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Regular Paper

Examining Progression in Mountain Bike Specialization: A Nationwide Study

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Abstract

The purpose of this study is to use the recreation specialization construct to examine the diversity of mountain bike riders in the US to meet their needs better, and to help strengthen the sport and the outdoor economy. At one end of the specialization continuum are Completely High Specialists, and at the other end are Completely Low Specialists. As recreationists gain skill and experience, make an activity central to their lifestyle, and invest more in equipment, they can progress in specialization. Little if any research used the construct to study the larger non-competitive and competitive mountain biker population. The authors analyzed a nationwide mountain bike data set collected in 2018 using snowball sampling. There were 13,623 mountain bikers across the US who provided usable online surveys. Specific recommendations are provided to help mountain bikers progress in specialization. Theoretical and methodological implications are also presented.

KEYWORDS: *Recreation specialization, mountain biking, progression, outdoor economy*

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Study Purpose

Recreation Specialization (explained below) is a conceptual framework and managerial tool for understanding the diversity among outdoor recreation activities such as mountain biking. The purpose of this study is to use the Recreation Specialization construct to better understand (1) the diversity of specialization, (2) the desire for progression, (3) the benefits of progression, and (4) ways to promote progression in specialization among mountain bikers in the US. By delineating subtypes of mountain bikers (e.g., market segments), community leaders can better understand their differing sociodemographics, aspirations, motivations, trail preferences, leadership, and contributions to the outdoor economy to help advance the sport.

Market Segmentation

Market segmentation is at the heart of modern marketing (Schneider et al., 2006). It involves grouping recreationists into homogenous categories based on the similarity with one or more variables (Mumuni & Mansour, 2014). As explained next, the authors of this paper specifically used recreation specialization variables to identify segments of mountain bikers. The segments were profiled using the following variables: socio-demographics, aspirations, motivations, trail preferences, leadership, and contributions to the outdoor economy.

Conceptual Framework

Bryan (1977) first defined recreation specialization as "a continuum of behavior from the general to the particular, reflected by equipment and skills used in the sport and activity setting preferences" (p. 175). At one end of the continuum are novices and at the other end are more avid participants. As recreationists gain skill, equipment, participation, and commitment, they can move from novice to expert (Bryan, 1977). For more than 40 years, researchers have examined recreation specialization in the context of hikers, anglers, canoeists and whitewater rafters, boaters, birders, hunters, off-highway vehicle users, campers, rock climbers, hikers and backpackers, skiers, photographers, ultimate frisbee players, scuba divers, and competitive mountain bike racers. The only study on the progression in mountain bike racing specialization was conducted by Shafer and Scott (2013). Surprisingly, little research used a multidimensional construct of recreation specialization to understand the diversity within the larger non-competitive and competitive mountain biker population, including all mountain biking styles.

Researchers generally agree that specialization is multidimensional and consists of behavioral, cognitive, and affective components (Manning, 2022; Scott & Shafer, 2001). Behavioral indicators include past experience (Choi et al., 1994; Hammitt et al., 2004) and investment in equipment (Donnelly et al., 1986). Cognitive variables include skill level (Needham et al., 2005; Vaske et al., 2004) and knowledge (Kerstetter et al., 2001; Lee & Scott, 2004). Indicators of affective attachment and commitment include involvement and centrality to lifestyle (McFarlane, 2004; McIntyre & Pigram, 1992). McFarlene (1994) reported a 3-factor solution to describe these dimensions of specialization in their study. The factors included past experience, centrality to lifestyle, and economic commitment. Similar factors were used in this study and include skill level and experience, centrality to lifestyle, and equipment and investment. A description of each factor follows.

Factor 1: Skill Level and Experience

Skill Level

The cognitive component of an activity can be measured by skill level, expertise, and knowledge (McIntyre & Pigram, 1992). Some studies have employed a self-assessment of skill by respondents (Hammitt, et al., 1989; Kerins et al., 2007; Scott, et al., 2005; Sorice et al., 2009). These studies asked respondents to classify their skill level from beginner to expert.

Experience Use History (EUH)

The "amount and extent of participation by the individual in recreational pursuits" is used to measure EUH (Schreyer et al., 1984, p. 34). Since specialization is a process that occurs over time, Hammitt et al. (1989) argued that "use experience has to be a phenomenon closely related to the specialization process" (p. 212). EUH was initially developed by Williams (1980) to measure behavioral involvement, and it was further developed by Hammitt and McDonald (1983) and Schreyer et al. (1984) as a measure of past experience (e.g., total visits, total years of use, and frequency of use).

Factor 2: Centrality to Lifestyle

The centrality of an activity to a participant's lifestyle is the affective component of specialization and refers to "friends or others and social interactions centered on the activity" as well as the "central role of the activity in the individual's life" (McIntyre & Pigram, 1992, p. 7). Centrality to lifestyle measures the extent of participants' lifestyle and social network connection to an activity (Sutton, 2003). Wellman et al.'s (1982) study of canoeists was one of the first attempts to incorporate centrality into the study of recreation specialization. Other researchers have since included it as a dimension of specialization by asking respondents to report organization or club memberships, social networks, newspaper articles, magazine subscriptions, brochures, books and videos owned, radio and television shows, media use such as websites about an activity, making family and career decisions in light of interest in an activity, and agreement to centrality statements (Beardmore et al., 2013; Bricker & Kerstetter, 2000; Chipman & Helfrich, 1988; Ditton et al., 1992; Kuentzel & McDonald, 1992; Lee, 1993; Scott & Shafer, 2001; Virden & Schreyer, 1988).

Factor 3: Equipment and Investment

Another behavioral component of specialization includes investment in equipment (Donnelly et al., 1986). This type of behavioral commitment often involves the investments made to engage in activities such as purchasing equipment (e.g., number of equipment items owned and value).

Specialization as a Hierarchical or Nonhierarchical Horizontal Phenomena

Specialization can function hierarchically across styles of activities (e.g., worm fishing from a dock to progressing toward fly-fishing on a stream) or it can be nonhierarchical horizontal wherein all styles of mountain biking can reach high degrees of specialization (Nelb & Schuster, 2007). Bryan (1977) suggested that recreationists would progress toward a particular recreation style within an activity such as fly-fishing for angler specialization. On the other hand, Kuentzel (2001) and Scott and Shafer (2001) suggest that there are multiple trajectories toward expert status. "Instead of progressing through stages of participation in well-established activities, leisure participants may instead be sampling from a growing variety of opportunities." (Kuentzel, 2001, pp. 353–354). This study takes on the latter proposition that progression of mountain bike specialization is a nonhierarchical horizontal progression.

Methodology

Survey Development

The online Qualtrics survey instrument was developed based on 18 different surveys that were collected from mountain bike clubs, research publications, IMBA, mountain bike groups, etc. A total of 79 questions were included in the survey after receiving feedback from 16 moun-

tain biking experts and professionals during two review phases. Although the survey was long, it met the goal of gaining a more comprehensive view of the current state of mountain biking.

Data Collection

Data were collected online from August 20 to September 20, 2018 using convenient and snowball sampling techniques facilitated by IMBA using mail, newsletters, paid social media posts on Facebook and Instagram, and a website. The goal of this sampling plan was to seek a wide range of study participants, not just those that are connected by websites, members of clubs, or IMBA. The sample included respondents from all 50 states and Puerto Rico.

Analysis

Data were analyzed using IBM SPSS Statistics Version 28.

1. Study responses were analyzed for completeness.
2. The original scores of the 13 specialization items were standardized into Z-scores (M=0, SD=1) and then examined in factor analysis. Factors were extracted using principal components analysis with varimax rotation.
3. The mean Z-score for each of the factors identified in step 2 was used in a two-step cluster analyses with 2 to 6 clusters specified to find the ideal solution.
4. Statistical differences among the clusters were examined using variables that measure sociodemographics, preferences, aspirations, behaviors, etc.

