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Research Paper

Classifications Of Recreation Specialization: Attitudinal And Behavioral Differences Across Specialization Types In The Nature Reserve Of Orange County, CA, USA

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Executive Summary

This article examines the challenge of preserving ecological conditions and maintaining accessibility in parks and protected areas (PPA). Drawing from empirical research that analyzes the social concept of recreation specialization, the selective channeling of interests and abilities into a specific recreational activity. This study aims to better understand recreation behavior across a sample population of recreationists in urban-proximate park settings at the Nature Reserve of Orange County, CA. Multivariate classification methods and an exploratory factor analysis assisted in the summarization of survey data, grouping recreationists based on commonalities and varying expressions of involvement, commitment, and skill. A one-way analysis of variance demonstrated significant and positive relationships across specialization types and various behavioral characteristics, supporting empirical research conducted in wildland settings. More specifically, positive relationships were found between specialization and recreation ecology attitudes, resource use and dependency, management perceptions, conservation knowledge, Nature Reserve/park values, and self-reported specialization. Trends displayed at an activity specific level in this research demonstrate that specialization dynamics vary according to activity type, which further endorses the idea that specialization is composed of unique social expressions that do not necessarily depict a developmental process or progression of behavior, attitudes, and preferences. Beyond identifying the ways in which specialization dynamics can influence recreation behavior and providing recreation managers with guidance to inform site-specific decisions, evidence from this study shows that measuring self-reported specialization can be as effective as implementing a multivariate classification approach. A novel result that can influence the way this concept is measured in future studies.

Keywords

Recreation specialization, recreation resource management, urban-proximate recreation, park and protected area, recreation behavior

Introduction

Over the past five years in the United States, a surge in PPA visitation (Ferguson et al., 2022), pandemic influenced growth in recreation participation (Probstl-Haider et al., 2023), and increases in recreation related investments (BEA, 2022), demonstrate a national increase in outdoor recreation participation (Outdoor Industry Association, 2022). With this increase in visitation comes the elevated potential for recreation-related ecological impacts and a diminished quality of the visitor experience due to crowding (Manning, 2022). This presents a significant challenge for protected area managers tasked with the challenge of preserving ecological resource conditions and maintaining access and high-quality outdoor recreation experiences that are a fundamental component to the health and well-being of individuals and society (Godbey et al., 2005; Thomsen et al., 2018). Research on social behavior has created a foundation for conceptual frameworks that inform contemporary outdoor recreation planning, through identifying the interrelationships between social and ecological factors (Manning, 2022).

Specialization theory, described as the selective channeling of interests and abilities into a specific activity, was initially applied to "man-environment research" from an environmental psychology perspective (Little, 1976). Introduced to the field of outdoor recreation by (Bryan, 1977), specialization, was examined through the case of trout fisherman, and a large body of the research has since retained a focus on recreational fishing (Beardmore et al., 2013; Salz & Loomis, 2005). The concept of recreation specialization has also been examined across activity types including birdwatchers (Stemmer et al., 2022), whitewater canoeists (Wellman et al., 1982), vehicle-based campers (McFarlane, 2004), backcountry hikers (Virden & Schreyer, 1988), rock climbers (Mueller & Graefe, 2018), scuba divers (Thapa et al., 2006), ultimate frisbee players (Kerins et al., 2007). Angler specialization levels have been crucial for developing realistic management applications such as harvest restrictions (Oh & Ditton, 2006), license fees and travel costs (Beardmore et al., 2013), and in establishing marine protected areas (Salz & Loomis, 2005). Beyond fishing, specialization has been perceived as a helpful conceptual tool for understanding how recreationists make decisions and process information about recreation opportunities (Bryan, 1979; Williams, 1985). Specialization has contributed to a more comprehensive understanding of recreation behavior (Bryan, 2000), site preference (Virden and Schreyer, 1988), conservation support (Oh and Ditton, 2006) and environmental attitudes (Dyck et al., 2003).

More recently, original perceptions of specialization as a developmental process and progression of behavior, attitudes and preferences (Bryan, 1979), have been reconceptualized to include a variety of socio-cultural factors that are likely to advance or impede a recreationists progression along the traditional continuum (Scott & Shafer, 2001). Additionally, recent studies have argued that classifying specialization as a developmental progression (Scott & Shafer, 2001, Sorice et al. 2009), can possibly mischaracterize trail users and park and protected area visitors. As a result, this underscores the necessity to accurately understand recreation behavior, attitudes, and values, to manage visitor experience and resource protection values across a population of recreationists. Therefore, this study will not view recreation specialization as a "continuum" (Bryan, 1979), because the affective, behavioral, and cognitive aspects that define their engagement may fluctuate throughout their participation in an activity (Kuentzel & Heberlein, 2006). Instead, recreation specialization will be recognized as

a snapshot in time, conveying the personal connections and individual nuances that define a recreationist's current participation.

Although a large body of research has focused on specialization in wildland settings (Manning, 2022), there is little knowledge examining specialization in urban-proximate settings; the recreation settings located close to urban areas, typically receiving high use intensity, and usually exhibiting a larger range of social influences (Manning, 2022; Sisneros-Kidd et al., 2021). Additionally, these areas often play a role in preserving habitat, and growing populations, increasing year-round use, and encroaching development often result in added pressure on ecological systems in urban-proximate settings, presenting managers with the continued challenge of balancing recreation use and maintaining healthy ecosystems (Sisneros-Kidd, 2021). Because most of the empirical research cited in this paper has been conducted in remote wildland settings, the transferability and consistency of findings to more urban-proximate areas is relatively unknown (Spernbauer et al., 2023). Therefore, further research examining recreation behavior in urban-proximate areas should provide managers with much needed direction for making empirically motivated decisions to protect recreation experience and ecological systems in areas that are understudied in the field of recreation resource management (D'Antonio et al., 2016; Schneider, 2000).

