

Assessing the Temporal Stability of Hunting Participation and the Structure and Intensity of Constraints: A Panel Study

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The intent of this panel study of Virginia hunters/non-hunters ($N = 497$) was to assess the temporal stability of: hunting participation; perceived constraint factor structure and intensity; and the interrelationship of participation and constraints. Findings suggest that participation/non-participation patterns were stable across time periods for the population, yet dynamic at the individual level. *Antihunting Attitude and Preference* to participate in other activities, *Costs* associated with hunting, *Access and Opportunity* to hunt, *Work and Family Commitments* and perceptions about hunting on *Public Lands* were viewed consistently as constraints by respondents. Although the structure of perceived constraints appeared stable, the intensity varied significantly over time and distinguished among participation groups. Given that most constraint research is psychologically grounded, it appears more appropriate to employ research designs (e.g., panel, repeated measures) that allow individual-level analyses. The *Antihunting Attitude and Preference* constraint, key to understanding behavioral response, deserves a more in-depth examination.

KEYWORDS: *Constraints, hunting, participation, non-participation, panel design*

Introduction

Perceived Constraints to Participation

Leisure constraints are “factors that inhibit people’s ability to participate in leisure activities, to spend more time doing so, to take advantage of leisure services or to achieve a desired level of satisfaction” (Jackson, 1988, p. 203), and the evolution of this line of research is well documented (Crawford, Jackson, & Godbey, 1991; Godbey, 1985; Goodale & Witt, 1989; Jackson, 1988; Jackson & Scott, 1999; McGuire, O’Leary, Yeh, & Dottavio, 1989; Samdahl & Jekubovich, 1997; Searle & Jackson, 1985). Efforts have been primarily directed at empirically identifying and analyzing constraints to leisure

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engagement and goal attainment. Specifically, researchers have identified barriers (Buchanan & Allen, 1985; Jackson & Searle, 1985), examined the effect of these barriers on leisure preferences and patterns over time (Jackson, 1990; Jackson & Witt, 1994) and across activity domains (McCarville & Smale, 1993), and analyzed the effect of these barriers on leisure choices and experiences of different populations (Alexandris & Carroll, 1997a, 1997b; Hawkins, Peng, Hsieh, & Eklund, 1999; Henderson, Stalnaker, & Taylor, 1988; Henderson, Bedini, Hecht, & Schuler, 1993; Hultsman, 1992; Jackson, 1993; Jackson & Henderson, 1995; McGuire, Dottavio, & O'Leary, 1986; Shaw, 1994; Sparrow, Shinkfield, & Karnilowicz, 1993).

Theoretical models also have been constructed to aid in conceptualizing the perceived constraint construct and, as a method for linking cognition and behavior, explaining variations in participation and non-participation (Jackson & Dunn, 1991; Wright & Goodale, 1991). Many of these efforts have involved classifying individuals according to their participation in a particular activity, and then looking for significant differences between these groups based on perceptions of the applicability of a series of constraints (Goodale & Witt, 1989; Wright & Goodale, 1991). Alexandris and Carroll (1997a, 1997b), in a study of constraint dimensions and their relationship to recreational sport participation, found that non-participants were significantly more constrained than participants. Specifically, highly active individuals perceived different constraints to participation than moderately and lesser active individuals. It is not surprising that both participants and non-participants reported a wide range of constraints, as actual participation in any activity has the potential to expose individuals to constraints. Sparrow, Shinkfield, and Karnilowicz (1993) took the position that participation in any leisure or recreation activity is inevitably constrained by factors that serve to limit both the nature and frequency of participation.

An implicit assumption in the early constraints literature was the inverse relationship between constraints and participation (i.e., perceived constraints led to either non-participation or a reduction in participation). One major problem with this approach is that the complete absence of constraints does not necessarily lead to participation; rather, constraints may mediate the degree to which individuals feel they can participate in leisure activities. For example, constraints are thought to influence leisure preferences in addition to intervening between preferences and actual participation. Tsai (2000) found that constraints indirectly hindered respondents' engagement in regular active recreation by imposing a moderate inhibiting influence on respondents' interests in participation.

Several other studies have challenged the assumption that reported constraints and antecedents to participation *always* prevent or inhibit the frequency of participation. Kay and Jackson (1991) and Shaw, Bonen and McCabe (1991) noted that an individual's belief that an activity is significant might compensate for encountered constraints. Individuals may exert effort to overcome such constraints, and subsequently succeed in maintaining their desired level of participation. These findings hold to the alternate view of

constraints as “negotiable”—the proposition that participation is dependent, not on the absence of constraints, but by successful negotiation through them using a variety of strategies. The interaction between strength of motivation and perception of constraints, for example, might be an important determinant of the successful negotiation of leisure constraints (Jackson & Rucks, 1993). Jackson (1999) noted that through negotiation an individual achieves their leisure goals, but often in a way that differs than that had the constraints been absent.

