



The Impact of COVID-19 on Speech and Language Development : Linear Mixed Model

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OBJECTIVE

The coronavirus disease-2019 (COVID-19) pandemic has created a new cultural norm where social influences are prevalent. The detrimental effect of speech and language development as a consequence of mask closure and social distancing measures and restrictions in children during the COVID-19 pandemic has been estimated. There are qualitative studies using questionnaire by child-related institutions, guardians, and medical workers that have been conducted. Therefore, this study was performed to investigate impact on subsequent results of speech and language development in children during pre and post COVID period.

METHOD

This retrospective cohort study was conducted between January 1, 2012 and October 13, 2022 in children aged 2 to 8 years who underwent a Preschool Receptive-Expressive language Scales (PRES) evaluation for suspected language development delay. (Pre-COVID-19; from January 1, 2012 to February 29, 2020, COVID-19 pandemic period; from March 1, 2020 to October 13, 2022) Hypoxic brain damage, seizure, premature, autistic feature including autism spectrum disorder and rare genetic disorders were excluded. The language evaluation was conducted using PRES in outpatient. The evaluation for articulation was conducted by Urimal Test of Articulation and Phonology (U-TAP) and Assessment of Phonology and Articulation for Children (APAC). Children's speech and language development were compared using linear mixed model (LMM) statistical techniques.

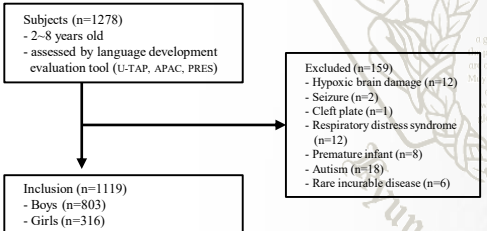


Figure 1. Flow chart of study participants enrollment

RESULTS

1119 children (boy 803, girl 316) were enrolled.

Table 1. Relationship of the impact of COVID-19 with the change of score of language assessment and gender by linear mixed model analysis

	Estimate	Standard error	t-value	p-value
U-TAP word-level consonant accuracy				
Intercept	70.7360			
Pre-COVID-19 (reference)	-			
COVID-19 period	-3.105	1.4160	-2.1920	0.0286
Girls (reference)	-			
Boys	1.646	1.4870	1.1070	0.2687
U-TAP word-level vowel accuracy				
Intercept	87.7128			
Pre-COVID-19 (reference)	-			
COVID-19 period	-2.9434	1.0225	-2.8790	0.0041
Girls (reference)	-			
Boys	0.6143	1.0954	0.5610	0.5751
U-TAP sentence-level vowel accuracy				
Intercept	91.6390			
Pre-COVID-19 (reference)	-			
COVID-19 period	-2.7830	1.0810	-1.5590	0.0105
Girls (reference)	-			
Boys	-1.4000	1.1700	1.1000	0.2326
APAC word-level consonant accuracy				
Intercept	75.2630			
Pre-COVID-19 (reference)	-			
COVID-19 period	-3.5300	1.5230	-2.3180	0.0209
Girls (reference)	-			
Boys	1.3930	1.6200	0.8600	0.3901
PRES receptive language				
Intercept	49.1297			
Pre-COVID-19 (reference)	-			
COVID-19 period	-0.5399	0.9764	-0.5530	0.5805
Girls (reference)	-			
Boys	-3.8775	1.0636	-3.6460	0.0003
PRES expressive language				
Intercept	45.4399			
Pre-COVID-19 (reference)	-			
COVID-19 period	-0.0041	0.9895	-0.0040	0.9967
Girls (reference)	-			
Boys	-3.2399	1.0664	-3.0380	0.0025

Abbreviations: PRES, Preschool Receptive-Expressive language Scale; U-TAP, Urimal Test of Articulation and Phonology; APAC, Assessment of Phonology and Articulation for Children; PCC, Percentage of consonants correct.

The outcomes of articulation were significantly decreased during COVID-19 pandemic period in word-level consonant accuracy (P=0.029), word-level vowel accuracy (P=0.004), sentence-level vowel accuracy (P=0.011) of U-TAP, and word-level consonant accuracy (P=0.021) of APAC, comparing to pre-COVID-19. Comparing pre-COVID-19 and COVID-19 pandemic period, there are no significant differences in PRES receptive and expressive language. However, during the COVID-19 pandemic period, PRES receptive (P=0.0002) and expressive (P=0.003) language development were significantly lower in boys than in girls.

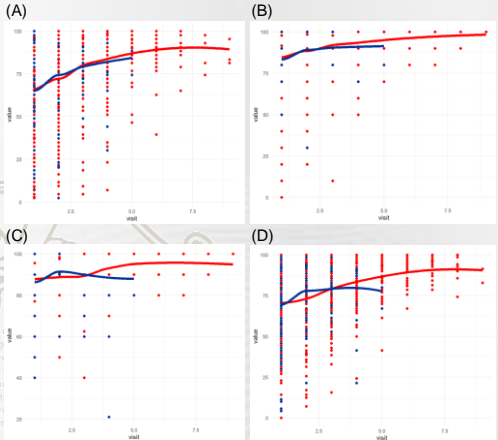


Figure 2. Plots of assessment results per hospital visit to all boys and girls. Red line represents pre-COVID-19. Blue line represents during COVID-19 period; (A) U-TAP word-level consonant accuracy, (B) U-TAP word-level vowel accuracy, (C) U-TAP sentence-level vowel accuracy, (D) APAC word-level consonant accuracy.

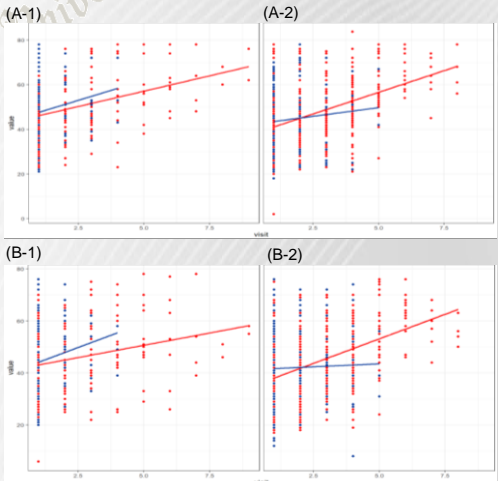


Figure 3. Plots of assessment results per hospital visit for boys and girls. Red line represents pre-COVID-19. Blue line represents during COVID-19 period; (A-1) PRES receptive language for girls (A-2) PRES receptive language for boys (B-1) PRES expressive language for girls (B-2) PRES expressive language for boys

CONCLUSION

The detrimental results of speech and language development in children during the COVID-19 pandemic were investigated. This study suggests that the indirect effects of social distancing and mask closure on the speech and language development of children during the COVID-19 pandemic might be harmful.