In this study, survey and GPS data collected in urban and peri-urban parks in the Nature Reserve of Orange County, CA, USA, were used to classify recreationists into three specialization types, if effort to understand various expressions of the concept, and the relationships that exist between specialization, its latent social components, and various behaviors, attitudes, and values. This novel application in an urban-proximate setting, classifies recreationists based on the common social components that comprise specialization, and examines identified relationships in correspondence with existing specialization literature in remote recreation locations. Specifically, this research will address the following research questions:

1. Does specialization demonstrate a social progression from one specialization type to the next or do social differences exist across specialization types that are distinct, unconnected, and influenced by socio-cultural factors?
2. Do relationships exist between specialization and various recreation behaviors, attitudes and values, and if so, are these relationships unique to the urban-proximate setting in which this study occurs?

Historical Classifications of Recreation Specialization

Specialization has been described as the progression or focusing of behavior, acquiring skills and knowledge, and the tendency to become committed to an activity which becomes the centrality of life (Scott & Shafer, 2001). Measurements of specialization are considered multidimensional and incorporate a combination of variables such as past experience, commitment, media involvement, club membership, and preferred technique or style (Kuentzel & Heberlein, 1992). Recent conceptualizations of the theory view specialization as multi-dimensional, composed most frequently of elements including experience, commitment, involvement, and skill (Scott & Shafer, 2001). Generally, specialization is measured with both behavioral and attitudinal indicators (Scott et al., 2005). Some behavioral indicators include participation, past-experience, general experience, recent experience and experience use history, and frequency of participation (Scott et al., 2005), while attitudinal indicators include enduring involvement

(McIntyre & Pigram, 1992), centrality to lifestyle (Wellman et al., 1982), social and economic investment (McFarlane, 2004), and self-reported knowledge and skill (Miller & Graefe, 2000). With attention to the notion that an individual's cognitive, social, and physical relationship with an activity can change over time due to a variety of socio-cultural factors (Scott & Shafer, 2001), it may only be valuable to analyze specialization in discrete time, as previously discussed.

Methods

Study Site

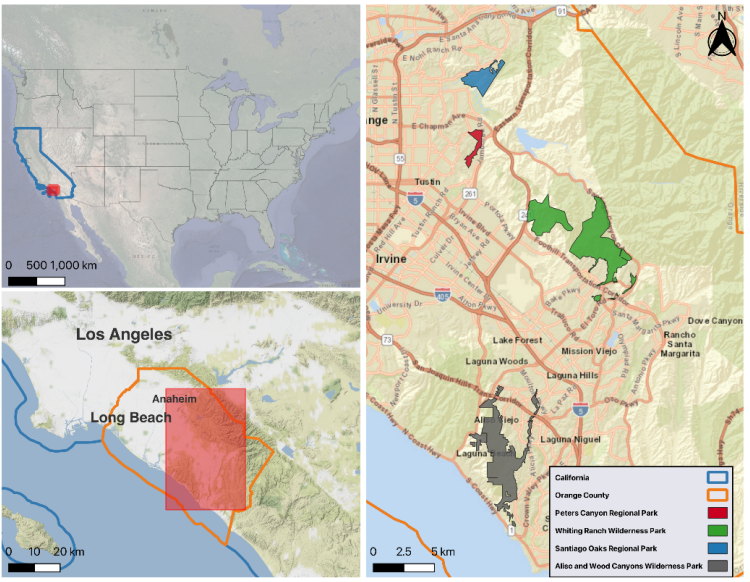
This study was conducted in four Parks of the Nature Reserve of Orange County, CA (the Reserve): Aliso and Wood Canyons Wilderness Park (ALWO), Peters Canyon Regional Park (PECA), Whiting Ranch Wilderness Park (WHRA), and Santiago Oaks Regional Park (SAOK) (Figure 1). Managed by the County of Orange, CA (OC Parks, 2024), these parks were chosen out of the total of 22 management units that comprise the Reserve due to their urban-proximate locations across the county, diversity of user characteristics, and moderate to high visitation rates (Monz et al., 2019), providing a robust and diverse sample of visitors. The reserve and the parks that lie within are proximate to the City of Irvine, CA. Irvine has a population of 307,670 and is a major metropolitan area in Orange County which has a population of over 3.18 million, making it the sixth most populous county in the United States (U.S. Census Bureau, 2024). The Reserve is a 38,000-acre (153.78 km^2) protected open space that spans multiple jurisdictional boundaries and management agencies, and plays a vital role in conserving the wildlife and plants that define the uniqueness and diversity of the landscape in Orange County, CA (Natural Communities Coalition, 2023). Due to the location of these parks they can be easily accessed by a large population base, and are often the only natural areas accessible to the surrounding urban residents (Sisneros-Kidd, 2021).

Although the parks examined in this study are located in an urban-proximate setting, they vary in topography, scenery, and recreation opportunities, and therefore it is likely that they attract a variety of activity types and recreationists seeking a range of experiences. ALWO, the largest of the parks in this study area is 4,500 acres and is known as a wildlife sanctuary offering a variety of experiences ranging from solitude to an expansive network of mountain bike trails. PECA, the smallest of the parks in the study area is 340 acres in size, and offers a variety of graded roads and trails, providing unique views of the 55-acre reservoir, and opportunities for hikers, mountain bikers and equestrians. WHRA is approximately 2,500 acres, and is highlighted by scenic rock formations, rolling hills, and meandering streams, enjoyed primarily by hikers and mountain bikers. SAOK is 1,269 acres and is known largely for its downhill mountain bike trails, although the park also offers secluded nature experiences, mountain vistas, and an orange grove for hikers and equestrians (OC Parks, 2024).