Research suggests that constraints influence participation either by reducing or eliminating the desire to participate or by removing or impeding perceived opportunities. Constraints emerge either intrinsically or are imposed by external forces or conditions (McCarville & Smale, 1993). In most research focusing on the general nature of activity participation, constraints appear dynamic—changing with social, personal or activity-based conditions. To more fully understand the nature of participation and constraints, there is a need for further, more controlled research investigating constraints to participation of both participants and non-participants in a particular activity over time. For purposes of this study, the activity of interest was hunting.

Hunting Participation

A large body of research has been conducted on outdoor recreation participation in general and hunting in particular. Early studies focused on describing hunters (Applegate, 1977; Hendee & Potter, 1971), their motivations to hunt and factors influencing satisfaction (Hautaluoma & Brown, 1978; Manfredo, Vaske, & Decker, 1994; Vaske, Donnelly, Heberlein & Shelby, 1982). As participation in sport hunting continues to decline in the United States (Bissell, Duda, & Young, 1998; Heberlein & Thomson, 1996), research has been conducted to identify factors that impact participation—initiation, frequency, and desertion. Research suggests that increased urbanization (and resulting removal of habitat); changing demographics (e.g., an aging population with higher disposable incomes, decreased family size, increased ethnic diversity); increased anti-hunting sentiments; lack of available opportunities (e.g., limited access to private lands, lack of availability of game, time constraints, declining availability of social supports); competition with other leisure activities and changing interests are associated with decreasing hunter participation rates (Enck, Swift, & Decker, 1993; Heberlein & Thomson, 1996; Hendee, 1969; Klessig, 1972; Peterle, 1977; Ruggeri, 1990; Sisson, 1991). This decline in participation may be problematic for individuals, communities and resource management agencies that will no longer experience the social, economic, and cultural benefits of hunting.

Leisure constraints is an area of research with tremendous potential for examining the dynamics of hunting participation/non-participation. People perceive constraints to hunting participation, and these perceptions vary by participation history, frequency and attitudes toward hunting. Backman and

Wright (1993), for example, compared the perceived constraints of former hunters, persons who had never hunted holding positive attitudes toward hunting, and persons who had never hunted holding negative attitudes toward the activity. Their findings support the notion that former participants and non-participants perceive constraints differently, and demonstrate the efficacy of using attitudes to segment respondents into more homogeneous groups. In surveys of deer and duck hunters, decreased participation, amount of game killed and the number of hunting partners were found to be associated with time constraints, decreasing opportunities to hunt, availability of game, declining interest, dissatisfaction with regulations, change of residence or loss of social support networks (Enck, et al., 1993; Klessig, 1972; Peterle, 1977). Barro (1995), in a panel study of Colorado deer hunters, found that investment, constraints, behavioral intentions and attitudes were associated with continued participation.

Assessing Temporal Stability

A few research efforts have investigated the temporal stability of various leisure factors. Allen, Donnelly and Warder (1984) found that certain recreation activity participation factors (outdoor/domestic, outdoor/active, creative crafts) were stable across seasons. Jackson and Witt (1994) assessed the change and stability of leisure constraints among Canadians over a four-year period (1988-1992) using identical instrumentation and survey administration procedures. The authors found little temporal change in aspects of measured constraints with respect to the unfulfilled desire to start a new activity. In fact, "mean scores for barrier items were virtually identical in the two surveys" (p. 334). The majority of differences reported were attributed to variation in the age and income structure of the two samples.

That limited research exists investigating constraint stability, in particular, indicates the need for further investigation. Additionally, leisure behavior research in general, and more specifically, leisure constraints research has remained largely cross-sectional in nature. Longitudinal studies are designed to permit observation over an extended period. Whereas trend studies track changes within some general population, and cohort studies examine more specific sub-population changes, panel design studies—the most powerful of longitudinal designs—incorporate analysis of the same sample of respondents over time.

The intent of this article is to present the findings of an investigation of hunters and non-hunters, focusing on the temporal stability of: 1) hunting participation/non-participation, 2) perceived constraint factor structure, 3) perceived constraint intensity, and 4) the interrelationship of hunting participation/non-participation and intensity of perceived constraints over the study period (1989-1992). This investigation was not approached from the perspective of cause and effect, but rather as an initial effort to isolate and explore temporal variation of constraints and participation.

Methods

The first phase of a study investigating various aspects of wildlife-associated recreation was conducted in 1989, soliciting information on hunting participation/non-participation and perceptions of constraints to participation. In 1992, three years after the initial phase, a survey instrument including an identical battery of constraint and participation questions was mailed to participants who, in 1989, had indicated a willingness to participate in future surveys (Wiggins, 1994). Those responding to both the 1989 and 1992 surveys comprise the study panel.

