





RESEARCH ARTICLE

Beyond message framing: Participant characteristics predict social acceptability of increased deer culling in Scotland

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Abstract

1. Wild deer are iconic symbols of Scotland's natural and cultural heritage, but their burgeoning populations are increasingly contributing to ecological and socio-economic harm. In response, the Scottish Government is considering new policy measures to increase the annual deer cull. However, deer management in Scotland is deeply rooted in cultural, economic, and ecological histories and increased culling could be morally contentious.
2. Deer management is topical and frequently in the media. Understanding whether there is a social licence to increase the cull is valuable for anticipating public responses to and the success of suggested policy reforms.
3. We used an online experiment to test whether members of the Scottish public perceived increasing the deer cull in Scotland to be more or less socially acceptable depending on how messages are framed in mock online news articles. Drawing from frames supported by previous literature and present in national news coverage, we tested the influence of text frames (i.e. justifications for deer culling), gain/loss frames (i.e. "increasing" a positive outcome vs. "reducing the loss of" the same positive outcome), and image frames (i.e. "healthy" vs. "unhealthy" deer and setting).
4. Participants generally perceived increasing the cull to be more acceptable than unacceptable, indicating broad public support. We found little evidence that perceptions of acceptability are sensitive to message framing. Participants were slightly more likely to perceive increasing the deer cull as more acceptable if they were shown the healthy image frame compared to the unhealthy image frame.
5. Instead, participants' gender identity, self-reported social identities (deer stalker, i.e. hunter, or animal protectionist), general experiences and perceptions of deer, and trust in the Scottish Government explained differences in perceptions.

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6. *Policy implications.* Public beliefs, knowledge, social identities, and trust in institutions can help explain why people hold different perspectives on lethal control of deer in Scotland. Engaging with these aspects could help attenuate social conflict as Scotland moves towards a more sustainable system of deer management, which will involve higher levels of culling, a controversial aspect of wildlife conservation.

KEYWORDS

deer culling, message framing, social acceptability, social identity, social licence to operate, wildlife governance and management

1 | INTRODUCTION

Wild deer are iconic symbols of Scotland's natural and cultural heritage, but their large and growing populations are increasingly causing problems. This growth is driven by an absence of natural predators, land-use strategies favouring high deer numbers, and limited public participation in deer hunting (Kirkland et al., 2021), typically referred to as “deer stalking” in Scotland. Large deer populations—particularly native red (*Cervus elaphus*) and roe (*Capreolus capreolus*)—have contributed to damage across woodlands, peatlands, and agricultural land (Gullett et al., 2023; Hobbs, 2009; Pepper et al., 2020). Large deer populations also pose concerns for human health and safety as well as deer welfare, due to risks associated with collisions with vehicles, disease transmission, and starvation (Hare et al., 2021; Scottish Animal Welfare Commission, 2021).

In response, the Scottish Government Deer Working Group (DWG) proposed a suite of sustainable deer management strategies that balance ecological health and diverse public interests (Pepper et al., 2020). Central to these recommendations is an increase in lethal control, prompting new deer management legislation proposals that would facilitate increased culling (Scottish Government, 2025).

However, deer management in Scotland is deeply rooted in cultural, economic, and ecological histories and intricately intertwined with issues of class and power (Jarvie & Jackson, 1998; Leavey-Wilson et al., 2025). While the Scottish Government holds legal responsibility for deer management, landowners set their own hunting and culling targets (Glenn et al., 2019). Private landowners, who collectively own and control most rural land, are sometimes influenced by economic and cultural motivations to maintain high deer densities (Doyle, 2023; Glenn et al., 2019). This unique governance structure has contributed to persistently elevated deer populations across much of rural Scotland and has intensified social tensions surrounding efforts to develop management strategies that reflect wider public interests (Kirkland et al., 2021).

Achieving proposed culling targets hinges largely on the willingness of private landowners to reconsider traditional land-use priorities and associated economic incentives (Kirkland et al., 2021; Macmillan, 2008; MacMillan et al., 2010). It also implies greater public participation in recreational deer stalking (von Essen et al., 2019),

necessitating the reconciliation of diverse personal motivations for hunting. This poses a further challenge in Scotland which, in contrast to many other European countries (Milner et al., 2006), does not have a strong public hunting culture (Wightman et al., 2002). Furthermore, the mobility of deer populations necessitates coordinated, collaborative management strategies across property boundaries (Kirkland et al., 2021; Taylor et al., 2025).

Beyond economic considerations, proposals to increase deer culling are morally contentious and could meet public resistance (Dandy et al., 2012; Hare et al., 2021; Whitefield et al., 2021). In this context, the concept of a ‘social licence to operate’—the informal societal approval or disapproval of policy actions (Darimont et al., 2021)—offers a valuable framework for understanding and anticipating public responses to potential deer management reform centred around increased culling (Moffat et al., 2016). Considering social licence is important for understanding social concerns and fostering ongoing trust, transparency, and legitimacy in policy processes (Butler et al., 2021). This is particularly relevant to deer management in Scotland, where stakeholders range from local residents to national organisations and positions on lethal control vary widely (Ford & Williams, 2016).

Closely linked to social licence to operate is the psychological concept of ‘social acceptability’, which focusses on perceptions and the degree to which people understand and support management actions or policy alternatives (Shindler & Brunson, 2004; Stankey & Shindler, 2006). Measuring social acceptability can help assess the presence and strength of social licence by generating insights into the factors that influence societal support or opposition (Ford & Williams, 2016). The success of wildlife management policies is influenced by social acceptability (Pomeranz et al., 2021), and a lack of social acceptability can lead to public opposition or non-compliance, and ultimately undermine implementation (Dandy et al., 2012). Controversial proposals such as increased culling may generate unforeseen, adverse impacts, particularly when implemented in the absence of social acceptance (Butler et al., 2021).

