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Understanding the acceptability of wolf management actions: roles of cognition and emotion

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ABSTRACT

Wolf management actions are seldom universally accepted and understanding diverse opinions is of value for conservation practitioners. Previous research has either investigated cognitions or emotions to understand public acceptability of wolf management actions. We investigated both concepts simultaneously to identify whether their predictive potentials are mutually exclusive. A survey measuring wildlife value orientations, valence (positive-negative emotions) toward wolves, and responses to wolf management actions (doing nothing, public education, lethal control) was completed by 597 Dutch and German university students. Valence predicted the acceptability of all wolf management actions. Wildlife value orientations predicted the acceptability of lethal control and partially public education but not of doing nothing. Emotions thus added predictive potential next to cognitions to understand responses to wolf management actions. For both research and practice, it is important to acknowledge that the acceptability of wolf management actions is not only guided by what people think, but also by what they feel.

KEYWORDS

Acceptability; emotions; lethal control; wildlife value orientations; wolves

Introduction

Since the start of the millennium, the Gray Wolf (*Canis lupus*) has been recolonizing Germany (Reinhardt & Kluth, 2007) and, after the first sighting in 2011, starting to explore the Netherlands (Groot Bruinderink, Jansman, Jacobs, & Harms, 2012). European wolves are protected under the Habitat Directive (1992) and the Bern Convention (1979) in the European Union (EU) countries. This means that lethal control is only permitted when the conservation status is not affected and there are no satisfactory alternatives to ensure public safety and minimize threats (e.g. to livestock) (Trouwborst, 2010). Although wolves are protected by EU legislation, people often differ in their views on how wolf populations should be managed. Public acceptability of wildlife management strategies can vary by the type of action and the severity of the problem being addressed (Jacobs, Vaske, & Sijtsma, 2014a; Martínez-Españeira, 2006; Mormile & Hill, 2017; Wittmann, Vaske, Zinn, & Manfredi, 1998). Severe management actions, such as lethal control (Pohja-Mykrä & Kurki, 2014; Treves & Karanth, 2003), are more likely to be supported by the public in situations that are considered to be serious human-wildlife problems such as agricultural damage caused by geese, risk to

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household pets by baboons or a human killed by a mountain lion (Jacobs et al., 2014a; Mormile & Hill, 2017; Wittmann et al., 1998). The context (e.g., species involved), perceptions, and deep-rooted social identities can also influence how acceptable a management action will be (Naughton-Treves, Grossberg, & Treves, 2003). For instance, lethal control of wolves is controversial (Way & Bruskotter, 2012) but might be acceptable depending on the conflict (e.g., threat to humans versus livestock). In contrast, previous research suggests that acceptability of 'hands-off' (doing nothing) management decreases as problem severity increases and that acceptability of lethal control increases as problem severity increases (Jacobs et al., 2014a; Wittmann et al., 1998). Understanding what factors predict the acceptability of management actions by the public, particularly in complex wildlife management scenarios, has value as public acceptability of management strategies is crucial to the success of wildlife conservation and management (Manfredo, 2008; Teel & Manfredo, 2010). For wolf management actions this is particularly important but also a challenge as wolf populations continue to expand and recolonize more areas across Europe.

Acceptability of wildlife management strategies can be predicted by cognitions and emotions (Hermann, Voß, & Menzel, 2013; Jacobs et al., 2014a; Sijtsma, Vaske, & Jacobs, 2012). Cognitions are mental dispositions and processes of reasoning, evaluation or decision-making and include values, beliefs or attitudes (Jacobs, Vaske, & Roemer, 2012). Emotions are expressed through physiological reactions (e.g., increased heartbeat), expressive reactions (e.g., smiling), behavioral tendencies (e.g., approaching), and emotional experiences (e.g., interpreting the situation, feeling happy) (Izard, 2007; Jacobs et al., 2012; Kleinginna & Kleinginna, 1981). Cognitive concepts might have more predictive potential in explaining public acceptability of wildlife management strategies than emotion concepts (Jacobs, Vaske, Dubois, & Fehres, 2014b). However, while the cognitive and emotional systems are different systems in the brain, they interact with each other (LeDoux, 1998). Decisions made by people in relation to wildlife management are not only driven by rational thoughts, but also by emotions (Nelson, Bruskotter, Vucetich, & Chapron, 2016). Previous research has either addressed cognitions (Hermann et al., 2013; Jacobs et al., 2014a; Sijtsma et al., 2012) or emotions (Jacobs et al., 2014b) to explain responses to wildlife management actions or in combination to explain behavior toward wolf populations and ecosystems (Lute, Navarrete, Nelson, & Gore, 2016). However, given the role of both concepts in predicting wildlife management actions, understanding to what extent their predictive values overlap or are mutually exclusive in explaining acceptability of wildlife management provides a critical contribution to our understanding of diverse public views in the context of wildlife management. Importantly, if two different strands of research explain the same thing, one of these strands may be obsolete, can validate each other or even offer different ways to arrive at a similar conclusion depending on the research context. This article adds to existing knowledge by investigating (a) the acceptability of wolf management actions in scenarios differing in problem severity; and (b) the predictive potential of both emotions and cognitions on the acceptability of these wolf management actions. Wildlife value orientations were used as a proxy for cognitions.

