The Development of Hominin Muscles of Mastication

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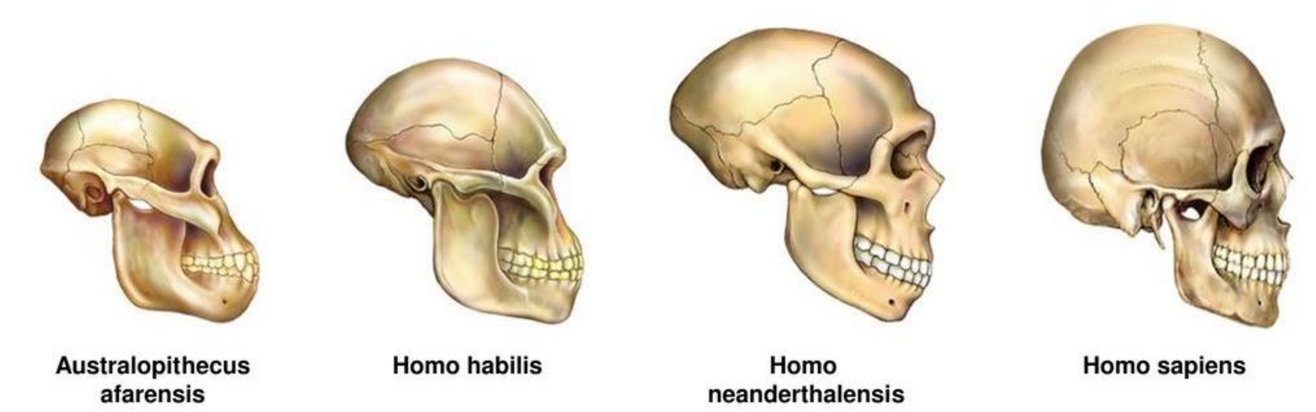
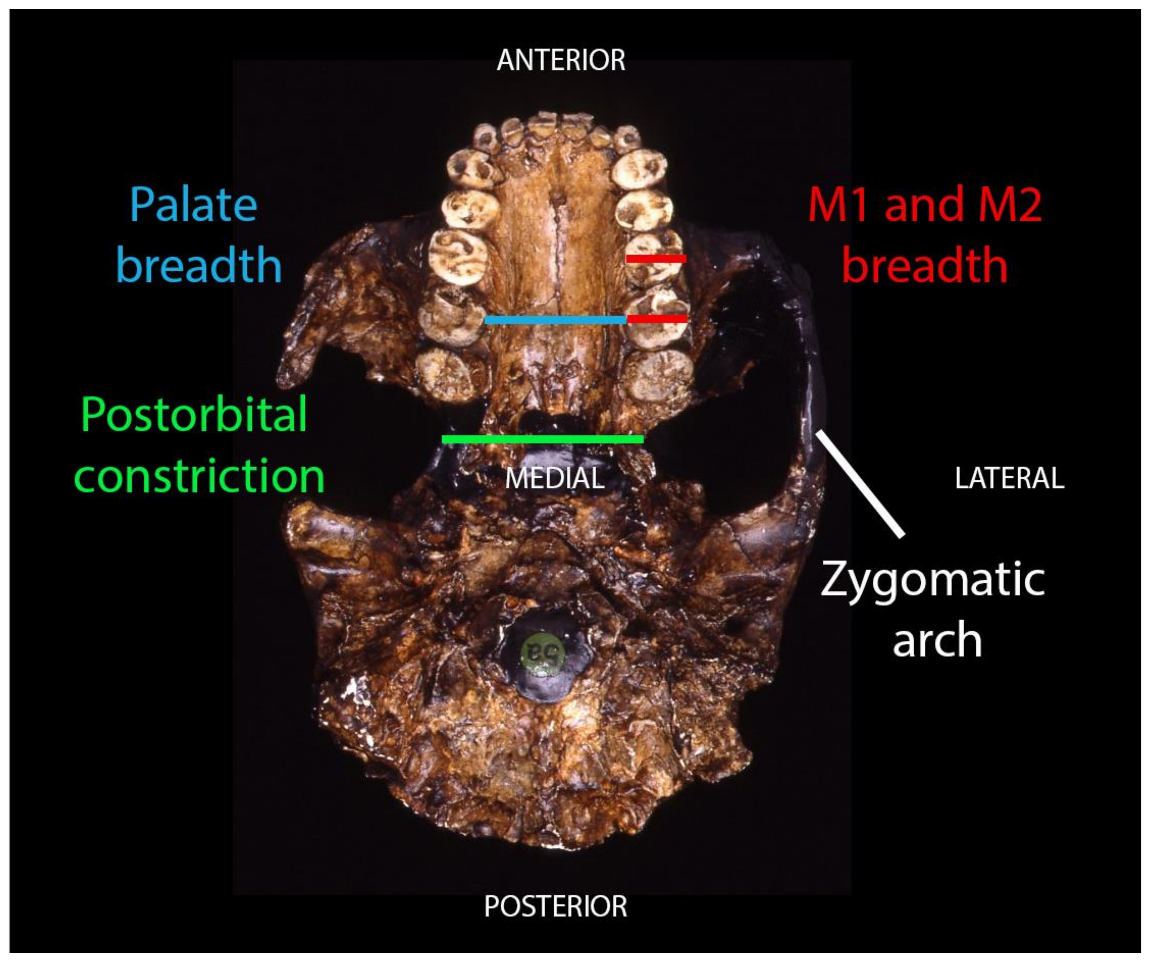
Background



