Well, Shoot: Firearm Target Practice as A Recreational Activity on A Rural 19th Century Homestead

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Background of Site

Excavation began on "Cabin Site #1" in St. Charles County, Missouri in the Summer of 2011. This site lies above the Femme Osage Creek Valley and is located within a mile of the famous Daniel Boone Homestead where Daniel Boone died and his son, Nathan, lived. It is located in wooded land. Original interest in this site began with archaeological excavation designed to recover baseline data on the homestead. Placed on a flat terrace, the site included evidence of approximately three structures, remains of a two-track road drive, and a stone well. General artifact content included numerous glass and ceramic fragments, shotgun shells, bullet casings, numerous personal effects, and one tin-enameled bucket with approximately 120 bullet holes.

Researchers conducted extensive background research on the site and found it to originally be the homestead of the Diedrich family from Hanover, Germany from 1871 to possibly the mid-1950s. The archaeology team used documented evidence such as plat and topographic maps, as well as tax records and deeds, to determine this information. Immigrating in 1868, Jacob Diedrich brought his wife and three young children. While the family eventually bought land and grew to seven members, they remained in a lower socioeconomic class and were relatively self-sustaining farmers until the 1940s. Throughout the late 1800s, the family's total worth was slightly over $200, the price of one year's tuition at a private girls' finishing school of the same time (Dixon 1874). With a gap in the deed records during the early 1900s, it is difficult to tell if the Diedrich family lived on the property until its abandonment in the 1950s or if the land switched ownership. Regardless, the relative socioeconomic status stayed the same, as evident by the archaeological record (Kindler 2016).

Purpose of Study

The presence of the bullet riddled bucket presented an interesting question. If the homestead family was poor, why would they waste precious resources shooting holes in a bucket? It is common to find shell casings at archaeological sites of the same time period (Dasovich, Personal Communication 2016). This is normally limited to a very small number of spent casings (1-5). The purpose of firing guns in the middle of a homestead are often considered to be utilitarian; butchering a hog would be a good example of this. There has been little analysis of such casings in archaeology sites.

A bucket riddles with an excessive number of bullet holes suggests either target practice or sport. The expenditure of such a large amount of munitions; however, may suggest that the property owners had more expendable income than the background research suggested. Perhaps these holes were not caused in one event. The research team formulated a methodology that included three features of analysis: caliber, deformity patterns, and bullet trajectory.

Analysis of Bucket

The bucket was found in a dry creek bed that also contained a period trash dump. The bucket is white with black trim and is ten by nine by nine inches. The weight is approximately two pounds. The use of tin enameled buckets fits the period of the site and it can be inferred that the Diedrich family owned and perhaps shot the holes in this bucket (2012 *oldandinteresting.com*). There were approximately 120 bullet holes on all sides of the bucket. This suggests there were approximately 60 bullets fired into the bucket. Approximately two-thirds of these are entrance holes and the rest are either exit holes or the direction was indistinguishable. The direction of a bullet as it impacts the bucket can be distinguished by the way the metal folds around the hole. If the metal flaps point inward toward the center of the bucket, then the holes are an entrance hole since the bullet pushed the metal from the bucket in. If the metal flaps point outward, then the holes must be exit holes because the bullet must have come from the center of the bucket and pushed the metal outward.

I measured the narrowest diameter of each hole using an electronic sliding caliper to determine the caliber. Table 1 shows the breakdown of caliber sizes as seen through entrance hole data. I determined caliber size by measuring an entrance hole's narrowest diameter. For example, for a hole to be considered to have been made by a .22 caliber bullet, its narrowest diameter measurement could not be smaller than 0.22 inches or larger than 0.29 inches. Therefore, an entrance hole measurement that fell between two calibers would mean that the hole would be considered to have been made by the lower of the two calibers. Caliber categories used are based on the common bullet calibers of the early 1900s.

Table 1. Measured Calibers of Entrance Holes

Caliber	Number of Holes	Average Diameter (in)
0.22	27	0.277
0.30	14	0.316
0.33	10	0.340
0.38	3	0.388
0.40	8	0.426
0.45	11	0.627

The average diameter of the entrance holes is 0.36 inches and the average diameter of exit holes is 0.48 inches. Inches are the unit commonly used to discuss bullet calibers. The greater average diameter of the exit holes is to be expected due to the tendency of a projectile to swerve/rotate off axis and lose velocity after it has made contact through the initial wall of the bucket. Due to this, I only used the measurements of entrance hole calibers to analyze data.