Data Collection and Sampling

Visitor questionnaires were administered at the four locations, in which sampling among multiple park entrances took place over seven consecutive days, beginning when the park opened at either 6:00 am or 7:00 am until approximately 5:00 pm or 6:00 pm. This stratified sampling technique ensured an equal amount of time was spent at each sampling location during the weekends, when higher visitation was expected. Visitors were intercepted at randomly selected minutes on the hour throughout the sampling period, and as a visitor entered the park they were invited to participate in

Figure 1
Study Area and Parks of Interest in the Nature Reserve of Orange County



the study by carrying a GPS eTrex 10 GPSunit (Garmin International Olathe, KS, USA) during their day-use of the park's trail system. Visitors were then asked to complete a post-experience survey instrument, with scales designed to measure dimensions associated with specialization. Technicians administered surveys via iPad handheld tablets, and orally administered surveys to respondents that had difficulty reading or seeing the written questions on the screen. Responses to this survey make up the sole dataset applied in this analysis. The analysis of GPS data examining relationships between specialization, spatial behavior and potential ecological disturbance is published in a separate manuscript (Van Deursen et al., 2024).

Figure 2
Conceptual Model Summarizing Survey Instrument Latent Variables

The survey instrument was designed using Qualtrics Research Suite (Qualtrics, 2024), and Figure 2 provides a conceptual overview of the survey design and components. The survey employed five Likert scales to measure dimensions of specialization, visitor perceptions, attitudes, and knowledge, and included opportunities for open-ended responses for descriptive items such as activity type (available options consisted of hiking/walking, biking, running, horseback riding or other). Survey participants who selected biking as their primary activity type were also prompted to specify the type of bicycle (i.e., mountain bike, road bike, e-bike, hybrid bike, gravel bike or other). Additional descriptive items addressed in the survey consisted of demographic information (birth year, gender, zip code/nationality and highest-level of education). Dependent and independent variables in the survey were drawn from empirical recreation specialization research and are further detailed in Table 1, Table 2, and Table S1. Qualtrics's display logic feature was used to auto populate the selected activity type and park location chosen by participants throughout various questions in the survey.

Table 1

Survey Contents: Categories of Specialization Indicator, and Components Used to Measure Specialization Dimensions

Specialization Dimension	Specialization Indicator	Specialization Component
Involvement	Participation/History	• Past Participation • Past Experience
	Enduring Involvement	• Self-expression
	Centrality to Lifestyle	• Local club membership • State club membership • National club membership • International club membership
Commitment	Travel Intention	• General travel intent • County travel intent • State travel intent
	Social Investment	• Activity access • Activity preference • Activity association • Importance
	Economic Investment	• Equipment costs
Skill	Ability	• Self-reported skill
	General Knowledge,	• Etiquette, equipment, culture

Survey questions (Table S1) were associated with one of the following nine specialization indicators and 19 specialization components reported in the literature: participation history (past participation and past experience), enduring involvement

(attachment and self-expression)(McIntyre and Pigram, 1992), centrality to lifestyle (membership in local, state, national, or international recreation or environmental based clubs)(Needham et al., 2009), travel intention (general, county, and state travel intention)(Scott et al., 2005; Scott and Shafer, 2001), social investment (importance, centrality to self, personal dedication and side bets) (Kerins et al., 2007), economic investment (estimated cost of replacing all recreation equipment)(Scott et al., 2005), ability (self-reported skill)(McFarlane, 2004), general knowledge (etiquette, technique and culture)(Oh and Ditton, 2006), and achievement (competitive history)(Scott and Godbey, 1994) (Table 1). These nine categories of specialization indicators were used to measure a recreationist's specialization type in an activity, by identifying three frequently used dimensions: involvement, commitment, and skill (Scott and Shafer, 2001). For instance, involvement was determined by specialization indicators consisting of participation history, enduring involvement, and centrality to lifestyle, which were further evaluated by seven specialization components (Table 1) measured by questions on the survey (Table S1). Similarly, commitment was determined by specialization indicators consisting of travel intention, social investment, and economic investment, evaluated by seven specialization components, and skill was determined by specialization indicators consisting of ability, knowledge, and achievement, evaluated by three specialization dimensions (Table 1).

Table 2
Survey Components for Measuring Behaviors and Attitudes

Variable	Behavioral and Attitudinal Component
Recreation Ecology Attitudes	• Leave-No-Trace Attitudes
Resource-Use and Dependence	• Place Attachment • Attribute Preferences • Environmental Preferences • Resource Attachment
Management Perceptions	• Trail Condition • Trail Difficulty • Park Infrastructure
Conservation Knowledge	• Familiarity with local conservation challenges • Minimum-impact behavior
Nature Reserve/ Park Values	• Pro-environmental behavior and park values
Specialization	• Self-assessment of specialization

Data Analysis

Survey data demonstrated in Table S1, were summarized using SPSS Statistical software (v.29,SPSS, Inc. Chicago, IL), in which a series of analytical steps were conducted to answer the research questions previously described:

1. A reliability analysis was conducted to assess each component of specialization to confirm the Cronbach's α reflected acceptable internal consistency between each of the comprising specialization indicator.
2. If the findings were statistically reliable, we performed a maximum likelihood exploratory factor analysis (EFA) with varimax rotation on the data, and imputed missing values with means for unanswered survey responses, which reduced the 19 specialization components, representing nine categories of specialization indicators, into four specialization factors. The maximum likelihood estimation procedure was preferred in this study, to minimize variance among scaled components and account for underlying structure in the data caused by latent variables (Costello & Osborne, 2005).
3. EFA results were reviewed and interpreted to correspond to specific dimensions of specialization (involvement, commitment, and skill). The EFA assisted in the identification of four influential specialization factors of the observed variables (Suhr, 2005) to better represent dimensions of involvement, commitment, and skill with unbiased parameter estimates (Pituch & Stevens, 2015). Based on the recommendations in Costello and Osborne (2005), variables with factor loadings below an absolute value of 0.40, cross-loading components, and freestanding components were removed from analysis prior to the EFA, to aid the interpretability of the model and achieve a more parsimonious result.
4. A hierarchical cluster analysis using Ward's method and squared Euclidean distance of EFA factor scores was employed to evenly classify respondents in the sample into three cluster groups, each representing a unique composition of scaled specialization indicators (Scott et al., 2005). Ward's hierarchical cluster analysis was used to classify study participants, to better understand the specialization type they express.
5. A one-way analysis of variance (ANOVA) was conducted to determine significant differences between the three specialization clusters and specialization components (Table 2), in effort to answer the first research question. ANOVAs were followed by either a Tukey or a Games-Howell post-hoc test, depending on the distribution and variance of the dependent variable in the analysis (Field, 2013; Vaske, 2019), to determine if there were significant differences between the clusters.
6. A second ANOVA was then conducted to examine differences between the three specialization clusters as well as behavioral and attitudinal variables in effort to answer the second research question. For the ANOVAs conducted on the behavioral characteristics and attitudinal variables (excluding self-reported specialization), Z scores were calculated, and response values were averaged and rescaled to standardize the distribution of each component and compare open ended responses to responses employing Likert scales.

It is important to note that the classification of specialization cluster types was based on the entire sample of recreationists at the Reserve, to account for and examine behavioral and attitudinal variations across activity and park specific expressions of latent specialization components (Ditton et al., 1992; Manning, 2022; Stankey & McCool, 1984).

Results

Activity Type, Park Location, and Demographics

The visitor-intercept survey had a total of 828 participants (including incomplete responses and 28 non-response surveys), which were relatively evenly distributed between the four study areas with 235 (28.4%) responses at ALWO, 232 (28.0%) responses at PECA, 184 (22.2%) responses at SAOK, and 177 (21.4%) responses at WHRA. The survey response rate was exceptionally high, at 96.8%. Among the 800 complete survey responses, 492 respondents (61.5%) selected hiking as their primary activity type, 256 (32%) selected biking, 46 (5.6%) selected running, and 6 (1%) of respondents selected an "other" activity type and provided an open ended response, which included "looking at the view", "physical therapy", "writing", "identifying plants", "lunch", and "mountain unicycling"). Among the 256 respondents who indicated their primary activity was biking a follow-up question asked them to specify the type of bike they were riding, and 215 (84%) selected mountain bike, 14 (5%) selected road bike, 14 (5%) selected e-bike, 8 (3%) selected hybrid bike, and 5 (2%) selected gravel bike. Respondents in the sample at the four study area parks were primarily male (62.9%), middle-aged, college educated individuals Table 3. The majority of respondents in the sample were highly educated, high earning individuals, having received at least a 4-year college degree (64.4%) and earn over 100,000 dollars a year (59.2%). California residents comprised almost the entire portion of the sample (96.5%) and non-California residents (3.5%) were representing 16 different U.S. states.

Table 3
Demographic Descriptives of Survey Sample

Visitor Demographics	Variable Level	Proportion of sample	Frequency	N
Gender	Female	35.6	285	800
	Male	62.9	503	
	Non-binary/third gender	0.9	7	
	Prefer not to say	0.5	4	
	Self-describe	0.1	1	
Age	18-22	6.3	50	794
	23-37	29.2	232	
	38-47	20.5	163	
	48-57	20.0	159	
	58-67	16.0	127	
	68+	7.9	63	
State Residency	In state	96.4	752	780
	Out of state	3.6	28	
Highest level of Education	HS grad or less	8.1	61	749
	Some college/Assoc. degree	27.4	205	
	B.A./B.S.	42.7	320	
	M.S./PhD/JD/MD	21.8	163	
Annual household income	<$34,999	6.1	46	785
	$35,000-$49,999	7.8	59	
	$50,000-$74,999	11.6	88	
	$75,000-$99,999	15.3	116	
	$100,000-$149,999	19.4	147	
	$150,000-$199,999	15.0	114	
	$200,000+	24.8	188	

Exploratory Factor Analysis on Categories of Specialization Components

The EFA resulted in a four-factor model containing ten specialization indicators which explained 69.3% of the variance in the dataset Table 4. After performing the reliability analysis on the specialization components, nine out of 19 specialization components were not considered reliable and therefore removed from the analysis: self-expression (enduring involvement), local and international club membership (centrality to lifestyle), general, county and state travel intent (travel intention), activity association (social investment), equipment costs (economic investment), and competitive history (achievement). The four factors produced in this model each represent latent specialization indicators and components indicated in Table 1 and Table 4. Factor 1 was determined to be comprised of commitment and social investment, Factor 2 was comprised of skill and ability/knowledge, Factor 3 was comprised of involvement and centrality, and Factor 4 was comprised of involvement and participation history. Among the four specialization factors, Factor 4: the involvement-participation history component, returned the lowest Cronbach's alpha of .628 and Factor 2: the skill-ability/knowledge component returned the highest Cronbach's α at .797. We retained components with a Cronbach's α value above .6 that we judged to be consistent and therefore representative of the latent specialization component they were intended to measure (Vaske, 2019).

