

Exploring Participant Development Through Adventure-Based Programming: A Model from the National Outdoor Leadership School

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Recreation program evaluation efforts historically have focused primarily on the identification of program-specific outcomes rather than focusing on the influence of specific mechanisms of change. The purpose of this study was to begin to examine programs offered by the National Outdoor Leadership School (NOLS) to develop an etiological model of participant development. Hierarchical modeling results identified participant antecedents and malleable program characteristics that predict participant development measured by a set of six targeted outcomes: communication, leadership, small group behavior, judgment in the outdoors, outdoor skills, and environmental awareness. Participants' perceptions of personal empowerment and previous expedition experience were both related to increases in all targeted outcomes. Five other predictor variables were significant in certain models.

Keywords National Outdoor Leadership School, participant development, outdoor education, multilevel modeling

How do recreation programs in general, and adventure-based programs more specifically, foster participant development? This question has been the focus of discussion for many years (Ewert, 1989; Ewert & McAvoy, 2000; Hanna, 1992; Hattie, Marsh, Neill, & Richards, 1997; Henderson & Fox, 1994; Kelley, Coursey, & Selby, 1997; Klint, 1999; Scherl, 1990; Warner, 1999). Many recreation programs continue to rely on “black box” programming, where it seems that simple participation is assumed to lead to participant development without any ability to describe the specific mechanisms through which change may occur. Such ambiguously conceptualized understandings of the specific characteristics of the participants and programs that actually foster this development result in the opacity of the process. Investigations of the specific mechanisms and interactions between participant

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characteristics, program characteristics, and developmental outcomes are necessary for recreation programs to be intentionally designed and implemented. Without constructing and testing theory-driven etiological program models of participant outcomes, or those designed to isolate the causes of changes in participants, explanations of how adventure-based recreation programs foster growth and development will remain elusive (Henderson, 2004).

One viable alternative to examining theoretical approaches is the construction of program-specific theories of change that are contextually relevant to the program structure, population, and intent (Baldwin, 2000; Baldwin, Persing, & Magnuson, 2004; Rogers, 2000). This approach highlights the need for well-established programs to examine, hypothesize, and test the agents of change within their program design and implementation. This “best practices” approach taken by Witt and Crompton (2002) appears to be one of the most promising for unlocking the mechanisms specific and unique to recreation programming. Existing program case studies provide guidance and empirical evidence of outcome achievement, but inferential testing of program models is notably absent. Although targeting program-specific outcomes can provide suggestions for improvements in professional practice, researchers can begin to generalize results only when recreation research and practice has developed more etiological models. Some of these models will be conceptually generalizable to other programs, settings, and populations and others will allow the identification and comparison of different mechanistic models of change and growth.

This study began the examination of one of the largest and most well-established adventure-based recreation programs in the United States, the National Outdoor Leadership School (NOLS), by building and testing a viable program model of the relationships between participant and program characteristics and their impact on participant development. Established in 1965, NOLS strives to be the leader in wilderness education by combining the development of leadership and technical outdoor skills with education regarding biology and natural history in naturally occurring environments. Courses are tailored to specific populations including youth, college-age students, individuals 25 years of age and older, individuals either currently working as or seeking to become outdoor educators, and individuals seeking to become NOLS instructors. Further, staff at NOLS also design and implement courses specifically for intact groups including perhaps most notably, National Aeronautics and Space Administration (NASA) crews. All course offerings range from eight days to a full academic semester in length, and students can elect to earn college credit at the undergraduate or graduate level for their studies with NOLS.

