An analysis of the categorisation of the Skhul-Qafzeh hominin remains as modern

Madalyn Grant

Abstract

The Skhul and Qafzeh hominin fossil remains were found in Qafzeh and Es Skhul Caves in Israel in the late 1920s and early 1930s (Pettitt 2013). Initially classified as descendants of *Homo heidelbergensis*—i.e. anatomically modern humans—continued analysis of the remains, particularly of the crania, has caused many academics to question this classification (Eiseley 1946). This paper investigates to what extent the Skhul and Qafzeh crania are modern *H. sapiens*, with particular focus on the anatomically modern and archaic traits of the splanchnocranium, neurocranium, and mandible. The analysis of the remains relative to other hominin species highlights that although the remains possess many anatomically-modern features such as a high cranial vault and gracile browridge, the number of archaic traits still apparent illustrates that the Skhul-Qafzeh remains are unlikely to belong to anatomically modern humans. In this paper, through the analysis of cranial anatomy, I conclude that Skhul and Qafzeh fossilised remains may represent a transitional species between archaic and modern *Homo sapiens*.

Keywords

archaic human, skull, cranium, *Homo*

Introduction

The unique and often confusing collection of modern human and archaic morphological features exhibited by the Skhul and Qafzeh hominin fossils continues to fuel debate within the biological anthropology community about what constitutes a modern human (Benazzi et al. 2011). Although the remains were placed and dated to the era of modern humans, the combination of both robust and derived traits has further prompted discussion about what morphological features make an anatomically modern human (AMH) (Shea and Bar-Yosef 2005). Through a comparative analysis of the Skhul-Qafzeh remains with other hominin fossils, both modern and archaic, this paper attempts to further clarify the taxonomy of these hominin fossils. The Skhul-Qafzeh hominin remains were discovered in the early twentieth century in a series of caves in Es Skhul and Qafzeh, Israel, and were classified as *Palaeoanthropus palestinensis*, a descendant of *Homo heidelbergensis,* in 1939 by anthropologists Arthur Keith and Theodore D. McCown (Pettitt 2013). As early as the 1940s, biological anthropologists began to contest the Skhul-Qafzeh's remains classification as modern, and instead argued that the remains represented either a *Homo neanderthalensis* (i.e. Neanderthal) group or a missing link between *H. neanderthalensis* and *H. sapiens* (Eiseley 1946). The Skhul and Qafzeh assemblage comprises a large number of specimens, including approximately five complete crania, three complete mandibles, and several long bones representing 14 adult remains and 11 children remains (Erella and Kuhn 2007).

The Skhul and Qafzeh remains in the context of late *Homo* taxa: Where do they fit in?

To verify whether the hominin fossils from Skhul and Qafzeh possess the derived morphological traits associated with AMHs, it is necessary to first establish what these traits are, regardless of whether they are found in the Skhul-Qafzeh remains or not, and then examine the fossils in the context of the criteria for modern humans. As the Skhul-Qafzeh cranial remains are well-preserved (Shea and Bar-Yosef 2005), I will focus my analysis on cranial features to ascertain how these hominin remains should be

categorised. I will base my analysis on *Homo sapiens* crania and cranial specimens from other archaic hominins such as *Homo neanderthalensis*, and will make comparisons between archaic and modern traits in the context of the Skhul-Qafzeh remains. Even though long bones were also recovered with the Skhul-Qafzeh crania, there is debate about whether these few long bones can be utilised to make taxonomic assessments. Therefore, long bones are not being assessed here.

Modern humans possess key cranial and postcranial diagnostic traits, such as smaller teeth and jaws for the former, and wider hip bones than our forbearers for the latter (Stringer et al. 1984; Ruff 2000). For many, although not all, biological anthropologists, cranial morphology is considered to be strongly linked to modernity and evolution due to the radical changes experienced by the skull during evolution, which includes '*the forward shift of the foramen magnum, flexion of the cranial base, retraction of the face and enlargement of the neurocranium*' (Hernàndez et al. 2011:1015). The importance of the skull in the context of modernity resides in the multitude of traits assessable that potentially reveal factors of the evolutionary process and postcranial changes such as bipedalism. AMH skulls are unique in their high braincase and short base, and they are the only hominin species that evolved to have a skull broadest at the top (Clarke 1998; Lieberman et al. 2001). The back of the skull is round, potentially resulting in a reduction of neck muscle size, the face small with a projecting nasal bone and the browridge is small and coupled with a tall forehead (Lieberman et al. 2001). As a result of these vertical and narrowing features, the mandible is small and short, and possesses no retromolar space (i.e. the empty space between the third molar and jaw) (Rak et al. 2002). This lack of space in the smaller jaw also affected teeth arrangement, which became parabolic rather than parallel, and the protrusion of the species' chin (Rak et al. 2002). The size of the teeth, compared to earlier species, are small, with this change most apparent in the front incisor and canine teeth (Grine 2004). Although not examined in this paper, the postcranial elements of AMH that are believed to exhibit derived morphology include, broadly speaking: the gracilisation of the overall skeletal frame, the lengthening of upper body long bones, the reduction of the ilium's flare, and the adaption of hands more inclined for precision rather than strength work (Crow 2004).

