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Matthew P. Hinrichs

University of Nebraska, matthewphinrichs@gmail.com

Mark P. Vrtiska

Nebraska Game and Parks Commission, mark.vrtiska@nebraska.gov

Mark Pegg

University of Nebraska-Lincoln, mpegg2@unl.edu

Christopher J. Chizinski

University of Nebraska-Lincoln, cchizinski2@unl.edu

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Motivations to participate in hunting and angling: a comparison among preferred activities and state of residence

Matthew P. Hinrichs,¹ Mark P. Vrtiska,²
Mark A. Pegg,¹ and Christopher J. Chizinski¹

¹ School of Natural Resources, University of Nebraska—Lincoln, Lincoln, Nebraska, USA

² Nebraska Game and Parks Commission, Lincoln, Nebraska, USA

Correspondence — Matthew P. Hinrichs, matthewphinrichs@gmail.com, School of Natural Resources, University of Nebraska—Lincoln, Lincoln, NE 68588.

ORCID

Christopher J. Chizinski <http://orcid.org/0000-0001-9294-2588>

Abstract

Motivations for hunting and fishing extend beyond harvesting game and include social, psychological, emotional, and physical benefits. We used data from a web-based questionnaire to compare relationships between preferred hunting or fishing activity types, state of residence, and motivations of hunters and anglers across the central United States (U.S.). Exploratory factor analysis yielded four motivation factors: nature, social, food, and challenge. Differences in terms of state were negligible across all motivation factors ($\eta^2 < .01$), indicating similarity across states. Nature ($\eta^2 = .01$) and social ($\eta^2 < .01$) factors were the first and second most important factors across activity types. We observed larger differences among the challenge ($\eta^2 = .03$), and food ($\eta^2 = .15$) factors, primarily driven by big game hunters. Big game hunters rated the food motivation factor greater than the other activity types. Overall, our results indicate that there might be a greater universality in these motivation factors among activity types and locations in the U.S.

Keywords: Hunter and angler recruitment, natural resource agencies, factor analysis, R3 programs, motivations

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Introduction

Motivations are the multitude of goals that drive interest in activities prior to participation (Decker et al., 1980; Reiss, 2004; Watkins et al., 2018). Many motivations for hunting and fishing extend beyond harvesting game and include the social, psychological, emotional, and physical benefits from participating in an activity (Hrubes et al., 2001). For example, motivations for participating in hunting and fishing often include spending time outdoors, being with friends and family, and harvesting meat for consumption. Understanding motivations allow state and federal wildlife and fisheries agencies (hereafter agencies) to minimize conflict between user groups and assess the demand for outdoor recreation (Vaske, 2019). Motivations can also aid agencies in predicting levels of support for management decisions and the development of specific programs (Schroeder et al., 2006; Ward et al., 2008; Watkins et al., 2018). Furthermore, agencies can tailor opportunities to meet the needs and desires of hunters and anglers by recognizing the diversity of reasons why they participate in wildlife-based recreation (Watkins et al., 2018). Identifying aspects of what draws individuals to prefer (and subsequently participate in) one activity over another can provide a foundation that agencies and nongovernmental organizations (NGOs) can use for attracting individuals with similar motivations to similar activities. For example, agencies can use motivations to establish new avenues or adjust current recruitment, retention, and reactivation (R3) efforts to promote participation in additional hunting and fishing activities.

Participation in hunting and fishing in the United States (U.S.) has been declining since the mid-1980s and this is likely to continue into the future (Burkett & Winkler, 2019; U.S. Fish and Wildlife Service, 2018; Winkler & Warnke, 2013). With this decline in participation come over-arching consequences for wildlife conservation and management, including the loss of revenue to support conservation and management of habitat and biota (Vrtiska et al., 2013), cultural tradition (Arnett & Southwick, 2015), political support (Enck et al., 2000), and connection to nature (Peterson et al., 2011). To address this decline in participation, there is greater effort among fish and wildlife agencies and NGOs to increase the relevancy of wildlife conservation among stakeholders, as well as enact strategies seeking to increase

the number of participants (Larson et al., 2014; Price Tack et al., 2018). Therefore, gaining a better understanding of what influences participation in wildlife-based recreation has increased in importance as agencies become concerned about future funding prospects and other conservation efforts (Enck et al., 2000; Hinrichs et al., 2020). An important step in addressing the decline in hunting and fishing participation is understanding the motivation to engage in such activities.

Numerous studies have emphasized the importance of activity-specific motivations (Ebeling-Schuld & Darimont, 2017; Gruntorad et al., 2020; Schroeder et al., 2018, 2019). Primary motivations for anglers often include companionship, food, nature, and sport (Beardmore et al., 2011; Finn & Loomis, 2001; Hunt et al., 2002). Big game hunter motivations often include being with friends and family, being outdoors, food, and excitement (Gigliotti, 2000; Gigliotti & Metcalf, 2016; More, 1973). Small and upland game hunter motivations often include spending time outdoors and tradition (Grams, 2018; Guttery, 2011; Hayslette et al., 2001). Waterfowl hunter motivations often include being with friends and family, being in nature, relaxation, and tradition (Enck et al., 1993; Schroeder et al., 2006). Among these activities, there are several commonalities of why individuals participate in hunting and fishing activities, which include spending time with companions, being outdoors, and tradition being among the most frequently cited.

