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Exploring Mountain Hikers' Wildlife Value Orientations and Disturbance of Birds of Prey: A Case Study from Norway

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Simple Summary: Outdoor recreationists might intentionally or unintentionally disturb birds or other wildlife. To better understand the unintended disturbance by mountain hikers of golden eagle breeding sites in a Norwegian national park, we studied hikers' willingness to accept measures to reduce their disturbance. Most of the hikers indicated that they were willing to change behaviors to avoid disturbing wildlife (or eagle breeding). By investigating the basic values towards wildlife among the hikers (e.g., to what extent they prioritized human interests over those of wildlife), we showed that people who cared more for wildlife tended to accept stricter measures and were more willing to change their behaviors. If the hikers had known beforehand that they could disturb wildlife, it is likely that many would have avoided the trip in periods of eagle breeding. Yet, there were some differences depending on peoples' values. Having knowledge of peoples' wildlife value orientations is therefore useful when aiming to manage human–wildlife interactions more sustainably.

Abstract: Wildlife value orientations (WVOs) are useful for gaining knowledge about how humans' relationship to nature, wildlife, and management differs between groups in society. Our study investigated the level of acceptance for the implementation of measures to avoid the disturbance of golden eagles among hikers with different WVOs. Our results indicated differences between WVO typologies regarding how they assessed the consequences of outdoor recreation on nature and wildlife, as well as measures to manage human traffic. These findings contributed to confirming our hypotheses that peoples' WVOs have an impact on how people assess wildlife and the natural environment, and that WVOs affect the acceptance of management measures. This study concluded that identifying and studying visitors' WVOs contributes to understanding the underlying dimensions that influence peoples' attitudes and behavior. WVOs has not been studied in a Norwegian context previously, and this study contributes new knowledge that is useful for managing human–wildlife relations in more sustainable ways.

Keywords: wildlife value orientations; protected area management; outdoor recreation; raptor conservation; golden eagle

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1. Introduction

Unintended effects on birds caused by outdoor recreationists are a growing problem globally [1]. Negative effects on wildlife include reduced abilities to access resources (e.g., food and nesting sites) and stress responses due to human presence [2]. It is well established that different bird species react differently to human disturbance, and that even individuals of the same species can react differently depending on former experiences with humans [3]. Recreational activities can have various consequences for birdlife. Among these consequences are temporary or permanent displacement, which can lead to significant ecological consequences for populations, such as the loss of breeding habitats, less time to hunt and feed, and reduced population viability [4].

Spaul and Heath [5] showed that both motorized and non-motorized recreation had negative impacts on different measures of breeding success among golden eagles (*Aquila chrysaetos*) in Idaho, USA. In another paper from the same field study, Spaul and Heath [6] recommended limiting recreational activities in zones 650–1000 m around nest sites, illustrating that the species is easily flushed when breeding. Meanwhile, research documents that a substantial proportion of people are not aware that they can, or do, disturb wildlife during outdoor recreational activities, nor are they aware of the consequences of their disturbance [7–10]. Therefore, further research is needed on people's awareness of recreational related disturbance, integrating both the human and the wildlife dimension into research on disturbance [7].

Gruas et al. [7] emphasize that despite the broad focus and scope of research that exists on the ecological consequences of human disturbance on wildlife, human awareness of wildlife disturbance is a less studied field of research. Few studies exist in this area. However, two examples are Taylor and Knight [9] and Sterl et al. [8]. Half of the respondents in Taylor and Knight's [9] study claimed that recreational activities, and they themselves, did not have negative impacts on wildlife, while Sterl et al. [8] found that only 12% thought they had disturbed wildlife during recreational activities. Gruas et al. [7] found the same pattern in their literature review, where only 34% of the studies found a predominance of recreationists being aware of their impacts on wildlife. These studies suggest that most people are not aware that they can, or do, disturb wildlife during outdoor recreation activities.

Research has shown a correlation between awareness of wildlife disturbance and acceptance of implemented management measures [9,11]. Accordingly, knowledge about ecological and biological consequences must be put in the context of social science to develop successful mitigation strategies targeting human behavior. Social science is needed to understand the differences inherent among the public, predicting behavior in wildlife-related issues [7,9,11].

