

Substitution interests among active-sport tourists: The case of a cross-country ski event

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Abstract

As of 2018, winter active tourism events are being canceled and delayed at increasing rates in the United States due to poor snow conditions, unsafe ice, and warm temperatures. This study explored substitution interests of winter active tourists in the case of a canceled cross-country ski event, with specialization and distance traveled as independent variables. Regardless of specialization and distance travelled, sport tourists are more interested in substituting spatially than substituting activities. This study extends the active tourism literature to include substitution interests in the context of a winter event. Recommendations for activity-consistent adaptation solutions are advanced to match the interests of skiers. This research highlights the considerable agency of tourists and managers to adapt to the changing climate through substitution.

Keywords: active tourism, substitution, climate change, sport event, winter tourism

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Introduction

Since the mid-20th century, the tourism industry has become progressively larger and more sophisticated (Gibson, 1998; de Knop, 2000). With this growth has come an increase in tourist preferences for recreation and sport opportunities whilst on vacation (Deery, Jago & Fredline, 2004). Indeed, some scholars have suggested that sport and tourism have developed a “symbiotic relationship” (Redmond, 1991, p.107). This relationship is perhaps most pronounced in the context of winter tourism, wherein most travelers cite winter recreation such as skiing or snowmobiling as their primary travel motivator (Alexandris, Kouthouris, Funk & Giovanni, 2009).

In the United States, winter recreation and its associated active tourism is big business, supporting 211,900 jobs and adding \$12.2 billion annually to the economy (Burakowski & Magnussen, 2012). The industry is largest in the U.S. Rocky Mountain range, the North East, and the Upper Midwest. However, in the 21st century, record-low snowfall and record-high winter temperature patterns have restricted winter recreation participation and negatively impacted the tourism economy nationwide (Gössling, Scott, Hall, Ceron, & Dubois, 2012; Scott & Lemieux, 2010). Changing climate conditions are likely to alter the current growth patterns of active winter tourism in the 21st century (Askew, Bowker, Green, & Poudyal, 2018).

Among several active tourism opportunities, cross-country skiing is under-represented in the literature. Considering the U.S.’s topography and the relative cost-friendliness of cross-country skiing compared to alpine skiing and snowmobiling, cross-country skiing is

far more accessible than other winter activities, leading to its participation. In the United States, conservative estimates put current participation at 7.8 million cross-country skiers (White, Bowker, Askew, Lagner, Arnold, & English, 2014).

Much like other winter activities, cross-country skiing is at risk of climate-related reductions in both opportunities and interest. In a 'no change' scenario, U.S. participation is projected to increase by 26% amongst adults between 2008 and 2030 (White et al., 2014), however climate change could curtail growth significantly, decreasing participation by up to 52% by 2060 (Askew et al., 2018). In the U.S. Midwest specifically, participation is expected to increase slightly (by 1.9%) between 2000 and 2050 (Bowker, English & Cordell, 1999), yet with climate change the activity could similarly decrease in participation by up to 41% (Bowker & Askew, 2013).

Winter events, such as cross-country ski races, are particularly hard-hit by climate-related changes and cancellations. With dates set far in advance and event registration beginning as early as one year ahead of the event, active tourists are left with little opportunity to alter their travel plans in the case of event cancellations and, as such, can be susceptible to financial and social losses. The U.S. Midwest in particular has been affected by this trend: winter seasons are shorter and increasingly wetter in the region since the 1970s (Easterling, Arnold, Knutson, Kunkel & LeGrande, 2017), resulting in several winter event cancellations. These cancellations come at cost to host communities who spend hundreds of thousands of dollars preparing and hosting these events (Daniels & Norman, 2003; Gibson, Kaplanidou & Kang, 2012). In some cases, like the American Birkebeiner

Challenge (the 'Birkie'), North America's largest cross-country ski event, the event represents a significant percentage of the host-town's annual tourism income and its 2017 cancellation subsequently carried a significant financial cost (American Birkebeiner Foundation, 2017a).

From a tourism management perspective, the continued growth of winter events largely relies on improved or stagnant climate conditions, availability of artificial snowmaking, and demand (Gössling et al. 2012). Given changing climate conditions, it is unlikely that active-winter tourism events will be sustainable in their 2018 forms; thus it is increasingly important to understand artificial snowmaking options and demand. For cross-country skiing, artificial snowmaking presents a significant challenge as maintaining miles of ski trails with artificial snow is both expensive and logistically complex. Further and realistically, the warmer temperatures may be too warm for snowmaking (Hennessy, Whetton, Walsh, Smith, Bathols, Hutchison & Sharples, 2008; Scott, McBoyle & Mills, 2003). Therefore, understanding tourist demand and substitution interests is paramount to planning winter events. While anecdotal observations exist regarding substitution interests following a canceled event (American Birkebeiner 2017a; The Canadian Press, 2017), empirical studies have yet to explore substitution interests in these instances.