However, despite the assessment of activity-specific motivations for hunters and anglers across the U.S., there have been few direct comparisons of motivations across hunting and fishing activity types. In one such study, Hayslette et al. (2001), directly compared motivations of dove hunters and non-dove small game hunters in Alabama, and found few differences in motivations between the activity types within the state. Non-harvest-oriented motivations such as companionship, nature, and tradition rated similarly among dove hunters and non-dove small game hunters. However, harvest-oriented motivations, such as filling daily bag limits, were rated greater for dove hunters than for non-dove hunters. Given the varying degrees of hunting socialization in rural and urban locations, types of environments hunted or fished, and amount of meat harvested associated with different hunting and fishing activities, we might observe differences in motivations between activities, particularly those more divergent activity

types. For example, hunters who prefer big game hunting might rate motivational items such as “filling the freezer” or “providing food for my family” greater and “spending time with friends and family” lower than those hunters who prefer waterfowl hunting. By assessing how similar or different activities types have important implications for understanding the universality of motivations across hunting and fishing activities.

Motivations to participate in leisure activities have cultural underpinnings (Kaplan, 1960), and thus may also vary across geographic areas. For example, across three non-western geographical locations (i.e., East-Asia, Middle-East, Australia), there were slightly different motivations for leisure activities (Iwasaki et al., 2007). We may observe differences among leisure motivations among more proximate locations as well, as reflected by regional cultural differences. For example, Nebraska deer hunters were highly motivated to spend time with family and friends (Grams, 2018), whereas harvesting a deer was the most important motivation in South Dakota (Gigliotti & Metcalf, 2016). Differences in game availability and hunting culture among states may also influence why hunters participate in activities. For example, hunters in states dominated by big game (e.g., Wyoming, Montana) may be more influenced by harvesting game and filling the freezer (Shrestha & Burns, 2011), whereas those in states dominated by waterfowl and upland game (e.g., South Dakota) may be more motivated by camaraderie and working with dogs (Grams, 2018). Furthermore, days participating in hunting and non-consumptive recreation may be dependent on where an individual lives (i.e., state; Li et al., 2003). For example, residents of Pennsylvania, on average, spent more time hunting and foraging than did residents of Colorado, yet Colorado residents spent more time participating in non-consumptive outdoor recreation (Li et al., 2003). Greater understanding of how hunting and fishing motivations vary across geographic scale has important implications for hunter and angler management such as R3. Identifying if hunting motivations are largely ubiquitous across geographic scale or if regional differences exist in motivations can help focus national R3 efforts in targeting the reasons why individuals participate in wildlife-related recreation.

The objective of our study was to understand the similarities (or lack thereof) of motivations among individuals who prefer big game,

small and upland game, waterfowl hunting, and fishing. We predict: (a) groups of individuals who prefer different activity types will differ in the strength of expressed motivations, (b) similar differences in motivations expressed among those groups across eight states in the U.S., and (c) individuals within states that are more proximate to each other will have similar motivations than those farther apart.

Methods

Study Areas

Our study consisted of hunters and anglers in Kansas, Michigan, Missouri, Montana, Nebraska, Oklahoma, South Dakota, and Wyoming (**Figure 1**). We selected states to reflect potential differences in activity types and experiences. For example, we expected Wyoming and Montana to be dominated by big game hunters, whereas we expected South Dakota and Kansas to be more upland-game



Figure 1. Map of the states included in this study (filled in gray) and the boundaries of the Central and Mississippi flyways.

oriented. To identify which states might participate in the study, we reached out to all states in the Central and Mississippi flyways, but these eight states were willing and able to share permit databases, had collected e-mail addresses in their licensing system, and had data that fit our requirements. These requirements were individual-level license data that we could divide into our *a priori* sampling groups based on license and permit purchases from 2012 to 2016. Our *a priori* sampling groups were waterfowl hunters, big game hunters, small and upland game hunters, other migratory bird hunters, multiple permit-type holders, and anglers. We signed data-sharing agreements with all states that participated in the study. All protocols and survey instruments were reviewed and approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20160215880 EX).