Wildlife value orientations (WVOs) have been used in human dimensions of wildlife research to understand differences between people regarding how they value wildlife and wildlife conservation [12,13]. WVOs mediate between peoples' general values and their wildlife-specific attitudes, differing between people who, e.g., put human needs above wildlife and those who rank the needs of wildlife and humans equal [14]. Teel and Manfredo [15] use this theory to form classifications based on a four-group typology representing these cultural ideologies: "traditionalists", "mutualists", "pluralists", and "distanced". Traditionalists have dominance values and an anthropocentric ideology, while mutualists have mutualism values that represent a biocentric ideology [15]. Pluralists have both mutualism and dominance values, which can be explained by context-dependency and pragmatism [15]. Distanced has neither mutualism nor dominance values, resembling little interest in wildlife and wildlife-related issues overall [15].

Previous studies show how WVOs can predict support or opposition towards management measures [16,17]. WVOs have also been linked to emotions towards wildlife [18] and anthropomorphism, the attribution of human traits to non-human animals [19]. Meanwhile, to the best of our knowledge, there are few studies on WVOs in the Nordic countries [12,20–22], and no studies on WVOs in Norway. In this study, we analyze mountain hikers' assessment of their disturbance of wildlife in general and of golden eagles more specifically, their willingness to change their behaviors, and whether the hikers' wildlife value orientations can explain differences in their knowledge and intended behaviors.

This study contributes to the literature on human–birdlife relations by investigating the behavioral intentions of hikers toward vulnerable wildlife. In particular, we studied the disturbance of golden eagles at the popular Norwegian mountain hiking route Knutshøe in Jotunheimen National Park, where the breeding success of golden eagles is claimed to be interrupted by human disturbance [23,24]. Using an on-site survey, we studied hikers' perceptions and assessments of disturbance of wildlife from general to specific scenarios related to golden eagles at Knutshøe, their views on different management measures to

reduce disturbance, and the possible links to WVOs. We tested the following hypotheses: (H1) there are significant differences among WVO typologies regarding perceptions of the environmental consequences of outdoor recreation, and (H2) there are significant differences among WVO typologies regarding assessment and acceptance towards management measures to reduce hiking due to vulnerable wildlife.

2. Methods

2.1. Study Site

Jotunheimen is a 3500 km^2 mountain area in south-central Norway (61.3–61.8 N; 7.4–8.8 E, see Figure 1), home to the highest peaks of northern Europe, including Norway's highest mountain, Galdhøpiggen (2469 m.a.s.l.). The landscape is characterized by rugged alpine peaks, glaciers, and deep valleys ranging between 900 m.a.s.l. and 2000 m.a.s.l. with characteristic fauna and flora for northern, alpine environments such as reindeer (*Rangifer tarandus*), wolverine (*Gulo gulo*), lemming (*Lemmus lemmus*), and glacier buttercup (*Ranunculus glacialis*). The raptor fauna includes species such as the rough-legged buzzard (*Buteo lagopus*), the golden eagle, and the northern hawk owl (*Surnia ulula*).

Figure 1. The location of Jotunheimen National Park in Norway, and a detailed map of the eastern part of the park with the study area, Knutshøe, including the hiking route marked in red. Darker colors indicate higher elevations, white are lakes or glaciers. (Map sources (open): https://kartkatalog.geonorge.no/metadata/topografisk-norgeskart-graatone/e84c9a6d-2297-4323-9078-36ac4b8e35e4 and https://kartkatalog.geonorge.no/metadata/naturvernomraader/5857ec0a-8d2c-4cd8-baa2-0dc54ae213b4?search=naturvern (accessed on 12 June 2024)).

About one third of Jotunheimen was protected as a national park (NP) in 1980, with the aim of protecting wild, unique, beautiful, and untouched mountain landscapes. Jotunheimen NP is considered Norway's most visited national park [25]. The park's visitor strategy has three main objectives: providing good experiences for visitors, increased value creation for local communities, and safeguarding conservation values [26]. The visitor strategy states that, due to less vulnerable conservation values compared to other NPs in this region of Norway, outdoor recreation and tourism are prioritized, but that this must be seen in relation to, and not impact, the conservation values negatively [26].

In Jotunheimen NP, a nesting site for golden eagle has been monitored next to the increasingly popular mountain hiking route across the peak of Knutshøe (Figure 1), near

the southeasterly border of the park [23,24]. The nesting site has been monitored since 1984, showing that successful breeding between 1984 and 2014 has been significantly reduced since then, likely due to the increased traffic from mountain hikers [23,24]. In recent years, no breeding has taken place at Knutshøe. Park managers have monitored traffic using automatic counters (Trafx infrared counters, see www.trafx.net) since 2016, showing that the number of hikers during the summer season running from mid-June to mid-September has doubled from around 6500 hikers in 2016 to over 13,000 in 2021 (national park manager Kari Sveen's personal communication).