Another feature of analysis is the pattern of deformation in the enamel surrounding the holes. There are two main patterns. The first pattern is described as circumferential and is characterized by concentric circles on the metal from the bullet impact (Figure 1). The second pattern is described as radial and is characterized by radiating points expanding from all sides of a hole, visible in the enamel (Figure 2). The circumferential pattern is present on approximately 27% of entrance holes and 2.2% of exit holes. The radial pattern, however, is present on approximately 72% of exit holes and on 1.4% of entrance holes. The radial pattern occurs more consistently on exit holes than the circumferential pattern does on entrance holes. The average width of these pattern markings, from the edge of the hole to the farthest end of the pattern, is approximately 0.56 inches.

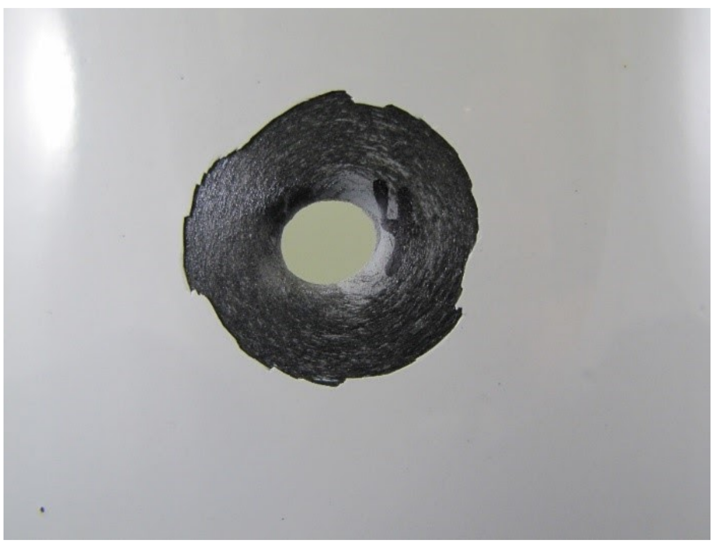

Figure 1. Circumferential Pattern

Figure 2. Radial Pattern

The final feature of analysis is the trajectory of the bullet. I used wood dowels to attempt to trace the trajectory of the bullets. Only 22 had potential exit hole partners. Assuming 60 bullets impacted the bucket, 37% of bullet trajectories can be estimated. Table 2 shows basic trajectory paths of these 22. Figure 3 shows general trajectory examples.

Table 2. Trajectory Paths

Number of Holes	Trajectory	Percentage of Sample
3	Bottom to top	8.8%
2	Top to bottom	5.9%
17	Relatively straight	50.0%

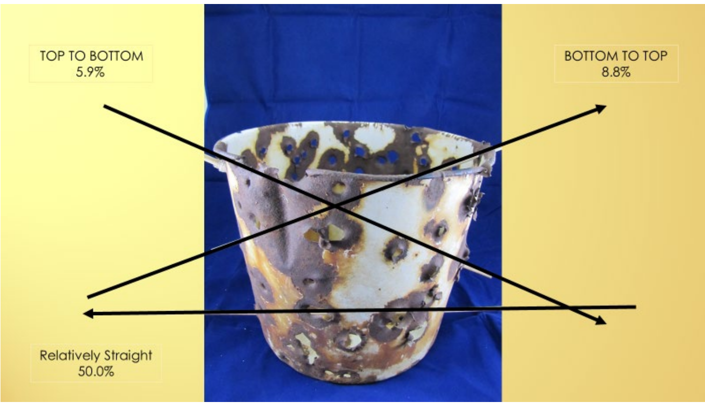

Figure 3. Trajectories

Experimental Archaeology

The whole purpose of doing experimental archaeology is centered on identifying how the original bucket's hole diameters do not exactly match caliber sizes. We set the experiment up to recreate the shooting of similar antique buckets.

Methodology

Our methodology included shooting three tin-enameled buckets of similar size with pre-determined bullet sizes matching as closely as possible the calibers studied. The experiment focused on four goals. The first is to determine if the measurements of the diameters of the holes would correspond to the known calibers. To ensure the integrity of this data, our shooter took care not so shoot to have multiple bullet holes in one location. The second goal is to determine if the enamel markings found on the old bucket would correspond with the enamel markings on recently shot buckets. The third goal is to match the casing scatter of the modern shooting event with potential casing scatter at the archaeological site. The final goal focused on the study of recordation of the movement of the bucket after each shot. This could tell us if the individuals shooting the bucket would have had to adjust their aim based on the bucket's movement, allowing us to better understand bullet trajectory paths.