Results and Discussion

A total of 19,224 individuals clicked on the survey link. Due to the large response rate any survey that was less than 86 percent complete was automatically removed from the final data set (Table 1). Additionally, all international respondents (n=105) were removed because the focus was on mountain bikers in the United States. A total of 5,601 respondents were removed leaving 13,623 included in the final analyses.

Mountain Bike Specialization Variables Were Identified with Guidance from the Literature

A total of 13 specialization items were selected from the survey instrument because they have the potential to belong to one of three dimensions of specialization examined in this study (Table 1). The literature on recreation specialization guided the authors as they reached a consensus in the selection of items.

Table 1
Means and Standard Deviations of the Specialization Variables used in Factor Analysis

Dimensions	Variable names	Survey questions and value labels	Mean (Median)	SD
Skill level and ability/experience (Behavior and Cognitive)	Self-reported skill level	Q1. How would you best describe your mountain biking ability/experience?[a]	3.61 (4.00)	0.85
	Years of participation	Q2. How long have you been mountain biking? (Years)[b]	16.52 (16.00)	10.50

Table 1 (cont.)

Dimensions	Variable names	Survey questions and value labels	Mean (Median)	SD
	Frequency of participation	Q8. During your riding season, how often do you mountain bike?[c]	3.04 (3.00)	0.84
Centrality to lifestyle (Affective)	Family and work trips	Q20. How often do you take your mountain bike with you on family and/or work trips when mountain biking is not the primary goal of trip?[d]	2.90 (3.00)	1.10
	Events attended (races and non-races)	Q21. How many mountain bike events/ festivals (non-races) did you attend in the last 12 months? And, how many mountain bike races did you participate in during the last 12 months?	1.42 (1.00)	3.07
	Engage with others on social media	Q50. How often do you engage with mountain biking companies, individuals, groups, and/or publications on social media?[d]	2.89 (3.00)	1.15
	Share experience on social media	Q51. How often do you use social media to share your mountain bike experiences?[d]	3.07 (3.00)	1.23
	Use Strava	Q52. How often do you use Strava to track your ride?[d]	2.95 (2.00)	1.78
	Engage with community	Q59. What ways do you currently engage with the local mountain bike community?[e]	1.72 (1.55)	0.66
Equipment and investment (Behavior)	Frequency of mountain bike purchases	Q15. How often do you purchase a mountain bike? (In years)	4.79 (4.00)	3.94
	Money spent on last mountain bike	Q16. Approximately how much money did you spend on your last mountain bike purchase?	3,424.81 ($3,000)	2,133.28
	Money spent on mountain bike maintenance	Q17. Annually, how much did you spend on maintaining your mountain bike?	405.68 ($300)	696.54
	Money spent on mountain bike equipment	Q18. Annually, how much do you spend on mountain bike related equipment and accessories?	476.21 ($300)	896.14

a. Measured on a 5-point scale (1=Beginner or new rider, 2=Novice, 3=Intermediate, 4=Advanced, 5=Expert)
b. Measured on a 5-point scale (1=Daily, 2=4-6 times a week, 3=2-3 times a week, 4=Once a week, and 5=A few times a year).
c. Measured on a 6-point scale (1=A few times a year, 2=A couple of times a month, 3=Once a week, 4=2-3 times a week, 5=4-6 times a week, 6=Daily).
d. Measured on a 5-point scale (1=Never, 2=Seldom, 3=Sometimes, 4=Frequently, 5=Always)
e. Measured with a mean score of 11 items (Lead group rides, Participate in group rides, Coach skills clinics, Participate in skills clinics, Volunteer at mountain bike events, Help with a NICA program, Participate in local races, Volunteer at local races, Attend your local mountain bike group's meetings, Attend meetings with land managers to advocate for mountain bikers, Contact my elected officials on behalf of mountain biking). Items measured on a 6-point scale (1=Never, 2=Once a year, 3=A few times a year, 4=Once a month, 5=Several times a month, and 6=Weekly).

The Specialization Dimensions Are Reliable and Valid

The original scores of the 13 specialization items that were defined in Table 1 were standardized into Z-scores (M=0, SD=1) and then examined in factor analysis (Table 2). Factors were extracted using principal components analysis with varimax rotation (Table 2). Four factor items that cross-loaded (<0.15) and had the lowest loading scores (<.50) were dropped from the factor and later analyses. Hasegawa and Gudykunst (1998) suggest that cross loading of 0.15 or more should be excluded from further analysis.

Three factors were identified (i.e., centrality to lifestyle, skill level and experience, and equipment and investment). They were similar to the specialization construct used to examine other recreational activities, especially the three-factor solution by McFarlene (1994) which included centrality to lifestyle, past experience, and economic commitment. The three-factor solution had eigenvalues greater than 1.0, and the total variance explained in the analysis (Table 2) is nearly 50%, which is considered acceptable (Streiner, 1994). Finally, the standardized Cronbach's alpha coefficients also indicate that the factors are reliable (have internal consistency) and measure their respective specialization dimensions: centrality to lifestyle, skill level and experience, and equipment and investment.

Table 2

Factor Loading Scores for Mountain Bike Specialization Variables

Specialization variables	Factor 1 Centrality to lifestyle	Factor 2 Skill level and experience	Factor 3 Equipment and investment
Share experience on social media	**.79**	-.06	-.01
Engage with others on social media	**.75**	.01	-.02
Engage with the community	**.66**	.25	.11
Events attended	**.54**	.14	.20
Use Strava	**.50**	-.16	.15
Frequency of participation[a]	.42	.35	.30
Frequency of mountain bike purchases[a]	-.41	.03	-.38
Family and work trips[a]	.41	.30	.08
Years of participation	-.18	**.82**	-.10
Self-reported skill level	.16	**.81**	.15
Money spent on last mountain bike[a]	.14	.47	.44
Money spent on mountain bike equipment	.09	.04	**.80**
Money spent on mountain bike maintenance	.06	.09	**.79**
Eigenvalues	3.47	1.76	1.25
Percentage of variance explained	26.66	13.56	9.61
Total variance explained	49.83		
Scale reliability: Cronbach's alpha (based on standardized items)	.719 (5 items)	.669 (2 items)	.657 (2 items)

[a] Items deleted after factor analysis due to cross loading.

In addition to the high factor loading scores and acceptable reliability coefficients for all three factors, the measures were also developed from a reasonable theoretical base and conceptual definition allowing the authors to interpret the factors in a meaningful way. As already mentioned, the three factors identified (centrality to lifestyle, skill level and experience, and equipment and investment) in Table 2 were similar to the specialization construct used to examine other recreational activities, especially the three-factor solution by McFarlene (1994). Furthermore, the first factor (centrality to lifestyle) has traditionally measured the use of printed media such as magazines, books, brochures, and newspaper articles. Similarly, this study used social media and other forms of engagement with the community as a measure of centrality to lifestyle. The second factor (skill level and experience) identified in this study is equivalent to Virden and Schreyer's (1988) 2-item domain that explains General Experience in hiking special-

ization (1. years of hiking experience and 2. self-rated level of hiking experience). The third factor identified in this study is similar to Needham and Vaske's (2013) 2 item domain that explains equipment (1. I have accumulated a lot of deer/elk hunting equipment and 2. I have invested a lot of money in deer/elk hunting equipment).

