Physical Therapy Interventions in an Outpatient Pediatric Setting for a 23-month-old Female with a Diagnosis of Prader-Willi Syndrome

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Abstract

Background and Purpose

Prader-Willi Syndrome (PWS) is a rare genetic neurodevelopmental disorder characterized by hypotonia, decreased muscle mass, and delayed gross motor development. These impairments can impact functional mobility and participation during early childhood. The purpose of this case report is to describe early physical therapy management in the outpatient setting for a toddler with PWS and significant gross motor delays.

Case Description

A 23-month-old female (22 months corrected age) with a medical diagnosis of Prader-Willi Syndrome presents with hypotonia, impaired antigravity strength, and delayed gross motor skill acquisition. Examination findings included limited postural endurance and difficulty with transitional mobility, including quadruped, crawling, kneeling, standing, and ambulation. Standardized outcome measures included the Ages and Stages Questionnaire (ASQ), Alberta Infant Motor Scale (AIMS), Gross Motor Function Measure-88 (GMFM-88), and Care and Comfort Caregiver Questionnaire (CareQ). The patient participated in twelve outpatient physical therapy sessions with interventions that focused on play-based and task-specific activities to promote proximal strength, postural control, transitional mobility, and caregiver education.

Outcomes

Following intervention, the patient demonstrated early functional improvements in proximal activation, tolerance of antigravity positions, and emerging transitional mobility skills. Observed

gains included improved tolerance to prone positioning, increased upper-extremity weight-bearing, improved initiation of sit-to-stand transitions with support, enhanced seated postural control, and emerging behaviors for crawling and kneeling. Caregiver's adherence to the home exercise program was consistently reported, and adjunctive side-altering vibration therapy was well tolerated and associated with improved upright tolerance and weight-shift initiation. Standardized outcome measures were not re-administered due to early discontinuation of care.

Discussion

This case report highlights the importance of early play-based physical therapy to support the development of foundational motor skills in a toddler with Prader-Willi Syndrome. The observed improvements during treatment suggest that targeted interventions to address hypotonia, proximal stability, and transitional mobility may facilitate early functional improvement. Further research should examine the longitudinal effects and potential role of adjunct interventions in this population.

Background and Purpose

Prader-Willi Syndrome (PWS) is a complex neurological disorder caused by a lack of gene expression on chromosome 15q11-q13, due to paternal deletion, maternal uniparental disomy, imprinting defects, or paternal translocation defects.[5, 8, 12] PWS affects both males and females, with a prevalence of 1 in 10,000 to 1 in 30,000 births, making it one of the most common causes of hypotonia and developmental delay.[5, 8] Early infancy is typically characterized by profound hypotonia, feeding difficulties, and poor arousal, followed by delayed motor development, cognitive impairment, hyperphagia, endocrine dysfunction, and characteristic behavioral phenotypes as the child ages.[12, 22]

Hallmark features of musculoskeletal impairments associated with PWS include significantly reduced muscle mass, generalized muscle weakness, and impaired postural control, which largely contribute to delayed gross motor development.[23] Children with PWS exhibit a 25-40% reduction in muscle mass and strength deficits of up to 70% compared to their peers without PWS, which impairs functional mobility, milestone acquisition, energy expenditure, and overall participation in daily routines.[23] These early motor challenges are clinically important, as motor delays often persist without targeted intervention and are associated with long-term limitations in functional independence and quality of life.[20]

Typically developing children between 22 and 24 months demonstrate independent ambulation with improved gait stability, the ability to transition independently between floor, sitting, and standing positions, emerging running skills, and early stair negotiation with support. At this age, toddlers are expected to squat to retrieve objects, climb onto furniture, initiate ball skills like throwing, and demonstrate improved postural control during dynamic play.[2, 4, 19] These gross motor skills require sufficient antigravity strength, proximal stability, balance reactions, and coordination, which are commonly impaired in children with hypotonia and neuromuscular conditions such as PWS. Failure to achieve these milestones by two years of age is considered a clinically meaningful motor delay and warrants skilled physical therapy.[2, 4]

Given the multisystem involvement of PWS, including neuromuscular, endocrine, respiratory, gastrointestinal, and behavioral domains, interdisciplinary management is essential across a patient's lifespan.[12, 22] Physical therapy plays an essential role in infancy and early childhood due to the pervasive hypotonia, reduced strength, postural instability, and delayed mobility. Evidence supports the use of early, intensive, and age-appropriate motor-based interventions to promote postural control, antigravity strength, transitional movements, and functional mobility in children with neuromotor impairments.[18] However, despite well-documented motor impairments associated with PWS, there is a lack of detailed clinical case reports describing physical therapy decision-making, motor assessment profiles, and early therapeutic progressions in toddlers with PWS in an outpatient setting.

The purpose of this case report is to describe the physical therapy management of a 23-month-old child with Prader-Willi Syndrome presenting with significant hypotonia, muscle weakness, and delayed gross motor development. This report highlights the patient's baseline motor profile, describes the selection and clinical utility of standardized outcome measures, including the Alberta Infant Motor Scale (AIMS), the Gross Motor Functional Scale-88 (GMFM-88), and the Care and Comfort Caregiver Questionnaire (CareQ), as well as the child's response to outpatient therapy over multiple sessions. By documenting objective outcomes and clinical reasoning strategies, this report aims to contribute to the limited research describing physical therapy interventions for young children with PWS and provide guidance for clinicians treating hypotonia and motor delays in similar patient populations.

Prior to preparing this case report, assent was obtained from the patient, and consent was provided by the patient's mother to proceed with data collection. All information contained in this case report meets the Health Insurance Portability Accountability Act (HIPPA) requirements of the clinical agency for disclosure of protected health information. This case report was completed under the direction of the Department of Physical Therapy and with the oversight of the College of Graduate Studies at Central Michigan University.

Case Description

Patient History and Review of Systems

A 23-month-old female corrected age of 22 months, with a diagnosis of hypotonia and lack of coordination secondary to Prader-Willi Syndrome presented to outpatient physical therapy. Birth history includes a cesarean section at 34 weeks' gestation, with a birth weight of 5 lb. 9 oz. The infant required a two-week hospital stay for temperature regulation and feeding difficulty, followed by a transfer to a specialty children's hospital for an additional six weeks. The pregnancy was high risk due to the maternal use of medication to manage arthritis.

The patient previously received occupational therapy services to address feeding through a state early intervention program for children with disabilities and/or developmental delays. She was tube-fed until she was 8 months old and now feeds orally without assistance. The child's mother reports severe muscle weakness, limiting the patient's ability to crawl, stand, and walk. This weakness was noted at birth and has persisted. The patient's mother was concerned about the patient's limited tolerance for tummy time and reported that the patient spends most of the day sitting and scooting by pulling her legs forward as her primary form of mobility. Caregiver goals include independent floor-to-stand and sit-to-stand transfers, achieving independence with crawling and walking, and promoting age-appropriate gross motor skills and general movement independence.

