

Primitive Weapons and Modern Sport: Atlatl Capabilities, Learning, Gender, and Age

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Even uncontrolled "experimentation" such as sporting use of early hunting gear can provide insights into archaeological questions. Analyzing the records of a standardized atlatl competition over eight years offers some insights into spear thrower capabilities, learning curves, and the use of weapons by women and children. The sample is now large enough to provide a plausible analog to prehistoric atlatl capabilities, allowing us to judge ethnographic accounts and archaeological expectations. Atlatl skills can be acquired fairly rapidly by any adult or older youths. The atlatl should reduce the importance of body size and strength, and all but the youngest members of a society should be biologically capable of atlatl use where social rules allow it.

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The recent surge of popular interest in early technology and "primitive skills" is sometimes viewed by archaeologists as the realm of hobbyists, amateurs, costumed romantics, and uncontrolled experimentation. Modern sporting use of atlatls provides a good example of why it is a mistake for us to be too snobbish. Examining the records of a standardized atlatl competition over eight years offers some insights into spear thrower capabilities, gender differences, and learning curves for throwers of all ages.

Atlatls, or spear throwers, preceded the bow in most areas of the world and survived to recent times in a few ethnographic areas. Basically a stick with a hook on the end, the atlatl acts as a lever to give a mechanical advantage when throwing a light spear (Hutchings and Bruchert 1997). Archaeological experiments with atlatls began a long time ago (see Knecht 1997; Whittaker 2006 for reviews) and continue with interest in the function of specific artifacts (Browne 1940; Peets 1959; Perkins 1992; Webb 1957), the biomechanical and physical basis of atlatl function (Baugh 1998, 2003; Butler 1975; Cundy 1989; Stodiek 1993; VanderHoek 1998), the capabilities of different projectile sys-

tems (Cattelain 1997; Couch et al. 1999; Frison 1989; Hill 1948; Hutchings and Bruchert 1997), and the skeletal effects of atlatl use (Angel 1966; Jurmain 1999; Whittaker 2003).

Modern recreational interest in "primitive skills" is evident in the success of popular journals such as *Primitive Archer* and *Bulletin of Primitive Technology*, which are aimed at a non-archaeological audience. Such journals publish practical tips for atlatlists and others, and accounts of experiments range in rigor and usefulness from zilch to exemplary. Recreational atlatlists are as devoted and opinionated as enthusiasts in any sport. Their practical experience has created a body of oral lore and an extensive literature.

Following the "World Open Atlatl Contest" started in 1981 (Laird 1984), the World Atlatl Association (WAA) was founded in 1988, and there are now also a number of state, regional, and European atlatl societies. Because atlatls are fairly easy to make and use at an elementary level, but difficult to really master, they are ideal for teaching experimental archaeology and for inspiring students and the public with respect and interest in pre-industrial technology (Whittaker and Mertz

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2002).

It is no longer possible to make diachronic observations of subsistence hunters using atlatls, nor is it practical to recruit a large group of experimental subjects and assign them the task of learning to use an atlatl over several years. Nevertheless, the sporting world of atlatlists provides a relatively large body of experienced throwers, some actively experimenting and publishing on atlatls, others capable of cooperating with experimenters. The sporting records that are developing can be used as a naturalistic experiment under circumstances where controlled experimentation is not possible.

THE INTERNATIONAL STANDARD ACCURACY CONTEST

The International Standard Accuracy Contest (ISAC) was developed in 1996 by Lloyd Pine (Tate 1996). Its purpose is to establish one uniform standard of comparison among atlatlists worldwide. The ISAC is now used as part of most competitive atlatl events in the United States and some in Europe. Scores are recorded and publicized by Pine and the WAA (<http://www.worldatlatl.org/>). The contest consists of 5 throws at 15 m and five at 20 m using a standardized bullseye target modeled after those used in archery (Figure 1). The ring diameters are 108 cm, 80 cm, 56 cm, 40 cm, 24 cm, and 10 cm, scoring 6, 7, 8, 9, 10, and X (tie-breaking 10) points respectively, for a possible high score of 100 with 10X. For our statistical computations, we treated X as .1 added point, thus 90XX = 90.2.