A Four-Cluster Solution Was Used to Create the Typology of Mountain Bikers

After confirming the reliability and validity of the specialization variables, the mean Z-score for each of the three factors was calculated and used in a two-step cluster analysis. Cluster analysis was used to group respondents into homogeneous groups based on three dimensional specialization scores. Noise handling was selected in SPSS to remove outliers. After randomly sorting the data, 2 to 6 clusters were examined, and based on criteria provided by Weinstein (1987), a four-cluster solution was selected with 75 outliers removed (Table 3). The criteria provided by Weinstein (1987) include homogeneity within the segment, heterogeneity between segments, sizable population, and meaningful segment data (e.g., segment data that are most practical and usable). Furthermore, 50% of the sample was randomly selected, and the same 2-step cluster analysis was conducted to confirm the stability of the four-cluster solution. Each cluster was given a name (Completely High Specialists, Purely Skill and Experience Specialist, Purely Centrality to Lifestyle Specialist, and Completely Low Specialist) based on the pattern of mean scores across the three dimensions of specialization that were identified in this study.

ANOVA results in Table 3 verified that mean Z-scores of each factor of specialization differed significantly across the three clusters: centrality to lifestyle (F = 8040.17, p<.001, η^2=.656), skill level and experience (F = 6957.48, p<.001, η^2=.623), and equipment and investment (F = 922.23, p<.001, η^2 = .179). Eta-squared (η^2) values measured the effect size or the strength of association and ranged from .179 to .656. Eta-squared values equal to .01 are small effects, .06 are medium effects, and .14 or higher are large effects. Scheffe's post hoc test was also used because it manages unequal group sizes and provides more conservative results (Vaske, 2008). Completely High Specialists had significantly (p<.001) higher centrality to lifestyle, skill level and experience, and equipment and investment. On the other end of the spectrum, completely low specialist had significantly lower levels of all three factors than most other groups (Scheffe's test, p<.001). The Completely High Specialists were above average (positive mean Z-scores) and low specialists were below average (negative mean Z-scores) in all three factors. Purely Skill and Experience Specialists had the highest levels of skill level and experience (p<.001) among the groups, and it was the only positive mean Z-score for that group (mean Z=0.65). Purely Centrality to Lifestyle Specialists had the second highest level of centrality to lifestyle (p<.001) among the groups and it was the only positive mean Z-score for that group (mean Z=0.16).

Table 3
Mean Z-Scores of Specialization Factors by Clustered Specialization Groups

Factor	Clusters					
	High (*n*=3,119)	**Skill/Experience (*n*=4,145)**	**Lifestyle (*n*=3,399)**	**Low (*n*=1,991)**	***F*-test**	η^2
Centrality to lifestyle	0.82a	-0.45b	0.16c	-0.60d	8040.17*	.656
Skill level & experience	0.42a	0.65b	-0.56c	-1.12d	6957.48*	.623
Equipment & investment	0.32a	-0.11b	-0.11b	-0.32c	922.23*	.179

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, p<.001).
*Significant (p<.001)

Who Are the Completely High Specialists When Compared to the Other Groups?

Similar to Dorow et al. (2010), the four subtypes of mountain bikers were first profiled based on demographic variables. The Purely Skill and Experience (90.7%) and Completely High Specialist (82.1%) groups had substantially more males ($p<.05$). They were also more likely married with kids that also ride mountain bikes ($p<.05$). It is important to note that Purely Centrality to Lifestyle (21.1%) and Completely Low Specialists (25.9%) were more likely single with smaller household incomes ($F=27.31$, $p<.001$). Finally, the Skill/Experience Specialists were significantly older ($M=50.34$ years) than the other three groups.

Recommendations

Loneliness and isolation is considered an epidemic in the United States with serious health risks (Office of the Surgeon Geneal, 2023). Nguyen et al. (2020) identified a significant association between loneliness and not having a spouse or partner ($p<.001$) across all age groups examined in their large nationwide survey. Given the high percentage of single mountain bikers that are Low Specialists (Table 4), community leaders should help them find opportunities to socialize with other mountain bikers in the community. It also appears that High and Skill/Experience Specialists are more likely to pass on the sport to their kids which is another reason to support progression.

This study further confirms that mountain biking tends to be a male-dominated sport. Therefore, another important way communities can advocate for progression and growth within the mountain population is to better understand barriers or constraints to women's participation in mountain biking. Irvin et al. (2021) found that study participants ($n=150$ women in Northwest Arkansas) were most likely to agree with the following ten of thirty constraints: I would like to try the sport before I financially invest in the gear ($M=3.95$), mountain biking is a male-dominated sport ($M=3.88$), the gear is too expensive ($M=3.87$), I would prefer to learn how to mountain bike from a female instructor ($M=3.71$), I would like to learn mountain bike in an all-female environment ($M=3.63$), my friends prefer to do other things ($M=3.58$), people who ride mountain bikes are super athletic ($M=3.57$), I cannot afford to buy a mountain bike ($M=3.43$), I don't know what trails are safe ($M=3.34$), and mountain biking looks scary ($M=3.31$). They recommend demonstrating inclusion in the sport (e.g., deconstructing the idea that women need expensive shoes and clothing), allowing women to borrow equipment, and providing same-sex programming (specifically for women) to encourage entry and participation in the sport.

What States Had the Largest Percentage of Purely Centrality to Lifestyle and Completely Low Specialists?

The state of full-time residence by clustered specialization groups is reported in Table 5. The percentages are often small because the sample is divided among 50 states (and Puerto Rico). Therefore, when percentages are two or three times larger in one specialization group compared to other groups, the results are often significant and meaningful despite the overall small percentages.

Recommendation

The states with significantly ($p<.05$) larger percentages of Purely Centrality to Lifestyle and/or Completely Low Specialists include Florida, Illinois, Indiana, Iowa, Kentucky, Minnesota, Missouri, New York, North Carolina, and Ohio. These states may benefit the most from this paper's recommendations regarding progression in mountain bike specialization.

Table 4

Sociodemographics Characteristics by Clustered Specialization Groups

Characteristics	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*[4]
Gender[1]							
Female	541 (17.4%)[a]	367 (8.9%)[b]	843 (24.8%)[c]	544 (27.4%)[d]	461.64*	6	.14*
Male	2,556 (82.1%)[a]	3,748 (90.7%)[b]	2,538 (74.8%)[c]	1,427 (71.9%)[d]			
Other	16 (0.5%)[a]	17 (0.4%)[a]	14 (0.4%)[a]	15 (0.8%)[a]			
Marital Status[1]							
Single	503 (16.3%)[a]	547 (13.3%)[b]	716 (21.2%)[c]	511 (25.9%)[d]	187.73*	15	.07*
Married	2,246 (72.6%)[a]	3,148 (76.6%)[b]	2,321 (68.7%)[c]	1,260 (63.9%)[d]			
Divorced	223 (7.2%)[a]	257 (6.3%)[a]	208 (6.2%)[a]	123 (6.2%)[a]			
Separated	25 (0.8%)[a]	31 (0.8%)[a,b]	14 (0.4%)[b]	15 (0.8%)[a,b]			
Widowed	19 (0.6%)[a]	21 (0.5%)[a]	18 (0.5%)[a]	9 (0.5%)[a]			
Other	79 (2.6%)[a]	105 (2.6%)[a]	101 (3.0%)[a]	54 (2.7%)[a]			
Have Kids[1]							
Yes, and they ride mountain bikes	1,331 (55.3%)[a]	1,666 (53.8%)[a]	1,043 (41.7%)[b]	506 (37.4%)[c]	193.03*	3	.14*
Yes, but they do not ride	967 (40.2%)[a]	1,462 (47.2%)[b]	1,204 (48.1%)[b]	715 (52.8%)[c]	63.60*	3	.08*
					F-test		η^2
Age[3]	44.97[a]	50.34[b]	43.10[c]	44.23[a]	304.87*		.068
Household Income (2017)[3]	145,602[a]	151,791[a]	132,584[b]	117,111[c]	27.31*		.011

*Significant (p<.001)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, p<.05).

[3]Cluster means with different superscripts indicate significant difference (Scheffe's test, p<.01).

[4]Cramer's V is a measure of strength of association between two variables.