Hunters and anglers were sent an e-mail invitation to an online questionnaire created in Qualtrics software ("Qualtrics," 2018). Recipients were able to opt-out by clicking a link in the invitation letter or answering "No" to the first question ("Do you wish to participate in this survey"). This question ensured that those who did not want to participate did not receive subsequent reminders as well as obtained consent to conduct the research. The questionnaire contained six sections: (a) current and past hunting and fishing participation, (b) activity preferences, (c) motivations, (d) constraints to waterfowl hunting, (e) mentorship, and (f) demographics. Our focus in this manuscript is the motivations among groups. Motivations were adapted from Beardmore et al. (2011) to include both hunting- and fishing-related motivations and also included the more salient motivations such as socializing, enjoying nature, and enjoying solitude (Decker & Connelly, 1989; Hayslette et al., 2001; Manfredi et al., 1996; **Table 1**). We used a tailored design method of invitation e-mail and reminder e-mails to maximize the number of responses (Dillman et al., 2014). We used responses from the later round of e-mails to gauge nonresponse bias. The use of the second or final wave to measure nonresponse bias reflects extrapolation methods, which are based on the assumption that individuals who respond after reminders are more likely to be similar to nonrespondents (Armstrong & Overton, 1977).

Table 1. Items used in this study to compare motivations across states and activity types. Respondents were asked to indicate the importance of the item on a five-point scale from not at all important (scaled to 1) to very important (scaled to 5) for why they participate in their most preferred activity type.

	Activity type		
	<i>Big game hunting</i>	<i>Fishing</i>	<i>Small and upland game hunting</i>
Harvesting a trophy animal		Catching a trophy fish	Harvesting a trophy animal
Filling my tag		Harvesting my daily fish limit	Harvesting my daily bag limit
Becoming an expert big game hunter		Becoming an expert angler	Becoming an expert small or upland game hunter
Using my equipment and skills to attract or harvest an animal		Using my equipment and skills to catch fish	Using my equipment and skills to attract or harvest an animal
Experiencing a challenge hunt		Experiencing a challenge fight	Experiencing a challenge hunt
Knowing where my food comes from		Knowing where my food comes from	Knowing where my food comes from
Filling my freezer		Filling my freezer	Filling my freezer
Eating big game meat		Eating fish	Eating small or upland game meat
Participating in big game hunting with family or friends		Participating in fishing with family or friends	Participating in small or upland game hunting with family or friends
Teaching someone to big game hunt		Teaching someone to fish	Teaching someone small or upland game hunt
Being alone		Being alone	Being alone
Viewing wildlife		Viewing wildlife	Viewing wildlife
Connecting with nature		Connecting with nature	Connecting with nature
Spending time outdoors		Spending time outdoors	Spending time outdoors
Processing big game*		Going boating*	Watching my dog work/ companionship of my dog*
			Watching my dog work/ companionship of my dog*
			Teaching someone to waterfowl hunt
			Using my equipment and skills to attract or harvest an animal
			Experiencing a challenge hunt
			Knowing where my food comes from
			Filling my freezer
			Eating waterfowl meat
			Participating in waterfowl hunting with family or friends
			Teaching someone to waterfowl hunt
			Being alone
			Viewing wildlife
			Connecting with nature
			Spending time outdoors
			Watching my dog work/ companionship of my dog*

* items were activity specific and not included in this assessment

Activity Preference Groups

Although we sampled from the six *a priori* activity types, we based analyses on an individual's stated participation rather than their revealed preferences (i.e., permit sales; Hinrichs 2019,). We focused on stated participation because of limitations of the data (i.e., limited from 2012 to 2016; respondents could have participated prior to our sample window; residents could have also participated in activities in other states missed from state databases). In addition, purchasing a permit does not guarantee how much or if they actually participated in the activity. Having an individual report what they have participated in and how frequently allowed for a better representation of individuals' participation patterns (Hendee et al., 1971). Furthermore, this approach allowed us to distinguish individuals who previously participated in an activity but no longer do, which is an important consideration in hunter and angler R3 efforts. Respondents could select only one activity as their most preferred activity from the following activities: big game (i.e., deer, elk, turkeys), fishing, small game (i.e., pheasants, quail, rabbits), non-waterfowl migratory bird (i.e., doves, rails, cranes), and waterfowl (i.e., ducks, geese). The response to this question determined the individual's preferred activity type used in subsequent analysis. Few individuals (< 2% of respondents) indicated a preference for non-waterfowl migratory bird hunting and thus, we combined these individuals with the small game group into a small and upland game activity type.

To bring context of who the respondents were, we characterized them with respect to several demographic categorizations, including sex, Hispanic origin, generation, and income. We used years as described by Pew Research (Dimock, 2018) to categorize respondents by generation: Silent (birth year ≤ 1945), Baby boomers (birth year in 1946–1964), Generation X (birth year in 1965–1980), Millennials (birth year in 1981–1995), and Generation Z (birth year ≥ 1996). We chose to assess generations as opposed to age to highlight cohort demographic effects (e.g., rigidity and flexibility in behavior, shared cohort life events) that affect each generation in different ways (Carlsson & Karlsson, 1970; Winkler & Warnke, 2013).