Based on its mission, NOLS courses offer a combination of generic outdoor leadership training as well as activity- and context-specific course objectives. The general objectives include safety and judgment, leadership, expedition behavior, outdoor skills, and environmental awareness. The safety and judgment objective includes wilderness hazard knowledge, performance of hazard avoidance techniques, and knowledge of emergency planning. Leadership includes decision-making skills, communication skills, feedback skills, initiative, awareness of the group, and personal awareness. Expedition behavior (i.e., more generically referred to as small group behavior in this study) includes responsibility to group support and teamwork. Outdoor skills include a variety of outdoor skills such as how to dress, cook, travel, route-find, and select a campsite. Environmental awareness includes both a knowledge component such as knowledge of Leave No Trace principles, land management skills, and local flora and fauna as well as an appreciation of the environment and/or culture component relevant to the course.

The first step of our examination involved clearly delineating distinct targeted outcomes from NOLS courses to be used as developmental indicators. This process included a semi-formal content analysis of NOLS’ existing course objectives and interviews with senior

staff (i.e., director-level), field instructors, and students. The NOLS course objectives were described in general in the brochure and on the website (www.NOLS.edu) and in detail in the course-specific documentation provided to students in their registration materials. All materials were reviewed and the consistent text was identified as the “generic” course objectives. Any course-specific learning objectives were considered idiosyncratic. The generic objectives were verified through high levels of agreement in the interviews with senior staff, field instructors, and students.

The second step involved creating a list of potentially important variables thought to play a role in the development of the targeted outcomes. This step was accomplished primarily through interviews with senior NOLS staff and field instructors as well as consulting existing literature addressing adventure program processes (e.g., Ewert & McAvoy, 2000; McKenzie, 2003; Sibthorp, 2003). This process resulted in a preliminary program model.

At this stage in the research process, for logistical reasons the researchers did not have access to all levels of data collection. Some variables such as instructor experience, instructional approach, and activity base or course type were considered potentially important but were not examined in this study. Given these limitations on data collection, we decided to concentrate on primarily participant-level variables for this initial study by focusing on a subset of potential predictors and outcomes that were able to be operationalized in this initial program model (see Figure 1). Therefore, the purpose of this study was to examine relationships between the eight hypothesized predictors and the six targeted outcomes through multilevel modeling.

Review of Literature

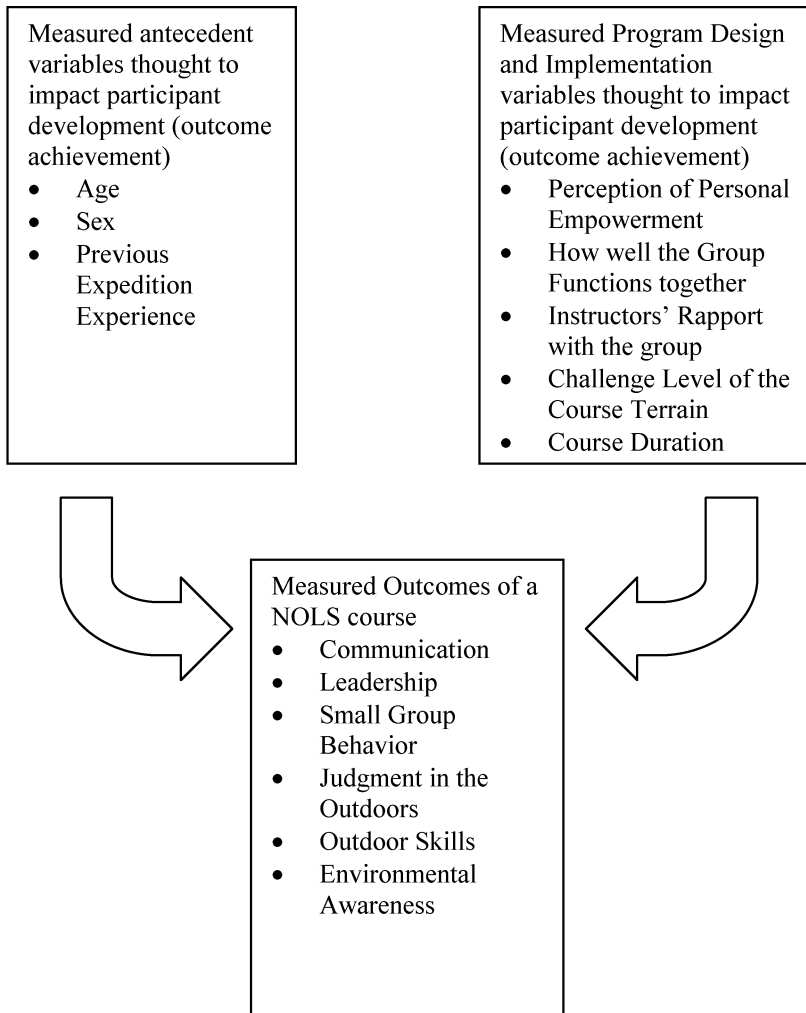
Outcomes of Adventure-Based Recreation Programs

