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Perceived Motor Skill Teaching Competence in Parents of Children With CHARGE Syndrome

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Children with CHARGE syndrome display significant delays in their motor development compared with peers without disabilities. Although individual constraints related to CHARGE syndrome characteristics are often a primary concern for motor development, environmental constraints have been shown to play a contributing role. Specifically, several studies have shown that parents can have a positive influence on the motor development of their children with CHARGE syndrome. However, little is known about parents' motor skill teaching competence. Thus, the purpose of this study was to determine the perceived motor skill teaching competence of parents and how that influenced their child's motor competence. Thirty children with CHARGE syndrome and their parents participated in the study. Each child was assessed on six gross motor skills using the Test of Gross Motor Development-3. Their parents completed a revised version of the Child Movement Skills Research: Parent Questionnaire to determine their perceived teaching competence. Results showed that perceived teaching competence was significantly associated with five out of the six motor skills assessed such that higher teaching competence was associated with higher child motor skill performance. These findings indicate that parents who feel more competence teaching motor skills have a positive influence on their child's motor competence.

Keywords: sensory impairment, gross motor skills, social support

CHARGE syndrome is a low incidence genetic condition impacting 1:10,000–1:15,000 live births that encompasses a variety of major and minor characteristics that impact many areas of the body, including the heart, eyes, ears, and nose (CHARGE Syndrome Foundation, 2024). Typically, children with CHARGE syndrome are deaf or have some degree of hearing loss. For these children, the main etiology, includes sensorineural hearing loss due to damage to the eighth cranial nerve; the inner sensory mechanism, the vestibule; and/or the

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Key Points

- Children with CHARGE syndrome had low levels of competence across all six motor skills.
- Parents of children with CHARGE syndrome felt the most competence teaching their child to run, kick, and throw.
- Parental perceptions of teaching competence were positively associated with their child's motor competence on five out of the six skills.

cochlea/semicircular canals. A sensorineural hearing loss causes the greatest impact to balance and kinesthetic control of one's body in space (Shah et al., 2013). Research supports the notion that damaged or missing vestibular organs work in coordination with vision exacerbate movement patterns, balance, and impact communication efforts (Brown, 2021). Consequently, children with CHARGE syndrome exhibit clear delays in their balance, locomotion, and object control skills (Haibach-Beach et al., 2020; Perreault et al., 2020), and subsequently, motor skill development is of greater importance compared with their peers without CHARGE syndrome.

Within Newell's (1986) model of constraints, motor development is driven by the interaction of individual, task, and environmental constraints. For children with CHARGE syndrome, individual constraints associated with their major and minor characteristics are often emphasized for the delays in their motor development, but social environmental constraints, especially individuals present at home and school, can play a vital role. Unfortunately, physical educators often lack the necessary experience and preparation to adequately instruct this unique population (Lane, et al., 2020; Lieberman, et al., 2012, 2023). However, parents have shown to be a major influence on the motor skill development of children and youth with visual impairments (Beach et al., 2024; Lieberman et al., 2021; Stribing et al., 2024; Stribing, Pennell, et al., 2021), and similar results have been found in children with CHARGE syndrome. In one study, Beach et al. (2021) found that parents of children with CHARGE syndrome participated in motor skills with their child and tracked their child's motor skills more frequently than the parents of peers without disabilities. Interestingly, parents' belief that their child could improve their motor skills or how much they value motor competence did not differ based on whether their child had CHARGE syndrome. In a similar study, Haibach-Beach, Perreault, Lieberman, and Stribing (2021) found that parental ratings of locomotor skill competence and the amount of time they spent engaging with their child in motor skills predicted their child with CHARGE syndrome's ball skills, locomotor skills, and total gross motor skills scores. Although the results of these studies suggest that parental involvement may be beneficial for improving motor competence in children with CHARGE syndrome, it is not clear how competent parents feel they are able to teach their children motor skills.

Lieberman et al. (2021) expanded on this research by examining the feasibility of a home-based 6-week gross motor skill intervention program for children with CHARGE syndrome. Six families with children with CHARGE syndrome were given a Gross Motor Development Curriculum book, videos, tip sheets, and a

variety of equipment to utilize during the home intervention program. Parents kept detailed weekly logs of each practice session and were interviewed postintervention about their experience. Measures of the child's motor competence and parental perceptions of their child's motor competence were taken pre- and postintervention. Overall, the results indicated that it is feasible to apply this protocol to increase gross motor skills for children with CHARGE syndrome; however, the findings also revealed that parents were less likely to teach the motor skills that they were less familiar with, such as the gallop and catch, despite being given resources to assist them with teaching these motor skills. Thus, the children in this study may not have received the full benefits of the home-based intervention since some parents may not have felt competence in teaching all the motor skills to their children.

