RESEARCH PAPER

Cuevas Medek Exercises With Dual-Task Training For Gross Motor Delay In A Toddler With Autism Spectrum Disorder: A Case Report

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ABSTRACT

Background: Gross motor delay is common in toddlers with autism spectrum disorder (ASD), with reported gross motor delay rates and impaired postural control affecting functional participation. Cuevas Medek Exercises (CME) is a distal-support-based, intensive, active-movement physiotherapy technique that relies on automatic postural reactions to induce experience-dependent neuroplasticity; however, there is limited evidence for its use in developmental motor delay associated with ASD.

Objective: To detail the gross motor and sensory results of an 18-month-old child with ASD and global gross motor delay after a 3-month occupational therapy program, which utilized CME, foundation developmental exercises, dual-task training and tactile desensitization.

Case Presentation: An 18-month-old child with ASD was seen with the following problems: Gross motor delay in attainment of head/neck control, sitting, standing, crawling, kneeling and tactile defensiveness of the feet/palms. A progressive, systematic, and structured 3-month intervention was provided, progressing from basic antigravity and desensitization exercises (Month 1) to supported dynamic balance and dual-task integration (Month 2) to functional ambulation and higher-level balance (Month 3).

Outcome Measures: Standardized normative testing was not done, but Individual Goal Attainment Scaling (GAS) was done for seven motor/sensory domains at baseline, mid-program (Month 1.5), and program end (Month 3).

Results: The overall GAS T-score went up from 33.9 at baseline to 65.3 at Month 3, above the threshold of T = 50, indicating "goals met or exceeded." The child progressed from using a maximum amount of support to sit and stand to independent sitting, walking, reciprocal crawling, and walking independently on knees and half-knees, with a significant reduction in tactile defensiveness of feet and palms.

Conclusion: Clinically significant gross motor and sensory improvements were found to be related to a combined CME and dual task occupational therapy protocol in a toddler with ASD and motor delay. Studies to differentiate the independent contributions of CME from concurrent maturation, components of conventional therapy, and family-delivered practice are needed.

Keywords: Cuevas Medek's Exercise autism spectrum disorder, gross motor delay, dual-task training, goal attainment scale, pediatric occupational therapy

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1. INTRODUCTION

Motor impairment in Autism Spectrum Disorder ASD has been reported at up to 68% in toddlers and was detectable as early as 6 months in infants at high familial risk [1]. Population-based studies show that both gross and fine motor delay occurred at significant rates in preschool children with ASD, with the severity of delay associated with the severity of core symptoms [2]. While previously considered a co-occurring feature, motor impairments are now understood to be intricately linked with core symptom expression and to impact play, joint attention, and social participation.

Case reports indicate that treatment with CME has produced positive results for children with hydrocephalus, congenital heart disease, and corpus callosum abnormalities. In children with motor delay of central nervous system origin, the motor scale age score relative to chronological/corrected age is better in children after treatment with CME. The evidence base is limited to case-level reports. CME has not been well studied specifically in children with ASD.

The idea of combining an intensive antigravity approach (CME) with a dual-task element [3, 4, 5] and structured tactile desensitization is a logical, and as yet untested, approach for toddlers with ASD who may also have motor delays and sensory processing differences.

The present report outlines the 3-month course and goal attainment scaling results of a combined program for an 18-month-old child with ASD, global gross motor delay [6,7], and tactile defensiveness. It provides information for the design of future controlled studies.

2. CASE PRESENTATION

2.1 Patient Information

The patient was an 18-month-old male referred for occupational therapy by his pediatrician after a diagnosis of autism spectrum disorder (ASD) was made with the use of the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) and the DSM-5 diagnostic criteria. The child was referred with delayed gross motor development, limited ability to hold him against gravity, and excessive tactile defensiveness in his feet and palms, which prevented him from bearing weight on his extremities and using his functional hands during play and self-care activities. Child born at term after an uncomplicated pregnancy and delivery with an unremarkable neonatal period and no reported comorbidities. No previous occupational or physical therapy services were received before this referral, and there was no family history. The parents of this child provided written informed consent for the child to participate in the intervention and for de-identified clinical information to be published in this case report.

2.2 Baseline Clinical Findings

The child had poor antigravity head/neck control at baseline (Month 0) with an inability to sustain prone-on-elbows and needed maximal physical support for sitting and standing; did not achieve independent quadruped position, crawling, kneeling, or half-kneeling; and had prominent withdrawal/distress responses to tactile input on the feet and palms consistent with tactile defensiveness. Rolling and supine-to-prone transitions were present but underdeveloped. At intake, no formal standardized motor assessment was administered (e.g., Gross Motor Function Measure, Peabody Developmental Motor Scales-2), so baseline severity is described clinically, and the anchor (−2) for Goal Attainment Scaling (Section 4) is based on that.

