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Variation in flintknapping skill among Folsom-era projectile point types: A quantitative approach

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ABSTRACT

The "Folsom-Midland Problem" has been a subject of considerable debate among archeologists who study lithic technology during the Folsom interval. Differing skill among flintknappers is one of the interpretations invoked to explain the co-occurrence of Folsom points with unifacially fluted and unfluted specimens. This research uses several quantitative variables to determine whether different Folsom-age point forms represent different levels of knapping skill. The width/thickness ratio, flake counts per ten millimeters, and a ratio of flintknapping errors are compared among four Folsom typological variants using Kruskal–Wallis H and Wilcoxon Each Pair tests. Coefficients of variation are also examined across several variables to compare consistency of production between the point forms. Results generally indicate that Folsom points are the most skillfully made, followed by unifacially fluted, Midland, and pseudo-fluted points, respectively. Miniature versions of the aforementioned point types do not appear to follow this trend, however.

1. Introduction

The variety of projectile point technologies that appear in many Folsom assemblages have been interpreted in numerous ways. Specifically, the "Folsom-Midland Problem" concerns the co-occurrence of Folsom and Midland point forms across many Folsom-age sites (Judge, 1970; LeTourneau, 1998). Some archeologists have interpreted Folsom and Midland points as belonging to two separate but closely related complexes (Gunnerson, 1987:15–16; Irwin-Williams et al., 1973:44, 47), but more recent investigations have indicated otherwise. Particularly, LeTourneau (2000:330, Table A.2) records one Folsom point and four channel flakes from the Winkler-I site, which had been previously reported as exclusively Midland (Blaine, 1968). Also, Bradley (2009:259–264) notes the presence of Folsom points in both the Goshen and Midland components of the Hell Gap site. Instead of representing different components, Folsom and Midland points were apparently coeval in both space and time. This co-occurrence raises the question of why the same groups of people would use two seemingly distinct projectile point technologies to achieve the same apparent goal. Arguments as to why this occurs include the idea that Midland points are simply Folsom points that turned out too thin to flute (Judge, 1970:44), that Midland points are made when individuals are trying to conserve raw materials (Hofman, 1992), or that Midland points are made by those who are not skilled enough to make Folsom points (Bamforth, 1991:311–314).

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This research is concerned with testing the third hypothesis, that different point types from Folsom assemblages required different levels of knapping skill to produce. Although research into flintknapping skill has been gaining increasing attention (Andrews, 2003; Bamforth, 1991; Bamforth and Bleed, 1997; Bamforth and Finlay, 2008; Geribàs et al., 2010; Lohse, 2010; Lohse et al., 2014; Schillinger et al., 2014; Weedman, 2002), most previous studies suffer from a lack of quantitative analysis. In this research, Folsom-era projectile points are broken down into five variants: Folsom, unifacially fluted, Midland, pseudo-fluted, and miniature, with the first four variants comprising the majority of the analysis. Three variables (the width/thickness ratio, flake scars per 10 mm, and the mistake ratio) are proposed to quantitatively compare knapping skill between the point variants.

2. Previous research in knapping skill

One of the fundamental assumptions regarding the making of Folsom points opposed to other Folsom-age variants is that the bifacially fluted forms are more risky to produce than the others (Ahler and Geib, 2000:800; Judge, 1970:48–49). In this instance, "risk" refers to the fact that Folsom points are prone to breakage during their manufacture (though estimated probabilities vary, see Amick, 1999:2 and Bamforth and Bleed, 1997:130–131), while the other types such as Midland are less likely to break in production. Two factors can affect the risk associated with making Folsom points: the cost of failure and the skill of the knapper. Bamforth and Bleed (1997:117) illustrate the varying costs of failure using the example of a tightrope walker. The walker has an equally likely chance of falling regardless of the height of the tightrope, but a rope that is 100 ft above the ground has a much higher cost of failure than a rope that is one foot up. In the case of Folsom, making fluted points while surrounded by plenty of knapping material assumes a low cost of failure because the knapper can always try again if a preform breaks, but the cost becomes considerably higher in situations where stone is at a premium (Hofman et al., 1990:246). Therefore, while both highly skilled and less skilled knappers may attempt to knap Folsom points where stone is readily available and the cost of failure is low, only highly skilled individuals would likely continue making fluted Folsom points when the cost of failure is greater. Attaining a high level of knapping skill requires extensive practice and may represent some degree of specialization, requiring other members of a hunter-gatherer group to cover the knapper's basic needs (Bamforth and Bleed, 1997:127), although such a necessity may vary seasonally (Cross, 1990:35, 45). In situations where the costs of failure and of specialization are high (such as a small family band located away from lithic raw materials in which everyone must contribute to foraging activities), individuals would be more likely to resort to knapping unfluted variants instead of Folsom points. Of course, this inference assumes that the other point types involve less skill to produce. This assertion is tested below.