Although evidence suggests that parents have a positive influence on their child with CHARGE syndrome's motor competence, it is unclear if parents feel competent teaching motor skills to their child and whether their teaching competence has an influence on their child's motor competence. Therefore, the purpose of this study was to determine the perceived motor skill teaching competence (PTC) of parents of children with CHARGE syndrome and its relationship with their child's motor competence.

Method

Participants

The participants were 30 children with CHARGE syndrome and their parents (mother = 19, father = 5, mother and father = 12) from 21 U.S. states and one Canadian province. Within the sample of children with CHARGE syndrome, the average age was 8.23 years (standard deviation = 2.39), the average height was 43.44 inches (standard deviation = 6.09), the average weight was 55.43 pounds (standard deviation = 20.81), there were slightly more females ($n = 17$) than males ($n = 13$), and the majority identified as White ($n = 25$). The children's CHARGE characteristics are available in Table 1.

Instruments

Children's motor competence was assessed using the brief form of the Test of Gross Motor Development-3 (TGMD-3; Brian et al., 2021). We chose to use the brief form of the TGMD-3 because it has good psychometrics properties but is less time consuming to administer than the full version of the TGMD-3. Children with CHARGE syndrome often need much more time to complete the TGMD-3 than children without disabilities due to the complexity and diversity of characteristics associated with the condition. They also become fatigued and lose motivation faster than children without disabilities, so the brief form allowed participants to complete the assessment in one session rather than needing to return for additional sessions. Based on Brian and colleagues' recommendations, the six motor skills chosen for this study were the run, hop, slide, one-arm strike, kick, and overarm throw. The administration procedures and scoring are available in Ulrich's (2019) study. Raw scores range from 0 to 8 for each motor skill, with higher scores indicating higher motor competence. Modifications were provided for specific

Table 1 Children's CHARGE Syndrome Characteristics (*N* = 30)

Characteristics	Category	*n*	Missing
Visual impairment[a] (right eye)	B1 (totally blind)	1	5
	B2 (20/600 and up)	2	
	B3 (20/200–20/599)	8	
	B4 (<20/199)	15	
Visual impairment[a] (left eye)	B1	1	5
	B2	4	
	B3	6	
	B4	15	
Hearing loss[b] (right ear)	Normal	0	2
	Slight	1	
	Mild	1	
	Moderate	3	
	Moderately severe	5	
	Severe	3	
	Profound	15	
Hearing loss[b] (left ear)	Normal	1	2
	Slight	0	
	Mild	2	
	Moderate	3	
	Moderately severe	3	
	Severe	3	
	Profound	16	
Semicircular canals (right ear)	Fully developed	1	8
	Partially formed	10	
	Missing	11	
Semicircular canals (left ear)	Fully developed	0	7
	Partially formed	7	
	Missing	16	
Heart defects	Yes	20	2
	No	8	
Atresia of choanae	Yes	11	2
	No	17	
Growth/development restrictions	Yes	18	4
	No	8	

[a]Visual impairment: B1 = totally blind; B2 = best corrected vision between 20/600 and up (travel vision); B3 = best corrected vision between 20/200 and 20/599 (legally blind); B4 = best correct vision better than 20/199. [b]Hearing loss: Normal = −10 to 15; Slight = 16 to 25; Mild = 26 to 40; Moderate = 41 to 55; Moderately severe = 56 to 70; Severe = 71 to 90; Profound = 91+.

skills based on guidelines for administering the TGMD-3 with children with visual impairments (Brian et al., 2018). The modifications consisted of using specialized equipment (e.g., beeping and bell balls) and the child's preferred mode of communication (e.g., American Sign Language).