Upon review of the patient's chart and medical history, it was determined that the patient is not currently taking any prescribed medications and has no prior medical history or concerns. She can scoot on her bottom for mobility while in a circle-sit position and roll from side to side. However, because she has not yet begun crawling or walking, all other forms of mobility depend on her family and parents' assistance. The patient is not yet potty-trained and requires the use of diapers. She is not yet verbal but can follow simple commands and directions. The patient is also Hispanic American and is learning to speak Spanish and English.

Clinical Impression #1

Patient presents to the outpatient multidisiplinary clinic with a medical diagnosis of PWS, as evidence by hypotonia and delayed gross motor development. Based on the caregiver's report and developmental history, the patient demonstrates significant weakness impacting her ability to crawl, stand, or walk. Primary concerns include limited postural control, decreased participation in prone activities, and reliance on scooting on her bottom for primary mobility. Early physical therapy intervention is indicated to promote postural stability, improve transitional movements, and facilitate the development of age-related gross motor skills to improve quality of life.[18] To objectively evaluate the patient's current level of motor function and functional participation, appropriate standardized outcome measures were utilized. The Alberta Infant Motor Scale

(AIMS) will be administered to establish a baseline motor developmental level relative to age-matched normative values. The AIMS is a validated tool to evaluate postural control and antigravity movement patterns in infants and toddlers.[9] It has demonstrated reliable use in infants with developmental delays and preterm birth histories.[14] Additionally, the predictive validity of the AIMS supports its use in monitoring developmental change over time.[24] To further quantify functional motor performance, the Gross Motor Functional Measure-88 (GMFM-88) will be administered. The GMFM-88 is a reliable and widely used measure to assess change in gross motor function in children with motor impairments, including those presenting with hypotonia.[6] Lastly, the Care and Comfort Caregiver Questionnaire (CareQ) was selected to assess caregiver-perceived ease of daily positioning and care. Although the CareQ has primarily been used in children with hypertonia, the domains of positioning, comfort, and caregiver-perceived ease of care are highly relevant to this child with generalized hypotonia and delayed gross motor development. Prior studies have demonstrated the measure's reliability and responsiveness in similar caregiving and motor impairment populations.[13, 15] These measures allow for objective monitoring of progress and support data-based clinical decision-making throughout the course of intervention.

Examination

Based on the patient's history and presentation of hypotonia, decreased coordination, and delayed gross motor skills related to PWS, a comprehensive physical therapy examination was conducted to assess range of motion, strength, tone, pull to sit response, righting reactions, positional tolerance, transitional movement, mobility, and gross motor skills.

Levels of physical assistance were defined using standardized pediatric physical therapy terminology. Minimal physical assistance (minPA) indicates that the therapist provides less than 25 percent assistance in initiating or completing a movement. Moderate physical assistance (modPA) reflects 25 to 50 percent assistance required for task completion, while maximal physical assistance (maxPA) indicates greater than 50 percent assistance. These definitions were used consistently throughout the degree of facilitation required for postural control, transitional movements, and functional mobility.[2, 18]

Range of Motion. Passive and active range of motion of the upper and lower extremities and the cervical spine were within functional limits. Symmetrical passive hip range of motion was also observed.

Tone. Patient demonstrates hypotonicity throughout all extremities and her trunk.

Strength. Manual muscle testing was not formally conducted due to the patient's age and cognitive level. Therefore, strength was assessed by observing functional mobility skills during play-based activities. During pull-to-sit testing, the patient did not initiate active cervical or trunk flexion on the first attempt, and the movement was discontinued due to low tone. On the second attempt, the patient demonstrated an extensor thrust pattern without active participation. The patient displays normal righting reactions bilaterally with lateral trunk tipping. Functional strength limitations were further observed during transitions, with the patient requiring moderate to maximal physical assistance for movement between developmental positions and for maintaining antigravity postures.

Positional Tolerance and Postural Control. Postural alignment, head and trunk control, and weight-bearing capacity were assessed across developmental positions, including supine, prone, sidelying, sitting, quadruped, kneeling, and standing.

The patient demonstrated fair tolerance in supine and sitting positions, with active movement of the extremities and independent maintenance of several seated postures, including ring, tailor, and long sitting. However, endurance in seated postures was limited, as fatigue led to posterior pelvic tilt and reduced upright trunk control. In prone, the patient was able to prop on elbows and lift the head to 90 degrees, but could sustain this position for only approximately 15 to 30 seconds before fatiguing. The patient showed the ability to reach and interact with toys in side-lying but was unable to maintain posture without moderate physical assistance and demonstrated minimal muscle activation, decreased weight-bearing through the lower extremities, and poor postural stability. These findings indicate limited postural control and endurance in more advanced developmental positions, consistent with hypotonia and delayed progression of gross motor skills. The findings from the positional exam are summarized in Table 1.

Transitional Movement Exam. The patient's ability to move between positions was evaluated to identify compensatory patterns and strength limitations. The patient demonstrated independence with early transitional movements, including rolling between supine, prone, and sidelying positions, indicating preserved foundational mobility patterns. When transitioning from sidelying to sitting, the patient required minimal physical assistance in the clinic, though the caregiver reported greater independence with this transition at home. However, transitions that required increased antigravity control and trunk stability were more limited. The patient required moderate assistance to move between sitting and prone and was unable to transition to or from quadruped without maximal physical assistance. Additionally, floor-to-stand transitions were not achieved without maximal support. These findings indicate that while early-stage transitional movements are emerging, the patient demonstrates significant difficulty with higher-level functional transitions that demand greater core strength, coordination, and postural stability. This pattern is consistent with hypotonia and delayed gross motor development, often associated with Prader-Willi Syndrome. Observations for each transitional movement are summarized in Table 2.

Gross Motor Exam. Gross motor abilities were assessed through observation and play-based activities. Skills were compared with age-appropriate developmental milestones to determine her current level of functioning and to guide intervention selection. The patient demonstrated foundational early motor abilities, including active limb movement in the supine position, head lifting in the prone position, rolling between the supine, side-lying, and prone positions, and the ability to maintain supported sitting with emerging postural alignment. However, she demonstrated difficulty with advanced motor skills that require antigravity strength and proximal stability. She demonstrated limitations in active chin tuck in the supine position, inconsistent weight-bearing through the lower extremities in supported standing, and a decreased ability to extend the elbows to bear weight and shift weight through the upper extremities. Although an independent sitting balance was present, the patient preferred prolonged sitting and avoided ring sitting due to limited core and hip stability. Righting reactions in a sitting position were present; however, she was unable to maintain a quadruped position or to progress to independent crawling. These findings indicate a significant delay in gross motor skill development, with several skills emerging but not yet achieved. Detailed milestones observed during the initial evaluation are presented in Table 3.

