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Research Notes

Hunting for Trophies: Online Hunting Photographs Reveal Achievement Satisfaction with Large and Dangerous Prey

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Despite its manifold implications, insight into what satisfactions hunters derive from trophy hunting has not been thoroughly investigated. We used a novel method to assess how common satisfaction might be from harvesting animals under different achievement contexts. We scored smile types—signals of emotion and satisfaction—in 2,791 online hunting photographs. We show that the odds of true "pleasure" smiles are greater when hunters pose: (a) with versus without prey, (b) with large versus small prey and, (c) with carnivores versus herbivores (among older men). We emerge with a generalizable achievement-oriented hypothesis to propose that the prospect of displaying large and/or dangerous prey at least in part underlies the behavior of many contemporary hunters. Given that achievement was also likely important among ancestral hunter-gatherers and remains so in contemporary cultural and commercial marketing contexts, management might benefit by increased attention to achievement satisfaction among hunters.

Keywords conservation, human predators, Internet, trophy hunting, smile type, online forums, size-selective predation

Introduction

Contemporary wildlife hunters demonstrate remarkably divergent behavior compared to other predators of vertebrate prey. Whereas most predators in the natural world typically select "substandard" (i.e., small, young, and/or weak) individuals within populations (e.g., Errington, 1946), wildlife hunters generally target large adult individuals (Festa-Bianchet, 2003; Mysterud, Tryjanowski, & Panek, 2006). Moreover, in the natural world, predators typically hunt as a means by which to consume food. Although this is also the case for many ungulate hunters, some wildlife hunters frequently harvest animals they do not eat, namely carnivores. Although often associated with hunting safaris in Africa, targeting carnivores

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is also common in North America, Europe, and beyond (Kruuk, 2002). Harvesting large or dangerous "trophy prey" is not only common in contemporary society, but might also have a long history, as evolutionary anthropologists have suggested that carcasses served as focal points in competitive displays among hunter-gatherers (Hawkes & Bliege Bird, 2002). Currently, hunters commonly pose for photographs with their prey and have the heads, hides, and ornamentation/weapons of animals preserved by taxidermy (Kalof & Fitzgerald, 2003).

This "trophy hunting" behavior (i.e., targeting of large prey and/or carnivores) can provide a potential vehicle for conservation and/or impose negative ecological and evolutionary effects on populations. In some African countries, for example, revenue from guided trophy hunts of lions and leopards can in theory or practice flow to local communities to provide incentives to protect harvested populations (e.g., Jorge, Vanak, Thaker, Begg, & Slotow, 2013; Lewis & Alpert, 1997; Lindsey, Alexander, Frank, Mathieson, & Romañach, 2006). On the other hand, management regimes that encourage or allow carnivore hunting can cause population declines (Clark & Rutherford, 2014; Lambert et al., 2006; Milner, Nilsen, & Andreassen, 2007; Packer et al., 2011; Woodroffe, 2001), particularly in infanticidal species such as lions and bears (Loveridge, Searle, Murindagomo, & Macdonald, 2007; Swenson et al., 1997). Declines of top-level predators from hunting and other means can subsequently impose cascading effects across trophic levels and throughout ecosystems (Estes et al., 2011; Ripple et al., 2014). Moreover, data from several wildlife and fisheries populations globally have revealed that size-selective hunting/fishing of large/old individuals can impose rapid phenotypic change (e.g., smaller bodies and horns) and/or serious demographic effects (e.g., Coltman et al., 2003; Darimont et al., 2009; Festa-Bianchet, 2003; Jorgensen et al., 2007; Milner et al., 2007, Mysterud, 2011).

Although the positive and negative conservation implications have been examined, reasons why these peculiar trophy hunting behaviors exist have not been explored thoroughly. New insights into reasons why hunters target a relatively narrow subset of prey types among and within species might help inform wildlife policy to extract larger benefits and/or mitigate negative effects. In addition, because hunting in general and trophy hunting in particular are ethically contentious (Clark, Lee, Freeman, & Clark, 2008; Gunn, 2001; Knezevic, 2009), an improved understanding of which hunting scenarios elicit satisfaction from achievement might also inform ethical and societal debate.

