Co-existing difficulties in children with persistent speech sound disorders (SSD) and motor speech involvement

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Introduction and aim

Speech sound disorders (SSD) is one of the most common neurodevelopmental disorders and often co-exist with other disorders such as fine-, gross- and oral motor difficulties. Oral motor function in SSD is rarely assessed in clinic or in research.

The overall aim was to investigate and describe orofacial function, speech characteristics, malocclusion, and other co-existing symptoms in children with SSD persisting after the age of six years.

Conclusion

The findings suggest that children with persistent SSD and motor speech involvement are at risk of orofacial dysfunction, malocclusions, general motor difficulties and other neurodevelopmental disorders, and should therefore be screened for co-occurring disorders. Children with SSD and poor orofacial function are at greater risk of malocclusion. An assessment of orofacial function is important when describing the characteristics of children with SSD, as it adds information for differential diagnostics and to ensure appropriate care.

Method

Participants

- 61 children with SSD aged 6:0-16:7 years (mean age 8:5), 14 girls and 47 boys and 44 children with typical speech development (TSD) aged 6:0-12:2 years (mean age, 8:8), 19 girls and 25 boys

Assessments

- Word naming with phonetic transcription of consonants and vowels and a video recording of spontaneous speech was performed for the children with SSD. Perceptual ratings of nasality were included
- Checklist for CAS (Iuzzini-Seigle & Murray 2017) was used for differential diagnostics together with Shriberg's classification system (Shriberg et al., 2010).
- Parents of both children with SSD and TSD completed a questionnaire including anamnestic information.
- The prevalence, type, and severity of malocclusion was registered by an orthodontist.
- Assessment of orofacial function consisted of a screening test (NOT-S) together with measurements of biteforce, chewing efficiency, jaw stability and sensory function.
- Logistic regression analyses were used to describe the relationship between orofacial function and malocclusion in children with SSD.

Results

- All participants with SSD had impaired consonant production to a varying degree (Table 1). Many participants also had impaired vowel production. Half of the participants had deviant nasality.
- All children with SSD were assessed as having motor speech involvement (34 Childhood Apraxia of Speech, 23 Speech Motor Delay, 3 Articulation Impairment and 1 Developmental dysarthria).
- Children with SSD performed poorer than children with TSD, on all orofacial function assessments than children with TSD, especially those involving jaw stability and sensory function (Figure 1 and 2).
- Children with SSD had a higher prevalence of malocclusions (61% vs 29%) and the malocclusions were also rated as more severe.
- In children with SSD, those with poorer orofacial function were at greater risk of malocclusion (Figure 3).
- General motor difficulties and other neurodevelopmental disorders were reported in children with SSD (Table 1).

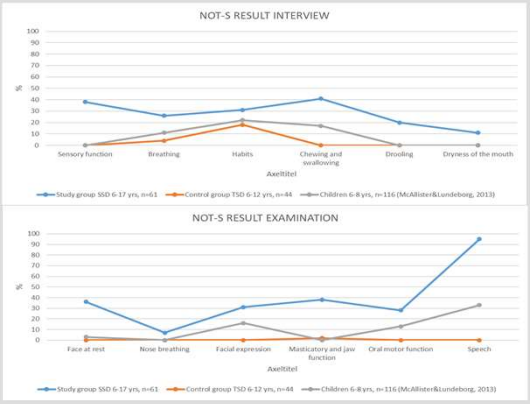

Figure 1. Distribution of NOT-S scores in different domains in children with SSD (n = 61) and children with TSD (n = 44). The results are also compared to 116 TD children, aged six to eight years, from McAllister & Lundeborg (2013).

Table 1. Background data on children with speech sound disorders (SSD) and children with typical speech development (TSD).

Variable	Children with SSD (n = 61)	Children with TSD (n = 44)
Background information		
Age, year:month mean ± SD	8:5 ± 2:8	8:7 ± 1:6
Sex: females/males	14/47	19/25
Confirmed neurodevelopmental disorder n (%)	9 (15)	0
Motor difficulties according to history and /or hypermobility in joints n (%)	34 (56)	4 (9)
Percentage Consonants Correct, mean ± SD	66 ± 22	100 ± 0

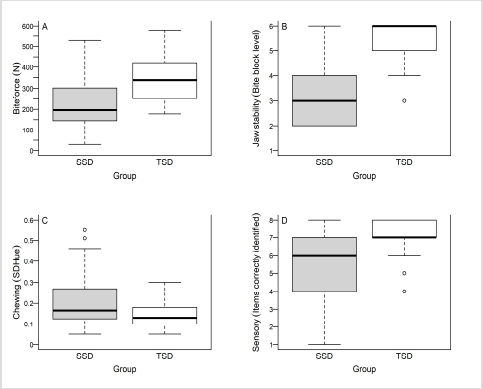

Figure 2. Boxplots describing orofacial function in children with SSD (grey) and children with TSD (white). Boxplots illustrate the 25th and the 75th percentile with the thick black line illustrating the median, the lower and upper whisker's show minimum and maximum values. "Extreme values" are marked as separate circles.

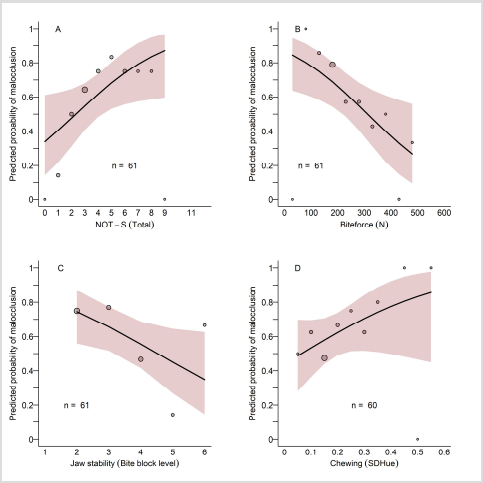

Figure 3. Illustration of the logistic regressions between malocclusion and NOT-S (panel A), bite force (B), Jaw stability (C), and chewing efficiency (D) in children with SSD. In each panel, the logistic regression function has been back-transformed to the probability scale (*y*-axis). The solid black curve illustrates the *output of the logistic regression model* describing the probability of a malocclusion (*y*-axis) for a particular predictor value (*x*-axis). The light red area illustrates the 95% CI around the regression function. The size of the circles are proportional to the number of participants in that group. Note that the logistic regression model was built on the continuous data of the predictor variables. Thus, the regression model aligns with empirical data.

Published articles in this project:

Mogren, Å., Sjögreen, L., Barr Agholme, M., & McAllister, A. (2020). Orofacial function in children with Speech Sound Disorders (SSD) persisting after the age of six years. *International Journal of Speech-Language Pathology*, 1-11. doi:10.1080/17549507.2019.1701081

Mogren, Å., Havner, C., Westerlund, A., Sjögreen, L., Agholme, M. B., & McAllister, A. (2022). Malocclusion in children with speech sound disorders and motor speech involvement: a cross-sectional clinical study in Swedish children. *European Archives of Paediatric Dentistry*. doi:10.1007/s40368-022-00728-4

Mogren, Å., Sand, A., Havner, C., Sjögreen, L., Westerlund, A., Agholme, M. B., & McAllister, A. (2022). Children and adolescents with speech sound disorders are more likely to have orofacial dysfunction and malocclusion. *Clin Exp Dent Res*. doi:10.1002/cre2.602

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