Standardized Testing. Standardized measures were administered to evaluate the patient's motor performance and caregiver-reported functional abilities.

The Ages and Stages Questionnaire (ASQ) is a parent or caregiver-completed developmental and social-emotional screening system for children aged one month to six years old.[3] The ASQ has demonstrated strong psychometric properties across diverse populations. Mezawa et al. validated the Japanese translation of the ASQ-3, establishing culturally appropriate cutoff scores and reporting high specificity (91%-99%) across developmental domains, indicating strong accuracy in identifying children without delays. However, it has a low sensitivity (8% to 34%) for detecting true delays.[16] Similarly, Dionne et el examined the ASQ's use within a Canadian First Nation (Mohawk) community, confirming strong internal consistency and cultural relevance.[7] Together, these studies support the ASQ's reliability and adaptability as a screening measure to identify developmental delays in varying populations. The ASQ was administered to obtain caregiver insight into the patient's development, as it was selected for its strong psychometric reliability across populations and its ability to identify strengths and delays across multiple developmental domains relevant to children with PWS.

At the initial examination, the patient scored a 0 out of 60 on the ASQ, indicating performance well below the expected range for her chronological and corrected age. This score reflects global developmental delay across all domains, consistent with the child's diagnosis of PWS. The absence of observable age-appropriate skills on the ASQ highlights significant limitations in motor and adaptive functioning and enhances the importance of early intensive intervention.[17]

The AIMS is an observational assessment designed to identify developmental motor delays in infants across four positions: prone, supine, sitting, and standing.[24] Each observed item receives a score of 1 (“observed”) or 0 (“not observed”), and the total raw score is converted to a percentile rank based on age norms. Scores below the 10th percentile indicate delayed motor performance, while scores above the 50th percentile reflect typical development. The AIMS has demonstrated strong reliability for identifying motor delays, as reported by Jeng et al., who found interrater and intrarater reliability correlation coefficient (ICC) of 0.99.[14] Furthermore, Ustad et al. reported good to excellent concurrent validity when compared to the Peabody Developmental Motor Scales-Second edition (PDMS-2) and acceptable to excellent predictive accuracy for identifying atypical motor function.[24]

The AIMS was administered at the initial examination to assess the patient’s baseline gross motor skills and developmental level, the results are shown in Table 4. At 23 months chronological age, 22 months corrected, the patient obtained a total AIMS score of 28. Although the patient’s age exceeds the 18-month cutoff for normative AIMS scoring, the skill items included in this assessment remain appropriate given the patient’s presentation and Ages and Stages Questionnaire results. According to the AIMS normative data, the score corresponds to an approximate motor skill level of an 8.5-month-old and falls within the 5th percentile, indicating a significant delay in gross motor development.

The GMFM-88 is a standardized observational tool used to evaluate changes in gross motor function in children with motor impairments. It is generally applied to patients with cerebral palsy but can also be used for other developmental disorders. The assessment included 88 items across five dimensions: lying and rolling, sitting, crawling and kneeling, standing, walking, running, and jumping. A 2024 study by Choi confirmed high interrater and intrarater reliability of the GMFM-88, supporting its use in both clinical and research settings to monitor progress.[6] Similarly, a study by Salavati et al. using a modified GMFM-88 in children with spastic cerebral palsy and cerebral visual impairment reported test-retest reliability ICC of 0.94 to 1.00, interobserver reliability ICC of 0.99 to 1.00, and internal consistency of 0.97 to 1.00.[21] This data supports the sensitivity to detect small but meaningful motor changes.

In this case, the GMFM-88 was selected to objectively assess the patient's functional mobility and gross motor progress throughout the physical therapy intervention. On the assessment, the patient obtained the following scores: Dimension A = 38/51 (75%), Dimension B = 32/60 (53%), Dimension C = 0/42 (0%), Dimension D = 6/39 (15%), Dimension E = 0/72 (0%), resulting in a total raw score of 143/264 and overall percent score of 29%. These results indicate that the patient demonstrates relative strength in early mobility skills like lying, rolling, and supported sitting. However, she exhibits marked limitations in higher-level motor skills that require antigravity control and postural stability, such as crawling, kneeling, and standing. These findings are consistent with hypotonia and motor delay associated with PWS.

The CareQ and CCHQ were used to assess the caregiver's perception of the child's functional abilities, comfort, and ease of care in the home environment. These caregiver-reported tools provide valuable insight into how motor impairments affect functional care, positioning, and overall participation in daily activities for children with motor impairments, including those with hypotonia or cerebral palsy. The CareQ was adapted from the original Care and Comfort Hypertonicity Questionnaire (CCHQ) developed and validated by McCoy et al., which demonstrated strong psychometric properties, including an ICC of 0.93 and a high internal consistency of 0.96.[15] The study by Hwang et al. further validated the CareQ in children with cerebral palsy, reporting high test-retest reliability (ICC = 0.97), and internal consistency of 0.94 to 0.98 across domains of personal care, positioning/transfers, comfort, and interaction/communication.[13] Similarly, the CCHQ has shown good reliability and validity for assessing difficulty and discomfort during caregiving tasks in children with motor impairments. In this patient, the CareQ total score was 42/75 (56%), indicating moderate difficulty with caregiving tasks. The CCHQ total score was 43/196 (22%), with the comfort subscale scoring 5/35, which may reflect a language barrier, as the caregiver is bilingual in Spanish and English. These measures provide insight into caregiver-perceived functional limitations and comfort during daily care activities, complementing direct observational assessment of the patient's motor performance.

Clinical Impression #2

Findings from the initial examination and standardized assessments indicate that the patient presents with significant hypotonia, impaired antigravity strength, and delayed gross motor skill acquisition secondary to Prader-Willi Syndrome. Although foundational mobility skills such as rolling and supported sitting were present, the patient demonstrated substantial limitations in postural endurance, transitional mobility, and upright functional tasks. These impairments limit her ability to crawl, kneel, stand, and ambulate independently, which are skills expected for her corrected age. Collectively, these findings suggest that the patient's neuromuscular impairments significantly restrict her functional participation and warrant skilled physical therapy intervention.

These findings are clinically significant because they affect the patient’s ability to participate in age-appropriate activities and achieve functional independence. Limitations in upright mobility and transitional control increase caregiver dependence for daily handling, positioning, and mobility within the home environment. Without early, task-specific intervention, delays in foundational motor skills may persist and further restrict participation in play and exploration. Therefore, early, intensive, play-based physical therapy is warranted to support the development of proximal stability, antigravity control, and functional mobility.

