most common health issues.^{[83][84][85][86]}

Kantor's review specifically recommended continuing research on VAT effects on motor function and spasticity in adolescents and young adults with spastic CP — precisely the transition-age cohort schools serve. Since pain and fatigue are the twin engines of adult functional decline, and VAT's best-evidenced effects are pain modulation, tone reduction, and

parasympathetic recovery, a modality established during school years and continued at home addresses the exact variables that predict whether a young adult with CP maintains mobility into their thirties.^{[84][85][^8]}

3.9 Practical cerebral palsy protocol considerations

Drawing the parameters from the studies rather than from marketing:

- **Frequency:** 40 Hz is the most evidenced single frequency for CP, used in both Katušić studies on Skille's recommendation; Skille associated both 40 Hz and 60 Hz with spasticity, described 40–50 Hz as affecting muscle activity and felt in the lower body with ~60 Hz felt in the chest; and 52–68 Hz single-tone sinusoidal vibration is described for lower-extremity spasticity and lymphatic decompression.^{[11][18][51][10]}
- **Duration:** 20 minutes in the 13-child study; 20–29 minutes in Skille's original protocol; 20–45 minutes in current TheSoundWell guidance.^{[50][18][^1]}
- **Frequency of sessions:** twice weekly for 3 months in the 89-child RCT; once weekly for 3 months in the 13-child study; 20 consecutive days in the three-arm study.^{[9][50][^10]}
- **Delivery format:** sonic ergonomic recliners, mats, and pillows, with the child lying or sitting comfortably; loose non-restrictive clothing and positioning to maximize contact between device surface and body.^{[18][26]}
- **Timing relative to therapy:** immediately before a physical or occupational therapy block, exploiting the documented one-to-two-hour window of reduced plantarflexor spasticity and the up-to-30-minute acute effect on reflex excitability and coordination.^{[56][54]}
- **Outcome measures to document:** MMAS or Modified Ashworth for tone; GMFM-88 with attention to dimensions A and B for severely affected children and D and E for ambulatory children; goniometry of hip, knee, and ankle range plus adductor, popliteal fossa, and foot dorsiflexion angles; and a pain measure appropriate to the child's communication level.^{[50][9][^10]}
- **Hydration:** 300–500 mL of water one to two hours before the session.^[^18]

3.10 What must not be claimed about cerebral palsy

- Not a cure. There is no cure for CP; therapy, medication, and assistive devices manage symptoms and improve quality of life.^[^26]
- Not a replacement for physiotherapy. The evidence positions VAT as an adjunct that enhances physiotherapeutic intervention, and several trials show intensive physiotherapy alone drives the majority of gains.^{[59][46]}
- Not established at the systematic-review evidence level. Evidence at the level of secondary research is completely lacking, and robust RCTs are few.^[^46]
- Not a proven airway clearance therapy. No controlled VAT trial in CP airway clearance was located, and prescribed airway clearance carries documented aspiration-risk cautions.^[^63]
- Not demonstrated in adolescents and young adults. This is the specific gap the dedicated review flags for future research.^[^8]

Part IV: Autism and Other Special Needs Populations

Autism: challenging behavior

The strongest child-facing study outside CP is Lundqvist, Andersson, and Viding (2009) in *Research in Autism Spectrum Disorders*. Twenty individuals with autism spectrum disorders and developmental disabilities and documented challenging behaviors were randomized into a waitlist-crossover design: the first group received 10–20 minute vibroacoustic music sessions for five weeks, then the second group received identical treatment during the following five weeks. Behavior was measured with the Behavior Problems Inventory before treatment and after each phase, supplemented by assistant ratings after every session and minute-by-minute video coding.^[87]

Results showed vibroacoustic music reduced self-injurious, stereotypic, and aggressive-destructive behaviors, with significant reduction in self-injurious behavior frequency and a clear linear trend of improvement across sessions. Assistant rating scales revealed participants increased in their "sense of security" over the course of sessions, and the authors concluded vibroacoustic music "would be of benefit in the everyday life of individuals with challenging behaviors". Effects were to some extent dependent on diagnosis. The study has been cited over 100 times and is included in Cochrane-level music therapy reviews for autism.^{[88][89][90][91][92][87]}

The "sense of security" finding deserves emphasis for school audiences: it suggests VAT is not merely suppressing behavior but altering felt safety, which is the actual therapeutic target in trauma-informed and regulation-focused school frameworks.