Derivation of the Study Population

In 1989, a random sample of 3,000 Virginia residents was drawn; half from each of two sampling frames. The first frame consisted of those individuals who had purchased a Virginia state hunting license. To ensure that a sufficient number of persons exhibiting a variety of participation patterns were selected for this study, the second frame consisted of all Virginia residents listed in telephone directories.

A modified version of the methods described by Dillman (1978) was employed to collect the data for both phases of the study. In 1989, a questionnaire, self-addressed pre-stamped envelope, and cover letter were mailed to sampled residents. One week following this initial mailing, a postcard reminder was mailed to the entire sample. Two follow-up mailings were subsequently conducted. After eliminating undeliverable or unusable returns, a total of 1,666 usable responses were received (780 persons from the sample of Virginia residents; 886 persons from the sample of hunting license purchasers)—an overall effective response rate of 66.2 percent (effective $N = 2,516$).

A test of non-response bias was conducted using a telephone interview with a five-percent sample of non-respondents. No significant differences between respondents and non-respondents were found regarding participation/non-participation variables, demographic and lifestyle characteristics, and the initial sampling frame from which they were drawn. [For a more detailed discussion of methods used in this study, see Wright and Goodale (1991)].

The 1,229 residents who participated in the initial study phase and indicated a willingness to participate in future studies were contacted to participate in the second phase. Identical mail survey methods were employed in 1992. Unfortunately, slightly over 21 percent of those who were contacted in the second phase had moved, were deceased, or returned unusable questionnaires, thereby reducing the study population ($N = 967$). A total of 594 completed questionnaires were returned, generating an effective response rate of 61.4 percent. Of these, missing values assigned to key variables further reduced the comparative study population to 497 respondents.

Respondent mortality is always a concern in paneled research and it certainly influenced the number of respondents utilized in this study. Basing

subsequent phases on those most willing to assist is an accepted and common practice in panel research—the attrition is minimized, although a potential for bias remains (Watson, 1998). In this study, for example, hunting may have been a more salient topic to those indicating a willingness to participate in both phases of the study; those who had never hunted in 1989 *may* therefore have been more likely to begin hunting prior to 1992. However, while attrition reduced the number of participants, the distribution of respondents among participation/non-participation groups in fact remained surprisingly proportionate: 40 percent of the respondents were categorized as non-hunters; the remaining 60 percent of respondents were distributed across three participation levels.

Survey Instruments

The survey instruments used in 1989 and 1992 were designed to collect a broad range of data on different aspects of wildlife-associated recreation. Common to both instruments, and serving as the comparative database for this study, were questions about respondents' hunting participation/non-participation and their perceptions of constraints to participation. Participation was assessed using a hierarchical set of three questions: respondents were asked whether they had hunted in the past; whether they had hunted during the most recent hunting season; and, if so, how frequently they had hunted.

The second set of questions solicited the degree to which respondents agreed or disagreed, on a 5-point Likert scale, with statements depicting perceived constraints to hunting participation. These statements were developed and refined through a two-stage process. First, an inventory of past leisure and/or recreation constraints research was conducted, and a pool of 40 potential constraint items was generated and adapted to the activity of hunting (Godbey, 1985; Goodale & Witt, 1989; Howard & Crompton, 1984; Searle & Jackson, 1985). To establish content validity, a panel of university and state wildlife agency researchers and administrators reviewed the item pool and suggested wording revisions and additional hunting-oriented constraint items. From the initial pool, 21 items were selected for use in 1989 and 1992.

Treatment of the Participation/Non-participation Data

Using the three participation questions to determine past and present hunting behavior, each respondent was grouped into one of five participation/non-participation categories for each time period. These five categories, selected based on discussions with state wildlife administrators knowledgeable about hunter behavior, were:

1. Non-Hunters—persons who had never hunted;
2. Former Hunters—persons who had hunted previously, but not during the most recent hunting season;

3. Infrequent Hunters—persons who hunted less than 7 days during the most recent hunting season;
4. Moderate Hunters—persons who hunted between 7 and 20 days during the most recent hunting season; and,
5. Frequent Hunters—persons who hunted more than 20 days during the most recent hunting season.

Changes in participation/non-participation were initially examined by computing and comparing the aggregate percentage of respondents assigned to each of the five participation/non-participation categories in each of the two time periods. Secondly, intra-individual change in participation/non-participation behavior was assessed by pairing the 1989 and 1992 data and partitioning each respondent into one of three participation change groups—"Stable," "Increasers" and "Decreasers." Respondents who were assigned to the "Stable" group reported no change in level of participation between 1989 and 1992. Respondents who began hunting, or resumed hunting after a hiatus, or increased the frequency of their participation were categorized as "Increasers." Conversely, "Decreasers" were respondents who reported decreasing the frequency of their participation, or did not hunt during the most recent season.

