

BACKGROUND

- The COVID-19 pandemic was influential and evidence continues to emerge on it’s long-term impacts, especially on children.¹⁻³
- Reports on developmental impacts have varied with some finding worse outcomes after COVID-19³⁻⁴ while others have seen no differences.⁵
- The Ages and Stages Questionnaire (ASQ-3)⁶ is a pediatric developmental screener which is readily accessible to many general pediatricians.

OBJECTIVES

- Determine whether ASQ-3 screenings at-risk for developmental delays (≤ 1 SD below mean) were different for children affected by the COVID-19 pandemic versus not.
- Ascertain differences in ASQ-3 screening scores for total scores and domain scores for children affected by the COVID-19 pandemic versus not.

METHODS

- Retrospective cohort study at the Child Health Clinic (CHC) at the Children’s Hospital Colorado for a well child check (WCC)
- Inclusion criteria: seen for 24 month (24m) well visit
- Exclusion criteria: incomplete 24m ASQ-3
- Data collected from the electronic medical record included ASQ-3 scores at 24m, patient demographics, birth history, insurance, and head circumferences

Group	Date of Birth (DOB)
Pre-COVID	DOB < 3/1/2018
Transitional	3/1/2018 \leq DOB < 3/1/2020
Post-COVID	DOB \geq 3/1/2020

Table 1. Study Groups. Patients were divided into study groups based on date of birth (DOB).

RESULTS

- Significant differences were seen between study groups when comparing total ASQ-3 scores and most domains, including communication, gross motor, and personal-social. Within fine motor and problem solving, less differences were found.
- The study groups were comparable across sociodemographic variables. Significant differences were seen for age (youngest in Post-COVID group), race (variable), and insurance (greater proportion of private insurance in Transitional group).

