INTERNATIONAL JOURNAL OF TOURISM RESEARCH
Int. J. Tourism Res. **14,** 269–284 (2012)
Published online 28 June 2011 in Wiley Online Library
(wileyonlinelibrary.com) **DOI:** 10.1002/jtr.860

Sensation-Seeking Attributes Associated with Storm-Chasing Tourists: Implications for Future Engagement

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ABSTRACT

This study explores recreational storm chasing, a new form of niche tourism. In particular, this study examines sensation-seeking traits associated with participants' socio-demographics, storm-chasing involvement and tour satisfaction levels. Results show that recreational storm chasers scored highest on Experience Seeking and lowest on Boredom Susceptibility sensation-seeking dimensions. Correlation tests showed that several socio-demographic, storm-chasing involvement and tour satisfaction indicators are associated with Thrill and Adventure Seeking, Boredom Susceptibility, and Experience Seeking dimensions. Marketing and management implications of study results also are discussed. Copyright © 2011 John Wiley & Sons, Ltd.

Received 30 June 2010; Revised 2 May 2011; Accepted 10 May 2011

Keywords: storm chasing; niche tourism; sensation seeking; personality traits; risk recreation.

INTRODUCTION

Risk recreational pursuits, such as white-water rafting, skydiving, scuba-diving and paragliding, are activities that are perceived to encompass some risk, danger or fear to participants and are sought out by millions of people throughout North America and the world (Ewert, 1985; Cater, 2006). Recreational storm chasing is a risk recreation activity undertook to closely experience severe atmospheric phenomena for leisure or recreation purposes rather than scientific endeavors. More recently, recreational storm chasing has evolved into a new form of tourism. People from all over the world travel to places with strong atmospheric activity and embark into organized and guided tours chasing extreme meteorological events, especially tornadoes.

Recreational storm chasing gained popularity with the release of the movie *Twister* in 1996 (Cantillon and Bristow, 2001), and it has lately increased interest from the public with *Storm Chasers*, a weekly television documentary produced by the Discovery Channel since 2007. In North America, recreational storm chasing mostly occurs in the 'Tornado Alley', a swath in the central USA, which extends from the southern Texas Panhandle through Nebraska and northeastward into eastern North Dakota and Minnesota where tornadoes most frequently occur (Bluestein, 1999; Brooks *et al*., 2003). Most storm-chasing tours are conducted during late spring and early summer when tornadoes are most frequent and active (Bristow and Cantillon, 2000), and they last between one and two weeks.

Although storm chasing is a new form of tourism, the origins of this activity goes back to the post-World War II period, when military-trained pilots with radar experience began flying through storms for scientific purposes (Bristow and Cantillon, 2000; Cantillon and Bristow, 2001). Technological advances coupled with an enhanced highway system expanded storm

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chasing from the air to the ground (Bristow and Cantillon, 2000); later, during the seventies, they evolved to a well-organized activity held by atmospheric scientists (Doswell, 2007). Gradually, storm chasing gained in popularity as a recreational activity in North America and around the world, including Australia, New Zealand and Germany (Robertson, 1999). As more people embarked in storm-chasing expeditions without having necessarily proper knowledge or equipment, storm-chasing tour agencies appeared to provide guidance and assistance to this emerging market (Cantillon and Bristow, 2001). Currently, tour agencies have experienced meteorologists and trained storm chasers as tour guides and sophisticated equipment to track the development of severe weather events while on the road. They also provide safety training, professional advice and transportation to their tourists. In parallel with weather-related technological advances, equipments have become more affordable and have enabled more people to engage in recreational storm chasing.

Recreational storm chasing has received little attention in the literature most likely because sampling procedure is challenged due to the dispersion of its participants and the strong weather dependence (e.g. short seasonality) of this activity. With the exception of an exploratory study conducted on the operational attributes (e.g. tour length, cost and composition) and clientele characteristics (e.g. demographics) of three storm-chasing tour agencies (Bristow and Cantillon, 2000; Cantillon and Bristow, 2001) and another one on the behaviour of five storm chasers on the southern plains (Robertson, 1999), there is a scientific dearth on this emerging form of tourism. Given the increasing popularity of recreational storm chasing, understanding its characteristics is needed (Robertson, 1999; Bristow and Cantillon, 2000; Cantillon and Bristow, 2001) especially to unveil the profiles and personality traits of their participants. Hence, a study was conducted in 2009 to develop a socio-demographic profile of recreational storm chasers in the USA and to examine sensation-seeking attributes associated with this emerging type of niche tourism. Specifically, this study addresses two objectives: (i) to explore the sensation-seeking traits associated with recreational storm chasing; and (ii) to examine the relationships between sensation-seeking traits and socio-demographics, storm-chasing involvement and tour satisfaction levels of their participants. By addressing these objectives, this study fills a gap in the niche tourism and risk-outdoor activities literature, enhancing our understanding of the personality traits of recreational storm chasers. Research findings also provide valuable information to tour agencies for the design and implementation of their marketing and management strategies.

LITERATURE REVIEW

Recreational storm chasing is defined as the recreational pursuit of an uncontrollable meteorological event (Cantillon and Bristow, 2001). Lately, tour agencies specialized on storm chasing has appeared to cater to chasers with experienced meteorologists as guides, safety and forecast equipment, transportation and several activities for the non-action periods. Few studies had yet looked into this activity from both the recreational and tourism perspectives. Robertson (1999) used qualitative methods to track routes and draw spatial patterns of five experienced storm chasers dispelling common stereotypes associated with this activity. He drew storm-chasing routes of those who chased daylong and those that undertook extended storm-chasing pursuits. Robertson (1999) found that storm chasing is not a thrill-a-minute experience, nor were recreational chasers 'reckless daredevils' as mass media depicted. Contrary to popular belief, of the primary threats to a cautious chaser, being in the way of a storm is the least likely hazard. Another study was conducted on recreational storm chasing from the operators' perspective, inquiring three storm tour operators about the length and cost of their tours, their packages and the overall demographics of their tourists (Bristow and Cantillon, 2000; Cantillon and Bristow, 2001). Their results showed that storm-chasing tours lasts one to two weeks, with a cost of 178 dollars per day on average; operators run about six tours per season on average, serving about nine people per tour. However, to the extent of the authors' knowledge, no other study has further examined recreational storm chasers.