Data Analyses

To quantify motivations, we used an exploratory factor analysis (EFA) to identify the appropriate number of factors with the parallel method and factor analysis with Promax rotation to find a minimum residual solution. We then fit the motivation model using factor analysis to group the 14 motivation questions into motivation factors (domains). For factors with eigenvalues > 1.0 and factor loadings $> .30$, a reliability analysis using the McDonald's omega (ω) criterion was calculated (DeVellis, 2016). McDonald's omega was used over the more ubiquitous Cronbach's alpha because numerous deficiencies with alpha have been documented in the psychometric literature (Dunn et al., 2014; Trizano-Hermosilla & Alvarado, 2016). In particular, alpha has routinely shown only to be representative of a measure's internal consistency when the assumptions of the τ -equivalent model are met, which is seldom (see Dunn et al., 2014 for a detailed explanation). As such, the larger the violation of tau-equivalence, the more coefficient alpha underestimates score reliability (Graham, 2006). Items were combined into factors if reliability was $\geq .60$ and the mean values from the items within a factor provided indices of motivation importance for each factor (Nunnally & Bernstein, 1994). All analyses were conducted in R (R Core Team, 2020). Factor analysis and McDonald's omega were calculated using the "psych" package (Revelle, 2019).

We then compared motivation factors as a function of activity and state of residence using analysis of variance (ANOVA). For each statistically significant main effect, we calculated the effect sizes using the "effectsize" package (Ben-Shachar et al., 2020). Effect sizes were important because with a large sample sizes ($n > 1000$), as in our study, significant p -values ($p \leq .05$) are likely even when the differences among groups are small (Sullivan & Feinn, 2012). In addition, for each statistically significant main effect, we conducted a posthoc multiple comparison of estimated marginal means to identify difference among levels of the factor (i.e., state of residence or activity type) using the "emmeans" package (Lenth, 2020). The effect size of Cohen's d (transformed from t ratio) was interpreted using criteria from Funder and Ozer (2019), the effect size of ω^2 was interpreted using criteria from Field (2013), and the effect size of η_p^2 was interpreted using criteria from Cohen et al. (2013).

Results

We received 7,875 completed questionnaires on which we based our assessment. After adjusting for undeliverables, invalid respondents, and individuals who chose to opt out, the response rate (minimum response rate; The American Association for Public Opinion Research, 2016) was 10%. Overall, there were no large differences between early or late respondents (**Table 2**). The similarity between early and late respondents in our measures suggested that minimal non-response bias was present and thus, the latter responses were retained and included.

Overall, respondent demographics indicated strong similarities across activity type and state of residence (**Table 3**). The proportion of males was the greatest among waterfowl hunters and least among anglers. The proportion of respondents of Hispanic origin ranged from .00 to .03 of respondents, with the greatest overall proportion from respondents in Oklahoma. The generation and income of respondents were also similar across state and activity type. Respondents tended to be most from Generation X and Baby boomers, and the least from Generation Z. Respondents' household income level tended to be well distributed across the income categories with a slight skew toward greater income levels.

Table 2. The test, test statistic, degrees of freedom (*df*), and *p*-value for statistical comparisons of early and late respondents to assess potential non-response bias. The interpretation of the effect sizes for Cramer's *V* were: negligible <.1, small =.1 to .3, medium =.3 to .5, and large >.5 (Cohen, 2013).

<i>Factor</i>	<i>Test</i>	<i>Statistic value</i>	<i>df</i>	<i>p value</i>	<i>Cramer's V</i>
Number of respondents	χ^2	26.0	6	<.001	.07
Years hunting	<i>t</i> test	.3	6720	.767	–
Years fished	<i>t</i> test	–1.0	3620	.310	–
Years purchasing permits					
Big game hunters	χ^2	4.6	3	.207	–
Waterfowl hunters	χ^2	25.8	3	<.001	.07
Small game hunters	χ^2	24.6	3	<.001	.05
Anglers	χ^2	16.0	3	.001	.05

Table 3. The proportion of respondents in several demographic categories (male, generation, and household income) from Kansas, Michigan, Montana, Nebraska, Oklahoma, South Dakota, and Wyoming by preferred activity. The preferred activity type was determined by question in the survey (see text for details). Note that individuals that did not want to respond to the questions were not included in the table.

