



An Examination of the Craniofacial Morphology of Adult and Juvenile Individuals with Class II Malocclusions

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Introduction

- A malocclusion is the misalignment of the teeth or jaws that is considered clinically abnormal.
- Proper alignment of the teeth and jaws is important because it not only creates a harmonious aesthetic among the features of the face but is also necessary for optimal function of the craniofacial complex and to prevent pain.
- Patients with severe malocclusions are more likely to develop TMD (temporomandibular joint dysfunction), have limited masticatory function, or develop obstructive sleep apnea (OSA) Performing treatment while dentofacial growth is still occurring is ideal because it allows for the dentofacial complex to 'grow into' the orthodontic corrections being made since the teeth more readily move during adolescence.
- This project aims to address two research questions:
 - How does craniofacial morphology differ among adult individuals with different types of Class II malocclusion and those with no malocclusion (Class I)?
 - Are morphological differences present during childhood to identify future malocclusion at early ages?

Materials

	Class I, D0	Class II, D0	Class II, D1	Class II, D2	Total by sex
Females	125	77	12	37	251
Males	130	60	16	28	234
Total by classification	255	137	28	65	485

Table 1: Adult sample size broken down by sex and malocclusion classification.

- Lateral Cephalograms were obtained from the Craniofacial Growth Consortium Study (originating from 6 historical North American growth studies
- Individuals primarily of European ancestry
- Each individual had two cephalograms: one during childhood (ages 4-6) and adulthood (ages 16-21)

Methodology

- Individuals were categorized into Classes and Divisions based on morphology of adult cephalogram:
 - Class:** anteroposterior relationship of maxilla and mandible, quantified by ANB angle
 - Class I: ANB angle between 0 and 4 degrees
 - Class II: ANB angle >4 degrees
 - Division:** orientation of maxillary incisors, quantified by MIA (maxillary incisor angle)
 - Division 0: MIA between 96 and 108 degrees
 - Division 1: MIA >108 degrees
 - Division 2: MIA <96
- This resulted in four categories:**
 - Class I (control group)
 - Class II Division 0
 - Class II Division 1
 - Class II Division 2
- Craniofacial morphology was quantified based on 8 angular and 9 linear measurements in the face
- Measurements were compared among malocclusion groups using ANOVA and post-hoc tests, statistical significance indicated at $p < 0.05$ level

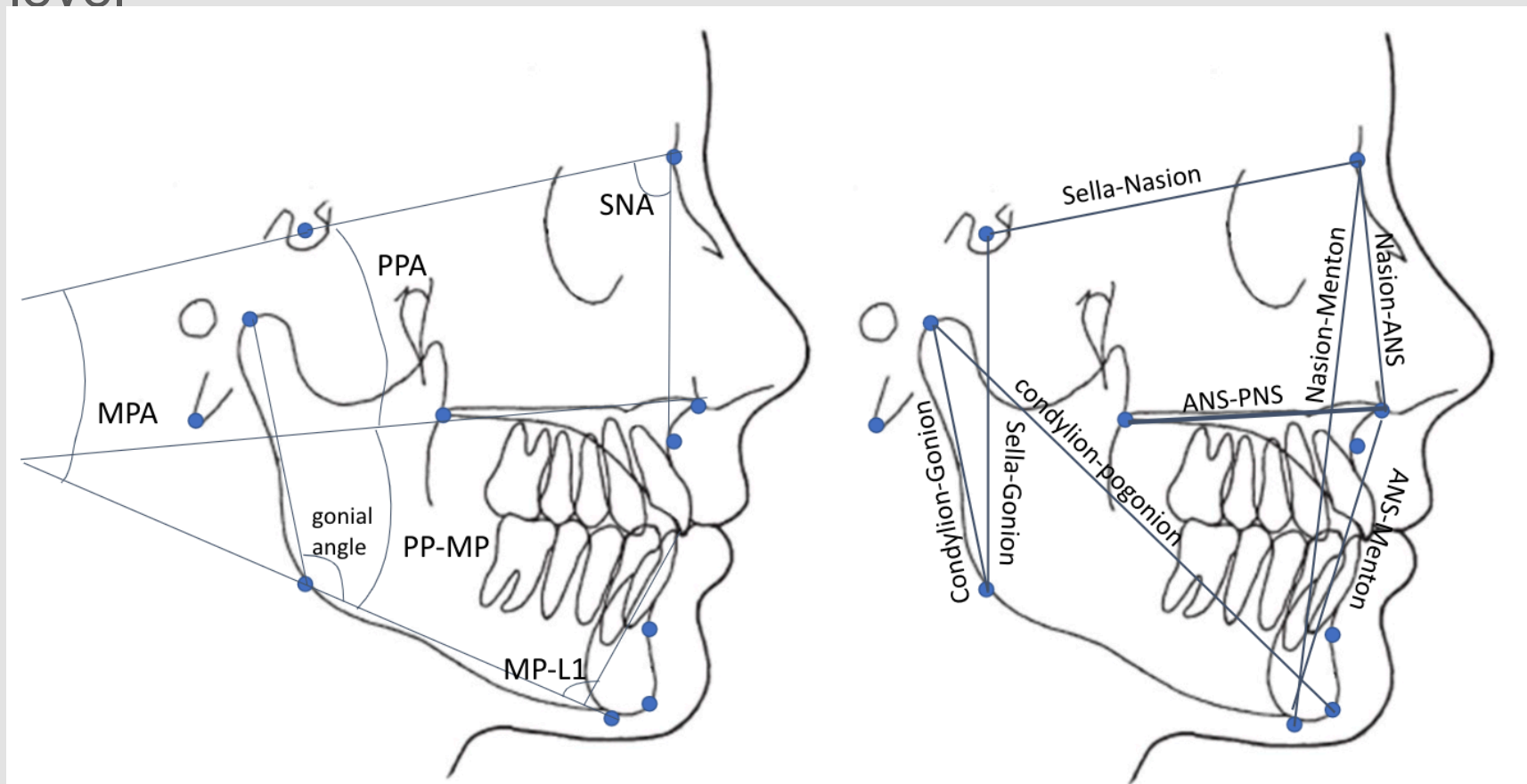


Figure 1: Measurements analyzed in this study. a) angular measurements, b) linear measurements.

