

Supplementary Table 1: *DYRK1A* phenotypes in this cohort. Pregnancy, birth, and infancy.

Participant	Health issues during pregnancy	Gestation period (weeks)	Birth weight (kg)	Birth complications	Anoxia/Hypoxia	Early infancy	Hospitalisation after birth	History of ear infections	Feeding difficulties during infancy	Tube fed in infancy
1	-	39	2.18	Cyanosis	-	-	-	-	+	-
2	-	40	2.9	Dropping heart rate, emergency c-section	+	Hypertonia	+	-	+	-
3	-	42	2.99	Induced, amniotic fluid contained meconium	+	Hydrocele, cardiovascular problems	+	+	+	-
4	-	42	6.07	-	-	-	+	-	+	-
5	-	Full term	2.85	+	-	Jaundice	+	+	+	-
6	Abnormal ultrasound results	37	2.24	Cyanosis	+	Bradycardia episodes, dairy allergy, vomiting and excreting blood, emergency blood transfusion, intubated	+	-	+	+
7	Abnormal ultrasound results	41	2.32	-	-	Bronchiolitis, ventilated	+	+	+	+
8	Intrauterine growth restriction	40	2.35	-	-	Suspected meningitis, hypertonia	+	-	+	+
9	-	39	3.25	-	-	-	-	+	-	-
10	Gestational diabetes	37	3.01	-	+	Failed hearing test, did not open eyes	+	+	+	-
11	-	41	2.89	-	+	Bathrocephaly, breastmilk intolerance, hypertonia	+	+	+	-
12	Intrauterine growth restriction	37	2.52	-	+	Jaundice	+	+	+	+
13	-	40	2.5	-	+	-	+	+	+	-
14	2 vessel umbilical cord, small gestational age, intrauterine growth restriction	38	2.04	-	+	Silently stop breathing, hypertonia	+	-	+	-
15	Preterm labour at 31 weeks. Bedrest 31 weeks - 39 weeks.	39	6.12	-	+	Pneumonia, hypotonia	+	+	+	-

16	2 vessel umbilical cord, premature rupture of membranes, fever of unknown origin for 1 week at 12 weeks	35	2.52	-	-	Jaundice, hypertonia	+	+	+	+
17	-	37	2.1	-	-	Hypertonia	+	+	+	-
18	-	39	2.95	-	-	Jaundice, hypertonia	+	-	+	-
19	Hospitalised at 25 weeks, bed rest from 25 weeks to 26 weeks	36	2.39	-	+	Colic, frequent infections	+	+	+	+
20	Intrauterine growth restriction	38	1.92	Induced labour	-	Hypertonia & hypotonia	+	+	+	+
21	-	36	3.8	+	-	Hypotonia	-	-	+	+
22	Intrauterine growth restriction	36	2.32	-	-	-	-	+	-	-
23	-	37	1.88	-	-	-	+	-	+	+
24	-	33	2	Umbilical cord complications, discoloured amniotic fluid.	+	Jaundice, respiratory support, hypertonia	+	-	+	+
25	-	39	3.37	Shoulder dystocia, obstructed labour.	+	Jaundice, hypotonia	+	+	+	-
26	-	40	3.18	Umbilical cord wrapped around neck.	-	-	+	+	+	-
27	Abnormal ultrasound results	25	2.15	-	-	Jaundice, hypertonia	+	-	+	+
28	-	37	2.02	Cyanosis	+	Jaundice, hypotonia	+	-	+	+
29	Abnormal ultrasound results	40	2.75	-	-	Hypertonia	+	Inner ear, moderate, hearing aids.	+	-
30	UN	37	2.35	UN	UN	UN	UN	-	UN	UN
31	-	40	3.12	-	-	Hypothyroidism, Hypotonia & hypertonia	+	+	+	+
32	-	37	2.75	-	-	-	-	-	-	-
33	-	40	3.49	-	-	-	-	-	-	-
34	+	40	2.77	-	-	Thrush	-	+	+	-

35	Intrauterine growth restriction	36	1.54	Umbilical cord malformation	-	Assisted ventilation, hypertonia	+	-	+	+
36	+	36	2.03	Caesarean section (2 nd twin), respiratory distress syndrome, cholestasis, blood transfusion	-	Hypertonia	+	-	+	+
37	Excessive amniotic fluid	38	2.1	Excessive fluid, umbilical cord around neck, emergency c-section	+	-	+	+	+	+
38	Intrauterine growth restriction	38	2.32	Elective caesarean	+	-	+	-	+	-

UN = unknown, + = feature present, - = feature absent

Supplementary Table 2: *DYRK1A* phenotypes in this cohort. Physical and medical features.