DOI: 10.1002/jtr

Personality traits and sensation seeking

Personality traits, defined as characterization and explanation of behaviour (Tellegen, 1991), are a central construct in understanding participation in risk recreation, thus to understand recreational storm chasing. Zuckerman (1971) postulated the Sensation Seeking construct to explain personality traits and behaviours associated with people's willingness to participate in risk recreational activities. He conceptualized sensation seeking as 'a trait defined by the seeking of varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social, legal and financial risks for the sake of such experience' (Zuckerman, 1994, p. 27). Thus, the sensation seeker is the individual who needs varied, novel and complex sensations and experiences to maintain an optimal level of arousal while having an expressed intolerance for boredom (Zuckerman, 1971; Pizam *et al*., 2004). Spontaneity and impulsivity also tend to drive sensation seekers' behaviours (Franken, 1993).

Zuckerman (1978) proposed the Sensation Seeking Scale (SSS) in an attempt to provide an operational measure of the optimal level of stimulation (i.e. sensation seeking), formulated earlier by Wundt in 1873 (Zuckerman, 1978). Since its development, SSS has gone through several modifications, with the SSS-V the most widely used. SSS-V is composed of four subscales (i.e. dimensions): (i) Thrill and Adventure Seeking, measuring the desire to engage in risky, impulsive and adventurous activities offering the individual unique sensations; (ii) Experience Seeking, measuring the desire to seek new sensations through the mind and senses and having an unconventional lifestyle; (iii) Boredom Susceptibility, measuring aversion to routine, repetitive and monotonous invariant situations; and (iv) Disinhibition, measuring the need to seek social stimulation through disinhibited behaviour. In turn, each of the four dimensions includes ten forced-choice items (Zuckerman, 1979). A high score in each dimension indicates a great need for stimulation or a high level of sensation seeking. A total score for sensation seeking is derived from the summation of four independent scales.

The SSS-V scale has been deemed as a reliable and valid measurement of sensation seeking for a variety of recreational activities including deep-sea diving, gliding, skydiving, and rock and mountain climbing (Zuckerman, 1978; Zuckerman *et al*., 1978; Shoham *et al*., 2000). However, SSS-V also has been criticized, mainly in four aspects as delineated by Arnett (1996) and Hoyle *et al*. (2002). First, responses to several items related to strenuous physical activities, such as skiing and mountain climbing, can be likely affected by respondent's age. Second, its wording in some items are colloquial and reflect idioms of the sixties and seventies (e.g. hippies, jet set and queer), hence not always appropriate. Third, the scale contained numerous items related to alcohol or drug use and sexual behaviour, thus rendering the form tautological for many sensation-seeking studies for which the scale had been used. Fourth, when applied to its full extent, the scale is too lengthy as it comprises 40 items in total. Additionally, the forced-choice format is cumbersome and may limit a full understanding of respondents traits (Hoyle *et al*., 2002).

More recently, Hoyle *et al*. (2002) revised the SSS-V developing the Brief Sensation Seeking Scale (BSSS). In the new scale, outdated colloquial statements as well as alcohol-, drug- and sex-related items were deleted. BSSS also is much shorter, comprising two items per dimension, and it uses a five-point Likert format instead of the original forced-choice format (Hoyle *et al*., 2002). Hence, the strength of the BSSS is its reflection of the full content domains of the SSS (Hoyle *et al*., 2002), and it also has shown high internal consistency and reliability (Hoyle *et al*., 2002; Gosling *et al*., 2003). Although previous studies have found practical to use the BSSS scale, it also has some limitations. First, it has mainly been applied to samples composed by students or adolescents without using control groups (Stephenson *et al*., 1999; Donohew *et al*., 2000; Palmgreen *et al*., 2001) reducing its validity. In addition, with only two items per category, the BSSS is too brief to fully identify sensation-seeking levels among participants.

Beyond SSS-V and BSSS, other scales also have been developed to measure sensation seeking, including the Arnett Inventory of

DOI: 10.1002/jtr

Sensation Seeking (Arnett, 1994), Impulsive Sensation Seeking Scale (Zuckerman *et al*., 1988) and Need Inventory of Sensation Seeking (Roth *et al*., 2007). However, the SSS-V and BSSS still remain the most widely used and are the basis of many of these subsequent scales.

Sensation seeking in risk recreation and tourism

Sensation seeking has been used to examine participation in risk recreation and to show that it can influence participation in these types of recreation activities (Ewert, 1985). Several studies have found that sensation seeking differentiates high- or low-risk activity participants from the general population (Babbitt *et al*., 1990; Slanger and Rudestam, 1997; Jack and Ronan, 1998; Diehm and Armatas, 2004). For example, female participants in an aerobic exercises class (i.e. low risk recreation) showed lower sensation-seeking levels than the Australian general population (Babbitt *et al*., 1990), whereas mountain climbers from a university club scored higher on each of the four dimensions and the total sensation-seeking scores than the control group (Cronin, 1991). Similar results were found regarding hang-gliding (Wagner and Houlihan, 1994; Jack and Ronan, 1998), skiing, rock climbing, white water kayaking, stunt flying (Slanger and Rudestam, 1997), skydiving, mountaineering, motor-car racing (Jack and Ronan, 1998), parasailing (Chirivella and Martinez, 1994) and downhill skiing (Calhoon, 1988).

Importantly, studies have shown that some risk recreation participants do not score high in all sensation-seeking dimensions because of the nature of the recreational activity itself or contextual conditions . For example, recreational surfers in Australia scored low on Boredom Susceptibility, which is related to the nature of surfing itself (Diehm and Armatas, 2004). Surfers have to control boredom because of the variability of surfing conditions, which may cause them to wait considerable lengths of time for appropriate conditions, such as good weather or optimal waves. Similarly, scuba divers in Pittsburgh (Pennsylvania, USA) did not score different from the control population on total sensation-seeking scores, scored significantly lower on the Boredom Susceptibility and Disinhibition dimensions but scored higher on the Thrill and Adventure Seeking and Experience Seeking dimensions (Taylor *et al*., 2001).