ISAC competition includes people of all ages and skill levels. Score sheets record gender, age if under 16, and state of residence. There are no restrictions on equipment, other than the requirement that points and shafts be less than 19 mm

in diameter. Out of intellectual curiosity, the score sheets classify equipment as "primitive" or "modern," although this is one area where the records are poorly kept. Atlatls and darts used in modern events include a few archaeologically supported replicas, but most are "inspired by" prehistoric or ethnographic gear and made using modern tools and a wide range of natural materials. To be considered "primitive" all materials must have been available to prehistoric or ethnographic atlatlists, with exceptions made for modern glues and waxed nylon "sinew." The "modern" class includes traditional forms that incorporate metal or plastics, and innovative atlatls made with space-age materials. "Modern" fiberglass and aluminum dart shafts are common as well as "primitive" milled wood, bamboo, and cane. One of the pleasures of the sport is in making and trying out new gear. In our data, the average scores for primitive equipment are a little higher than for modern gear. This appears to reflect a preference among some of the most prolific and high scoring participants for making their own "traditional" equipment, rather than any real advantages of the equipment itself. (For practical tips on atlatl manufacture, see *The Atlatl*, bulletin of the World Atlatl Association <http://www.worldatlatl.org/> and references in Whittaker 2004 and Bruchert 2000).



Figure 1. Atlatlists posing for sympathetic magic at an ISAC target, Cahokia, 1997. Standing: K. Hines, C. Brown, S. Brown. Kneeling: R. Madden, J. Whittaker.

Table 1: Atlatl Competitions Between 1996 and 2003

Year	No. of Scores	% Scores by Women	% Scores by Youth	No. of Throwers ²	% Throwers Female ³	% Throwers Youth ⁴	No. of Events ⁵
1996	272	10	2	134	14	2	23
1997 ¹	398	6	4	128	9	5	41
1998	1116	20	11	422	22	11	62
1999	1754	22	16	541	19	19	67
2000	1952	23	13	551	21	17	73
2001	2788	27	15	761	25	22	108
2002	2532	27	14	710	24	20	86
2003	2688	26	12	754	24	18	90
Total	13500	24	13	2310	24	20	483

¹Only scores above 40 were recorded for 1997. This results in a lower number of scores and total competitors and probably reduces the proportion of both women and youth as well as the proportion of scores attributable to them.

²Total number of throwers is number of individuals who participated in any of the eight years.

³% of individuals participating in any year who have been female (554 different women).

⁴% of individuals participating in any year who have been youth (453 different youths).

⁵Number of Events counts multi-day events as one event. 1999 events are probably undercounted because dates were not consistently recorded.

Although the ISAC was created by and for atlatl sports, so that there would be one standard of comparison among atlatlists all over the world, it can serve more serious research purposes as well. For some questions, such as the development of skill with age and practice, it is hard to imagine a long-term experiment requiring participants to practice, and this kind of voluntary, naturalistic set of observations, in spite of some problems is probably as good as one can get and equivalent to a sociological survey, for example.

THE DATA SET

Lloyd Pine kindly provided his accumulated ISAC records from 1996 to 2003. We have also referred to some year-end high score records for 2004 but did not analyze complete data for that year. Despite efforts by Pine and the authors that must be modestly described as heroic, there are some problems in the data that should be noted. Unlike the Olympics or major league baseball games, atlatl events are pleasantly small and informal, and the WAA has no money, no power, and no bureaucratic apparatus to oversee scorekeeping. Individual event organizers and scorekeepers use a standard recording form but fill it out at many different levels of completeness, legibility, and consistency. The scores are carefully recorded and checked at events because some competitors care about them, but peripheral information on partici-

pants such as age, gender, and equipment is frequently neglected. Participant names are spelled or misspelled in a bewildering plethora of variants over the course of several years and many events. With personal knowledge of the competitors, and arduous cross-checking and proof-reading of 13,500 scores, we have whipped the data into reasonable consistency but some errors will remain, particularly for participants who only show up once or twice.

The basic demographics of eight years of ISAC competition are shown in Table 1, where it can be seen that after initial growth, numbers of events and participants have been fairly steady for the last few years.

ATLATL CAPABILITIES

The modern atlatl world includes no one who was born with an atlatl in his hand and used it every day, and we have not yet attracted any of the super-athletes one sees in professional sports although there are participants with impressive physiques and unusual skills. In ISAC competition, a score of 70 is considered competent but not exceptional, and the highest score so far achieved by anyone is 98XXXXX (98.5). Atlatlists argue about when we will "break 100" on the ISAC. This relates to the archaeologically more useful question of whether we are approaching the top capabilities of normal equipment and human throwers, rel-

evant to understanding the possibilities and limitations of hunting with atlatls.