This study extends the literature by exploring active tourists' substitution interests in the case of a cross-country ski event. The study uses recreation specialization theory (Bryan, 1977, 2000) to explain differences in substitution interest (Choi, Loomis & Ditton, 1994;

Peterson, Stynes, Rosenthal & Dwyer, 1984) and explores the influence of distance traveled to substitution interests.

Literature Review

Three kinds of sport tourism are generally delineated: spectator tourism, visits to sports-related attractions, and active tourism. The latter is broadly defined as traveling to participate in a sport or recreation activity (Gibson, 1998). In the 1980s, active tourism grew and became the most common form of sport tourism, relegating sport spectatorship to a distant second (Hall, 1992). Among the most frequently-engaged in active tourism activities are golf, tennis, and skiing (Gibson, 1998, 2003). In many ways, active tourism is heavily dependent on the biophysical environment of the destination. For example, the most frequently engaged in activities are practiced outdoors and most are nature-based. Nature-based tourism is travel to a natural area and often involves engagement in activities that put the traveler in direct contact with nature (Valentine, 1992; Fredman & Tyrväinen, 2010). Consequently, changes to the environment, including those produced by climate change, will have important ramifications for active tourism and merits targeted research to guide management responses.

Climate change and active tourism

Climate change is the most urgent and dire threat to the tourism industry (Elsasser & Burki, 2004; Scott, 2011). Specifically, climate change will significantly affect recreation options, which will alter active tourism opportunities (Dawson, Scott & McBoyle, 2009; Dawson & Scott, 2010) and interests (Getz & Page, 2016; Gibson, 2003; Gössling, Scott, Hall, Ceron & Dubois, 2011).

A growing body of literature examines the challenges climate change presents for tourists, managers, and other active tourism stakeholder groups (Gössling & Hall, 2006; Gössling et al., 2012; Smith, Seekamp, McCreary, Davenport, Kanazawa, Holmberg, Wilson & Nieber, 2015). Of these, water-based and winter activities have received the most attention (Michailidou, Vlachokostas & Moussiopoulos, 2016; Barrio & Ibanez, 2015). In terms of water, climate change will affect beach and surf recreation (Perch-Nielson, 2010; Han, Noh & Oh, 2014), as well as fishing, hunting, and wildlife viewing (Ahn, de Steiguer, Palmquist & Holmes, 2000). For the winter season, change will come in the form of temperature and precipitation patterns (Dawson, Scott & Havitz, 2013; Scott & McBoyle, 2007), affecting skiing, snowboarding, and skating. As such, winter recreation site managers and active tourism destinations must develop a firm understanding of tourist substitution preferences in the face of climate change.

Substitution

In the mid-1970s, Hendee and Burdge (1974) identified substitution as the “interchangeability of recreation activities in satisfying participants’ motives, needs, and preferences” (p. 157). Based in the ‘Opportunity Theory’ of recreation, the idea is people participate in whatever is available (Hendee, 1969), and based on their interests and constraints. When participation in a preferred activity is impossible due to weather, budget, abilities, or access constraints, recreationists have the option of substituting an alternative time or place (e.g., visiting a different park; visiting the same park at a different time), substituting an alternative activity (e.g. replacing hiking with walking), or

ceasing recreation altogether (Peterson, Stynes, Rosenthal & Dwyer, 1985). Substitution seemingly applies equally to active tourism.

Shelby and Vaske (1991) extended Hendee and Burge's (1974) work and categorized substitution strategies by how much of the desired experience is retained. Their five substitute categories were:

strategic, in which visitors seek a different means of gaining access to the same activity in the same setting at the same time; *temporal*, involving the original activity in the original setting but with a change in the timing of a visit; *resource*, in which a new setting is found for the original activity; *activity*, in which a new activity is pursued at the original setting; and *resource and activity* defined as different recreation activities at different settings, or perhaps such altogether dissimilar activities as working or shopping (Brunson & Schelby, 1993, p. 69).