Previous studies suggest that, as risk recreation activities vary, the demographics of risk recreation participants might influence their sensation-seeking levels (Zuckerman *et al*., 1978; Pizam *et al*., 2004). For instance, gender difference was found significantly associated with sensation-seeking levels in hang-gliding, mountaineering, skydiving and automobile racing (Jack and Ronan, 1998), whereas no gender differences were found in rock climbing (Llewellyn and Sanchez, 2008) and mountain climbing (Burnik *et al*., 2008). Also, a negative association between age and sensation-seeking levels was found in hang-gliding, mountaineering, skydiving and automobile racing (Wagner and Houlihan, 1994; Jack and Ronan, 1998). Finally, Pizam *et al*. (2004) found significant differences in sensation-seeking levels among undergraduate participants from different nationalities, suggesting that cultural context may shape personality traits.

Sensation seeking can be expressed in many facets of individual's life; thus, the characterization of sensation seeking in terms of novelty has a significant effect on tourist destination choice (Arnett, 1994). Novelty seeking is the opposite of familiarity seeking (Jang and Feng, 2007) and has been applied by many researchers to explain tourist decision making on destinations (Cohen, 1979; Lee and Crompton, 1992; Dimanche and Havitz, 1994; Petrick, 2002; Ariffin, 2008). Previous studies have found that sensation- and novelty-seeking influence travel destination choice. Travelers with a high level of novelty seeking rarely return to previously visited destinations, continuously switch destinations, have a greater desire to visit unfamiliar places, pursue innovative vacations and undertake international trips, whereas those with a low level of novelty seeking have a higher intension to revisit (Zuckerman, 1979; Wahlers and Etzel, 1985; Feng and Jang, 2004; Lepp and Gibson, 2008; Assaker *et al*., 2011).

Differences between low and high sensation seekers also exist in the types of activities they undertake while travelling for pleasure. Overall, those with higher sensation-seeking levels tend to prefer stimulating, high-energy and

DOI: 10.1002/jtr

outdoor activities such as mountain biking and wilderness hiking (Galloway and Lopez, 1999; Pizam *et al*., 2004) and overall adventure tourism (Miles, 1978; Gilcrist *et al*., 1995). In addition, those who participate in extreme sports while touring for pleasure tend to score high on sensation seeking as compared with those preferring visiting cultural, natural or man-made attractions or attending traditional sports (Pizam *et al*., 2002). Specifically, it seems that Thrill and Adventure Seeking is the sensation-seeking dimension most likely to influence tourism behaviour whereas Boredom Susceptibility is the least influential one (Pizam *et al*., 2002).

Different sensation-seeking levels also determine travel behaviour, in terms of number of activities engaged while travelling (Galloway *et al*., 2008), although it does not appear to influence the number and length of leisure trips nor the trip planning (Pizam *et al*., 2004). In terms of travel arrangements, sensation seekers tend to prefer active and spontaneous vacations and would choose less comfort while travelling (Pizam *et al*., 2004). They also prefer independent styles of travel; they tend to arrange their own travel, especially through the Internet, as compared with those with low sensation-seeking levels who prefer to travel in packaged or guided groups and are more open to recommendations from travel agents or advertisement (Pizam *et al*., 2002, 2004; Lepp and Gibson, 2008).

The limited available information on recreational storm chasing, especially within the sensation-seeking framework, urges for further examination. This is especially important, taking into consideration that anecdotal evidence suggests a growth in this form of niche tourism, that sensation seeking appears to influence recreation and travel behaviour (Ewert, 1985; Gilcrist *et al*., 1995; Pizam *et al*., 2002, 2004) and that sensation seekers are suggested to be an appealing and lucrative market for specialized and tailored leisure travel (Pizam *et al*., 2002). Specifically, further examination on the relationship between sensation seeking and participant demographics, previous experience, current and future involvement is needed to fill a gap in the current literature on risk recreation and niche tourism (Taylor *et al*., 2001; Pomfret, 2006).

STUDY METHODS

Sampling procedures and partnering agencies

The subjects of this study were recreational storm chasers participating in organized tours in 2009. As recreational storm chasers are not readily identifiable in a list, storm-chasing tour agencies were approached to assist on the distribution and collection of questionnaires. An Internet search resulted in the identification of 18 storm-chasing tour agencies. From those, four were no longer in business, three declined partnering in this study and two were never reached, resulting in nine agencies that were willing to partner in our study. However, due to various reasons (e.g. reduced tornado activity and economic crisis in 2009), only five companies actually assisted in this study.

With the exception of one Canadian company, partnering tour agencies were based in four states throughout the USA: Illinois, California, Oklahoma and Maryland. In 2009, these agencies operated tours between April and August, which is the active tornado season. Partners represent both recent and long-established operations. One of the study partners had less than five years in business; one had between five and ten years and two have been in this business for more than ten years. Operators ran about 3 to 10 tours, with the number of customers ranging from 3 to 15 per tour.

Research instrument and data collection

Partnering agencies helped to distribute the survey forms among their 2009 customers. The survey instrument gathered information on the sensation-seeking personality traits associated with storm chasing, as well as indicators of this activity involvement, tour satisfaction and socio-demographic characteristics. Sensation seeking traits were examined using 16 statements representing four dimensions of SSS-V scale (Zuckerman, 1979), although three modifications were introduced: (i) the number of sensation-seeking items were reduced; (ii) wording was modified to reflect current context and storm-chasing activity; and (iii) a five-point Likert scale was used for measurement (where 1 = strongly disagree and 5 = strongly agree) instead of the forced-choice format following

DOI: 10.1002/jtr

the BSSS scale (Hoyle *et al.*, 2002). Thus, the modified SSS-V scale adopted in this study has four dimensions each with four attributes: (i) Experience Seeking (e.g. 'I like to explore strange places'); (ii) Thrill and Adventure Seeking (e.g. 'I like to do frightening things'); (iii) Boredom Susceptibility (e.g. 'I get restless when I spend too much time at home'); and (iv) Disinhibition (e.g. 'I like to have unconventional exciting experiences'). Several attributes were inquired in reverse order, meaning that high levels of agreements indicated lower sensation-seeking levels and thus were reverse coded for analysis.