<i>Preferred activity</i>	<i>Categories</i>	<i>State abbreviations</i>							
		<i>KS</i>	<i>MI</i>	<i>MO</i>	<i>MT</i>	<i>NE</i>	<i>OK</i>	<i>SD</i>	<i>WY</i>
Big Game	Male	.84	.84	.83	.73	.84	.79	.78	.84
Fishing	Male	.80	.74	.74	.63	.76	.69	.77	.75
Small and Upland Game	Male	.87	.80	.82	.82	.86	.85	.79	.83
Waterfowl	Male	.89	.86	.88	.84	.91	.88	.90	.88
Big Game	Of Hispanic origin	.02	.01	.01	.01	.01	.02	.02	.02
Fishing	Of Hispanic origin	.02	.00	.01	.03	.01	.03	.01	.03
Small and Upland Game	Of Hispanic origin	.01	.00	.01	.00	.02	.03	.00	.02
Waterfowl	Of Hispanic origin	.02	.02	.00	.01	.00	.02	.00	.01
Big Game	Generation Z	.02	.03	.01	.03	.02	.03	.02	.02
	Millennials	.20	.25	.27	.30	.24	.37	.29	.21
	Generation X	.39	.35	.40	.30	.37	.39	.38	.29
	Baby boomers	.35	.35	.27	.33	.34	.20	.28	.43
	Silent	.05	.03	.04	.04	.04	.01	.03	.06
Fishing	Generation Z	.01	.02	.01	.03	.03	.01	.02	.01
	Millennials	.12	.19	.20	.17	.17	.29	.19	.16
	Generation X	.37	.27	.37	.33	.35	.33	.35	.28
	Baby boomers	.43	.45	.38	.42	.41	.36	.37	.51
	Silent	.06	.08	.03	.05	.05	.01	.07	.04
Small and Upland	Game Generation Z	.01	.02	.01	.00	.01	.02	.02	.00
	Millennials	.14	.14	.12	.05	.17	.25	.16	.10
	Generation X	.26	.27	.36	.33	.33	.29	.33	.33
	Baby boomers	.53	.49	.46	.48	.46	.41	.41	.52
	Silent	.05	.09	.06	.14	.04	.02	.09	.05
Waterfowl	Generation Z	.03	.04	.02	.02	.03	.03	.04	.03
	Millennials	.26	.27	.29	.33	.29	.43	.25	.19
	Generation X	.37	.34	.31	.28	.32	.32	.29	.24
	Baby boomers	.32	.29	.35	.33	.31	.20	.39	.47
	Silent	.03	.05	.03	.05	.05	.01	.04	.06
Big Game	<\$60,000	.21	.17	.19	.27	.21	.22	.22	.21
	\$60,000 – \$99,999	.27	.27	.25	.26	.26	.30	.25	.27
	\$100,000 or more	.31	.31	.31	.22	.31	.29	.26	.30
Fishing	<\$60,000	.21	.13	.21	.21	.19	.24	.21	.23
	\$60,000 – \$99,999	.24	.26	.18	.24	.24	.25	.27	.25
	\$100,000 or more	.28	.28	.32	.25	.32	.26	.27	.27
Small and Upland Game	<\$60,000	.17	.17	.13	.15	.19	.20	.10	.20
	\$60,000 – \$99,999	.23	.19	.20	.30	.25	.17	.27	.31
	\$100,000 or more	.38	.30	.42	.33	.36	.44	.37	.36
Waterfowl	<\$60,000	.18	.21	.11	.25	.22	.17	.20	.25
	\$60,000 – \$99,999	.23	.21	.23	.27	.30	.27	.28	.25
	\$100,000 or more	.39	.35	.39	.19	.33	.33	.26	.28

Table 4. Results of the exploratory factory analysis with promax rotation of respondents from eight states in the U.S. The order of the motivation factors begin with the factor that explained the most variance.

<i>Motivations</i>	<i>Factor loading</i>	<i>Mean (SD) of motivation item</i>	<i>Variance explained (%)</i>	<i>McDonald's ω</i>
Food motivation			34	.83
Obtaining my daily limit or filling my tag	.58	2.36 (1.24)		
Knowing where my food comes from	.65	3.08 (1.42)		
Filling my freezer	.90	2.58 (1.43)		
Eating fish/meat	.80	3.34 (1.30)		
Nature			26	.77
Viewing wildlife	.66	4.18 (.92)		
Connecting with nature	.86	4.21 (.93)		
Spending time outdoors	.66	4.60 (.65)		
Challenge			24	.73
Harvesting a trophy	.58	2.36 (1.24)		
Being an expert	.68	3.03 (1.35)		
Using skills and equipment	.59	3.81 (1.10)		
Challenging hunt or fight	.57	3.66 (1.15)		
Social			15	.62
Teaching someone to hunt or fish	.87	3.69 (1.18)		
Spending time with friends and family	.46	4.27 (.95)		

Exploratory Factor Analysis

Our initial EFA revealed four motivation factors. In this model, one motivation item, "being alone," was not well discriminated among factors, so it was removed from the model. After removal, a four-factor solution (nature, social, food, challenge) was still the most appropriate number of factors (**Table 4**). Overall, model fit was acceptable ($\chi^2 = 322.51$; Tucker Lewis Index = .954; RMSEA = .047).

Comparing Activity Type and States

Results of the ANOVA indicated that hunter and angler motivations were different ($p < .01$) among activity type and state of residence (**Table 5**). The effect sizes for state of residence were negligible for all motivation factors ($\eta^2_p < .01$). Given the relatively small relationship between state of residence and differences in motivations, we aggregated activity types across states and did not conduct a multiple comparison analysis among states. However, we observed larger effect sizes for relationships between some but not all motivation factors

Table 5. Results of analysis of variance and partial eta squared (e.g., effect size) values for model variables by activity types among activity and state for respondents who completed a survey in eight states in the U.S. The preferred activity type was determined by question in the survey (see text for details).