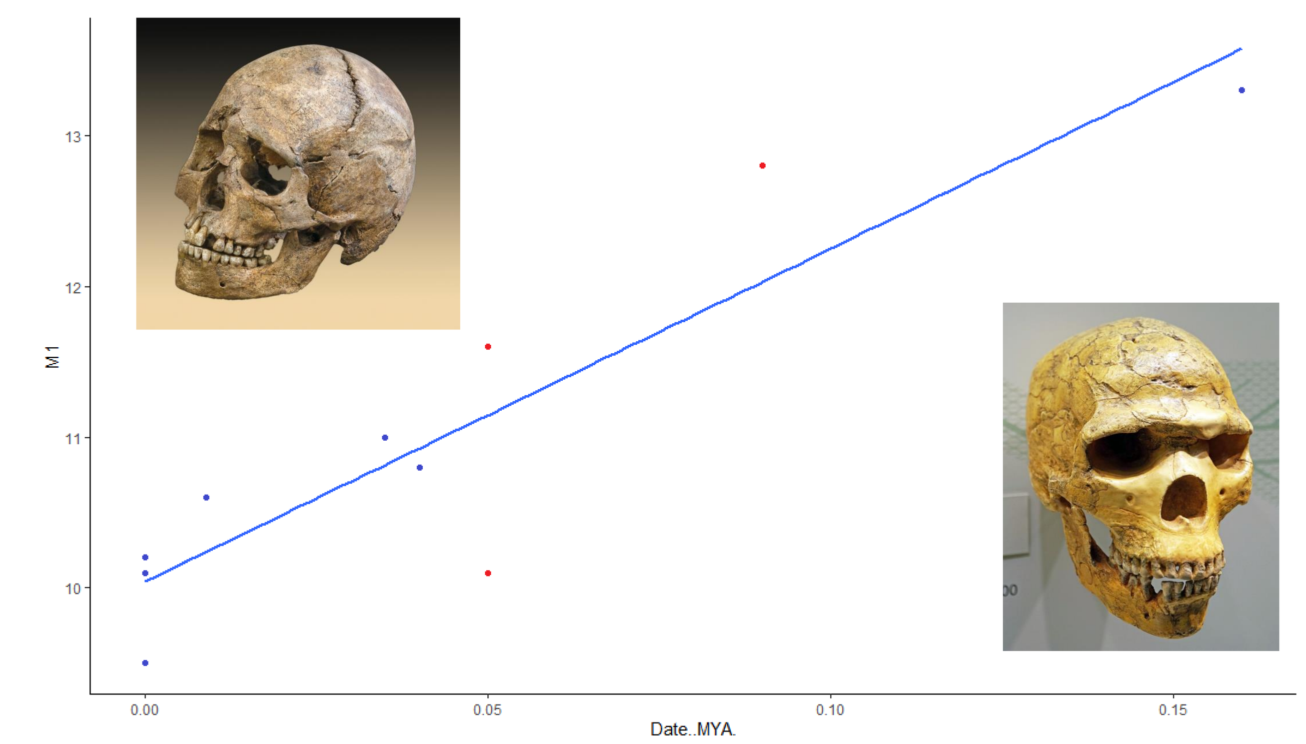
Hominins are primates belonging the same evolutionary line as modern humans. Different diets require varying levels of masticatory strength and dental size. Early hominins adapted to be better suited for leaf and grass-based diets that require extensive chewing. Later hominins were more omnivorous, requiring different masticatory adaptations. **These dietary adaptations are reflected in the fossil record of hominins via measurable changes in bone structure over time**, as those better adapted to their diet were able to pass along their genes. **By examining the size of the zygomatic arch, postorbital constriction, palate breadth, and molars of hominins we can gain a better understanding of the evolutionary development of modern human mastication.**

Materials and Methods

The data collected originates from the SUNY Oneonta Anthropology Department's Cast Collection. 31 Fossil hominins and modern *Homo sapiens* were measured. **All measurements are in mm** and were taken by hand by Jacob Lyons and Zachary Lebid. All data analysis and visualization was done with the guidance of Dr. McGrath.



