Supporting Information for

Unravelling technological behaviors through core reduction intensity. The case of the early Protoaurignacian assemblage from Fumane Cave.

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Supporting Information Methods S1.

The knapping experiment was performed by one of us (EM), an experienced right-handed flint knapper, after receiving tutoring on the defining features of the Protoaurignacian lithic technology. The knapper reduced the available raw materials with the goal of producing blades and bladelets using the most common platform reduction strategies identified at Fumane Cave by Falcucci and Peresani (2018). The knapper could freely choose among the raw materials available. Cores were in most cases roughly decorticated and flat platforms with steep striking angles were positioned in the most suitable area of the blank, aiming at exploiting in most cases the longest flaking surface available for laminar production. The first blank removals took advantage of the natural ridges and convexities of the core, although single or two-sided crests were sometimes used to allow the first laminar blanks to be successfully detached. Knapping direction was mostly unidirectional, although removals from opposite striking platforms were also used to maintain the cores' longitudinal convexities. The knapper used both soft stone and organic (i.e., antler) hammers during the optimal production phases. A hard hammerstone was instead used in the early reduction phases to detach fully cortical blanks, and occasionally to perform maintenance operations (e.g., remove core tablets). Likewise, dorsal thinning was used to reduce the overhang and allow the successful extraction of blanks using marginal percussion.

The progression of the knapping could involve a narrow surface only or expand to more surfaces using a semi-circumferential knapping progression. Bladelet production was optimized by isolating rather convergent and straight flaking surfaces, in agreement with the technological evidence from Fumane Cave, where pointed bladelets are a common occurrence (Falcucci and Peresani, 2018). Maintenance operations were carried out throughout the reduction sequence and resulted in the removal of lateral comma-like blanks, core tablets, and plunging maintenance flakes. In two cases, cores were rotated to begin independent reduction sequences after opening new striking platforms. Core reduction was interrupted when the raw material was almost completely exhausted or when the core's convexities and/or striking angles, as well as the recurring occurrence of hinged blanks, prevented the successful progression of the knapping.

All blanks bigger than 10 mm in maximal dimension produced during the knapping experiment were collected, divided into reduction phases, and analyzed using several discrete and metric attributes (Andrefsky, 1998). These blanks can be thus sorted and analyzed according to specific temporal frameworks of the core reduction. This dataset is part of the research compendium associated with our paper (Lombao et al., 2023).

S1 References:

Andrefsky, W.J., 1998. Lithics: Macroscopic Approaches to Analysis. Cambridge Manuals in Archaeology. Cambridge University Press, New York.

Falcucci, A., Peresani, M., 2018. Protoaurignacian Core Reduction Procedures: Blade and Bladelet Technologies at Fumane Cave. Lithic Technol. 43, 125–140. https://doi.org/10.1080/01977261.2018.1439681

Lombao, D., Falcucci, A., Moos, E., Peresani, M., 2023. Research compendium for "Unravelling technological behaviors through core reduction intensity. The case of the early Protoaurignacian assemblage from Fumane Cave." Zenodo. https://doi.org/10.5281/zenodo.8212573