Wildlife value orientations are patterns of basic beliefs about wildlife and human-wildlife relationships that give meaning and direction to human values in the context of wildlife (Fulton, Manfredo, & Lipscomb, 1996). Research has identified two predominant wildlife value orientations, domination, and mutualism (Manfredo, Teel, & Henry, 2009). People with a dominance wildlife value orientation believe that wildlife should be used and managed for

the benefit of humans. Mutualists tend to see wildlife as part of an extended family that deserve care and rights. Research in various nations has demonstrated the reliability of the scale (Gamborg & Jensen, 2016; Hermann et al., 2013; Jacobs et al., 2014a; Teel & Manfredo, 2010; Zainal Abidin & Jacobs, 2016). Wildlife value orientations also predicted acceptability of management actions in different countries with different taxa (Hermann et al., 2013; Jacobs et al., 2014a). For instance, mutualism predicted protective intentions toward the reintroduction of wolves and bison in Germany (Hermann et al., 2013). Domination predicted the acceptability of severe management interventions with geese and deer in the Netherlands; however, less well than mutualism predicted these management interventions as being unacceptable (Sijtsma et al., 2012). The psychometric scale of wildlife value orientations is a useful tool to measure people's cognitive processes (i.e., basic beliefs about wildlife). However, the magnitude of the predictive capability of mutualism and domination is context-specific (Vaske, Jacobs, & Sijtsma, 2011). Wildlife value orientations predict acceptability of lethal control well (Jacobs et al., 2014a; Whittaker, Vaske, & Manfredo, 2006) yet predict less severe management actions or even doing nothing less well (Jacobs et al., 2014a).

Emotions are potent drivers of behaviors (LeDoux, 1998) and a potential cause of human responses to wildlife and wildlife issues (Jacobs, 2012; Manfredo, 2008). In general, emotions influence virtually all other mental processes (Jacobs et al., 2012) including memory (Talarico & Rubin, 2007), motivation (Izard, 2009), decision-making (Damasio, 1999) and perception (Dolan, 2002). In the context of human-wildlife interactions, emotions influence decisions and beliefs pertaining to wolves (Slagle, Bruskotter, & Wilson, 2012), identification of wildlife in complex natural scenes (Öhman, Flykt, & Esteves, 2001), acceptability of wolf management actions (Jacobs et al., 2014b), willingness to pay for large carnivore management and conservation (Johansson, Sjöström, Karlsson, & Brännlund, 2012) or as mediator between intrinsic values and behaviors that benefit wolf populations (Lute et al., 2016). While these studies suggest that emotions toward wildlife can predict cognitions pertaining to wildlife, other research indicates that cognitions can also predict emotions. Perceived danger and controllability of one's reactions when encountering a wolf were found to be predictors of fear toward wolves among Swedish stakeholders (Johansson & Karlsson, 2011). The same findings were obtained in a larger sample of Swedes living in areas where bears and wolves were present (Johansson, Karlsson, Pedersen, & Flykt, 2012). Trust in authorities responsible for carnivore management also predicted fear toward wolves (Johansson, Karlsson, et al., 2012).

