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COGS 184

Commentaries Week 3

Over the hominid ancestry we have seen a correlation between an increase in group size and neocortical volume. Dunbar et al. posit that groups are normally maintained by the social currency of grooming. However, with larger groups, grooming becomes too demanding in terms of time so language may have replaced it as a faster and more prolific version of social bonding. Specifically, this paper wanted to determine if they could use neocortical volume to estimate the group size for modern humans as there is a predicted relationship between the two.

Three methods, Extra Critical Neurons index, Encephalisation Quotient (EQ) and absolute neocortical volume were used to approximate a "best-fit" metric of determining group size. This neocortex ratio ("best-fit") predicted a group size of 147.8. Dunbar et al. to see if there is evidence to support that this hypothesis was correct (or at least approximately close to reality). Determining group size is challenging: many modern human societies (like elephants or dolphins) are fission-fusion societies meaning that individuals are constantly coming and going, statuses change, and relationships are in flux. Therefore, it is important to make a distinction that group size isn't the *number* of individuals one is *around* but the *number* of individuals with whom they can *maintain a relationship*. Dunbar et al. go through a number of examples of farming communities, academic groups, and units in the military—all of which have been criticized.

As we mentioned at the beginning, researchers want to investigate the origin of language and explosion of neocortical volume. Dunbar et al. stated that with the neocortical volume modern humans had, that ratio of 4.1 would predict a huge portion of grooming time: 41%. This grooming would still have been essential to maintain group cohesion in hunter-gatherer societies. However, that much time spent grooming would cut severely into the time to forage, fabricate tools, etc. Language would have been more likely to emerge as a substitute for grooming in that it's 2.76 times more efficient. However, many researchers consider language to have originated from exchanging information on the environment (say during hunts).

It is likely that increases in group size would have forced a method to maintain group cohesion that did not take up necessary time to gather, hunt, and plan. As group sized grew, language may have started to develop in tangent. Likewise, with an increase in language, facilitates to support the memory and socio-emotional factors would have been needed. This may be why we see an exponential neocortical growth in later *Hominid* societies.

The discussion of hunter-gatherer societies reminded me of elephant and dolphin societies in that they're fission-fusion and highly dependent on monitoring the actions of others. In COGS 143, I learned that elephants will only respond to calls of those who they are close to. Similarly, they remember calls from elephants who have been away

for 40+ years. I believe that the fission-fusion society might be the true motivator for neocortical volume. When individuals are moving in and out or even up and down a hierarchy, it's essential to have a way of recording who they are, what their relationship is to you, and more. This may involve things like remembering calls or vocalizations of that individual (like elephants) which could have been a precursor to language. Similarly, just the task of tracking the movement of individuals in society requires neocortical support.

One major critique of the article is the argument that brain size increased exponentially during *sapiens* but not as much before. Dunbar et al. mentions that it was our neocortical size that pushed the grooming requirement to 25-30% implying that language may have been forced to develop in that species. However, if you look at the timelines and cortical volume given in COGS 184 lecture, the increase of brain size from *Ardipithecus ramidus* to *Australopithecus afarensis* is 40; from *Australopithecus afarensis* to *Homo habilis* is 288; from *Homo habilis* to *Homo erectus* is 161; and from *Homo erectus* to *Homo sapiens* is 241. I may not have properly understood the claims of the authors but it would not be right too claim that the neocortical leap in *Homo sapiens* is more than any other given that we see the largest surge in *Homo habilis*. I would be very careful in directly tying language capabilities to neocortical size.

One thing I learned was the idea that language may not have arisen from hunting. As language seems to only exist in humans, it would make more sense for language to develop from our unique socio-cultural setting. In COGS 144, we learned that lions can form complex hunting groups with each individual playing a specific role. Similarly, groupers (fish) use gestures to recruit moray eels and napoleon wrasses to join a hunt and use a referential gesture to indicate where a prey escaped. While this isn't verbal language, gestures seem sufficient for hunting. This doesn't seem like a clear motivation for language to develop.

I was confused by the points made on the three group types: tribe, clan/village, and band/camp. I wonder what the author was trying to get at? Why split communities into mean group sizes instead of ecological pressures they face? As we've seen on dolphins, the environment in which a species or group lives can even affect the personalities, behaviors, and beliefs. (For example, shallow, warm water dolphins can be more juvenile and act out than deep water dolphins). Dunbar et al. use examples of Australian aboriginals and Eskimos which live in very, very harsh environments where—like deep water dolphins—a fission-fusion society would not make sense. I would be curious to see how fission-fusion and not-fission-fusion societies developed language as I'd assume there would be very different motivations.

While I don't quite understand the point of calculating the group size of modern day humans from neocortical size, I do think a number of hypotheses on language are fascinating. Specifically, the idea that language might not serve an information-sharing role but rather a very social one. Dunbar et al. mentions that language might help categorize individuals and provide class information. In COGS 184, we already can see the increasing importance of monitoring the behaviors of others. Language could also

be less of this cerebral-abstract thinking and more of a motivation for behavior in a group or sanctioning. I wish Dunbar et al. went into more depth about this because I think they're on to something.

In "Social Complexity: The Role of Primates' Grooming and People's Talking", Andrew Whitten focuses his critique on the role of social complexity. He points out that the Dunbar analysis relies on the *number* of individuals in a group but isolates that from a discussion of the complexity of those relationships. For example, in a fission-fusion society (as Dunbar at al. mentioned) there is added complexity in not just the number of individuals who may or may not be present but the rate of change in individuals being present, changes in social status, and even changes in the relationship. I wanted to connect this to African elephants as they have a fission-fusion society and will only respond to calls of elephants with whom they have a close relationship. I believe Whitten is trying to emphasize that it's not just about the *quantity* of relationships an individual can maintain but the *quantity* of factors one must track to maintain relationships.

Dunbar suggests that grooming helps with group cohesion and to avoid conflicts. Whitten, however, does not think that that applies to modern human groups like that of the military units Dunbar et al. selected. He states that the military company is not representative of people one has a relationship with. However, Dunbar at al. may have brought it up as an example of the upper limit for cohesion and conformity. Moroever, Whitten critiques Dunbar et al. for not specifying whether the nature of these groups he speaks of are cooperative or competitive. Whitten also critiques how language could be a substitute for grooming and what the direct benefit is. I would counter that grooming is physical attention and language is socio-emotional attention so *attention* or even the monitoring of third parties might be the key motivator.

In "Did Primates Need More Than Social Grooming and Increased Group Size of Acquiring Language", Jan Wind points out that much of this paper is a "chicken and egg" problem in that we don't see whether it was the increase in neocortical size that led to an increased need for grooming or vice-versa. She also questions why there would be an increase in brain size only marked after *sapiens*. If neocortical size pushes the increased need for grooming then we would see more grooming and even the need for language in *habilis* not just *sapiens*. Potentially, hunter-gatherer societies have to spend more time together (increased group size) to maintain trust and cohesion and require more cooperate activities. With more cooperation, they could hunt meat more successfully. Because of meat and social grooming (for cohesion), the neocortex may have grown in size.