We can examine the overall mean and maximum scores for different subgroups of the data set (Table 2), but these include many participants who tried their hand once or twice on a whim, or who compete because they come to events with more serious family members, or who enjoy the events but have no interest in practicing, and so on. Accordingly, we find it more useful to look at "frequent participants" arbitrarily defined as those with 10 or more scores over the course of the eight-year data set. There are 250 frequent participants, comprised of 51 women, 155 men, and 44 youths, of whom eight were girls and 36 boys. The frequent competitors account for 70 percent of the total scores recorded. Here we can see people who

are perhaps engaged enough to practice and improve over time and may be reaching the limits of their capabilities (Table 3).

It is apparent that as sporting interest in atlatls has grown, so has skill, in some senses at least. More people are practicing, and over the eight years of ISAC records, the top scores have risen, and the number of people achieving higher scores has increased. After the first year of competition, the top 20 scores ranged from 64 to 87 (Pine 1997). In 2004 the top 25 scores from nine years of competition ranged from 91X to 98XXXXX. However, our data shows that both maximum scores and average scores for the better throwers have leveled out. Most of the top throwers reach a peak in a year or two of competition, and their scores remain steady thereafter (Figures 2, 3). It seems un-

Table 2. Scores¹ of All Atlatl Contestants by Year

Year	No. of Males	No. of Females	Mean Scores		Maximum Score Males	Maximum Score Females
			Males	Females		
1996	116	18	46.33	23.31	87.0	43.0
1997 ²	117	11	62.12	52.27	93.2	72.0
1998	329	93	47.47	23.80	93.0	67.0
1999	441	101	50.58	29.71	97.2	73.0
2000	437	114	52.53	32.39	94.3	81.2
2001	568	195	53.33	32.35	94.1	85.2
2002	537	174	54.61	35.20	96.2	84.1
2003	568	187	55.22	37.29	98.5	92.1
2004 ³					97.3	87.0

¹Scores with X were treated as decimals for statistical computation; thus, 93XX=93.2.

²Only scores above 40 were recorded for 1997. This results in inaccurately low numbers of competitors and inaccurately high mean scores.

³Only information on high scores was available for 2004.

Table 3. Scores of Frequent¹ Competitors

Age	N of Scores	Max Score	Mean Score All	N Females ¹ Scores		Mean Score Females		N Males ¹ Scores		Mean Score Males	
				Females	Score	Females	Score	Males	Score	Males	Score
5	4	14	11	0	—	—	—	4	14	11	11
6	16	22	9.8	0	—	—	—	16	22	9.8	9.8
7	34	71	19.3	3	12	4	31	31	71	20.8	20.8
8	62	76	18.4	12	30	2.5	50	50	76	22.2	22.2
9	69	74	26.5	8	16	7	61	61	74	29.1	29.1
10	98	73	27.6	38	52	18	60	60	73	33.7	33.7
11	135	79	32.5	50	56	24.6	85	85	79	37.2	37.2
12	136	86	41.5	41	68	25.3	95	95	86	48.4	48.4
13	127	88.1	38.6	46	70.1	31.8	81	81	88.1	42.5	42.5
14	116	87.2	49.6	33	74.1	34	83	83	87.2	55.9	55.9
15	183	92.2	57.9	32	61	28.5	151	151	92.2	64.1	64.1
Adult	8342	98.5	59.5	2063	92.1	41.7	6279	6279	98.5	65.9	65.9

¹Defined as having competed more than 10 times in the eight years for which scores are available.

likely that we will see a sudden leap in the level of proficiency of the top throwers, although there will surely be occasional scores that push the limits. If atlatl sports were to become popular and subject to the same economic and social pressures as Olympic sports, a superior group of top competitors would probably develop, and the current high scores might seem commonplace, just as the supposedly unattainable four minute mile was eventually conquered. However, the average competent and fit human in any population past or present will always perform to a lower standard than professional athletes.

It has been justly said that the failures of modern experiments do not necessarily prove the impossibility of a prehistoric technique or the inefficiency of a technological system (Clark 2002). Lifelong familiarity and practice with atlatls might give native users a skill or technological trick unknown to moderns. We cannot claim that modern atlatl scores are proof that prehistoric folk could not have done better, but with a large body of data collected over a long span from many different individuals, using a variety of gear, and often practicing intensely, it becomes increasingly unlikely that past atlatlists would have been significantly better than today's best.