This categorization elucidates that not all substitution options are equal in terms of opportunity or experience, nor are all equally desirable. Substitution has been studied in multiple contexts around the world: fishing in Australia (Sutton & Oh, 2015); forest recreation in Denmark (Termansen, Zanderson & McClean, 2008); urban park recreation in Wuxi City, China (Yu & Wang, 2008), among others. In every instance, research bears out the supposition that individuals are flexible and generally willing to substitute rather than discontinue their involvement in recreation (Oh & Ditton, 2006).

Results reveal substitution preferences vary based on experience, group features (participating alone or with a group), accessibility, and fees. The more experience in a preferred activity, the less likelihood of activity substitution (Sutton & Oh, 2015) or

spatial substitution (Bristow & Jenkins, 2018) but higher likelihood of temporal substitution (Dawson, Havitz & Scott, 2011b; Landauer, Sievanen & Neuvonen, 2009; Ruddy, Scott, Johnson, Jover, Pons & Steiger, 2015). A positive correlation exists between site accessibility and proximity via roads and likeliness to substitute (Bristow & Jenkins, 2018; Larson & Crooks, 2018; Termansen, Zanderson & McClean, 2008). User fees also affect spatial substitution: these divert low-income participants to alternate recreation sites that do not have fees (Lamborn, Smith & Burr, 2017). For this project group and fees were deemed less likely influential as fees were collected uniformly from all Birkie registrants, and registration is individual-based.

Within the winter active tourism sector, a growing body of literature since 2010 explores the substitution interests and preferences of alpine skiers and snowboarders (Dawson, Havitz & Scott, 2010, 2011a, 2011b; Dawson, Scott & Havitz, 2013; Pickering, Castley & Burt, 2010; Ruddy et al. 2015) in the context of climate change. Alpine skiers' and snowboarders' substitution preferences differ based on the length of time their preferred ski mountain is closed due to poor snow conditions (part of a day, a whole day, part of the season, the whole season): the longer the closure, the higher the likelihood of activity substitution (Ruddy et al., 2015). In addition, participation group influenced substitution among alpine skiers with solo skiers less likely to substitute temporally or spatially than those who ski with a team or a group. Solo skiers were more likely to substitute another activity.

A gap remains in the literature regarding both the interests and actual behaviors of cross-country skiers in the North American context, and substitution interests in an event context. Recreation specialization is one variable that has explained variation in substitution interest in other activities such as angling, contract bridge, and alpine skiing (Dawson, Havitz & Scott, 2011a; Oh & Ditton, 2006; Scott & Godbey, 1994) and very relevant to active-sports tourism, thus it is included in this study.

Recreation specialization

About the same time as substitution entered the recreation literature, recreation specialization was introduced to highlight the intra-group differences among same-activity recreationists (Byron, 1977). Using anglers as his pool of subjects, Bryan observed equipment preferences, experience levels, and involvement in fishing to identify differences among them. From this research, he proposed recreationists exist on a continuum with the inexperienced, uninvolved novices on one end and experienced, highly committed experts on the other. Recreation specialization theory posits that highly specialized recreationists are “part of a leisure social world with a shared sense of group identification derived from similar attitudes, beliefs, and experiences” (Salz, Loomis & Finn, 2001, p.240). Consistently, research reveals Bryan’s (1977, 2000) validity of intra-group differences along a specialization spectrum (Choi et al., 1994; McCormack, Giles-Corti, Bulsara & Pikora, 2006; Oh, Sutton & Sorice, 2013; Scott & Havitz, 2011b, 2013). To provide satisfactory experiences to a diverse clientele, these intra-group differences must be considered by managers.

Most specialization studies have construed recreation specialization as a multidimensional construct, comprising at least three components: “(a) a behavioral element referring to past experience, (b) a cognitive element that is inclusive of recreationists’ skill and knowledge, and (c) an affective element that refers to the enjoyment, satisfaction and importance recreationists’ ascribe to an activity” (Jun, Kyle, Graefe & Manning, 2015, p. 426). However, consensus on what dimensions should be included and what items define each dimension remains absent (Kuentzel & McDonald, 1992; Scott, Cavin, & Shafer, 2007). The dimensions selected for this study are those established by Virden and Shreyer (1988) and Dyck, Schneider, Thomson & Virden (2003) and include 1) experience, measured by self-reported level of experience, number of years involved, and frequency of participation; 2) investment, measured by amount of money spent on the activity and number of equipment items owned; and 3) centrality to life, measured by extent to which participant’s life is organized around the activity, social group, team membership, and relative importance of the activity in one’s life. These three dimensions capture the attitudinal and behavioral orientation of the individual toward the activity, for example, by underlining the purchasing behavior (equipment investment), therein offering insight into the level of commitment the individual shows toward the activity.