A diversity of targeted outcome variables in adventure-based recreation programming exist. For example, over the last decade articles have examined adventure program impacts on self-efficacy (Propst & Koesler, 1998; Sibthorp, 2003), self-concept (Garst, Schneider, & Baker, 2001), perceived competence (McIntyre & Roggenbuck, 1998), and resiliency (Green, Kleiber, & Tarrant, 2000). A meta-analysis of 151 adventure education samples from 96 studies identified 40 major outcomes that were classified into six major categories: leadership, self-concept, academic, personality, interpersonal, and adventuresomeness (Hattie et al., 1997). Despite the diversity of potential program outcomes, most researchers agreed that evaluated program outcomes should be specifically related to a program’s goals and objectives (Allen, Stevens, Hurtes, & Harwell, 1998; Hattie et al., 1997).

Predictors of Growth

Numerous variables are considered potentially important to participant development through adventure programs. Some of the more widely examined participant-level variables include age, sex, previous similar experiences, perceptions of empowerment, challenge level, group cohesion, instructor rapport, and course duration.

These variables were divided into two categories: participant-level predictors and course-level predictors. The participant-level predictors were age, sex, previous expedition experience, and sense of personal empowerment. The course-level predictors included the group’s perception of the group’s level of functioning, the group’s perception of the level of challenge presented by the course terrain, the group’s perception of the instructors’ rapport with the group, and the length of the course in days. These eight predictors were determined to be of primary interest through extensive interviews with NOLS senior staff and field instructors regarding factors generally considered important to achieving the



Note: Variables not operationalized in this study are excluded from the figure.

FIGURE 1 Program model for NOLS courses.

course objectives and from reviews of existing literature on possible predictors of adventure program participant development (e.g., Hattie et al., 1997; McKenzie, 2003; Sibthorp, 2003). The eight predictors were the focus of this initial study.

Participant-Level Predictors. Age has long been considered instrumental in developmental processes with the highest potential for change associated with youth. Age has been examined in a variety of adventure program research (e.g., Ewert, 1988; McKenzie, 2003; Sahler & Carpenter, 1989) and plays a role in design, implementation, and effectiveness of adventure-based recreation programs. In their synthesis of research, Ewert and McAvoy (2000) reported that younger participants often showed the greatest development in adventure-based programs.

The role of gender, commonly operationalized as biological sex, in development through adventure has also been examined. Some research on the role sex plays in outcome achievement has shown that male and female participants respond differently to adventure

program participation (e.g., Ewert, 1988; Kelley et al., 1997; Propst & Koesler, 1998; Russell, 2003), but other research has failed to find these differences (e.g., Gass, 1990; Hattie et al., 1997; Rawson & Barnett, 1993). However, in their state-of-knowledge paper, Ewert and McAvoy (2000) stated that females have generally shown larger developmental gains than males in adventure programs, which has also been supported by two recent studies on adventure education and wilderness therapy (McKenzie, 2003; Russell, 2003). Similarly, Rodriguez and Roberts (2005) found that female participants were more favorable in terms of evaluating the impact of Student Conservation Association (SCA) trips.