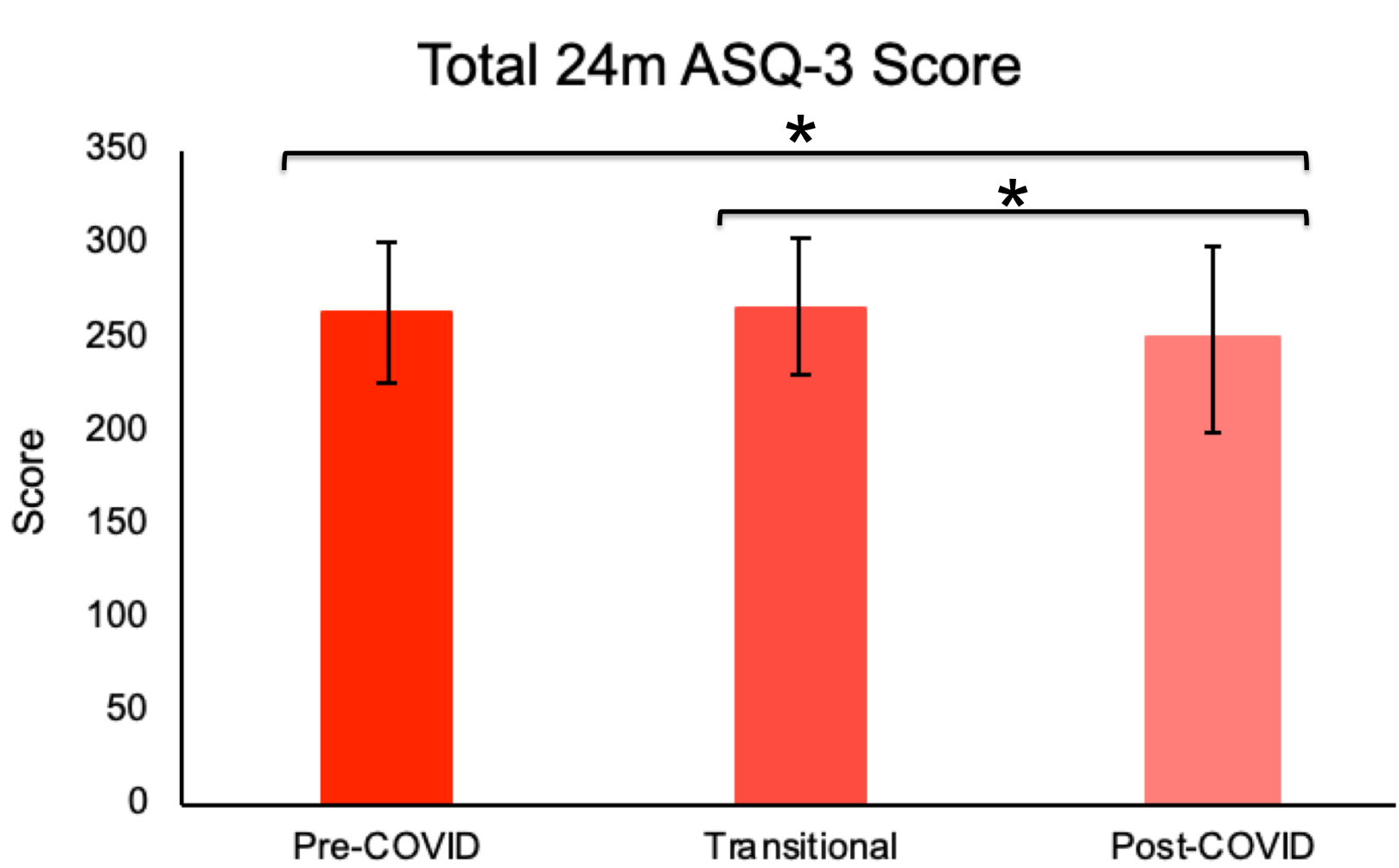


Figure 1. Total ASQ-3 Scores at 24m. Statistically significant differences were seen between the three groups when the post-COVID group was used as a reference group (* $p<0.05$).

	Total n=664	Pre-COVID n=211	Transitional n=263	Post-COVID n=190
Age (months) at 24m WCC, mean (SD)	24.85 (0.7)	25.00 (0.8)	24.82 (0.7)	24.74 (0.6)
OFC percentile at 24m WCC, mean (SD)	57.73 (28.6)	57.40 (28.0)	59.67 (28.7)	55.46 (29.0)
Gestational age (months) at birth, mean (SD)	38.76 (1.9)	38.89 (1.7)	38.80 (1.8)	38.57 (2.4)
Prematurity (< 37 weeks GA), n (%)	60 (9.8)	19 (9.5)	24 (10.3)	17 (9.7)
Birthweight (grams), mean (SD)	3154 (547)	3151 (554)	3173 (506)	3131 (588)
Male Sex, n (%)	303 (45.6)	95 (45.0)	125 (47.5)	83 (43.7)
Hispanic/Latino Ethnicity, n (%)	246 (37.0)	78 (37.0)	89 (33.8)	79 (41.6)
Maternal age (years) at birth, mean (SD)	29.31 (5.8)	29.01 (5.8)	29.04 (6.0)	30.03 (5.5)
Race, n (%)				
White/Caucasian	202 (33.9)	59 (29.9)	96 (41.0)	47 (28.5)
Black/African American	181 (30.4)	64 (32.5)	67 (28.6)	50 (30.3)
Asian	55 (9.2)	23 (11.7)	19 (8.1)	13 (7.9)
American Indian/Alaska Native	6 (1.0)	2 (1.0)	3 (1.3)	1 (0.6)
Native Hawaiian/Pacific Islander	7 (1.2)	3 (1.5)	4 (1.7)	0 (0.0)
Multiracial/Other	145 (24.3)	46 (23.4)	45 (19.2)	47 (28.5)
Primary language spoken, n (%)				
English	531 (80.0)	164 (77.7)	218 (82.9)	149 (78.4)
Spanish	61 (9.2)	23 (10.9)	16 (6.1)	22 (11.6)
Other	72 (10.8)	24 (11.4)	29 (11.0)	19 (10.0)
Child’s insurance, n (%)				
Government-sponsored	513 (77.3)	170 (80.6)	190 (72.2)	153 (80.5)
Private	144 (21.7)	38 (18.0)	72 (27.4)	34 (17.9)
Unknown	7 (1.1)	3 (1.4)	1 (0.4)	3 (1.6)

Table 2. Sociodemographic Characteristics of Study Participants. A total of 664 patients were included in this study with the above demographic characteristics. Limited differences were found between the three study groups with those bolded representing a statistically significant difference.