Understanding how people will perceive and respond to new wildlife management strategies, such as increased deer culling, requires attention beyond social licence and towards the factors that shape it. One key influence is media coverage, which plays a central role in shaping social acceptability in the digital era (McCombs &

Valenzuela, 2020). According to Media Effects Theory (Borah, 2016), mass media coverage can influence public attitudes and perceptions through *framing*—the selective emphasis of certain elements of a topic over others (Entman, 1993; Goffman, 1974; Scheufele & Tewksbury, 2007). Whether consciously or not, communicators can steer attention towards or away from specific facets of a policy issue, which can shape information processing. Media framing can therefore influence responses to conservation issues (e.g. Kusmanoff et al., 2020; Martell & Rodewald, 2024).

Framing is particularly salient for contentious issues which invite diverse interpretations (Goffman, 1974; Niemiec et al., 2020). In Scotland, where deer management remains morally and culturally contested, the way proposed policy changes are framed in the media may influence their social acceptability. Increased deer culling, for instance, may be more socially acceptable if framed in terms of public objectives, such as animal welfare, environmental conservation, or public health and safety (Hare et al., 2021). This has become more relevant since the release of the 2020 DWG report (Pepper et al., 2020), which amplified public discourse surrounding deer management and elevated deer and broader wildlife policy within the Scottish news agenda (McCombs et al., 2013; McCombs & Valenzuela, 2020). Scottish news coverage of deer management often emphasises certain justifications over others, thereby potentially shaping the lens through which the public view these issues.

One relevant framing mechanism is loss aversion, a well-documented cognitive bias where people prefer to avoid potential losses compared to acquiring equivalent gains (Tversky & Kahneman, 1992). Deer culling could therefore be more socially acceptable when outcomes are framed in terms of preventing losses (e.g. 'reducing the loss of biodiversity') rather than achieving gains (e.g. 'increasing biodiversity'). Loss-framed messages are generally more effective at influencing behaviour and intentions, while gain-framed messages more effectively shape lower-commitment choices and attitudes (Homar & Cvelbar, 2021). Such framing effects have been documented across a range of environmental contexts. Gain frames were more influential for behavioural intentions towards climate change among Vietnamese farmers (Ngo et al., 2022). In Argentina, participants strongly preferred to avoid losses when making decisions about sustainable agriculture (Gonzalez-Ramirez et al., 2018). Similar loss aversion tendencies have been reported in public attitudes to transnational open land habitats in Denmark and the Netherlands (Vogdrup-Schmidt et al., 2019) and water conservation in China (Li & Wang, 2024).

Beyond text frames, visual media can play a powerful role in shaping public perceptions of environmental issues (Hansen & Machin, 2013; Ison et al., 2024). Visual Framing Theory (Rodriguez & Dimitrova, 2011) emphasises that the emotional and cognitive impact of images (Altinay & Williams, 2019; Joffe, 2008) can simplify complex issues (McInerney et al., 2014) and evoke empathy or concern (Nanda et al., 2012). For example, images of malnourished deer or degraded landscapes could increase the social acceptability of lethal control, while images of healthier deer in more biodiverse

environments could reduce it. These visual cues work in tandem with textual frames to influence social acceptability.

It is possible that media presentation of this issue in turn influences public perceptions and thus the social licence. Against growing recognition that perceptions of environmental issues are sensitive to framing and the increasing attention being given to the importance of social licence to operate in wildlife research and policy, we conducted an online experiment to test whether message framing in online news articles influences the perceived social acceptability of increased deer culling in Scotland.

We tested the following research hypotheses, that increasing the deer cull would be more acceptable to participants who are:

H1. Shown the 'promoting deer welfare' text frame, then, in descending order of mean acceptability scores, by those shown the 'protecting biodiversity' frame, the 'promoting human health and safety' frame, and lowest in those presented with the 'addressing climate change' frame.

H2. Shown the 'loss' frame compared to those shown the 'gain' frame.

H3. Shown the 'unhealthy' image frame of a deer and its surroundings compared to those shown the 'healthy' image frame.

(Supporting Information S1 for extended hypotheses)

2 | METHODS

2.1 | Experimental design

We reviewed 122 recent Scottish online news articles related to deer culling, management, and legislation to identify text frames. We used the Nexis online database (<https://tinyurl.com/h6prjyrs>) to search for national-level coverage published after February 2020, corresponding with the release of the DWG report and marking an increase in news media coverage of these issues. With input from an expert focus group (14 staff from environmental and animal welfare organisations in Scotland and academics with expertise in deer management, conservation, social sciences, and animal welfare) to ensure policy relevance, we combined and reduced our list of identified text frames to include: (a) protecting biodiversity (with reference to habitats, woodlands, or peatlands); (b) addressing climate change (with reference to carbon or carbon emissions); (c) promoting deer welfare (with reference to starvation during winter); and (d) promoting human health or safety (with reference to road safety and Lyme disease).

For each text frame justification, we wrote a gain-framed and loss-framed version (Kahneman & Tversky, 1979). The gain frame emphasised 'increasing' a positive outcome, while the loss frame

TABLE 1 Gain/loss frames per text frame.

Text frame	Gain	Loss
Protecting biodiversity	Culling more deer would increase biodiversity by protecting habitats such as woodlands and peatlands in Scotland	Culling more deer would reduce biodiversity loss by protecting habitats such as woodlands and peatlands in Scotland
Addressing climate change	Culling more deer would help to address climate change by increasing the amount of carbon sequestered in Scotland	Culling more deer would help to address climate change by reducing the amount of carbon released into the atmosphere in Scotland
Promoting deer welfare	Culling more deer would improve deer welfare by making more food available, so more deer avoid starvation during winter in Scotland	Culling more deer would reduce threats to deer welfare by making more food available, so more deer avoid starvation during winter in Scotland
Promoting human health and safety	Culling more deer would improve human health and safety by making roads safer for motorists and reducing the prevalence of Lyme disease in Scotland	Culling more deer would reduce threats to human health and safety by making roads safer for motorists and reducing the prevalence of Lyme disease in Scotland

Note: Bold text indicates changes between sentences.

emphasised 'reducing the loss of' the same positive outcome (Table 1).