2.2. Data Collection

During the peak summer hiking season of 2021, from July to September, a questionnaire was handed out to a random sample of hikers at the Knutshøe mountain and answered in situ. A total of 20 days was spent sampling hikers in the study area, either as they approached the mountain or as they returned after having visited the peak. Fridays, Saturdays, and Sundays were prioritized, as those were days with the most traffic. About half of the field-work days took place before and after the main public summer holidays, and half fell within the public holidays in July. The questionnaire was designed to collect information about the hikers' perception of wildlife disturbance in general, by mapping people's perception of disturbance caused by outdoor recreation activities and what management measures they would find acceptable to reduce disturbance.

The questionnaire was the same for the whole sample, except for a random half group (n = 139) that received additional information that the area is an important nesting site for golden eagles and information about the possible consequences of disturbing the golden eagle during the breeding period. This was not further proceeded, as the analyses showed that there was no difference between those who received this information (n = 139) and those who did not (n = 144) in terms of behavioral intentions.

However, it is worth noting that around half of the respondents in the sample were informed about the consequences of disturbing golden eagles during the breeding period through the survey information. Regarding questions about hiking Knutshøe, and the disturbance of golden eagles in particular, behavioral intentions were investigated, assuming the hikers were not already familiar with this issue, as there was no information at the trailhead, nor was information provided to the hikers in advance about the possibility of disturbing golden eagles on the trail. Due to persistent COVID-19 restrictions, and therefore a lack of foreign tourists, the survey was only designed in Norwegian, and the final sample consisted of 283 respondents, all able to complete a survey in Norwegian. The questionnaire is available in the Supplementary Materials.

2.3. Statistical Analyses

Questionnaire responses were coded and entered into Microsoft Office Excel before being transferred to the statistics program IBM SPSS 27 for further analysis.

A factor analysis (Oblimin with Kaiser Normalization rotation) was conducted for all the items included in the questionnaire. We used items from established scales on basic beliefs from previous studies [14,27,28] and created a modified scale for this study to fit the issue and context. These items were used as parameters for analyses to identify "mutualism" and "domination" orientations [29]. A total of nine items were chosen from a combination of items retrieved from Fulton et al. [27], Kaltenborn et al. [28], and Jacobs et al. [14] after correcting for cross-loadings and low correlations between the items. The factorability of the data was tested using the Kaiser–Meyer–Olkin (KMO) test, where values close to 1 indicate that the factor analysis is suitable for providing reliable factor solutions [30]. The test showed a high correlation between the items, with KMO = 0.806.

Based on the factor analysis, two index variables with mean values were formed. A combination of hierarchical and non-hierarchical cluster analyses was conducted to identify clusters in the sample. The hierarchical cluster analysis (Ward's method) was first conducted to identify the cluster solutions in the dataset. Further, a non-hierarchical

analysis (K-Means) was conducted to make stable clusters with small variations within the clusters, and large variations between the clusters [31]. Based on our interpretation of the results, a four-cluster solution made up the best clusters.

The dependent variables consisted of the respondents' assessment of recreational activities' impact on nature and wildlife, the right to roam, management measures to regulate traffic, and behavioral intentions, given a hiking restriction. The variables were measured on a balanced Likert-scale from 1 to 7. A one-way analysis of variance (ANOVA) with post hoc testing was conducted to test for significant differences (at an f-value with a significance level of $p = \leq 0.05$) between the four WVO typologies (presented in the results). Post hoc tests were then implemented to identify statistically significant differences. Levene's test for homogeneity of variance tested whether equal variance could be assumed between the groups. Where equal variance could not be assumed ($p < 0.05$), Tamhane's T2 post hoc test was used, and where equal variance could be assumed ($p > 0.05$), Tukey's post hoc test was used.