Overall, research has revealed that emotions can predict cognitions and *vice versa* in the context of human-wildlife relationships. A logical next question is about understanding the nuances with which emotions and cognitions accurately predict the acceptability of wildlife management actions in different scenarios. Emotion theorists and researchers use two different theoretical perspectives to account for the variety of emotions, discrete and dimensional. From the discrete perspective, several qualitatively different emotions are distinguished, such as fear, joy, or sadness. For instance, being in the state of joy is not more or less than being in the state of fear. These are just different states with different characteristic properties such as action tendencies (e.g., approach or withdrawal) (Izard, 2007). From the dimensional perspective, emotions are characterized as being positioned along different dimensions. The most frequently used dimensions to classify emotions are valence (the positive-negative dimension) and arousal (the activation-relaxation dimension) (Russell, 2009; Russell & Barrett, 1999).

Previous research suggests that valence is superior to any other measure of emotion (e.g., arousal or a discrete emotion measure such as joy or fear) in accounting for the variety of emotional states (Bradley & Lang, 1994). If one measures different properties of emotional states (e.g., action tendencies, conscious feelings), valence captures a larger portion of the total variance across those properties than any other measure of emotion. Valence toward wolves has the stronger predictive potential for the acceptability of lethal wolf control than any discrete measure of emotion (Jacobs et al., 2014b). Therefore, the dimensional perspective has guided the present research.

Hypotheses

Based on the previous reasoning, the following four hypotheses were examined:

H1: Acceptability of doing nothing, in terms of wolf management, decreases as problem-severity increases.

H2: Acceptability of lethal wolf control increases as problem severity increases.

H3: Wildlife value orientations will predict the acceptability of lethal control.

H4: Valence will predict the acceptability of lethal control.

Methods

Sample

A five-page paper questionnaire was distributed to university students enrolled in courses in natural (e.g., physics; chemistry), environmental (e.g., natural resource management) and social (e.g., education, psychology) sciences in the Netherlands ($n = 368$ students from 10 classes) and Germany ($n = 229$ from 9 classes) in 2014 and 2016, respectively. In the Netherlands, native speakers, as well as international students, had the option of completing the survey in either Dutch or English whereas in Germany, the questionnaire was translated in German (the translated questionnaire was tested with five German native speakers in a pilot survey). Each student received the same questionnaire with the same scenarios on wolves. The questionnaires were distributed in the last 15 min of each class and participation was voluntary. Individuals in the German sample were on average slightly older ($M = 24.2$) than in the Dutch sample ($M = 20.6$), and there were more females in the Dutch sample (64%) compared to the German sample (46%). The Dutch sample represented more students from the natural sciences (the Netherlands 69%; Germany 29%), and fewer from the environmental (the Netherlands 25%; Germany 39%) and social sciences (the Netherlands 4%; Germany 29%).

Questionnaire Design

The four-part questionnaire included (a) a validated scale on wildlife value orientations (Teel & Manfredo, 2010), (b) acceptability of management strategies, (c) dimensions of emotions (Jacobs et al., 2014b), and (d) demographics (e.g., age, gender).

Acceptability of Management Strategies (dependent Variables)

Acceptability of three different management strategies (lethal control, educating the public, hereafter as ‘education’; and doing nothing, hereafter as ‘no action’) was measured for three different scenarios of human-wolf conflicts increasing in their severity, similar to previous research (Jacobs et al., 2014a). Educating the public was included given that, in both countries, education programs are in place and widely used to prepare people for the return of wolves (e.g., ‘Willkommen Wolf’ by NABU in Germany, ‘Wolven in Nederland’ in the Netherlands). In the first scenario, a pack of wolves is seen by hikers in a natural area. In the second scenario, wolves living in a natural area have killed a sheep on a nearby farm. In the third, wolves living in a natural area have killed a hiker. The scenarios present three levels of problem severity for humans (no problem, economic damage, human casualty). Although the real danger that wolves pose to humans is highly controversial and rare (e.g., rabid wolves, Linnell et al., 2002), we chose the latter scenario to present an extreme situation with doing nothing as the opposite extreme, to reflect the full range of potential scenarios. Some people have a very real fear about wolves potentially killing a human, and hence this scenario is important in shaping thought in some people and therefore worth investigating.

For each scenario, students were asked how acceptable the following management actions were on a 7-point scale (-3 = ‘very unacceptable’ to $+3$ = ‘very acceptable’ with 0 as neutral point): 1. Lethal control; 2. Education; 3. No action.