Understanding satisfaction can provide valuable insight into human behavior generally (e.g., tourism or recreation studies), as well as into specific consumptive (e.g., hunting) and non-consumptive activities (e.g., hiking; Dunn Ross & Iso-Ahola, 1991; Hendee, 1974; Manning, 2011; Vaske & Roemer, 2013). Satisfaction can be described as the congruence between expectations and outcomes, and is measured at the outcome of an experience (Dunn Ross & Iso-Ahola, 1991; Manning, 2011; Vaske & Roemer, 2013). As a consumptive recreation activity, hunting and hunter behavior is thought to be dominated by the expectation of harvesting an animal (Hammitt, McDonald, & Patterson, 1990; Tynon, 1997; Vaske, Donnelly, Heberlein, & Shelby, 1982; Vaske & Roemer, 2013).

Many studies derived from hunter and angler interviews and surveys take a multiple satisfactions approach (Arlinghaus, 2006; Decker, Brown, Driver, & Brown, 1987; Decker & Connelly, 1989; Hendee, 1974; Holland & Ditton, 1992; Potter, Hendee, & Clark, 1973; Vaske & Roemer, 2013). Hypotheses derived from this approach suggest that hunters and anglers can obtain satisfaction from multiple outcomes related to achievement, affiliative, and/or appreciative dimensions (Decker et al., 1987; Decker & Connelly, 1989; Hendee, 1974). These satisfactions can be further described by activity-specific and activity-general sub dimensions (Arlinghaus, 2006; Beardmore, Haider, Hunt, & Arlinghaus, 2011; Hendee,

1974). Within achievement, for example, harvesting an animal is specific to the activity of hunting (i.e., activity-specific), whereas competence testing and skill development are elements of hunting shared with many recreation activities (i.e., activity-general). In addition, a "mellowing out" hypothesis suggests that hunters shift from predominantly achievement or affiliative to appreciative satisfaction over time (Decker et al., 1987). Earlier, however, Potter et al. (1973) suggested that achievement is more important to hunters when species characteristics (i.e., large size, low density) make the probability of harvest low. Conversely, affiliative and appreciative satisfactions might be more important with smaller and easier-harvested animals such as birds (Hayslette, Armstrong, & Mirarchi, 2001).

We draw from this body of work to gain increased insight into achievement satisfaction among trophy hunters, particularly the activity-specific element of harvesting an animal. We postulate that a similar achievement-oriented process might also explain a focus on larger individuals *within* large-bodied (i.e., ungulate) animal populations. After all, the probability of harvest would be lower for larger individuals, which are generally older, demographically rarer, and presumably more wary (Clark, 1994; Loehr et al., 2005; Loison, Festa-Bianchet, Gaillard, Jorgenson, & Jullien, 1999). Similarly, because carnivores exist at low densities, detecting and then harvesting them—all other factors being equal—would be more difficult than with ungulate prey. Accordingly, our achievement-oriented "trophy hypothesis" predicts that a wide range of hunters would be more likely to display signs of satisfaction when posing with large individuals within species and/or with carnivorous species. In testing this hypothesis, we accounted for whether hunters were guided or not because guided hunters express particular interest in acquiring trophy specimens (Barnes & Novelli, 2008; Schmidt, Ver Hoef, & Bowyer, 2007).

We addressed hypotheses related to achievement satisfaction (discussed below) using photographs from online hunting resources. We scored smile types, which convey emotion and from which satisfaction can be inferred (Ekman & Friesen, 1982). Guillaume Duchenne first differentiated between two smile types in 1862: a "true smile" involving spontaneous eye and mouth muscle activation, and a "false smile" that lacks eye muscle activation (Ekman, Davidson, & Friesen, 1990; Figure 1). Although also a social signal of cooperation and trust, true smiles provide an honest, involuntary indication of pleasure (Ekman et al., 1990; Ekman & Friesen, 1982; Johnston, Miles, & Macrae, 2010). We used this pleasure smile type to infer satisfaction under various contexts of achievement.