Empirical research has established a link between level of specialization and substitution interests among, for example, anglers, (Choi et al., 1994; Oh, Sutton & Sorice, 2013) and alpine skiers (Dawson, Scott & Havitz, 2011b, 2013). In the case of alpine skiers, specialized skiers were more likely to substitute another form of physical activity (hiking,

running, etc.) or the time of participation (temporal) than less specialized skiers, but less likely to substitute place (spatial substitution), preferring instead to stay in their chosen region (Dawson, et al. 2013).

Clearly specialization is not the only variable influencing substitution interests.

Substitution may also be a function of the distance between a person's home and the activity's location (McCormack et al., 2006). As such, it is important to understand the role, if any, of distance in substitution decisions for active sports tourism.

Distance Traveled

As least two explanations exist as to how distance traveled affects outdoor recreation and tourism behaviors: 1) gravity model and 2) inertia model. The gravity model suggests the convenience of close destinations makes them accessible while the novelty of far-away destinations make them exciting (Nyaupane & Graefe, 2008, Smith 1989; Timmermans, 2001). Inertia expands on the gravity model by suggesting that beyond a considerable distance (500 or 1,000 miles, or 1-2 days' travel time), the friction of distance not only diminishes but reaches a point of reversal (Wilkinson, 1972; Wolfe, 1972). Friction in this context represents the detractors, de-motivators and barriers to travel. In other words, the further away a person travels from home, the less friction they will experience in any additional distance. The inertia model has been successfully applied to transportation policy and marketing to inform campaigns to increase favorability of public transit options (Cantillo, Ortuzar, & Williams, 2007; Wilkinson, 1972). In outdoor recreation and tourism research, research to date reveals distance has a positive relationship with

overall trip expenditures (Oh & Hammitt, 2011; White et al., 2014), time needed to plan the trip, time spent at the destination, and a negative relationship with perceived impact of climate variations and poor conditions (Richardson, Loomis & Weiler, 2006). The influence of distance traveled on activity substitution interests remains unknown.

Given current and anticipated changes to the natural environment, cross-country skiing may become unsafe, inaccessible, or simply, impossible in many parts of the United States and elsewhere with similar climates. Thus, active cross-country skiing tourists will be under pressure to substitute, and managers must diversify the use of ski facilities. From a management perspective, the substitution interests of skiers are paramount to managing cross-country ski destinations and events. Yet, little research exists to support these management challenges. The purpose of this study is to extend the literature by assessing the substitution preferences of cross-country skiers registered in a North American event. This study advances the active tourism literature to include substitution interests of active tourists in the context of a winter event, considering specialization and distance traveled.

Specific questions of interest include,

RQ1. How do substitution interests of cross-country skiers differ based on level of specialization in the case of a canceled event?

RQ2. How do substitution interests of cross-country skiers differ based on distance traveled in the case of a canceled event?

Based on previous research (Choi et al., 1994; Nyaupane & Graefe, 2008), the following hypotheses emerge:

H1: Highly specialized skiers are more interested in spatial substitution compared to low- and medium- specialized skiers.

H2: Highly specialized skiers are less interested in activity substitution compared to low- and medium- specialized skiers.

H3: Long-distance travelers are more interested in spatial substitution, compared to short-, and moderate-distance travelers.

H4: Long-distance travelers are less interested in activity substitution compared to short-, and moderate-distance travelers.

Methods

An online survey was distributed to a sample of registrants from the 2018 American Birkebeiner Challenge who were also registered in the cancelled 2017 event. The survey explored the relationships between level of specialization, distance traveled, and substitution interests.

Site

The American Birkebeiner Challenge (the 'Birkie') is an annual 54 km cross-country skiing race hosted in February in northern Wisconsin. In 2018, the event welcomed tourists from 36 countries and 49 states (American Birkebeiner, 2018). Participation numbers peaked at just over 12,000 participants in 2015, making it the largest cross-country ski event in North America and one of the largest winter sporting events in the U.S. Midwest.

Hayward, Wisconsin, a community of just over 2,300 people located 70 miles south of Lake Superior in the northwest of Wisconsin (City of Hayward, n.d.) hosts the event. The community also hosts the Honor the Earth Pow Wow every July and the World Lumberjack Championships in August.