Table 4

EFA Results Applying Maximum Likelihood Estimation and Varimax Rotation

	EFA Factors	Rotated Factor Loading	Mean Score	Component Total Correlation	Chronbach's Alpha	Eigenvalue	Cumulative Variance Explained
Factor 1[a]					.702	3.05	30.503
	Activity Access (Social Investment)	.488	3.29	.413			
	Activity Preference (Social Investment)	.691	.368	.568			
	Activity Interest (Social Investment)	.712	3.11	.562			
	Importance (Social Investment)	.406	3.98	.429			
Factor 2[b]					.797	1.505	45.552
	Self-reported skill (Ability)	.822	3.14	.666			
	Etiquette, equipment, and culture (General Knowledge)	.739	3.14	.666			
Factor 3[c]					.639	1.322	58.77
	State Club Membership (Centrality to Lifestyle)	.998	1.06	.487			
	National Club Membership (Centrality to Lifestyle)	.489	1.09	.487			
Factor 4[d]					.627	1.057	69.341
	Past Participation (Participation History)	.766	3.12	.469			
	Past Experience (Participation History)	.573	2.37	.469			

[a] Factor comprised of social investment components and referred to as Commitment-Social Investment component.
[b] Factor comprised of Ability and General Knowledge indicators and will be referred to as the Skill-Ability/Knowledge component.
[c] Factor comprised of Centrality to Lifestyle indicators and will be referred to as the Involvement-Centrality component.
[d] Factor comprised of Participation History indicators and will be referred to as the Involvement-Participation History component.

The Ward's hierarchical cluster analysis using the EFA factor scores resulted in a three-cluster solution, grouping the entire sample of recreationists based on latent specialization components. Cluster 1 contained 105 cases (13.1%), Cluster 2 contained 302 cases (37.8%) and Cluster 3 contained 393 cases (49.1%) Table 4. The cluster analysis identified three distinct types of recreationists across four parks and three primary activities, with unique survey responses and similarities in the four latent specialization factors. Clustering the sample population based on social commonalities, made it possible to associate each cluster with a specialization type in which the cluster with the lowest values would be known as the casual (least specialized) type, the cluster with median values would be known as the active (moderately specialized) type, and the cluster with the highest values would be known as the committed (most specialized) type (Scott and Shafer, 2001).

Table 5
Comparison of Specialization Factors Across Specialization Types

Latent Specialization Factors	Specialization Type			F-ratio	P-value
	Cluster 1 (Casual)	Cluster 2 (Active)	Cluster 3 (Committed)		
Factor 1: Commitment-Social Investment[1]	2.082^{a}	3.479^{b}	3.396^{b}	152.804	<0.001
Factor 2: Skill-Ability/Knowledge[1]	2.503^{a}	2.980^{b}	3.092^{b}	26.66	<0.001
Factor 3: Involvement-Centrality[1]	1.075^{ab}	1.085^{a}	1.115^{b}	4.491	0.011
Factor 4: Involvement-Participation History[2]	2.186^{a}	2.170^{a}	3.725b	777.727	<0.001

[1] Groups with different subscripts are significantly different with Tukey procedure at α=.05.
[2] Groups with different subscripts are significantly different with Games-Howell at α=.05.
[3] Cluster 1 contained 105 cases and was designated the *casual* specialization type.
[4] Cluster 2 contained 302 cases and was designated the *active* specialization type.
[5] Cluster 3 contained 393 cases and was designated the *committed* specialization type.

Social Factors Across Specialization Types

The one-way ANOVA: comparing latent specialization factors and the three generated clusters (Table 5), demonstrated a subtle difference in means across clusters, however, an increasing trend in mean factor scores was evident across the clusters for two latent specialization factors: Factor 1 (commitment and social investment) and Factor 2 (skill-ability and knowledge). Although the involvement components (participation history and centrality) don't exhibit a positive, linear trend across the clusters, each cluster demonstrates unique expressions of commitment, involvement, and skill characteristics. Based on this result (Table 5), Cluster 1 was associated with the casual specialization type, Cluster 2 was associated with the active specialization type, and Cluster 3 was associated with the committed specialization type. We found significant differences among specialization type for all latent specialization factors, with the lowest means among the casual group. Generally, the casual specialization type displayed low values across all factors, the committed specialization type displayed high values across all factors.

For Factor 1 (commitment and social investment) (F(2,797) =152.804, p<.001), active(3.479) and committed(3.396) respondents had significantly higher scores than the casual (2.082) respondents. For Factor 2 (skill-ability and knowledge) (F(2,797)

= 26.660, $p<.001$), active (2.980) and committed (3.092) did not differ significantly, but were significantly higher than the casual (2.503) respondents. The differences for Factor 3 (involvement and centrality) were subtle ($F(2,797) = 4.491$, $p<.05$), but the mean for committed (1.115) respondents was higher and significantly different than active (1.085) and casual (1.075) respondents. Finally, Factor 4 (involvement and participation history) was most stark ($F(2,797) = 777.727$, $p<.001$), where the committed (3.725) was significantly higher than casual (2.186) and active (2.170) respondents, which did not differ significantly from each other.