At the time of the initial evaluation, both short-term and long-term goals were established to guide intervention and monitor progress in gross motor skill development. Short-term goals, targeted for achievement over six weeks, focused on improving the patient’s postural control, upper extremity and core strength, and ability to move between developmental positions. These included maintaining quadruped for thirty seconds with minimal physical assistance to promote early crawling, sustaining prone on extended elbows for thirty seconds to increase upper-extremity antigravity strength, and maintaining short sitting with symmetrical lower-extremity weight-bearing and neutral pelvic alignment for one- or two-minutes during play to improve seated postural stability. Additional short-term goals emphasized improving transitional movements, such as transitioning between sitting and quadruped with minimal physical assistance in one out of three trials, decreasing head lag during pull-to-sit through activation of cervical flexors, demonstrating less than fifty percent head lag, and completing sit-to-stand transitions with upper extremity support and minimal physical assistance to promote lower extremity strength for upright function. A caregiver goal was also included to ensure family independence with an initial home exercise program to support skill carryover across environments.

Long-term goals, projected to be achieved within three to six months, were established to support continued skill progression toward age-appropriate mobility. These include maintaining quadruped independently for one to two minutes, sustaining upright sitting postural alignment during play, transitioning independently between quadruped and tall kneeling, demonstrating reciprocal crawling for five feet, maintaining standing with bilateral upper extremity support for thirty seconds, and caregiver independence with an advanced home exercise program. These goals collectively supported the development of foundational strength, postural control, and functional mobility needed for age-related gross motor tasks.

The prognosis for improvement is favorable, provided consistent therapy and adherence to a caregiver-guided home exercise program are maintained. Based on the patient's response to initial intervention, improvements are anticipated in postural control, transitional mobility, upper extremity weight-bearing, core activation, and progression toward independent crawling and standing over the next 3-6 months. The patient requires ongoing physical therapy to develop antigravity strength, improve postural alignment, and facilitate functional mobility. Intervention to focus on play-based activities will target prone-on-elbows positioning, quadruped weight-shifting, supported kneeling, and standing with upper extremity support, with assistance as needed. Caregiver education will promote correct positioning, safe facilitation, and skill carryover at home. Progress will be monitored through direct observation, standardized measures (GMFM-88, CareQ, CCHQ), and reassessment of gross milestones.

Interventions

The patient's physical therapy sessions during outpatient rehabilitation were focused on improving postural control, transitional movement abilities, and gross motor skill development.

Interventions were selected based on examination findings, caregiver goals, and current evidence supporting early, play-based motor facilitation in children with hypotonia and motor delays. Treatments emphasized facilitating active participation in developmental positions, guiding transitional movements, promoting weight-bearing and weight-shifting, maintaining alignment, and supporting the acquisition of age-related movement patterns through play-based activities. Caregiver education was integrated throughout to ensure skill carryover and consistency in the home environment.

Visit 1. The patient's mother reports that the patient prefers bottom scooting for mobility to interact with toys. They have been practicing prone positioning on a peanut ball at home to promote upper extremity weight bearing. Treatment focused on facilitating postural control, antigravity strength, and transitional movement skills through play-based activities.

Strengthening and postural control activities included prone on elbows, prone on extended elbows (requiring moderate physical assistance, more pronounced on the left), quadruped positioning (maximal assistance to assume and maintain), pull-to-sit transitions from an incline wedge for core activation, and supported sitting activities to promote upright trunk control. Transitional mobility practice included rolling supine to and from prone, sidelying to sit with moderate assistance, prone to quadruped with maximal assistance, and sit-to-stand transitions with facilitated symmetrical weight bearing through the lower extremities.

Balance and neuromotor control activities consisted of static and dynamic sitting balance challenges, bilateral side-lying play with reaching, prone on extended elbows on an incline wedge, and short sitting in a cube chair. In short sitting, the patient maintained bilateral weight bearing through the feet for approximately 10 seconds before demonstrating knee extension and loss of posture. The patient demonstrated limited tolerance to therapist handling during this session, with frequent crying and resistance to facilitation. Caregiver education emphasized the importance of short sitting with equal lower extremity weight bearing while reaching for toys and continued prone positioning (on elbows and extended elbows) to support tolerance to position, upper extremity strength, and preparation for crawling. Home practice strategies were reviewed and demonstrated.

Visit 2. The patient's mother reported continued practice of short sitting at home, noting improvement in the patient's ability to maintain flat feet while seated. Treatment this session continues to target postural stability, antigravity strength, and transitional movement patterns through repetition of activities introduced in Visit 1, with the addition of quadruped positioning over a small playground ball to facilitate anterior-posterior weight shifting and core activation.

The patient demonstrated improved tolerance to the therapist's handling throughout the session. In prone positioning, the patient tolerated the position for a prolonged duration, maintaining prone on extended elbows and reaching with bilateral upper extremities for approximately half of the treatment session. In short sitting in a cube chair, the patient maintained feet flat with facilitation; however, she showed a preference for leaning posteriorly against the backrest rather than maintaining upright trunk control.

Quadruped was practiced both on the mat (maximal assistance to assume and maintain) and over a small playground ball to support improved alignment, weight-bearing through the upper extremities, and controlled trunk activation. Sitting balance and core stability activities were reinforced through dynamic reaching tasks performed in a short sitting and side-lying position. Caregiver education reinforced symmetrical weight-bearing through the lower extremities in a short seated position and continued prone strengthening activities.

Visit 3. The child's mother reported continued home practice of short sitting with feet flat. Interventions this session focused on strengthening, postural control, and transitional mobility. Strengthening activities included prone on elbows, prone on extended elbows (with moderate physical assistance to maintain elbow extension), quadruped positioning (maximal assistance to assume and hold position), bench sitting, pull-to-sit from incline wedge, and core/trunk righting activities. Transitional movements addressed rolling between prone, supine, and sidelying, transitioning from sidelying to sit with moderate assistance, prone to quadruped (maximal assistance), sit-to-stand, and floor-to-stand. Neuromotor and balance training included static and dynamic sitting balance, quadruped weight-shifting, and supported standing activities.

The patient engaged in bilateral sidelying play and reaching; prone on elbows on an incline wedge; short sitting in a cube chair with symmetric lower-extremity weight-bearing; and quadruped positioning over a small playground ball to facilitate anterior-posterior weight shifts. The patient tolerated handling well throughout the session and demonstrated improved ability to maintain feet flat in short sitting. In short sitting, she was able to lean forward to reach for toys while stabilizing through the opposite lower extremity. The patient also tolerated prone and supported quadruped for play-based tasks. Caregiver education focused on the continued practice of short sitting, as well as prone on elbows and hands. In addition, the patient’s mother was educated on supported tall kneeling and standing at surfaces with decreased anterior trunk lean while engaging one upper extremity in play and using the other for support.