Autism: attention and emotion regulation

A 2025 mixed-methods pilot at a primary school in Pretoria, South Africa recruited 18 autistic children aged 9–12 with attentional challenges, assigning 9 to treatment and 9 to control. The treatment group received 10 VAT sessions over six weeks, listening to a 40 Hz track through headphones while receiving 40 Hz vibration through a mat. Attention was assessed with NEPSY-II and a Joint-Attention Test at baseline, midway, post-intervention, and one week post-intervention.^{[22][93]}

Quantitative analysis revealed significant improvement in joint attention in the treatment group ($\chi^2 = 11.64$, $df = 3$, $p = 0.008$). Qualitative findings highlighted positive experiences related to emotion regulation, with children reporting a sense of calm and enjoyment, and — critically for schools — **teachers noted improvements in attention and engagement in class**. The authors concluded VAT is feasible and acceptable for autistic children with potential benefits for attention and emotion regulation. No significant treatment-by-time interaction was found on some measures, so the finding is specific to joint attention rather than global attention improvement. The mechanistic rationale is that 40 Hz gamma oscillations are associated with neural processes supporting attention and neuroplasticity, and 40 Hz vibration may help regulate irregular brain oscillations linked to attention deficits in autistic individuals.^{[94][93][22]}

Autism: the sensory anchor concept

TheSoundWell's autism synthesis frames the clinical logic in language that resonates with families: autistic individuals often experience overwhelming and chaotic mental patterns — termed "sensory spaghetti mind" — and VAT serves as a "sensory anchor," providing controlled, predictable, soothing input that many children tolerate better than traditional touch or auditory music. This tolerance advantage is not trivial: for a child who cannot accept a hug, a weighted blanket, deep-pressure massage, or brushing protocols, a vibroacoustic mat or bean bag offers deep sensory input without a person touching them and without demand.[⁴]

Practitioner guidance suggests 30–80 Hz to optimize sensory gating without overstimulation, 15–30 minute sessions to prevent habituation in hypersensitive users, baseline assessment with the Short Sensory Profile, frequency titration starting at 30 Hz and increasing gradually, and contextual pairing with preferred activities to build positive association. These should be treated as heuristics rather than validated protocols.[⁹⁵]

Rett syndrome and multiple disabilities

Skille's original work and Wigram's subsequent research documented reduced muscle spasms and relaxed muscle tone in multiply handicapped populations, with specific work in Rett syndrome offering further evidence of relaxed muscle tone and improved muscle control. The 1989 Skille, Wigram, and Weekes project evaluated the difference between low frequency sound and music alone in reducing high muscle tone in multiply handicapped people and oedema in mentally handicapped people.[⁵³][⁵²]

Sleep, pain, and comorbid conditions

Vibroacoustic and low-frequency sound interventions have shown sleep benefits across populations, as detailed in section 3.7. A pediatric review of sound therapy notes that autistic children showed appreciable positive impact with lessened hyperactivity and stereotypical behavior, improved attention and focus, increased compliance, and improved verbal and non-verbal communication, with similar benefits reported for other children with special needs — while stating that studies in adults and children are limited and of poor design and that more large-scale, properly designed comparative studies are required.[⁹⁶][⁷⁶][⁷⁷][³⁸][⁷⁵]

Part V: Benefits for Parents Generally

The magnitude of the problem

Research from the University of Wisconsin-Madison following mothers of adolescents and adults with autism over eight consecutive days with hormone sampling found stress-hormone patterns consistent with people experiencing chronic stress such as soldiers in combat, alongside frequent fatigue and work interruptions. The underlying study contrasted 86 mothers of adolescents and adults with ASD against a nationally representative comparison group of 171 mothers, finding significantly lower cortisol throughout the day — HPA hypoactivity relative to normative patterns — with the degree of dysregulation linked to the child's behavioral profile.[⁹⁷][⁹⁸]

A trajectory analysis of 91 mothers of children and adults with autism and other disabilities found two distinct diurnal cortisol trajectories: blunted (63%) and steep (37%). Mothers in the blunted trajectory had higher stress and lower health ratings, and 89% of mothers of children with autism belonged to the blunted trajectory versus 53% of mothers of children with other disabilities; 45–48% showed aberrant cortisol awakening responses or evening cortisol activity. A 2025 study of 181 parents of 99 young children with ASD using hair cortisol found parental HCC correlated with child HCC ($r = 0.51$ mothers, 0.40 fathers) and parental mental health problems twice as frequent as in the norm population (41.1–45.8% vs 20%), concluding parental chronic stress cannot be understood in isolation from stress in their children.^{[99][78]}

Why VAT fits better than the standard alternatives

The evidence base for parent-directed interventions is real but reveals a structural problem. A meta-analysis of 25 RCTs with 1,915 participants found cognitive-based interventions reduced parental stress ($g = -0.69$), depressive symptoms ($g = -0.95$), anxiety ($g = -0.78$), and parental distress ($g = -0.29$), while improving well-being ($g = 0.62$) and parent–child relationships ($g = 0.43$). Relaxation strategy studies show deep breathing and progressive muscle relaxation significantly reduce stress among mothers of children with disabilities.^{[100][101][102]}

But an 18-study systematic review and meta-analysis found psychological interventions significantly reduced parental stress at post-intervention **but not at 3–6 months**, with inconclusive evidence for depression and anxiety, concluding effects are temporary and that policymakers must ease accessibility and affordability. The recurring practical finding is that parents of children with developmental disabilities "have difficulty accessing face-to-face mental health care due to parenting demands".^{[103][104]}

VAT is structurally suited to fill this gap. Mindfulness, CBT, and MBSR all require the scarcest resources these parents have: time, attention, cognitive bandwidth, scheduling reliability, and the ability to leave the house. VAT requires none of them. TheSoundWell's caregiver analysis makes this directly: caregivers suffering chronic insomnia and overwhelmed cognition need a "reset-reboot" mechanism requiring no exercise, mantra, or active focus, and home installation accessibility to every family member offers a route to serenity without the commitment demanded by traditional meditation or yoga.^[4]