3. Results

3.1. Wildlife Value Orientations

The factor analysis identified a two-factor solution with an eigenvalue above 1 (mutualism eigenvalue 3.44 and domination eigenvalue 1.46), explaining 54.44% (factor 1 38.21% and factor 2 16.22%) of the total variation (Table 1). The analysis revealed strong factor loadings for all nine items (above 0.4). Cronbach's alpha (α) showed a value of $\alpha = 0.828$ for the mutualism items (six items), showing a satisfactory value within the requirement of minimum 0.7 [32]. The domination items, containing three items, show an α value = 0.505, which is below a satisfactory value and could be explained by the few items in the model [32]. The mean inter-item correlation was therefore tested, where the optimal mean inter-item correlation is recommended to be between 0.2 and 0.4 [32]. Our test showed that the average correlation was within the required range (mean inter-item correlation 0.25), and we therefore chose to proceed with this factor solution.

Table 1. Factor analysis measuring Knutshøe mountain hikers' attitudes towards wildlife on a seven-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree), and reliability analysis (Cronbach's alpha).

Statements about Wildlife	Factor Analysis		Reliability Analysis	
	Mutualism	Domination	α	α If Item Removed
Wildlife has intrinsic value and should have rights similar to the rights of humans [1]	0.659			0.814
Humans should take as much care for wildlife as for ourselves [2]	0.719			0.798
Humans are no more important than any other species of animal [2]	0.778			0.789
Animals should have rights like the rights of humans [1]	0.841			0.770
Wildlife has an equal right as humans do to life on Earth [2]	0.723			0.807
Wildlife has the same right to a good life as humans [2]	0.664		0.828	0.815
Hunting helps people appreciate natural processes [1]		0.699		0.456
Humans should manage wildlife for human benefit [1]		0.720		0.380
The needs of humans should take priority over fish and wildlife protection [3]		0.653	0.505	0.374

[1] Adapted from Fulton [27]. [2] Adapted from Kaltenborn [28]. [3] Adapted from Jacobs [14].

Based on the identified WVOs from the factor analysis (mutualism and domination values), a cluster analysis identified four groups of hikers, labeled (1) pluralists, (2) mutualist, (3) traditionalists, and (4) distanced (Table 2). The typologies were identified using the approach of Teel and Manfredo [15] as a guideline, where scores > 4.50 are considered high- and <4.50 are considered low-average values. The pluralist segment (1) made up 32% of the sample, mutualists (2) 21%, traditionalists (3) 13%, and distanced (4) 34% of the respondents. Eleven (3.9%) respondents could not be classified due to missing data.

Table 2. Four WVO typologies identified from the cluster analysis of the mountain hikers at Knutshøe, Jotunheimen. The mutualism and domination index shows mean scores.

WVO Typologies	n	%	Valid %	Mutualism	Domination
1 Pluralists	88	31.1	32.4	5.81	4.86
2 Mutualists	57	20.1	21.0	6.38	2.61
3 Traditionalists	36	12.7	13.2	3.15	5.07
4 Distanced	91	32.2	33.5	4.23	3.54
Total	272	96.1	100.0		
Missing	11	3.9			
Total	283	100.0			

3.2. Hikers Perceptions of Consequences Caused by Outdoor Recreation Activities

Our findings showed that when assessing the consequences that can be caused by recreational activities, hikers rated the disturbance of wildlife as being of medium concern (Table 3). Most concern was expressed for human waste and garbage, while the least concern was expressed for wear and tear on trails. The ANOVA test showed significant differences in how the four typologies considered the disturbance of wildlife that was not encountered. The traditionalists (mean (M) = 3.22) assessed this to be of less concern than the mutualists (M = 4.35) and pluralists (M = 4.10). Regarding the disturbance of encountered wildlife, there were no significant differences between the four groups. Wildlife avoiding certain areas due to human disturbance was considered a more severe consequence throughout the sample. Mutualists (M = 5.67) considered this a severe consequence, while traditionalists (M = 4.44) and distanced (M = 4.64) considered this to be of medium concern. The marking and development of new trails was assessed to be of more severe consequence to mutualists (M = 4.43) than traditionalists (M = 3.86), while there were no significant differences between the groups regarding the development of new infrastructure.

Table 3. Knutshøe mountain hikers' assessment of consequences of outdoor recreation activities on nature and wildlife. Mean scores on scale from 1 = not a serious consequence to 7 = very serious consequence and standard errors (S.E.).