Treatment of the Perceived Constraints Data

The temporal stability of perceived constraints to hunting was assessed using analyses of both constraint structure and intensity. To examine the structure of constraints, data from each time period (1989 and 1992) pertaining to the 21 different constraints items were independently analyzed using Principal Components Analysis (with oblique rotation). Constraint factor structure stability was assessed using statistics generated by the two Principal Component Analyses and Cronbach's alpha test of scale reliability; specifically, (1) the number of factors retained; (2) the strength of factor loadings and order in which individual items loaded into each factor; (3) the amount of variance explained overall; (4) the amount of variance explained by each factor; and (5) the reliability coefficients of each factor were compared.

The items retained in each factor were subsequently formed into summated scales, used in turn to determine the intensity of respondents' perceived constraints for each time period. Mean scores on each scale were computed for all respondents and the aggregate differences between time periods calculated. Paired *t*-Tests (repeated measures) were used to determine temporal stability of perceived constraint intensity. While this aggregate approach allowed the assessment of changes in the intensity of constraints as a population, a disaggregate approach—unique to a repeated measures design—allowed for the examination of intra-individual differences.

A disaggregate approach to investigating constraint intensity is particularly interesting when data are paired with individual participation/non-participation data. One-way Analyses of Variance with *post hoc* Scheffé range

tests were performed to assess differences between respondents who increased, decreased or remained stable in their level of participation/non-participation, with regard to the intra-individual change in intensity of perceived constraints.

Results and Discussion

Stability of Participation Patterns—Aggregate Analyses

Review of the aggregate distribution of respondents across participation/non-participation categories for each time period indicated that minor changes had occurred (Table 1). Of all participation categories, the greatest change was seen among "Infrequent" hunters—an overall decrease of 2.6 percent. Smaller percentage changes were found among "Moderate" (+1.2%) and "Frequent" (−0.9%) participants. While the overall number of persons actively hunting decreased by 3.7 percent between 1989 and 1992, a more significant shift in membership was observed between non-participant categories.

The group of respondents indicating they had "Never" hunted in 1989 (23.7% of the study population) decreased to 13.5 percent in 1992 (Note: This group, by definition, could not increase). Conversely, a 12.5 percent increase was observed among "Former" hunters. While it is reasonable to assume that the decrease in the proportion of those "Never" hunting and the comparable increase in "Former" participants were more than coincidental, the aggregate nature of this particular analysis limited the ability to draw more specific conclusions about the exact dynamics of hunting participation.

Stability of Participation Patterns—Disaggregate Analyses

In order to more fully examine the temporal stability of hunting participation, respondents' participation/non-participation behaviors from each time period were paired to determine the exact nature of the dynamic (Table 2). Overall, slightly less than 60 percent of the 497 respondents ($n = 295$) remained in the same participation/non-participation category at the end of

TABLE 1
Aggregate Distribution of Respondents among Participation/Non-participation Categories, 1989 and 1992 (N = 497)

	Non-Participation		Participation		
	Never	Former	Infrequent	Moderate	Frequent
1989	23.7%	16.3%	13.1%	21.5%	25.4%
1992	13.5%	28.8%	10.5%	22.7%	24.5%
1989-1992 Change	−10.2%	+12.5%	−2.6%	1.2%	−0.9%

TABLE 2
Disaggregate Distribution of Respondents among Participation/Non-participation Categories, 1989 and 1992 (N = 497)

		1992					
		Non-participation		Participation			
		Never (n = 67)	Former (n = 143)	Infrequent (n = 52)	Moderate (n = 113)	Frequent (n = 122)	
1989	Non-participation	Never (n = 118)	57%	39%	2%	1%	1%
		Former (n = 81)	0%	84%	7%	7%	2%
	Participation	Infrequent (n = 65)	0%	20%	37%	38%	5%
		Moderate (n = 107)	0%	11%	11%	48%	30%
		Frequent (n = 126)	0%	3%	6%	24%	67%

Note: Values along the diagonal represent "Stable" participation change group members. Values below the diagonal represent "Decreasers" and those above the diagonal, "Increasers".

the three-year period. Of those who had never hunted in 1989 ($n = 118$), for example, 67 remained in that category in 1992 (56.8%).

The majority of respondents who began hunting after 1989 ($n = 118$) did not hunt in 1992 ($n = 46$). While some decrease in the ranks of the "Never" category was expected (again, the category membership could not increase), the large shift in respondents previously categorized as "Never" to the "Former" category was surprising. This finding may represent an anomaly in the data, perhaps attributable to some previously unknown measurement error influenced by interpretation of questions assigning respondents to categories. While great care was taken to increase content validity of the instrument by eliminating ambiguous wording and minimizing sampling bias, it would appear that assignment of these respondents to a participation change group (i.e., "Increasers") might be spurious. Therefore, these respondents were eliminated from subsequent analyses.