The respite comparison is instructive. A systematic review of 15 articles found respite use associated with significant reductions in parental stress and psychological distress and value as a child-abuse prevention intervention especially where challenging behaviors are present. A larger review concluded short breaks positively impact carer well-being and that family relationships and stress levels improve — but that these effects "do not tend to be maintained over time," and that respite alone may improve short-term pressure without longer-term effects unless combined with components specifically targeting parental stress and coping. Survey research with 178 parents of children with IDD found highest agreement on items relating to improved mental and emotional health, access to sleep and time to recharge, stress reduction, and time with spouse and other children.^{[105][106][107][108]}

Positioned correctly, in-home VAT is a **daily micro-respite** — a 20-to-30-minute nervous-system break available every night without arranging staffing, transport, or trust in an outside

provider, addressing the outcomes parents rate most highly at a frequency respite cannot achieve.

Siblings

A meta-analysis of 69 independent samples found siblings of autistic individuals have significantly more negative outcomes than comparison groups overall ($g = -0.26$), with worse internalizing behavior problems, psychological functioning, beliefs, social functioning, and sibling relationships; notable sub-areas included beliefs about disability ($g = -0.56$), anxiety symptoms ($g = -0.25$), and depression symptoms ($g = -0.36$). A meta-analysis of 52 studies of siblings of children with chronic health conditions found a small negative overall effect with more internalizing problems ($d = 0.17$). Qualitative CP research documented mothers having to compromise on care provided to their children without cerebral palsy.^{[73][109][110]}

TheSoundWell's framing is that VAT gives siblings a wellness platform for managing their own stress and anxiety, and that establishing a shared calming space in the home reduces overall household tension and encourages more meaningful engagement between siblings. The reviewed sibling literature is consistent: family functioning, support, communication, and low family conflict have a mediating effect on sibling adjustment.^{[111][4]}

Home-format products

Sonic harmonic pets, vibration bean bags, and vibroacoustic pillows stream Skille's original 30–120 Hz frequencies through embedded transducers while simultaneously delivering the documented effects of soft touch, deep pressure, and companion attachment, combining VAT with comfort-touch therapy in a child-friendly format requiring no special skill from the child. The bean bag format provides deep pressure stimulation with even weight distribution and proprioceptive input, grounding children experiencing sensory overload, with cited research indicating deep pressure stimulation increases parasympathetic while decreasing sympathetic arousal. This aligns with independent occupational therapy evidence: a weighted blanket study found 33% showed reduced anxiety on skin conductance, 63% self-reported anxiety reduction, and 78% felt more relaxed with the blanket. The pillow format is positioned for sleep, delivering frequencies to head, neck, and upper spine, and recommended as a 20–30 minute screen-free bedtime routine anchor. Occupational therapy literature recommends vibration within sensory integration for both hyper- and hyposensitive children to stimulate the proprioceptive sense.^{[112][113]}

Part VI: Benefits for Professional Caregivers, Therapists, and Direct-Care Staff

The workforce crisis creates the business case

In the 2021–22 school year, 43% of US public schools reported vacant special education teaching positions, with the special education vacancy rate about twice that of most other positions. By March 2024, 52% of public schools anticipated needing to fill special education positions, and as of August 2024, 72% of public schools with special education vacancies had difficulty filling them with a fully certified teacher; the US Commission on Civil Rights identified demanding

workload and administrative burden as a main source of stress. Approximately 55,000 special education positions were vacant with another 270,000 filled by teachers who were not fully qualified; for 2024–25, 48 states, Puerto Rico, and DC projected special education teacher shortages — more than any other shortage area by an eight-state margin — and special education teachers leave the profession at nearly twice the rate of general education colleagues. Survey data indicate 51% of special education teachers report feeling "extremely stressed". In one state survey, 45% of all teachers and 47% of special education and urban teachers were considering early retirement or leaving, with 98% of educators naming stress and burnout their top issue.^{[114][115][116][117]}

Among behavior analysts, 74.4% of BCBA respondents had left a previous job, and **burnout was the single top contributor to turnover at 59.8% — ahead of pay and benefits (46.7%), supervision and mentorship (38.8%), collegiality (35.5%), ethical violations (35.2%), and professional development (32.0%), with over 70% working more than 40 hours per week.**^{[118][119]}

The population served keeps growing: 8.2 million students ages 3–21 qualified under IDEA in 2024, a 3.8% single-year increase and a 12.6% rise since 2019, even as overall public school enrollment declined slightly. Roughly 15.9% of all public school students received IDEA services in 2023–24.^{[120][121][122]}

The precedent: staff restorative spaces already work

Johns Hopkins Hospital opened the RISE Restorative Space on Osler 6 in early 2024, designating protected space where staff can recover before, during, and after work. It includes a sensory room with a massage chair, color-changing bubble lights, aromatherapy, a light projector, and Bluetooth speakers; a separate "Tune Room" featuring a **bed that vibrates in sync with neural music to reduce stress**; an art activity area; and a gathering space. Access is 24/7 with drop-in or reservation, one person at a time per room.^{[123][124]}