In 2017, the Birkebeiner was cancelled due to lack of snow and unfrozen ice crossings that rendered the course unsafe. Due to the nature of the event and the planning expenses of an outdoor sport event, all participants lost their registration fees and some also encountered financial losses associated with the cancellation of travel and accommodation plans. This event and its participants were selected for study because the participants have recent experience with a climate-related cancellation.

Sample

In 2018, just over 12,000 individuals registered for the race. As a sample of 373 was desired for a 95% confidence level that the results would be representative of the population of Birkie registrants, and past research reported a 23% response rate (Anderson, Bovard, Wang, Beebe & Murad. 2016). A random sample of 2,000 participants was drawn. To create the random sample, the Birkebeiner registration database was shuffled using Excel's shuffle function. A drawing for two Birkebeiner hoodies incentivized participation.

Instrument

A questionnaire based on previous research was developed and piloted ($n = 18$) with cross-country skiers who were not registered in the 2018 Birkebeiner. The sole modification from the pilot was a revised list of 'ski-related items owned' in the specialization scale. The final questionnaire was estimated to take 5 to 7 minutes to complete.

The questionnaire began with a confirmation the respondent was registered in the 2018 Birkebeiner. Next, a 12-item scale measured specialization in cross-country skiing, derived from previous studies (Dyck et al., 2003; Wellman et al., 1982). Questions included: how long have you been cross-country skiing (in years), how many times do you cross-country ski in an average season, what is the total amount of money you've invested in cross-country skiing, and to what extent do you agree that your life is organized around cross-country skiing (measured on a 5-point scale where 1 = strongly disagree and 5 = strongly agree)? The specialization scale items were borrowed from Dyck et al. (2003) and Virden and Schreyer (1998) and adapted to suit this activity (cross-country skiing). Then, a question asking about distance traveled to the event was posed, and a question relating to substitution interests was presented. The substitution interest options were written in partnership with the event organizers based on the two types of substitution available: activity and spatial substitution options (Table 1). Interest was measured on a 5-point scale where 1 = very disinterested and 5 = very interested. Finally, respondents completed a 4-item list of demographic questions derived from a previous study on the American Birkebeiner (Anderson et al., 2016) that included age, gender, education level, and relationship status.

(Insert Table 1)

Administration

The questionnaire was delivered online to a random sample of 2018 Birkebeiner registrants via the Qualtrics website, and was active for 10 days in March 2018, beginning one-week after the 2018 event. Following recommended online protocol (Dillman, Smyth, Christian, 2014), a pre-notice email was sent by event organizers (whom the registrants are familiar with) to advise of the upcoming questionnaire. Further, the instrument was brief and easily answered, so attrition was reduced. The response rate without any reminder was 22.1% (N = 441), similar to that of Anderson et al.'s (2016) study with the same population (i.e., 23%). Incomplete responses were eliminated, so the size of the analyzed sample was 418.

Analysis

Data were analyzed using RStudio Statistics software package. Following prior research (Dyck et al. 2003; Virden & Schreyer, 1988; Wellman et al., 1982), the responses to specialization items were transformed to z-scores. Cronbach alpha for the specialization scale was $\alpha = 0.98$ mirroring similarly strong alphas in Dyck et al. (2003; $\alpha = .91$) and Virden and Schreyer (1998; $\alpha = .83$). All items met the minimum reliability threshold of 0.7 so there was no need to remove items for subsequent analyses (Paterson, 1994; Table 3). Participants' z-scores across specialization items were averaged to produce a single overall index of recreation specialization. The sample was then separated into three specialization categories based upon the overall specialization z-scores (Dyck et al. 2003;

Wellman et al., 1982): low specialization (< Q1 value; $n = 103$), medium specialization (Q1-Q3; $n = 200$), and high specialization (>Q3 value; $n = 104$).

Each dimension of the specialization scale had a Cronbach's alpha of >0.7 indicating strong internal reliability within-dimensions (Table 2). The standard deviation of each item is high relative to the means, indicating a high degree of variance between respondents. After conversion of item responses to z-scores, and separation into three groups based on overall z-score, 25% ($n = 103$) were classified as high specialization, 49% ($n = 200$) were medium, and 26% ($n = 104$) were low.