Participant	Current feeding difficulties	Facial features	Other physical features	Eye anomalies or vision impairments	Glasses	Surgeries	MRI results
1	+	High arched palate, ear anomalies, narrow mouth/thin lips, broad nose/nasal bridge	Long fingers, large gap between big toe and second toe	Myopia, strabismus, superior oblique palsy	+	Adenoidectomy	Microcephaly, small brain stem, asymmetrical skull~
2	+	-	-	Hypermetropia	+	-	Few punctate T1 hyper-intensities adjacent to L frontal horn, no ventriculomegaly or other significant abnormality, mild diffuse white matter, and parenchymal volume loss
3	+	Eye anomalies, ear anomalies, broad nose/nasal bridge	Long fingers and toes	Myopia, strabismus	+	Perforated ear drum surgery, grommets, hernia	Enlarged posterior fossa tentorium elevated, lateral, 3rd, 4th ventricle is enlarged (stable). White matter volume decreased (grey-white matter differentiation is normal). Scattered areas of T2 prolongations in the periventricular and subcortical white matter bilaterally. Cortical atrophy with apparent cerebellar tonsillar absence.
4	-	Eye anomalies, deep set eyes	-	Myopia, astigmatism	+	Dental	Large frontal lobe~
5	-	Micrognathia, overbite, narrow mouth/thin lips, broad nose/nasal bridge, deep set eyes	Hyperconvex left first fingernail, long fingers	Strabismus	-	Tongue tie release, grommets, hernia	Ventricles mildly enlarged and appears slightly dysmorphic squaring of the frontal horns of both lateral ventricles. Patchy high signal on the long TR of both lateral ventricles and adjacent to the occipital horns. Prominent perivascular space adjacent to the occipital horn of the left lateral ventricle.
6	+	Micrognathia, eye anomalies, ear anomalies, narrow mouth/thin lips, thick coarse hair	-	Hypermetropia, astigmatism	-	Fundoplication revision, hernia, feeding tube placement	No abnormal results~
7	+	-	Hair line abnormality, single transverse palmar crease	Hypermetropia, cataract, unusual and weak shapes nerves	+	-	Cerebellar atrophy
8	-	Micrognathia, eye anomalies, deep set eyes	-	Myopia, photophobia, bilateral anterior segment development anomaly	+	-	Abnormal high signal seen peripherally in the left transverse sinus as well as in the superior sagittal sinus as well as near the tentorium on the right with corresponding low signal on the gradient echo sequences. Abnormal signal lies peripherally, and the main central sinuses return normal signal.
9	-	Eye disorders, narrow mouth/thin lips, broad nose/nose bridge	-	Strabismus	-	Hypospadias	No abnormal results~
10	+	Eyes wide set apart, ear anomalies, nose anomalies	-	Myopia, strabismus, nystagmus	-	Grommets, Hernia	1st MRI: Increased white matter 2nd MRI: white matter resolved~
11	-	Pointy nose, prominent eyes	Forward shoulders	Myopia, astigmatism	+	Undescended testes, dental, grommets, adenoidectomy, feeding tube placement hernia	Apparent hypoplasia/volume loss of the brainstem and cervical medullary junction, inflammatory changes of paranasal sinuses and right maxillary effusion.
12	+	Micrognathia	-	-	-	-	No abnormal results~