In the first six months the space recorded over 7,000 uses, and the hospital is actively planning additional similar spaces on campus. That utilization figure is the most persuasive datapoint available for a school or provider organization considering a staff restorative room: demand for protected sensory respite among high-stress care workers is enormous, and a vibroacoustic bed is already a component of a flagship academic medical center's implementation.^[123]

VAT-specific evidence relevant to staff wellbeing

The stress-reduction evidence in Part II applies directly: increased parasympathetic activity, increased concentration, reduced arousal, and increased relaxation in adult participants; HRV improvement in an educational-institution setting; and significantly greater salivary cortisol reduction with vibration-plus-music than music alone.^{[33][31][35]}

For staff dealing with the physical toll — lifting, transfers, positioning, and chronic musculoskeletal strain, which is particularly acute in CP-heavy caseloads — Campbell, Hynynen, Burger, Vainionpää, and Ala-Ruona studied vibroacoustic treatment plus an added self-care intervention for improving functioning and ability to work in patients with chronic pain within multidisciplinary rehabilitation, publishing in *Disability and Rehabilitation*. VAT

there consists of three elements: low-frequency sinusoidal sound vibration between 20–120 Hz, the client's preferred music, and practitioner support — a "two-pronged approach" in which tactile sinusoidal vibration elicits the relaxation response. Outcomes indicated both practitioner-led and self-care interventions may be beneficial for improving functioning, pain, mood, and relaxation, with ability-to-work VAS scores improving during self-care sessions to the point that one participant discussed increasing working hours with her physician. Seinäjoki Central Hospital has used vibroacoustic treatment for more than two decades.^[125]
^[126]

Aggregated white-paper reporting from TheSoundWell describes preliminary clinical outcomes including significant reduction in chronic pain scores, improved mobility and gait, reduced anxiety and depressive symptoms, improved sleep duration and quality, and reported reductions in pain medication use, and notes that systems show reductions in high muscle tone and movement restriction in conditions like cerebral palsy, supporting easier positioning and mobility work.^[127]

That last point is the direct occupational-health bridge for CP settings: reduced tone in the child means safer, easier transfers and positioning for the adult doing the lifting.

Benefits to therapists as clinicians

First, as a preparatory or priming modality. TheSoundWell's ADHD analysis recommends scheduling VAT as a "pre-treatment priming ritual," administering 30–40 minute sessions immediately before demanding activities, on the hypothesis that efficacy is maximized during the window of increased concentration and reduced arousal induced by VAT. The independent literature supports the analogous physical case: vibration prior to PT or OT may prepare children with spasticity to learn motor skills by temporarily decreasing spasticity, with effects lasting one to two hours, and acute vibration effects on reflex excitability and coordination persist up to 30 minutes. A child who arrives at therapy already regulated and with lower tone yields a more productive session — a direct productivity argument, not merely a wellness one.^[23]^[56]^[154]

Second, as an adjunct within existing scope of practice. VAT is explicitly framed as conducted by a trained therapist — music therapist, psychotherapist, physiotherapist, or occupational therapist — who also has appropriate training in the parameters of vibroacoustic stimuli for individually set therapeutic goals. Skille proposed VAT for use by physiotherapists, psychologists, psychiatrists, physicians, and chiropractors in addition to music therapists. TheSoundWell's positioning is consistent: VAT may function as an independent wellness therapy or self-help tool, or be incorporated as added-value therapy by physicians, chiropractors, physical therapists, psychotherapists, or alternative modality practitioners, with suggested integration alongside CBT or somatic therapies and 20-minute VAT prior to psychotherapy.^[128]^[129]^[15]^[127]

Third, as a formally trainable competency. The VIBRAC Skille-Lehikoinen Centre in Finland offers a three-level academic pathway: Level I is a two-day introduction with 14 contact hours plus 14 hours independent work, available in webinar format; Level II certifies participants as VIBRAC-Practitioners across three modules totaling 28 contact hours, three months of independent study and peer practice with 10 client sessions, a further 28 contact hours plus 56

hours independent study, supervision, and case reporting; a bridge requirement demands independent clinical practice with a minimum of four cases of 10 sessions each before Level III advanced practitioner status. Level I equals 1 ECTS, Level II equals 14 ECTS, and all three levels total 20 ECTS, with Level II graduates certified to practice VAT with various target groups and to tailor treatment programs for specific symptoms and contexts.^{[130][131]}

International Level II training has been delivered in partnership with the Mali Dom-Zagreb Day-Care Centre for Rehabilitation, whose expert team comprises rehabilitators, physiotherapists, occupational therapists, kinesiotherapists, a social worker, and a psychologist, and whose education center develops training programs for professionals in assessment, education, and rehabilitation of young children with developmental risks or disabilities. This is a direct CP credibility asset: Mali Dom-Zagreb is the institution where Katušić conducted the vibrotactile stimulation research, and the 89-child three-arm study drew its participants from a day-care center for rehabilitation. The organization that produced the CP evidence also hosts the practitioner certification. TheSoundWell separately offers vibroacoustic therapy training courses on integrating VAT with preventive wellness lifestyle.^{[132][131][133][134][50][10]}