		Wildlife Value Orientations					Post Hoc	
	Sample Mean (S.E.)	1 Pluralists	2 Mutualists	3 Traditionalists	4 Distanced	*f*	Tukey	Tamhane's T2
Disturbance of encountered wildlife.	3.94 (0.10)	3.99 (0.16)	4.28 (0.23)	3.69 (0.29)	3.79 (0.17)	1.40	N.S.	
Disturbance of wildlife not encountered.	3.91 (0.09)	4.10 (0.14)	4.35 (0.20)	3.22 (0.26)	3.72 (0.13)	5.99 ***	3 < 1, 2 > 4	
Wildlife avoiding areas because of human use.	4.99 (0.10)	5.14 (0.15)	5.67 (0.21)	4.44 (0.28)	4.64 (0.16)	7.18 ***	2 > 3, 4	
Wear and tear on trails.	3.69 (0.09)	3.71 (0.17)	4.07 (0.22)	3.58 (0.29)	3.48 (0.14)	1.78	N.S.	
Wear and tear on vegetation with no marked trails.	4.67 (0.09)	4.82 (0.16)	5.21 (0.21)	4.17 (0.32)	4.39 (0.14)	5.02 **		2 > 4
Human waste and garbage.	6.45 (0.07)	6.60 (0.09)	6.61 (0.15)	6.40 (0.15)	6.24 (0.14)	2.12	N.S.	
Marking and development of new trails	4.38 (0.09)	4.71 (0.15)	4.43 (0.20)	3.86 (0.25)	4.24 (0.15)	3.40 *	2 > 3	
Development of new infrastructure.	4.98 (0.10)	5.10 (0.16)	5.34 (0.23)	4.53 (0.27)	4.81 (0.17)	2.43	N.S.	

Note: * $p \leq 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.3. Attitudes towards Management Measures to Reduce Disturbance from Hiking

Results from the ANOVA test showed some disagreement about the extent of the right to roam and what duties are included along with these rights (Table 4). Mutualists stand out by having most insight on the premise of not harming nature or disturbing wildlife as part of the premiseof the right to roam (M = 6.65 and 6.41, respectively). In contrast, traditionalists, to a lesser extent, agreed with these assumptions (M = 5.89 and 5.17, respectively). Overall, there was broad agreement throughout the sample that the right to roam gives the public the right to roam freely in nature.

Table 4. Knutshøe mountain hikers' knowledge and attitudes about the right to roam. Scores on scale from 1 = strongly disagree to 7 = strongly agree, presented as mean values and (S.E.).

		Wildlife Value Orientations					Post Hoc	
	Sample	1 Pluralists	2 Mutualists	3 Traditionalists	4 Distanced	*f*	Tukey	Tamhane's T2
The right to roam gives the public the right to roam freely in nature.	4.41 (0.13)	4.63 (0.23)	4.18 (0.27)	4.69 (0.31)	4.22 (0.22)	1.03	N.S.	
The right to roam gives the public the right to roam freely in the outback.	5.67 (0.09)	5.63 (0.18)	5.70 (0.20)	5.97 (0.22)	5.58 (0.16)	0.59	N.S.	
The right to roam presupposes that the public does not cause damage to nature.	6.13 (0.08)	5.91 (0.17)	6.65 (0.10)	5.89 (0.24)	6.13 (0.14)	4.07 **		2 > 1, 3, 4
The right to roam presupposes that the public does not cause disturbance to wildlife.	5.81 (0.08)	5.84 (0.16)	6.41 (0.13)	5.17 (0.26)	5.66 (0.14)	6.96 ***		2 > 1, 3, 4
Local rules and regulations apply before the right to roam.	5.62 (0.11)	5.74 (0.19)	6.18 (0.18)	5.26 (0.31)	5.29 (0.19)	3.80 *		2 > 4

Note: * $p \leq 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Further, management measures to reduce the negative impact of outdoor recreation were investigated. Analyses of the measures considered in this study showed large variations, but in general information was viewed as the most appropriate measure (Table 5). Hiking bans due to wildlife disturbance were also considered to be one of the most appropriate measures among some typologies. The post hoc test showed that mutualists (M = 6.18) assessed a traffic ban to be the most favorable measure and differed significantly from the remaining groups, and especially traditionalists (M = 4.50), who assessed a traffic ban as far less favorable. For less traditional measures in Norwegian protected-area management, such as physical barriers to ban traffic due to wildlife disturbance, pluralists and mutualists were significantly more positive to this measure than the traditionalists and distanced. For limitations on the number of hikers per day and restricting hiking without a guide, significant differences between the groups could also be identified. Mutualists (M = 4.50 and 4.42, respectively) to a larger extent assessed these measures as acceptable, in contrast to traditionalist (M = 3.26 and 3.71, respectively) and distanced (M = 3.45 and 3.78), who, to a lesser extent, assessed these measures as favorable. For the measure regarding limiting group sizes, the ANOVA test showed significant differences, but the differences were too small to be identified by the post hoc test ($p = 0.02$).