Table 6
Comparison of Predictor Variables Across Specialization Types

Behavioral and Attitudinal Components	N	Specialization Type			F-ratio	P-value
		Casual	Active	Committed		
Recreation Ecology Attitudes[2]	777	4.198[a]	4.334[a]	4.371[a]	2.419	0.09
Resource Use and dependency[2]	779	3.464[a]	3.915[b]	4.146[c]	47.223	<0.001
Management Perceptions[2]	783	3.950[a]	4.154[b]	4.284[c]	12.086	<0.001
Conservation Knowledge[2]	780	2.078[a]	2.525[b]	2.859[c]	31.304	<0.001
Nature Reserve/Park Values[2]	763	4.252[a]	4.284[a]	4.300[a]	0.224	0.799
Self-reported specialization[1]	796	3.690[a]	3.750[a]	3.930[b]	5.637	0.004

[1] Groups with different subscripts are significantly different with Tukey procedure at α=.05.

[2] Groups with different subscripts are significantly different with Games-Howell at α=.05.

When examining cyclists and hikers independently, increasing trends between specialization types and Factor 2 (skill/ability and knowledge) and Factor 3 (involvement and centrality), were also evident. Among runners, an increasing trend was not evident between specialization type and Factor 2 (skill/ability and knowledge) and Factor 3 (involvement and centrality), but an increasing trend between specialization type and Factor 4 (involvement and participation history) suggests intelligible specialization designations for each cluster.

In general, these trends indicate that committed recreationists reported a higher level of skill attainment in relation to the ability of other participants, and were more knowledgeable in relation to the etiquette, technique, and culture of other participants, while casual recreationists reported less skill attainment and less knowledge of etiquette, technique and culture than other participants. Casual recreationists also generally disagreed with statements indicating their personal dedication or willingness to participate in substitutes such as: "If I didn't have access to hiking, biking, running, or etc. I'm not sure what I would do," "I prefer hiking, biking, running, or etc. over most anything else," and "other activities don't interest me as much as hiking, biking, running, or etc.," while active and committed recreationists either agreed or submitted neutral responses in correspondence with these statements. On average committed recreationists reported that they had been biking, hiking, running, or etc. at the park over 11 years prior to their visit, while casual and active recreationists reported less than 10 years.

Behavioral Characteristics Across Specialization Types

In addition to the differences examined between the latent specialization factors, a second one-way ANOVA was performed to assess differences between six behavioral characteristics across the three specialization types. The behavioral and attitudinal components in the analysis included the following response variables: recreation ecol-

ogy attitudes, resource use and dependency, management perceptions, conservation knowledge, Nature Reserve/park values, and self-reported specialization which are defined in Table 2 and Figure 2. We found a positive, linear trend across specialization and every component examined, and significant differences were reported for all components except for the recreation ecology attitudes and Nature Reserve/park values components (Table 6).

For the Resource use and dependency variable we found significant differences ($F(2,776) = 47.223$, $p<.001$) between clusters, where means for committed (4.146) respondents were significantly higher than the active (3.915) and casual (3.464) respondents. For Management Perceptions the result was also significant ($F(2,780) = 12.086$, $p<.001$), with the same pattern where means for the committed (4.284) respondents were significantly higher than the active (3.950) and casual (4.154) respondents. This pattern was also consistent for Conservation knowledge ($F(2,777) = 31.304$, $p<.001$), where means for committed (2.859) respondents were significantly higher than active (2.525) or casual (2.078) respondents. When we evaluated respondents self-reported level of specialization, the result was intuitive and significant ($F(2,793) = 54.127$, $p<.001$), where the means for committed (3.930) respondents were significantly higher than the active (3.750) and casual (3.690) respondents, but the means among the active and casual respondents did not differ significantly.

Generally, these results indicate that casual recreationists express less agreement than active and committed recreationists when responding to questions such as "the trails I use mean a lot to me." " I have distinct preferences for specific trail attributes," "the trails, terrain, facilities, and infrastructure here are in good condition and adequate maintained", "traveling off designated trails negatively impacts vegetation and wildlife," and "recreation use is compatible with the conservation goals of the Nature Reserve." Casual recreationists were also found to express less familiarity than other participants when relating with statements such as: "the effects of invasive species on plant and animal habitat," "the effect of erosion on water quality and trail conditions," and threatened or endangered species endemic to Orange County."

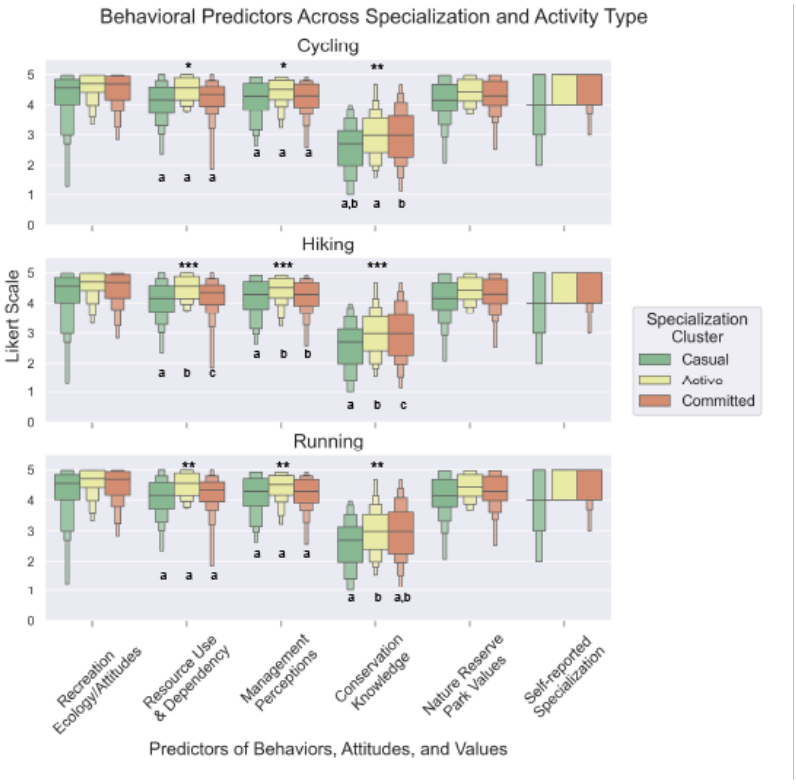
Behavioral and Attitudinal Characteristics Across Specialization Type and Activity Type