Parents' PTC was assessed using a modified version of the Child Movement Skills Research: Parent Questionnaire (Jackson et al., 2012). This measure was originally designed to assess parent perceptions of their child's motor competence for the skills assessed by the TGMD and was later adapted for use with parents of children with visual impairments (Stribing, Stodden, et al., 2021) and CHARGE syndrome (Beach et al., 2021; Haibach-Beach et al., 2021). Due to the lack of available measures for parents' PTC, we chose to adapt this measure because it was focused on parent perceptions and aligned with the skills from the TGMD. For each item, parents were given the following prompt, "How confident are you in your ability to teach a child with CHARGE syndrome ...." This prompt was followed by each of the six skills their child was assessed on (run, hop, slide, one-arm strike, kick, and overarm throw). Parents responded to each item on a 5-point Likert scale ranging from 1 = *no confidence* to 5 = *complete confidence*. A psychometric analysis revealed excellent internal consistency ($\alpha = .956$).

Procedure

The study received ethics approval from SUNY Brockport's institutional review board. The study took place at the 15th International CHARGE Syndrome Foundation conference in Orlando, Florida. Consent from parents and assent from children were obtained prior to data collection. During data collection, each child was tested on the brief form of the TGMD-3 in a large room at the conference venue. The room had adequate space so that the protocol for each motor skill could be carried out accurately (Ulrich, 2019). Appropriate modifications to equipment and/or communication mode were made when needed. Each child was video-recorded on an iPad during testing so that scoring could take place after data collection was complete. While each child was being tested on their motor competence, their parent(s) completed a demographic survey and the PTC questionnaire.

Data Analysis

SPSS version 28 was used to analyze the data. Video recordings of each child were scored by two trained research assistants based on the established protocol. Adequate interrater agreement was achieved for each skill (75%–94% agreement). Descriptive statistics were calculated using raw scores for the children's TGMD-3 and the parents' PTC competence. Next, Spearman rho correlation coefficients were calculated to examine the relationship between the children's motor competence and their parents' PTC competence.

Results

Children's median (*Mdn*) motor competence on the brief version of the TGMD-3 ranged from 0.00 to 2.00. Children scored highest on the kick (*Mdn* = 2.00) and run (*Mdn* = 1.50) and lowest on the slide, hop, overarm throw, and one-arm strike (all

Mdn = 0.00). Parent's *Mdn* PTC ranged from 2.00 to 4.00. Parents were more confident in teaching their child to run, kick, and throw (all *Mdn* = 4.00), and less confident in teaching their child to slide (*Mdn* = 3.00), one-arm strike (*Mdn* = 3.00), and hop (*Mdn* = 2.00).

The results of the correlation analysis are in Table 2. For children's motor competence, the analysis revealed significant positive relationships between all motor skills. Likewise, there were significant positive relationships between parents' PTC scores across all motor skills except for PTC for the kick, which only had significant positive relationships with PTC for the run and overarm throw. When examining the relationship between the children's motor competence and parents' PTC, there were several significant relationships between children's motor competence on the locomotor skills and parent's PTC. Children's motor competence on the run had significant positive relationships with parents' PTC for the hop, slide, and one-arm strike; children's motor competence on the hop had significant positive relationships with parent's PTC for the hop and slide; and children's motor competence on the slide had significant positive relationships with parent's PTC for the hop, slide, overarm throw, and one-arm strike. For the ball skills, children's motor competence on the overarm throw only had a significant positive relationship with parent's PTC for the hop, and children's motor competence on the kick only had a significant positive relationship with parent's PTC for the slide. Interestingly, there were no significant correlations between children's motor competence on the one-arm strike with any of the parent's PTC scores, and parent's PTC for the run and kick had no significant relationships with any of the children's motor competence scores.

Discussion

Physical activity programs focused on motor skill development that incorporates the family can be an effective intervention strategy (Scott-Andrews et al., 2022) with parental involvement recognized as a best practice (Horodyska et al., 2015). Parental involvement is important and effective in motor skill development; however, parents often lack the competence to teach their child motor skills (Lieberman et al., 2021). While parental perspectives of motor competence in youth with CHARGE syndrome have been associated with their child's motor competence, this is the first study to examine parental perceptions of teaching competence with their child with CHARGE syndrome's motor competence.