(Insert Table 2 here)

For distance traveled, the U.S. postal service zip-code of the event and the zip-codes of the survey respondents were converted to latitudinal and longitudinal values. Then, the distance between each zip code and the event was calculated using the Haversine formula for world-circle distance (Euclidean distance on a sphere; Arsin, Ibrahim & Hatta, 2016). The resulting distance in miles for each respondent was used as a proxy figure for distance traveled. From these results, four categories of distance were drawn mirroring the four distance groupings established by the National Tourism Resources Review Commission (1973): local distance: <50 miles, short distance: 50-100 miles, moderate distance: 101-599 miles, and long distance: >600 miles (Nyaupane & Graefe, 2008). Given the small number of local distance group respondents ($n = 16$) and the focus of this study on active tourist substitution interests, this group was eliminated from further

analysis. The distance traveled (in miles) for international respondents was winsorized to 600 miles (and classified in the long-distance group; $n = 47$).

As the dependent variables were moderately correlated at best, ANOVAs tested hypotheses 1 through 4 for differences in substitution by specialization and distance travelled. To identify where differences existed among specialization groups, a conservative Tukey post-hoc test was performed (Cannon et al. 2011).

Results

Similar to past Birkie research (Anderson et al. 2017), respondents' ages ranged from 18 to 75 or older, with the median age in the 50-54 and the mode at the 55-59 years of age. The majority of respondents were male (74.1%), married (76.2%), and had at least a bachelor's degree (91.5%). Demographic frequencies of the sample are shown in Table 3. The demographics closely matched the characteristics of the population, per the results of the Birkie 2018 event (American Birkebeiner Foundation, 2018).

(Insert Table 3 here)

Substituting recreational cross-country skiing had the highest interest of the activity items ($M = 3.75$), while substituting an indoor leisure activity had the lowest ($M = 1.83$).

Substitution interests among specialization groups significantly differed ($p < .05$) in four of the six substitution interest items (Table 4). As hypothesized, those in the high specialization group expressed greater interest in shortening the course, changing the

route of the course, and substituting a ski-related activity than low groups ($F = 17.14, p < .001$; $F = 10.67, p < .001$; $F = 3.13, p < .01$, respectively). The low specialization group was more interested in substituting another outdoor recreation activity than both the medium and high specialization group ($F = 3.99, p = .002$). The high-specialization group showed more interest in substitution when the item maintained cross-country skiing as the main activity (e.g. shortening the course, or substituting a ski-related activity) and less interest when the substitution item changes the activity (e.g. substituting another outdoor activity). In contrast to the 2nd hypothesis, level of specialization did not differentiate interest for substituting recreational cross-country skiing or substituting an indoor leisure activity. Given these findings, hypothesis 1 was supported, and hypothesis 2 was not.

The distance respondents traveled ranged from 9 to 9571.2 miles, with an average of 305.6 miles and a standard deviation of 585.8 miles, indicating a very broad geographic distribution. Based on mileage, respondents included 16 local-distance travelers (less than 50 miles, 4%), 48 short-distance travelers (50-100 miles, 11.7%), 298 medium-distance travelers (101-599 miles; 72.9%) and 47 long-distance travelers (600 miles or more; 11.4%). Distance travelled did not statistically differentiate any substitution interests (Table 5), so hypotheses 3 and 4 were not supported.

(Insert Tables 4 and 5 here)

Discussion

A questionnaire employed electronically to active-sport tourists focused on substitution interests found specialization influenced substitution whereas distance traveled did not.

Results were both similar to and different from past findings and will be discussed, along with management opportunities and future research ideas.

Overall, regardless of specialization and distance traveled, respondents were more interested in spatial substitution than activity substitution items. This extends past research where experienced active tourists reveal more interest in temporal substitution than activity or spatial substitution (Bristow & Jenkins, 2018; Dawson et al., 2011b; Landauer et al., 2009; Ruddy et al. 2015; Sutton & Oh, 2015) by highlighting a higher interest among all active tourists in spatial over activity substitution in the absence of temporal substitution options. This finding is particularly salient for event and destination managers as events have limited temporal substitution opportunities by nature.

Registrants' desire to retain the activity, even if it requires location or course changes, indicates that active sport tourists have a stronger interest in the activity than the destination. Certainly, it is possible that the iconic nature of the Birnie is unique enough that skiers prefer to have the event, regardless of its course features and spatial features. However, it is also possible that the Birnie is not an exception and a hierarchy of substitution options, with spatial substitution higher than activity substitution, exists by interest. Given changing climate conditions, event managers and destination coordinators should consider 'Plan B's' that prioritize spatial substitution over activity substitution. For example, a cross-country ski event might change the course to a loop that covers a smaller area, a solution that would make snowmaking more tenable (Landauer, Pröbstl, & Haider, 2011). This solution is both practical and retains the tourism income in the

