

Gross Motor Skill Changes of Children with Developmental Delay, Hypotonia and Pronation Wearing Surestep SMOs

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Figure 1 | Surestep SMO

Introduction

The purpose of this study was to analyze the changes in gross motor skills of children with developmental delay, benign hypotonia and significant pronation who wore Surestep SMOs over a 16 week period. This study compared the rate of change of gross motor skill level of the participants relative to their same-age peers. Surestep SMOs are indicated for children with developmental delay, hypotonia and pronation¹. The Peabody Developmental Motor Scale 2 (PDMS-2)² was used to assess gross motor skill level of the participants and used as the reference for typically developing children. The PDMS is a norm-based test designed to evaluate a child's skill level relative to same-age peers³. It has been evaluated for reliability and validity⁴ and can be used as a global measure of change in motor development⁵.

Method

Twenty seven children were recruited for this study. Five children had an underlying diagnosis, such as Down syndrome, and did not qualify due to non-benign hypotonia. Four children started the study but did not follow through with data collection. Eighteen children (11 males, 9 females) fully participated in this study. Each child presented with developmental delay, benign hypotonia and significant pronation upon weight bearing. Developmental delay was assessed using the PDMS-2. Benign hypotonia was assessed based on the clinician's clinical experience and a lack of an underlying diagnosis. Significant pronation was assessed by measuring and comparing the degree of calcaneal valgus of the participant to typical. Typical calcaneal valgus was determined based on Valmassy's equation⁶: 7 minus the child's age.

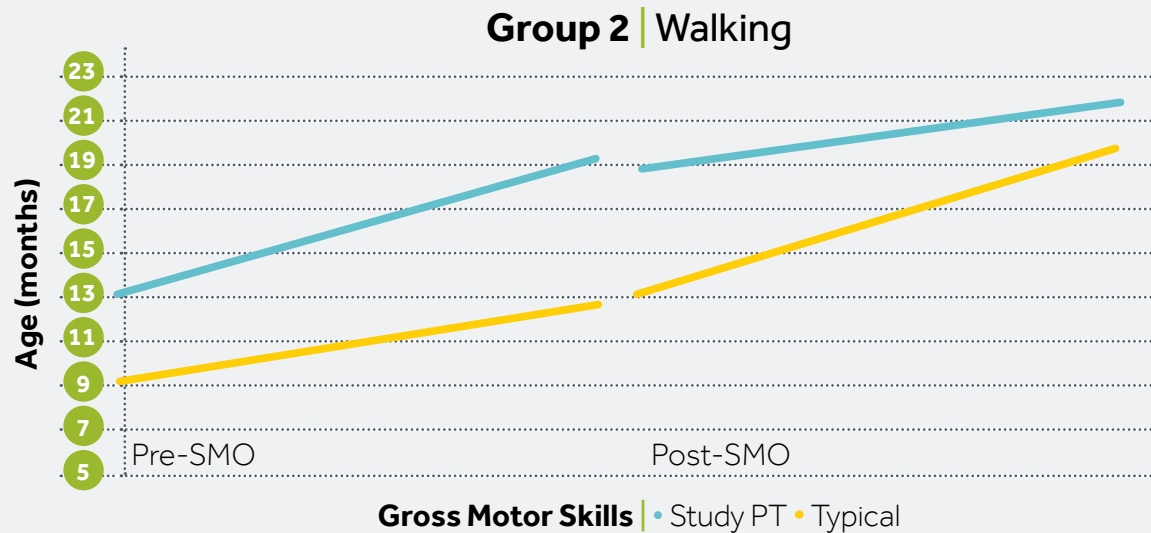
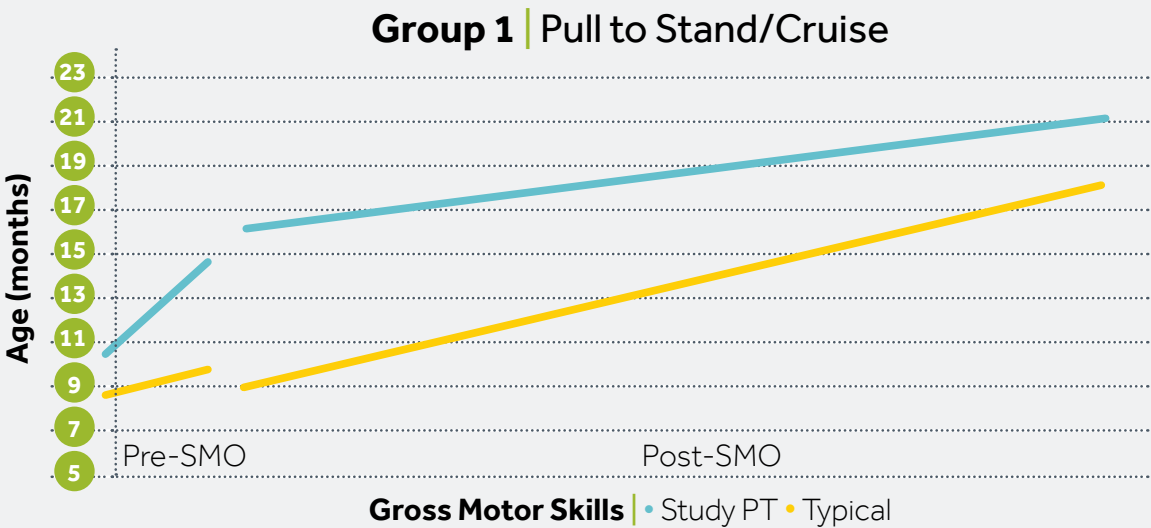
The participants were separated into two groups based on initial gross motor skill level. The first group was pulling to stand and cruising when they were evaluated. The second group was taking independent steps. There were 11 participants in Group 1 (PTS) and 7 participants in Group 2 (Walk). Mean age at initial testing was 15.8 ± 2.1 months and 18.6 ± 2.1 months respectively. Each child was evaluated and fit with Surestep SMOs (Figure 1) by an ABC Certified Orthotist (CO). Video was taken and gross motor skills were assessed for mastery with the PDMS-2 test every 2 weeks for 16 weeks. The age of the participant in months was plotted when a skill was mastered, or when he or she received a score of 2. Item numbers tested included skills from the Locomotion and Object Manipulation subsets. Examples included crawling, standing, walking, squatting, stairs, and kicking. Parent reported data was collected for items that had been mastered prior to the initial evaluation. Data for the participants was compared to the developmental normal, per the PDMS-2, to evaluate the rate of change of gross motor skills mastery for both groups and to compare the participant's skill level to their same-age peers.