This paper examines to what extent the splanchnocranium, neurocranium, and mandible possess the aforementioned characters of *H. sapiens*. The combination of the robusticity or gracileness of the splanchnocranium and neurocranium in relation to the predetermined line of the coronal plane (Cameron and Groves 2004)—known as prognathism—of the Skhul-Qafzeh remains looks distinctly archaic; that is, the features of the skull are more aligned along the coronal plane, especially in the midface (Simmons 1991). Evidence from CT and radiograph data show that the Skhul and Qafzeh crania have larger sphenoid bones, affecting the degree of facial projecting and may explain the more robust and pronounced facial morphology observed in these specimens. The browridge, counter to the singularly archaic phenotypes aforementioned, possess a mixture of both derived traits (e.g. the gracile and seemingly underdeveloped brow) and archaic traits (e.g. the pronounced supraorbital tori) (Clark and Willermet 1997). Furthermore, the frontal bone, in the case of the Skhul-Qafzeh hominin remains, are clearly different in aspects of their morphology and robusticity than those of Near Eastern *H. neanderthalensis* (Clarke and Willerment 1997). In considering the neurocranial anatomy of the Skhul-Qafzeh remains, most scholars concur that specimens Skhul 5, Qafzeh 6 and 9 have *H. sapiens*-like cranial parameters, such as high cranial vaults with endocranial capacities of approximately 1500–1554 cm^3 (Cartmill and Smith 2011; Vasilyev 2011).

Although many scientists acknowledge that the Qafzeh and Skhul skulls, when considered as a group, are highly variable in their expression of chins (Klein 2000), active attempts to utilise the chin morphology as a guide to the classification of the Skhul-Qafzeh hominin persists. Broadly speaking, the Qafzeh hominins possess what would be considered a modern chin whereas the Skhul remains do not appear to have chins (Ichim et al. 2006). Thus, it can be argued that anterior symphyseal morphology is not a good diagnostic morphological region by which to taxonomically classify the remains from Skhul and Qafzeh.

Many scholars postulate that when making morphological and metric comparisons of the splanchnocranium and neurocranium, the Skhul-Qafzeh remains are similar to European *H. sapiens* (Cro-Magnons) and that remains from both groups retain primitive phenotypes. Examples of such similarities include: prominent and low browridges, weak endocranial parietal bossing, and strong

temporal bulges. These scholars argue that these shared ancestral characteristics may reflect the primitive condition of these traits, which are retained in *H. sapiens* today and potentially provide evidence for the case of the Skhul-Qafzeh remains being AMH with some retained derived traits (Clark and Willermet 1997; Kubo et al. 2011). This argument is usually coupled with the highlighting of the AMH traits the Skhul-Qafzeh possess that appear too progressed to belong to an archaic human. Further to this, there are confounding factors which may influence variation in craniofacial morphology. For example, prognathism within modern humans varies as a direct result of climate and genetic drift (Baab et al. 2009). Therefore, comparisons of the degree of prognathism between AMH and archaic *H. sapiens* may be flawed due to differences in environmental conditions between these hominin groups. This is highlighted through the example of modern African, Native American, and Indigenous Australian cranial morphology, all of whom show similarities in the degree of robusticity to archaic hominins; yet these crania are undeniably *H. sapiens* (Schwartz and Tattersall 2000). This adds uncertainty to the validity of the inferences that can be made using craniofacial remains as discrepancies between the fossil group may be indicative of environmental differences rather than evolutionary ones.