Atlatls have more inherent limitations to accuracy than bow and arrow. The difficulty of controlling human error and variability in each throw makes atlatling a challenging sport. Cattelain (1997:230) states that in European events using the same targets and distances for bows and atlatls, the best spear throwers attain only 65 percent of the scores of the best archers. He gives no detailed data, but this agrees with our experiences. It is much harder to develop proficiency in throwing a dart with the atlatl than in shooting an arrow with a bow. A bow allows a regular draw for consistent velocity, produces a relatively flat trajec-

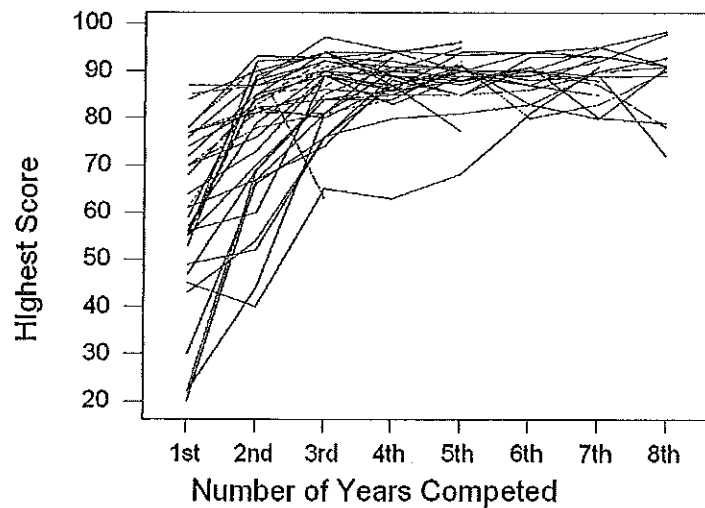


Figure 2. Learning curve for atlatlists who have scored 90 or above at some time (N = 35), maximum score for a year graphed against number of years of competition.

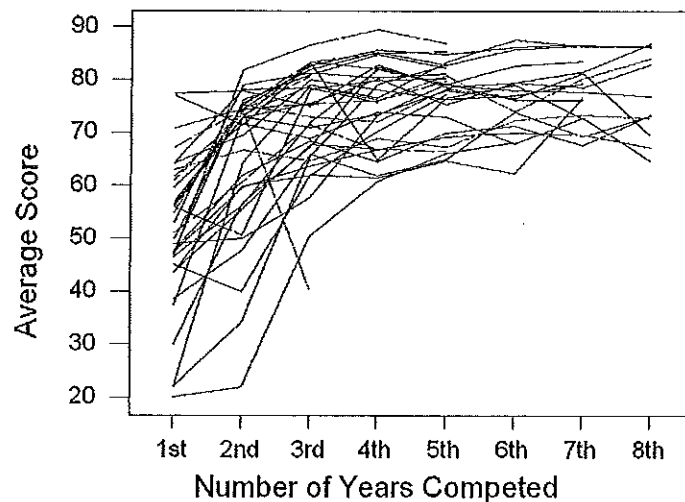


Figure 3. Learning curve for atlatlists who have scored 90 or above at some time (N = 35), yearly mean scores graphed against number of years of competition.

tory, makes sighting down the arrow to the target possible, and gives a consistent release of the projectile, none of which is possible in throwing.

The ISAC serves as a standard against which some early experiments and ethnographic accounts can be gauged. Unless an experimenter is proficient with a prehistoric technology, no fair trial can be made. Modern ISAC and other results allow us to say with confidence that some early experiment-

ers were simply not able to give the atlatl a fair test. Peets (1959) was unable to hit a man-sized target at 18–37 m (20–40 yd). Browne (1940:211) admitted that he could not have hit a bison one shot out of 10 at 18–37 m (20–40 yd) and concluded that “any close degree of accuracy is impossible with the atlatl.” We can now feel sure that they were doing something wrong, and their experimental results should be regarded with suspicion. The suggestion that atlatls would only be useful for flinging volleys of spears into massed herds (Browne 1940:212) can be dismissed with scorn by the many modern atlatlists who have taken deer and other game. To put modern accuracy in a more concrete comparative perspective, a score of 90 would mean that at ranges from 15–20 m, the atlatlist hit a target the size of my chest ten times in a row. A score of 98 would mean the atlatlist was hitting a dinner plate eight out of 10 times.