Visit 4. During this treatment session, physical therapy interventions emphasized improving postural stability, transitional mobility, and proximal strength to address deficits related to hypotonia and poor coordination secondary to PWS. The session incorporated therapeutic activities, neuromuscular re-education, and manual facilitation techniques to promote active engagement and motor control. The patient was positioned prone with elbows and hands supported, receiving moderate to maximal assistance to promote scapular stability, upper-extremity weight-bearing, and trunk extension. Quadruped activities were utilized to facilitate co-activation of the shoulder and pelvis, promoting alignment and endurance in the antigravity position. Transitional mobility training included rolling between supine, sidelying, and prone positions; transitioning from sidelying to sit, prone to quadruped. Transitioning from sitting to standing, and floor to stand transfers were practiced to improve lower extremity strength, symmetrical weight distribution through the pelvis, build endurance, and postural control for mobility. Core activation, as well as static and dynamic sitting balance activities, were emphasized to enhance midline orientation, trunk control, and sustained engagement during play. Overall, the patient tolerated the session well, demonstrating intermittent fatigue and decreasing participation at times.

Upon reassessment of the goals established at the initial evaluation, the patient has shown gradual improvement in proximal control, postural endurance, and tolerance of supported positions. She demonstrates increased ability to maintain upright trunk alignment during sitting with less assistance and improved initiation during facilitated transitions. However, she requires moderate to maximal facilitation for weight-bearing and transitional movements due to persistent hypotonia and varying engagement during sessions.

Visit 5. Upon arrival to therapy session, the patient's mother reports they've been consistently working on short sitting and have attempted tall kneeling, but the patient is not tolerating the position well. Interventions in this session continued to target strengthening, postural control, and transitional mobility. Strengthening activities included prone on elbows, prone on extended elbows, quadruped positioning with maximal physical assistance to assume and maintain, short sitting with attention to symmetrical lower extremity weight-bearing, tall kneeling with support, pull-to-sit from an inclined wedge to facilitate cervical and trunk flexor activation, trunk righting activities, and core activation through play.

Transitional mobility training included rolling between prone and supine, transitioning from sidelying to sitting with moderate physical assistance, moving from prone to quadruped with maximal physical assistance, and practicing sit-to-stand and floor-to-stand transfers with support. Balance and neuromotor training targeted postural stability and functional weight shifting, including dynamic sitting balance activities, quadruped positioning, and anterior-posterior weight shifting over a small playground ball to promote upper and lower extremity weight bearing, and supported standing tasks to enhance lower extremity engagement and upright posture. Home exercise education to the caregiver remains consistent with previous visits, emphasizing short sitting, prone on elbows and hands, as well as, tall kneel and standing with upper extremity support.

Visit 6. The patient's mother reported continued adherence to the home exercise program, focusing on short sitting, sit to stands transitions, and supported standing with neutral pelvic alignment to facilitate lower extremity and core activation. Treatment activities remained consistent with prior visits including prone on elbows and hands, quadruped positioning, short sitting, tall kneeling, trunk righting activities, core activation, transitional movements (rolling between prone and supine, sidelying to sit, sit-to-stand, floor-to-stand), as well as static and dynamic sitting balance, quadruped anterior-posterior weight shifting, and supported standing activities. Additional activities introduced during this session included short sitting to quadruped transitions and cruising along an elevated surface for toy engagement, both of which required maximal physical assistance. The patient showed noticeable improvement with quadruped over the playground ball during play, demonstrating increased upper extremity weight-bearing tolerance and emerging forward movement patterns consistent with early crawling. In contrast, maintaining tall kneeling remained challenging, as the patient exhibited decreased trunk and pelvic stability, requiring moderate to maximal assistance to sustain alignment and prevent anterior trunk lean.

Visit 7. The caregiver reported continued adherence to the home exercise program, with no new concerns. Intervention activities remained consistent with previous sessions, targeting postural stability, proximal strengthening, and functional transitional movements. The patient engaged in static and dynamic sitting balance activities while reaching for toys, as well as bilateral coordination practice using a playground ball for supported throwing and catching. The patient demonstrated improved tolerance to prone on elbows and quadruped over a small playground ball during play. However, sustaining both short and tall kneeling positions continued to be challenging due to an anterior trunk lean and limited pelvic stability. Sit-to-stand transitions showed improvement, with the patient intermittently pushing up from the surface and maintaining standing using one to two upper extremities for support while reaching. The patient demonstrated intermittent distractibility during seated play, frequently attempting to remove her shoes, requiring redirection to the task. Caregiver education emphasized the continued practice of supported standing, with a focus on maintaining neutral pelvic alignment, to promote postural control and lower extremity activation.

Visit 8. This session served as a progress checkpoint. The patient demonstrates gradual improvement in core strength and stability across multiple positions, including short sitting, tall kneeling, and supported standing. However, she continues to experience significant difficulty in quadruped, particularly with pushing up through the upper extremities to assume and maintain the position. Despite this, she is increasingly attempting to pull her lower extremities beneath her, indicating emerging readiness for early kneeling-based crawling. Although the patient has not yet met her short-term or long-term goals, steady progress toward each goal is evident.

Treatment activities remained consistent with those of previous sessions, focusing on postural control, proximal stability, and transitional mobility. The patient required maximal physical assistance to transition from tall kneeling to half kneeling due to difficulty achieving pelvic and trunk alignment. She demonstrated increased initiation of sit-to-stand transitions, using her upper extremities for support, with minimal to moderate physical assistance. As the session progressed, the patient exhibited signs of fatigue and decreased participation, including increased hypotonia and reduced ability to maintain antigravity postures. Caregiver education reinforced the continued importance of supported standing and positioning strategies to promote postural control between sessions. Additionally, the caregiver was instructed in side-sitting play to encourage weight-bearing through one upper extremity while the opposite hand engages in reaching tasks, supporting improved strength and endurance.

Visit 9. The mother of the child reported no new concerns since the patient was last seen and confirmed adherence to home exercises. Treatment remains consistent with previous sessions. The patient exhibited increased fussiness during the floor-to-stand transition with maximal physical assistance but became calm and engaged in play when standing with support. The patient demonstrated improvement in upper extremity strength during this session by independently transitioning from prone on elbows to a prone on hands and weight-shifting to play with toys.

Visit 10. The patient's mother reports they had focused on standing with support since their last visit and playing in a kneeling position. Like previous sessions, treatment focused on strengthening the upper and lower extremities and the core in various developmental positions, enhancing symmetrical strength and endurance through transitions, and improving both static and dynamic balance. During this session, the patient exhibited increased fussiness when completing floor-to-chair and standing-to-quadruped transitions, which required maximal physical assistance. However, she demonstrated improvement with strength and endurance by using upper extremity support for standing play, decreased anterior trunk lean, indicating improved core activation. Upon observation of the patient during standing play, she demonstrated asymmetrical weight-bearing through the lower extremities, with preference toward the right. When tactile cues were applied to the left glute and quadriceps, she was able to assume a more symmetrical weight-bearing position independently.