Supplementary Figures

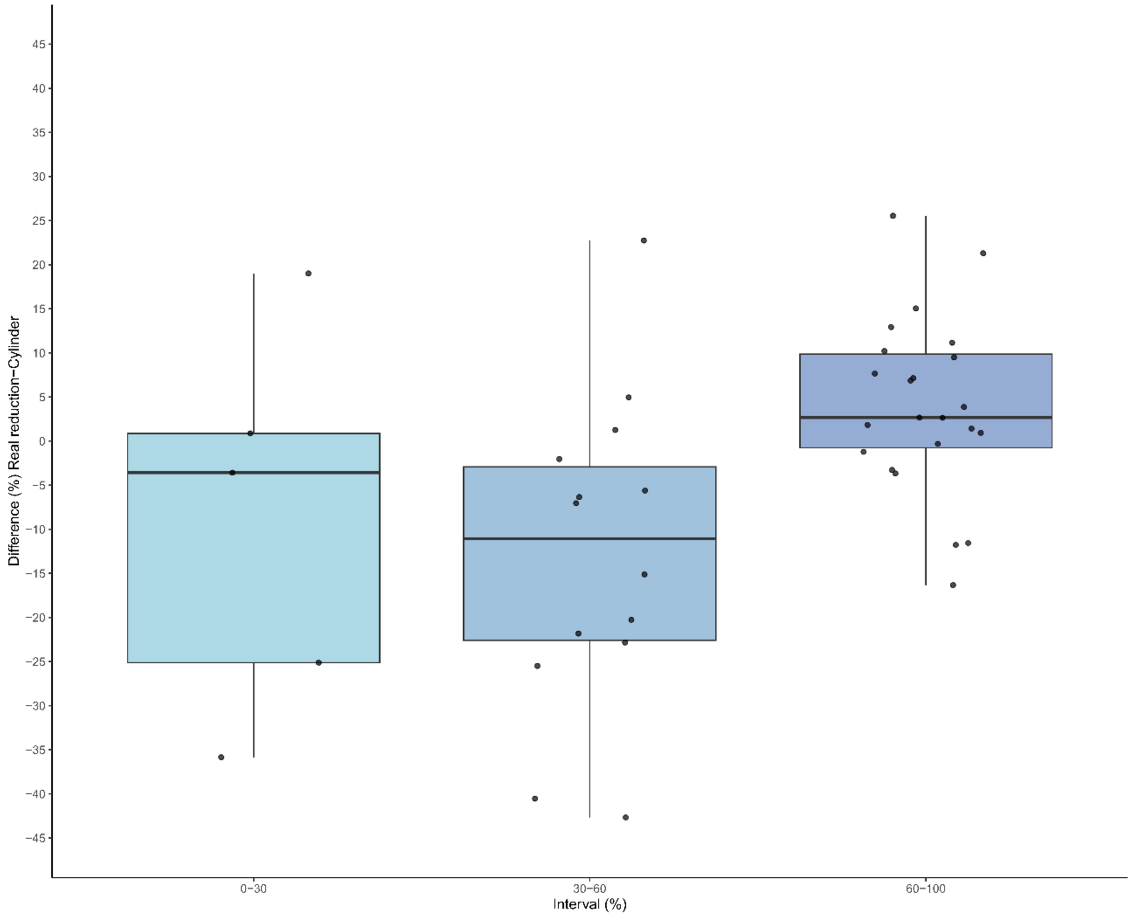

Figure S1. Boxplot + jitter plot showing the differences between the actual extracted volume percentage and the extracted volume percentage estimated through the VRM using the cylinder formula as a function of the drawdown range (0-30%/30-60%/80-100%).