The survey instrument also collected information on activity involvement by querying about past and current storm-chasing experience. Future involvement in storm chasing (i.e. likelihood of doing tornado chasing on their own) and willingness to recommend tornado chasing to others were assessed on a five-point Likert scale anchored in one (very unlikely) and five (very likely). Respondents also were inquired about their storm-chasing experience, characteristics of their tour, decision-making process and socio-demographics. Finally, satisfaction with 22 tour operational attributes representing four business components (i.e. operator, package, education and information, and logistics) also was assessed using a five-point Likert scale anchored in one (very unsatisfied) to five (very satisfied).

A pre-test of the instrument was conducted among undergraduate students to assess content validity, after which some questions were reworded for increased readability. Self-administered questionnaires were distributed by partnering tour operators at the end of each of their storm tours starting on April 2009. Participants were asked to insert their completed questionnaires in a self-addressed postage prepaid envelope and seal it. Tour operators then collected all sealed envelopes and put them in the mail. Data collection closed in August once the 2009 tornado season was over. Altogether, 51 completed questionnaires were received, of which, one was duplicated and removed, resulting in 50 valid questionnaires for a 43.5% response rate (50/115).

Data analysis

Descriptive analyses were first performed to examine the socio-demographic information of recreational storm chasers, characteristics associated with overall involvement with this activity, satisfaction levels and sensation-seeking traits. Cronbach's reliability analysis was performed to test the internal consistency of the attributes comprising sensation-seeking dimensions and tour operational dimensions. The 0.33 corrected item-total correlation was used as the criterion to retain an item within a dimension (Ho, 2006). Composite scores of each sensation-seeking and tour operational dimension were calculated by averaging the scores of attributes comprised in each dimension. An overall sensation-seeking score also was obtained by adding all sensation-seeking item scores.

Next, a series of Pearson r correlations were performed to examine whether sensation-seeking items and dimensions (i.e. composite scores) were associated with participants' socio-demographic characteristics (i.e. age, education, income), storm-chasing involvement (i.e. past experience, current involvement, future involvement), willingness to recommend storm chasing to others and levels of satisfaction with different operational business attributes and overall experience satisfaction of storm-chasing tours. An index (0–4) was constructed to measure past experience by summing the four indicators: whether the participant took an organized tour, encountered a tornado or chased tornado for fun in the past, or had a job/study related to weather. A similar index (0–4) also was developed to measure current involvement using four indicators: whether participants considered themselves knowledgeable on storm chasing, whether they were a member of a weather-related organization, whether they had their own equipment and whether they subscribed to at least one weather-related magazine.

RESULTS

Profile of respondents

The majority of recreational storm chasers who responded to the survey were male (62.0%), White people (95.8%) or non-Hispanic (92.5%). Recreational storm chasing in the Tornado Alley mostly attracted middle-aged empty-nester tourists. On average, study participants

DOI: 10.1002/jtr

were 41.9 years old (median = 43.5 years old), and the majority (58.3%) were at least 41. Only one-tenth (10.4%) of the participants were younger than 26 years. Nearly two-thirds (63.3%) of the respondents were single, mostly without children (55.1%). An interesting finding is that about three-quarters (71.4%) of the participants did not have children no matter they were single or married.

Recreational storm chasers taking organized tours were highly educated. The majority (60.5%) of respondents had at least a college degree, and over one-quarter (25.6%) had an advanced degree. Over one-quarter (29.3%) of the survey participants reported a gross annual household income of at least $75 000. The majority (61.0%) had at least $50 000 of annual household income. The majority (71.7%) of the participants were full-time employees; 15.2% were retired from a previous job or profession. As it might be expected because of geographic proximity, the larger proportion of tour participants came from North America (56.4%), from either the USA (43.4%) or Canada (13.0%). Interestingly though, results show that recreational storm chasing in the Tornado Alley captured tourists from more remote areas. About half (43.6%) of the respondents were from Europe (30.5%), including the UK, the Netherlands, Belgium and France; from Australia (10.9%); and from Venezuela (2.2%).

Tour profile and tourists involvement in storm chasing

Recreational storm-chasing tours examined in this study were lengthy; nearly three-quarters (72.0%) lasted at least two weeks, and the remaining (28.0%) lasted one week. No tours of less than one week were reported. About half (48.9%) of the respondents took the tour alone, and about one-quarter (22.2%) were accompanied by friends. The remaining took their tours accompanied by their spouse (11.1%), their siblings (11.1%) or other family members (13.3%). Almost two-thirds (63.3%) of the respondents learned about their storm-chasing tour operator from an Internet search, suggesting that it is imperative for these companies to have an appealing website with updated and complete information about their tours. A relatively large proportion (22.4%) of the participants learned about their tour operators from friends or relatives; thus, pursuing high levels of satisfaction is very important to encourage positive word-of-mouth among potential tourists. As it might be expected, given the time and economic investment in this type of tourism, the majority (76.7%) of the respondents decided to take their tours at least one year in advance and 19.1% at least six months in advance. Half (50.0%) of the respondents signed up for their tours one year in advance and 38.1% six months in advance.

Results show that tours were successful expeditions in terms of number and variety of atmospheric phenomena tourists spotted on their trip. The vast majority of storm chasers (95.8%) spotted at least one atmospheric phenomenon during the chasing, being hail (91.3%) and lightning (89.1%) the most frequent atmospheric phenomena experienced. Nearly half of them experienced a microburst (47.8%) and funnel cloud (50.0%). A large proportion (34.8%) of storm chasers spotted at least one tornado, which is important as this event is highly desirable to experience in these types of tours. On average, responding storm chasers spotted more than three types of events (*mean* = 3.2). The majority of the respondents (69.6%) experienced at least three different types of events, and over a third (37.0%) experienced four different types of events or more.