Visit 11. The patient's mother confirms adherence to home exercises and that the patient is able to roll onto the side and transition into the sitting position independently. Upon arriving to the therapy session, the patient's mother attempted to have her support under the axilla, and she refused to place her feet on the ground. During this session, the Gross Motor Functional Measure-88 was administered to reassess baseline functional mobility at a chronological age of

26 months. Based on observed tasks that were completed, the patient demonstrated foundational mobility skills in lying, rolling, and sitting balance. However, she continues to have significant limitations in postural control, transitional mobility, crawling, kneeling, and walking. These results suggest a lack of coordination, weight-bearing abilities, strength, and balance. Throughout the assessment, she exhibited improved strength and endurance, demonstrating independence with sit-to-stands, using bilateral upper extremities for assistance. She also demonstrated improved tolerance and strength in a prone position by pushing up from prone on elbows to prone on hands, holding for 10-15 seconds. The patient displayed increased fussiness, with maximal physical assistance to facilitate lower extremity positioning, and refused to extend elbows to assume quadruped position.

Visit 12. Since the last visit, the patient's mother reports that adherence to home exercises has been difficult due to increased fussiness from the patient. Patient participated in rolling prone to side-lying to supine, ring sitting, side sitting with weight-bearing through one upper extremity, prone on elbows, side-lying to side sitting, short sitting, supporting standing, quadruped anterior-posterior rocking, floor to tall kneel to half kneel to stand.

A side-to-side whole-body vibration platform was introduced as an adjunct to ongoing physical therapy. The vibration system delivers mechanical oscillations that stimulate muscles, enhance neuromuscular activation, and support antigravity weight-bearing and postural control in children with neuromotor impairments. Gusso S. et al. studied the effects of vibration therapy in adolescents with Down's syndrome; results showed improved performance in the 6-minute walk test, jump efficiency, and lean muscle mass after 20 weeks.[11] A separate feasibility trial in children with cerebral palsy indicated that side-alternating vibration protocols were well tolerated and resulted in measurable improvements in gross motor function and mobility. A feasibility trial by Adaikina A. et al. stated that the use of vibration protocol was well tolerated and showed measurable improvements in gross motor function and mobility in children with cerebral palsy.[1] Given the patient's hypotonia, delayed transitional sills, and limited antigravity strength, the vibration plate was selected to enhance upright tolerance, increase proximal activation, and provide supported weight-bearing opportunities. Parameters were individually adjusted for safety and engagement.

The patient tolerated the vibration platform, starting with sitting on the therapist's lap with her feet placed on the plate. The patient initiated leaning forward to touch the surface with her hands. She then sat on the plate and initiated sit-to-stands. She also demonstrated improved strength and coordination by initiating independent cruising along elevated surfaces to interact with toys. However, she required moderate to maximal physical assistance with the following leg to facilitate placement. The patient required minimal to moderate physical assistance to assume a right-side-lying-to-side-sit position, with maximal facilitation to perform a floor-to-stand transition. She demonstrated improved weight-bearing through the left upper extremity during left-side-seated play but displayed increased difficulty during right-side-sit play, preferring long- and ring-sit positions with trunk rotation.

Outcomes

Following twelve outpatient physical therapy sessions, the patient demonstrated early functional improvements in proximal strength, postural control, and tolerance of antigravity positions. Clinical observations indicated increased tolerance for prone positioning, improved ability to sustain prone positioning with extended elbows, and enhanced upper-extremity weight-bearing during play. Midway through the episode of care, the patient demonstrated improved initiation of sit-to-stand transitions using bilateral upper-extremity support, improved upright trunk control during short sitting, and reduced anterior trunk lean during supported standing.

Improvements were also observed in transitional mobility and seated balance. The patient demonstrated increased independence with side-lying-to-sitting transitions, greater reaching beyond the base of support during seated play, and emerging attempts to pull the lower extremities beneath the body in preparation for quadruped and kneeling activities. Caregiver education was consistently incorporated into treatments, and the patient's mother reported regular adherence to home exercises in most sessions. Introduction of side-alternating vibration therapy was well tolerated and facilitated improved upright tolerance, forward weight-shift initiation, and the emergence of assisted cruising along elevated surfaces.

Standardized outcome measures were not re-administered due to early discontinuation of care prior to planned reassessment. As a result, quantitative post-intervention comparison data are unavailable. However, consistent clinical observations indicate a positive response to intervention, characterized by improved proximal activation, postural endurance, and emerging transitional mobility skills.

Discussion

This case report describes the physical therapy management of a toddler with Prader-Willi Syndrome presenting with significant hypotonia, delayed gross motor development, and limited postural control. Over the course of outpatient intervention, the patient demonstrated early functional mobility. These findings support the role of early, play-based physical therapy to address motor delays associated with PWS and highlight the importance of individualized intervention strategies during early childhood.

Children with PWS commonly exhibit reduced muscle mass, generalized weakness, and impaired postural control, which contribute to delayed acquisition of gross motor milestones. Consistent with prior literature, this patient demonstrated relative strengths in early mobility skills such as rolling and supporting sitting, while exhibiting marked limitations in higher-level motor skills requiring coordinated trunk and extremity activation, including quadruped, kneeling, and standing. These findings align with documented neuromuscular characteristics of PWS and reinforce the need for interventions targeting proximal stability and antigravity strength.

Observed improvements in prone tolerance, upper-extremity weight-bearing, and initiation of sit-to-stand transitions are consistent with evidence supporting task-specific, play-based interventions for children with hypotonia and motor delays. Repeated exposure to developmental positions and transitions likely facilitated improvements in neuromuscular activation and postural endurance. Although independent crawling and ambulation were not achieved during the episode of care, emerging preparatory behaviors, such as weight-shifting and attempts to pull the lower extremities beneath the body, suggest readiness for continued motor skill progression with ongoing therapy.

Caregiver involvement played a critical role in supporting the patient's progress. Consistent caregiver-reported adherence to home exercises likely contributed to skill carryover across environments and reinforced therapeutic gains achieved during sessions. Addressing caregiver confidence and ease of handling is particularly important for children with hypotonia, as motor impairments can significantly impact daily care routines and participation within the home.

Side-alternating vibration therapy was introduced as an adjunct intervention and was well tolerated by the patient. Patient demonstrated improvements in tolerance for the upright position, forward weight-shift initiation, and assisting with cruising following vibration exposure. While evidence supporting the use of vibration therapy in toddlers with hypotonia remains limited, preliminary research suggests potential benefits for neuromuscular activation and weight-bearing. In this case, vibration therapy appeared to complement traditional interventions by enhancing engagement and postural activation.