Using this approach, we tested whether hunters show more true pleasure smiles when: (a) securing a harvested animal or otherwise experiencing companionship and nature when

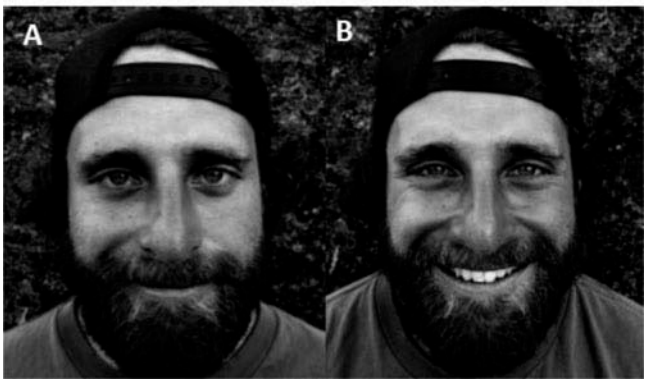

Figure 1. Facsimile photographs of a (A) false smile and; (B) true smile.

on hunts (to assess relative roles of "achievement" versus "affiliative /appreciative" components of the multiple satisfactions hypotheses) by comparing smile types of hunters posing with and without their harvested animals; (b) posing with small versus large specimens within species; and (c) posing with carnivores versus herbivores (the latter two to test our "trophy" hypothesis discussed above). Finally, we also examined whether hunter age might influence smile types under the above comparisons ("mellowing out" hypothesis discussed above).

Methods

We initially assessed 5,972 images of adult male hunters who appeared aware of the camera and looked toward the photographer. After independent assessment of precision and inter-observer agreement (discussed below), 2,791 of these images were analysed. Hunters were posing alone either without prey (e.g., at hunting camps; $n = 207$) or with prey ($n = 2{,}584$) of various sizes (small, large) and types (ungulates, carnivores). Photographs were from British Columbia and Alberta, Canada, and available on professional guide outfitter websites ($n = 2{,}312$) or online hunting forums ($n = 479$). Our sample set of hunters differ in age, context (i.e., subsistence, sport) and modes (i.e., guided, unguided hunting).

To determine smile type, we scored AU6 (mouth) and AU12 (eye) facial muscles as either active or inactive. True smiles were classified when both muscles were activated (Ekman et al., 1990; Figure 1). We coarsely classified hunter age as young or old, based on presence of grey/white hair, although we acknowledge inter-individual variation exists in the expression of grey hair due to differential expression among males and use of hair dye. Prey were classified as either carnivores (e.g., grizzly bear [*Ursus arctos*], black bear [*Ursus americanus*], lynx [*Lynx canadensis*], bobcat [*Lynx rufus*], grey wolf [*Canis lupus*], coyote [*Canis latrans*], wolverine [*Gulo gulo*], cougar [*Puma concolor*]; $n = 972$) or herbivores (e.g., elk [*Cervus canadensis*], mule deer [*Odocoileus hemionus*], whitetail deer [*Odocoileus virginianus*]; $n = 1{,}612$). For herbivores only, we scored relative size by counting antler tines. We classified individuals with more than its species mode as large and others as small. Number of tines was unidentifiable in six photographs, leaving 1,606 for size comparisons.

To evaluate precision and inter-observer agreement, we first assigned an independent confidence rating for age and smile variables in each photograph (high, medium, low). Once all pictures were scored, a third party unaware of the hypotheses: (a) presented the researcher with a ~10% random subset of images ($n = 500$) to re-score and, additionally, (b) scored the variables herself. For hunter age, overall bias was low (95% proportional agreement for both tests) and no images were dropped. For smile type, assessments of medium and high confidence images suggested little bias in both tests (96% and 100% proportional agreement). For low confidence images, however, proportional agreement was 92% and 94%. Based on results of this subset evaluation, we dropped photographs where smile type confidence was low ($n = 3{,}181$) from analyses, leaving us with 2,791 images.