Results

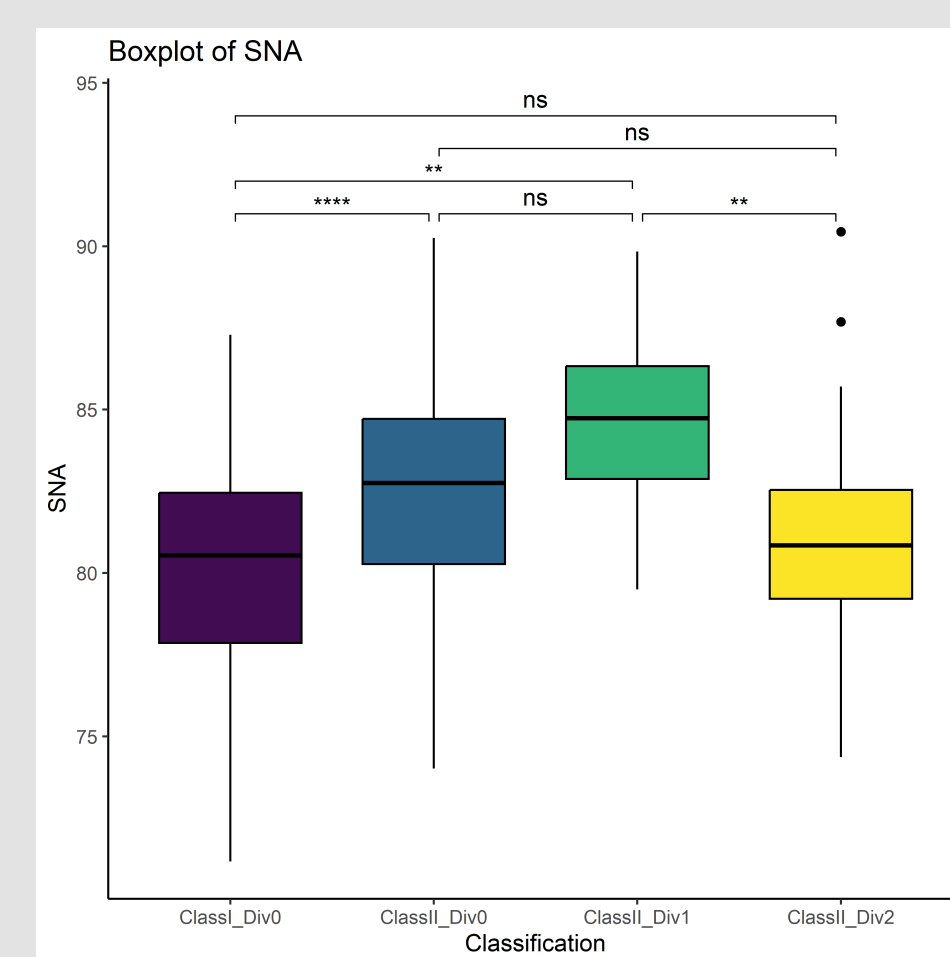
		Childhood Classification		
Females		Class I	Class II	Class III
Adult Classification	Class I	53	70	2
	Class II	11	115	0
Males		Class I	Class II	Class III
Adult Classification	Class I	33	95	2
	Class II	11	93	0

Table 2: Results indicating number of subjects and their respective occlusion/malocclusion in both childhood and adulthood.