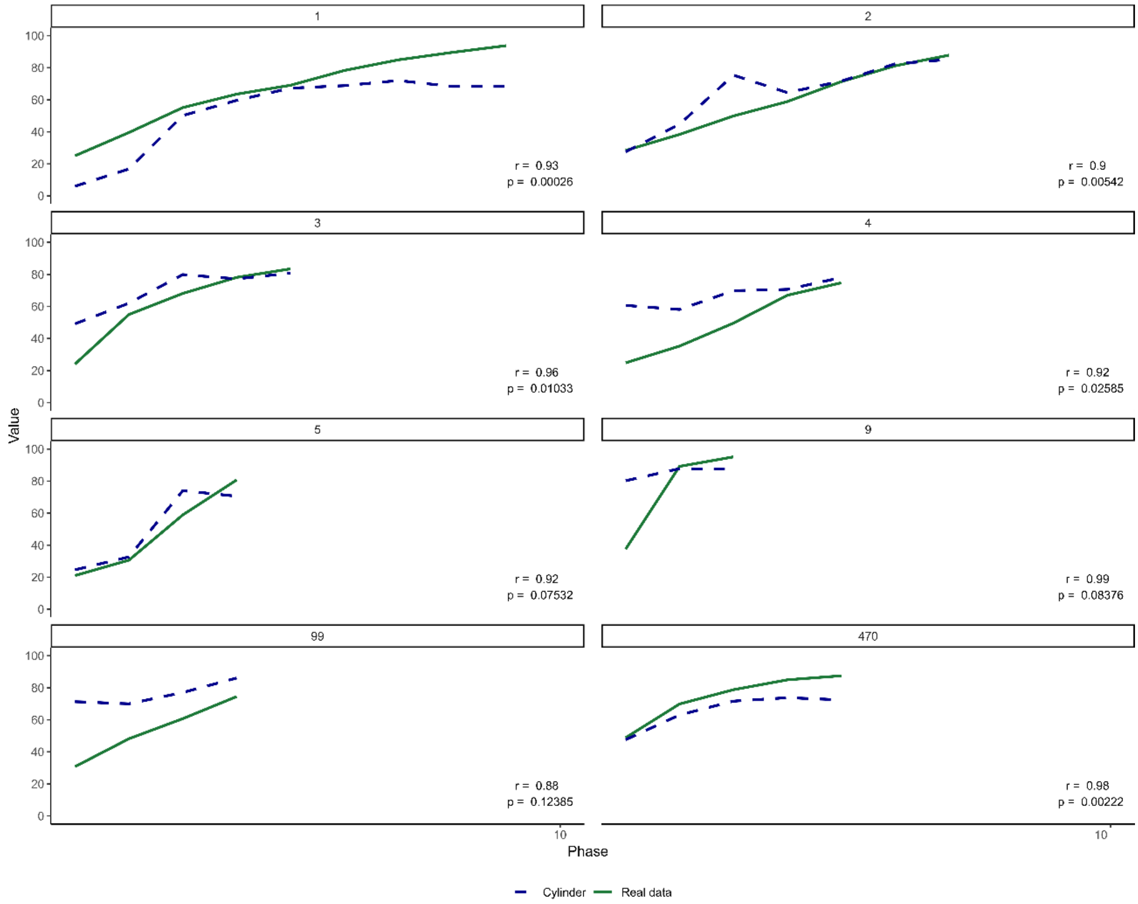

Figure S2. Line plot showing the evolution of the percentage of actual extracted volume and the percentage of extracted volume estimated through the VRM using the cylinder formula in each reduction sequence (i.e., core) by phase. The values indicate the correlation between both slopes.