13	+	Eye abnormalities	-	Hypermetropia, strabismus, optic nerve hypoplasia	+	-	Mega cisterna magna, dysmorphic ventricles, hypoplasia of the optic nerves and chiasma, slight ventriculomegaly, incomplete folding of the right hippocampus, callous commissure of reduced thickness
14	+	Micrognathia, overbite, ear anomalies	Long fingers and toes	Myopia, strabismus	+	Feeding tube placement	Small cranial to facial relationship, consistent with some degree of microcephaly. Incomplete myelination with nonspecific T2 changes in the periatrinal white matter. Mild diffuse parenchymal volume loss, ventricles are now mildly enlarged without signs of obstruction. Stable T2 changes in the periventricular and subcortical white matter.
15	+	Micrognathia, overbite, high arched palate, eye anomalies, ear anomalies, thick coarse hair, long eyelashes	Accessory nipple, small hands and feet, prominent 4th toe, long nails, no palm creases	Hypermetropia, myopia, strabismus, photophobia, optic nerve hypoplasia	+	Repair vascular ring, direct Laryngoscopy/bronchoscopy, myringotomy, frenectomy, dental, esophagogastrroduodenoscopy, excision of L orbital benign cyst tonsillectomy, grommets	Stable tiny focus of magnetic susceptibility in the mesial left occipital lobe, stable small calibre optic nerves and aspherical globes, stable dysmorphic features.
16	+	High arched palate, eye anomalies, ear anomalies, narrow mouth/thin lips, short philtrum, stork bite	pectus excavatum, Contractures of the elbows and 5 th finger, claw toes	Hypermetropia	+	Sinus surgery, ear reconstruction, nasal reconstruction, foot reconstruction	Immature maturation of the myelin~
17	-	Narrow mouth / thin lips, short philtrum	-	Strabismus	+	Grommets, hernia	No abnormal results~
18	-	Underbite, eye anomalies, narrow mouth/thin lips	Broad first toes, 5th finger clinodactyly, inverted nipples, pectus excavatum	Myopia, cortical visual impairment	+	Bilateral otoplasty	Bilateral T2 hyper-intensities within the dorsal brainstem
19	+	Ear anomalies	-	-	-	Tongue tie release, grommets	Hypogenesis of the corpus callosum
20	+	Micrognathia	-	-	-	-	No abnormal results~
21	+	Macroglossia, eye anomalies	-	Myopia, nystagmus	-	Feeding tube placement	No abnormal results~
22	-	Submucous cleft palate, deep set eyes	-	Myopia, optic nerve hypoplasia, cortical visual impairment	+	Grommets, dental	Optic nerve hypoplasia, microcephaly. ~
23	-	Eye anomalies	-	Astigmatism	+	-	Multiple white matter hyperintense flares~
24	+	Broad nose/nasal bridge, eyes close together	-	Hypermetropia	-	Hernia, adenoidectomy	No MRI performed
25	-	Micrognathia, narrow mouth/thin lips	hyperextensibility, pectus excavatum	Strabismus	-	Scoliosis surgery, grommets	No abnormal results~
26	-	Micrognathia, overbite, ear anomalies, metopic ridge, eye anomalies, narrow mouth/thin lips, tall forehead	Left vertical talus, 5th finger clinodactyly, proximally placed thumb, torticollis	Hypermetropia	+	Vertical talus surgery	Microcephaly, reduced grey matter~

27	-	Narrow mouth/thin lips, eyes set close together	-	Strabismus	-	Nissen fundoplication	Hypoplasia of the encephalic tube~
28	+	Micrognathia	-	-	-	-	Ventriculomegaly, ventricular enlargement, ventricular distension~
29	-	Broad nose/nasal bridge	-	Myopia	+	Phimosis, epidermoid cyst nose, hernia, adenoidectomy	No abnormal results~
30	+	Eye anomalies, ear anomalies, narrow mouth/thin lips, short philtrum, thick coarse hair	-	Optic nerves hypoplasia, strabismus, astigmatism	+	Intestine resection surgery, tonsillectomy, feeding tube placement	Microcephaly~
31	+	Micrognathia, overbite, high arched palate, eye anomalies, stork bite, prominent occiput	Torticollis, sacral simple	Myopia, strabismus	-	Tongue and lip tie, grommets	Volume loss in the anterior frontal and temporal lobes. Prominence of the CSF spaces anterior to the frontal and temporal lobes, diffuse cerebral atrophy
32	-	Micrognathia, ear anomalies, eyes wide set apart, thick eyelashes and eyebrows, midface hypoplasia	-	-	-	-	Increase in the supratentorial ventricular system in relation to hydrocephalus of origin to be determined, rest of PND.
33	+	Micrognathia, deep set eyes	-	-	-	Dental, tonsillectomy	Bilaterally but slightly more significant on the right than left, the hippocampal regions show abnormal T2 signal and FLAIR signal, indicating mesial temporal sclerosis in the appropriate clinical setting. Myelination pattern slightly delayed.
34	-	Micrognathia	-	Myopia, scar tissue on macula	+	Hypospadias, cellulitis surgery, grommets	No abnormal results~
35	-	Eye anomalies	-	Hypermetropia	+	Intestinal biopsies	Abnormal results~
36	-	Micrognathia, ear abnormalities, short philtrum	-	-	-	-	Thinning corpus callosum, ventricular dilatation~
37	+	Down slanting palpebral fissures	-	Optic nerve hypoplasia, strabismus	-	Grommets	Ophthalmology report showing hypoplastic optic discs but MRI showing intact midline structures. Significant plagiocephaly. Good grey and white matter diffusion but less gyrification than expected. Optic discs thin. No midline deficits. Corpus callosum intact.
38	+	Narrow mouth/thin lips, thin ala nasi, deep set eyes	Long fingers and toes	Myopia, astigmatism, squint	+	-	Reduced overall brain volume, delayed myelination, no focal lesions or structural abnormalities~

UN = unknown, + = feature present, - = feature absent, ~ = parent report