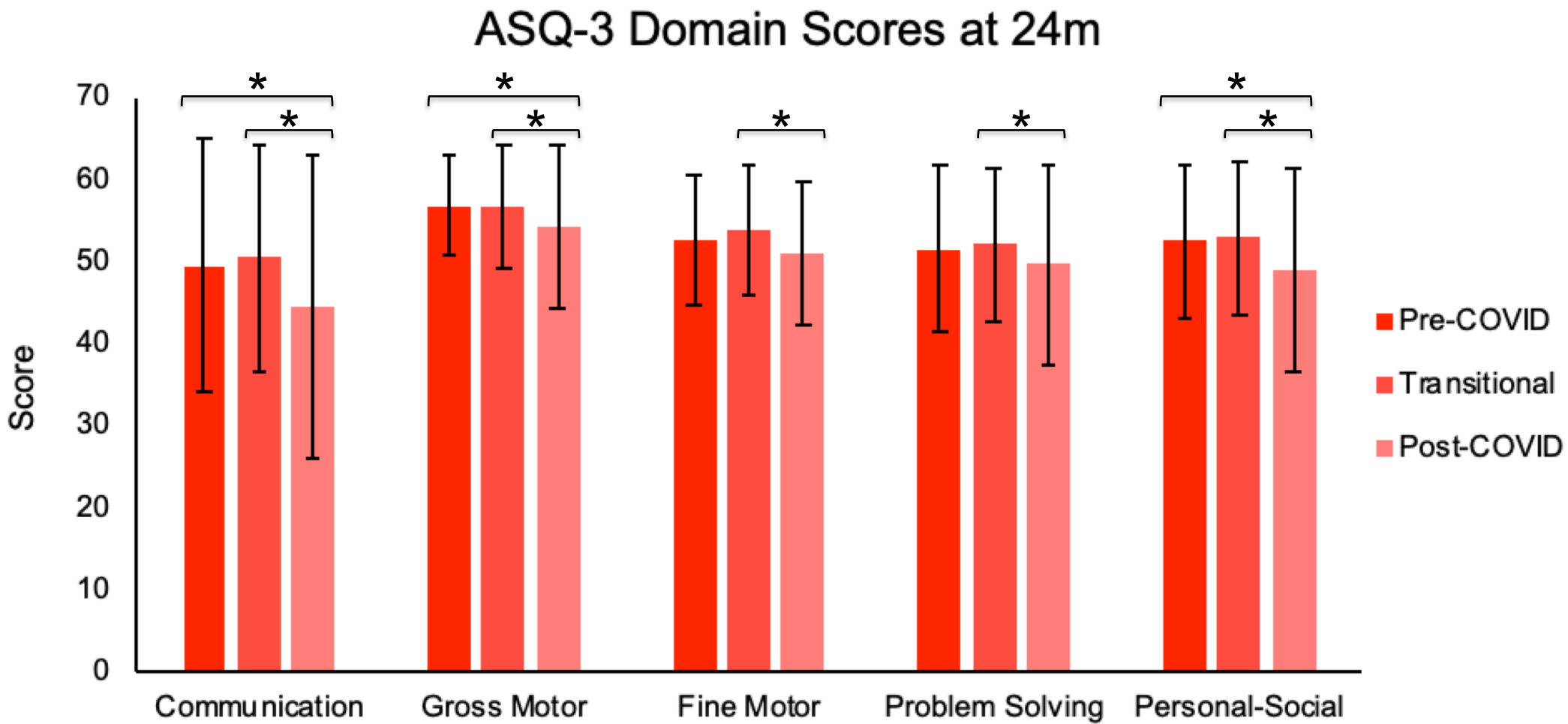


Figure 2. Individual Domain Scores Across Study Groups at 24m. Almost all groups were significantly different from one another within all categories on the ASQ-3, but there was not statistically significant difference between the pre-COVID and post-COVID groups for fine motor and problem solving. Statistically significant differences are indicated with a * ($p<0.05$) and the post-COVID group served as the reference group.