3. INTERVENTION PROTOCOL

The child was involved in a structured, progressive 3-month occupational therapy program, provided by a licensed pediatric OT, 5 days a week, at about 45 minutes per session. The program included 3-monthly phases of Cuevas Medek Exercises [3, 4], basic developmental positioning and transitional exercises, graded sensory desensitization, and dual-task exercises [8, 9] (Tables 1–3). Each month's activities were modified day to day according to the child's emerging skills and tolerance, in keeping with the CME principle of distal support, which is graded to elicit active postural responses rather than passive handling.

Table 1. Month 1 Protocol - Foundational Antigravity Control and Sensory Preparation

Key Activity	Therapeutic Rationale	Dosage
CME balancing (distal-support facilitation)	Provokes automatic antigravity postural reactions across prone, sitting, and kneeling positions, per CME principles [10]	Graded distal-support trials, tolerance-based
Sitting with support (progressing to bed-edge sitting)	Builds static sitting tolerance as the base for head and upper-limb control	Progressive duration, 3-5 trials/session
Desensitization of feet and palms	Graded tactile exposure to reduce defensive responses limiting weight-bearing and hand use	5-10 min/session, graded texture/pressure progression

Table 2. Month 2 Protocol - Dynamic Balance, Standing Preparation, and Dual-Task Integration

Key Activity	Therapeutic Rationale	Dosage

CME standing	Provokes standing postural reactions via graded distal support, advancing from Month 1 sitting work	Graded distal-support trials, tolerance-based
Sitting with minimal support (dual-tasking)	Reduces external support while adding a concurrent attentional task to promote automatic postural control	5-8 trials/session, 30-60 sec each
Crawling on inclined surface	Uses reduced gravitational demand to facilitate an emerging reciprocal limb pattern[11]	3-5 min/session, graded incline

Table 3. Month 3 Protocol - Functional Ambulation and Higher-Level Balance

Key Activity	Therapeutic Rationale	Dosage
Walking	Primary functional gait practice, building on the standing tolerance achieved in Month 2	3-5 supported walking /sessions
Walking on balance board (with support)	Integrates gait with a dynamic balance surface as the most advanced task of the program	3-5 trials/session, supported
Sitting-to-standing transition (with support)	Bridges Month 2 standing/squat work into a functional transitional movement	5-8 repetitions/session, graded support

Note: All CME components were provided by the treating occupational therapist after standard precautions were taken for distal-support handling [4]. In line with principles of sensory integration in children's OT, desensitization activities were designed to tolerate tactile input to increase the variability in texture and pressure.

4. OUTCOME MEASURES

GAS scores each goal on a 5-point scale (−2 = baseline level; −1 = less than expected progress; 0 = expected level of attainment; +1 = somewhat more than expected; +2 = much more than expected), and an overall T-score (mean 50, SD 10) can be calculated across goals, with a T ≥ 50 indicating that goals were met or exceeded on average. GAS has been demonstrated to be responsive to change in pediatric rehabilitation populations, including sensory integration outcomes relevant to this case.

Time points for scoring were baseline (Month 0, the beginning of the intervention), Month 3 (the end of the program), and Month 1.5 (the program's target midpoint). Interpolated estimates of the Month 1.5 values, based on the treating clinician's recollection of the functional level at Month 1.5, are provided and are not independently measured values in Section 5. It is explicitly reported as a limitation (Section 7), and the Month 1.5 column is meant to be indicative of the trend, not an accurate evaluation.