Our expert focus group suggested the two image frames to test: (a) healthy, and (b) unhealthy individual deer and landscape. The 'healthy' image frame showed a healthy-looking red deer (*Cervus elaphus*) with good body and coat condition, in a more biodiverse forest setting. The 'unhealthy' image frame depicted a red deer with less healthy-looking body and coat condition, and in a more ecologically degraded setting (consistent with negative deer impacts resulting from high densities). We chose to use images of red deer because this species was the most frequently depicted in existing news coverage. Both images were sourced from iStock, a publicly available image repository.

2.2 | Experimental conditions

Our experiment employed a full factorial $4 \times 2 \times 2$ design, combining three experimental factors: text frames (four levels), gain/loss frames (two levels), and image frames (two levels). This resulted in 16 total combinations, for which we designed mock online news articles about deer culling in Scotland (Figures 1 and 2).

We designed the mock articles to mimic how authentic Scottish online news articles report on this issue while avoiding sensational or extreme language, which can influence perceptions of conservation

issues (Niemiec et al., 2020). To mitigate potential biases associated with specific news outlets or respondents' political leanings (Boykoff & Boykoff, 2007; Freitag et al., 2021), we also avoided imitating exact fonts, layout, or design of Scotland's ten most widely read news providers.

Our expert focus group reviewed the mock articles for comprehensibility, neutrality, accuracy, and relevance to contemporary policy considerations in Scotland.

2.3 | Sample

Qualtrics (Qualtrics, 2024) recruited a sample of 1215 adults residing in Scotland. To increase external validity (Rahman et al., 2022; Vaske et al., 2022), we stratified our sample by age, ethnicity, and gender identity to reflect the latest Scottish population estimates (Scottish Government, 2019). As only 17% of the Scottish population lives in rural areas, we oversampled this group (30%) to allow more precise rural–urban comparisons (Hare et al., 2021).

2.4 | Procedure

We conducted our online experiment on the Qualtrics survey software (Qualtrics, 2024). We asked participants to record their age, ethnicity, gender identity, and current rural or urban residency, to verify eligibility based on quotas. We indicated that the aim of the experiment was 'to understand what people in Scotland think about wildlife' in order to minimise sampling bias—for example, by attracting participants with a particular interest in deer management or deterring those who were not interested. We randomly assigned participants to read one of 16 experimental conditions and explained they were reading 'an excerpt from a recent Scottish online news article'. After reading the mock article, participants indicated how acceptable or unacceptable it would be to increase the deer cull in Scotland using a seven-point bipolar Likert-type response scale item ('very acceptable' to 'very unacceptable', with a midpoint of 'neither acceptable nor unacceptable' and an 'I do not know' option to distinguish neutrality from uncertainty) (Mirzaei et al., 2022).

Participants recorded their general experiences and perceptions of deer in Scotland (the extent of knowledge of the annual deer cull, perceptions of deer abundance, frequency of encounter with deer, and whether they enjoy knowing that wild deer live in Scotland) (Hare et al., 2021), their self-reported social identities (the extent to which they identify as a deer stalker (common word for 'hunter' in Scotland), animal protectionist, and environmental conservationist), and the extent to which they trusted the Scottish Government to make the right decisions regarding the environment. Participants also recorded additional demographic information, including level of formal education, where they grew up (rural/urban classifications), and land ownership. We removed and replaced any participants whose responses indicated minimal attention.