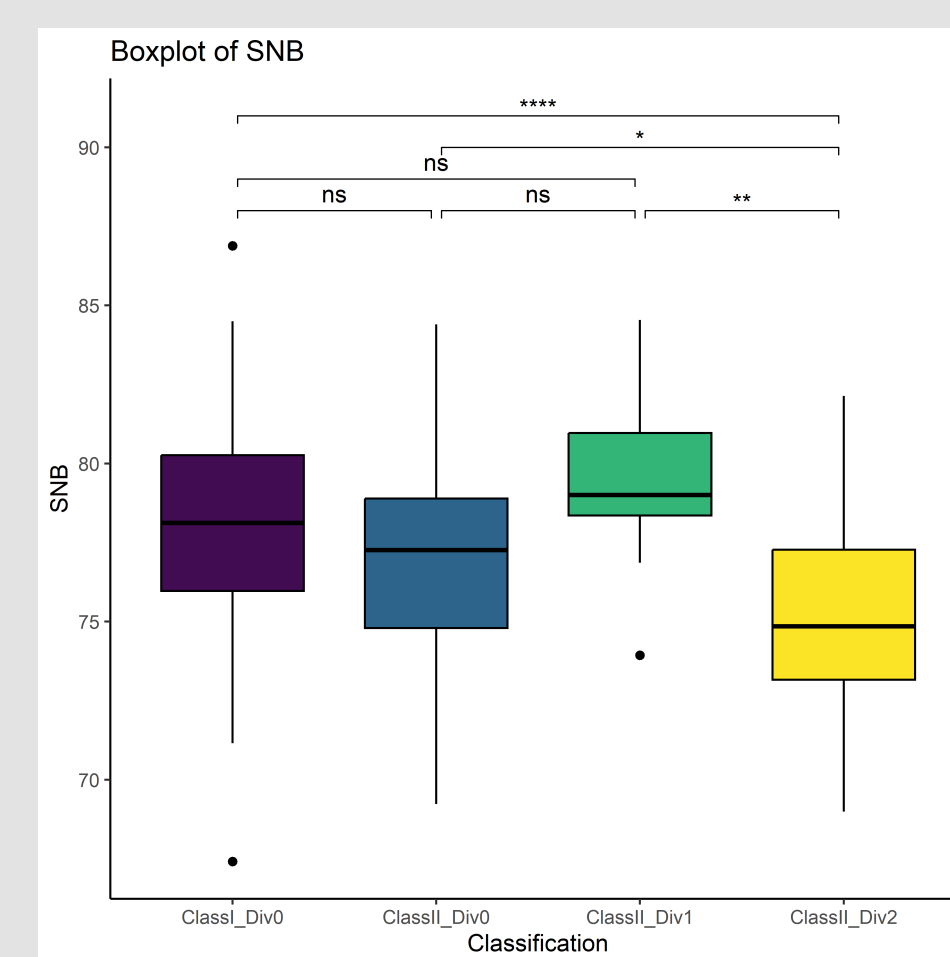
	Anteroposterior face measurements				Vertical Face Measurements								Incisor Angle		Cranial Base Measurements		
	SNA	SNB	Co-Po	ANS-PNS	MPA	PPA	PP-MP	N-M	N-ANS	ANS-M	Gonial Angle	S-G	Co-Go	LIA (MP-L1)	NSB Angle	S-N	B-S
Juvenile Females	S	NS	NS	S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NM	NS	NS	NS
Adult Females	S	S	S	S	NS	S	NS	NS	NS	S	NS	NS	NS	S	NS	NS	NS
Juvenile Males	S	S	NS	NS	S	NS	S	NS	NS	NS	S	NS	NS	NM	NS	NS	NS
Adult Males	S	S	NS	S	S	S	NS	S	S	NS	NS	NS	NS	S	NS	NS	NS

Table 3: Results from ANOVAs comparing measurements among malocclusion groups. S = significant ($p < 0.05$), NS = not significant ($p > 0.05$), NM = not measured.