Table 5. Knutshøe mountain hikers' attitudes towards measures to reduce wildlife disturbance, including disturbance of golden eagle caused by hiking. Scores on scale from 1 = not appropriate to 7 = very appropriate, presented as mean values and standard error (S.E.).

		Wildlife Value Orientations					Post Hoc	
	Sample	1 Pluralists	2 Mutualists	3 Traditionalists	4 Distanced	*f*	Tukey	Tamhane's T2
Digital information (websites and social media)	5.68 (0.09)	5.78 (0.16)	6.02 (0.18)	5.83 (0.25)	5.31 (0.16)	3.06 *	2 > 4	
Information on signs, posters, brochures, etc.	5.68 (0.08)	5.74 (0.15)	6.09 (0.15)	5.71 (0.24)	5.36 (0.15)	3.58 *	2 > 4	
Hiking bans due to wildlife disturbance	5.27 (0.10)	5.40 (0.16)	6.18 (0.15)	4.50 (0.32)	4.88 (0.18)	11.17 ***		2 > 1, 3, 4
Physical barriers to ban traffic due to wildlife disturbance	4.83 (0.11)	5.09 (0.19)	5.54 (0.22)	4.32 (0.32)	4.33 (0.20)	6.68 ***	4 < 1, 2 > 3	
Limitations on how many people can hike per day	3.83 (0.12)	4.02 (0.22)	4.50 (0.26)	3.26 (0.34)	3.45 (0.19)	4.58 **	2 > 3, 4	
Limitations on group sizes	3.83 (0.12)	4.045 (0.22)	4.32 (0.24)	3.29 (0.34)	3.52 (0.20)	3.21 *		
Possibility for guided hikes	4.15 (0.11)	4.42 (0.20)	4.59 (0.24)	3.71 (0.31)	3.78 (0.18)	3.78 *	2 > 4	
Hiking bans in the area without a guide	3.40 (0.13)	3.61 (0.22)	3.82 (0.29)	3.03 (0.34)	3.08 (0.21)	2.22		N.S.
Parking fees	2.91 (0.12)	3.22 (0.23)	2.64 (0.25)	2.54 (0.31)	2.92 (0.19)	1.49		N.S.

Note: * $p \leq 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.4. Wildlife Disturbance and Behavioral Intentions

Finally, the hikers' behavioral intentions were studied regarding hiking Knutshøe and the possibilities of disturbing vulnerable wildlife (Table 6). The respondents were asked about their behavioral intentions, if they, prior to their hike, had been aware of/informed that the hike could not be conducted without disturbing vulnerable wildlife, including how likely they would have been to conduct the listed alternative behaviors. The listed scenarios ranged from still conducting the hike, choosing a different hike, or at a different time of the year, visiting another area, or conducting a different activity than hiking. The ANOVA test again showed significant differences between the four value typologies. Mutualists and pluralists were the least inclined to still conduct the hike (knowing it could not be conducted without disturbing golden eagles; M = 2.07 and M = 2.67, respectively). In contrast, traditionalists and distanced respondents were somewhat more inclined to still conduct the hike, even if they knew they could disturb vulnerable wildlife (M = 3.28 and 2.97, respectively). Ultimately, our results showed that even if some WVO typologies were more inclined than others to defy a hiking restriction, there is a clear tendency that if information that the hike could not be accomplished without disturbing vulnerable wildlife, choosing another hike, or another time, was considered the most likely behavioral alternative among the sample.

Table 6. Self-reported behavior among Knutshøe mountain hikers if informed that the hike could not be completed without disturbing vulnerable wildlife, such as golden eagles. Scores on scale from 1 = not likely to 7 = very likely, presented as mean values and standard error (S.E.).