Respondents who reported being "Former" hunters in 1989 ($n = 81$) were much more likely to remain in that category in 1992 (84%) than to have resumed some level of participation. Moreover, 20 percent of the "Infrequent" hunters ($n = 13$ of 65), 11 percent of the "Moderate" hunters

($n = 12$ of 107) and three percent of the "Frequent" hunters ($n = 4$ of 126) in 1989 did not hunt in 1992.

As might be expected, those reporting they hunted less than six days per year in 1989 ("Infrequent") were the most tenuous in their activity. Only 37 percent of these "Infrequent" hunters continued to participate at that level in 1992. However, an almost equal number of respondents had increased their participation to the "Moderate" level and a few had even increased to a "Frequent" level.

It would appear that "Moderate" and "Frequent" hunters were the most stable in their level of hunting activity, although those hunting between seven and 20 days per year in 1989 ("Moderate") were more likely to decrease their activity than those hunting more frequently. Eleven percent of the "Moderate" hunters had decreased their level of participation in 1992 and an equal number did not hunt at all. Almost 30 percent of these respondents increased their frequency of participation, however, to more than 20 days per year.

Again, those hunting most frequently in 1989 were the most temporally stable in their participation (67% continuing at the same level) and demonstrated the lowest propensity not to hunt in 1992 (3%). It is interesting to note that the number of respondents who decreased their participation from "Frequent" to "Moderate" was comparable to the number increasing participation from "Moderate" to "Frequent," suggesting the fluidity of participation among hunters who participate in the activity with greater frequency. Therefore, in contrast to the participation/non-participation stability suggested by the aggregate data (see Table 1), the paired data (see Table 2) suggests that participation/non-participation was much more dynamic.

Stability of Constraint Factor Structure—Aggregate Analyses

Principal Component Analyses performed separately on the 1989 and 1992 data sets each produced factor solutions retaining six factors with Eigen values in excess of 1.0. The first factor, depicting respondents' *Antihunting Attitude and Preference* (or lack thereof) for hunting as a leisure activity, was composed of seven items in 1989 and 1992 (Table 3). Items loading on this factor were remarkably similar between the time periods. The items, hunting "kills defenseless animals" and there is "no longer a need to hunt for food," resulted in factor coefficient loadings of .883 or higher, implying a strong association and high proportion of variance explained relative to this factor. Further, the item depicting respondents being "embarrassed to tell people [they] hunt" due to others' disapproval of the activity produced loadings of .856 and .781 in 1989 and 1992, respectively.

Alternately, items depicting "preferences" for other leisure activities or "preferring to stay at home" produced lower loadings, but sufficient to indicate a clear association with this factor. This first factor represents both the positive-negative continuum of attitudes toward hunting and the relative priority assigned to hunting as a leisure activity.

TABLE 3
Results of a Principal Components Analysis of Perceived Constraint Factors, 1989 and 1992

Perceived Constraint Factors and Items	1989					1992				
	Factor Rank	Variance	Eigen Value	Cronbach's Alpha	Factor Loadings	Factor Rank	Variance	Eigen Value	Cronbach's Alpha	Factor Loadings
<i>Antihunting Attitude and Preference</i>	1	28.39	5.94	.84		1	23.57	4.94	.84	
Prefer other leisure					.646					.603
Prefer free time at home					.604					.581
Hunting kills defenseless animals					.908					.900
Embarrassed to tell					.856					.781
No longer need to hunt for food					.899					.883
Game populations too low					.611					.623
Require too much effort					.544					.527
<i>Costs</i>	2	12.47	2.61	.77		2	12.20	2.57	.70	
Equipment costs					.822					.717
License costs					.824					.747
Travel costs					.764					.779
Laws too confusing					.609					.600
<i>Access and Opportunity</i>	3	7.97	1.67	.81		3	7.90	1.67	.72	
No access to private land					-.837					-.788
Do not know where to go					-.831					-.779
No opportunities near home					-.765					-.698
No one to hunt with					-.699					-.652
<i>Family and Work Commitments</i>	4	6.90	1.44	.70		5	6.20	1.29	.71	
Family commitments					-.844					-.850
Work commitments					-.827					-.787
<i>Public Lands</i>	5	6.40	1.34	.77		4	7.40	1.54	.77	
Public lands too crowded					.885					.886
Public lands too dangerous					.899					.892
<i>Physical Effect and No Barriers</i>	6	5.10	1.08	.14		6	5.30	1.11	-.12	
No barriers					.727					.741
Physical disability					.569					-.467
<i>Total Percent of Variance Explained</i>		67.00					62.50			

The second factor in each time period reflected respondents' perceptions associated with the *Costs* of hunting. Statements depicting concerns over "equipment," "license," and "travel" costs produced loadings greater than .717 in both time periods. Also ascribed to this factor, in both phases, was a statement about "hunting laws being too confusing." This item generated loadings of .609 and .600 in 1989 and 1992, respectively.