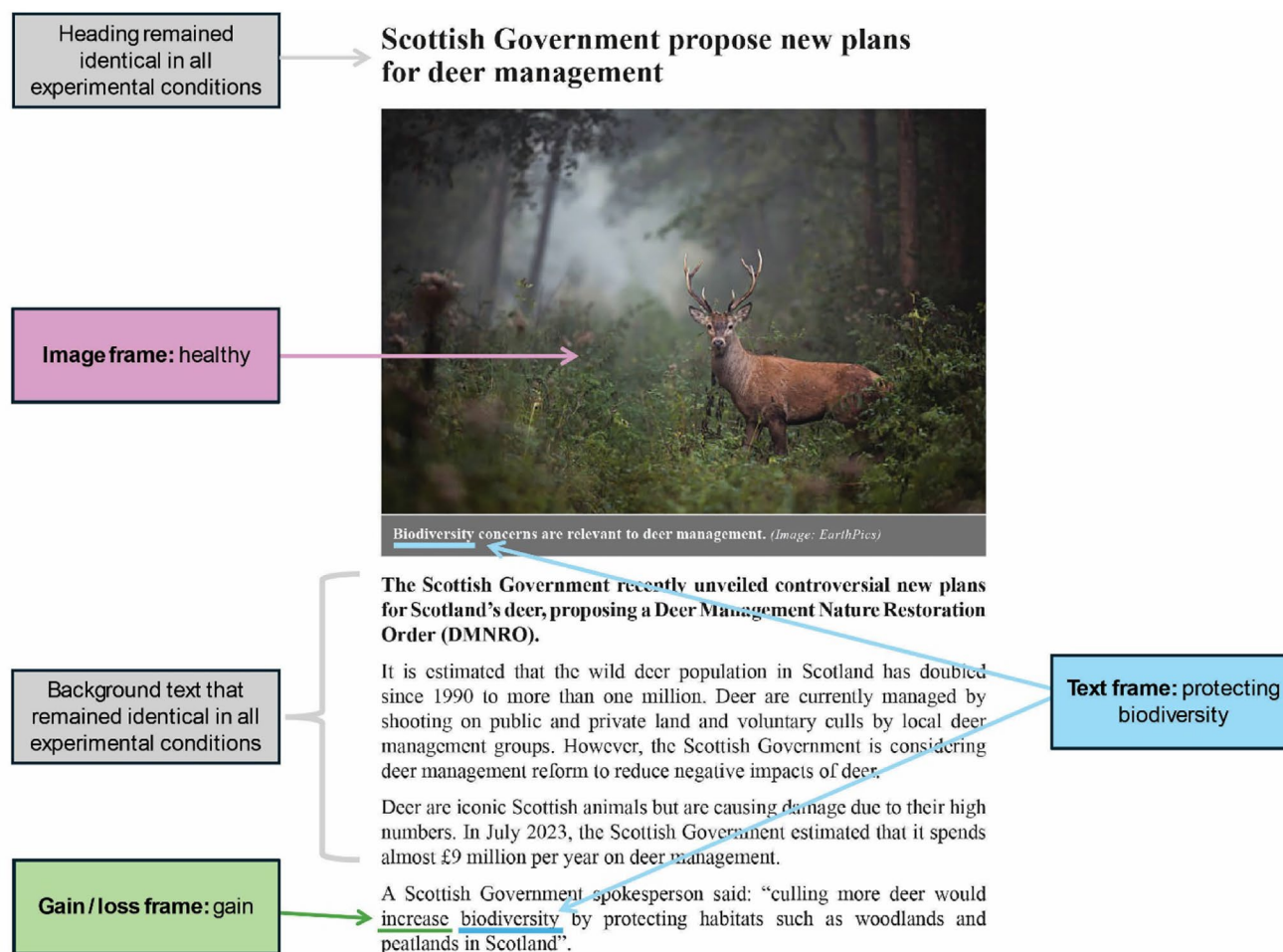


FIGURE 1 Example mock online news article showing elements that we held constant (grey) or varied (blue, green, pink) across 16 experimental conditions. This example shows the mock article for one condition: protecting biodiversity text frame, gain frame, and healthy image frame.

2.5 | Ethics

The Oxford Central University Research Ethics Committee reviewed and approved our study (reference: SOGE C1A 24 41). All participants provided free and informed consent via an online form as part of the Qualtrics survey. Upon completion, we debriefed participants about the research aims. See [Supporting Information S2](#) for the full instrument.

2.6 | Data analysis

We received responses from 1215 participants. We combined participants who reported their highest level of education as 'primary school' ($n=3$) with 'secondary school' ($n=407$) to create a single 'primary or secondary school' category. We regrettably removed responses from three participants identifying as transgender, non-binary, other gender, or preferring not to disclose their gender identity, as we could not reliably estimate the effects of gender for these groups due to the low sample size. We combined

respondents currently living in 'very urban' and 'quite urban' locations into a single 'urban' category ($n=797$), and 'very rural' and 'quite rural' locations into a single 'rural' category ($n=339$). We did the same for participants' childhood rural-urban classifications, resulting in single 'urban' ($n=807$) and 'rural' ($n=329$) categories. We excluded 71 responses from participants who answered 'I do not know' for the acceptability of increasing the deer cull, retaining only responses from 'very unacceptable' to 'very acceptable', resulting in a final dataset of 1136 responses across 16 experimental conditions (median number of responses per experimental condition: 72; range: 59–84).

We used ordinal logistic regression to quantify associations between acceptability of increasing the deer cull and the three experimental variables (text frame, gain/loss frame, image frame), while accounting for participants' demographic characteristics (age, gender identity, formal education, current rural-urban residence, childhood rural-urban residence, and land ownership), self-reported social identities, general experiences and perceptions of deer, and the extent to which they trust the Scottish Government to make the right decisions regarding the environment.