Table 5
State of Full-Time Residence by Clustered Specialization Groups

State[1]	Clusters[2]				χ^2	*df*	Cramer's
	High	Skill/Experience	Lifestyle	Low			*V*
	n=3,119	*n*=4,145	*n*=3,399	*n*=1,991			
Alabama	40 (1.3%)[a]	18 (0.4%)[b]	40 (1.2%)[a]	22 (1.1%)[a]	792.22*	153	.15*
Alaska	10 (0.3%)[a]	22 (0.5%)[a]	13 (0.4%)[a]	7 (0.4%)[a]			
Arizona	115 (3.7%)[a]	74 (1.8%)[b]	114 (3.4%)[a]	45 (2.3%)[b]			
Arkansas	51 (1.6%)[a]	23 (0.6%)[b]	48 (1.4%)[a]	28 (1.4%)[a]			
California	484 (15.6%)[a]	693 (16.8%)[a]	392 (11.6%)[b]	220 (11.1%)[b]			
Colorado	352 (11.3%)[a]	718 (17.4%)[b]	281 (8.3%)[c]	161 (8.1%)[c]			
Connecticut	24 (0.8%)[a]	37 (0.9%)[a]	29 (0.9%)[a]	16 (0.8%)[a]			
Delaware	6 (0.2%)[a]	11 (0.3%)[a]	9 (0.3%)[a]	6 (0.3%)[a]			
DC	7 (0.2%)[a]	5 (0.1%)[a,b]	2 (0.1%)[a,b]	0 (0.0%)[b]			
Florida	42 (1.4%)[a]	73 (1.8%)[a,b]	94 (2.8%)[c]	48 (2.4%)[b,c]			
Georgia	122 (3.9%)[a]	107 (2.6%)[b]	142 (4.2%)[a]	74 (3.7%)[a]			
Hawaii	11 (0.4%)[a]	12 (0.3%)[a]	9 (0.3%)[a]	2 (0.1%)[a]			
Idaho	49 (1.6%)[a]	107 (2.6%)[b]	47 (1.4%)[a]	29 (1.5%)[a]			
Illinois	35 (1.1%)[a]	70 (1.7%)[b]	80 (2.4%)[c]	56 (2.8%)[c]			
Indiana	32 (1.0%)[a]	38 (0.9%)[a]	56 (1.7%)[b]	40 (2.0%)[b]			
Iowa	25 (0.8%)[a]	29 (0.7%)[a]	19 (0.6%)[a]	37 (1.9%)[b]			
Kansas	15 (0.5%)[a,b]	12 (0.3%)[b]	24 (0.7%)[a]	16 (0.8%)[a]			
Kentucky	25 (0.8%)[a]	24 (0.6%)[a]	28 (0.8%)[a]	30 (1.5%)[b]			
Louisiana	1 (0.0%)[a]	4 (0.1%)[a]	10 (0.3%)[b]	3 (0.2%)[a,b]			
Maine	12 (0.4%)[a,b]	26 (0.6%)[b]	11 (0.3%)[a,b]	4 (0.2%)[a]			
Maryland	44 (1.4%)[a]	64 (1.5%)[a]	56 (1.7%)[a]	28 (1.4%)[a]			

Table 5 (cont.)

State[1]	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
Massachusetts	46 (1.5%)[a]	64 (1.5%)[a]	60 (1.8%)[a]	16 (0.8%)[b]	792.22*	153	.15*
Michigan	142 (4.6%)[a]	149 (3.6%)[b]	151 (4.5%)[a,b]	97 (4.9%)[a]			
Minnesota	83 (2.7%)[a]	119 (2.9%)[a,b]	125 (3.7%)[c]	75 (3.8%)[b,c]			
Mississippi	10 (0.3%)[a,b]	7 (0.2%)[b]	12 (0.4%)[a,b]	9 (0.5%)[a]			
Missouri	45 (1.4%)[a]	29 (0.7%)[b]	83 (2.4%)[c]	42 (2.1%)[a,c]			
Montana	41 (1.3%)[a]	88 (2.1%)[b]	29 (0.9%)[a]	26 (1.3%)[a]			
Nebraska	11 (0.4%)[a,b]	10 (0.2%)[b]	13 (0.4%)[a,b]	14 (0.7%)[a]			
Nevada	21 (0.7%)[a]	34 (0.8%)[a]	16 (0.5%)[a]	8 (0.4%)[a]			
New Hampshire	21 (0.7%)[a]	32 (0.8%)[a]	26 (0.8%)[a]	9 (0.5%)[a]			
New Jersey	28 (0.9%)[a]	30 (0.7%)[a]	21 (0.6%)[a]	19 (1.0%)[a]			
New Mexico	33 (1.1%)[a]	61 (1.5%)[a]	34 (1.0%)[a]	24 (1.2%)[a]			
New York	58 (1.9%)[a]	119 (2.9%)[b]	86 (2.5%)[a,b]	62 (3.1%)[b]			
North Carolina	124 (4.0%)[a,b]	160 (3.9%)[b]	170 (5.0%)[c]	99 (5.0%)[a,c]			
North Dakota	7 (0.2%)[a]	2 (0.0%)[b]	10 (0.3%)[a]	1 (0.1%)[a,b]			
Ohio	75 (2.4%)[a]	95 (2.3%)[a]	163 (4.8%)[b]	101 (5.1%)[b]			
Oklahoma	19 (0.6%)[a]	9 (0.2%)[b]	25 (0.7%)[a]	12 (0.6%)[a]			
Oregon	96 (3.1%)[a]	161 (3.9%)[a]	105 (3.1%)[a]	65 (3.3%)[a]			
Pennsylvania	97 (3.1%)[a]	135 (3.3%)[a]	99 (2.9%)[a]	66 (3.3%)[a]			
Puerto Rico	2 (0.1%)[a]	0 (0.0%)[a]	2 (0.1%)[a]	0 (0.0%)[a]			
Rhode Island	8 (0.3%)[a]	7 (0.2%)[a]	9 (0.3%)[a]	5 (0.3%)[a]			
South Carolina	22 (0.7%)[a]	24 (0.6%)[a]	22 (0.6%)[a]	9 (0.5%)[a]			
South Dakota	18 (0.6%)[a]	6 (0.1%)[b]	7 (0.2%)[b]	7 (0.4%)[a,b]	792.22*	153	.15*
Tennessee	77 (2.5%)[a]	62 (1.5%)[b]	108 (3.2%)[a]	50 (2.5%)[a]			
Texas	113 (3.6%)[a]	90 (2.2%)[b]	133 (3.9%)[a]	63 (3.2%)[a]			

Table 5 (cont.)

State[1]	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
Utah	68 (2.2%)[a]	73 (1.8%)[a]	60 (1.8%)[a]	21 (1.1%)[b]			
Vermont	35 (1.1%)[a,b]	48 (1.2%)[b]	32 (0.9%)[a,b]	12 (0.6%)[a]			
Virginia	89 (2.9%)[a,b]	95 (2.3%)[b]	102 (3.0%)[a,b]	65 (3.3%)[a]			
Washington	91 (2.9%)[a]	126 (3.0%)[a]	60 (1.8%)[b]	57 (2.9%)[a]			
West Virginia	13 (0.4%)[a]	19 (0.5%)[a]	15 (0.4%)[a]	4 (0.2%)[a]			
Wisconsin	90 (2.9%)[a]	76 (1.8%)[b]	85 (2.5%)[a]	60 (3.0%)[a]			
Wyoming	26 (0.8%)[a]	39 (0.9%)[a]	22 (0.6%)[a]	17 (0.9%)[a]			

*Significant (p<.001)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, p<.05)

Most Purely Centrality to Lifestyle or Completely Low Specialists Expressed a Desire to Progress in Mountain Bike Specialization

The motivations and aspirations of mountain bikers suggest that the Purely Skill and Experience Specialists are the most likely to have reached a ceiling in progression. On the other hand, the Purely Centrality to Lifestyle and Completely Low Specialists are more motivated and aspire to progress. That is, both High and Skill/Experience Specialists ranked the motivation, 'To develop and improve my riding skills', significantly lower (F=51.23, p<.001) than the other two groups with the second highest effect size (η^2=.012) among all nine motivations that were examined (Table 6). Moreover, they were substantially more content (21.0% and 30.5% respectively) with their current mountain biking experiences when compared to the Completely Low (10.8%) and Purely Centrality to Lifestyle Specialists (16.1%) (Table 7). High and Skill/Experience Specialists were also substantially less likely (8.5% and 7.3% respectively) to aspire to become proficient riding technical trails when compared to the Lifestyle and Low Specialists (18.6% and 26.4% respectively).