Item loadings for Factor 3 were again consistent between the two time periods. This factor described lack of *Access and Opportunity* to hunt. Four statements loaded on this factor in both time periods. Insufficient "access to private lands" produced the highest loadings, $-.837$ and $-.788$ respectively. Similarly, not knowing "where to go," having "no opportunities to hunt near home," and lacking the social support (i.e., "no one to hunt with") also were significant and consistent between time periods.

The only major difference found between the two factor structures (1989 and 1992) was the transposition of the fourth and fifth factors. In the initial phase, concerns over *Family and Work Commitments* produced a larger Eigen value than concerns over the perceptions that hunting on *Public Lands* is "crowded" and "dangerous." In the second phase, respondents' concerns over *Public Lands* produced a greater Eigen value and explained more variance than their views that *Family and Work Commitments* left little time for hunting. Be that as it may, the strength and direction of the loadings for items assigned to each factor were remarkably stable between time periods.

Statements that respondents perceived no barriers to their hunting, or that they were unable to hunt "due to physical disabilities" comprised the final factor in both time periods (see Table 3). This factor, *Physical Effect and No Barriers*, was neither as discernable nor as intuitive as the five previous factors, even though the same items loaded on this factor consistently in both time periods. The only exception was the negative direction of the 1992 factor loading for the "disability" item.

The amount of variance explained by each model differed slightly between the two time periods; 67 percent of the total variance was explained by the 1989 model, slightly less (62.5%) in 1992. The variance explained by the factors in each time period indicated that most of the loss of explanatory power in the 1992 model was lost in the first factor, *Antihunting Attitude and Preference*. This factor explained almost five percent (4.8%) less variance in 1992 than in 1989. The *Costs* factor showed only a slight reduction in variance explained in 1992 (0.2%), and *Access and Opportunity* accounted for the same amount of variance in each phase (7.9%).

Even though the *Family and Work Commitments* and *Public Lands* factors were transposed between the two models, the variance explained by each was consistent. Comparing the variance explained by the fourth factor in each model, a 0.5 percent increase was observed. Conversely, there was a 0.2 percent decrease in the amount of variance explained by the fifth factor. However, upon direct comparison of the factors, *Public Lands* explained only one percent more variance in 1992 than it did in 1989; similarly, constraints associated with *Family and Work Commitments* explained 0.7 percent less vari-

ance in the second phase. The final factor, *Physical Effect and No Barriers*, showed a 0.2 percent increase between 1989 and 1992.

The reliability coefficients reported for each factor were similarly stable. Five of the six factors in each model produced highly reliable alpha statistics ($> .70$). Moreover, these statistics were consistent across time periods with the largest difference in Cronbach's alpha (.09) found for the third factor. The sixth factor was not deemed reliable in either time period ($\alpha = .14$ and $-.12$, respectively). A decision was therefore made to eliminate this factor from additional analyses. With this exception, the factor structure of constraints to hunting was temporally stable in terms of the number of factors, composition, amount of variance explained (overall and by individual factors), and reliability.

Stability of Constraint Intensity—Aggregate Analyses

Whereas constraint factor structure was temporally stable, intensity of perceived constraints was dynamic. Based on a paired *t*-Test (repeated measures), differences between 1989 and 1992 were assessed for each summated constraint scale (Table 4). Significant differences were found between the two phases for the *Antihunting Attitude and Preference* [$t = 7.804, p = .001$], *Access and Opportunity* [$t = 2.627, p = .009$], *Family and Work Commitments* [$t = 2.983, p = .003$] and *Public Lands* [$t = -4.548, p = .001$] constraint scales. Respondents reported that perceived *Antihunting Attitude and Preference*, *Access and Opportunity*, *Family and Work Commitments* constraints decreased between 1989 and 1992. Conversely, perceptions that *Public Lands* were "crowded" and "dangerous" had increased. No significant differences between phases were reported for the *Costs* constraint scale.