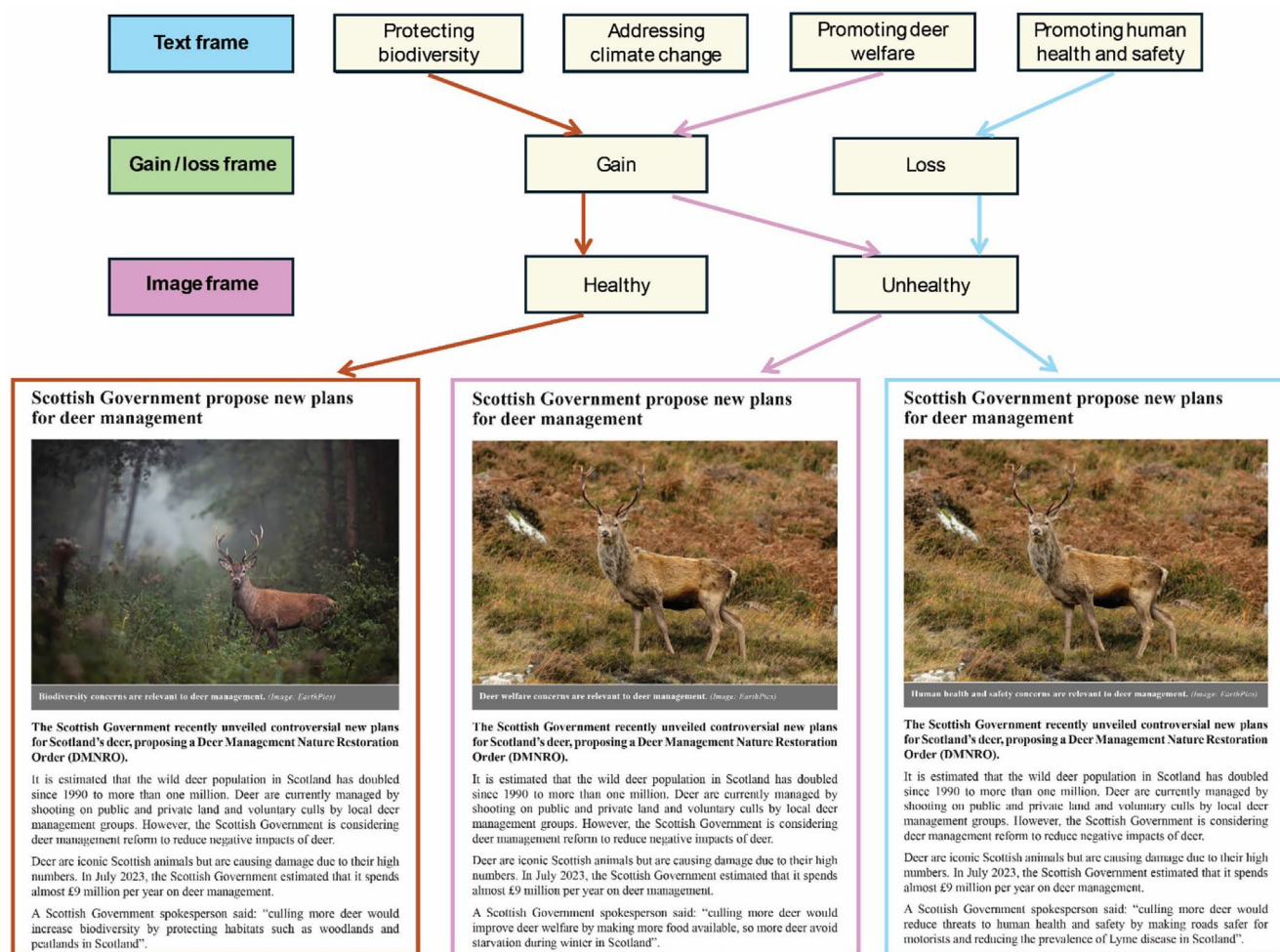


FIGURE 2 Full factorial design, showing three of 16 mock articles (all mock articles in [Supporting Information S3](#)). Coloured arrows and article borders show which combination of text, gain/loss, and image frames appear in each example mock article.

We fitted one model with only the main effects of the three experimental variables and one with all possible two-way interactions among experimental variables (each with the same covariates). Analysis of deviance on the model containing interactions showed that no interactions were statistically significant (all p -values > 0.05), so we used the model with main effects only as the global model.

We compared all possible models nested within the global model according to Akaike Information Criterion (AIC) values and identified the top-supported model based on the lowest AIC (Sutherland et al., 2023). We calculated the AIC weight (AIC_w) for the top-supported model relative to competitor models within two AIC points after removing models containing redundant variables (Arnold, 2010). For each categorical predictor with more than two levels, we used Tukey tests to examine differences between levels.

We analysed data using R version 4.4.1 (R Core Team, 2024). We used the 'ordinal' package (Christensen, 2024) for model fitting and the 'MuMIn' package (Bartoń, 2024) for model selection. For Tukey tests and analysis of deviance, we used the 'emmeans' package (Lenth et al., 2024). We visualised model estimates, predictions, and

both 85% and 95% confidence intervals, consistent with our model selection approach (Sutherland et al., 2023) using the 'ggplot2' package (Wickham, 2009). We used the 'Likert' package (Bryer & Speerschnieder, 2016) to calculate and visualise percentages of responses from the raw data.

3 | RESULTS

Most participants indicated it would be acceptable (i.e. very acceptable, acceptable, and somewhat acceptable combined) to increase the deer cull in Scotland in 15 of 16 experimental conditions (Figure 3). The most acceptable condition contained the deer welfare text frame, gain frame, and healthy image frame, with 70% of participants assigned to this condition indicating that increasing the cull would be 'very acceptable', 'acceptable' or 'somewhat acceptable'. The least acceptable condition contained the climate change text frame, gain frame, and unhealthy image frame, with 48% of participants assigned to this condition indicating that increasing the cull would be 'very acceptable', 'acceptable' or 'somewhat acceptable'.

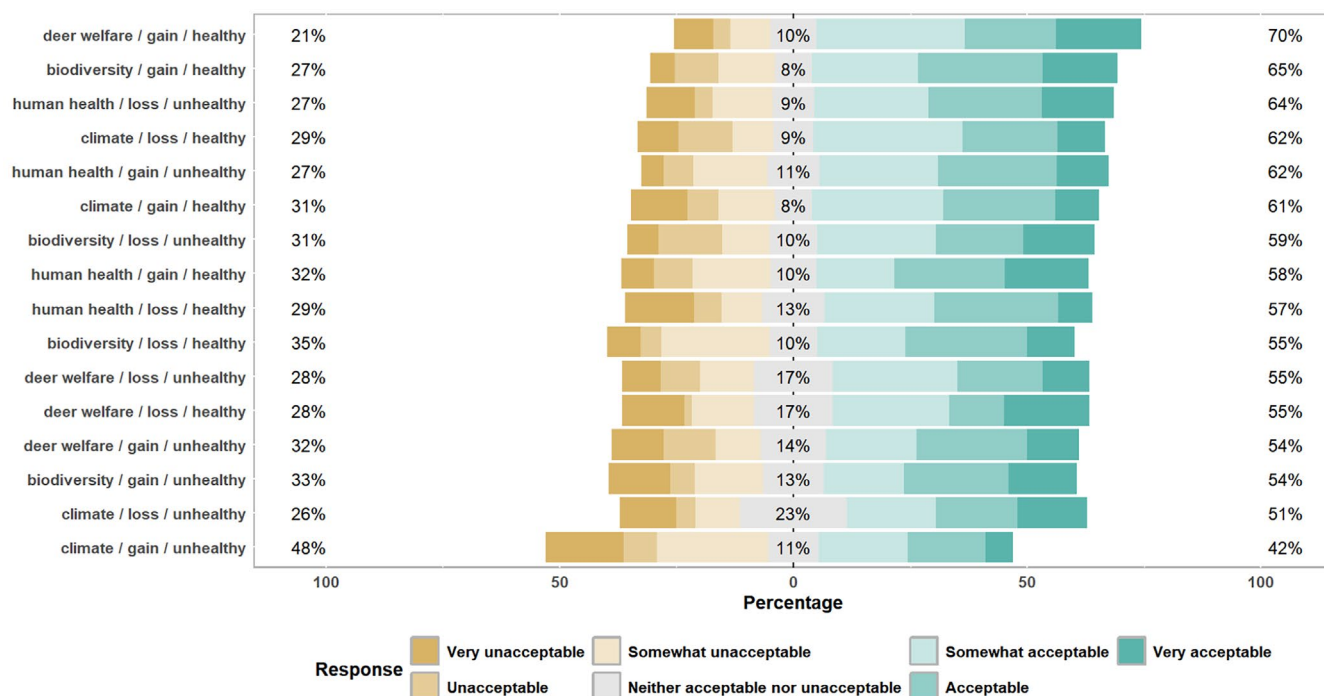


FIGURE 3 Acceptability of increasing the deer cull across 16 experimental conditions. Vertical axis labels indicate the levels of each experimental condition '[text frame] / [gain/loss frame] / [image frame]'. Percentages show combined proportions of participants in each condition who indicated very unacceptable, unacceptable, or somewhat unacceptable (left), neither acceptable nor unacceptable (middle), or somewhat acceptable, acceptable, or very unacceptable (right). Colours show responses on the 7-point Likert scale.