Recommendations

Better meet the needs of Lifestyle and Low Specialists to promote progression in specialization. Examples of how the mountain bike community can help promote progression are provided throughout this paper, especially Tables 17, 18, and 19.

Table 6
Reasons for Mountain Biking by Clustered Specialization Groups

Motivations[1]	Clusters				*F*-test	η^2
	High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)		
Recreation (fun)	1.41[a]	1.70[b]	1.61[c]	1.81[d]	49.42*	.012
Connecting with nature	0.48[a]	0.60[b]	0.55[b]	0.61[b]	12.19*	.003
Exercise (health and fitness)	1.27[a]	1.52[b]	1.45[b]	1.51[b]	34.06*	.008
Relaxation (escape from everyday life)	0.70[a]	0.67[a]	0.68[a,b]	0.58[b]	5.84*	.001
Socializing/hanging out with family/friends	0.43[a]	0.26[b]	0.34[c]	0.24[b]	40.67*	.010
To develop and improve my riding skills	0.26[a]	0.15[b]	0.32c	0.33[c]	51.23*	.012
Training for racing/competition	0.36[a]	0.09[b]	0.12[b]	0.03[c]	209.30*	.047
Excitement/Action/ Adrenaline	0.64[a]	0.60[a]	0.58[a]	0.49[b]	9.34*	.002
Explore new places	0.44	0.40	0.38	0.38	4.23*	.001

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
[1]Items re-coded with 3 being the top reason and 1 being ranked last. Items that were not ranked among the top 3 were coded with a 0 value for the analysis. Nonresponse to all variables was treated as missing data.
*Significant ($p<.001$)

Table 7
Highest Aspirations by Clustered Specialization Groups

Highest Aspiration[a]	Clusters[2]				χ^2	*df*	Cramer's *V*
	High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991			
What is your mountain biking dream/highest aspiration?[b]					1263.2*	24	.18*
Participate in a race	11 (0.4%)[a]	21 (0.5%)[a]	58 (1.7%)[b]	34 (1.7%)[b]			
Win a mountain bike race	164 (5.3%)[a]	55 (1.3%)[b]	125 (3.7%)[c]	27 (1.4%)[b]			
Go on a bikepacking trip (multi-day bike camping)	281 (9.0%)[a]	430 (10.4%)[a,b]	384 (11.3%)[b]	238 (12.0%)[b]			
Take multi-day mountain bike vacation to a destination location (ex. Moab, UT)	1,068 (34.3%)[a]	1,237 (29.9%)[b]	1,339 (39.4%)[c]	618 (31.0%)[b]			
Ride challenging, remote backcountry trails	437 (14.0%)[a]	570 (13.8%)[a]	350 (10.3%)[b]	139 (7.0%)[c]			

Table 7 (cont.)

Highest Aspiration[a]	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
Get into dirt-jumping or downhilling	40 (1.3%)[a,b]	34 (0.8%)[b]	52 (1.5%)[a,c]	43 (2.2%)[c]			
Become proficient riding technical trails	264 (8.5%)[a]	304 (7.3%)[a]	631 (18.6%)[b]	525 (26.4%)[c]			
I'm content with my current mountain biking experiences	655 (21.0%)[a]	1268 (30.5%)[b]	368 (10.8%)[c]	321 (16.1%)[d]			
Other	197 (6.3%)[a]	233 (5.4%)[a]	90 (2.6%)[b]	46 (2.3%)[b]			

*Significant (p<.001)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, $p<.05$).

Recreation Specialization is Not Always Linear

Earlier specialization research typically grouped recreationists along a linear specialization continuum (e.g., low, medium, and high) using a single item or the sum of responses across dimensions. Currently that approach is considered too simplistic in the profession because progression is not always linear. Some people can progress, decline, or maintain their status along a specialization spectrum (or within one or more dimensions of specialization) due to changes in leisure, work, or personal circumstances (Scott & Shafer, 2001). For example, "Progression is multi-dimensional and people's involvement can be expected to change in a variety of ways. Over time, some individuals may continue to participate in activities regularly and accrue commitments but exhibit little evidence of skill development (Scott & Godbey, 1992, 1994). Other individuals may participate in leisure activities infrequently but demonstrate a high level of skill development and personal commitment." (Scott & Shafer, 2001, p. 338). Therefore, what has been considered mid-level specialization (e.g., intermediate) in previous research was considered single dimension specialists (i.e., Purely Skill Level and Experience Specialist and Purely Centrality to Lifestyle Specialist) in this study. These findings complement Scott and Shafer's (2001) proposition that progression is multidimensional and people do not "progress in behavior, skills, and commitments in a lock step fashion." (p. 338). "Kuentzel and McDonald (1992) made the same point in their study of paddlers. They noted that commitment and lifestyle involvement did not keep pace with experience (i.e., skill and years of participation)." (Scott & Shafer, 2001, p. 338). This is consistent with the Purely Skill and Experience Specialists which had a significantly higher skill level and experience in this study. Kuentzel and McDonald (1992) suggest this might be due to ceiling effects in commitment or lifestyle changes, but to be certain, they believe time series data are needed to examine this. Although this study did not use time series data, it did include an innovative question (see Table 7) that asked respondents to report their mountain biking dream/highest aspiration. This study supports a ceiling effect for Skill/Experience Specialists but not for the Lifestyle and Low Specialists.

Recommendations

Future research should examine the advantages or benefits of becoming a single factor mountain bike specialists (e.g., Purely Centrality to Lifestyle Specialists with an above aver-

age score in centrality to lifestyle) rather than an intermediate specialist (or average/mid-level specialists in or among two or more specialization factors). It is well known that the average camper does not exist (Shafer, 1969). The same seems to be true for mountain bikers. The four clusters reflect some of the diversity within the population. Perhaps more interestingly, there were no mean Z-scores near 0 in Table 3, which suggests that there is no such thing as an average mountain biker even within any single specialization factor (centrality to lifestyle, skill level and experience, and equipment and investment). Finally, future research examining progression in specialization should consider measuring aspirations and motivations if time series data are unavailable.

Completely High Specialists Contribute More to the Outdoor Economy

As already mentioned, the Completely High Specialists spend more on mountain bike equipment and other investments which contributes to more retail sales (Table 3). As tourists, they also make the greatest contributions to the outdoor economy especially when compared to the Completely Low Specialists. They are most likely to (96.2%) and more frequently (M=10.25 times per year) travel beyond their local trails (p<.001) (Tables 8 and 9). They are most likely to take longer trips (overnight, weekend, 4+ days, week long, and multiple weeks), travel with more people (M=3.95), spend more per day during trips beyond their local trails (M=$261.96/day), take their mountain bike with on family and/or work trips (M=3.55 on a 5-point scale), attend mountain bike events/festivals (non-races) (M=2.83/year), and participate in mountain bike races (M=3.54/year) (Tables 9, 10, and 11).