Wildlife Value Orientations and Emotions (independent Variables)

Wildlife value orientation statements included the two ideologies of domination (including statements on hunting and utilization/use beliefs) and mutualism (including statements on social affiliation and caring beliefs, Teel & Manfredro, 2010). Respondents could rate on a 7-point scale how much they agreed with each statement from -3 = ‘strongly disagree’ to $+3$ = ‘strongly agree’ with 0 as neutral point. To reflect the latent constructs, average scores of associated items were calculated as composite indices. The composite index of domination was a combination of the averaged statements of the dimensions of hunting and use while the composite index of mutualism was the averaged statements of the social affiliation and caring dimensions.

Both dimensions of emotions, valence and arousal, were measured through bipolar scales (valence: don’t like – like, unpleasant – pleasant, negative – positive, not enjoyable – enjoyable and arousal: passive – active, relaxation – tension, without energy – energetic, not calm – calm), following Jacobs et al. (2014b). Respondents were asked to rate their emotions toward wolves on a 7-point scale with ‘not at all’ to ‘very strong’. Mean scores of the two WVO ideologies (domination and mutualism) as well as of the emotional dispositions (discrete emotions, valence, and arousal) were used in further analyses.

Statistical Analyses

Internal consistencies of valence, arousal, domination, and mutualism were estimated with Cronbach’s alpha for the complete data set as well as for the German and Dutch samples separately. While there is no generally accepted cutoff point for Cronbach’s alpha (Vaske,

2008), a Cronbach's alpha above .70 was considered to indicate acceptable reliability (Bland & Altman, 1997). The predictive potential of emotions and wildlife value orientations (both independent variables) for the acceptability of wolf management actions (dependent variable) was tested using linear regression analyses. Likelihood ratio tests in R version 3.3.3 (R Core Team, 2017) were used to compare the goodness-of-fit of the two models: model 1: wildlife value orientations and model 2: wildlife value orientations *and* emotions.

Results

Scale Reliability

All scales showed an acceptable reliability against the accepted cutoff point of .70, except for the arousal scale (Table 1) which was subsequently removed from further analyses. Scale reliability (Cronbach's alpha) was similar in both countries. Therefore, the combined data set was used for further analyses. While the reliability of 'mutualism' would increase by .01 by dropping one item the original items were kept within this dimension given the negligible small reliability gain and the possibility to compare the original dimension with previous studies. The reliability for 'domination', 'valence' and 'acceptability of management actions' did not increase when deleting items. All original items were kept within their constructs.

Acceptability of Wolf Management Actions (H1, H2)

Management acceptability patterns were similar in both countries and no significant differences were found for the acceptability of certain management strategies between Germany and the Netherlands (Figure 1). In both countries, mean ratings for the acceptability of lethal control were low overall. However, within each country, mean acceptability ratings were significantly higher for the scenario where the 'wolf kills human' (Germany: $M = -1.76$, the Netherlands: $M = -1.28$) compared to 'wolf kills sheep' (Germany: $M = -2.5$, the

Table 1. Reliabilities of multiple-item scales (German and Dutch data set combined).

Construct	Mean (SD)	Cronbach's Alpha
<i>Wildlife value orientations^a</i>		
Use (6 items)	-.71(1.1)	.75
Hunting (4 items)	-.09 (1.3)	.70
Domination (use and hunting items combined)	-.46 (1.0)	.80
Social affiliation (4 items)	.01 (1.4)	.81
Caring (5 items)	.05 (1.4)	.86
Mutualism (affiliation and caring items combined)	.03 (1.2)	.87
<i>Emotions^b</i>		
Valence toward wolves (4 items)	.72 (1.3)	.90
Arousal toward wolves (4 items)	.66 (.97)	.56
<i>Acceptability of management actions^c</i>		
Acceptability – doing nothing (3 items)	-1.2 (1.5)	.80
Acceptability – educating public (3 items)	2.1 (1.1)	.79
Acceptability – lethal control (3 items)	-2.0 (1.3)	.83

^aVariables were coded on 7-point scales from -3 (strongly disagree) to 3 (strongly agree) with 0 as neutral point.

^bVariables were coded on a 7-point scale from -3 (not at all) to 3 (very strong) with 0 as neutral point.

^cVariables were coded on 7-point scales from -3 (very unacceptable) to 3 (very acceptable) with 0 as neutral point.