Our top-supported model ($AIC_w = 0.52$) contained image frame, gender identity, identification as a deer stalker, identification as an animal protectionist, knowledge of the deer cull, perceptions of deer abundance, frequency of encounter with deer, and trust in the Scottish Government to make the right decisions regarding the environment.

All else being equal, participants were more likely to perceive increasing the deer cull to be more acceptable if they were assigned the healthy image frame compared to the unhealthy image frame (Figure 4a; difference [SE] in log odds ratio = 0.17 [0.11]). Male participants were more likely to find increasing the cull more acceptable than female participants (Figure 4b; difference [SE] in log odds ratio = 0.48 [0.11]). Acceptability was generally higher among participants identifying more strongly as deer stalkers (Figure 4c) and lower among participants identifying more strongly as animal protectionists (Figure 4d).

General experiences and perceptions of deer also helped to explain differences in acceptability. Greater existing knowledge of the deer cull was related to higher acceptability of increasing the deer cull. Participants who answered 'strongly agree' to having existing knowledge of the deer cull were more likely to indicate higher acceptability than participants who answered strongly disagree (Figure 4e; difference [SE] in log odds ratio = 1.81 [0.25]). Notably, 56.78% of participants indicated they were aware of the cull (i.e. strongly agree, agree, somewhat agree), and 31.78% indicated that they were not aware (i.e. strongly disagree, disagree, somewhat disagree). Moreover, participants who perceived the number of deer in Scotland to be too high

were more likely to indicate that increasing the deer cull was more acceptable compared to those who thought deer abundance was about right or too low (Figure 4f). The largest proportion of participants, 47.36%, indicated that deer numbers were 'about right', 25.79% of participants indicated deer numbers were too high, and 13.82% of participants indicated that numbers were too low. There was no clear relationship between the frequency in which participants encounter deer and acceptability of increasing the cull (Figure 4g).

Participants who reported a greater level of trust in the Scottish Government to make decisions regarding the environment were more likely to perceive increasing the deer cull as acceptable (Figure 4h).

4 | DISCUSSION

We conducted an online experiment using mock online news articles to assess whether message framing explains differences in perceived social acceptability of increasing the deer cull among a sample of the Scottish public. We found limited evidence that our experimental factors—text, gain/loss, and image frames—explained differences in social acceptability. Participant characteristics, including gender identity, self-reported social identities, general experiences and perceptions of deer, and trust in the Scottish Government to make the right decisions regarding the environment, better explained differences in social acceptability.

Small variations in acceptability across the 16 experimental conditions indicate relatively consistent attitudes towards the issue of