We used an information theoretic approach to rank candidate models with a generalized linear model (GLM) using maximum likelihood estimation. We specified a binomial link to estimate the effect of hunter age, guides, prey presence, prey size, and prey type (as appropriate) on smile type over three sets of models to test the hypotheses outlined earlier. We used Akaike's Information Criterion (AIC) to guide model selection; results presented relate to top model sets ($\Delta\text{AIC} < 2$; Table 1).

Results

We revealed patterns that: (a) support the hypothesis that achievement plays a prominent role among multiple satisfactions, (b) support our achievement-oriented trophy hypothesis, and (c) challenge a "mellowing out" hypothesis (Table 1; Figure 2). After accounting for age (older hunters showed true smiles more than younger hunters; 58% vs. 50%; odds ratio 1.36; 95% CI 1.16–1.60; $p < .001$), our top model revealed that the odds of hunters showing true smiles with harvested prey were 1.6 times greater than hunters otherwise

Table 1
Results for the top candidate generalized linear models (AIC < 2) predicting true pleasure smiles by hunters

Model form	*p*-value				
With vs. without prey ($n = 2{,}791$)	Age	Prey	Interaction	Δ AIC	ω
age, prey	<.001	.001		0	.68
age, prey, age*prey	.09	<.001	.49	1.5	.32
Small vs. large herbivores ($n = 1{,}606$)	Age	Size	Interaction	Δ AIC	ω
age, size	.48	.002		0	.72
age, size, age*size	.45	.010	.79	1.9	.28
Herbivores vs. carnivores ($n = 2{,}584$)	Age	Type	Interaction	Δ AIC	ω
age, type, age*type	.39	.71	.002	0	.97

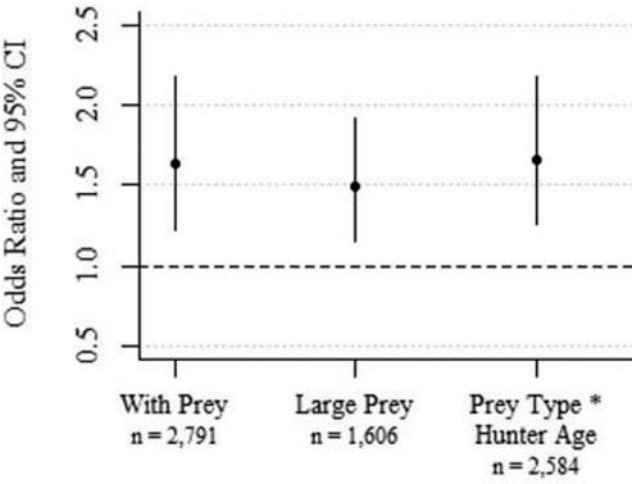

Figure 2. The odds of hunters showing a true smile. Effects of prey presence, size, and type (herbivore vs. carnivore) on the odds ratio (and 95% confidence intervals) of hunters displaying a true pleasure smile. Odds ratios (l to r) of hunters showing true smiles when posing with prey vs. without prey ($p < .001$), with large versus small prey ($p = .002$), and the interaction between prey type and hunter age ($p = .002$; higher odds of true smiles posing with carnivores than herbivores, but only among older hunters).

with companions and in nature, but without prey (55% vs. 41%, odds ratio 1.63; 95% CI 1.22–2.18; $p = .001$). Size and carcass type also influenced emotional signals; results from top models identified that the odds of hunters showing true smiles were 1.5 times greater when posing with large prey compared with small prey (60% vs. 52%; odds ratio 1.49; 95% CI 1.15-1.92; $p = .002$), regardless of age ($p = .480$) and significantly higher with carnivores than with herbivores, although only among older hunters (odds ratio test; interaction term $p = .002$; Figure 2). Models with guide status did not occur in the top model sets.