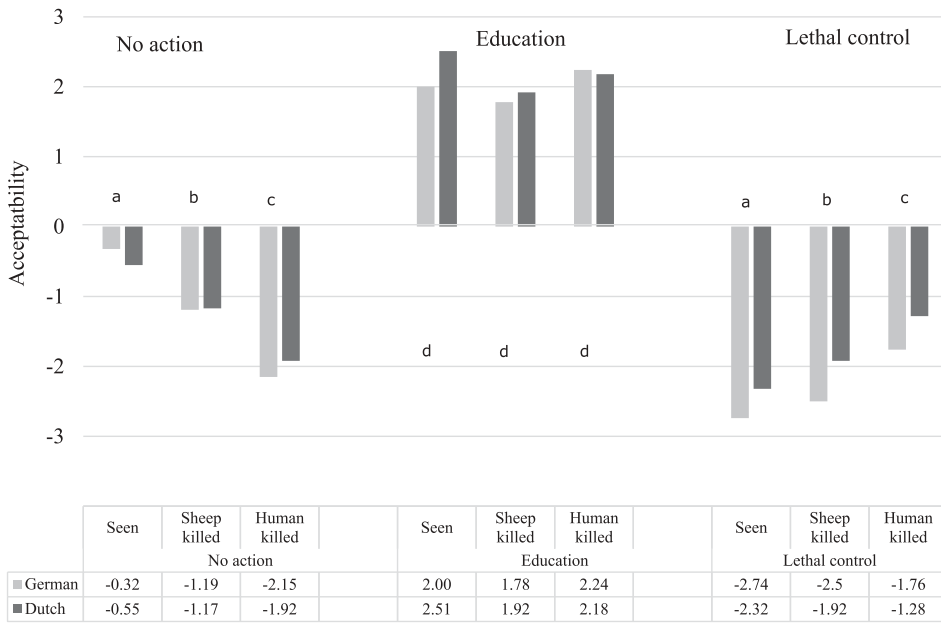


Figure 1. Average acceptability measures of management actions for different problem levels for the German (gray) and Dutch (black) sample. Acceptability was measured on a 7-point scale from -3 (very unacceptable) to $+3$ (very acceptable) with 0 as a neutral point. The acceptability for the three management strategies (from left to right) 'No action', 'Education' and 'Lethal control' are presented for each of the three presented scenarios with wolves 'Seen' (wolf only seen), 'Sheep killed' (wolf has killed sheep) and 'Human killed' (wolf has killed human). Acceptability of 'No action' and 'Lethal control' is statistically significantly different across problem levels as estimated by paired-sample t -tests, $p < .001$ for all pairwise test and indicated by different letters. While there were no significant differences between countries, significant differences among problem levels are indicated with a, b and c.

Netherlands: $M = -1.92$) or 'wolf is seen' (Germany: $M = -2.74$, the Netherlands: $M = -2.32$) scenarios as well as for the scenarios 'wolf kills sheep' or 'wolf is seen' (paired-sample t -tests, $p < .001$). Mean ratings for the acceptability of the management strategy 'No action' were similarly low in both countries. They were, however, within each country significantly higher for the scenario 'wolf is seen' (Germany: $M = -.32$, the Netherlands: $M = -.55$) compared to 'wolf kills sheep' (Germany: $M = -1.19$, the Netherlands: $M = -1.17$) and 'wolf kills human' (Germany: $M = -2.15$, the Netherlands: $M = -1.92$) as well as 'wolf kills sheep' compared to 'wolf kills human' (paired-sample t -tests, $p < .001$). Mean ratings for the acceptability of 'Education' were high, overall, in both countries without significant differences between scenarios.

Predictive Potential of Wildlife Value Orientations and Emotions on the Acceptability of Wolf Management Actions (H3, H4)

The predictive potential of wildlife value orientations and emotions on the acceptability of wolf management was estimated for all three management actions. Wildlife value orientations significantly predicted the acceptability of lethal control with an adjusted R^2 of .25 (Table 2).

Table 2. Acceptability of management actions no action, education, and lethal control explained by WVOs (Wildlife Value Orientations) and valence (German and Dutch Data set combined). Linear regression analysis with beta coefficients and adjusted R^2 ; p values represented as $p \leq .001^{***}$, $p \leq .01^{**}$, $p \leq .05^*$.

	No Action		Education		Lethal Control	
	Beta	Adjusted R^2	Beta	Adjusted R^2	Beta	Adjusted R^2
Model 1: WVOs		.00		.01		.25***
Domination	.05		.07		.48****	
Mutualism	.06		.13*		-.17***	
Model 2: WVOs and valence		.05***		.04***		.30***
Domination	.06		.08		.46****	
Mutualism	-.03		.08		-.09**	
Valence	.26***		.15***		-.24***	

Domination was a stronger positive predictor (beta = .48) for the acceptability of this management strategy than mutualism, which was negatively correlated (beta = -.17). Mutualism was the only significant predictor for education (beta = .13) while neither wildlife value orientation could be used to predict a preference for taking no action (Table 2). These findings support hypothesis 3.