Limitations should be considered when interpreting the findings of this case report. Standardized outcome measures were not re-administered due to early discontinuation of care, limiting the ability to quantify changes over time. Additionally, findings from a single case may not be generalizable to all children with PWS. Future research should explore longitudinal outcomes of early physical therapy intervention and further investigate adjunct modalities, such as vibration therapy, in young children with hypotonia and genetic neurodevelopmental disorders.

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Table 1.

Positional Exam Findings at Initial Exam

Positional Exam	
Supine	Pt actively moves upper and lower extremities and brings hands to feet. Head remains supported on mat.
Prone	Pt displayed head in midline while POE. Able to lift head to 90 degrees, however, unable to maintain greater than 15-30 seconds before fatiguing. Pt is unable to maintain POE without minPA, prefers to push with left arm over the right.
Sidelying	Pt is able to lay on right and left side, and reach for toys. Pt is able to bring bilateral UE's through full shoulder flexion ROM in sidelying for interaction with toys. Pt is unable to lift head up laterally against gravity or prop onto lower arm or elbow.
Sitting	Pt is able to maintain ring sitting, tailor sitting, and long sitting independently. Pt's preferred sitting is long sitting. Pt does not like to keep legs flexed for ring or tailor sit. For short durations, pt is able to sit upright, however, when fatigued pt exhibits a posterior pelvic tilt while in ring and long sitting. In short seated in a cube chair, pt prefers to sit with knees extended, non-WB through lower extremities. When placed feet flat, pt maintains for 2-3 seconds before extending knees.
Quadruped	Pt unable to maintain position without modPA at stomach. No mucle activation palpated when placed into position. Pt is able to lift head to neutral or horizontal, while in quadruped.
Tall kneeling	Unable to achieve independently. Required modPA to maintain position.
Half kneeling	Not assessed at initial evaluation.
Standing	When placed in standing, patient demonstrates hip and knee flexion and was not willing to place weight through bilateral lower extremities.

Table 1. Summary of findings includes fair tolerance in supine and sitting positions, but limited endurance in the prone position. The patient also demonstrates poor postural control in antigravity positions like quadruped and kneeling. These findings are consistent with hypotonia and delayed postural control.

Table 2.

Transitional Movement Findings at Initial Exam

Transitional Movement Exam	
Rolling	Pt rolls independently from supine to and from prone, prone to and from sidelying to and from supine.
Sidelying to Sit	Patient requires minPA to sit from sidelying bilaterally. Patient's mother reported patient is able to transition independently at home.
Sit to and from Prone	Requires modPA to transition from sitting to prone safely.
Sit to and from Quadruped	Unable to perform, requires maxPA
Floor to Stand	Unable to perform, requires maxPA

Table 2. Summary of findings includes some independence with early transitional mobility, like rolling and sidelying to sit. Patient requires increased assistance for transitions that require antigravity strength and trunk stability. Upon reflection, these findings suggest a significant delay in functional movement and transitional control, which is consistent with the patient's medical diagnosis of PWS.

Table 3.
Gross Motor Skills Expected by Age [2, 4, 19, a]

Gross Motor Skills	
Expected by: (months)	
0-2	[X] Prone, lifts head to 45 degrees, clears airway both directions [X] Supine, actively rotates head to both directions toward stimulus [X] Supported sitting briefly, maintains head in midline for 2-3 seconds [X] Supported standing, demonstrates intermittent hip and knee flexion
3-4	[X] Prone pushes up to forearms with head at 90 degrees [E] Supine, brings hands to midline with active chin tuck: no active chin tuck observed [X] Supine, demonstrates purposeful upper and lower extremity movement [X] Supine, rolls supine to sidelying: performs independently [ ] Pulls to sit without head lag: Initial attempt with elbow support, the patient did not initiate movement to sit up, and the activity was discontinued for safety due to hypotonia. On the second attempt, the patient displayed an extensor thrust pattern and did not assist moving into a seated position. [X] Supported sitting begins to straighten back and align head with body [X] Supported standing begins to actively bear weight on lower extremities
5-6	[E] Prone on elbows weight shifts and reaches for toy: Patient required minPA, did not reach for toy independently in prone [E] Prone pushes up on extended elbows: Patient requires minPA [ ] Prone pivots using lateral trunk flexion [X] Supine brings feet to hands/face [X] Prone rolls to supine [X] Supine rolls to prone [X] Sits with upper extremity propped [X] Ring sits independently: Patient prefers to long sit and avoids keeping legs bent [ ] Supported stand bears weight on lower extremities and aligns trunk with hips: Patient did not accept weight through bilateral lower extremities during supported stand [X] Held vertically, tilted 45 degrees rights head 75-100% of movement cycle
7-9	[X] Sits with equilibrium reactions present in all directions: Patient displays normal righting reactions in multiple directions

[a] [x]=observed, [E]=emerging, [NT]=not tested, [NA]=not age appropriate

Table 3. Outlines the expected emergence of foundational gross motor skills from birth through 16 months, based on established developmental milestone references. Typical motor progression

during this period includes early head control, prone extension, rolling, development of sitting balance, transitional movements, and the initiation of standing and weight-bearing behaviors.[2, 4, 19] These normative expectations provide a framework for comparing the patient's observed performance to age-appropriate motor skills and identifying delays or atypical patterns that inform clinical decision-making to guide intervention planning.

Table 4.