		Wildlife Value Orientations					Post Hoc	
	Sample	1 Pluralists	2 Mutualists	3 Traditionalists	4 Distanced	*f*	Tukey	Tamhane
Defy the recommendation and take the hike anyway	2.72 (0.11)	2.67 (0.19)	2.07 (0.22)	3.28 (0.36)	2.97 (0.17)	4.36 **		2 < 3, 4
Made the hike, but made sure to hike considerately	3.60 (0.13)	3.49 (0.21)	2.68 (0.28)	4.03 (0.38)	4.11 (0.20)	6.44 ***	2 < 3, 4	
Chose another hike in the area	4.83 (0.11)	5.03 (1.19)	5.78 (0.20)	4.58 (0.36)	4.15 (0.19)	10.67 ***	2 > 3, 4 > 1	
Chose another mountain hike in the area	4.64 (0.11)	4.90 (0.19)	5.24 (0.23)	4.47 (0.33)	4.11 (0.18)	5.63 ***	1 > 4 < 2	
Chose another time of the year	4.26 (0.12)	4.36 (0.21)	5.18 (0.25)	4.03 (0.36)	3.69 (0.19)	7.18 ***	2 > 3, 4	
Visited another mountain area	3.90 (0.13)	4.22 (0.22)	4.77 (0.27)	2.77 (0.32)	3.50 (0.20)	9.24 ***	2 > 4, 3 < 1	
Chose another activity in the area	2.84 (0.12)	3.01 (0.22)	3.04 (0.31)	2.39 (0.30)	2.74 (0.20)	1.03	N.S.	

Note: ** $p < 0.01$, *** $p < 0.001$.

4. Discussion

Our findings suggest that hikers might be willing to change their behavior (change the original plan) and find substitutes for hiking the Knutshøe trail, given that they have the necessary information on how their presence can cause disturbance to birds of prey. This is in line with the findings in a recent study of rock climbers' responses to information that they might disturb reestablished peregrine falcon nests in Harpers Ferry NP, USA [33]. Furthermore, our results confirm our hypotheses that: (H1) there are significant differences among WVO typologies regarding perceptions of the environmental consequences of outdoor recreation, and (H2) that there are significant differences among WVO typologies regarding how they assess, and whether they would accept, management measures to reduce traffic due to vulnerable wildlife.

4.1. Perceptions of Consequences Caused by Outdoor Recreation Activities

Looking at how the respondents' assessed the consequences of outdoor recreation activities on nature and wildlife, our study reveals that there is little knowledge about the likely environmental consequences of outdoor recreation on nature and birdlife among a group of Norwegian mountain hikers. The results show that the disturbance of wildlife was viewed to be of medium concern, with differences among WVO typologies. Gruas et al. [7]

conducted a literature review showing that despite the uneven distribution in geography, taxonomy, and activities among the studies reviewed, most studies found that recreationalists, to a substantial extent, are unaware of the disturbance caused to wildlife [7,33]. On the other hand, Steven et al. [34] reviewed studies on the recreational disturbance of birds, showing that in 88% of the papers, recreational activities were reported to have negative effects on birds. Distinguishing between the different impacts that were caused, reproduction success showed negative effects in 85% of the papers and immediate behavior impacts in 90% of the papers [34]. For the papers on physiological impacts, all papers showed negative effects [34]. That is, while research shows clear signs that recreational disturbance leads to negative effects on birds, people themselves are not aware of this disturbance and the consequences. This is problematic, particularly because research has shown a correlation between people's perception of their own impact on nature and wildlife and their acceptance of management measures [9,11]. Therefore, it is important to provide information and raise awareness on the human-related disturbance of birds, and wildlife in general.

4.2. Attitudes towards Management Measures to Reduce Disturbance from Hiking

As the right to roam is a prerequisite right for Nordic outdoor recreation [35], we included questions regarding the hikers' interpretation of these rights and the duties that they entail. While the sample mean showed that there was a high agreement that the right to roam presupposes not causing damage to nature, there was somewhat less agreement regarding the presumption of not causing disturbance to wildlife. Even though most respondents were aware that the right to roam also entails some duties, it was still surprising to see that there was greater agreement that these duties apply towards nature and less towards wildlife.