<i>Term</i>	<i>df</i>	<i>Sum of square</i>	<i>Mean square</i>	<i>F-value</i>	<i>p-value</i>	<i>Partial eta squared</i>
Challenge						
Activity	3	1762.0	587.0	338.0	<.001	.030*
State	7	181.0	25.8	14.9	<.001	.003
Residuals	32429	56396.0	1.7			
Food motivation						
Activity	3	9317.0	3106.0	1854.0	<.001	.146***
State	7	323.0	46.2	27.6	<.001	.006
Residuals	32421	54318.0	1.7			
Social						
Activity	3	181.0	6.4	49.6	<.001	.009
State	7	5.9	7.3	6.0	<.001	.003
Residuals	16219	19761.0	1.2			
Nature						
Activity	3	204.0	68.0	92.2	<.001	.011*
State	7	36.8	5.3	7.1	<.001	.002
Residuals	24307	17935.0	.7			

Partial eta squared values <.01 are negligible, .01 to .05 are small*, .06 to .13 are medium**, and >.14 are considered large***.

and preferred activity types (**Tables 6 and 7**). Among activity types, the social ($\eta_p^2 < .01$) motivation factor had a negligible effect size and differences among the activity types was minimal. Differences among activity types within the challenge ($\eta_p^2 = .03$) and nature ($\eta_p^2 = .01$) motivation factors were small, as were any individual comparisons of activity types. Nature was the greatest motivation factor for all activity types (mean >4) and there were only minimal differences by activity types. Differences between activity types for the food motivation factor had a large effect size ($\eta_p^2 = .15$). The largest differences in the food motivation was observed between big game hunters and anglers, followed by medium differences between big game hunters and small and upland game hunters, as well as big game hunters and waterfowl hunters (Table 7).

Table 6. Mean (SD) of the motivation factors by preferred activity type of respondents from eight states in the U.S. The preferred activity type was determined by question in the survey (see text for details).

<i>Motivation factor</i>	<i>Preferred activity</i>			
	<i>Big Game</i>	<i>Fishing</i>	<i>Small and Upland Game</i>	<i>Waterfowl</i>
Challenge	3.44 (1.28)	3.03 (1.32)	2.82 (1.39)	3.33 (1.37)
Food	3.47 (1.28)	2.30 (1.33)	2.39 (1.29)	2.63 (1.29)
Nature	4.42 (.81)	4.24 (.91)	4.20 (.93)	4.38 (.80)
Social	3.99 (1.12) 3	.93 (1.09)	3.82 (1.20)	4.20 (1.01)

Table 7. Multiple comparison of estimated marginal means for contrasts of motivations by activity type.

<i>Contrast</i>	<i>Estimated difference</i>	<i>df</i>	<i>t ratio</i>	<i>Adjust p-value</i>	<i>Cohen's d</i>
Food					
Big Game Hunting – Fishing	1.16	32421	68.10	<.001	.76
Big Game Hunting – Small and Upland Game Hunting	1.03	32421	44.39	<.001	.49
Big Game Hunting – Waterfowl Hunting	.83	32421	37.42	<.001	.42
Fishing – Small and Upland Game Hunting	-.13	32421	-5.52	<.001	-.06
Fishing – Waterfowl Hunting	-.33	32421	-14.34	<.001	-.16
Small and Upland Game Hunting – Waterfowl Hunting	-.20	32421	-7.12	<.001	-.08
Nature					
Big Game Hunting – Fishing	.17	24307	13.28	<.001	.17
Big Game Hunting – Small and Upland Game Hunting	.21	24307	11.63	<.001	.15
Big Game Hunting – Waterfowl Hunting	.03	24307	1.87	.243	.02
Fishing – Small and Upland Game Hunting	.03	24307	1.81	.269	.02
Fishing – Waterfowl Hunting	-.14	24307	-8.04	<.001	-.10
Small and Upland Game Hunting – Waterfowl Hunting	-.18	24307	-8.22	<.001	-.11
Challenge					
Big Game Hunting – Fishing	.42	32429	24.03	<.001	.27
Big Game Hunting – Small and Upland Game Hunting	.62	32429	26.3	5 <.001	.29
Big Game Hunting – Waterfowl Hunting	.15	32429	6.63	<.001	.07
Fishing – Small and Upland Game Hunting	.21	32429	8.40	<.001	.09
Fishing – Waterfowl Hunting	-.27	32429	-11.42	<.001	-.13
Small and Upland Game Hunting – Waterfowl Hunting	-.47	32429	-16.71	<.001	-.19
Social					
Big Game Hunting – Fishing	.07	16219	3.21	.007	.05
Big Game Hunting – Small and Upland Game Hunting	.19	16219	6.68	<.001	.10
Big Game Hunting – Waterfowl Hunting	-.18	16219	-6.60	<.001	-.10
Fishing – Small and Upland Game Hunting	.12	16219	4.18	<.001	.07
Fishing – Waterfowl Hunting	-.24	16219	-8.76	<.001	-.14
Small and Upland Game Hunting – Waterfowl Hunting	-.36	16219	-1.87	<.001	-.17