Modern distance records with the atlatl are also useful. David Engvall holds the world record of 258.64 m (848 ft 6 5/8 in) for an atlatl throw using modern materials and designs (Engvall 1995; Tate 1995). Using primitive materials, Wayne Brian’s record is 177.19 m (581 ft 4 in, Clubb 1994). The world record for a modern aerodynamically designed javelin throw is 98.48 m (<http://www.guinnessworldrecords.com/>). These modern standards suggest that when Edge-Partington (1903) records Australians throwing light reed spears 274 m (300 yd) with a woomera and heavy wooden spears “accurately to a distance of 120 yards [110 m]” by hand, we should wonder if these

accounts are not exaggerated. Compilations of ethnographic records show that the normal hunting range for bow and arrow or for spear throwers was 10 to 30 m (Cattelain 1997; Cundy 1989; Hutchings and Bruchert 1997). This accords well with the experience of modern sport atlatl use and competitive primitive archery, as well as the increasing number of reports from modern hunters using atlatls (e.g. Berg 1996, 2002, 2004; Becker 1992; Fogelman and Berg 1998).

GENDER AND AGE

There are few scholars today rash enough to insist that women are inherently inferior to men in most physical or mental capabilities, but children have obvious limitations. As archaeologists attempt to incorporate women and children in the traditionally androcentric and adult dominated views of the past (Kamp 2001), the ability of different parts of prehistoric social groups to learn, use, and access weapons and other technology becomes an important issue. Using the data subset of frequent participants (those with 10 or more scores over eight years), we were able to examine the abilities of women and children in several ways.

Although a few women are now achieving scores comparable to the top men, even women who are frequent competitors have both lower maximum scores and lower mean scores than men (Table 3). Of 35 scores over 90, only one has been made by a woman (Table 4). This is not lack of opportunity since the average number of scores recorded for the 51 frequent competitor women

Table 4: Number and Percent of High Scorers by Year¹

Year	Scoring 70 and Above				Scoring 90 and Above			
	Females		Males		Females		Males	
	Number	% Total	Number	% Total	Number	% Total	Number	% Total
1996	0	0	15	13	0	0	0	0
1997 ²	2	1.8	36	31	0	0	1	0.9
1998	1	1	49	15	0	0	3	0.9
1999	4	4	63	14	0	0	6	1.4
2000	6	5	73	17	0	0	13	3
2001	9	5	94	17	0	0	15	2.6
2002	14	8	107	20	0	0	16	3
2003	10	5	109	19	1	0.5	22	3.9
2004 ³	6		81		0		15	

¹This is the total number of individuals scoring over the indicated goal. Most are adults, but some are youth.

²Only scores over 40 were kept which results in inaccurately high percentages of the total.

³Only scores over 70 for men and 50 for women were available for 2004.

Table 5. Scoring Ability by Age for Youth Frequent Competitors¹

	Boys	Girls	Both
Youngest Age at First Average Score of 30 or Over	7	12	7
% Never Averages 30 or Over	36.1	87.5	45.5
Youngest Age at First Average of 50 or Over	8	14	8
% Never Averages 50 or Over	58.3	87.5	63.6
Youngest Age at First Average of 70 or Over	14	—	14
% Never Averages 70 or Over	86.1	100	88.6

¹This table is based on the scores of 8 girls and 36 boys who all competed at least 10 times during the 8 years for which scores were available.

(35.8) is similar to the average (38.5) for the 155 men. Average scores over a year may be a more potent index of competency than maximum scores, since consistency in performance is necessary for a successful hunter or warrior. Obviously it is much more difficult to average a score of 70 or above than to have achieved it once. Of female adult frequent participants, 62.8 percent never achieve a yearly mean score of 50 and 96.1 percent never reach a mean score of 70, while only 19.4 percent of males fail to reach 50, and 58.1 percent fall short of 70. Of adult male frequent participants, 40 percent achieve a mean score of 50 or better in their first year of competition; only 15.7 percent of females do. No women averaged 70 or more in their first years, which is a high standard reached by only 3.9 percent of males ($N = 6$ out of 155).