Recommendations

An important contribution of this paper, especially within the context of the special issue, is realizing that progression in mountain bike specialization can help grow the outdoor economy. As an aside, the aforementioned results (like most of the results presented in this paper) can provide additional insight on how to help promote progression. In this instance, the data suggest engaging (e.g., recruiting new members to various mountain bike organizations and providing information about volunteering opportunities) with Low Specialists on local trails where they are more likely to be found.

Table 8

Travel Beyond Local Trails by Clustered Specialization Groups

Trip Characteristics	Clusters[2] High n=3,119	Skill/Experience n=4,145	Lifestyle n=3,399	Low n=1,991	χ^2	df	Cramer's V
Did you travel beyond your "local" trails in the last 12 months to mountain bike?[1]					1129.69*	3	.299*
Yes	3,000 (96.2%)[a]	3,472 (83.8%)[b]	2,983 (87.8%)[c]	1,232 (61.9%)[d]			

*Significant (p<.001)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, p<.05).

Table 9
Mountain Bike Tourism by Clustered Specialization Groups

	Clusters					
	High (*n*=3,119)	**Skill/Experience (*n*=4,145)**	**Lifestyle (*n*=3,399)**	**Low (*n*=1,991)**	***F*-test**	η^2
How many times in the past 12 months did you travel beyond your "local" trails to mountain bike?	10.25[a]	6.52[b]	6.40[b]	4.15[c]	88.07*	.024
Please indicate how many of the following trips you made beyond your "local" trails to mountain bike in the past 12 months.						
Overnight	3.49[a]	2.21[b]	2.19[b]	1.38[c]	47.33*	.016
Weekend	4.21[a]	2.86[b]	2.67[b]	1.87[a]	59.99*	.019
4+ days	1.34[a]	1.07[b]	0.84[c]	0.59[d]	58.72*	.021
Week-long	0.79[a]	0.61[b]	0.50[c]	0.35[d]	39.70*	.015
Multiple weeks	0.39[a]	0.45[a]	0.29[a]	0.18[a]	1.32	.001
On average how many people are in your group when traveling beyond your local trails to mountain bike?	3.95[a]	3.04[b]	3.00[b]	2.59[b]	12.84*	.006

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
*Significant ($p<.001$)

Table 10
Daily Trip Expenditures by Clustered Specialization Groups

	Clusters					
Daily Expenditures	**High (*n*=3,119)**	**Skill/Experience (*n*=4,145)**	**Lifestyle (*n*=3,399)**	**Low (*n*=1,991)**	***F*-test**	η^2
On your last trip how much did you spend PER DAY when traveling beyond your "local" trails to mountain bike?						
Total Sum	261.96[a]	223.74[b]	221.01[b]	200.52[b]	29.51*	.008

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
*Significant ($p<.001$)

Table 11
Mountain Bike Experiences by Clustered Specialization Groups

Mountain Experiences[1]	Clusters					
	High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)	*F*-test	η^2
How often do you take your mountain bike with you on family and/or work trips when mountain biking is not the primary goal of the trip?[1]	3.55[a]	3.04[b]	3.12[c]	2.54[d]	381.46*	.083
How many mountain bike events/festivals (non-races) did you attend in the last 12 months?	2.83[a]	0.72[b]	1.39[c]	0.53[d]	693.87*	.141
How many mountain bike races did you participate in during the last 12 months?	3.54[a]	0.49[b]	0.96[c]	0.17[d]	993.16*	.191

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
[1]Items measured on a 5-point scale (1=Never, 2=Seldom, 3=Sometimes, 4=Frequently, and 5=Always).
*Significant ($p<.001$)

Completely High Specialists are Leaders in the Mountain Biking Community

High Specialists are substantially more likely to be leaders or board members of a local mountain bike group/club (26.3%, $p<.001$) when compared to the other three groups (Table 12). High Specialists also volunteer at least 2 to 3 times more hours (M=55.25 hours/year) and donate 2 to 4 times more money (M=$312.60/year, $p<.001$) to do trail work when compared to other groups (Table 13). Among the 11 items examined, the six most common ways (based on mean scores and effect sizes) all study participants engage with the local mountain bike community are reported in Table 14. They include: (1) *Participate in group rides,* (2) *Lead group rides,* (3) *Participate in local races,* (4) *Volunteer at mountain bike events,* (5) *Attend your local mountain bike group's meeting,* and (6) *Volunteer at local races.* Although they were among the most common for all study participants, they were significantly higher for the High Specialists ($p<.001$). Among the top 3 of 6 items examined, all study participants also think it is important that mountain bikers (1) *volunteer to maintain trails,* (2) *pay for trail development*, and (3) *volunteer but they do not have time* (Table 15). The High Specialists were significantly ($p<.001$) more likely to agree with the first two items above. Low Specialists were significantly ($p<.001$) more likely to agree with item 3 above. Among the 8 items examined, the top two threats to gaining/enhancing trail access by all participants were *Liability issues* and *Lack of available public lands.* Interestingly, these were significantly (p<.001) greater threats for Low Specialists (Table 16). However, the High Specialists were most concerned with 14 of 15 mountain biking issues examined in the study. The four most concerning issues (and with the largest effect sizes) for the High Specialists

were included in Table 16. *Motorized vehicles (ATVs and Motorcycles) on trails* was the only issue provided in Table 16 that was significantly ($p<.001$) more concerning for the Low Specialists.

Recommendations

Promote mountain bike progression to help develop more leaders in the community. This can be done by inviting all mountain bikers to participate in group rides, bike races (as participants or volunteers especially at local races), special events, and group meetings. Low Specialists believe it is important to volunteer (especially to maintain trails), but they do not have time. The lack of free time is a common reason for Americans not volunteering. This is especially true for all the specialization groups identified in this study except the Completely High Specialists. There are a lot of helpful tips available online regarding how to recruit volunteers in these situations. For example, it is helpful to make volunteering more accessible by creating volunteering opportunities at schools if parents have children or ask employers to encourage volunteerism. Be more flexible with volunteer times and consider evenings or weekend hours. Teach something new to volunteers to help them build their resume, while having fun.

Finally, issues and concerns that might attract Low Specialists to leadership roles include liability issues, lack of available public lands, and motorized vehicles (ATVs and Motorcycles) on trails.

Table 12

Leader or Board Member by Clustered Specialization Groups

Leader or Board Member	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
Are you a leader or board member of your local mountain bike group/club[1]					1102.27*	6	.209*
Yes	820 (26.3%)[a]	251 (6.1%)[b]	257 (7.6%)[c]	32 (1.6%)[d]			
No	2,235 (71.7%)[a]	3,750 (90.6%)[b]	3,036 (89.3%)[b]	1,864 (93.8%)[c]			
We do not have a local group/club	62 (2.0%)[a]	137 (3.3%)[b]	105 (3.1%)[b]	92 (4.6%)[c]			

*Significant ($p<.001$)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, $p<.05$).