The hikers' views on appropriate management measures to reduce the negative impact of outdoor recreation also varied among the WVO typologies. Mutualists viewed hiking bans due to wildlife disturbance as the most appropriate measure to reduce wildlife disturbance. Even though there is little tradition of using strict hiking restrictions in Norwegian NPs due to the right to roam, our results show that throughout the sample, a hiking restriction due to wildlife disturbance was viewed as an appropriate measure. On the other hand, information (both digital and traditional) was considered the most favorable measure throughout the sample. Information strategies are a common form of measure in NP management worldwide, due to resource efficiency, in contrast to more expensive and demanding direct measures [17]. Seen in the context of people being unaware of wildlife disturbance, and that the acceptance of implemented measures is dependent on this knowledge [9,11], this information is necessary both in combination with other stricter measures and on its own.

4.3. Wilflife Disturbance and Behavioral Intentions

When looking at the self-reported behaviors among the respondents, if they were informed that the hike could not be conducted without disturbing vulnerable wildlife, a key finding was that the behavioral intentions of still conducting the hike, even though the respondents knew it would disturb vulnerable wildlife, showed significant differences between WVO typologies. Traditionalist and distanced hikers differed significantly from the mutualists by having a somewhat larger probability of still conducting the hike. This corresponds with the characteristics of the typologies, where traditionalists consider human needs to be more important than wildlife, and distanced hikers lack interest in wildlife-related issues [15]. It is also in line with previous studies, which found that mutualism predicts support for wildlife laws and regulations [36]. However, it should be emphasized that the analyses showed low mean values for all the four typologies, indicating the low probability for conducting the hike when being aware it could not be carried out without disturbing vulnerable wildlife.

4.4. Management Implications

Based on knowledge about WVOs, communication can be adapted to increase the understanding and acceptance of issues related to vulnerable wildlife. Freeman et al. [16] claim that preparing information and communication based on WVOs will be useful for appealing to human cognitions, and thus better be able to influence behavior. Miller et al. [17] examined this assumption in an analysis of how people with different WVOs assessed different messages regarding bear safety. Their results showed that appealing to people's WVOs is effective for influencing people's behavior, showing, e.g., that mutualists and traditionalists differed in how they perceived messages as important or not [17]. While our results do not have any basis for claiming the effect of adapting information to the different value orientation segments, our results, in line with established research, speak for further research on this.

Mutualists are the segment in our sample that is most likely to view hiking bans as the most appropriate measure to protect vulnerable wildlife threatened by recreationists, bearing in mind this is considered a controversial measure in Norwegian nature management, as it conflicts with the right of common access [35]. Maybe, therefore, traditionalists view this as a considerably less favorable measure. Borrie et al. [37] tested the predictive effect people's values have on management measures among visitors to Yellowstone NP. They found that people with different values supported different management measures and highlight that even if information can have some effect on people's attitudes, it will not necessarily reach the underlying attitudes and beliefs they hold and reach full support.

5. Limitations and Suggestions for Further Research

This study is based on a limited number of respondents hiking the Knutshøe mountain, and caution with further generalization should therefore be emphasized. The variables included in the analyses identifying WVOs are not exhaustive, and the inclusion of additional variables could contribute to more precise clustering. This could also possibly contribute to achieving a satisfactory Cronbach's alpha value for the domination domain, which had few variables and a relatively low Cronbach's alpha value [34].

Further research should be conducted among a larger sample in national parks or protected areas in Nordic countries. In the case that the breeding time for birds is of specific concern, studies should be conducted longitudinally to investigate if there exist differences in attitudes and behavioral intentions across seasons. Broader focus on demographic variables such as gender, education, income, age, etc., should be investigated further as well, considering how previous studies have shown a correlation between, e.g., WVO and gender (see, for example, Liordos et al. [38] and Vaske et al. [39]).

6. Conclusions

This study contributes to the human dimensions of the wildlife literature by analyzing the links between hikers' WVOs, perceptions of whether their activity disturbed wildlife (and golden eagles), and their willingness to change their behavior to minimize this disturbance. Moreover, our study is a novel study in a Nordic context, as there are few studies on WVOs in the Nordic countries, and, to the best of our knowledge, no Norwegian studies. This study speaks for a broader focus on WVOs in nature and wildlife management, since our results showed significant differences in predicted behavior, the assessment of environmental consequences, and the interpretation of the right to roam and management measures. This is in line with previous research, showing how WVOs can contribute to predicting behavior in various wildlife-related issues [14,40]. Gruas et al. [3] stated that few studies have looked at the relationship between the awareness of disturbance and WVOs, though they stress the influence that WVOs have on environmental attitudes. In conclusion, this emphasizes the importance of understanding the human dimension integrating social psychology in management and the conservation of birds of prey.

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