> **Results**

Average age of pull to stand was 13.5 ± 2.2 and 13.4 ± 1.5 for Group 1 and 2 respectively. Average age for independent walking was 17.9 ± 2.1 and 18.1 ± 2.0 . Compared to typical, the rate of change for Group 1 was 4 times slower than typical prior to receiving SMOs and was almost 2 times faster than typical after receiving SMOs. The rate of change for Group 2 was almost 2 times slower than typical prior to receiving SMOs and was over 2 times faster than typical after receiving SMOs. The rate of change of gross motor skills gain after receiving SMOs was the same for both groups (0.28 ± 0.1). Figure 2 shows the rate of change for each group pre- and post-SMOs as well as the typical comparisons.

Figure 2
Comparison of the rates of gross motor skill gains of study participants to typical developing children pre and post receiving SMOs for both Group 1 (Pulling to Stand/ Cruising) and Group 2 (Walking).



> **Discussion**

This study suggests that the Surestep SMOs improve gross motor skills and aid children with benign hypotonia, developmental delay and significant pronation by helping them attain the same gross motor level as their peers. The data would suggest that these children master gross motor skills at a faster rate than their peers once they receive Surestep SMOs. Rate of skill acquirement increased for all participants after receiving SMOs when compared to pre-SMO rates as well as typical rates, suggesting that the SMOs do not slow children down and actually help them gain skills faster than typically developing children. The participants in Group 2 who had a pre-SMO rate similar to typical developing children had some of the fastest post-SMO rates, suggesting that even if a child is gaining skills close to a typical rate but are significantly pronated and delayed, he or she will benefit from Surestep SMOs. The study participants represent children that are normally “stuck” on one or more gross motor skills and are having issues progressing due to their foot and ankle alignment and stability along with a lack of proper postural control development. It is important that we evaluate and provide Surestep SMOs to children with developmental delay, hypotonia and pronation as soon as they start to pull to stand to help facilitate development of age appropriate gross motor skills and postural control alongside their peers.

> **References**

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