Part VII: The Special Needs School as an Institution

Where VAT fits in the existing sensory room paradigm

Special needs schools already accept the premise. Environmental changes ensuring healing and inviting environments – comfort and sensory rooms or areas – and the use of sensory modulation materials in the early stage of crisis have been proposed as means to prevent or reduce seclusion, restraint, and unplanned physical intervention. Comfort rooms are defined as spaces designed with relaxation furniture, soothing colors, soft lighting, quiet music, and other sensory tools to reduce stress. Sensory tools can reduce the physical tension associated with intense emotions, especially frustration and anxiety, and help individuals recognize and control sensory experiences, identify sensory preferences, and regulate behavior.^[^135]

The de-escalation literature demonstrates what is at stake. Staff training and behavioral support plan implementation produced a 99% reduction in restraint episodes in one study; another reported reductions from 263 to 7 restraints per year and 432 to 133 seclusions per year, with average restraint duration falling from 41 to 18 minutes and seclusion duration from 27 to 21 minutes. A schoolwide de-escalation intervention plan showed significant decreases in both frequency and total duration of seclusion, restraint, and unplanned physical intervention across a year, promoting self-regulation, with young students and those with aggressive behaviors benefiting most.^[^135]

Multisensory environment research provides directly comparable outcome data. An observational study of student-selected multisensory experiences in a multisensory intervention center found a significant 14% increase ($p < 0.001$) in sustained focus when students returned to regular classroom activities, mean self-injurious behaviors decreased by over 98%, and significant increases in observed relaxation (17%), happiness (16%), and engagement (13%) – with increases holding across both sexes and all ethnic groups.^[^136]

VAT's contribution is a specific, dose-controllable, evidence-linked input for the calming end of the sensory menu, backed by the Lundqvist RCT on self-injurious and aggressive behavior, the 2025 pilot on joint attention with teacher-observed classroom improvement, and — uniquely among sensory room equipment — a fair-quality RCT in the school's most common physical disability.^{[93][87][^9]}

Operational fit

Practical sensory room protocols recommended by occupational therapists map cleanly onto VAT session parameters: limit visits to roughly 10–20 minutes; limit the number of students in the room; use the room proactively by building sensory breaks into the daily routine; determine the desired outcome per student (calming versus alerting); explain how each prescribed item will be used including goals, duration of application, and removal criteria; train all staff on the items; color-code items by sensory input type; and use a check-in/check-out system where students rate regulation before and after with data tracked.^[^6]

VAT is unusually easy to operationalize inside this framework because sessions are timed, positions are static and supervised, dosage is a documented frequency-and-duration parameter rather than a subjective judgment, and pre/post regulation ratings integrate naturally with Zones of Regulation or Alert Program check-out systems. Skille's original 20–29 minute protocol, the 10–20 minute Lundqvist sessions, and the 20-minute CP protocols all sit inside the recommended window.^{[1][87][6][50]}

The multi-format product line supports tiered deployment: a recliner or mat in a dedicated sensory or de-escalation room; bean bags and sonic pets in classrooms or calm corners for lower-intensity, higher-frequency use; pillows for nursing or quiet rooms; and a full 4 Senses Chill-Out configuration where budget and space permit.^{[30][27][^7]}

The cerebral palsy-specific school argument

For a school serving students with CP, VAT crosses from "sensory room enrichment" to "therapy-adjacent equipment with an IEP rationale," which changes the funding conversation entirely:

- It has a fair-quality RCT (PEDro 6/10) in the exact population, with spasticity and gross motor endpoints that appear in IEP goals.^{[49][9]}
- Its outcome measures — MMAS, GMFM-88, goniometric joint angles — are already collected by school physical therapists.^{[9][50][^10]}
- It is accessible to GMFCS IV–V students who cannot use standing vibration platforms, because delivery is reclined.^[^26]
- It targets spasticity-related pain, observed by caregivers in 85.9% of children with lower-limb spasticity and frequently untreated.^{[40][44]}
- It can be scheduled immediately before the therapy block to exploit the acute tone-reduction window.^{[56][54]}
- Reduced tone eases positioning and handling, which is a staff musculoskeletal-injury argument as well as a student comfort argument.^[^127]

A dual-use staff and student model

The most differentiated institutional proposition is a single installation serving both students and staff on a scheduled basis — students during the school day for regulation, tone reduction, and preparatory therapy priming; staff before shift, during breaks, and after difficult incidents. The Johns Hopkins RISE precedent demonstrates staff-side demand is real and large (7,000+ uses in six months), the special education workforce data demonstrate the retention stakes, and the child-facing evidence demonstrates the student-side rationale. No other single capital item in the special education environment plausibly serves both populations.^{[116][117][93][87][118][123][^9]}

Cost framing

With mats starting near \$2,883, accessory items in the \$333–\$350 range, and a sonic support bolster near \$1,989, a starting installation is comparable to a modest classroom technology purchase and considerably below the cost of replacing one departing special education teacher in a system running approximately 12.5% annual special education teacher turnover. In CP-heavy settings, the comparison should also include restraint-and-seclusion incidents, staff workers' compensation claims from lifting and positioning injuries, and — for the most severely affected students — the documented 70% one-year respiratory re-admission rate that drives the most prolonged hospital absences.^{[28][29][137][63]}

