

## Correspondence

### Reply to Henthorn and Deutsch:

# Ethnicity Versus Early Environment: Comment on 'Early Childhood Music Education and Predisposition to Absolute Pitch: Teasing Apart Genes and Environment' by Peter K. Gregersen, Elena Kowalsky, Nina Kohn, and Elizabeth West Marvin [2000]

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#### To the Editor:

Drs. Henthorn and Deutsch have selectively analyzed our data and omitted a key factor in their analysis. A full analysis of our data does not support their conclusions.

As shown in our original report [Gregersen et al., 2001], as well as by the work of others [Baharloo et al., 1998], two factors are associated with the development of AP: (1) the age at which formal musical training is begun and (2) exposure to "fixed do" training before the age of 7. Therefore, any difference between the prevalence of AP among subgroups of Asian subjects must take account of these two factors. We have investigated the association of these two factors among Asians with or without an Asian childhood in our study populations. For this analysis we included only Chinese, Korean, and Japanese subjects with childhoods in Asian countries ( $n = 48$ ) compared with those in the same ethnic groups who grew up in North America ( $n=19$ ). The age of onset of formal musical training was slightly earlier in those with childhoods in Asia (6.1 years vs. 6.4 years), but this difference was not significant ( $P=0.4$ , Wilcoxon rank). However, as shown in Table I, there was a strikingly increased risk of exposure to early fixed do training among Asians who grew up in an Asian country, with  $OR = 11.79$  (95% CI 1.45–95.88,  $P=0.0066$ , Fisher's exact test), compared with Asians spending their childhood in North America.

Similar associations are observed when the Chinese, Korean, and Japanese groups are analyzed separately. The rate of early fixed do training among Caucasians (5.9%) was similar to the rate in Asians who grew up in North America (5.5%). Furthermore, a multivariate analysis among Asians fails to support a strong independent effect of Asian childhood in the development of AP when exposure to fixed do training is taken into account ( $P > 0.1$ ). To the extent that such an effect can be found, it is among Koreans and not in Chinese or Japanese. However, the numbers of subjects are small in these subgroups; therefore it would require a much larger study to provide support for an independent effect of the location of childhood upbringing on the development of AP in Koreans. For those wishing to explore these data further, the primary dataset is available at <http://www.nslj-genetics.org/ap/>.

Thus, as we stated in our original report [Gregersen et al., 2001], a full data analysis reveals that age of music training and exposure to fixed do training before age 7 are the only factors that strongly predict

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TABLE I. Distribution of Exposure to Fixed Do Training by Age 7 in Asian Music Students (Chinese, Japanese, or Korean), According to Where Early Childhood Was Lived

	Fixed do training by age 7 <sup>a</sup>	No fixed do training
Asian childhood	19	29
Childhood in N. America	1	18

<sup>a</sup>Criteria for fixed do training as described in Gregersen et al. [2001].

the development of AP. This is true in both Asians and Caucasians. Of course, these data reflect associations and do not prove causation. For example, it is possible that the presence of AP in a child may provoke parents to provide music lessons early in life, rather than the reverse. Since the development of AP is more highly valued as a pedagogical goal in many Asian countries, it is difficult to say what aspect of Asian culture leads to the higher rates of AP that have been observed in Asian music students overall. Language exposure could play a role, but certainly there are many other factors to be considered. We note that Deutsch et al. [2006] have recently confirmed the higher rate of AP in Chinese music students, and in that study ascribe this to exposure to tonal language early in life. However, they did not adjust their analysis for exposure to early fixed do training, and thus we question the strength of the conclusions from that study as well.

A second issue raised by the comments of Henthorn and Deutsch concerns the use of the term “ethnicity” and its relation to the genetic differences between ethnic groups. In our view, “ethnic” differences encompass all the cultural, environmental, and genetic differences that can be found between the major population groups, and are certainly not limited to genetics. Indeed, these cultural biases may extend to Asian families living in North America. Overall, Asian ethnicity does

show some association with AP in our dataset, independent of type and age of onset of music training. As Henthorn and Deutsch point out, some investigators have interpreted our findings to mean that genetic differences account for the different prevalence rates of AP among Asians and Caucasians. Although this is possible, we do not think that this is a likely explanation. It is much more plausible that cultural factors lead to the selection of subjects with AP to pursue advanced musical training in Asian families and communities. We do not view ethnic differences in AP as strong evidence for genetics. Rather, it is the familial aggregation of AP that provides evidence of genetics, as we and others have consistently observed [Baharloo et al., 1998, 2000; Gregersen et al., 2001].

Thus, we believe that the current evidence does not support a strong role for *either* genetics or tonal language exposure as an explanation for the higher rates of AP in Asian musicians compared with Caucasian musicians. Based on strong familial aggregation, genetic factors are likely to play a role in both ethnic groups. Based on the current data analysis, the role of tonal language exposure remains to be established.

## REFERENCES

- Baharloo S, Johnston PA, Service SK, Gitschier J, Freimer NB. 1998. Absolute pitch: An approach for identification of genetic and nongenetic components. *Am J Hum Genet* 62:224–231.
- Baharloo S, Service SK, Risch N, Gitschier J, Freimer NB. 2000. Familial aggregation of absolute pitch. *Am J Hum Genet* 67:755–758.
- Deutsch D, Henthorn T, Marvin E, Xu H. 2006. Absolute pitch among American and Chinese conservatory students: Prevalence differences, and evidence for a speech-related critical period. *J Acoust Soc Am* 119:719–722.
- Gregersen PK, Kowalsky E, Kohn N, Marvin EW. 2001. Early childhood music education and predisposition to absolute pitch: Teasing apart genes and environment. *Am J Med Genet* 98:280–282.