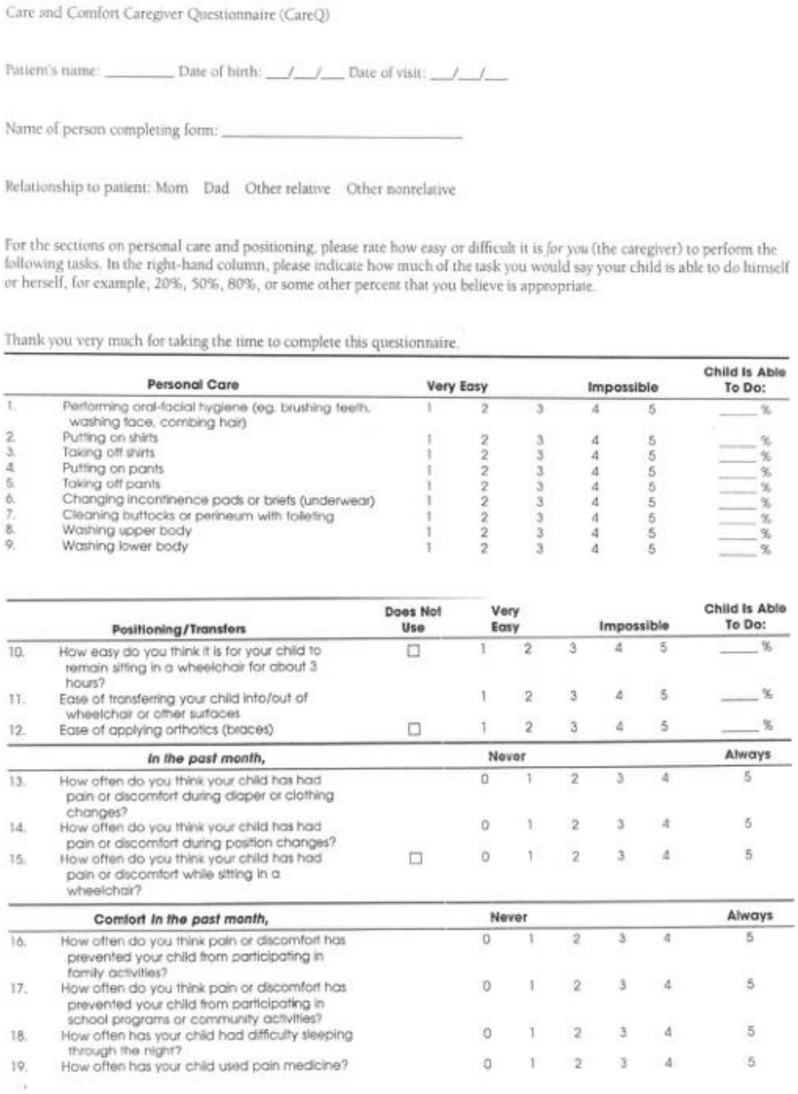
Short and Long-term Goals Established at Intitial Evaluation

Short term goals in 6 weeks	Long term goals in 3-6 months
Patient will maintain quadruped for play for 30 seconds. One out of 3 trials with minPA.	Patient will maintain quadruped independently for play for 1-2 minutes for 2 of 3 trials.
Patient will maintain prone on extended elbows for 30 seconds independently to build upper-extremity strength for crawling.	Patient will demonstrate 75 to 100% improvement in neutral pelvis positioning for 1-2 minutes while sitting for play.
Patient will short sit with symmetrical weight-bearing through bilateral lower-extremities, while maintaining a neutral pelvis, and feet flat for 1-2 minutes while playing.	Patient will transition quadruped to and from tall kneel for 2 of 3 trials independetly.
Patient will transition sit to and from quadruped with minPA for one out of three trials.	Patient will crawal 5 feet with reciprocal pattern independently.
Patient will demonstrate less than 50 percent head lag with pull to sit and active chin tuc k for improved cervical strengthening.	Patient will stand for 20-30 seconds with bilateral upper-extremity support for 2 of 3 trials.
Patient will transition sit to and from standing with upper-extremity support and minPA for increasing strength of bilateral lower-extremitities.	Patient and family will be independent with advanced home exercise program, to continue gains made within therapy.
Patient and family will be independent with initial home exercise program, to maximize benefits of therapy.	

Table 4. Short and long-term goals outlined in this table were established at the initial examination based on the patient's primary impairments in antigravity strength, postural control, and transitional mobility. Short-term goals emphasize supported participation in foundational developmental positions and focus on proximal stability, symmetrical weight-bearing, and cervical trunk activation as required for higher-level mobility. Long-term goals build upon these skills by advancing toward independence with postures, reciprocal crawling, improved pelvic alignment during sitting, and supported standing, which is essential for age-appropriate functional mobility and participation. Including caregiver independence in initial and advanced home exercise programs underscores the importance of carryover across environments.

Figure 1.

Side-alternating whole body vibration plate used as an adjunct to physical therapy intervention. The device provides low-amplitude mechanical oscillations to support neuromuscular activation and antigravity weight-bearing during supported sitting and standing activities.[10]



Care and Comfort Caregiver Questionnaire (CareQ)

Patient's name: _________ Date of birth: ___/___/___ Date of visit: ___/___/___

Name of person completing form: ______________________________

Relationship to patient: Mom Dad Other relative Other nonrelative

For the sections on personal care and positioning, please rate how easy or difficult it is *for you* (the caregiver) to perform the following tasks. In the right-hand column, please indicate how much of the task you would say your child is able to do himself or herself, for example, 20%, 50%, 80%, or some other percent that you believe is appropriate.

Thank you very much for taking the time to complete this questionnaire.

	Personal Care	**Very Easy**			**Impossible**		**Child Is Able To Do:**
1.	Performing oral-facial hygiene (eg. brushing teeth, washing face, combing hair)	1	2	3	4	5	_____ %
2.	Putting on shirts	1	2	3	4	5	_____ %
3.	Taking off shirts	1	2	3	4	5	_____ %
4.	Putting on pants	1	2	3	4	5	_____ %
5.	Taking off pants	1	2	3	4	5	_____ %
6.	Changing incontinence pads or briefs (underwear)	1	2	3	4	5	_____ %
7.	Cleaning buttocks or perineum with toileting	1	2	3	4	5	_____ %
8.	Washing upper body	1	2	3	4	5	_____ %
9.	Washing lower body	1	2	3	4	5	_____ %

	Positioning/Transfers	**Does Not Use**	**Very Easy**			**Impossible**		**Child Is Able To Do:**
10.	How easy do you think it is for your child to remain sitting in a wheelchair for about 3 hours?	☐	1	2	3	4	5	_____ %
11.	Ease of transferring your child into/out of wheelchair or other surfaces		1	2	3	4	5	_____ %
12.	Ease of applying orthotics (braces)	☐	1	2	3	4	5	_____ %
	In the past month,		**Never**					**Always**
13.	How often do you think your child has had pain or discomfort during diaper or clothing changes?		0	1	2	3	4	5
14.	How often do you think your child has had pain or discomfort during position changes?		0	1	2	3	4	5
15.	How often do you think your child has had pain or discomfort while sitting in a wheelchair?	☐	0	1	2	3	4	5
	Comfort *In the past month,*		**Never**					**Always**
16.	How often do you think pain or discomfort has prevented your child from participating in family activities?		0	1	2	3	4	5
17.	How often do you think pain or discomfort has prevented your child from participating in school programs or community activities?		0	1	2	3	4	5
18.	How often has your child had difficulty sleeping through the night?		0	1	2	3	4	5
19.	How often has your child used pain medicine?		0	1	2	3	4	5

Figure 2.

The Care and Comfort Caregiver Questionnaire (CareQ) was used to assess caregiver perceived ease of daily activities such as personal care, positioning, transfers, and the child's comfort. The caregiver rates the level of task difficulty, their child's participation, and the frequency of pain or discomfort experienced while providing care.[13, 15]