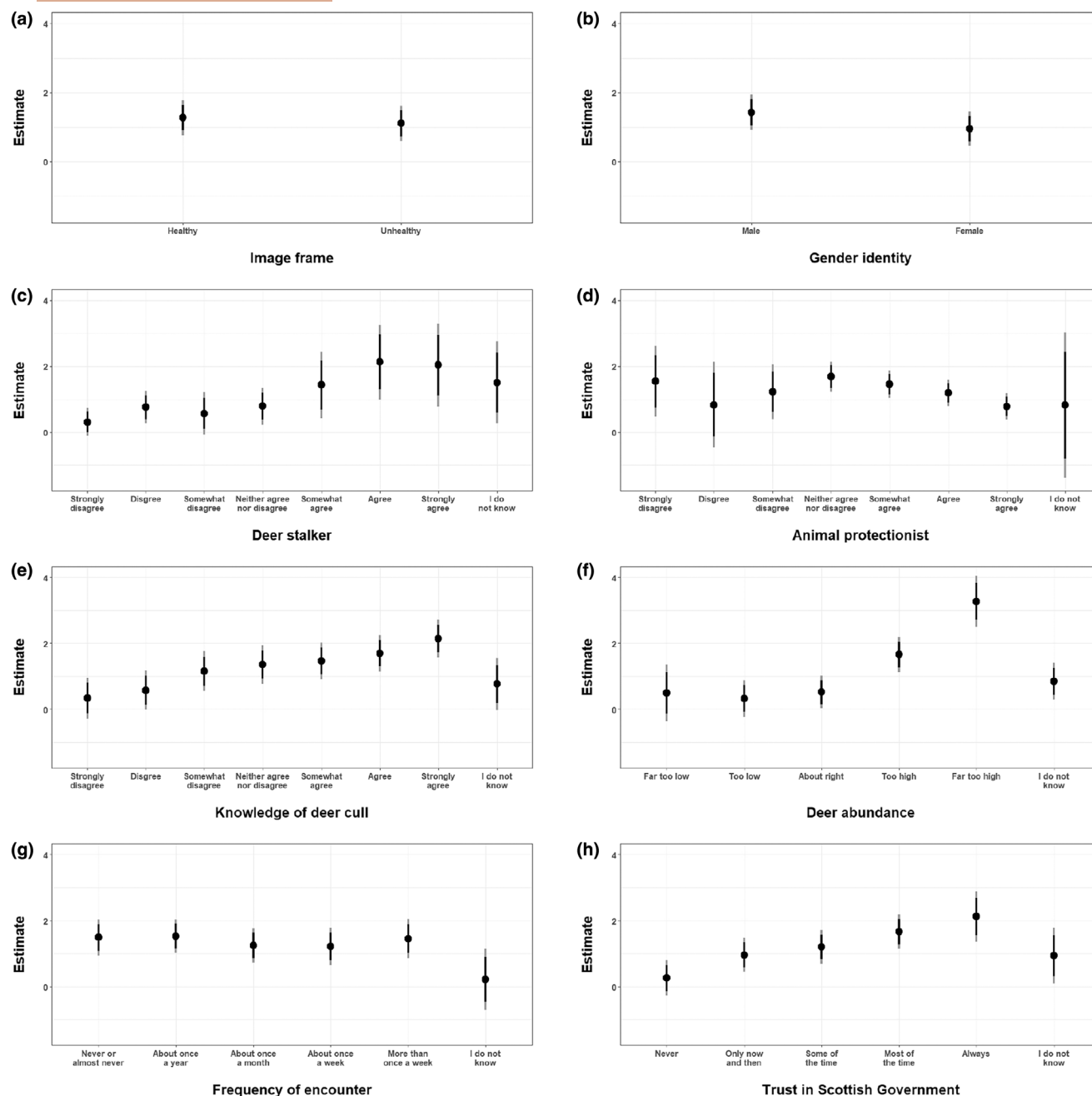


FIGURE 4 Estimated marginal means (85% confidence intervals in black, 95% in grey) for (a) image frame, (b) gender identity, (c) identification as a deer stalker, (d) identification as an animal protectionist, (e) existing knowledge of the annual deer cull, (f) perceptions of deer abundance, (g) frequency of encounter with deer, and (h) trust in the Scottish Government to make the right decisions regarding the environment.

increasing the deer cull in Scotland. This aligns with evidence showing general acceptability of deer culling when it serves broader public interests (Hare et al., 2021; Whitefield et al., 2021), and suggests social licence to increase the cull among the Scottish public. If so, general public backlash over increased culling may be unlikely despite a history of conflict and resistance from some interest groups (Kirkland et al., 2021; Whitefield et al., 2021).

We found no associations between text frame or gain/loss frame and acceptability. These findings contradict theoretical

predictions and empirical findings in other contexts that message framing can influence public perceptions of environmental issues (e.g. Badullovich et al., 2020; Gonzalez-Ramirez et al., 2018; Hafner et al., 2019; Homar & Cvelbar, 2021; Li & Su, 2018; Ngo et al., 2022; Tversky & Kahneman, 1992; Vogdrup-Schmidt et al., 2019). This distinguishes deer culling in Scotland from environmental issues where public opinion tends to be more responsive to communication strategies. However, it aligns with findings from similarly controversial conservation contexts. For instance, Niemiec

et al. (2020) found that message framing had little impact on public voting intentions regarding wolf reintroduction in Colorado. However, messages that conveyed perceived social norms (i.e. widespread support)—particularly when aligned with participants' social identities—had stronger effects on perceptions. Similarly, our findings suggest that self-reported social identities helped explain differences in the acceptability of increasing the deer cull in Scotland. This supports previous research linking social identity to positions on contentious wildlife conservation issues (Bruskotter et al., 2019; Hare et al., 2024; Kansky et al., 2014; Leavey-Wilson et al., 2025; Lute et al., 2014; van Eeden et al., 2019), including lethal control of high deer populations (Blossey et al., 2025; Hare et al., 2024).

The acceptability of deer culling in Scotland, a contentious issue in wildlife conservation, appears to be shaped less by media messages and more by identity politics, values, and disagreement over using lethal control (Dawson et al., 2024; Hare et al., 2024; Kansky et al., 2014; Liordos et al., 2017; Lute et al., 2014; van Eeden et al., 2019). Although our sample expressed higher acceptability than expected, long-standing, deeply rooted perceptions—shaped by issues of class, power dynamics, job security, and contested narratives around the goals of culling—may constrain the effectiveness of message framing in the Scottish context (Jarvie & Jackson, 1998; Kirkland et al., 2021; Leavey-Wilson et al., 2025).

The influence of message framing therefore seems to be conditional, particularly in value-laden or identity-relevant contexts like culling, where social, political, and experiential factors may be more salient. While conflict surrounding deer management in Scotland may appear, on the surface, to revolve around concerns such as deer numbers, their impacts, and management practices, it is also influenced by deeper factors, including historical controversy, blame, and mistrust (Kirkland et al., 2021; Leavey-Wilson et al., 2025). Our finding that respondents who did not trust the Government's decision making concerning the environment were less likely to find an increased cull acceptable might reflect this. All our mock online news articles specified a 'Scottish Government spokesperson' as the messenger justifying an increased cull. Trust in the source of information is crucial for shaping public perceptions and action (Corner et al., 2015; Mathiesen et al., 2022; Sleeth-Keppler et al., 2017), with trust in governments playing a key role in conservation (Thaker et al., 2019) and climate (Kulin & Johansson Sevä, 2021; Muñoz-Ulecia et al., 2025) issues. This is important in this context as the Scottish Government is preparing legislative changes. Altering the person who communicates a message can influence how it is perceived and responded to (Kotcher et al., 2023; Muñoz-Ulecia et al., 2025; Wabitsch, 2024), so changing the spokesperson from the Scottish Government to an environmental NGO, deer hunting organisation, or community group, for example, might have elicited different perceptions of social acceptability.

There also appears to be an effect of social identities tied to the role, place, and values of deer amid shifting policy, cultural, and environmental contexts (Leavey-Wilson et al., 2025). This is supported

by our finding that the extent to which respondents identified as a deer stalker or animal protectionist influenced social acceptability, and is indicative of a conflict with deeper roots than disagreements over deer management objectives (Kirkland et al., 2021; Leavey-Wilson et al., 2025). Our findings are consistent with Social Identity Theory (Tajfel & Turner, 1986) and Cultural Cognition Theory (Douglas & Wildavsky, 1982), which propose that people interpret information through the lens of their group identities and cultural values. Accordingly, messaging alone is unlikely to override ingrained values or social identities tied to land use, environmental ethics, or trust in authority.

Alternatively, our results may indicate that the differences between the frames used in our mock articles were too subtle for a framing effect to be detected. Our approach differs from other framing studies where frames were more strongly accentuated, such as those evaluating climate change communication that used frames like 'hope' versus 'doom and gloom' (Ettinger et al., 2021). We designed the articles to maintain realism, believability, and to minimise participant awareness of the experiment's purpose.