Relationship of Participation/Non-Participation and Constraint Intensity

One-way Analyses of Variance with *post hoc* Scheffé range tests were used to assess differences between participation change groups (i.e., "Stable", "Increasers", "Decreasers") with respect to change in intensity of perceived con-

TABLE 4
Aggregate Results of a Paired *t*-Test of Individual Differences in the Intensity of Perceived Constraints¹, 1989-1992

Perceived Constraints Scale	1989	1992	1989-1992 Change	<i>t</i>	<i>p</i>
Antihunting Attitude and Preference	4.057	3.837	-.201	7.804	.001
Costs	3.445	3.380	-.065	1.611	.108
Access and Opportunity	3.853	3.773	-.080	2.627	.009
Family and Work Commitments	3.207	3.067	-.140	2.983	.003
Public Lands	2.489	2.709	.220	-4.548	.001

¹Table values represent mean scores for a 5-point Likert scale, where 1 = strongly disagree and 5 = strongly agree.

straints. Significant differences were found between groups for three of the five constraint scales (Table 5). With regard to intensity of the *Antihunting Attitude and Preference* constraints scale, there was a significant difference between participation change groups [$F = 9.905, p = .001$]. Specifically, those respondents that remained stable or experienced a decrease in participation between the two study phases reported an increase in antihunting attitude and a low preference for hunting as a leisure activity, and differed significantly from "Increasers" who experienced a slight decline in the intensity of this constraint.

Similarly, there was a significant difference between participation change groups with regard to intensity of the *Costs* constraint scale [$F = 3.942, p = .020$]. "Increasers", differing from those that remained "Stable", perceived the intensity of cost constraints to have lessened over the three-year period. Although all three participation change groups perceived an increased intensity in the *Access and Opportunity* constraints scale [$F = 4.365, p = .013$], those whose participation decreased over the study period differed significantly from and reported greater constraint intensity than did either those whose participation increased or remained stable. There were no significant differences found between groups with regard to the *Family and Work Commitments* or *Public Lands* constraint scales.

Conclusions

The purpose of this study was to assess the temporal stability of perceived constraints and hunting participation/non-participation. Five conclusions can be drawn from this study that further enhance our understanding of hunting participation, constraints, and their interrelationship.

1. *Participation/non-participation patterns were stable for the population, yet dynamic at the individual-level.* It can be concluded that to gain a better un-

TABLE 5
Changes in the Intensity of Perceived Constraints to Hunting Participation (1989-1992) between Participation Change Groups

Perceived Constraints Scale	Participation Change Group			F	p
	"Increasers"	"Stable"	"Decreasers"		
Antihunting Attitude and Preference	-.038 ^a	.184 ^b	.302 ^b	9.905	.001
Costs	-.131 ^a	.141 ^b	.113 ^{ab}	3.942	.020
Access and Opportunity	.020 ^a	.028 ^a	.278 ^b	4.365	.013
Family and Work Commitments	.000	.163	.215	1.007	.366
Public Lands	-.259	-.200	-.227	0.120	.887

Note: Mean scores (representing change in the intensity of perceived constraints on a 5-point Likert scale, where 1 = strongly disagree and 5 = strongly agree) with different superscripts differ significantly at $p \leq .05$ based on Scheffé range test comparisons.

derstanding of the individual nature of recreation and leisure behavior, efforts must be taken to conduct panel research. In this study, the nature of individual participation/non-participation would have mistakenly appeared stable (as *was* the case for the aggregate, population-level data), had it not been for the study design utilizing identical respondents and allowing individual-level analysis. To illustrate, consider momentarily the aggregate data presented in the left and top margins of Table 2. If one merely sums the number of persons hunting in 1989 ($65 + 107 + 126 = 298$) and those who reported hunting in 1992 ($52 + 113 + 122 = 287$), the number of respondents who hunted (at any level) decreased by only 3.7 percent. Comparing the number of persons in each of the participant categories in 1989 and 1992, the number of hunters participating fewer than seven days ("Infrequent") decreased by 20 percent, "Moderates" increased by five percent, and "Frequents" decreased by three percent. These data indicate that participation rates were fairly stable at the population-level of analysis.

Yet, when data are disaggregated and assessed at the individual level, a dynamic picture of participation/non-participation behavior is gained. This dynamic was masked in aggregate analyses due to mitigating effects of recruitment and desertion among categories. Respondents who participated infrequently were more tenuous in their participation patterns than more avid participants. Over 63 percent of "Infrequent" participants changed categories between 1989 and 1992. These respondents were the most likely to stop hunting, or even increase their participation significantly by 1992. Moreover, 52 percent of "Moderate" and 32 percent of "Frequent" participants experienced some change in level of participation, much of which was migration back and forth between the two categories.

The respondents who exhibited the lowest propensity to change were those categorized as "Former" hunters in 1989. In 1992, over 84 percent of these respondents remained in that category. This may suggest that once a person ceases participation, the likelihood of enticing them to return is relatively low.

2. *The factor structure of perceived constraints to hunting participation in Virginia appeared to be stable, but the intensity of perceived constraints varied significantly between time periods.* Constraint factor structures from each time period were remarkably similar in terms of the number of factors, their composition, variance explained and scale reliability. *Antihunting Attitude and Preference* to participate in other activities explained the greatest amount of variance to hunting participation in both time periods. In addition, *Costs* associated with hunting, *Access and Opportunity* to hunt, *Work and Family Commitments*, and perceptions about hunting on *Public Lands* were viewed consistently as constraints by respondents.