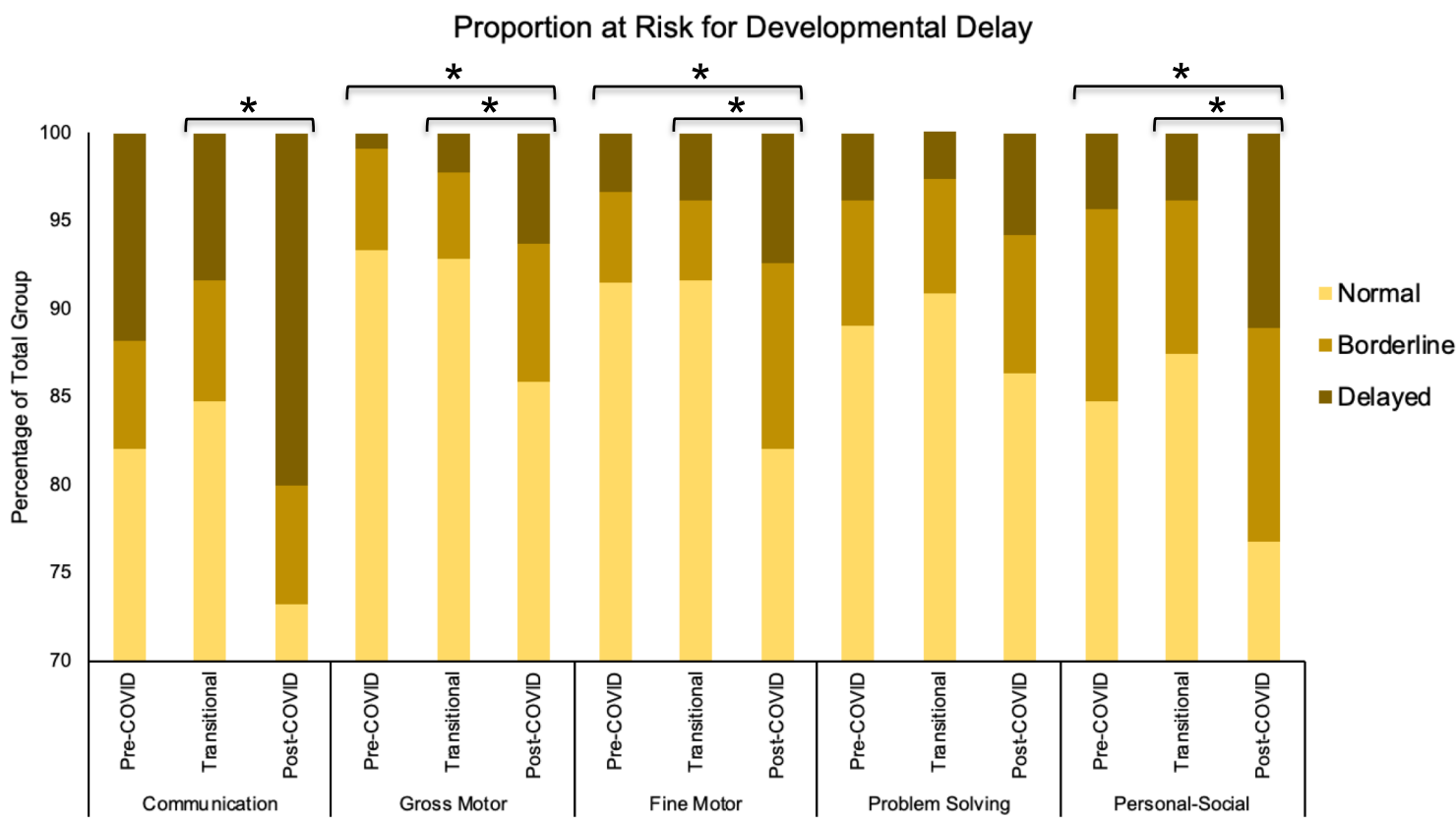


Figure 3. Risk of Developmental Delay Based on Domain Scores. Truncated graph displaying percentage of total group with Normal versus Borderline versus Delayed scores for the ASQ-3 domains. Statistically significant differences were seen between the groups for gross motor, fine motor, and personal-social using post-COVID as the reference group (* $p<0.05$). Within communication, a significant difference was only seen between the transitional and post-COVID group. No differences between groups within problem solving.

- Limited differences were seen between the Pre-COVID and Transitional group.
- More children in the Post-COVID group were at risk for developmental delay.
- No differences among the 3 study groups for delay risk within Problem Solving.

CONCLUSIONS

- There were differences between the 24m ASQ-3 total and domain scores for children born around the COVID-19 pandemic.
- Children born after the pandemic had the lowest total and domain scores. These children also had greatest rates of being identified as at risk for delay by the ASQ-3.
- A greater proportion of children with private insurance in the Transitional group could be indicative of decreased access to care during the COVID-19 pandemic for those with other types of insurance.

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CONTACT INFORMATION

- alyssa.cole@cuanschutz.edu

DISCLOSURES

- No disclosures from any authors.

REFERENCES