Similar to previous studies (Haibach-Beach et al., 2019; Perreault et al., 2021), children with CHARGE syndrome in the current study received very low motor competence scores; however, parent PTC was significantly associated with five out of the six motor skills assessed such that low teaching competence was associated with low child gross motor skills. These findings suggest that parents who understand how to teach motor skills are better able to teach their child. Perhaps more interesting are the findings across motor skills, such that two of the skills with the lowest parent PTC, the hop, and slide had significant positive relationships with the most motor skills. Specifically, higher PTC scores for the hop were significantly positively associated with four of the motor skills assessed: the run, hop, slide, and overarm throw, while higher PTC scores for the slide were significantly

Table 2 Correlations Between Children's MC and Parent PTC

	Run MC	Hop MC	Slide MC	Throw MC	Kick MC	Strike MC	Run PTC	Hop PTC	Slide PTC	Throw PTC	Kick PTC	Strike PTC
Run MC	1.00	.69**	.69**	.58**	.73**	.62**	.27	.46*	.47**	.11	−.02	.43*
Hop MC		1.00	.75**	.72**	.54**	.75**	.13	.38*	.38*	.08	−.05	.32
Slide MC			1.00	.82**	.64**	.52**	.28	.47**	.42*	.36*	.19	.44*
Throw MC				1.00	.65**	.50**	.10	.40*	.31	.26	.10	.23
Kick MC					1.00	.57**	.16	.30	.38*	.09	−.12	.25
Strike MC						1.00	−.16	.27	.18	−.25	−.35	.08
Run PTC							1.00	.55**	.73**	.54**	.58**	.57**
Hop PTC								1.00	.91**	.48**	.29	.67**
Slide PTC									1.00	.47**	.32	.66**
Throw PTC										1.00	.79**	.63**
Kick PTC											1.00	.58**
Strike PTC												1.00

Note. MC = motor competence; PTC = perceived teaching competence.
*$p \leq .05$. **$p < .01$.

associated with four of the PTC scores, the run, hop, slide, and kick. While not all the motor skills were associated with PTC scores, notably, the parents PTC scores for the kick and run were not associated with any of the motor skill scores, these results provide further evidence of the importance of the family role in motor development.

Understanding how to teach motor skills to children without disabilities does not necessarily translate to teaching motor skills to children with disabilities. Children with CHARGE syndrome have multisensory needs and muscle laxity along with other cognitive and physical impairments, which delay their motor skill development (Haibach-Beach, Perreault & Lieberman 2021). Parents may restrict their child's opportunities either intentionally or unintentionally by not providing them the opportunities they need to develop their motor skills (Beach et al., 2024). Some parents shield their children from participating fearing possible injuries, or inability on the part of their child (Stribing, Pennell, et al., 2021).

Other parents may encourage their child but may not have the knowledge of how to best teach their child using modified equipment or effective cues and communication for their child (Beach et al., 2024). Previous research on parental involvement of youth with CHARGE syndrome found that parents had lower expectations of their child's motor competence, however, were very involved with their children's participation, including tracking their child's motor skills more regularly than parents of children without disabilities (Beach et al., 2021). Haibach-Beach, Perreault, Lieberman, and Stribing (2021) found that the amount of time parents of children with CHARGE syndrome spent engaging with their child in physical activity was a predictor for gross motor skill scores, further indicating the importance of parental involvement in their motor development.

The limitations of this study relate to the convenience sample and analysis. The participants all attended the International CHARGE Syndrome Conference and therefore may not be representative of all children with CHARGE syndrome, as these parents had the means and ability to attend this biennial event. Another limitation is that the current study had a relatively small sample size. Although CHARGE syndrome is a low incidence disability, a larger number may have yielded more robust results. A limitation to the analysis is that we did not collect demographic information on the parents/guardians beyond their relationship to their child, so we were unable to analyze the data based on parent/guardian demographic variables. Additionally, there is always a risk that multiple comparisons in a correlation analysis may produce false positive results, so our findings should be approached with some caution. Future research should focus on intervention strategies involving parents to determine the direct influence of teaching competence on their child's motor competence. Future research should also examine the perceived motor skill competence of children with CHARGE syndrome and its relationship with their actual motor competence. Last, involving interventions at school with the physical education teacher would also increase knowledge and understanding of the system of motor development in a child's life.

Conclusions

The current study examined the PTC of parents of children with CHARGE syndrome and its relationship with their child's motor competence. The findings indicate that children with CHARGE syndrome have low levels of motor competence across all six motor skills; however, parent PTC had a significant positive influence on five of the six skills their child was assessed on. Although parent PTC was lowest for the hop, slide, and one-arm strike PTC for the hop and slide appears particularly beneficial for many of the motor skills assessed in this study. Overall, the findings of this study provide further evidence that parents are an important social environmental constraint in their child with CHARGE syndrome's motor development. Thus, it is important that parents of children with CHARGE syndrome are properly educated on how to teach their child motor skills so they can help to improve their child's mobility and physical activity participation leading to an enhanced quality of life.

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