Storm chasers that responded to the survey were evenly divided between those having at least one previous storm-chasing experience (53.2%) and those who were first-timers (46.8%; Table 1). Of the experienced chasers, about half (48.9%) took an organized tour before, and nearly one third (29.8%) encountered a tornado before. About half of the storm chasers (49.0%) considered themselves knowledgeable on storm chasing, and over a quarter were a member of a weather-related organization (30.0%), had their own equipment (28.0%) or were subscribed to at least one weather-related magazine (24.0%). The majority stated that they would recommend tornado chasing to others ($M = 4.20$), and some would do tornado chasing on their own ($M = 2.45$).

Satisfaction with storm chasing tours

Overall, all business attributes of the storm-chasing tours received very high satisfaction

DOI: 10.1002/jtr

Table 1. Indicators of previous, current and future involvement in recreational storm chasing and willingness to recommend this activity to others

Storm Chasing Involvement ($n = 50$)	N	%
Previous experience in storm chasing		
None	22	46.8%
At least one experience	28	53.2%
Types of previous experience		
Took an organized tour before	23	48.9% [1]
Encountered a tornado before	14	29.8%
Chased tornado for fun	7	14.9%
Job/study is weather related	3	6.4%
Indicators of current involvement		
Consider self knowledgeable on storm chasing	24	49.0%
Member of a weather-related organization	15	30.0%
Have own equipment	14	28.0%
Subscribe to at least one weather-related magazine	12	24.0%
Indicators of future involvement		
Would do tornado chasing on your own	50	2.45 [2]
Willingness to recommend		
Would recommend tornado chasing to others	50	4.20 [2]

[1]Percentages sum to more than 53.2%, as respondents were able to select multiple categories.
[2]Measured on a five-point Likert scale from (1) very unlikely to (5) very likely.

Table 2. Satisfaction with tour operational attributes

Tour operational attributes	M[1]	Standard deviation
Tour operator ($\alpha = 0.873$)	**4.69**	**0.41**
Experience of guides	4.82	0.39
Knowledge of guides	4.82	0.39
Friendly attitude of guide/staff	4.76	0.43
Driving skills of guides/staff	4.65	0.63
Responsiveness of tour operator	4.60	0.61
Ease to contact/reach the tour operator	4.65	0.60
Ease of booking/registration	4.52	0.74
Tour package ($\alpha = 0.740$)	**4.37**	**0.59**
Price of tour	4.04	0.90
Length of tour	4.76	0.43
Number of people per group	4.34	0.85
Tour design and itinerary	4.33	0.85
Education and information ($\alpha = 0.810$)	**4.48**	**0.54**
Learning during the trip	4.34	0.90
Safety instructions during the chase	4.64	0.61
Website information	4.52	0.64
User friendly website	4.40	0.53
Logistics ($\alpha = 0.846$)	**4.24**	**0.59**
Weather-forecasting equipment	4.58	0.67
Vehicle comfort and reliability	4.48	0.71
Lodging and accommodations	4.30	0.84
Provision of meals	4.04	0.91
Activities during 'non-action' time	4.26	0.94
Provision of snacks and drinks	4.02	0.84
Souvenir and memorabilia offerings	4.00	0.78

[1]Measured on a five-point Likert scale from (1) very unsatisfied to (5) very satisfied.

scores. 'The experience of the guides' ($M = 4.82$) and 'the knowledge of the guides' ($M = 4.82$) were the attributes that received highest satisfaction scores (Table 2). In turn, the 'provision of snacks and drinks' ($M = 4.02$) and the 'souvenir and memorabilia offerings' (satisfaction $M = 4.00$) received the lowest satisfaction scores. Reliability analysis (Cronbach's alpha) indicated strong internal consistency among the attributes included to define each of the four business dimensions examined ($\alpha = 0.740$–0.873). Overall, respondents were very satisfied with all dimensions of the storm-chasing tours, especially with the 'tour operator' ($M = 4.69$) and 'education and information' ($M = 4.48$) dimensions in which the company staff play a critical role. Although still high, the 'tour package' dimension was ranked third ($M = 4.37$). These results are associated to the relative lower satisfaction levels of the tour price ($M = 4.04$) as compared with other variables included in this business dimension. Respondents were least satisfied with the 'Logistics' ($M = 4.24$) of storm-chasing tours, although again still reported high levels of satisfaction for this dimension.

Sensation seeking traits associated with recreational storm chasing

Recreational storm chasers tended to be neutral on sensation-seeking attributes, with 12 of the 16 sensation-seeking items ranked as either neutral or low. Respondents scored lowest on 'I don't mind watching a movie I have seen before' ($M = 2.12$), followed by 'I prefer quiet parties

DOI: 10.1002/jtr

with good conversation' ($M = 2.70$) and 'I prefer not to use a guide even in a place they don't know' ($M = 2.76$). Respondents did show a preference to explore strange places ($M = 4.32$) and to have unconventional exciting experiences ($M = 4.10$). Likewise, respondents scored relatively high on 'I like to try new foods that I have never tasted before' ($M = 3.69$) and 'I like friends that are different than me' ($M = 3.60$).

Cronbach's tests indicated acceptable levels of internal reliability for three of four sensation-seeking dimensions after the removal of several items: Experience Seeking, Thrill and Adventure Seeking and Boredom Susceptibility. The Disinhibition dimension was removed from further analysis because an acceptable alpha coefficient was not obtained ($\alpha = 0.249$), even after several items were removed as corrective measure (Table 3). The Thrill and Adventure Seeking dimension ($\alpha = 0.789$) showed the highest internal reliability, after 'Relaxation is my most important goal for recreation' was removed. After removing the 'I don't mind watching a movie I have seen before' item, the Boredom Susceptibility reached an acceptable internal reliability ($\alpha = 0.680$). Experience Seeking had the lowest alpha ($\alpha = 0.529$) even after two items (i.e. 'I like to try new foods that I have never tasted' and 'I prefer not to use a guide even in a place I don't know') were removed to increase reliability. In sum, eight statements representing three of the four original dimensions were retained. Of these three final dimensions, respondents had moderately high score for the 'Experience Seeking' dimension ($M = 3.77$). Surprisingly, storm chasers did not show signs of having high sensation-seeking traits on the 'Thrill and Adventure Seeking' ($M = 3.02$) nor the 'Boredom Susceptibility' dimensions ($M = 3.15$). Of the 55 possible points, respondents scored low in their overall sensation-seeking sum score ($M = 26.04$).