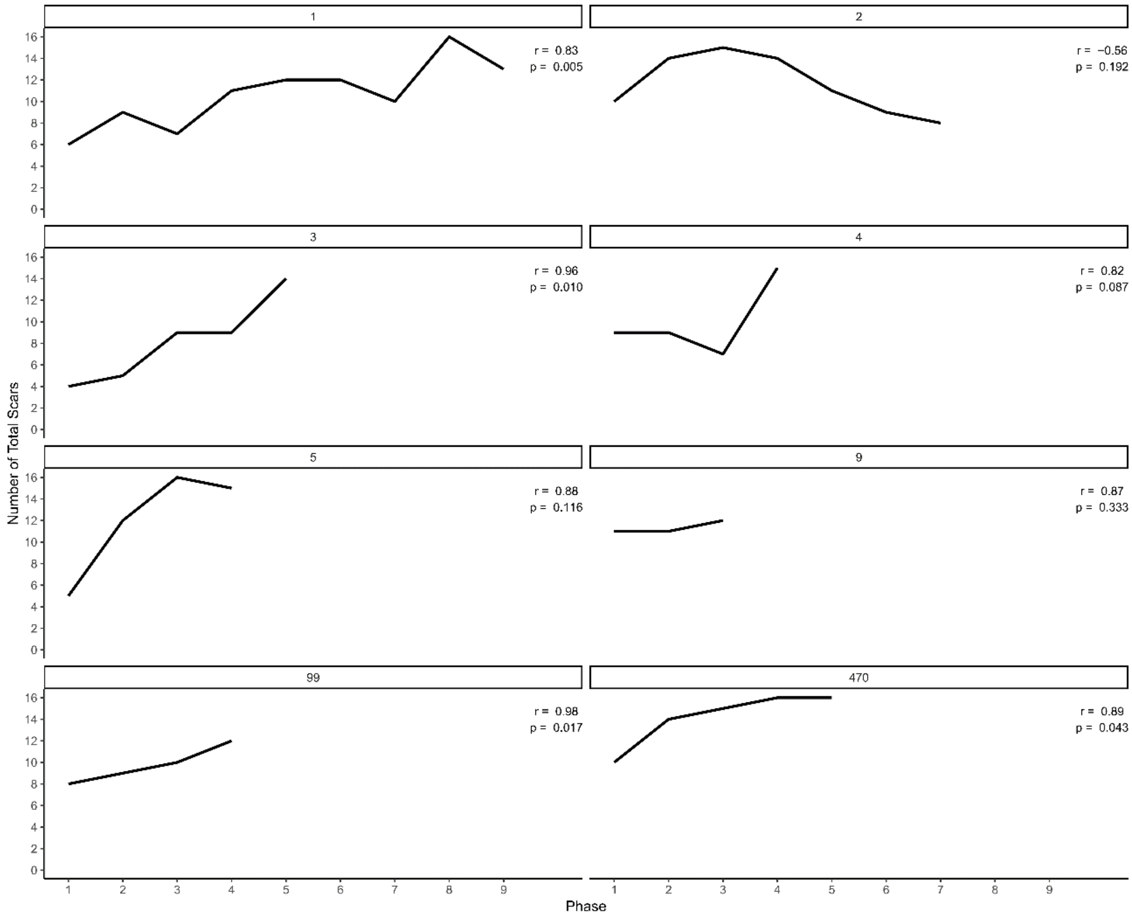

Figure S3. Line plot showing the evolution of the number of total visible scars in each reduction sequence (i.e., core) by phase. The values indicate the correlation between the number of visible lifts and the percentage of actual extracted volume.