Discussion

Our study is among the first to explicitly test for any differences in motivations among big game hunters, anglers, small and upland game hunters, and waterfowl hunters among multiple states. Previous research on motivations often highlights the importance of motivation factors by wildlife recreationists, but few have ever directly compared motivations using a single survey from a common pool of respondents. Our prediction that motivations (and the variation within) were associated with preferred activity type was supported in some respects, but rejected in others. Overall, our results largely agree with the literature indicating some of the most important motivational factors to hunters and anglers. Motivations related to settings are often cited as important (Hammit et al., 1989; Hayslette et al., 2001; Schroeder et al., 2018; Vaske et al., 1986). We similarly observed that nature (i.e., setting) was our most important motivational factor for all our activity types. Furthermore, there were only small differences among the activity types. There is substantial evidence that recreational behavior, as well as most other human behavior, is strongly influenced by a social setting (Kennedy, 1974).

Previous research has also highlighted the importance of the social motivational factor (Beardmore et al., 2011; Gigliotti & Metcalf, 2016; Schroeder et al., 2006), which was also supported by our study. Challenge is another often cited reason for participating in wildlife-based recreation, particularly among those trying to hone skills such as trophy hunters (Bhandari et al., 2006; Darimont et al., 2017; Hayslette et al., 2001; Stedman et al., 2008). We observed that the challenge motivation factor was one of the least important motivation factors we assessed. Although this factor was ranked lower, we observed only small differences among the activity types. Overall, our results indicated a strong similarity in the strength and rank order of motivation factors among activity groups and agreement with other published studies.

The greatest difference observed among the activity types was for the food motivation factor. Anglers, small and upland game hunters, and waterfowl hunters similarly ranked the food motivations consistently lower among the other motivation factors. Big game hunters ranked food motivations slightly greater than challenge. Literature on

big game hunter motivations often indicates that food motivations are ranked relatively high (Black et al., 2018; Gigliotti & Metcalf, 2016; Shrestha & Burns, 2011). Initial research on the role of connecting conservation to local foods movements could potentially generate greater relevancy of wildlife management and conservation through expansion of social networks among individuals supporting wildlife-based recreation, and this warrants further study (Stedman et al., 2017).

Contrary to our prediction, we observed little difference among states in the motivations to participate in hunting and fishing. In other words, the nature motivation did not differ whether the participant was in Montana, Michigan, or Oklahoma; this factor was similarly expressed by individuals in all those states. The similarity in motivations across the states in this study suggests that there may be a universality in motivations across the country. We consistently observed that the nature and social motivations were the most important, followed by challenge and food (except among big game hunters, as discussed earlier). However, we only studied a relatively small subset of states and it is possible that we could have identified differences by including more states in our analyses. Nonetheless, our study spanned more than 2000 miles and it seems likely that our assessment would have likely captured geographic variation in motivations if it was present. It is possible that state of residence may be too coarse and not the proper geographic scale for identifying cultural differences in motivations, as differences might be greater within states than across states. Future studies should compare hunting and fishing motivations from more regions of the U.S. and attempt to identify geographic scales that minimize within-group differences in motivations, if they exist.

A few other caveats should be noted to understand the generalizability of our results. Although we had more than 7,000 respondents, this was only 10% of who we intended to survey. Our assessments did not indicate that there was a potential nonresponse bias, but we had few female respondents, respondents of color, and younger participants (i.e., Generation Z). Although our respondents do largely reflect the demographic makeup of hunters and anglers in the country (U.S. Fish and Wildlife Service, 2018), research has indicated that these groups do vary in motivations to hunt and fish from "traditional" hunters and anglers (Adams & Steen, 1997; Angus, 1995; Keogh George, 2016; Larson et al., 2014; Ryan & Shaw, 2011).

We also only tested a relatively narrow band of motivations (Manfredo et al., 1996). The motivations we explored primarily focused on the important factors specifically tied with the act of hunting and fishing (e.g., challenge, eating meat, knowing where their food comes from). Perhaps exploring a greater range of motivational items (e.g., learning, exploration, introspection, tradition), such as those from the Recreation Experience Preference Scales (REP; Manfredo et al., 1996), may have indicated more nuanced differences among states or activity types. Similarly, we assessed broad categories of preferred wildlife recreation activity types, which did not preclude respondents from partaking in multiple activity types (many did). Restructuring how we categorized participants into the activity types may have indicated different relationships. Furthermore, within each activity type, there is a gradient in how important the activity is to individuals (i.e., recreational identity, specialization), which has been shown to influence motivations (Lee et al., 2007; Manning, 2011; McFarlane, 1994). Despite these caveats, our study provides a direct comparison of wildlife-based recreational activities and state of residence that provides the background to assess other differences in motivations and how universal recreational motivations are among wildlife recreationists.