We take these figures to mean first that women are unsurprisingly close if not equal to men in inherent physical capabilities with the atlatl, as shown by the high scores that are now closing the gap (and increasing parity in many other sports as well). However, in our society, it is also not surprising that women are less likely to participate and excel in throwing sports. The rather faint application that this has to the archaeological record is to suggest that there is no reason other than social or symbolic ones why women should not be associated with atlatls. In fact we wonder if the atlatl even serves as an equalizer, where body size and strength becomes less important for hunting success than in using a spear thrown by hand. These points have already been made by Doucette (2001) in critiquing older interpretations of female burials with atlatls at Archaic sites in the Southeast like Indian Knoll (Webb 1946, 1957; Winters 1968).

For ISAC purposes, the youth category is defined as under 16. Ages are not always reliably

recorded at events, but we feel that we caught and corrected all the frequent participant youths. Again, while a few of the older youths compete essentially level with the adults, youth scores are generally lower. If we look at maximum scores by age (Table 3), there is a jump from 22 at age six to 71 at age seven, with another increase around 12–14. These suggest important steps in physical maturity, but because there are inevitably a few precocious kids who outshine the rest of their age group, it is perhaps better to look at average scores again. Here the major jump in average score (reflecting consistency rather than luck) occurs around age 9 (from 18.4 at 8 to 26.5 at age nine).

Looking at the ages at which mean scores are first achieved (Table 5), 30 is reached by a few youths at age seven but 45 percent never make it. By age 10 about 25 percent of children 10 and younger can average 30 for the year. If 50 is the standard, 63.6 percent of youths never get there, and the youngest with a mean of 50 is age eight. Of youths 11 or younger about 10 percent average 50 or better. The youngest to average 70 is 14, and 88.6 percent of youths never reach that average, but then most adults (67.5 percent) don't do that well either. Throughout, girls do less well than boys, with a mean of 30 only reached at 12, 50 at 14, and 70 never achieved.

Applying this data to interpreting prehistoric children is complicated by many factors. Modern western children may be larger for their age and in better nutritional health than many prehistoric populations, or they may be more obese and sluggish. We don't have the anthropometric data to compare our throwers to prehistoric children. The atlatl is unlikely to be as important to any modern child as it may have been to someone growing up in a culture where if you couldn't throw stones,

sticks and spears, you didn't get breakfast, although we know a few of the young competitors today who are real enthusiasts. With all that, it still seems valid to suggest that there are major turning points in child development. It is not until between six and seven that our children become capable of hitting the target with any regularity, with another substantial gain in ability around 11–12, and we suspect that some such boundaries are cross-cultural, although subject to substantial individual and cross-cultural variability.

There are not many ethnographic accounts of atlatl training. Laughlin (1980:28) describes Aleut atlatl use from kayaks as "the most skilled and demanding form of hunting practiced by human beings." Stretching and flexibility training by an adult may start with children as young as one year old, surely before they could throw effectively. Throwing games with atlatl and dart were apparently common for older children before kayak training began around age 10. Australian children engaged in throwing games, mock combat with spear throwers, and hunting small game from an early age (Lockwood 1980; Roth 1902).

Such ethnographic accounts conform to our cultural myths about the value of childhood training, which leads us to wonder if someone who grew up with an atlatl in his or her hand would be a prodigy by modern standards. Nevertheless, our data suggest that it is more likely that there is little point in intensive training before physical abilities develop around six or seven, and that a youth or adult who starts late and practices assiduously can do as well as most with longer experience. If a society has reasons to prevent children's access to weapons, this need not hinder older youths when they are finally trained.

CONCLUSIONS

Spear throwers are excellent for sport and for teaching about prehistoric technology because, although almost anyone can quickly learn to use one, any real competence requires considerable work and inspires respect. It is probably now too late to observe atlatl training and use over the long term in any society where spear throwers are still an integral part of the subsistence equipment. Accordingly, a large body of modern sport records provides an analog that we can use to understand some

aspects of atlatl capabilities, and individual or group variation. ISAC scores confirm ethnographic and archaeological evidence that the high degree of accuracy necessary for successful hunting is certainly possible with atlatls at essentially the same ranges as ethnographic bow hunting. ISAC scores allow us to judge the accuracy of some ethnographic reports and the adequacy of some experiments. Women should be as capable of using atlatls effectively as men, and so should older juveniles. Only for the youngest children do we have biological grounds to question an association with atlatls and emphasize symbolic use.

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