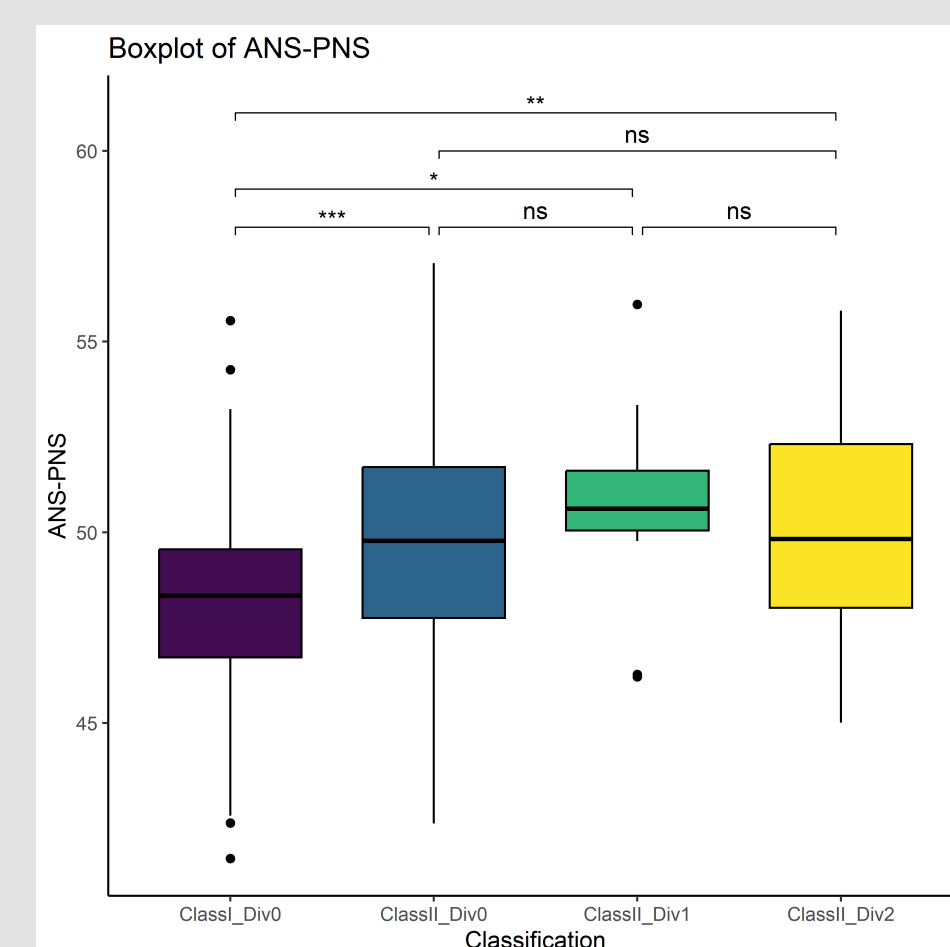
Adult Female Box Plots



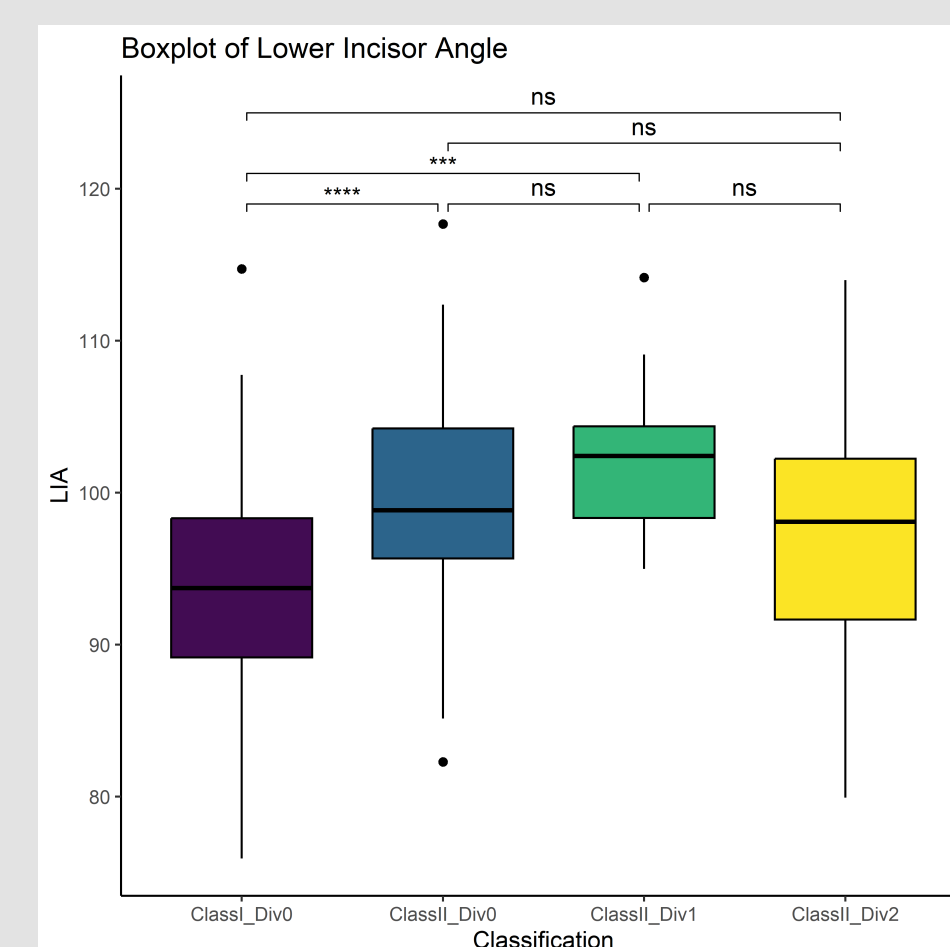
SNA: CII,D0 and CII,D1 have a larger SNA compared to the control group