Socio-demographic, activity involvement and satisfaction indicators associated with sensation seeking traits

Findings showed that age and education are correlated to some attributes of the sensation-seeking traits. There was a moderate negative correlation between age and 'I like to do frightening things' ($r = -0.285$, $p = 0.049$) and 'I

Table 3. Level of agreement with sensation seeking attributes among recreational storm chasers

Sensation-seeking dimensions and items[1]	M[2]	Standard deviation
Experience seeking ($\alpha = 0.529$)[3]	**3.77**	**0.69**
I like to explore strange places.	4.32	0.77
I may change my itinerary on impulse when I travel.	3.22	0.91
Thrill and adventure seeking ($\alpha = 0.789$)[4]	**3.02**	**1.10**
I prefer safe sports/activities (e.g. yoga).	3.14[6]	1.23
I like to do frightening things.	3.14	1.23
I like to try risky sports.	2.78	1.45
Boredom susceptibility ($\alpha = 0.680$)[5]	**3.15**	**0.85**
I get restless when I spend too much time at home.	3.46	1.20
I prefer friends who are excitingly unpredictable.	3.04	1.07
I like the comfortable familiarity of my usual environment.	2.94[6]	1.00
Overall sensation seeking (sum)[7]	**26.04**	**5.35**

[1]Disinhibition dimension was removed due to unacceptable scale reliability ($\alpha = 0.249$) with four items, (i.e. 'I like to have unconventional exciting experiences', 'I like friends that are different than me', 'Stimulants make me uncomfortable', and 'I prefer quiet parties with good conversation').
[2]Measured on a five-point scale from (1) strongly disagree to (5) strongly sgree.
[3]'I like to try new foods that I have never tasted before' and 'I prefer not to use a guide even in a place I don't know' were removed to improve scale reliability ($\alpha = 0.195$).
[4]'Relaxation is my most important goal for recreation' was removed to improve scale reliability ($\alpha = 0.628$).
[5]'I don't mind watching a movie I have seen before' was removed to improve scale reliability ($\alpha = 0.616$).
[6]Scale item means reverse coded. Percentages were not changed.
[7]Sum ranged from 5 to 55 (minimum = 13; maximum = 38).

DOI: 10.1002/jtr

like to try risky sports' ($r = -0.309$, $p = 0.033$) from the Thrill and Adventure Seeking dimension (Table 4). A similar correlation also was found between 'I get restless when I spend too much time at home' ($r = -0.267$, $p = 0.066$) and 'I prefer friends who are excitingly unpredictable' ($r = -0.281$, $p = 0.053$) within the Boredom Susceptibility dimension. Results also showed a strong negative correlation between education and 'I like to do frightening things' ($r = -0.428$, $p = 0.004$) and 'I like to try risky sports' ($r = -0.435$, $p = 0.004$). No significant correlations were found between any sensation-seeking attribute and household income or between any socio-demographic indicator and the Experience Seeking attributes.

Results revealed several activity involvement attributes associated with sensation-seeking attributes. There was a moderate negative correlation between past experience in storm chasing and 'I like to do frightening things' ($r = -0.282$, $p = 0.055$) and 'I like to try risky sports' ($r = -0.264$, $p = 0.073$) from the Thrill and Adventure Seeking dimension and with 'I prefer friends who are excitingly unpredictable' ($r = -0.266$, $p = 0.071$) from the Boredom Susceptibility dimension (Table 5). Positive correlations were found between respondents' willingness to be involved in this form of recreation in the future and the 'I get restless when I spend too much time at home' attribute ($r = 0.303$, $p = 0.034$) from the Boredom Susceptibility dimension and between participants' willingness to recommend storm chasing to others and 'I prefer safe sports/activities' ($r = 0.414$, $p = 0.03$) from the Thrill and Adventure Seeking dimension. No significant correlations were found between current involvement in recreational storm chasing and any sensation-seeking attributes.

Findings also show positive associations between several tour satisfaction indicators and sensation-seeking attributes. Specifically, results show that 'I like to do frightening things' (Thrill and Adventure Seeking dimension) was positively associated with satisfaction levels of the package ($r = 0.287$, $p = 0.044$) and the education resources ($r = 0.242$, $p = 0.091$) of the storm-chasing tour (Table 6). Similarly, it was found that the higher the respondents' agreement with the 'I like to explore strange places' attribute (Experience Seeking dimension), the higher the satisfaction with the tour logistics ($r = 0.274$, $p = 0.054$) and with the overall storm-chasing tour ($r = 0.277$, $p = 0.051$). No significant correlations were found between satisfaction levels with the tour operator and any sensation-seeking attribute. Also, no significant correlation was found between the overall sensation-seeking score and any of the satisfaction indicators.

Table 4. Socio-demographic characteristics associated with sensation-seeking attributes

Sensation-Seeking dimensions and items	Socio-demographics (*r*)		
	Age	Education	Income
Experience seeking	**-0.003**	**-0.098**	**0.146**
I like to explore strange places.	-0.064	-0.113	0.111
I may change my itinerary on impulse when I travel.	0.048	-0.055	0.131
Thrill and adventure seeking	**-0.296****	**-0.431*****	**0.038**
I prefer safe sports/activities (e.g. yoga).	-0.141	-0.176	0.101
I like to do frightening things.	-0.285**	-0.428***	0.031
I like to try risky sports.	-0.309**	-0.435***	-0.025
Boredom susceptibility	**-0.192**	**-0.219**	**0.193**
I get restless when I spend too much time at home.	-0.267*	-0.172	0.092
I prefer friends who are excitingly unpredictable.	-0.281*	-0.078	0.134
I like the comfortable familiarity of my usual environment.	0.122	-0.239	0.219
Overall sensation seeking (sum)	**-0.274***	**-0.393****	**0.150**

*$p < 0.1$;
**$p < 0.05$;
***$p < 0.005$.