Discussion

Although not to our knowledge previously tested, logic would predict that many "trophy" hunters would derive satisfaction from harvesting large or dangerous animals. But, what is trophy hunting? Most research that invokes this term has focused on a few well-known systems and, in doing so, provided a *de facto* definition for the phenomenon. These flagship systems include big horn sheep (*Ovis canadensis*) and lions (*Leo pantera*) for which data are rich, phenotypic targets are extreme, and socioeconomic and conservation implications are profound (Coltman et al., 2003; Lewis & Alpert, 1997; Lindsey et al., 2006). In contrast, data we collected from social media supported our hypotheses that achievement is prominent and that trophy-seeking behavior represents a more generalizable phenomenon, one broadly applicable to contemporary wildlife hunting. Specifically, we detected a strong signal of achievement-oriented satisfaction over a range of hunted species and hunter types (including unguided hunters; discussed below).

Although our method did not test satisfactions associated with companionship and nature appreciation directly, it yielded independent evidence that displaying prey evokes satisfaction in some achievement contexts. Moreover, that old hunters actually show more satisfaction displaying large/dangerous prey than when posing with small/herbivorous prey suggests achievement-oriented satisfaction has not decreased with age. One explanation for this is that "mellowing out" could be more related to non-consumptive aspects of hunting (e.g., relaxing, being outdoors) not tested here, whereas photographs that we used are taken of hunters posing with prey (an activity-specific context of achievement; Arlinghaus, 2006; Beardmore et al., 2011). Although this aspect of achievement appears to have increased with age, satisfaction from other aspects of hunting might also have increased to the same or greater extent. Finally, targeting carnivores might be an infrequent experience. In this way, an older hunter may be more satisfied for having fulfilled a long-awaited vision, whereas younger hunters with more limited experience may discount the exceptionality of the outcome.

How generalizable might a focus on achievement be among today's hunters in the developed world? Despite well-accepted "categories" of hunters (those who harvest for meat, recreation, trophies, or population control; Festa-Bianchet, 2003; Mysterud, 2011), we detected a signal of achievement focus across a diverse sample of hunters. Men were more likely to show true smiles under contexts of greater achievement with prey (versus without prey), with larger prey, and—among older men—with carnivores. Moreover, we found evidence of these patterns in nearly 3,000 pictures of men posing with a variety of prey species, types (herbivores, carnivores), and sizes. Hunters represented an age spectrum and those with and without (expensive) guides across the varied cultural and economic geography of western Canada and beyond.

Although photographs provided novel insight, our approach has limitations. For example, we acknowledge that those who post photographs online might be especially

achievement-oriented and/or particularly committed to hunting (Bryan, 1977). On the other hand, given the ubiquitous nature of social media today, we suggest that it is unlikely that a small subset of particularly achievement-oriented hunters post hunting photographs online. We also acknowledge that we do not know when during the hunting trip the photographs were taken, and that pictures without prey might have been earlier in the hunt. If this is the case, one might expect more smiles with prey than without. Accordingly, there might have been less time for affiliative and appreciative satisfactions to accumulate, influencing the probability of a true smile. Finally, although we assume that these photographs provide insight into the activity-specific aspect of harvesting an animal, the satisfaction shown might additionally be related other elements of achievement, such as competence testing and skill development.

Despite these potential biases in our sample set, photographs might provide a more accurate signal of satisfaction than data provided by hunters themselves. Multiple satisfactions research is based almost exclusively on self-report survey and interview data (e.g., Arlinghaus, 2006; Beardmore et al., 2011; Dunn Ross & Iso-Ahola, 1991; Hammitt et al., 1990; Hayslette et al., 2001; Potter et al., 1973). Such approaches can impose respondent bias where interviewees do not respond truthfully (Rasinski, Willis, Baldwin, Yeh, & Lee, 1999). In contrast, emotions in general and involuntary "true" smiles in particular generally do not lie and offer an alternative to these traditional satisfaction ratings. One interpretation is that these individuals are simply happy with the outcomes of their hunting experience and that smiling in these photographs simply follows cultural expectation. However, we reject this explanation, noting that hunters posing without prey, or with smaller prey, were significantly less likely to smile. We instead invoke an evolutionary explanation, given that pleasure evolved as an emotion to positively reinforce any behavior that is adaptive (Carlson, Buskist, Heth, & Schmaltz, 2009).

