

Distance Gradient in Prenatal Dental Development

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In postnatal dental development, and in crown size itself, there is a demonstrable "distance gradient" so that teeth closer together within a jaw quadrant show higher correlations. Thus, adjacent teeth exhibit systematically higher communality in both tooth formation and crown size than more remote teeth in the same quadrant, despite absolute differences in formation (calcification, root elongation, and movement) and in crown size (specifically the mesio-distal crown diameter) (S. M. GARN, A. B. LEWIS, and R. S. KERESKY, *J Dent Res* **44**: 350-354, 1965 and **46**:1481, 1967; S. M. GARN, C. G. ROHMANN, T. BLUMENTHAL, and F. N. SILVERMAN, *Amer J Phys Anthropol* **27**:75-82, 1967).

We applied this analytic model to intraindividual correlations of tooth stage in the 20 deciduous teeth of 52 male and female embryos in the 14 to 58 mm size range; all embryos were macroscopically and histologically "normal" (A. R. BURDI, S. M. GARN, and R. L. MILLER, *J Dent Res* **49**:889, 1970.) By first separating the correlations according to sex, and then combining them and pooling correla-

tions according to degree of proximity, the hypothesis of a distance gradient was confirmed.

As indicated in the table, adjacent teeth showed the highest developmental correlation, teeth separated by one intermediate tooth showed lower mutual correlations, teeth separated by two teeth showed still lower correlations, and deciduous teeth separated by three intervening teeth showed the lowest correlations. This "distance gradient" was true for maxillary and mandibular teeth, and for both male and female embryos although intraembryo correlations were systematically higher for female embryos. Overall, the values of r dropped by 0.04 for each intervening tooth. Adjacent teeth of the same morphologic class (deciduous incisors or deciduous molars) were only slightly higher in developmental communality than adjacent teeth of different morphologic classes (eg, deciduous canine and deciduous first molar).

This preliminary analysis, restricted to the 14 to 58 mm embryo, confirms the applicability of analytic models borrowed from postnatal dental development, and indicates that anatomic "distance" is a useful structuring principle in both prenatal and postnatal developmental time. Closer developmental communality between teeth of a single morphologic class appears to be, for the most part, a product of minimal distance.

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TABLE
DISTANCE GRADIENT IN PRENATAL DENTAL DEVELOPMENT

Type of Correlation	No. of Intervening Teeth	Intraquadrant Developmental Correlations				Combined r
		Males		Females		
		r_s	r	r_s	r	
Maxilla						
Intraquadrant	0	4	0.903	4	0.952	0.932
Intraquadrant	1	3	0.834	3	0.919	0.883
Intraquadrant	2	2	0.735	2	0.901	0.837
Intraquadrant	3	1	0.740	1	0.883	0.824
Mandible						
Intraquadrant	0	4	0.917	4	0.943	0.931
Intraquadrant	1	3	0.831	3	0.887	0.862
Intraquadrant	2	2	0.774	2	0.831	0.804
Intraquadrant	3	1	0.701	1	0.862	0.795
Intraclass adjacent	0	4	0.923	4	0.954	0.941
Interclass adjacent	0	4	0.896	4	0.938	0.919

All values of r are derived from mean z transformations of r , and are based on the number of correlations shown.