The cranial capacities of the Skhul-Qafzeh remains can be considered in the context of AMHs and *H. neanderthalensis* to understand whether the Skhul-Qafzeh remains should comprise a distinct group. The cranial vault volume of an AMH adult is 1300 ± 50 cm^3 (Gunz et al. 2010). The endocranial capacity of *H. neanderthalensis* is approximately 1600 cm^3 (Bar-Yosef et al. 1999), however, Stanyon et al. (1993) argue that the measurement is much smaller at potentially 1412 cm^3. The cranial capacity of the Skhul-Qafzeh remains is 1518 ± 36 cm^3. The suggestion that Neanderthals show among the highest cranial capacities among late-*Homo* taxa, and that AMHs show the lowest mean value in this range, comes in direct conflict with the commonly held perspective of the Skhul and Qafzeh cranial remains being completely modern; the cranial capacity taken from the remains is higher than any recorded average amongst AMHs (Rightmire 1998). This marks the remains as distinctly different to AMHs, and the Skhul-Qafzeh cranial volume falls more in line with what is observed in *H. neanderthalensis*. It must be noted that the application of equations that determine relative brain size from endocranial volume that have been devised from AMH standards and their application to past societies—especially those only examinable in the fossil record (which may be fragmentary)—is problematic (Oliver and Tissier 1975).

Comparisons between the AMH skeletal remains from Romania (known as 'Peştera cu Oase')—which are the oldest bones found of a modern human and presumed to be *H. neanderthalensis*—suggest that the remains of Skhul-Qafzeh can also be disqualified from the *H. neanderthalensis* branch of *Homo* (Trinkhaus 2003). This is due to the Peştera cu Oase mandible possessing a combination of archaic and modern features similar to those of the Skhul-Qafzeh hominin, which, when the remains were assessed, was still readily classified as an AMH. Furthermore, Trinkaus (2003) argues that the Peştera cu Oase hominin remains were biologically older than Skhul-Qafzeh and, if the theory of continuity was pursued, then the Skhul-Qafzeh remains must have been modern. Similarly, due to the high degree of prognathism within archaic communities, the bone protrusion at the anterior of the mandible was atypical; yet, within AMHs, this feature is found on almost every mandible (Schwartz and Tattersall 2000). Quantitative and qualitative analyses using mandibular morphology—including trigonometric parameters—shows that, collectively, the mandibles of the Skhul-Qafzeh remains were comparable to those of the Amud, La Ferrassi, and Banolas (Vasilyev 2011) all of which are remains of *H. neanderthalensis* from Europe and the Middle East. Vasilyev (2011) cites the length of the alveolar arch and the length of the three molars as a few of the key features assessed, as the angle of the arch and the robusticity of the molars differs in archaic and modern humans. The combination of unique mandibular ramus morphology and the presence of a retromolar space indicates that the mandibular remains from Skhul and Qafzeh cannot be validly classified as *H. sapiens* or *H. neanderthalensis*, despite the researchers of the study concluding that the skulls appear relatively modern (Çakır and Noyan 2007).

Concluding remarks

The mixture of derived and archaic morphological traits present in the Skhul and Qafzeh hominin fossils highlights the lack of consensus in the biological anthropological community about what skeletal features can be considered as 'modern'. The splanchnocranium of the Skhul-Qafzeh remains, in relation to the predetermined line of the coronal plane, most resembles that of an archaic human, as these features are robust and protruding; by contrast, several of the remains possessed gracile browridges similar to AMHs demonstrating that the cranial remains show similarities to both archaic and modern *Homo sapiens*. Similarly, the Skhul-Qafzeh remains have a higher cranial capacity than what is found in anatomically modern humans, comparable to that of an archaic human, yet the high cranial vault and overall shape of the braincase has also lead academics to postulate that it appears modern. Additionally, the mandible possesses both archaic and modern characteristics with trigonometric parameters similar to that of serval European *H. neanderthalensis* remains and bone protrusion at the anterior of the mandible similar to that of most AMHs. Through the analysis of what features are broadly accepted as anatomically modern, this essay has argued that the splanchnocranium, cranial volume, and aspects of mandibular morphology show modern and archaic features. Limitations of this analysis include potential examiners' bias and the information outlined in this essay should be viewed with this in mind.

In summary, by comparing the splanchnocranium, neurocranium, and mandible of the Skhul-Qafzeh fossils to the academic information currently available, I conclude that despite modern humans sometimes displaying archaic phenotypes, the abundance of archaic traits found on the skulls of Skhul-Qafzeh provide a basis to argue that the hominin fossils found cannot be strictly categorised as *H. sapiens.* Rather, based on evidence presented in this paper, the Skhul and Qafzeh remains likely represent a transitional species that shows anatomical similarities to anatomically modern *Homo sapiens*.

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