DOI: 10.1002/jtr

Table 5. Indicators of involvement in recreational storm chasing associated with sensation-seeking attributes

Sensation-seeking dimensions and items	Indicators of involvement (*r*)			
	Past experience	Current involvement	Future involvement	Recommending to others
Experience seeking	**0.056**	**-0.049**	**0.119**	**-0.125**
I like to explore strange places.	0.075	0.009	0.123	-0.053
I may change my itinerary on impulse when I travel.	0.022	-0.083	0.077	-0.146
Thrill and adventure seeking	**-0.250***	**-0.060**	**0.011**	**0.227**
I prefer safe sports/activities (e.g. yoga).	-0.078	0.085	0.058	0.414***
I like to do frightening things.	-0.282*	-0.092	-0.002	0.144
I like to try risky sports.	-0.264*	-0.130	0.076	0.041
Boredom susceptibility	**-0.111**	**0.021**	**0.182**	**0.012**
I get restless when I spend too much time at home.	0.096	0.138	0.303**	-0.117
I prefer friends who are excitingly unpredictable.	-0.266*	-0.056	0.014	0.166
I like the comfortable familiarity of my usual environment.	-0.113	-0.053	0.088	-0.007
Overall sensation seeking (sum)	**-0.190**	**-0.040**	**0.125**	**0.112**

*$p < 0.1$;
**$p < 0.05$;
***$p < 0.005$.

Table 6. Tour satisfaction associated with sensation-seeking attributes

Sensation-seeking dimensions and items	Tour satisfaction (*r*)				
	Operator	Package	Education	Logistics	Overall
Experience seeking	**-0.022**	**-0.113**	**0.059**	**0.150**	**0.206**
I like to explore strange places.	0.095	0.016	0.056	0.274*	0.277*
I may change my itinerary on impulse when travel.	-0.113	-0.186	0.042	-0.002	0.080
Thrill and adventure seeking	**0.173**	**0.221**	**0.189**	**0.157**	**0.015**
I prefer safe sports/activities (e.g. yoga).	0.146	0.102	0.120	0.166	-0.109
I like to do frightening things.	0.199	0.287**	0.242*	0.192	0.096
I like to try risky sports.	0.100	0.171	0.122	0.053	0.046
Boredom susceptibility	**0.113**	**0.061**	**0.089**	**0.089**	**0.024**
I get restless when I spend too much time at home.	0.190	0.083	0.159	0.132	0.042
I prefer friends who are excitingly unpredictable.	0.043	-0.013	-0.025	0.014	-0.021
I like the comfortable familiarity of my usual environment.	0.014	0.069	0.063	0.054	0.034
Overall sensation seeking (sum)	**0.154**	**0.135**	**0.174**	**0.178**	**0.074**

*$p < 0.1$;
**$p < 0.05$;
***$p < 0.005$.

CONCLUSIONS

This study developed a socio-demographic profile of recreational storm chasers in the USA and analysed the relationship between sensation-seeking traits of storm chasers and their socio-demographic, storm-chasing involvement and satisfaction indicators. Most of these respondents were single and did not have children even if they were married. However, this is not consistent with the age distribution of respondents, given that most

DOI: 10.1002/jtr

were middle aged. These results suggest that family obligations, especially related to childbearing, may hinder engagement in recreational storm-chasing tours. Results also may suggest that people with children may not be as interested on risk recreational activities, results that need further exploration. The comparatively high level of education of recreational storm chasers may be associated with their relatively high income. The majority of participants had an annual household income over $50 000, which is particularly high, given that most of the respondents were single and did not have children. Although the USA is a major market for recreational storm chasing, nearly half of the respondents were international tourists, mostly from Europe, suggesting that storm-chasing tour operators need to consider the international market when promoting or marketing their services. This large international draw to the USA for storm chasing, especially from Europeans, is not surprising as severe weather phenomena are rare in Europe.

Respondents were almost equally composed of experienced and inexperienced storm chasers, suggesting that recreational storm chasing is not necessarily a one-time tourism experience nor it is an activity requiring highly specialized skills as compared with other risk recreation activities (Meisel and Cottrell, 2004). These results may suggest a positive augury to this type of niche tourism, which may be especially positive for those travel agents and companies offering tailored trips as they capture a wealthy market (Pizam *et al*., 2002). About half of the storm chasers considered themselves knowledgeable on storm chasing, and over a quarter are member of a weather-related organization, have their own equipment, or are subscribed to at least one weather-related magazine, suggesting relatively high levels of engagement in this type of recreational activity. Importantly, for the continuity of this type of niche tourism activity, the majority would recommend tornado chasing to others, and some would engage in tornado chasing on their own in the future.

Storm chasers perceived that the tour operator, especially the experience and knowledge of guides, was the most important business component of storm-chasing tours confirming that safety and customer service were practices that tourists highly value. Although these results are not surprising as these two elements can significantly reduce any risk associated with storm chasing, they are critical to fight some negative image, (e.g. describing recreational chasers as 'reckless daredevils') associated with this type of recreational activity. Results show that storm chasers were very satisfied with the four business components examined in this study, although some attention could be paid to their pricing strategy. Especially important given the nature of storm chasing, respondents were very satisfied with the recreational activities provided during 'non-action' times.