Hunting and fishing is a global phenomenon with almost every human culture having roots in this activity (Megarry, 1995; Peterson et al., 2011). The broad universality of motivations, as indicated in this study, may indicate ultimate (i.e., evolutionary) reasons why there might not be much variation across states and activity types. Despite potential cultural differences across space, hunting (including its motivations) may have evolved to provide a few core benefits to male hunters (Gurven et al., 2009; Lee & DeVore, 1968; Liebenberg, 2008). For example, the achievement or challenge factor has been suggested to be important during mate selection (Lee & DeVore, 1968). Furthermore, evolutionary anthropologists suggest that males hunt to provision oneself and family, and those expected to return meat (i.e., the food motivation factor) and maintain coalitions with other males (i.e., social; Gurven et al., 2009).

Management Implications

Motivations have been an important focus of study in leisure studies and been linked to other important concepts linked to participation such as constraints, specialization, and satisfaction. Results from this study indicate a potential avenue to recruit new hunters. As opposed to the other activity types, the successful result of a big game hunt provides a relatively large quantity of meat and can be viewed as an important source of subsistence (Arnett & Southwick, 2015), indicating a potential avenue to draw interest in big game hunting. More individuals in the U.S. are interested in obtaining a sustainable, natural, and local form of meat (Goguen & Riley, 2020). The “locavore movement” provides an opportunity for agencies and NGOs to highlight the importance of locally and ethically sourced meat in the recruitment of new hunters (Larson et al., 2014) and among urbanites who may view hunting less favorably (Wilkins et al., 2019). Agencies, in collaboration with NGOs and industry, may want to market and promote programs that teach an individual how to properly butcher and cook a variety of wild game. Programs such as ‘From Field to Plate’ (<https://from-field-to-plate.com>) and ‘Field to Fork’ (<https://www.qdma.com/recruit/field-to-fork>) have been successful in targeting individuals who have never hunted but want locally sourced food.

Other than the influence of acquiring meat by big game hunters, this study indicated that there are few differences in motivations among participants who prefer different types of wildlife-based recreation. Furthermore, there was a lack of differences among participants from different states. The similarities observed among activity types and states of residence suggest a universality in hunting and fishing-related motivations, which has some important management implications. If the major goals of participants in wildlife-based recreation are similar, then strategies could be developed to increase the relevancy of one type of wildlife-based recreational activity to another. Marketing and communication strategies could be developed that highlight the role of nature and social motivations, and used for encouraging participation in alternative or substitute activities. Agencies, NGOs, and other stakeholders currently invest significant resources in the R3 of hunters and anglers (Larson et al., 2014), and the ability to simplify messages and strategies holds promise. Given that there are

relatively few differences among states and activity types, outreach appealing to the core motivations of hunters and anglers could be used similarly in Montana, Michigan, or Oklahoma, thereby increasing efficiency of larger outreach campaigns. Furthermore, the National R3 Plan to increase more hunters and shooting sports participants, especially among non-traditional audiences (Council to Advance Hunting and the Shooting Sports, 2016), may be simplified by developing broad campaigns that appeal to the motivations of hunters and anglers throughout the country. Agencies, NGOs, and other stakeholders could collaborate and provide cohesive, targeted campaigns that are transmissible among states and activities, instead of developing individual marketing and education campaigns for each state or wildlife-based recreational activity. Fewer and broader campaigns could be used to target regions and be more efficient in the use resources, while still effectively reaching intended audiences.

Although the potential for broad strategies to encourage adoption of other wildlife-based recreational activities exists, many agencies and NGOs have been encouraging anglers to try hunting and hunters to engage in angling for decades. A participant already engaging in a wildlife-based activity is seen as a "low-hanging fruit" that can be encouraged to participate in complementary activities. In reality, few wildlife-based recreationists actually transition between the two activities (Hinrichs et al., 2020). Substitutability in leisure activities has been defined as the interchangeability of recreation activities in satisfying participants' motives, needs, wishes, and desires (Hendee & Burdge, 1974). If there are few differences in the reasons that wildlife-based recreationists participate in an activity (i.e., motives), as suggested in our study, then further research should focus on what influences individuals to engage in one recreational activity over another (Needham & Vaske, 2013). Theory suggests that only when an alternative activity is perceived as satisfying the needs and providing the outcomes equivalent to the original activity, can it be considered substitutable for the participant (Iso-Ahola, 1980). An activity should be considered an alternative or a complement, but not a substitute, if a replacement does not provide the same benefits as the original (Shelby & Vaske, 1991). As recommended by Brunson and Shelby (1993) and Ditton and Sutton (2004), there continues to be a need to integrate recreation substitutability, leisure motivations, and constraints to leisure research.

Understanding why individuals choose to prefer and engage in one form of wildlife-based recreation over another will be essential for increasing the stakeholder base (both traditional users and non-traditional users) for wildlife conservation and management.

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