Valence had significant additional predictive potential when combined with wildlife value orientations for the acceptability of lethal control (LR test, $F = 46.6$, $p < .001$) and had a stronger negative beta (-.24) on lethal control than mutualism. Valence also added significantly to the predictive potential of taking no action (LR test, $F = 28.8$, $p < .001$) and education (LR test, $F = 20.5$, $p < .001$) with a beta of .26 and .15, respectively. These findings support hypothesis 4. As an overall pattern, wildlife value orientations predicted acceptability of lethal control only, while valence predicted acceptability across management actions, with effect sizes in the same range.

Discussion

With the return of wolves to western Europe it is critical to understand the diversity of views held by people given that the available management options can be controversial and public support is important for long-term management success. We tested the roles of cognition and emotion in university student samples. These samples do not represent the entire populations of Germany and the Netherlands and acceptability of management strategies might be different for other stakeholders (e.g., farmers); yet, for testing relationships between concepts the samples were appropriate. Also, the three scenarios and different management actions included in this article do not necessarily reflect all problem situations and interventions, nor do they necessarily represent the most common real-world scenarios. For theoretical reasons, however, and building on previous literature where similar contexts were used, the scenarios were suitable for the hypotheses posed. Including other problem situations and management actions in the future research could increase the immediate practical value for managers. Overall, our analyses showed internal consistency among scales; except for arousal which was excluded from further analyses. These results align with previous studies which showed that arousal is more difficult to measure through self-report than valence (Bradley & Lang, 2000) and that wildlife value orientations (Hermann et al., 2013; Jacobs et al., 2014a) and valence (Jacobs et al., 2014b)

have adequate reliability in samples with German and Dutch students and measures were feasible to test our hypotheses.

Acceptability of Wolf Management Actions among German and Dutch Students

Consistent with previous research (Jacobs et al., 2014a; Martínez-Espíñeira, 2006; Mormile & Hill, 2017; Wittmann et al., 1998), the acceptability of management actions varied in our study depending on how serious the wildlife-human conflict was. In the scenario where a wolf kills a human, lethal control was more acceptable and taking no management action less acceptable compared to scenarios where a wolf was just seen or had killed livestock. In contrast, when a wolf was only seen (a perceived threat), lethal control was less acceptable and no management action more acceptable, compared with scenarios where livestock or humans are killed by wolves. Educating the public was a clearly accepted management action in both countries; particularly when humans were involved (i.e., wolf kills human and wolf is present). Building on previous studies, education strategies for the support of returning wolves might involve information on how to act when encountering a wolf as well as information about their local presence (Frank, Johansson, & Flykt, 2015), and emphasized successful projects in which co-existence between humans and wolves are possible (Hermann et al., 2013). However, while education can inform people about (e.g., how to behave for their own safety or what to do to support co-existence), it may not serve as the solution to all wildlife management situations (McKenzie-Mohr, 2011). Humans process information differently, based on their values, beliefs and attitudes (e.g., Munro & Ditto, 1997; Wood, 2000) as well as their emotions (e.g., Kühne & Schemer, 2015) and the interplay between cognitions and emotions have been shown to be important to consider when it comes to decision-making (Schwarz, 2000). Hence, understanding value orientations and emotions in relation to wildlife provides an opportunity to not only create tailored messages but also offers a starting point to find creative ways to foster community support for wildlife management actions.

Predictive Potential of Wildlife Value Orientations and Emotions on the Acceptability of Wolf Management Actions

In this article, domination and mutualism were significant predictors for and against lethal control, and mutualism for education. This confirmed the positive link between domination and acceptability of management strategies that involve direct control over wildlife (Hermann et al., 2013; Sijtsma et al., 2012). Neither ideology, however, effectively predicted a preference for no management action.