intended host community. Alternatively, managers might explore options for moving winter tourism events to another destination. This approach was successfully used for the Iditarod sled dog race in Alaska, which moved its start line 300 miles north from the original starting point in Anchorage to make the race possible in 2017 (Chinchar, 2017). In any case, changing the current point-to-point layout of the Birkie course by changing, shortening, or moving the course would exclude one of the destinations (start point or end). In the case of the Birkie, for instance, the end destination, Cable, Wisconsin, may experience lower visitation and lower tourism income on the event weekend if the course were changed or shortened as these solutions would concentrate the race in the Hayward area. As such, an implication of spatial substitution for the destinations is possible shifts in visitor numbers and tourism income. Destination managers might offset these shifts by promoting accommodation options in the affected second destination (in this case, Cable).

Consistent with hypothesis 1, some substitution literature (Sutton & Oh, 2015) and the initial specialization proposal (Bryan 1977), highly specialized skiers were more interested than low specialized skiers in continuing with skiing, which may be explained by the relative higher investments and experience levels of the high specialization group. Based on these findings, planners and managers of high-profile competitions should preserve the activity to align with highly specialized cross-country skiers' interests, as these are the likely target market for high profile events. For instance, managers can plan course alterations ahead of time or host an activity-related showcase or expo, such as a ski demonstration or meet-and-greet with professional athletes. These activity-consistent

solutions offer active tourists options for substituting without compromising the involvement in the activity (in this case, cross-country skiing).

Interestingly, distance traveled did not significantly influence substitution interests among cross-country skiers. This result is curious as it is inconsistent with gravity and inertia models that suggest distance should influence tourist interests and preferences (Smith, 1989; Timmermans, 2001; Wolfe, 1972). The results are unresponsive of hypotheses 3 and 4. Similarly, findings are also inconsistent with previous research on distance and other tourist attitudes and behaviors such as perceived impact of climate variation (Richardson et al., 2006) and trip planning and total tourism spend (White et al. 2014). This nonsignificant result may be explained by the iconic nature of Birkie that makes the importance of attending the event override the relevance of distance. Subsequently, regardless of participant draw, event and ski-managers should consider spatial substitution options as more attractive to active tourists than activity substitution options.

This study did not explore interest in temporal substitution, given the time-specificity of the case: the date and start time of the Birkie are decided a year ahead of the event with no flexibility. However, perhaps changing the time of the event would be similarly more attractive to participants than substituting another activity. Future research should explore temporal substitution in comparison with the other two types to elucidate the interests of active tourists across all possible substitution options. This line of research may lead to a clearer picture of the hierarchy of substitution interests.

The present study is limited by the particularities of the case, a uniquely large cross-country ski event with a rich international history. Thus, generalizations of these findings may be limited. Further, it is also likely that this sample of participants are more specialized, on the whole, than average recreationists, as the event case is a marathon-distance race event few inexperienced skiers would consider entering. Future research might explore the same constructs (substitution interests, specialization, and distance traveled) with registrants of a more accessible event such as a 15km ski race or non-competitive skiing, such as the American Birkebeiner Foundation's Prince Haakon event, which may be more family-friendly than the 50km race studied. This would be particularly salient research as most cross-country ski events in North America are in the 15-30km range, thus results of such a study would be generalizable.

Future research could explore which event features caused specialization to matter, and distance traveled to not, as influences in substitution interests. Finally, it would be interesting to extend this research on substitution interests and preferences to include actual substitution behaviors in future work.

Conclusion

The changing climate presents a growing threat to active tourism, especially tourist events which are particularly vulnerable due to their time-sensitivity. However, as previous research shows and this study confirms, substitution options exist and active tourists show interest, to varying degrees, in substituting spatially or by activity to

preserve the participation opportunity. This study also demonstrates a model for social science research to contribute to the climate change resilience and adaptation literature, specifically by showing a method for studying responses to shifting weather and extreme events. The findings of this, and previous studies, are promising as a reminder of the significant agency of active tourists and tourism managers to address the climate change challenges.

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Appendices

Table 1: Substitution interest measure (*Question: On a scale of 1 (not at all interested) to 5 (very interested), please indicate your interest for each of the following substitution options in the case of a future Birkie cancellation.*)

Substitution type	Item
Spatial	Change the <i>route</i> of the course
	<i>Shorten</i> the course
Activity	Substitute recreational cross-country skiing
	Substitute another ski-related activity (e.g. attending the Birkie Fest)
	Substitute another outdoor recreation activity (running, hiking, mountain biking, snowshoeing)
	Substitute an indoor leisure activity (visit a museum, a casino, etc.)