Each bucket was set 20 yards away from the shooter and was shot six times. After each shooting session, we numbered the holes in the order of the fired rounds in case that previous holes were damaged by future shots. The bucket freely moved after each shot, mimicking the original shooting event(s). We recorded each change in the bucket's attitude. For the first bucket, the project's shooter used a .22 Winchester long rifle with 40 grain lead bullets. For the second bucket, the shooter used a .30/30 Winchester rifle with 150 grain, semi-jacketed, copper bullets. For the final bucket, the shooter used a .40 Smith and Wesson handgun with full metal jacketed, 180 grain bullets (see Table 3).

Table 3. Shooting Session Information

	Bucket 1	Bucket 2	Bucket 3
Caliber	0.22	0.30/30	0.40
Grain	40	150	180
Type of Ammo	Lead bullets	Semi-jacketed	Full metal jacket
Notes	Throws every 3rd casing	Copper bullets	NA


Figure 4. Bucket 1


Figure 5. Bucket 2


Figure 6. Bucket 3

Summary of Data

After shooting the first bucket, we measured the diameters of the six entrance holes, and they averaged to 0.41 inches. After the six shots, the bucket rotated no more than 45 degrees in total. Each casing is ejected to the right of the weapon in the following pattern of two feet, two feet, and five feet, two feet, two feet, and five feet. The average entrance diameter of the second bucket is 0.37 inches, with a total rotation of 15-20 degrees and a consistent casing scatter of half a foot to the right of the weapon. Finally, the average diameter of the third bucket is 0.47 inches, rotated with a total of approximately 45 degrees and with a varying casing scatter pattern of one, two, three, or four and a half feet to the right of the weapon. No bucket moved significantly from its original location enough to be noted (see Table 4). As for enamel markings, all entrance holes on all three buckets had circumferential markings and all exit holes on all three buckets had radial markings. The width varied depending on the grain of the ammunition with lower grains width causing a larger radius and higher grains causing a smaller width.

Table 4. Shooting Session Data

	Bucket 1	Bucket 2	Bucket 3
Ammo Used	0.22	0.30	0.40
Avg. Diameter	0.411	0.365	0.474
Rotation (degrees)	Less than 45	15-20	~45
Casing Scatter	2/2/5 ft right	0.5 ft right	1/2/3/4-5 ft right

Data Analysis

Comparison of analyses between the original bucket and the newly shot bucket showed interesting results. When comparing hole diameter made by each caliber of bullet, we determined that the hole diameter is not a reliable way to estimate the caliber of ammunition used. As seen in the experimental data above, a .22 bullet caused holes that averaged 0.41 inches in diameter. This means that by using the initial method of predicting caliber, the bullet caliber would have been predicted as a .40 bullet. Similarly, a .30 bullet hole that averaged 0.37 inches would be predicted as a .33 bullet and a .40 bullet hole that averaged 0.47 inches would be predicted as a .45 bullet. As for deformation patterns, the patterns found on the newly shot buckets corresponded with those found on the old bucket. The patterns found on the experimental buckets are even more consistent, however. It may be inferred that the patterns are, therefore, consistent with the type of hole, entrance for circumferential and exit for radial, but time and deterioration could affect the visibility of these markings as well as the potential of multiple bullets to enter and exit at the same location. As for the effect of casings in the archaeological record, there are distinct patterns in the dispensing of casing from a weapon. However, casings are rarely found in piles or even in multiples as the dispensing patterns would predict if the shooter was standing in one spot for multiple shots. This may affect the final question which was the movement of the bucket and the corresponding movement of the shooter. None of the buckets moved from their location except to rotate slightly. This combined with the lack of casing piles may suggest that the shooter did not stay located in one spot for long periods of time.

Conclusions

The researchers designed this experiment to fulfill the purpose of initial research into shooting as a recreational past time in the early 20th century. The bucket found at Cabin #1 gave us basic information regarding predicting caliber, enamel markings on similar buckets, and the scatter of casings in the archaeological record. There are many unanswered questions that have been raised by this study that can promote further research on the topic. While this study focused on the casings in the archaeological record, there is room for study on the presence of bullets and their deposition patterns in similar contexts. Some questions raised are if this event was designated or if the shots were random and isolated?; if the shooting was done for recreation, would a family of low economic status spend money on ammunition?; and who would be doing the shooting, bored farmhands, head of household, modern day hunters? Overall, this was meant to be a pilot study to serve as a springboard to promote further research on recreational shooting in a rural context. This line of research could reveal many details on the daily life of those of lower socioeconomic status and possible activities they used to fill their downtime.

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