1. Ayed, M., Embaireeg, A., Kartam, M., More, K., Alqallaf, M., AlNafisi, A., Alsaffar, Z., Bahzad, Z., Buhamad, Y., Alsayegh, H., Al-Fouzan, W., & Alkandari, H. (2022). Neurodevelopmental outcomes of infants born to mothers with SARS-CoV-2 infections during pregnancy: A national prospective study in Kuwait. *BMC Pediatrics*, 22(1), 319. <https://doi.org/10.1186/s12887-022-03359-2>
2. Davies, C., Hendry, A., Gibson, S. P., Gliga, T., McGillion, M., & Gonzalez-Gomez, N. (2021). Early childhood education and care (ECEC) during COVID-19 boosts growth in language and executive function. *Infant and Child Development*, 30(4), e2241.
3. Hessami, K., Norooznezhad, A. H., Monteiro, S., Barrozo, E. R., Abdolmaleki, A. S., Arian, S. E., Zargarzadeh, N., Shekerdemian, L. S., Aagaard, K. M., & Shamsirsaz, A. A. (2022). COVID-19 Pandemic and Infant Neurodevelopmental Impairment: A Systematic Review and Meta-analysis. *JAMA Network Open*, 5(10), e2238941. <https://doi.org/10.1001/jamanetworkopen.2022.38941>
4. Sato, K., Fukai, T., Fujisawa, K. K., & Nakamuro, M. (2023). Association Between the COVID-19 Pandemic and Early Childhood Development. *JAMA Pediatrics*, 177(9), 930–938. <https://doi.org/10.1001/jamapediatrics.2023.2096>
5. Pinheiro, G. S. M. A., de Souza, R. C., de Oliveira Azevedo, V. M. G., Guimarães, N. S., Pires, L. G., Lemos, S. M. A., & Alves, C. R. L. (2023). Effects of intrauterine exposure to SARS-CoV-2 on infants' development: A rapid review and meta-analysis. *European Journal of Pediatrics*, 182(5), 2041–2055. <https://doi.org/10.1007/s00431-023-04910-8>
6. Sheldrick, R. C., Marakovitz, S., Garfinkel, D., Carter, A. S., & Perrin, E. C. (2020). Comparative Accuracy of Developmental Screening Questionnaires. *JAMA Pediatrics*, 174(4), 366–374. <https://doi.org/10.1001/jamapediatrics.2019.6000>