We predicted that images of deer in poorer health and set against a less healthy backdrop, which emphasise negative ecological and deer welfare implications of current deer densities, would elicit higher acceptability for increasing the deer cull. Instead, our healthy image frame was associated with higher acceptability, albeit with a small effect size. This challenges evidence suggesting that lethal control in wildlife management is more acceptable if the animal is ill or injured, compared to an animal in prime health (Woodroffe et al., 2005). Our unhealthy image frame might have stimulated more of a caring instinct among participants, because unhealthy or abused animals can evoke feelings of pity (Tiplady et al., 2013).

However, differences between our healthy and unhealthy image frames may not have been apparent to participants in a sample of the general public. Without a reference point for comparison—since participants viewed only one image—the distinctions we were trying to portray between a healthy deer in a 'healthy' ecosystem and an unhealthy deer in a less "healthy" ecosystem may not have been pronounced enough to discern. Furthermore, perceptions of wildness and beauty can vary (Madsen et al., 2024). In Scotland, 'barren' hill-sides can be perceived as beautiful even when their ecological function is diminished (Habron, 1998; Monbiot, 2013), and attachment to a place can influence perceptions of and intentions to protect that place (Tonge et al., 2015).

The stronger relevance of images over text frames reflected in our results is particularly notable given the rising prevalence of social media as a news source (Newman et al., 2024), where visual communication is used to convey complex issues (Cárcamo Ulloa et al., 2015; Krause & Bucy, 2018; Raspopova & Simakova, 2020). Images can play a significant role in environmental communication (Blewitt, 2010; Hansen & Machin, 2013), influencing public perceptions of environmental issues (Altinay & Williams, 2019), emotions, and intentions to engage in pro-conservation behaviours (Ison et al., 2024). Image frames could be especially influential for those who are undecided about their stance on issues (Krause &

Bucy, 2018). As such, it is crucial to further elucidate how visual content can shape public perceptions of controversial conservation issues.

As predicted, male participants were more likely to find increasing the deer cull acceptable, which is consistent with males being generally more accepting of lethal control in wildlife management (Dougherty et al., 2003; Koval & Mertig, 2004; Loyd & Miller, 2010; Sijtsma et al., 2012). Moreover, males may have greater exposure to deer in Scotland (Dandy et al., 2011), which may heighten awareness of their abundance.

Neither of our rural–urban measures predicted acceptability, echoing findings of consistent attitudes across rural and urban residents regarding deer culling in Scotland, but challenging broader assumptions that rural and urban values regarding lethal control of deer are markedly different (Blossey et al., 2025; Hare et al., 2021; Whitefield et al., 2021).

Greater knowledge of Scotland's annual deer cull was associated with higher acceptability among participants. This echoes findings from Australia linking lethal control acceptability with knowledge of species biology and wildlife management (Dawson et al., 2024). Prior knowledge likely mitigates initial shock or negativity by clarifying the justifications and complexities of culling. Only 57% of our sample indicated some degree of knowledge of the annual deer cull in Scotland (Supporting Information S9), which is surprisingly low considering prominent media coverage.

We presented only one justification for increased deer culling per mock online news article to isolate the effects of individual frames. In reality, however, increasing the cull could help achieve all four justifications simultaneously, and news coverage typically presents multiple reasons for culling together. By assessing the impact of each text frame separately, we found that no justification alone influenced acceptability. Combining multiple justifications may produce a stronger effect. Furthermore, it is possible that repeated exposure to particular frames could influence acceptability over time. Regular engagement with a consistent news source may exert a cumulative impact on acceptability that our study did not capture. Further research could explore both repeated and combined exposure to text frames to better reflect real-world media consumption patterns.

5 | CONCLUSIONS

Our findings suggest that increasing the deer cull is broadly acceptable to the Scottish public. While media presentation may have the potential to influence social acceptability, we found limited evidence for such an effect in this study. The social acceptability of deer culling was predicted more by socio-demographics, social identities and trust in the government than by specific message frames in the news. Public beliefs, knowledge, social identities, and trust in institutions can help explain why people hold different perspectives on lethal control of deer in Scotland. These findings reflect the long-standing controversy surrounding this issue and highlight the role of social identities in shaping social acceptability. Engaging with

these aspects could help attenuate social conflict as Scotland moves towards a more sustainable system of deer management, which will involve higher levels of culling, a controversial aspect of wildlife conservation.

AUTHOR CONTRIBUTIONS

Jessica Frater, Darragh Hare, Mike Daniels, and Paul J. Johnson conceived the project and designed the experiment. Jessica Frater reviewed the media coverage and collected and analysed experimental data with the support of Darragh Hare, Emily K. Madsen, Paul Johnson, and Jessica Tacey. Jessica Frater led the writing of the manuscript; Darragh Hare, Mike Daniels, Jessica Tacey, Emily K. Madsen, and Paul Johnson provided support in editing and revision. All authors contributed critically to the drafts and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

M.D. previously worked for the John Muir Trust (JMT) and was a member of Scottish Environment LINK's Deer Group, both of which are active in the policy discourses surrounding deer management in Scotland. D.H. has consulted for JMT. D.H. is an Associate Editor for *People and Nature* but was not involved in the peer review and decision-making processes.

DATA AVAILABILITY STATEMENT

Datasets and code for analyses are available through GitHub (<https://github.com/jessica-frater/beyond-message-framing.git>). Data has been archived on University of Oxford OneDrive servers. All data used within our Supporting Information is listed under the data sources section.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supporting Information S1. Hypotheses.

Supporting Information S2. Full online experiment.

Supporting Information S3. All 16 experimental conditions.

Supporting Information S4. Descriptive statistics.

Supporting Information S5. Summary results from global model.

Supporting Information S6. Summary results from top-supported model.

Supporting Information S7. Summary results from model selection.

Supporting Information S8. Summary results from pairwise Tukey tests.

Supporting Information S9. Summary responses from top-supported model.

Supporting Information S10. Number of responses per experimental condition.

Supporting Information S11. Overall distribution of responses.

Supporting Information S12. Frequency of frames.

Supporting Information S13. Existing news article review titles.

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