SNB: CII,D2 has a smaller SNB compared to the control group

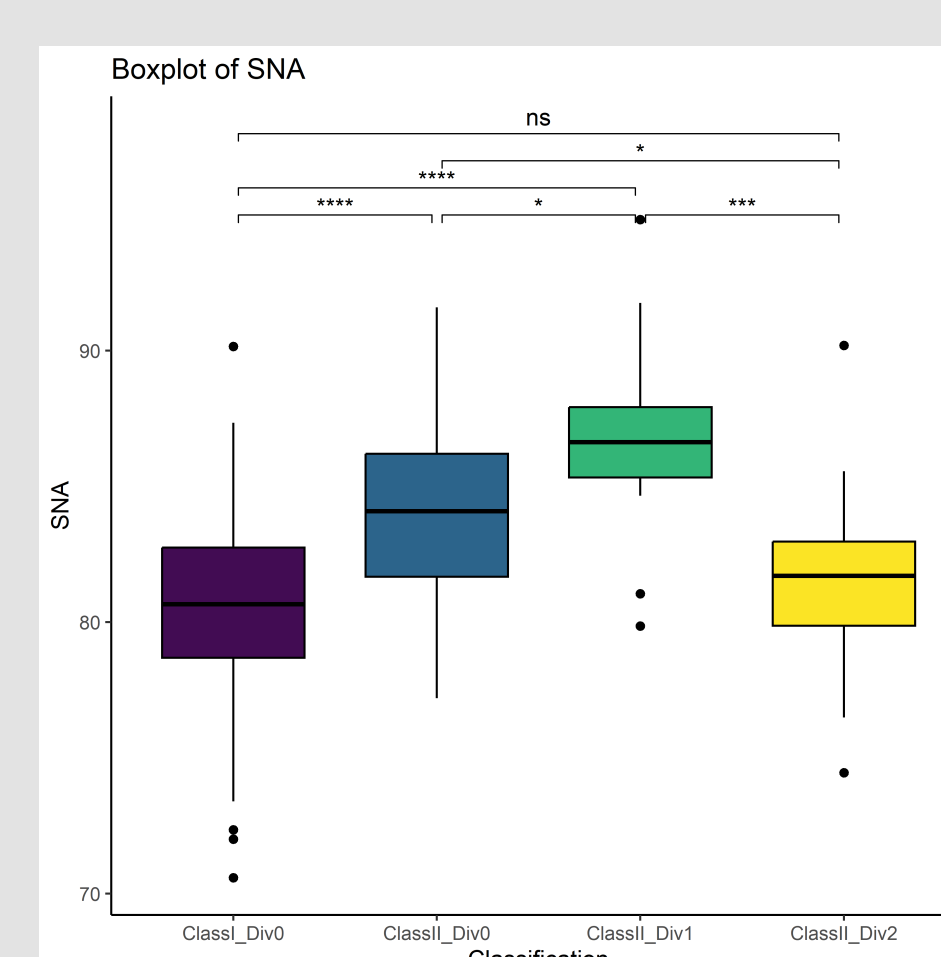


ANS-PNS: CII,D1 and CII,D2 have a larger ANS-PNS compared to the control group

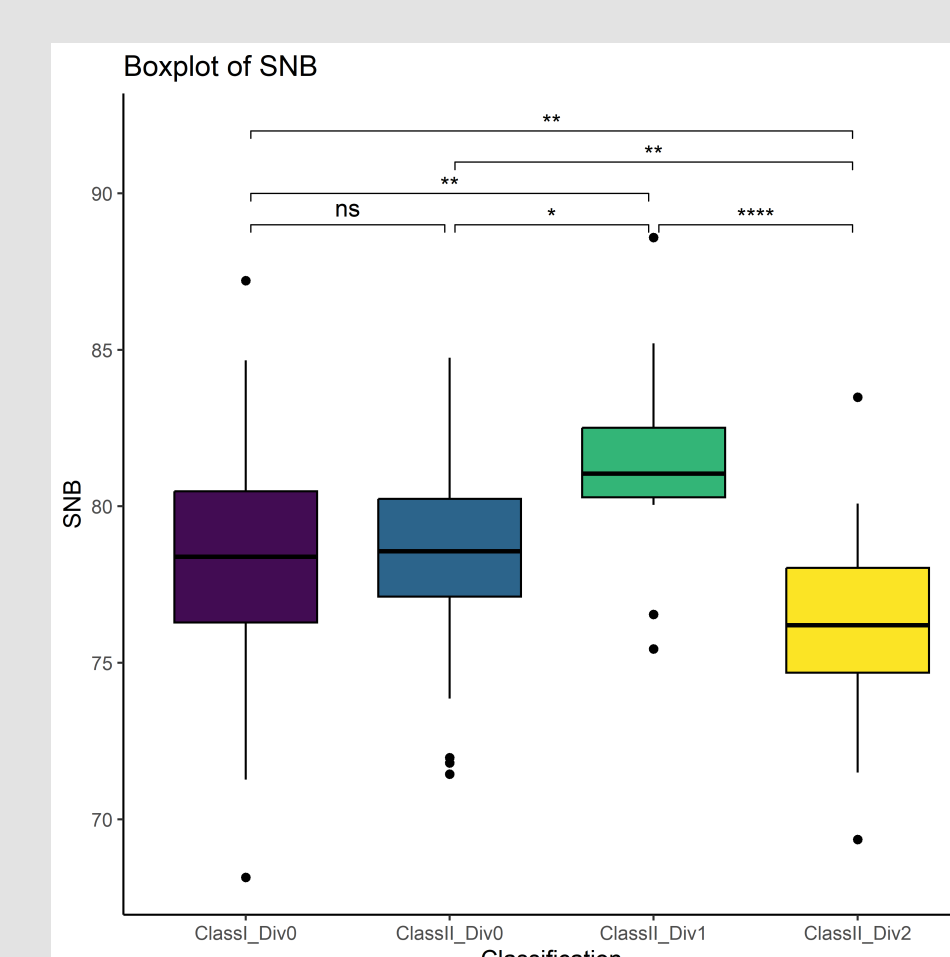


LIA: CII,D0 and CII,D1 have a larger LIA compared to the control group