The realm of "skill" itself includes two essential aspects, which Bamforth and Finlay (2008:2–3) call connaissance and savoir-faire. Connaissance refers to the knowledge, understanding, and problem-solving abilities – basically the know-how involved in performing a task. Savoir-faire is the physical strength, dexterity, and coordination that go into successfully performing a task. One achieves the greatest level of skill when both of these aspects are at an optimum, usually while one is an able-bodied adult. In the case of flintknapping, a young child would lack both the connaissance and the savoir-faire involved in tool making. A physically adept individual who learns to knap early in life would have the savoir-faire but not the connaissance necessary to skillfully make tools. On the other hand, an older individual who has knapped for many years would retain the connaissance, but declining physical aptitude may hinder the knapper's savoir-faire, inhibiting his or her production of well made tools (Lohse, 2010:158–160; Weedman, 2002:737–739). Additionally, a skilled knapper should be consistent as well, meaning that the knapper can regularly produce tools that exhibit relatively little variation in their dimensions compared to tools produced by less proficient individuals.

The process by which individuals learn to flintknap also has an effect on the way skill is manifested in the archeological record. The most archeologically distinguishable form of learning is apprenticeships, in which the remains produced by the master flintknapper are clearly segregated from those made by novices (Bamforth and Finlay, 2008:9). However, apprenticeships only commonly appear in complex, sedentary societies. Hunter-gatherers generally do not rely on formal teaching and instead novices typically learn by doing (Hayden and Cannon, 1984). The lack of formal teaching does not mean that novices receive no help from experts, however. Ferguson (2008) proposes that "scaffolding" is a useful learning technique that appears in archeological flintknapping contexts. Scaffolding involves the cooperation of an expert and a learner in order to produce viable tools. The novice works on making a tool until he or she encounters an insurmountable problem, and the expert corrects the problem so that the novice may continue. In this way, the novice manages to produce viable tools that he or she could not have made otherwise.

Because individual knappers may vary in terms of performance from tool to tool, and because learning processes such as scaffolding may generate artifacts that are made by multiple individuals of different skill levels, the unit of analysis in this study is the artifact and not the knapper(s) who made it. For example, focusing on the artifact also eliminates the need to account for the likelihood that another individual may have resharpened a point after it was produced. Evidence for this occurrence may be present on points that have different patterns of pressure flaking between the proximal and distal ends. It is important to reiterate that this analysis is not looking for differences in skill among individual knappers and is instead measuring the skill level involved in the production, use, and maintenance of individual points. For the most part, the variation observed in this analysis lies within the physical realm of savoir faire, based on the fact that most of the points and preforms follow their respective reduction sequences or flaking techniques, indicating that the knappers at least had a cognitive understanding of the technologies involved. However, there are a few exceptions that do not follow the usual reduction sequence and may suggest a lack of connaissance on the part of the knappers. Additionally, some pseudo-fluted Folsom points may represent attempts to meet the end goal of projectile point production while failing to understand the technological processes involved.

The first hurdle in assessing flintknapping skill is finding a way to quantify it. Bamforth and Finlay (2008:5–6) present two tables listing attributes that are common in artifacts made by skilled and unskilled knappers (Table 1). Some of the variables listed are not applicable for discarded Folsom artifacts (such as large size, extreme length, or overshot flaking), and others like platform preparation are not assessed here, but other variables can be readily operationalized or at least observed in this sample. Among indicators of high levels of skill, useful variables include thinness relative to width, regularity of form, multistage reduction strategies, and consistency in production. For indicators of novice knappers, irregularity of form, steps and hinge terminations, and inconsistency in production are useful. Consistency in production is often quantified using the coefficient of variation (CV), which is a ratio of the standard deviation and the mean of a sample. According to Bamforth and Finlay (2008:5), coefficients of variation for any chipped stone assemblage generally falls between 2% and 60%, but standardized artifacts produced by skilled knappers should be in the realm of 10% to 15%.

3. Sample and methods

In addition to the aforementioned Folsom and Midland types, three additional Folsom point variants are recognized: unifacially fluted, pseudo-fluted, and miniature (Amick, 2002:177–183; Fig. 1). Points are considered Folsom if they are fluted on both faces. Folsom fluting is distinctive from ordinary basal thinning in that it covers at least 50% of both the length and the width of the point and creates a bi-concave cross section. A point is called unifacially fluted if it meets the same criteria as Folsom but is only fluted on one face, with the other face being laterally flaked. Midland points are not fluted and instead rely on an assessment of three criteria to identify them. Midland points are generally less than five millimeters thick, they exhibit collateral flaking in which lateral flake scars overlap across the middle of the point to

Table 1
Indicators of skillful and unskilled knapping in archeological assemblages. Modified from Bamforth and Finlay (2008:5–6), Tables I and II.

Indicators of high levels of skill	Indicators of unskilled knapping
Unusually large size	Irregularity in form
Extreme thinness relative to width	Predictable errors
Extreme length relative to width or thickness	Stacked steps and hinge terminations
Extremely complex outline form	Mis-hits and hammermarks
Regularity of form	Inconsistency in production
Volume	Wasteful and ineffectual use of raw material
Plan-view symmetry	Failure to rejuvenate
Smooth/symmetric cross-section	Low length/breadth flake ratio
Precise and regular finishing flaking	Deviation from expected chaîne opératoire
Intentional "overshot" flaking	Peripheral spatial knapping location
Minimal platform preparation	
Very low matric variation in artifact size	
Reliance on complex, patterned multistage reduction strategies	
Consistency in production	