We examined the relationship between activity type and specialization types which was significant ($F(2,797) = 7.306$, $p<.001$), and encouraged us to further explore potential differences among the behavioral and attitudinal variables and the primary activity types in the dataset. When the data were split by activity-type, we found the result (Figure 3) was relatively consistent with the behavioral components and specialization cluster in Table 6. Individually, each activity type displayed significant relationships between specialization and resource use and dependency, management perceptions, and conservation knowledge ($p<.05$), but we found there were no significant differences between the three specialization types and recreation ecology attitudes, Reserve/park values, and self-reported specialization ($p>.05$). Among the cyclist respondents, although the resource use and dependency and management perceptions were significant and showed a linear trend, post-hoc tests found no significant differences among specialization clusters. However, for conservation knowledge, the means for committed cyclists were significantly different and higher than those for the active and casual cyclists. Similarly, committed runners reported the same relationship, although post-hoc tests found no significant differences among specialization clusters for other behavioral variables. The clearest differences within activity-type were among hikers,

where we found significant differences among specialization types on the resource use and dependency, management perceptions, and conservation knowledge. Except for management perceptions where committed hikers did not differ significantly from active hikers, mean scores for committed hikers were significantly higher than those for the casual and active hikers for resource use and dependency and conservation knowledge.

Figure 3

Comparison of Behavioral Variables Across Specialization Type and Activity Type



Note: Significance is indicated as * p.05, ** p.01, and *** p.001. Groups with different subscripts are significantly different with Games-Howell at α=.05. Response items in this study were standardized and re-scaled on a 5-point Likert scale to improve interpretation.

Discussion

The ability to group recreationists based on psychological, motivational, and attitudinal elements (Scott et al., 2005), is pivotal in understanding the social drivers of recreation behavior and managing recreation in parks and protected areas. Results from this analysis demonstrate that unique social expressions, and distinct preferences are portrayed among each specialization type as identified by significant differences between specialization type, latent specialization factors, and behavioral and attitudi-

nal components. These findings contribute to the existing knowledge that categorizes individuals based on expressions of involvement, commitment, and skill in discrete time, rather than positioning them along a continuum in which various stages of specialization are developmentally linked (Kerins et al., 2007; Scott and Shafer, 2001). Understanding specialization in this context demonstrates that empirical evidence identified in rural areas may also apply to urban-proximate settings, contributing to a more thorough understanding of specialization theory and a more precise depiction of recreation behavior.

Although the scales in this study are continuous measures, classifying individuals in separate and unique specialization types recognizes the understanding that the latent components comprising specialization type can vary from one individual to the next (i.e., two individuals with the same degree of specialization can have differing combinations of dimensions) (Harshaw et al., 2021). For this reason, findings from this study cannot confirm that a linkage or progression exists between various levels of specialization, or else latent components would be more consistent between recreationists. Therefore, this study suggests that the historically popular terminology referring to specialization "levels" (Scott & Shafer, 2001), implies a temporal specialization progression that may not always exist, and for this purpose specialization will be classified by "type"; groups that are distinct, unconnected, and influenced by socio-cultural factors; a finding that contradicts a suite of historical interpretations of the construct and will provide managers with a new approach for leveraging specialization as a predictive tool.

While using a multivariate procedure to classify recreationists by specialization type, the group recognized as casual, returned significantly lower mean values than the active and committed specialization types regarding two latent specialization factors (Factor 1 and Factor 2). An increasing relationship identified between three specialization types and the majority of historically applied components (Table 2), indicates that this study appropriately classified recreationists based on social similarities, and the statistical clusters were properly associated with their respective specialization types. Non-increasing trends observed between specialization types and two latent specialization factors (Factor 3 and Factor 4), demonstrate that social tendencies can vary among individual recreationists at any given point in their leisure career. However, with respect to the three dimensions initially intended to evaluate specialization: involvement, commitment, and skill, committed recreationists expressed higher mean values than casual recreationists on all accounts. The fact that significantly positive relationships were not identified across specialization types for all social elements, supports the theory that each specialization type is composed of unique social expressions that do not necessarily depict specialization as a developmental process or progression of behavior, attitudes, and preferences (Bryan, 1979).

In addition to classifying recreationists based on specialization type, this study identified behavioral and attitudinal differences occurring within each specialization type. Positive associations were found across the casual, active and committed specialization types and recreation ecology attitudes, resource use and dependency, management perceptions, conservation knowledge, Nature Reserve/park values and self-reported specialization. These findings, notably derived from an urban-proximate study site, coincide with empirical research carried out in wildland settings, indicating that casual or less specialized recreationists have weaker associations with concepts of resource use and dependency, conservation knowledge, management perceptions/

preferences, recreation ecology attitudes, and Reserve/park values. For the population of respondents, a positive relationship was found between specialization and management perceptions, but in empirical research there is an unclear distinction between specialization and management preferences or preferences for site attributes (Lee et al., 2007; Lepp & Herpy, 2015). Despite little previous research reviewing the efficacy of measuring self-reported specialization, specialization types identified by multivariate clustering were positively correlated with self-classifications of the construct (Kerins et al., 2007; Needham et al., 2009; Scott et al., 2005; Sorice et al., 2009). This is an outcome that suggests measuring self-reported specialization can hold as much value (at a population level) as the multivariate classification processes applied in this study.