Table 4. GAS Goal Definitions and Scoring Anchors

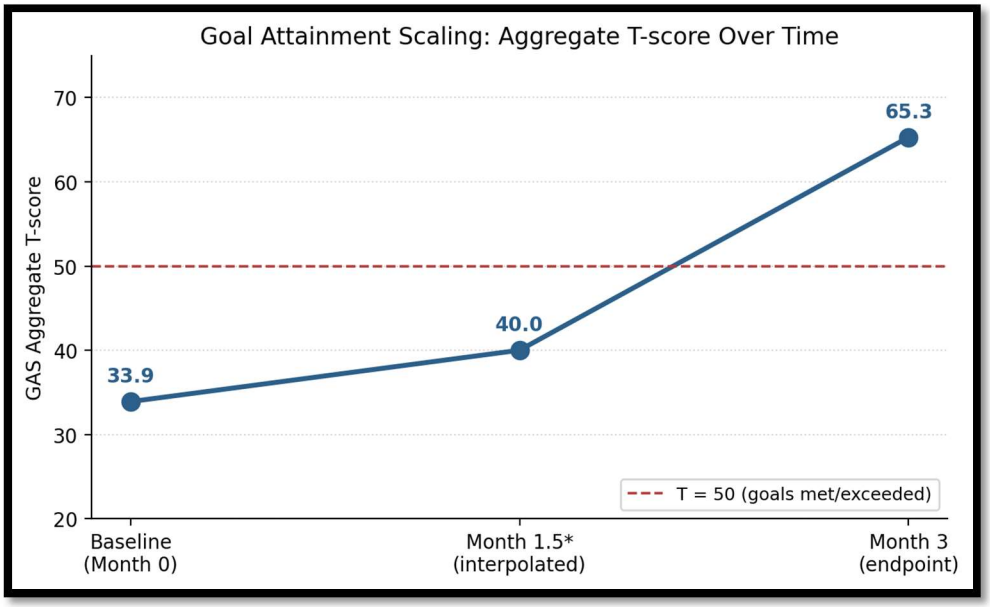
Domain	−2 (Baseline)	0 (Expected)	+2 (Much more than expected)
Head/neck control & prone tolerance	Poor control; cannot sustain prone-on-elbows	Head control adequate for supported sitting	Full independent antigravity control, sustained prone-on-hands
Sitting	Requires maximal support	Sits with minimal support / brief unsupported sitting	Independent sitting with dynamic reach / dual-task tolerance
Standing & walking	No standing tolerance	Standing with minimal support	Independent walking
Rolling / supine-prone transitions	Absent	Present, functional but immature pattern	Fully refined, used functionally in play
Quadruped / crawling	Not achieved	Independent quadruped, emerging reciprocal crawling	Independent reciprocal crawling across varied surfaces
Kneeling / half-kneeling	Not achieved	Independent kneeling, brief	Independent kneeling/half-kneeling with functional transitions

Tactile sensory tolerance (feet/palms)	Marked defensiveness, withdrawal/distress to touch	Tolerates weight-bearing/handling without distress	Full tolerance, tactile input integrated into functional tasks