We speculate that contemporary hunters display the evolutionary legacy of those coupled behavioral–emotional systems. Specifically, achievement associated with securing prey—particularly large, dangerous, and rare items—likely had fitness benefits in ancestral environments (Hawkes & Bliege Bird, 2002). Such prey would signal greater costs of acquisition and, accordingly, stronger competitive ability. Moreover, our hypothesis is consistent with interpretations related to other seemingly achievement-oriented "costly" modern behaviors, such as the purchase and display of luxury objects (e.g., expensive automobiles, designer clothes, valuable jewellery), as vestigial forms of competitive signaling (Griskevicius et al., 2007).

Contemporary cultural forces align with an explanation related to competition and likely serve to reinforce trophy-seeking behavior. For example, hunting associations (e.g., Boone and Crockett Club) have elaborate competitive scoring systems based on prey size, rewarding social status to those who harvest trophy-sized (i.e., larger) animals (Reneau, Buckner, Wright, & Nesbitt, 2014; Strickland et al., 2013). Similarly, marketing material by the hunting equipment industry often highlights a product's potential efficacy in securing a large or dangerous prey item; carcass displays in hunting magazines, for example, often emphasize the size of harvested animals (Kalof & Fitzgerald, 2003).

Although wildlife and fisheries research has often focused on the potential ecological and evolutionary effects of size-selective harvests and the exploitation of carnivores, new insight for management can emerge from improved understanding of the unusual predator (i.e., humans) present in all systems (Clark & Rutherford, 2014). The array of influences that we identify likely interact to underlie trophy-seeking-and-displaying behavior common among contemporary wildlife hunters and anglers (e.g., McClenachan, 2009).

Indeed, the word "trophy" implies recognition of achievement that can be shown to others. Accordingly, we suggest that a broader definition of trophy hunting and fishing be considered for utility in management and societal consideration of these activities.

Several specific implications arise from our working hypotheses. First, if online trophy display provides widespread and easy access to knowledge about the largest of a specimen's kind, "runaway" reinforcement of trophy-seeking behavior could potentially occur for some species or populations, even on a regional scale. Such a scenario might motivate hunters to invest greater resources in acquiring a more impressive trophy, for example, by accessing previously unexploited populations. Second, depending on the prey's life history and demographic characteristics, a strong motivation to target larger individuals could interact either positively or negatively with conservation objectives. For example, removing older, larger lions in Africa in some cases can increase the opportunity for younger males to rear a cohort of young, thus reducing the probability of demographic declines (Whitman, Starfield, Quadling, & Packer, 2004). In contrast, removing the largest trophy rams can lead to rapid undesirable changes to body and horn size (i.e., reducing breeding value and genetic quality; Coltman et al., 2003; Festa-Bianchet, Pelletier, Jorgenson, Feder, & Hubbs, 2014). More generally, what might emerge from overlaying these human and biological dimensions of trophy hunting, in its broader sense here, is an improved understanding about how harvest and economic policy might be designed to focus targets away from sensitive species and/or individuals within populations (Courchamp et al., 2006; Gunn, 2001; Harris, Cooney, & Leader-Williams, 2013; VanDeVeer, 1979). Moreover, ethical considerations, that societal debate about hunting and fishing often invoke, require consideration of what benefits (i.e., utility) accrue to participants (Arlinghaus et al., 2007; Gill, 2000). If our interpretation that competition among hunters underlies the displays of hunting achievement is valid, scholars of ethics and society in general can evaluate whether such benefits are non-trivial and irreplaceable—conditions required to justify a behavior (Gunn, 2001; VanDeVeer, 1979).

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