Bipolar Knapping

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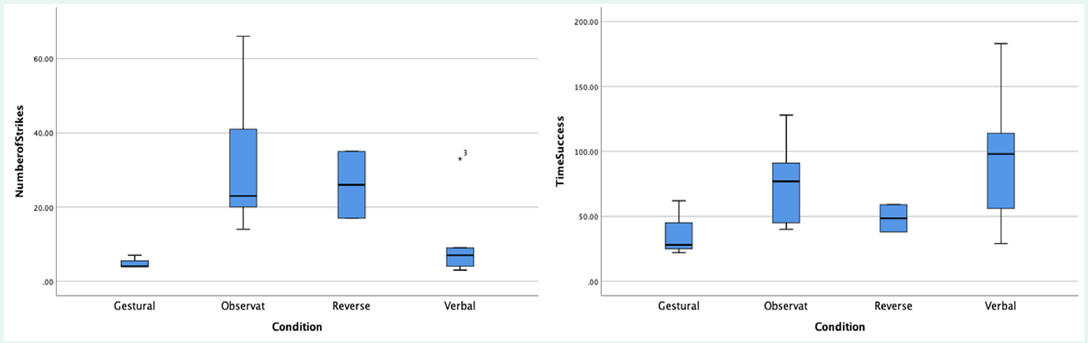
*T*he technique of bipolar flint knapping is a distinctive and ancient process used to create core tools or flakes from materials such as chert, flint, or quartzite. The process is deceptively simple using a base stone called an anvil, a hammerstone that is comfortably held in the hand for striking, and the rock in the middle which is to be struck to create the desired tool. Preferred outcomes include core tools, usable flake blanks, and bipolar cores (Leaf 1979).

*E*arly bipolar knapping has been thought of as a technique that does not need much skill, a hypothesized accident of nut cracking. Others believe that regardless of its beginnings, bipolar knapping not only required skill, but lasted much longer due to its usefulness, and that the usefulness and skill needed to flint knap may have helped to lead to the ability to communicate verbally (Morgan et al, 2015). While we are not exactly sure when hominins picked up an accidental flake and realized how it could be used, or how to make them we do know that bipolar knapping is still in use. How does communication help in teaching the bipolar technique of knapping?

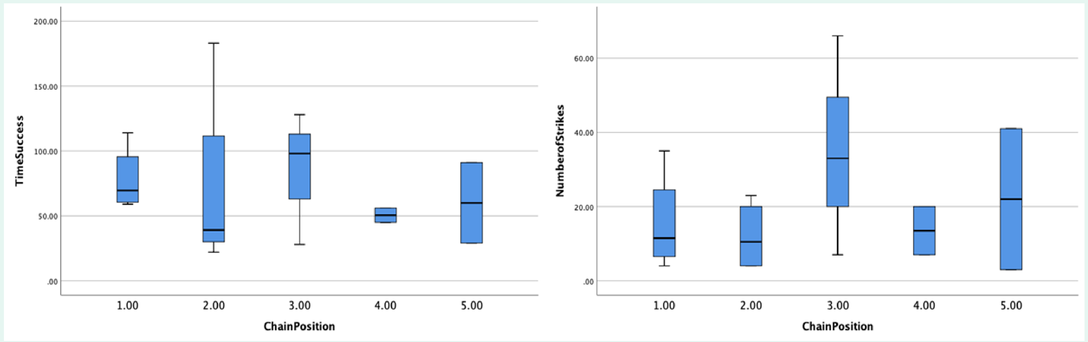
*W*e propose to test this with a series of transmission chains across several methods of learning (observation, gestural, verbal, and reverse engineering), within a set amount of time to determine which method, if any, proves best at conveying the bipolar knapping skill. Our thought is that the use of communication for the teaching methods of bipolar flaking would increase the success of creating a flake sharp enough to cut a carrot thus showing a need for the progression of language, including speech. We expect to find that verbal instruction is the most effective way to teach bipolar knapping out of observation, gestural, or verbal methods. It is possible that there may not be a difference between them, in which case how would knapping have helped to further communication among hominins?

The three flakes created by the gestural group. The large middle one is the flake used in the video to the upper right (image & video by LJ Strunck 2024).



The whisker charts above show the results of the data for time to cut the carrot, and the second for how many strikes were needed. This data was first run through a Kruskal-Wallis test for normality.

The whisker charts below show the data according to the position on the chain that the participants were at regardless of their test condition. Again, this data went through a Kruskal-Wallis test for normality (Putt 2024 (includes charts).

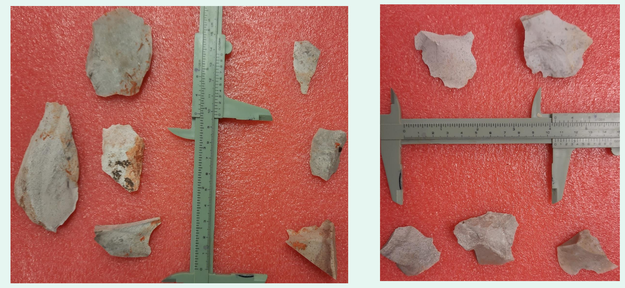


*T*he data all went through Kruskal-Wallis testing for normality. For the upper two charts to the left, the hypothesis test summary offered differing results. The time success had a significance of .337 which favored the null hypothesis, but the number of strikes had a significance of .043 which rejected it. Results under .05 meant that there was a significant difference in the conditions which is not likely due to chance (Putt 2024).

*T*he bottom two charts had a different conclusion than from the first. Here we find that the significance level is .780 for the time success distribution and .788 for the distribution of strikes needed. The significance level for this test remained at .050. Both of these results favored retaining the null hypothesis (Putt 2024).

*T*here was also a third test done, a Pairwise Comparison of Condition, that looked at how each teaching type measured against another when looking at the number of strikes. Again, the significance level is .05. Gestural-Observation was at .017, and Verbal-Observation at .036 (Putt 2024). These numbers support the hypothesis, while Gestural-Verbal at .566 do not. Nor did any of the calculations for Reverse against any of the other three.

*T*he conclusion for this test of bipolar flaking is that the hypothesis is conditionally disproven. I say conditionally as our sample size was small, no more than five subjects in a chain, and critically the gestural chain only went up to three due to lack of participants not failure. Also, all chains, other than the reverse engineering, completed. It is possible that being able to extend the chain until it naturally breaks could show a difference in the effectiveness of the learning via communication type.



The right five flakes are from the observation group, and the left grouping from verbal (images by LJ Strunck 2024).

*R*eferences cited:

Leaf, Gary R., "Variation in the form of bipolar cores," Plains Anthropologist 24 no. 3 (1979)

Morgan, T J H, N T Uomini, L E Rendell, L Chouinard-Thuly, S E Street, H M Lewis, C P Cross, et al. "Experimental Evidence for the Co-Evolution of Hominin Tool-Making Teaching and Language." Nature communications 6, no. 1 (2015): 6029–6029..

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