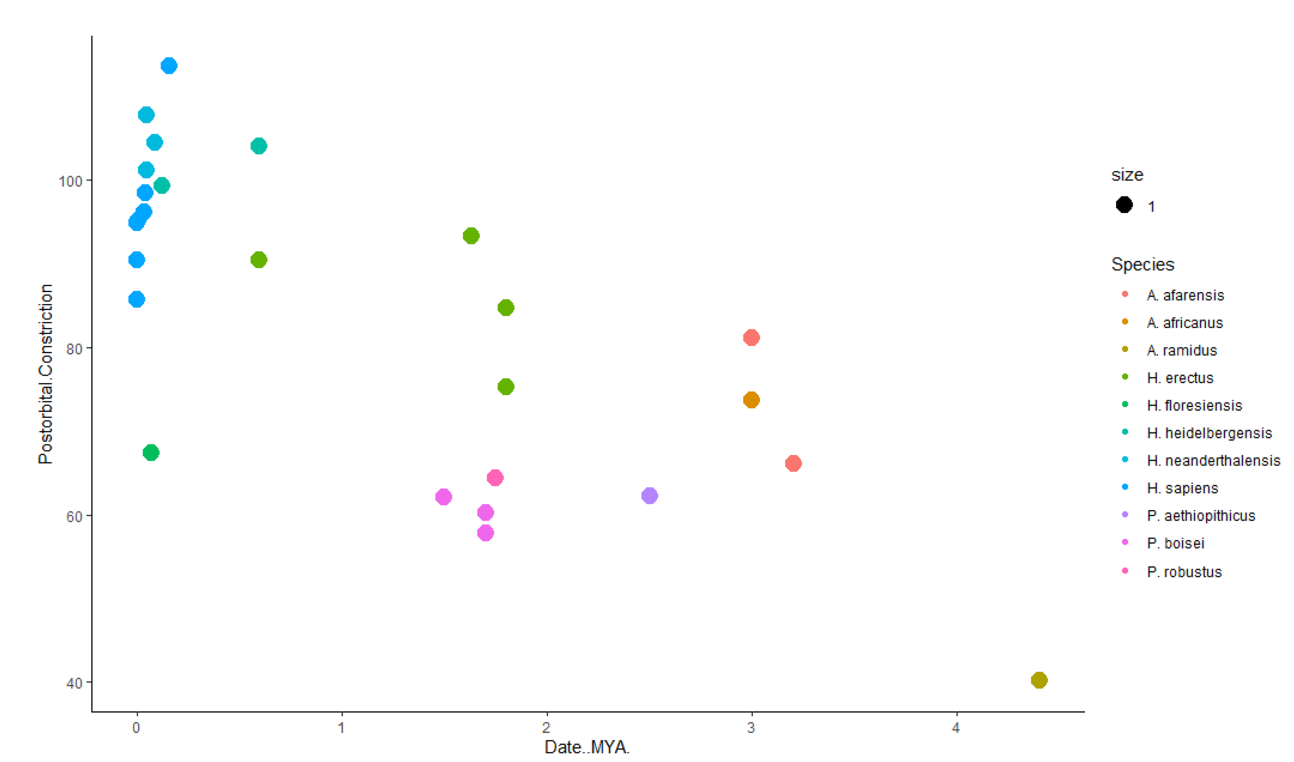
Molar Size Results



The examination of *Homo sapiens* and *Homo neanderthalensis* first permanent molar size over the past 150,000 years reveals a dramatic decrease in overall size for both species.

This is indicative of less of a need for large grinding teeth, likely denoting a shift towards a diet more reliant on cooked food and less time spent eating.