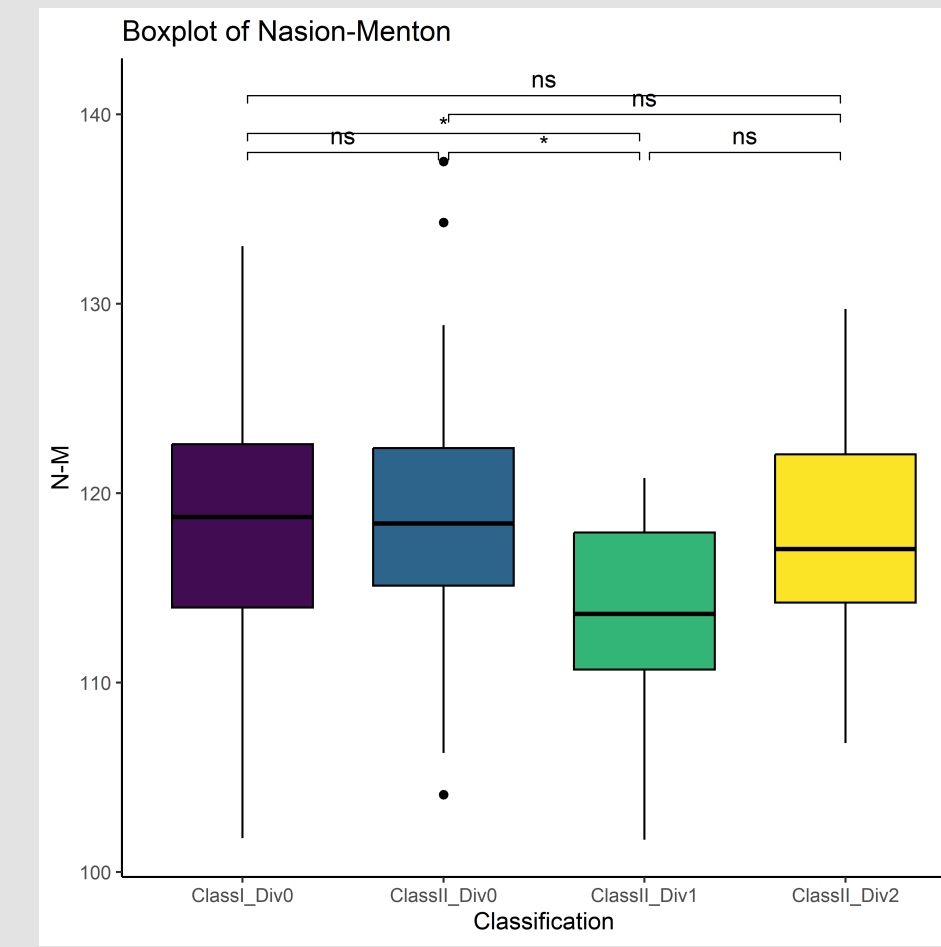
Adult Male Box Plots



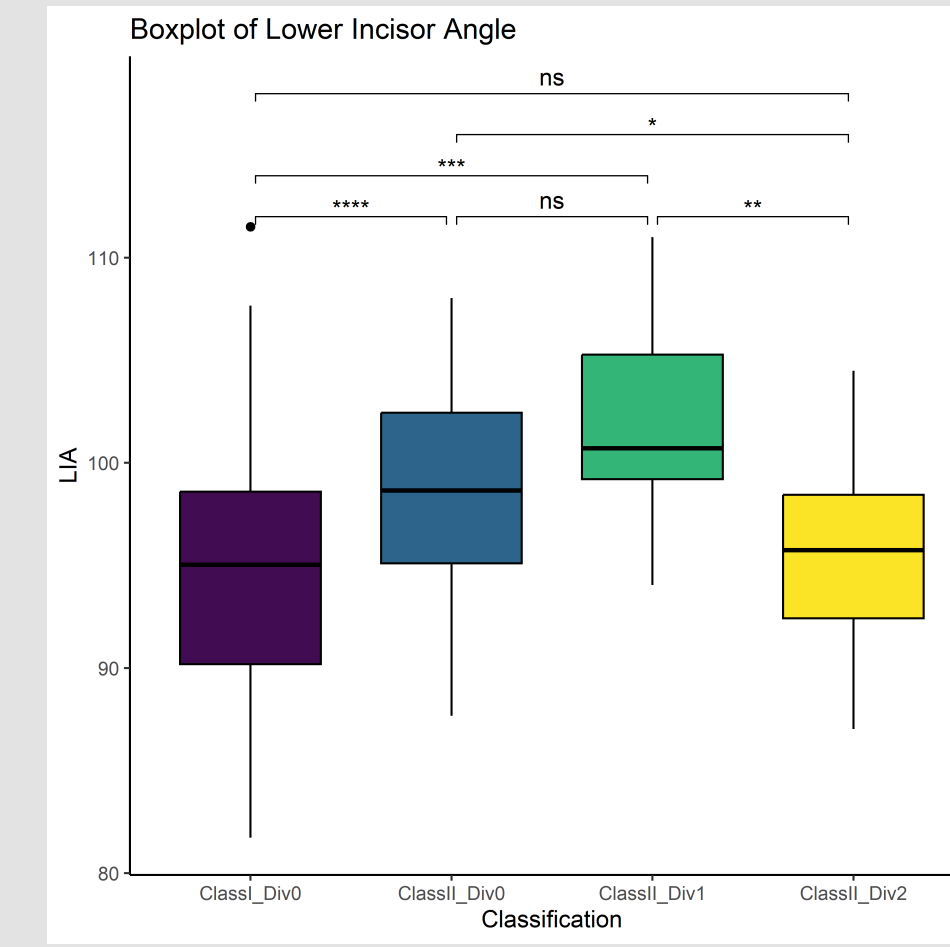
SNA: CII,D0 and CII,D1 have a larger SNA compared to the control group



SNB: CII,D1 has a larger LIA and CII,D2 has a smaller LIA compared to the control group