Table 13
Trail Maintenance Commitment by Clustered Specialization Groups

Commitment	Clusters				*F*-test	η^2
	High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)		
How much money (annually) do you normally contribute toward trail maintenance and stewardship?	$312.60[a]	$142.77[b]	$119.01[b]	$70.66[b]	61.49*	.015
Annually, how many hours do you volunteer for trail maintenance and/or building?	55.23[a]	20.97[b]	21.24[b]	14.42[b]	104.13*	.019

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
*Significant ($p<.001$)

Table 14
Ways Currently Engage with the Local Mountain Bike Community by Clustered Specialization Groups

Community Engagement	Clusters				*F*-test	η^2
	High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)		
What ways do you currently engage with the local mountain bike community?[1]						
Lead group rides	3.08[a]	1.52[b]	1.86[c]	1.21[d]	1179.42*	.219
Participate in group rides	4.10[a]	2.35[b]	3.12[c]	1.97[d]	1176.75*	.218
Volunteer at mountain bike events	2.46[a]	1.44[b]	1.73[c]	1.25[d]	1015.53*	.194
Participate in local races	2.64[a]	1.44[b]	1.74[c]	1.20[d]	1237.94*	.227
Volunteer at local races	2.02[a]	1.26[b]	1.44[c]	1.16[d]	739.93*	.149
Attend your local mountain bike group's meeting	2.54[a]	1.59[b]	1.84[c]	1.33[d]	739.75*	.149

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
[1] Each item was measured on a 6-point scale (1=Never, 2=Once a year, 3=A few times a year, 4=Once a month, 5=Several times a month, and 6=Weekly).
*Significant ($p<.001$)

Table 15
Volunteer Work and Trail Maintenance by Clustered Specialization Groups

	Clusters					
	High (*n*=3,119)	**Skill/Experience (*n*=4,145)**	**Lifestyle (*n*=3,399)**	**Low (*n*=1,991)**	***F*-test**	η^2
Please indicate the extent you agree or disagree with the following statements about volunteer work and trail maintenance[1]						
It is important that mountain bikers volunteer to maintain trails	4.67[a]	4.43[b]	4.54[c]	4.31[d]	113.01*	.026
I would like to volunteer but I do not have time	2.82[a]	3.28[b]	3.29[b]	3.50[c]	118.54*	.027
I am willing to pay for trail development (new mountain bike trails)	4.07[a]	3.91[b]	4.01[a]	3.77[c]	39.45*	.009

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
[1]Each item was measured on a 5-point scale (1=Disagree, 2=Somewhat Disagree, 3=Neutral, 4=Somewhat Agree, and Agree=5).
*Significant ($p<.001$)

Table 16
Biggest Threats and Issues by Clustered Specialization Groups

	Clusters					
Threats and Issues	**High (*n*=3,119)**	**Skill/Experience (*n*=4,145)**	**Lifestyle (*n*=3,399)**	**Low (*n*=1,991)**	***F*-test**	η^2
What do you consider as the biggest threats to gaining/ enhancing trail access?[1]						
Liability issues	5.51a	5.69b	5.39a	5.15c	27.00*	.006
Lack of available public lands	5.74a	5.77a	5.33b	5.04c	45.10*	.011

Table 16 (cont.)

Threats and Issues	Clusters: High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)	*F*-test	η^2
What are the most pressing issues facing mountain biking today?[2]						
Overall loss of trail access	3.74[a]	3.58[b]	3.51[b]	3.13[c]	100.48*	.023
The "dumbing down" of trails	3.42[a]	3.11[b]	3.03[b]	2.47[c]	211.21*	.048
Motorized vehicles (ATVs, Motorcycles) on trails	3.35[a]	3.36[a]	3.43[a,b]	3.54[b]	8.76*	.002
Not enough mountain bikers getting organized and involved in advocating for mountain bikers	3.40[a]	3.06[b]	3.15[c]	2.83[d]	105.46*	.025
Land managers not supportive of mountain biking	3.51[a]	3.36[b]	3.38[b]	3.03[c]	70.38*	.017

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, p<.05).
[1]Items ranked with 1 being biggest threat to 9 being lowest threat.
[2]Items measured on a 5-point scale (1=not at all concerned, 2=slightly concerned, 3=somewhat concerned, 4=moderately concerned, and 5=extremely concerned).
*Significant (p<.001)

How Can the Mountain Bike Community Help Purely Centrality to Lifestyle and Completely Low Specialists progress?

The Completely High Specialists are one of the best target markets for tourism, retailers, shop rides, mountain bike races and festivals, volunteering, donating, leadership positions, etc. Furthermore, they are more likely to pass on the sport to their kids. In summary, they contribute substantially more to the sport than the other groups examined in this study. Given that the Lifestyle and Low Specialists seek progression and have not reached a ceiling, what can the mountain bike community do to help them become High Specialists and see the sport continue to mature?

The most preferred trails by all participants include traditional singletrack and mountain bike optimized singletrack (Table 17) with the following features: trail quality, proximity to home/work, natural beauty of the area, number of miles in the trail system, natural technical features, and range of trail difficulty (Table 18). However, the Completely Low Specialist are much more likely to prefer forest/gravel road or double track (p<.001) (Table 17). Both Lifestyle and Low Specialist also are more likely to prefer trail features including proper trail signage, trailhead features (bathrooms, pavilion, playground, and safety), and easy climbs (p<.001) (Table 18). Finally, Low Specialists often do not feel represented in the mountain bike media and by mountain biking companies (Table 19).

Recommendations

Besides providing popular singletrack trails for all mountain bikers, forest/gravel road or double track should also be available for Low Specialists, especially closer to their homes. But, there still needs to be route development and maps created to help inform the users about the opportunities. It is important to provide more trail features such as signage, bathrooms, easy climbs etc. for Low and Lifestyle Specialists. Also, it is understandable that mountain bike media and mountain biking companies might feel more compelled to represent the Completely High Specialists given their greater financial commitment to mountain biking equipment, travel, etc. However, the Lifestyle and Low Specialists groups feel less represented, which may discourage them from progressing and becoming Completely High Specialists and future leaders. The mountain bike community should better represent them.

Table 17

Trail Preferences by Clustered Specialization Groups

Type of Trails	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
What kind of trails do you prefer to ride?[1]					656.68*	15	.132*
Forest/gravel road or double track	42 (1.3%)[a]	174 (4.2%)[b]	108 (3.2%)[c]	285 (14.3%)[d]			
Traditional singletrack	1,232 (39.5%)[a]	1,945 (47.0%)[b]	1,205 (35.5%)[c]	655 (32.9%)[c]			
Mountain bike optimized singletrack	1,648 (52.9%)[a]	1,859 (44.9%)[b]	1,929 (56.8%)[c]	947 (47.6%)[d]			

*Significant ($p<.001$)
[1]Percentages are by columns. The total does not equal 100 percent because not all items were included in the table.
[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, $p<.05$).

Table 18

Importance of Features by Clustered Specialization Groups

Trail Features	Clusters High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)	*F*-test	η^2
Please indicate the importance of the following features when determining where to ride.[1]						
Trail quality (design & features)	4.22[a]	4.08[b]	4.13[b]	3.99[c]	31.78*	.007

Table 18 (cont.)

Trail Features	Clusters				*F*-test	η^2
	High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)		
Proximity to home/work	3.82[a]	3.91[b]	3.87[a,b]	3.94[b]	7.90*	.002
Natural beauty of the area	3.58	3.64	3.55	3.55	5.86*	.001
Number of miles in the trail system	3.78[a]	3.67[b]	3.64[b]	3.35[c]	100.94*	.023
Proper trail signage	3.09[a]	2.88[b]	3.31[c]	3.39[c]	126.33*	.029
Natural technical features	3.72[a]	3.42[b]	3.45[b]	3.04[c]	194.37*	.044
Range of trail difficulty	3.69[a]	3.45[b]	3.58[c]	3.39[b]	59.68*	.014
Flow trails (berms/jumps)	2.96[a]	2.63[b]	3.05[c]	2.82[d]	85.49*	.020
Trailhead features (bathrooms, pavilion, playground, safety)	2.45[a]	2.20[b]	2.56[c]	2.62[c]	95.63*	.022
Long descents	3.00[a]	2.72[b]	2.83[c]	2.50[d]	74.34*	.017
Easy climbs	2.04[a]	1.99[a]	2.23[b]	2.51[c]	130.51*	.030

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
[1]Items measured on a 5-point scale (1=not important, 2=slightly important, 3=moderately important, 4=important, and 5=very important).
*Significant ($p<.001$)

Table 19
Representation by Clustered Specialization Groups

Representation	Clusters[2]				χ^2	*df*	Cramer's *V*
	High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991			
How often do you feel represented in the mountain bike media and by mountain biking companies?[1]					859.2	21	.151*
Always	113 (3.6%)[a]	49 (1.2%)[b]	60 (1.8%)[c]	23 (1.2%)[b,c]			
Frequently	999 (31.8%)[a]	729 (17.9%)[b]	745 (22.1%)[c]	219 (11.2%)[d]			
Sometimes	1,515 (48.8%)[a]	2,065 (50.7%)[a]	1,811 (53.7%)[b]	842 (43.2%)[c]			
Seldom	433 (13.9%)[a]	951 (23.4%)[b]	626 (18.5%)[c]	608 (31.2%)[d]			
Never	56 (1.8%)[a]	276 (6.8%)[b]	133 (3.9%)[c]	259 (13.3%)[d]			

*Significant ($p<.001$)
[1]Percentages are by columns
[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, $p<.05$)

Is Centrality to Lifestyle a Key Factor (or Precursor) to Becoming a Completely High Specialists?