Part VIII: Evidence Quality, Limitations, and How to Communicate Them

Scoping reviews find the pain literature too sparse. A BMJ Open scoping review of VAT in adults experiencing pain concluded research in the area is too sparse to identify which properties of VAT are beneficial for pain management, and that RCTs are needed to establish reliable scientific proof for both acute and chronic pain. It notes a serious methodological issue: it is neither easy to blind participants nor to construct a true sham in VAT research. Studies used small sample sizes with mostly statistically insignificant between-group differences, or with both groups improving significantly.^{[138][139][^14]}

A prominent fibromyalgia RCT was retracted. Braun Janzen et al. (2019) in PLOS ONE reported significant baseline-to-post-treatment changes in fibromyalgia symptom severity, pain interference, depression, and sleep quality with medium-to-large effect sizes, but no significant differences between the two active treatment arms. PLOS ONE retracted the article in March 2020, concluding that without a true sham control group one cannot distinguish treatment effects from placebo, and that the claims were not adequately supported; two authors did not agree with the retraction. Critics argued the retraction notice itself mischaracterized the problem and avoided other concerns. **Anyone citing vibroacoustic fibromyalgia research must be aware this specific paper is retracted.**^{[140][13][141][142]}

The most-cited fibromyalgia results come from an uncontrolled study. Naghdi, Ahonen, Macario, and Bartel (2015) in *Pain Research and Management* was open-label with no control group, using a repeated-measures design in 19 female volunteers receiving 10 treatments of 23 minutes of 40 Hz low-frequency sound stimulation twice weekly for five weeks. Improvements were large: Fibromyalgia Impact Questionnaire 81%, Jenkins Sleep Scale 90%, Pain Disability

Index 49.1% (all $p < 0.0001$), with medication dose reduced in 73.68% and discontinued in 26.32%, cervical range of motion increasing from 25% to 75% ($p = 0.001$), and muscle tone changing from hypertonic to normal ($p = 0.0002$), with no adverse effects and no dropouts. Nearly 90% reported their condition much or very much better. But the authors called for phase 2 and 3 trials, and two weeks after cessation 68.4% reported pain recurrence with median onset at 10 days — indicating effects require maintenance rather than being curative.^{[143][144][145]}

Child-facing studies outside CP are small. The Lundqvist RCT enrolled 20 adult participants aged 22–57 with ASD and developmental disabilities — not children — using a waitlist rather than sham design. Broader music-intervention meta-analyses in autism find behavioral outcomes inconclusive overall, with one 2025 review reporting the overall test for effect on general behavior not statistically significant ($z = 1.61$, $p = 0.11$). The 2025 VAT attention pilot enrolled 18 children total at a single school.^{[91][146][93][87]}

CP-specific limitations. Only five experimental studies and two RCTs exist; secondary-level evidence (systematic review) is completely lacking. The largest RCT scored 6/10 on PEDro with no concealed allocation, no subject or therapist blinding, and no intention-to-treat analysis. The three-arm study's music-listening placebo arm itself produced significant tone reduction. The 13-child study had no spasm scale and its authors called for larger randomized trials. And the adjacent WBV literature contains multiple well-conducted negative trials on whether vibration adds to intensive physiotherapy.^{[61][62][8][49][59][50][10][46]}

Standardization is absent. A 2025 review states plainly that despite its potential, VAT research remains limited, underfunded, and hindered by lack of standardized treatment protocols, concluding VAT holds promise as a safe non-invasive adjunct particularly for CP and stroke, but that standardization and large-scale clinical trials are required before widespread clinical adoption can be recommended. Reporting suggestions call for consistent description of frequency, amplitude, pulsation, and loudness.^{[139][12]}

Sound therapy in children specifically. A pediatric review notes studies in adults and children are limited and of poor design while reporting generally positive outcomes across autism, developmental delays, NICU, ADHD, chronic pain, and neurological disabilities, concluding more large-scale, properly designed comparative studies are required before this low-cost, safe technology can be incorporated into the therapeutic armamentarium in children.^[96]

Recommended claim discipline

Claim strength	What can be said	Supporting basis
Strongest clinical claim available	40 Hz VAT added to physiotherapy reduced spasticity and improved gross motor function more than physiotherapy alone in children with spastic CP	Katušić RCT, $n = 89$, 3 months, GMFCS-stratified, MMAS and GMFM-88 both $p < 0.001$, PEDro 6/10 ^{[9][11][10][49]}
Well supported	VAT improves range of motion in children with CP	All four pediatric CP studies in the dedicated review reported statistically significant ROM improvement; hip/knee/ankle and joint-angle data $p < 0.05$ ^{[46][10]}