Study results show that responding storm chasers are overall neutral on their sensation-seeking traits, contradicting previous studies in risk recreation that show high scores in every sensation-seeking dimension (Cronin, 1991; Wagner and Houlihan, 1994; Slanger and Rudestam, 1997) or in some of them (Cronin, 1991; Taylor *et al*., 2001; Diehm and Armatas, 2004). These results may suggest that the nature of recreational storm chasing reduces sensation-seeking perceptions, most likely due to the very high safety measures adopted in those organized tours (e.g. sophisticated equipments, experienced guides). The overall low sensation-seeking scores among storm chasers also may be associated to the age of respondents, as previous studies have found a negative association between age and sensation-seeking levels in different recreational activities (Wagner and Houlihan, 1993; Jack and Ronan, 1998). These results also may be associated with the varied cultural background of the study sample, as Pizam *et al*. (2004) found significant differences in sensation-seeking levels among participants from different nationalities. In addition, the programmed recreational and education activities organized during the many inactive ('non-action') hours may have lowered the scores within the Boredom Susceptibility dimension, although low scores in this sensation-seeking dimension has been reported in other types of risk recreation such as scuba-diving and surfing (Taylor *et al*., 2001; Diehm and Armatas, 2004). The relative low score in Thrill and Adventure Seeking among respondents confirm that

DOI: 10.1002/jtr

storm chasers may not be driven by the sole thrill of this activity as usually portrayed by the media (Robertson, 1999).

Study results confirm previous findings on other forms of risk recreation. For example, the negative moderate correlation found between age and Thrill and Adventure Seeking supports previous findings in hang-gliding, mountaineering, skydiving and automobile racing (Wagner and Houlihan, 1993; Jack and Ronan, 1998). However, a negative correlation between Thrill and Adventure and education level emerge for the first time in this study. On this regard, it is advisable to replicate this finding in other studies to control for the cultural backgrounds among the international respondents, which may influence their perceptions and sensation-seeking levels as reported elsewhere (Pizam *et al*., 2004).

The negative correlation between past experience in recreational storm chasing and two items of the Thrill and Adventure Seeking dimension suggests that more experience may reduce the fright and risks recreational storm chasers perceive in the activity, most likely because experienced storm chasers have already experienced first-hand safety measures while touring. Thus, individuals that have previous experience with storm chasing are likely not seeking the same level of thrills and new adventures. Likewise, a positive correlation between an item of Thrill and Adventure Seeking with willingness to recommend storm chasing to others may indicate that thrill and adventure seekers do find that experience on these chases and subsequently would recommend this activity to others.

Correlations found between storm chasing involvement and items on the Boredom Susceptibility dimension is likely due to the increase of tolerance to boredom with repetition. In other words, those individuals with personalities high in boredom susceptibility likely do a particular activity only a few times before they move on to a different new and exciting activity, whereas those individuals who pursue greater involvement in an activity are more tolerant to boredom. These results also may be due to the little influence that Boredom Susceptibility may have in tourism behaviour (Pizam *et al*., 2002). Finally, the few significant correlations found between sensation seeking and several satisfaction levels indicate that personality traits may not influence satisfaction levels. This is certainly good news for tour operators that seek to satisfy customers of diverse personality traits.

Beyond these findings, this study also has some important academic and marketing implications. The first and most important academic implication is that the sensation-seeking construct is yet to be further tested. Specifically, results showed that the Disinhibition dimension was not applicable in our study as it showed non-acceptable internal reliability. Given that Disinhibition is usually examined with items related to sexual preferences and use of alcohol or drugs, it is not surprising that they are not applicable to recreational storm chasing. However, these results raise some questions regarding sensation seeking, deserving further exploration, as it may be the case that some dimensions may not be as applicable to certain types of recreational activities and their participants. It also is advisable that future studies examine whether differences exist between recreational storm chasers and the general population or control groups regarding their sensation-seeking levels as conducted in other risk recreation activities (Calhoon, 1988; Cronin, 1991; Chirivella and Martinez, 1994; Wagner and Houlihan, 1994; Slanger and Rudestam, 1997; Jack and Ronan, 1998). Previous studies also suggested that sensation seeking could be a useful tool for marketing segmentation (Chang *et al*., 2006; Lepp and Gibson, 2008). Even within tourists that engaged in the same recreation activity, differences in sensation seeking and novelty seeking were found on their expenditures, social contacts and preferred programs (Chang *et al*., 2006). For tour operators, it would be best if they could further segment recreational storm chasers and design separate messages in promotional media to attract specific target groups of recreational storm chasers, when feasible.

As to important marketing implications for the practice of recreational storm chasing, storm-chasing tour companies should pay attention to the international market, given the large proportion of tourists from Europe and other continents besides the USA. Also, results suggest that tour operators should update their websites and post detailed information on their tours and itinerary at least one year ahead, as the majority signed and

DOI: 10.1002/jtr

booked their tours well in advance. This is especially important, taking into consideration that sensation seekers tend to arrange their own travel, especially with the use of the Internet (Pizam *et al*., 2002, 2004). Given that a relative large proportion of storm chasers are members of weather organizations and are subscribers of weather-related magazines, tour companies may consider those outlets for their promotional efforts. It also is advisable that tour companies emphasize the safety and comfort of the tour and their equipments when advertising their services. Finally, study results show that tour operators emphasize the educational component of their tours and make sure to market this component on their advertising materials, especially on the Internet.

Study limitations

Although study results bring out new information on recreational storm chasing and shed light to further research, results should be interpreted with caution, mainly because of two main limitations. First, drawing a random sample of recreational storm chasers is not feasible, given the relatively small number of participants who are dispersed throughout the USA and even the world. Second, although recreational storm chasing is a small niche market and, therefore, a small sample size is justified and acceptable, it is still a limitation of this study. A very slow season because of few severe weather conditions in 2009 may have reduced the number of recreational storm chasers. As a result, some storm-chasing operators were forced to cancel some or all their tours, significantly reducing the pool of potential study participants. In addition, the 2009 economic crisis in the USA also may have reduced the number or recreational storm chasers, given that this activity is a relative expensive recreational activity. The small number of respondents in this study also limited the capacity to conduct some statistical analysis to examine further relationships between sensation seeking and recreational storm chasing.

ACKNOWLEDGEMENTS

The authors express their gratitude to the tour operators who partnered with us in this study. Our gratitude also extends to the editor and the anonymous reviewers for their insightful comments and suggestions.

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