Future research should examine the proposition that a pathway for mountain bike progression is engaging in social activities that are central to lifestyle. Table 20 lists the top two ways mountain bikers are introduced to the activity. The Low Specialists were most likely (41.4%, $p<.001$) to have tried it on their own (Table 20) and least likely (36.6%, $p<.001$) to bike with friends (Table 21) which is opposite of Lifestyle and High Specialist. Table 14 provides some ideas on promoting more social activities for the Low Specialists (and all groups). The number one way all groups engage with the local mountain bike community is by participating in group rides, and eMTBs can help. Technology such as eMTB could be a game changer for the less skilled specialists. Low and Lifestyle Specialists are most likely to purchase an eMTB to be able to keep up with friends and/or a partner that rides mountain bikes (15.7%, $p<.001$) (Table 22). However, both groups were less likely to know where eMTBs are allowed, and more likely not to have a final opinion about eMTBs.

Recommendations

Introduce new mountain bikers through social groups. Provide group ride opportunities so Low and Lifestyle Specialist can meet new friends. Provide them with access to eMTBs during groups rides so they can keep up with the group. Inform Low and Lifestyle groups about where eMTBs are permitted and how they can benefit from eMTBs.

To better understand the role of Centrality to Lifestyle as a possible precursor to becoming a Completely High Specialist, future research should consider including the Serious Leisure Inventory and Measure derived from the serious leisure framework (Gould et al., 2008), Auckland Individualism and Collectivism Scale (Shulruf et al., 2007), and Community Organization Sense of Community Scale (Hughey et al., 1999) along with recreation specialization measures. This line of research seems promising given evidence provided by Gallant et al. (2013) which suggests that serious leisure is an avenue for nurturing community. Therefore, it seems possible that the opposite is also true, that community might also be an avenue for serious leisure and becoming a Completely High Specialist.

Table 20

Introduction to Mountain Biking by Clustered Specialization Groups

	Clusters[2]						
Type of Introduction	High n=3,119	Skill/Experience n=4,145	Lifestyle n=3,399	Low n=1,991	χ^2	df	Cramer's V
How did you get introduced to mountain biking?[1]					205.43*	21	.07*
Friend	1,258 (40.3%)[a]	1,589 (38.3%)[a,b]	1,489 (43.3%)[c]	728 (36.6%)[b]			
Tried it on my own	1,177 (37.7%)[a]	1,910 (46.1%)[b]	1,166 (34.3%)[c]	824 (41.4%)[d]			

*Significant ($p<.001$)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, $p<.05$).

Table 21
Mountain Bike Partners by Clustered Specialization Groups

Biking Partners	Clusters: High (*n*=3,119)	Skill/Experience (*n*=4,145)	Lifestyle (*n*=3,399)	Low (*n*=1,991)	*F*-test	η^2
Who do you usually mountain bike with?[1]						
Alone	6.12[a]	6.72[b]	6.29[a]	6.12[a]	41.57*	.010
My partner/spouse	2.58[a]	2.41[a]	2.57[a]	2.61[a]	2.54	.001
Friends	6.29[a]	5.70[b]	6.04[c]	4.92[d]	121.28*	.028
My child(-ren)	1.58[a]	1.57[a]	1.33[b]	1.23[b]	12.32*	.003
My family (spouse/ partner and children)	1.30[a]	1.23[a]	1.22[a]	1.10[a]	2.58	.001
Race Team	1.44[a]	0.21[b]	0.41[c]	0.07[d]	417.73*	.090
Shop Ride	1.50[a]	0.53[b]	1.02[c]	0.44[b]	168.36*	.038
Local mountain bike group or organization	3.18[a]	1.30[b]	2.66[c]	1.33[b]	348.09*	.076

Note. Cluster means with different superscripts indicate significant difference (Scheffe's test, $p<.05$).
[1]Items re-coded with a rank of 8 being the most to 1 being the least. Items not ranked were coded as 0 in the analysis. Nonresponse to all 8 items was treated as missing data.
*Significant ($p<.001$)

Table 22
eMTB by Clustered Specialization Groups

eMTB	Clusters[2]: High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
If you own an eMTB, why did you purchase it?[1]							
To be able to keep riding despite age	23 (13.4%)[a]	49 (20.6%)[a]	24 (20.9%)[a]	16 (19.3%)[a]	35.96*	12	.140*
To be able to keep riding despite injury	9 (5.2%)[a]	18 (7.6%)[a]	7 (6.1%)[a]	6 (7.2%)[a]			
To be able to keep up with friends and/or a partner who rides mountain bikes	12 (7.0%)[a]	7 (2.9%)[a]	18 (15.7%)[b]	13 (15.7%)[b]			

Table 22 (cont.).

eMTB	Clusters[2] High *n*=3,119	Skill/Experience *n*=4,145	Lifestyle *n*=3,399	Low *n*=1,991	χ^2	*df*	Cramer's *V*
For fun (27.3%)[a]	47 (21.4%)[a]	51 (27.8%)[a]	32 (19.3%)[a]	16			
Other	81 (47.1%)[a]	113 (47.5%)[a]	34 (29.6%)[b]	32 (38.6%)[a,b]			
If you own an eMTB, do you know where you are and are not allowed to ride it? (Not all public use trails that allow mountain bikes allow eMTBs)							
Yes	198 (6.4%)[a]	236 (5.8%)[a]	146 (4.5%)[b]	49 (2.7%)[c]	54.51*	6	.067*
Do you have a final opinion on eMTBs?							
No	438 (14.2%)[a]	815 (19.9%)[b]	723 (21.5%)[b]	593 (30.2%)[c]			

*Significant (p<.001)

[1]Percentages are by columns.

[2]Cluster proportions with different superscripts indicate significant difference (Z-tests for independent proportions, p<.05).

Conclusion

This study is the first to use recreation specialization to study the larger non-competitive and competitive mountain biker population, including all mountain biking styles. This study was a nationwide survey and used innovative questions such as mountain bike aspirations that were very useful when studying progression in recreation specialization without having time series data. The survey was among the most comprehensive as well with 79 survey questions. Only the most significant and meaningful results related to helping mountain bikers progress were presented.

This study makes several contributions to recreation specialization theory. Perhaps most interesting, most mountain bikers are specialists in at least one specialization factor. What has been considered mid-level specialization (e.g., intermediate) in previous research was considered single dimension specialists (i.e., Purely Skill and Experience Specialist and Purely Centrality to Lifestyle Specialist) in this study. That is, there are both multidimensional specialists and single-factor specialists in the mountain biking population. There is no such thing as an average mountain biker. There is not even such a thing as an average mountain biker within any single specialization factor that was examined in this study. That is, every group was either above average

or below average (i.e., there were no mean Z-scores near 0) in the different specialization factors presented in Table 3. Recreation specialization is an ideal theory to help better understand this tremendous diversity within mountain biking.

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