Table 2: Means, standard deviations, and reliabilities for specialization measure of respondents to a questionnaire to 2018 Birkie registrants

Dimension	α	Indicators	M	SD
Experience	.97	How many years have you been cross-country skiing? ^a	25.25	13.50
		How many times do you cross-country ski, in an average season? ^a	37.57	29.68
		How many cross-country ski races have you participated in over the past 5 years? ^a	11.16	10.14
		What is your level of experience in cross-country skiing? ^b	4.27	0.71
Economic and equipment Investment	.74	Excluding travel, what is the total amount of money you have invested in cross-country skiing in the last five years? ^c	4.31	1.84
		Which of the following cross-country skiing items do you own? ^d	13.46	2.73
Centrality to lifestyle	.99	To what extent do you agree that your life is organized around cross-country skiing? ^b	3.80	0.96
		To what extent do you agree that many of your friends are involved in cross-country skiing? ^b	3.59	1.05
		Do you belong to a cross-country skiing group, club, or team? ^e	0.43	0.50
		How many times have you participated in the American Birkebeiner Challenge? ^a	8	9.72
		Compared to other recreational activities, how important is cross-country skiing to your lifestyle? ^b	4.54	0.60
		Total Scale	.99	

^a Item measured numerically (open response, only numeric values accepted)

^b Item measured on a scale of 1-5 where 1=lowest and 5=highest (i.e. 1 = very inexperienced and 5 = very experienced; 1= strongly disagree and 5= strongly agree)

^c Item measured where 1 = < \$500, 2= \$500-999, 3= \$1000-1499, 4= \$1500-1999, 5= \$2000-2499, 6= \$2500-2999, 7= >\$3000

^d Item measured by number of items selected from a list of 20.

^e Item measured by 'yes' or 'no' answers; conversion: Yes = 1, and No = 0

Table 3: Demographic frequencies of respondents to a questionnaire to 2018 Birkie registrants

	Frequency	Percentage of total
Gender		
Female	106	25.90
Male	304	74.10
Relationship status		
Married	314	76.20
Never married	53	12.90
Cohabiting	28	6.70
Divorced	10	2.40
Widowed	4	0.90
Separated	3	0.70
Education		
Graduate or professional degree	221	53.50
Bachelor's degree (4-year)	157	38.00
Some college but no degree	15	3.60
Associate degree (2-year)	10	2.40
High school	9	2.20
Less than high school	1	0.02
Age		
18-24	12	2.90
25-29	28	6.80
30-34	41	9.90
35-39	38	9.20
40-44	17	4.10
45-49	50	12.10
50-54	38	9.20
55-59	71	17.20
60-64	59	14.30
65-69	42	10.20
70-74	13	3.10
75+	4	0.01

Table 4: Comparisons of substitution preferences by cross-county skier specialization levels among respondents to a questionnaire to 2018 Birkie registrants

Item/Group	Low (M, n = 103)	Medium (M, n = 200)	High (M, n = 104)	F-value	p-value
Substitute recreational XC skiing	3.56	3.82	3.84	2.69	0.07
Substitute another ski-related activity	2.85 ^a	3.02	3.23 ^a	3.13	0.04*
Substitute outdoor recreation activity	3.33 ^a	2.95	2.96 ^a	3.99	0.02*
Substitute indoor leisure activity	1.94	1.76	1.86	1.76	0.17
Change route of the course	4.07 ^{ab}	4.31 ^b	4.52 ^a	10.67	<0.01**
Shorten the course	3.99 ^{ab}	4.38 ^b	4.51 ^a	17.14	<0.01**

Significance: < .001 (**), <0.05 (*)

Means with the same superscripts are significantly different.

Table 5: Comparisons of substitution preferences by cross-county skier distance groups among 2018 Birkie registrants

Item/Group	Short distance (mean)	Medium distance (mean)	Long distance (mean)	F-value	p-value
Substitute recreational XC skiing	3.89	3.74	3.72	0.61	0.76
Substitute another ski-related activity	3.36	3.01	2.87	0.07	0.14
Substitute outdoor recreation activity	3.11	3.06	3.09	0.96	0.64
Substitute indoor leisure activity	2.00	1.81	1.81	0.33	0.49
Change route of the course	4.33	4.29	4.34	0.88	0.94
Shorten the course	4.46	4.3	4.28	0.30	0.22