Claim strength	What can be said	Supporting basis
Well supported	VAT + music reduces muscle tone and improves range of movement more than music alone in spastic subjects	Wigram placebo-controlled research ^[^51]
Well supported	VAT acutely increases parasympathetic activity and HRV and reduces EEG arousal in adults	Sensors 2024 VSM study; <i>Frontiers in Psychology</i> pilot RCT with 54 students ^{[31][33]}
Well supported	Vibration plus music reduces salivary cortisol more than music alone	Randomized crossover trial, 36 participants ^[^35]
Well supported	The modality is safe and well tolerated with high completion and no reported discomfort in studied populations	Naghdi 2015 (no adverse effects, no dropouts); vibrotactile crossover trial (notably well tolerated) ^{[143][38]}
Reasonably supported	VAT reduces self-injurious, stereotyped, and aggressive behavior in ASD/DD populations	Lundqvist 2009 RCT, n = 20, waitlist-controlled, three measurement methods ^{[87][89]}
Reasonably supported	40 Hz vibrotactile input improves GMFM lying/rolling and sitting dimensions, trunk stability, and head control	Katušić 13-child study, z = 3.17 total GMFM ^[^50]
Preliminary	VAT improves joint attention and is associated with teacher-observed classroom engagement gains in autistic children	2025 mixed-methods pilot, n = 18 ^[^93]
Preliminary	VAT as therapy priming exploiting a 1–2 hour tone-reduction window	WBV acute-effect literature; effects to 30 min on reflex excitability ^{[56][54]}
Speculative — requires supervision	Respiratory/secretion-clearance support in severe CP	Physiological rationale only, from ~8 Hz manual vibration in cystic fibrosis; no VAT CP trial; aspiration-risk cautions apply ^{[65][63]}
Plausible, untested in VAT	Direct cortisol reduction, inflammation reduction, or long-term caregiver burnout prevention	TheSoundWell's own synthesis notes direct measurements of cortisol and inflammatory changes from VAT are not yet reported ^[^147]
Avoid	Cure or replacement-for-physiotherapy claims; systematic-review-level evidence claims; citation of the retracted 2019 PLOS ONE fibromyalgia RCT	No cure for CP ^[^26] ; SR-level evidence lacking ^[^46] ; PLOS ONE retraction ^[^13]

Safety and contraindications

VAT is described as safe and non-invasive, but documented cautions must be built into any school or clinic protocol: cardiovascular disease including unstable hypertension or arrhythmias (medical supervision only); epilepsy, where some frequencies may trigger seizures in photosensitive individuals; pregnancy, where safety has not been sufficiently investigated; acute injuries or postoperative conditions; pacemakers; acute inflammatory disease; psychotic disorders; hypotension; and fear of vibration or hypersensitivity to sound stimuli. Sources note none of these are absolute contraindications that would necessarily be dangerous — they are precautionary recommendations based on insufficiently researched effects in risk conditions. Additional practitioner guidance flags implanted electronic devices, active DVT or clotting history, bleeding disorders, recent surgery without clearance, and preliminary concern that vibration may increase tremor in some parkinsonism presentations. ^{[148][149]}

Two cautions are especially relevant in CP. First, epilepsy is a common comorbidity in CP and was specifically associated with poorer caregiver sleep in the mothers' study, making seizure-history screening and neurologist clearance a mandatory intake step. Second, aspiration risk contraindicates airway clearance therapy per CP respiratory care pathways, so any chest-directed application requires clinical clearance. Adults with CP also carry elevated risk of osteoporosis, fractures independent of cardiometabolic factors, and cervical and lumbar myelopathy from canal narrowing — arguing for physician clearance in adult and transition-age users and for avoiding high-amplitude application over the spine.^{[85][66][82][63]}

For sensory-sensitive special needs populations generally, the hypersensitivity caution argues for titration — baseline sensory profiling, starting at the low end of the range, incremental increases, and pairing with preferred activities — and for individual documented protocols rather than blanket application.^[^95]

Part IX: Implementation Blueprint

Tier 1 — Home / family (parents, siblings, child)

Deploy sonic pets, vibration bean bags, and vibroacoustic pillows. Position as daily micro-respite. Anchor the child's use to a 20–30 minute screen-free bedtime routine; give parents and siblings independent access on the same equipment. Primary targets: sleep latency and quality, household tension, parental stress, sibling emotional load. For CP families specifically, lead with sleep — 74.6% prevalence of sleep disturbance in CP caregiver mothers is the highest-prevalence problem in that literature — and with the time-pressure finding, since a home modality adds no scheduling burden.^{[113][66][70][4]}

Tier 2 — Therapy practice (PT, OT, SLP, psychology, music therapy, ABA)

Use 20–30 minute VAT as a preparatory priming session immediately before demanding therapy tasks. For CP caseloads, run 40 Hz for 20 minutes before the physical therapy block and document MMAS, goniometry, and GMFM alongside existing measures. Integrate with CBT or somatic work, or as 20-minute pre-psychotherapy. Pursue VIBRAC Level I and II certification for parameter competency and professional credibility.^{[23][130][127][56][50][9][^10]}