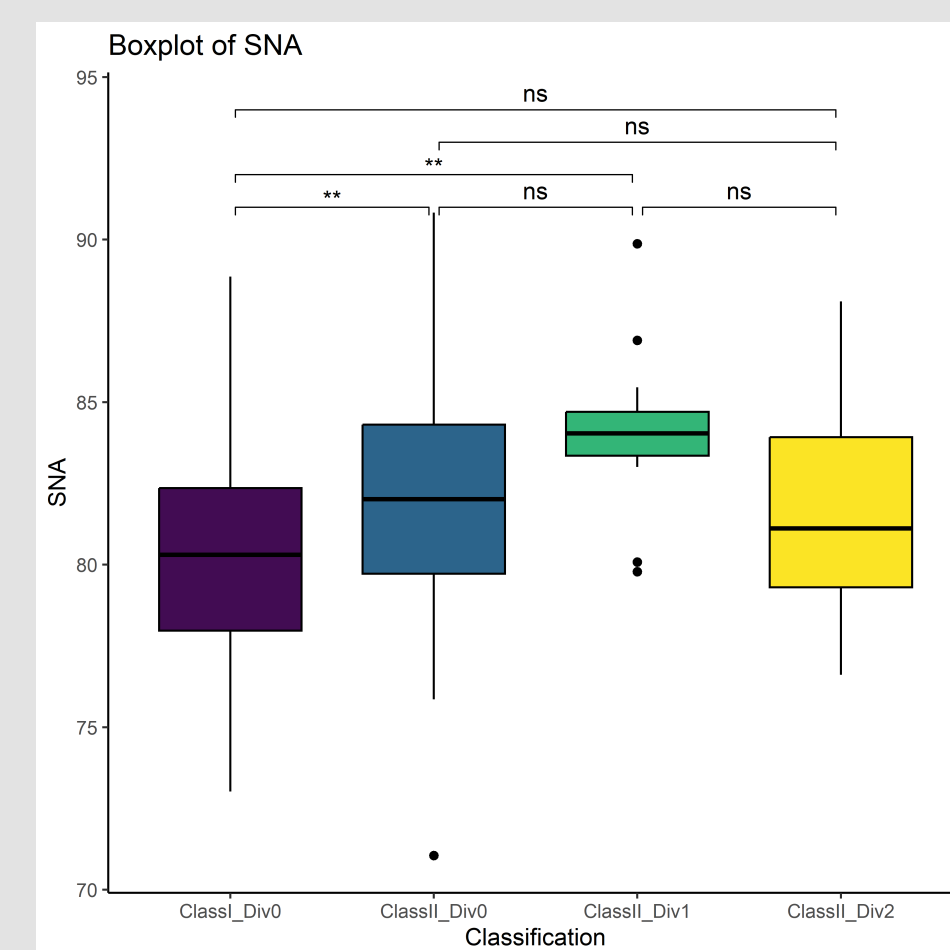


N-M: CII,D1 has a smaller N-M value compared to the control group

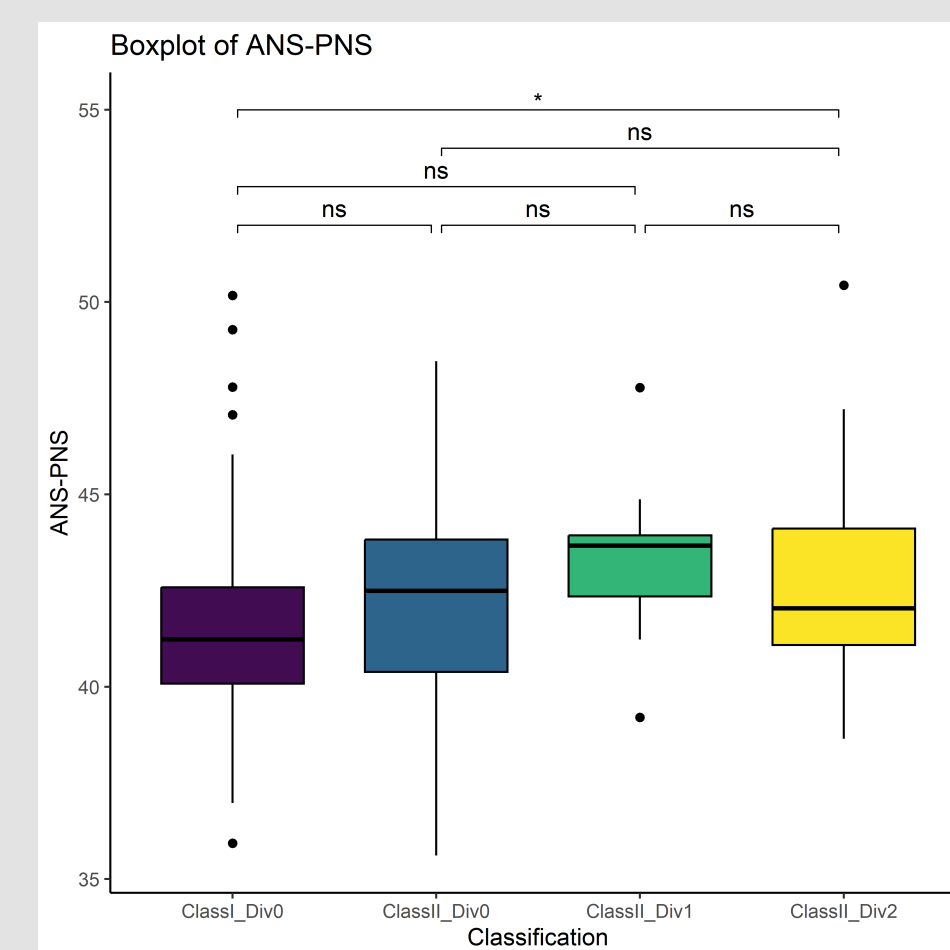


LIA: CII,D0 and CII,D1 have a larger LIA compared to the control group

Juvenile Female Box Plots

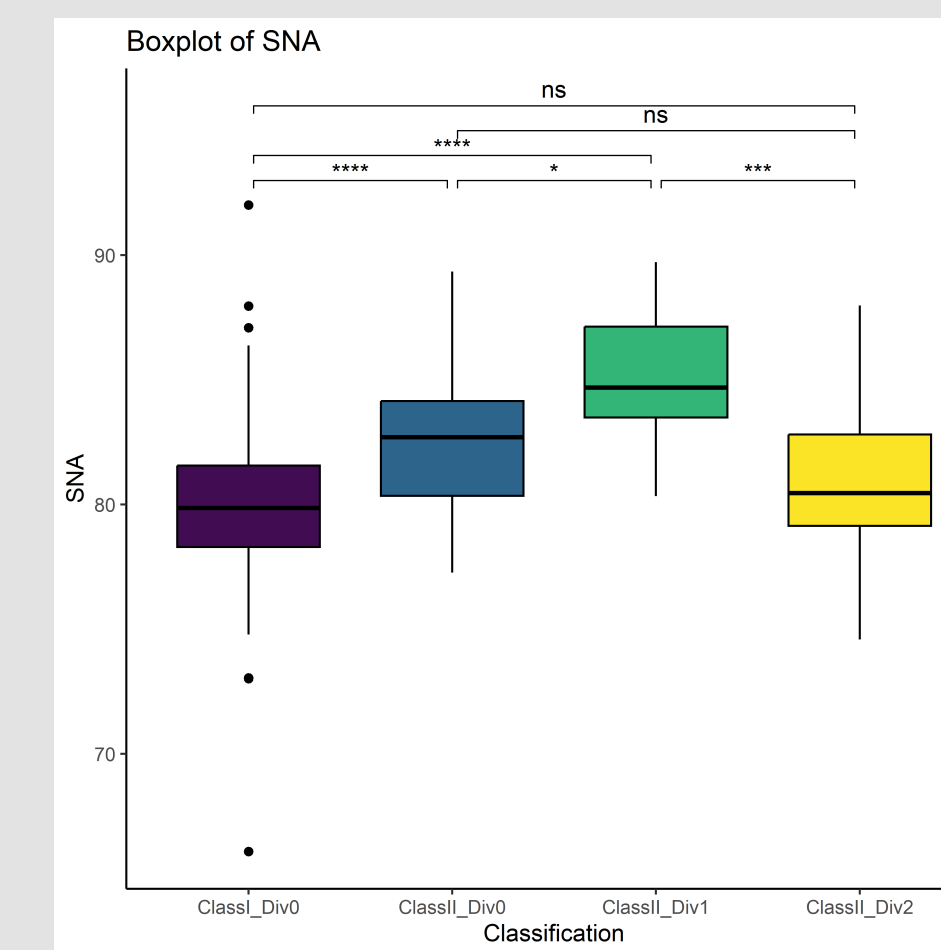


SNA: CII,D0 and CII,D1 have a larger SNA compared to the control group

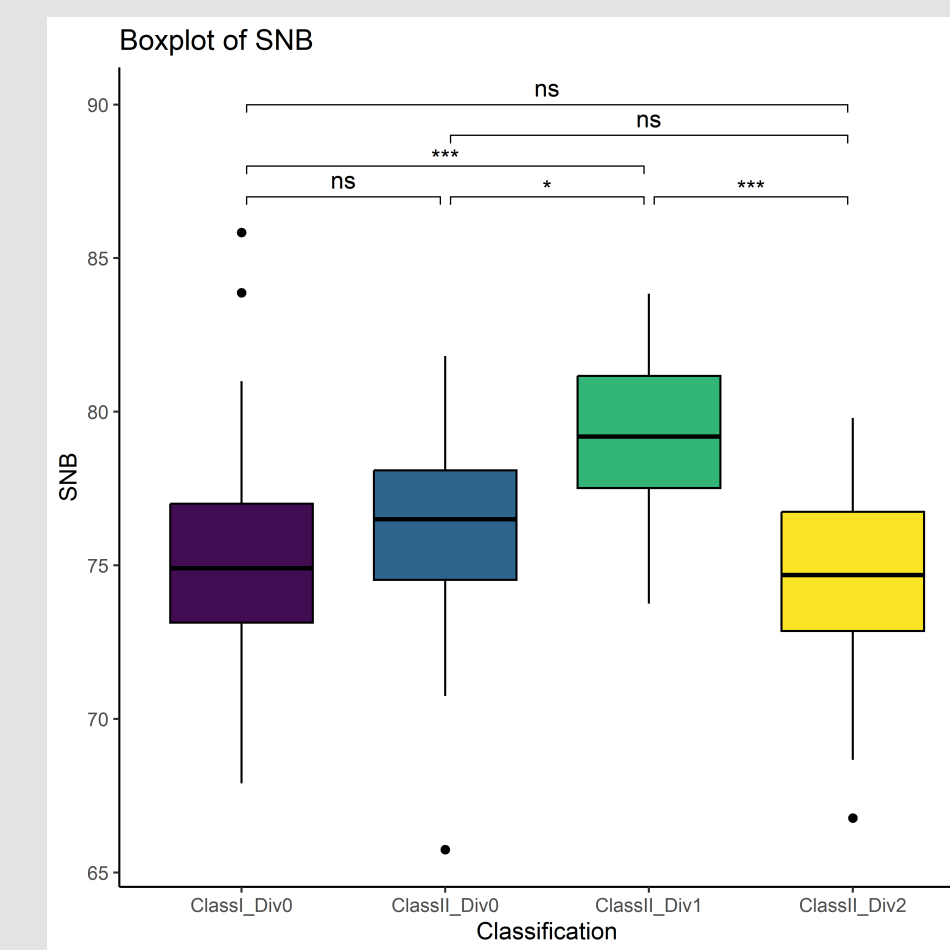


ANS-PNS: CII,D2 has a larger ANS-PNS compared to the control group

Juvenile Male Box Plots



SNA: CII,D0 and CII,D1 have a larger SNA compared to the control group



SNB: CII,D1 has a larger SNB compared to the control group

Discussion

- Class II Division 0:**
 - Anteroposterior misalignment of the maxilla and mandible is due to the anterior projection of the maxilla rather than the position of the mandible.
 - This more anteriorly-placed maxilla is due to a greater SNA angle compared to the control group for both sexes and age groups.
 - Lower incisors are more proclined in Class II Division 0 compared to the control group.
- Class II Division 1:**
 - Anteroposterior misalignment of the maxilla and mandible is due to the anterior placement of the maxilla. Compared to Division 0, the SNA angle for Division 1 was even larger relative to the control group.
 - The anterior face is shorter compared to the control group.
- Class II Division 2:**
 - Anteroposterior misalignment of the maxilla and mandible is due to posterior placement of the mandible
 - Larger ANS-PNS indicates a longer maxilla in juvenile females, adult females, and adult males that is not more anteriorly positioned.
 - Relatively longer maxilla compared to mandible results in a mandible more posteriorly-positioned.

Conclusion

Research Question 1:

- Class II Division 0 and 1 differ from the control group primarily in the position and length of the maxilla.
- Class II Division 2 differs from the control group primarily in the position of the mandible.
- The differences in craniofacial morphology between groups are more distinct among adults, compared to the juvenile groups.

Research Question 2:

- The majority of subjects with a Class I occlusion during childhood maintained the same classification of occlusion throughout adulthood.
- However, about half of subjects with a Class II malocclusion during childhood developed a Class I occlusion, indicating that 'self-correction' of Class II malocclusions is possible.
- The position and length of the maxilla provides the best indication of future malocclusion during childhood.

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References