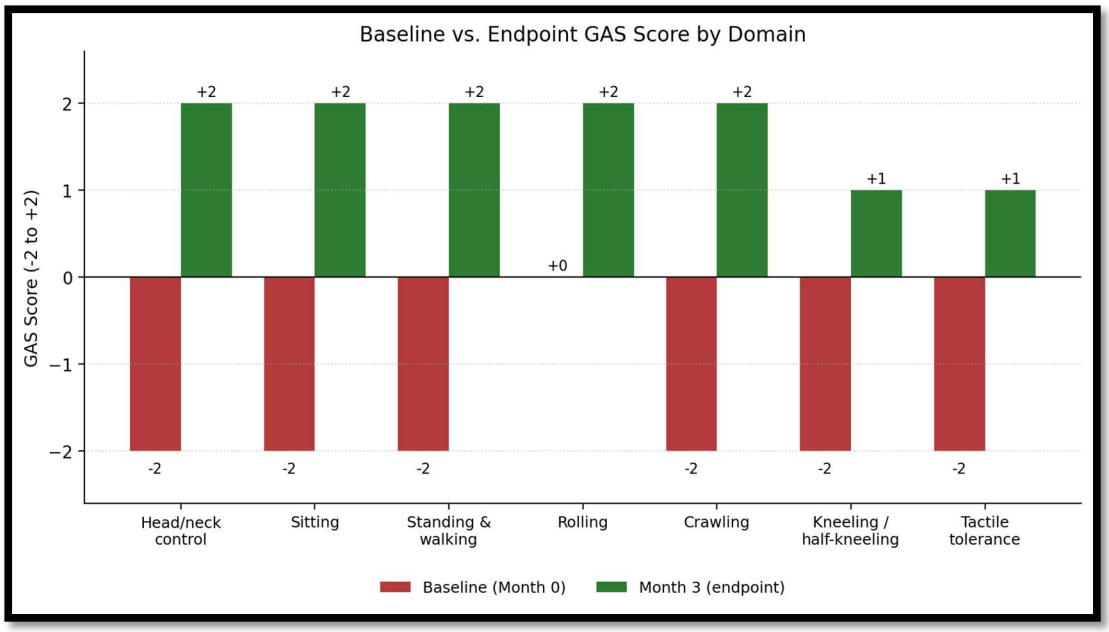
5. RESULTS

Table 5. GAS Scores by Domain Across Time Points

Domain	Baseline (Month 0)	Month 1.5	Month 3 (endpoint)
Head/neck control & prone tolerance	−2	0	+2
Sitting	−2	0	+2
Standing & walking	−2	−1	+2
Rolling / supine-prone transitions	0	+1	+2
Quadruped / crawling	−2	−1	+2
Kneeling / half-kneeling	−2	−1	+1
Tactile sensory tolerance (feet/palms)	−2	0	+1
Aggregate GAS T-score	33.9	40.0	65.3



Graph 1. Aggregate GAS T-score across baseline, Month 1.5 (interpolated), and Month 3. The dashed reference line (T = 50) denotes the threshold at which goals are, on average, met or exceeded.



Graph 2. Baseline versus Month 3 (endpoint) GAS score for each domain, showing the net change achieved over the intervention period.

At Month 3, the child was no longer requiring maximum assistance for sitting and standing, but was sitting and walking independently and moving dynamically; was not tolerating quadruped position, but was walking and half-kneeling independently; and was unable to kneel, but could now kneel and walk independently. Feet and palms were highly tactile defensively and significantly decreased; the child's weight-bearing with tactile input from different textures without distress by the end of the program. The overall GAS T-score increased from 33.9 at baseline to 65.3 at Month 3, reaching the T = 50 level where goals are met or exceeded.

6. DISCUSSION

This case presents clinically relevant improvements in gross motor function and tactile-sensory processing in an 18-month-old with ASD after a 3-month programme that included the Cuevas Medek Exercises programme, a selected programme of foundational developmental exercises, dual-task training, and graded tactile desensitization [12]. The progression (from maximal-support sitting/standing at baseline to independent walking, reciprocal crawling, and kneeling by Month 3) is fairly consistent with other case reports that have been published in the CME that report gains in the motor scale greater than chronological or corrected age in children with other motor delays related to central nervous system involvement[14].

Dual-task elements provide evidence that concurrent cognitive-motor demands can support more efficient automatic postural control in children with developmental differences in motor and cognitive domains [8, 9]. They may be particularly relevant in the context of ASD, where motor, attentional, and social-communicative development are closely interwoven and may have been restricted by a concurrent sensory processing difference, which structured tactile desensitization is responsive to in pediatric OT [15].

As with all single-case reports, causality can be attributed to any single aspect of this multimodal approach. Gains could be due to the CME approach, conventional/foundational exercises, concurrent training, dual-task training, spontaneous maturation during the 3-month window, or family-delivered carryover training or any mix of those.

7. LIMITATIONS & FUTURE RECOMMENDATIONS

- *First,* it is a single-case description, and there is no control/comparison condition to support the conclusion.
- *Second*, a standardized, normed motor assessment (e.g., GMFM, PDMS-2, AIMS) was never conducted at any time point; outcomes in this study are based on Goal Attainment Scaling (GAS) and clinical

observation, and while this is a validated, responsive method for assessing pediatric rehab outcomes, it is inherently less objective than normed testing.

- *Third,* the multimodal nature of the protocol (CME, foundational exercises, dual-task training, and desensitization) makes it impossible to separate the effects of its components.
- *Fourth,* any gains observed over 3 months in an infant of 18 months of age may have been due to natural maturation.
- *Future recommendation*: Controlled, multiple-baseline, and randomized designs, with standard motor outcome measures and, if possible, blinded assessment, should be used in future studies.

8. CONCLUSION

A 3-month occupational therapy intervention using Cuevas Medek exercises, basic developmental exercises, dual-task exercises, and tactile desensitization had a significant positive effect in a toddler with global motor delay and ASD, as evidenced by improvements in GAS T-scores (33.9 to 65.3) across the gross motor and sensory tolerance subsections. The observations help to support further controlled examination of the dual-task-integrated motor delay protocols using CME in young children with ASD.

Declaration of Patient Consent

The authors confirm that appropriate parental consent forms were obtained for all participants. Through this form, parents consented to the publication of their child's clinical details in the journal, with the understanding that their child's name and initials would be withheld and that reasonable steps would be taken to protect their identity. However, complete anonymity cannot be assured. This study was carried out in accordance with the principles set out in the Declaration of Helsinki.

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None.

Conflicts of Interest

The authors declare no conflicts of interest.

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