INTRODUCTION

Mandibular plane angle (MPA) is used clinically to diagnose malocclusion and dysmorphology and assess treatment. Numerous cephalometric systems use MPA to categorize individuals into facial types. Accurate models of ontogenetic change in MPA will maximize the efficacy of orthodontic treatment by elucidating normal variation in MPA at different time points. Change in MPA captures several aspects of mandibular and craniofacial development, including mandibular growth rotation and changing anterior and posterior facial heights, resulting in considerable variation between individuals in the rate and magnitude of growth-related change in the MPA. Previous studies demonstrate a tendency for MPA to decrease during childhood and adolescence (1–3), although the timing and rate of these changes vary by study. To evaluate patterns of growth-related change, we examine MPA using cephalometric data compiled from six longitudinal studies of human growth and development.

METHODS

Study Sample: 7,026 lateral cephalographs from 728 individuals (366 males, 362 females)

- Exclusion criteria: Low quality cephalographs with unobservable sella
- Inclusion criteria: One cephalograph between ages 6 and 9 and one cephalograph between ages 15 and 21 per individual
- Eight cephalographs per individual for growth modeling

Assessment: MPA is the angle between the sella-nasion plane and the gonion-menton plane

- Adult facial type determined by MPA from cephalograph closest to 18 years of age
- Hyperdivergent: MPA > 38°
- Normodivergent: 38° ≥ MPA ≥ 29°
- Hypodivergent: MPA < 29°

RESULTS

Mean MPA at age 6 and annual change in MPA differ significantly by adult facial type.

The pattern of MPA growth-related change varies by adult facial type.

<table>
<thead>
<tr>
<th>Adult facial type</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPA at age 6</td>
<td>Hyper</td>
<td>Normo</td>
</tr>
<tr>
<td></td>
<td>42.8°</td>
<td>36.7°</td>
</tr>
<tr>
<td>Mean annual change</td>
<td>-0.14°</td>
<td>-0.35°</td>
</tr>
<tr>
<td>MPA at age 18</td>
<td>41.7°</td>
<td>33.1°</td>
</tr>
<tr>
<td></td>
<td>41.9°</td>
<td>33.4°</td>
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</tbody>
</table>

CONCLUSIONS

- Multiple patterns of craniofacial growth can produce a hyper-, normo-, or hypo-divergent adult facial type
- Differences in MPA early in development, overall change in MPA during growth, and the timing and rate of change in MPA all differ by adult facial type
- MPA early in development is not necessarily consistent with adult facial type
- Individuals with large MPA in childhood and adolescence may not require early orthodontic or surgical intervention to reach a normo-divergent adult phenotype
- Large and diverse longitudinal samples such as the MU Craniofacial Growth Study are needed in the construction of craniofacial growth standards

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REFERENCES