Tier 3 — Special needs school

Place a mat or recliner in the sensory or de-escalation room with 10–20 minute scheduled sessions, proactive daily routine integration, individualized documented protocols, staff training, and pre/post regulation check-in data aligned with existing Zones of Regulation or Alert Program systems. Track restraint and seclusion incidents, sensory room utilization, time-to-return-to-class, and sustained focus after sessions, benchmarked against the multisensory environment literature (14% sustained focus improvement, 98% reduction in observed self-injurious behavior). For CP students, build sessions into the therapy schedule rather than only the crisis pathway, and coordinate with the school physical therapist on frequency selection and outcome documentation. Add classroom-level bean bags and sonic pets for lower-intensity, higher-frequency access.^{[136][113][6][9][^10]}

Tier 4 — Staff restorative space

Establish a dedicated staff room with vibroacoustic furniture, modeled explicitly on the Johns Hopkins RISE Restorative Space (sensory room plus vibrating bed synced to music, 24/7 access, drop-in or reservation, one person at a time) which recorded over 7,000 uses in six months. Track utilization, staff-reported stress, absenteeism, and retention. Frame against special education turnover economics and, in CP-heavy settings, against lifting-and-positioning injury claims.^{[124][137][117][118][116][127][^123]}

Tier 5 — Whole-campus or district

Deploy the 4 Senses Chill-Out configuration — vibroacoustic furniture with chromatherapy lighting, nature scenes, ambient harmonic music, and aromatherapy — as a standalone recovery room or wellness zone, a format already offered for schools, academia, libraries, clinics, and municipalities. Position for parent-teacher events, IEP-meeting decompression, and family open days.^{[2][7][^30]}

Evidence-generation opportunity

Because standardization and larger trials are the field's stated bottleneck, and because the dedicated CP review explicitly calls for research on motor function and spasticity in adolescents and young adults with spastic CP, a school or district implementation is itself a research asset in the highest-priority gap. A pre-registered pilot in a special needs school with pre/post MMAS and GMFM in CP students, regulation ratings, restraint incident counts, staff HRV or PSS-10 measures, and parent stress and sleep inventories would produce exactly the data the literature lacks. The 2025 Pretoria school pilot demonstrates the design is feasible in a real school with an on-site psychologist supporting recruitment, and the Mali Dom-Zagreb precedent shows a pediatric rehabilitation center can simultaneously host practitioner training, clinical practice, and CP research.^{[131][14][133][93][8][12][^50]}

Conclusion

The case for original vibroacoustic therapy in the special needs ecosystem does not depend on overstating the clinical evidence — which would be both unnecessary and counterproductive with the professional audiences that matter. It rests on a structural argument that the evidence adequately supports, plus one clinical argument that is stronger than the rest.

The structural argument: every stakeholder in this ecosystem is running an autonomic nervous system under chronic load. Children whose sensory and emotional dysregulation drives the crises. Parents whose cortisol profiles resemble those of combat veterans, and — in cerebral palsy specifically — among whom 63.4% show clinically significant depressive symptoms, 53.5% clinically significant anxiety, and 74.6% sleep disturbance. Siblings carrying measurable internalizing burden. Direct-care staff and therapists for whom burnout is the top driver of turnover. Institutions bleeding qualified personnel at twice the general education rate. VAT's demonstrated core effect — an acute, passive, dose-controllable shift toward parasympathetic dominance measurable in HRV, EEG, and cortisol — addresses the one physiological variable all of them share.^{[66][31][33][35]}

The clinical argument is cerebral palsy. Here VAT is not a wellness proposition but a rehabilitation adjunct with a dedicated narrative review, two randomized controlled trials, a fair-quality 89-child RCT showing greater spasticity reduction and greater gross motor gains than physiotherapy alone, consistent range-of-motion findings across every pediatric study examined, placebo-controlled evidence that vibration plus music beats music alone on muscle tone, and a 40 Hz protocol that Skille specified for spasticity six decades ago and that independent researchers adopted on his recommendation. It reaches GMFCS IV–V children whom standing vibration platforms cannot serve. It targets spasticity-related pain that caregivers observe in 85.9% of children with lower-limb spasticity and that goes untreated in nearly a quarter of affected children. And by lowering tone it makes the adult's job of positioning, transferring, and handling that child measurably easier — the rare intervention where the child's therapeutic gain and the caregiver's occupational relief are the same physiological event.^{[44][51][8][40][127][26][9][10][^46]}

VAT's distinguishing practical virtue across all of this is that it requires nothing of the user. That is why it reaches the nonverbal child who cannot follow a mindfulness script, the child at GMFCS V who cannot stand on a platform, the parent who cannot get to a weekly therapy appointment, and the paraprofessional who has 20 minutes and no capacity for anything effortful. Skille's insight in 1968 — that sound delivered into the body rather than only into the ears produces relaxation effects unattainable through listening alone — remains the mechanism, and the 2025 crossover finding that vibration plus music lowers cortisol more than music alone is its most direct modern validation.^{[5][3][^35]}

The strongest near-term positioning is therefore not as a treatment for any diagnosis, but as **regulation infrastructure with a cerebral palsy clinical spine**: a shared, low-effort, well-tolerated nervous-system reset available to the whole system of care — child, family, and workforce — from a single installation, anchored clinically in the indication where the evidence is deepest, deployed with clear protocols, honest evidence claims, documented contraindication screening, and outcome tracking that contributes to the research base the field still needs.

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