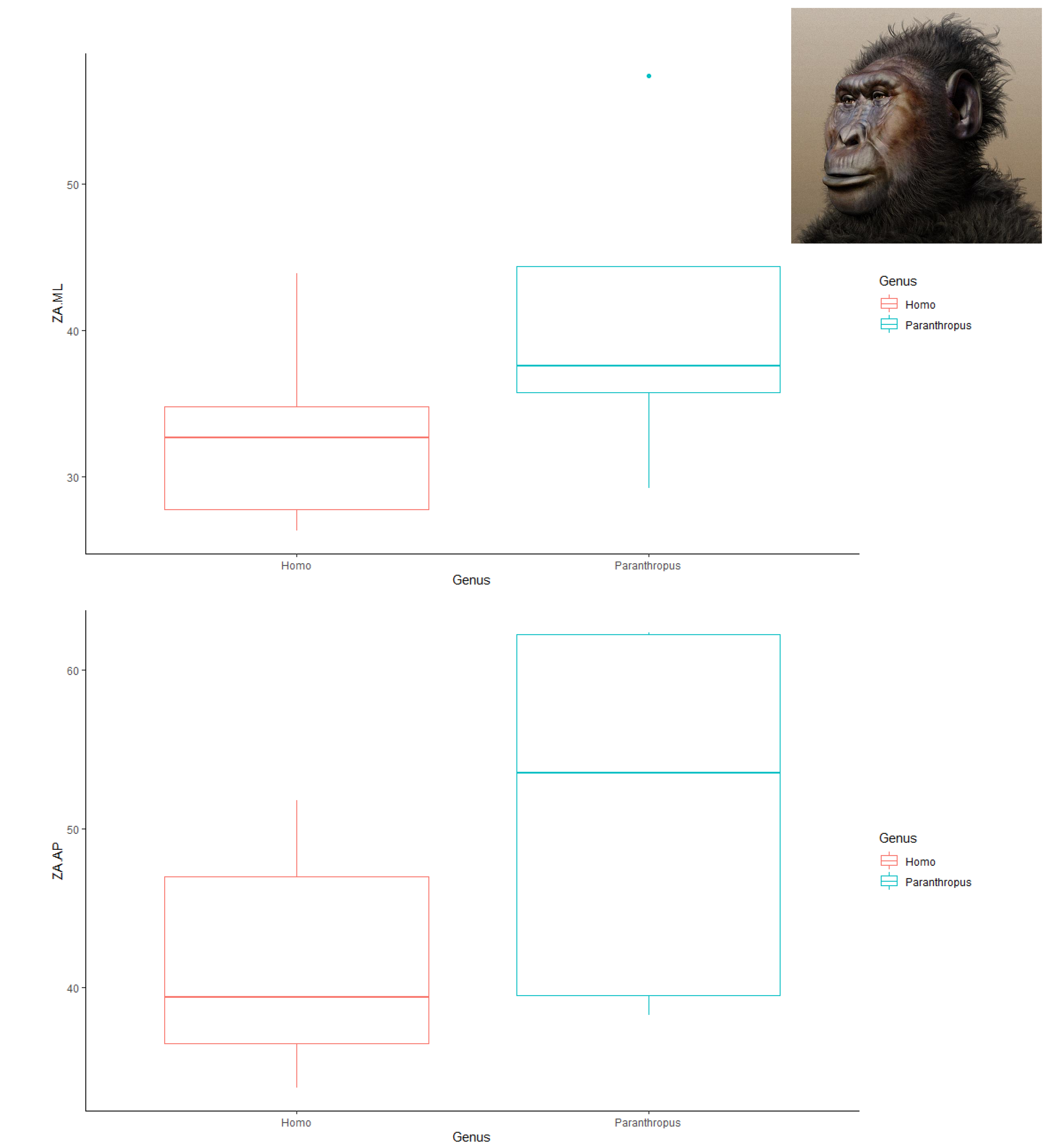
Postorbital Constriction Results



By plotting the postorbital constriction of hominins over the course of 4.5 million years, a gradual decline is visible. As the graph approaches modern *Homo sapiens*, the level of postorbital constriction reduces, displaying a decrease in the robusticity of the masticatory system.

*When examining postorbital constriction, a larger number signifies a lesser degree of constriction, interpreted as smaller chewing muscles overall.

Zygomatic Arch Results



By plotting both the maximum anteroposterior and mediolateral length of the zygomatic arch for genus *Homo* and genus *Paranthropus* it is evident that the zygomatic arches of *Paranthropus* are far larger and better adapted for their presumed diet of leaves and grasses.

Conclusions

Through the utilization of proxy measurements, it is possible to track the decrease in masticatory robusticity in hominins over time. This decrease in robusticity is likely the result of dietary changes, shifting from the consumption of low energy plant-based diet to a less time consuming and more calorically dense omnivorous diet. Some paleoanthropologists have suggested the development of cooking led to both the reduction of the mastoid process and the dramatic increase in brain size, due to greater amounts of expendable energy via more easily processed and digested food. Cooking likely developed ~1.8 mya, and the data collected supports this theory as postorbital constriction begins to reduce dramatically in genus *Homo* around the same time.