Whereas constraint factor structure was temporally stable, intensity of perceived constraints was dynamic. A paired *t*-Test (repeated measures) was employed to assess differences between 1989 and 1992 for each summated constraint scale. Significant differences were found for the *Antihunting Attitude and Preference*, *Access and Opportunity*, *Family and Work Commitments* and

Public Lands constraint scales. Specifically, constraints decreased between 1989 and 1992 for all constraint scales except *Public Lands*, for which the intensity of constraints had increased. No significant differences between phases were reported for the *Costs* constraint scale.

3. *Intensity of Antihunting Attitude and Preference, Costs, and Access and Opportunity constraints distinguished those who increased, decreased, and remained stable in their participation.* Significant differences were found among "Increasers", "Decreasers" and "Stable" respondents with regard to change in intensity of perceived constraints. "Decreasers" and "Stable" respondents, reporting increased intensity of the *Antihunting Attitude and Preference* constraint scale, were significantly different from "Increasers," who reported a slight decrease in intensity.

Decreased intensity of *Costs* among "Increasers" was significantly different from comparable increases in intensity reported by respondents categorized as "Stable." No significant differences were found between either those that increased or remained stable in their participation/non-participation and those who experienced a decrease. This particular constraint appears to have more relevance to those who continue to participate than those who do not.

In contrast, increases in the intensity of the *Access and Opportunity* constraint differentiated those who decreased their participation from all others. The research literature has suggested for many years that insufficient access to private lands has been a particularly difficult impediment to overcome for hunters, particularly in the Eastern United States where little public land is available. Furthermore, the social support networks of friends and family members with which to participate, knowing where to go, and finding opportunities to hunt in proximity to home appear to be critical to sustained participation.

4. *Given that most constraint research is psychologically grounded, it appears more appropriate to employ research designs (panel, repeated measures) that allow individual-level analyses.* To illustrate this point, consider the *Antihunting Attitude and Preference* constraint that was shown to decrease in intensity at the population-level. When data were analyzed at the individual level, however, respondents who remained stable or experienced a decrease in participation actually reported an increase in antihunting attitude and low preference for hunting as a leisure activity, differing significantly from "Increasers" who reported a slight decrease in the intensity of this constraint. This disparity in the findings of population- and individual-level analyses suggests that cross-sectional designs may be less suitable for constraints research and that findings of aggregate analyses may be misleading.

5. *The Antihunting Attitude and Preference constraint appears key to understanding behavioral response (i.e., hunting participation/non-participation), but the nature of this constraint deserves a more in-depth examination, focusing on the interrelationships among attitude toward, interest in, and preference for hunting as a leisure activity.* Within each of the analyses conducted in this study, the importance of the *Antihunting Attitude and Preference* constraint was consistently

demonstrated. A significant decrease in the intensity of this perceived constraint was found when comparing data for 1989 and 1992. Moreover, the *Antihunting Attitude and Preference* constraints scale distinguished between "Increasers" and those who remained "Stable" or decreased their participation. "Increasers" reported a slight decline in the intensity of *Antihunting Attitude and Preference*, respondents who were "Stable" or "Decreasers" reported the intensity of this constraint increased over the three-year period.

These findings also illustrate the duality of the *Antihunting Attitude and Preference* construct and the need for future research. For example, does the fact that "Decreasers" and "Stable" respondents experienced an increase in intensity of this constraint mean that anti-hunting sentiment increased? Or, did the preference for use of their free time in pursuit of other pastimes have more relevance? Unfortunately, the bifurcated nature of this constraint factor makes it difficult to determine the dynamics between the two individual dimensions and the relationship to behavioral change.

Intuitively, a hierarchical relationship between a person's attitude toward an activity and their preference to engage in it is suggested. As noted by Nadirova and Jackson (2000), sequential encounters with leisure constraints might be experienced hierarchically, and the negotiation process may occur not only between categories, but also within a category. For example, is a positive attitude (or the absence of a negative one) a necessary precursor for establishing a preference to engage in an activity? Are attitudes antecedent to derivation of interest, thus serving as a threshold beyond which an individual must proceed in order to cultivate interest in an activity?

A fertile area for research is, therefore, an exploration of the interrelationships among attitudes toward, interest in, and preference for hunting as a leisure activity. The ability to isolate, measure and model these constructs (within the context of a leisure activity), in terms of their antecedents, strengths and sustainability, would be invaluable in explaining why people choose to adopt one activity over another, why they continue or discontinue participation, and further explain how each mitigates a person's ability to negotiate constraints.

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