Including valence in the models significantly increased the explained variance of acceptability of all three management actions. The increase in explained variance was 3% and not substantial. It is important to know that emotion has predictive potential when combined with wildlife value orientations. Ancillary analyses suggest that valence as a standalone predictor would have a larger effect size, i.e., $\beta = .25$, for doing nothing, $\beta = .17$, for education and $\beta = -.34$, for lethal control (all $p < .001$). Including valence in the model specifically suppressed the predictive potential of mutualism, but hardly at all for domination. Additional analyses indeed confirm that the correlation between valence

and mutualism ($\beta = .33$) is larger than the correlation between valence and domination ($r = -.16$; for both $p < .001$). As mutualists believe that wildlife is part of an extended family and deserving of rights and care, it makes sense that those people have more positive emotions toward wolves. Research might benefit from simultaneously investigating emotions and cognitions when the aim is to gain a deeper understanding of the social aspects of human-wildlife interactions. Whether the finding, that emotion when used in combination with cognition has predictive potential, can be applied to different contexts – other samples, other nations, other species, other dependent variables – is a question for future studies. Nevertheless, an increasing body of literature strengthens the argument that emotions play an important role in wildlife-related issues (Lute et al., 2016; Nelson et al., 2016). Given the relationship between cognitions and emotions, conservation professionals have also been urged to acknowledge that their decisions are not emotion-free (Nelson et al., 2016). Furthermore, emotions can be an important link between values and the human behaviors that might ultimately benefit wildlife populations (Lute et al., 2016).

In this article, valence was the most robust predictor in the sense of predicting acceptability across management actions with effect sizes in a narrow range. Domination was the strongest predictor yet predicted acceptability of lethal control only and hence effect sizes varied drastically – stable prediction (valence) versus strong spike (domination). Whether this pattern would generalize across different samples, species and emotion measures need to be answered with future research. If so, the pattern could suggest that emotion has a more general influence on other mental processes, while abstract cognitions have a more specific and perhaps more substantial effect on some mental processes. The occurrence of an emotional state is often based on the coarse-grained and quick judgment of stimuli (Jacobs et al., 2012). As emotions anticipate appropriate behaviors in important situations (e.g., fear for a large predator prepares the body for a flight or fight response), a relatively simple judgment that does not require lengthy processing has emerged in the course of biological evolution as part of the emotional system (LeDoux, 1998). Cognitive processing is often more fine-grained and complex as it typically takes place in non-urgent situations and therefore can be much more context-specific and include the weighting of a variety of thoughts. From this perspective, the observed more general influence of emotion and more contextual influence of cognition make sense theoretically. This has an immediate practical consequence for managers: emotion is always relevant regardless of the management action, whereas basic beliefs about wildlife are relevant for some actions and not for others.

For managers, it is important to realize that influencing thoughts and feelings is not easy and there are ethical considerations in doing so. People are shaped by millions of messages and hence a few messages from wildlife management agencies are not likely to change negative feelings into positive feelings toward wolves. It would be valuable for management agencies to also emphasize positive human emotions toward wolves in communication, perhaps thus making a small contribution to the positive societal appraisal of wolves in the landscape. Further, communication with the public would benefit from being more about a ‘two-way’ dialogue compared to ‘one-way’ outreach and education to foster support for wildlife management actions (Decker, Riley, & Siemer, 2012; Harding, Hendriks, & Faruqi, 2009). Since valence was the most robust predictor in our study, further research would be valuable to understand how people feel about wolves and how they are managed rather than what people know about it. This would likely mean more engaged education rather than just messaging and could provide exciting research opportunities in the future.

Conclusions

In this article, the predictive potential of emotions and wildlife value orientations for the acceptability of wolf management strategies were simultaneously investigated. Findings suggested that cognitions and emotions are not mutually exclusive, and both might be useful for understanding human responses to wildlife management actions. Future research on human dimensions of wildlife may benefit from the combined study of both cognitive and emotional responses to wildlife. Studying cognitions and emotions collectively rather than independently helps to determine which predicts the other and which approach is perhaps more appropriate for certain kinds of studies or message framing. While student populations cannot be used to generalize findings to entire populations, the results of this study showed that educating the public was preferred in any scenario; irrespective of the severity of the human-wildlife conflict. This suggests promoting education programs that foster co-existence with wolves. This could be done for instance through highlighting good examples of successful projects which succeeded in overcoming difficulties and reconciling human interest with wildlife conservation efforts (Hermann et al., 2013) as well as information on how to act when encountering a wolf (Frank et al., 2015). Understanding people's acceptability of wildlife management actions might become more and more important with human populations expanding and landscapes becoming increasingly shared with wildlife.

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