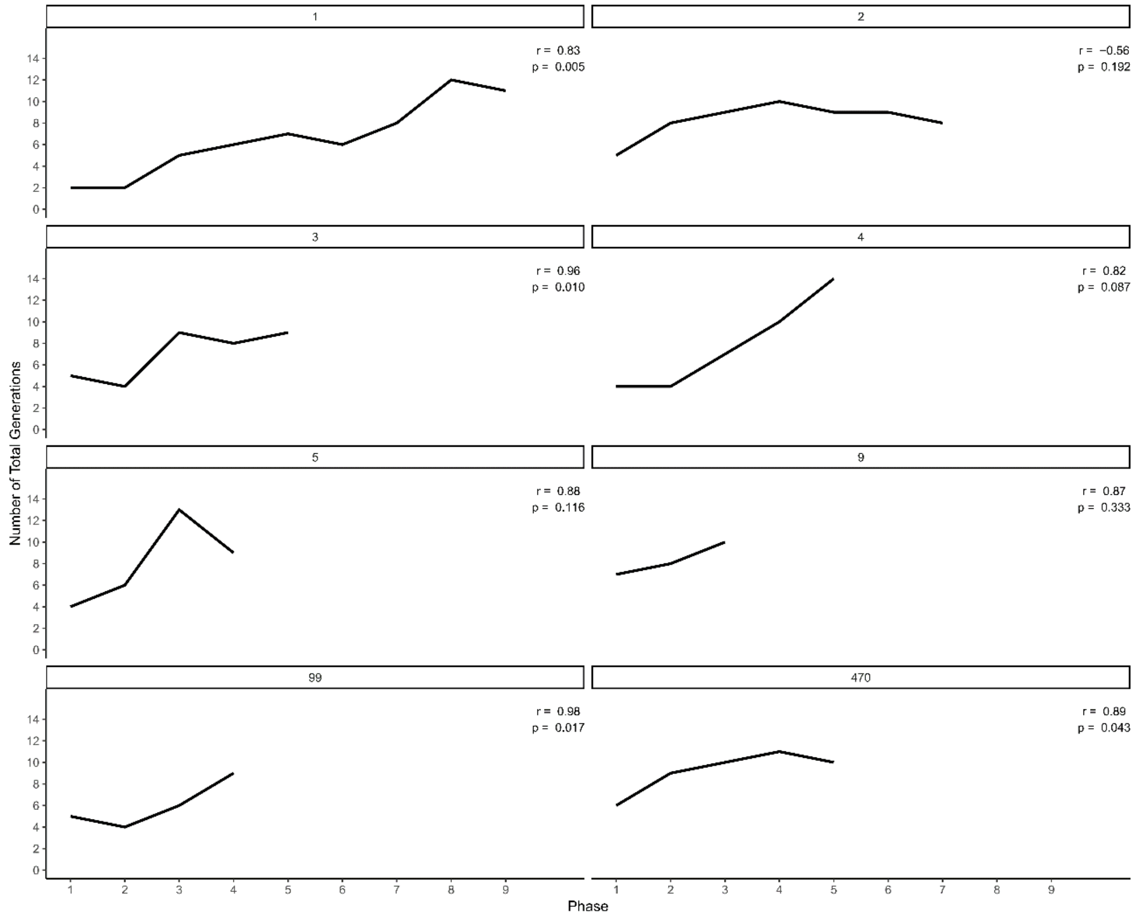

Figure S4. Line plot showing the evolution of the number of generations identified for VRM correction in each reduction sequence (i.e., core) by phase. The values indicate the correlation between the number of generations identified for VRM correction and the percentage of actual extracted volume.

Supplementary Tables

	Cube	Cylinder	Ellipsoid	Experimental Data	Prism
Cylinder	0.27	-	-	-	-
Ellipsoid	<0.01	0.55	-	-	-
Experimental Data	1	1	0.12		-
Prism	1	0.13	<0.01	0.58	
Sphere	<0.01	0.91	1	0.23	<0.01

Supplementary Table S1. Dunn test post-hoc comparisons of Estimated Volume medians for each geometric formula and the actual original volume.

	Cube	Cylinder	Ellipsoid	Experimental Data	Prism
Cylinder	0.47	-	-	-	-
Ellipsoid	<0.01	0.02	-	-	-
Experimental Data	0.13	1	0.11		-
Prism	1	0.02	<0.01	<0.01	
Sphere	<0.01	0.07	1	0.28	<0.01

Supplementary Table S2. Dunn test post-hoc comparisons of Percentage of Extracted Volume medians for each geometric formula and the actual original volume.

	Block	Flake	Nodule	Slab	Undet.	Total
Maiolica	9 (9.89%)	19 (20.88%)	32 (35.16%)	3 (3.30%)	28 (30.77%)	91 (73.39%)
Other	1 (50%)				1 (50%)	2 (1.61%)
S_Rossa			1 (16.67%)		5 (83.33%)	6 (4.84%)
S_Variegata	4 (44.44%)	1 (11.11%)	2 (22.22%)	1 (11.11%)	1 (11.11%)	9 (7.26%)
S_Variegata 3	2 (12.5%)	1 (6.25%)	10 (62.5%)	1 (6.25%)	2 (12.5%)	16 (12.9%)
Total	16 (12.9%)	21 (16.94%)	45 (16.94%)	5 (4.03%)	37 (29.84%)	124 (100%)

Supplementary Table S3. Contingency table of raw material varieties and blank types for all analyzed cores from the A2-A1 assemblage of Fumane Cave.

Raw Material	Total Cores	Total Products	Ratio Products/Cores
Maiolica	91	4676	51.38
Other	2	517	258.5
Scaglia Rossa	6	397	66.16
Scaglia Variegata	9	621	69
Scaglia Variegata Type 3	16	468	29.25

Supplementary Table S4. Number of total cores, total products, and ratio of total products/total cores for each raw material.

Range (% of Extracted Volume)	AE Cylinder	AE Ellipsoid	AE Cube	AE Sphere	AE Prism
0-30	8.94	8.56	42.5	12.6	40.4
30-60	12.9	0.25	16.8	-17.5	26.1
60-100	-4.02	-14.3	-3.86	-26.7	2.60

Supplementary Table S5. Average error (difference between the actual value and the value obtained in each geometric formula) for each geometric formula as a function of the extracted volume percentage range.

Phase	N	Mean	Median	Min	Max	SD	CV
1	8	30.06	26.71	21.05	48.82	9.11	0.30
2	8	50.76	43.87	30.65	89.19	19.97	0.39
3	8	64.54	69.82	49.60	95.11	15.69	0.24
4	7	72.54	74.52	58.88	84.96	9.62	0.13
5	5	77.22	74.76	69.08	87.49	7.94	0.10
6	2	79.77	79.77	78.32	81.22	2.05	0.03
7	2	86.39	86.39	84.94	84.94	2.05	0.02
8	1	89.58	89.58	89.58	89.58	NA	NA
9	1	93.79	93.79	93.79	93.79	NA	NA

Supplementary Table S6. Descriptive statistics of the percentage of volume extracted for all experimental cores, categorized by their respective reduction phases.