In comparison to the population of recreationists sampled in the Reserve, activity specific behaviors assisted in understanding how specialization dynamics vary among cyclists, hikers, and runners. For instance, although this study predicted that committed recreationists would return higher responses on Likert scales assessing various values, attitudes and behaviors, the trends displayed by the runner population demonstrate that specialization dynamics may vary according to activity type. Because unique behavioral patterns emerged among specialization types in correspondence with activity, it is likely that not all casual recreationists will evolve to become committed in different avenues. However, in this social analysis, behaviors and attitudes are displayed in discrete time and therefore casual recreationists should not be seen as less specialized than active and/or committed recreationists, because patterns vary from group to group in a unique and unconnected manner. This study provides evidence that specialization should not always be understood as a developmental process (Bryan, 1977, 1979), however it does not suggest that an evolution from one specialization type to the next is impossible. Perhaps, an advancement between specialization types could exist for certain individuals; a realization illuminating the true complexity of specialization theory and the extent in which it drives recreation behavior in an understudied population of urban-proximate recreationists.

Limitations

The initial set of components intended to classify recreation specialization was reduced due to large amounts of variation in response to questions prompting recreationists on; the total estimated cost of replacing all personal hiking, biking, running, etc. equipment, the number of times a recreationist traveled out of state or county in the last year to hike, bike, run, etc., the importance of hiking, biking, running, etc. compared to other activities, and their highest hiking, biking. running, etc. achievement. Although some categories of specialization indicators (enduring involvement, travel intention, economic investment and achievement) were not helpful in measuring specialization, each component used in the classification process (social investment, ability, general knowledge, centrality to lifestyle and participation history) contained an original social dimension of specialization: involvement, commitment, and skill. Additionally, some specialization indicators were limited by their comprising components; centrality to lifestyle, an indicator of involvement, solely included the club membership component, when it could have included involvement in social media or engagement in online platforms. Although the pool of specialization components was reduced to keep the survey brief, it is recommended that a range of components are used to determine each specialization indicator in future studies. Variance in this dataset can also be

attributed to the general nature of recreation specialization as a social theory in which individual and socio-cultural factors are known to advance or impede a recreationists progression along the traditional specialization continuum (Scott & Shafer, 2001). For instance, at any given moment a recreationist's behavior and attitude may change for several complex psychological or socio-cultural reasons.

The analytical approach used to classify specialization with latent components may limit this study's capacity to address the idea of specialization progression, however this approach has been previously applied in specialization research (Bricker & Kersetter, 2000; McIntyre & Pigram, 1992; Scott & Shafer, 2001). Longitudinal research designs have been employed to analyze the specialization continuum theory in past studies (Harshaw et al., 2021) and would be recommended in future applications. Although reporting on attitudes is common practice in recreation resource management (Dyck et al., 2003; Manning, 2022; Sisneros-Kidd et al., 2021), actual behaviors of specialized recreationists cannot be assumed from this review and should be verified with spatio-temporal evidence such as GPS tracking in future analyses (Van Deursen et al., 2024).

Specialization research in urban-proximate park settings is somewhat limited (Kerins et al., 2007; Scott et al., 2005) and therefore it was unintended but not surprising to see varying patterns exhibited in specialization behavior relationships across locations and activities. Norms have been found to be more crystallized in backcountry settings (Manning, 2022), which furthermore contributes to the understanding that social expressions of specialization in this study population could be more variable than they would be in a remote park setting. Additionally, due to the varying opportunities provided by parks in this study, certain locations may be more appealing to active and committed recreationists, while casual recreationists may prefer activities that occur in more controlled settings (health/fitness centers or paved sidewalks/paths) (McFarlane, 1996; Merrill & Graefe, 1998; Virden & Schreyer, 1988); resulting in potential sample bias.

Management Implications

Specialization has enabled recreation resource managers to plan for an array of visitor demands and understand the varying sensitivities individuals have for management actions (McIntyre & Pigram, 1992). Examining specialization within certain activities has also provided managers with information to make resource-oriented decisions and accommodate an influx of users with specific recreation preferences (Merrill & Graefe, 1998). Contributing to these management applications, this study has assisted in revealing relationships between specialization and behaviors, attitudes and values at the Reserve. These findings will be helpful in a prescriptive context, providing park managers with an explanation for why individuals participate in certain activities, choose certain trails, and recreate at certain parks. Even beyond the Reserve, this research contributes to historical schools of thought that use concepts of specialization to improve visitor experience and protect park resources. Understanding that specialists have distinct preferences for trail and environmental features, could provide managers with specific criteria for designing trails and designating trail difficulty ratings. Understanding how goals vary according to specialization type and activity type, can expose a spectrum of environmental, educational and cultural values that would be important to consider when instituting managerial changes. Furthermore, this comprehensive

analysis of a specialization survey can assist in identifying the diverse demographic of recreationists visiting these parks, as well as the visitor experience preferred at each park. In addition, this study has verified that empirical research examining recreation in wildland settings, can be applicable even in an urban-proximate location; findings that have an increasing importance as populations grow in areas with increased access to recreation opportunities.

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