Another participant-level predictor of growth is previous similar experience with adventure programs. This variable has not been as widely investigated as age and sex. Although the predetermined participant characteristics described above play a role in the achievement of adventure program outcomes and should be accounted for in program designs, they are not malleable. Many programmers are more interested in factors that can be actively manipulated through design or implementation such as participant empowerment, group functioning, challenge level of terrain, instructor rapport, and duration of the program. Personal empowerment similar to age, sex, and previous experience can be considered a participant-level variable.

There is general support for empowering student-driven educational processes in adventure-based programs (e.g., Hyde-Hills, 1998; Kimball, 1991; Wilson, 1995). Empowering processes effectively transfer responsibility to the program participants (Hyde-Hills). Two previous studies (Sibthorp, 2003; Sibthorp & Arthur-Banning, 2004) investigated the role that a sense of personal empowerment can play in adventure-based recreation program outcome achievement. In both studies, the results indicated that students who felt they played an active role in the decision-making and had responsibility during adventure-based recreation programs also perceived greater developmental benefits from program participation.

Course-Level Predictors. Group dynamics and the level of group functioning or cohesion are widely regarded as critical mediators of group productivity and learning in a variety of settings (e.g., Bollen & Hoyle, 1990; Ringer, 2002). In adventure-based recreation programs, the design often entails a small (10–15 person) group on an extended and isolated expedition. This type of recreational experience seems to heighten the role that group dynamics play in individual development and learning. Ewert and Heywood (1991) studied Outward Bound participants and concluded that individual participants benefited from enhanced levels of group functioning and “achieving personal goals is optimized when members operate within a supportive and well-functioning social group” (p. 613). Similarly, Estes (1994) and McFee (1993) found the role of group dynamics was critical to the achievement of course objectives and individual learning in studies of Outward Bound participants. In his study of a weeklong adventure camp, Hastie (1995) suggested that the student social systems were critical to making the program successful. Finally, in their review of groups in wilderness settings, Ewert and McAvoy (2000) held that, if group dynamics were productive, a variety of benefits were achieved through group expeditions. If the group dynamics did not work, the program’s intended outcomes were not achieved. Group functioning appeared to be central to participant development.

Providing challenges is also widely considered critical and necessary for human growth and development especially through recreation and adventure (e.g., Caldwell, 2000; Garst et al., 2001; McKenzie, 2003). Although challenge is a subjective and complex construct, one way to operationalize it is through the challenges presented by the choice of course terrain. This choice of terrain is one course design factor that can often be manipulated by the organization or the instructor to achieve varying levels of challenge for the participants, as opposed to weather or other environmental variables that exist outside of the programs’ control. If experiencing challenges is important to learning and motivation, then

the challenge level of the course terrain is a potentially important factor in the developmental process.

Relationships between participants and leaders are often cited as critical components of both general and adventure-based recreation program success. (e.g. Bocarro & Witt, 2003; Raiola, 2003). Participants need to feel they matter to program leaders or facilitators to feel “safe” and to allow for full participation. In adventure-based programs, instructor rapport may become a more dire need in terms of mortal safety, which makes relationships specifically important due to the real and perceived risk involved in the activities. For example, in a study of 250 youth who participated in ten-day wilderness therapy courses, O’Brien (1990) identified that the quality of the relationship with the adult instructor was related to the participant’s perception of program performance. Specifically, O’Brien found the quality of the relationship with the adult program leader was a significant predictor of “(a) how well they (students) had done on the course, (b) how they felt about themselves after the course, and (c) whether they expected the course to help them in everyday life” (p. 53). More recently, a study by Rodriguez and Roberts (2005) indicated that the overall quality of SCA crew leaders played an important role in the impact of courses on students’ lives. They noted that students’ perceptions of the quality of their crew leaders was not affected by the students’ gender.

Finally, length of a program or duration of exposure to an intervention is related to participant outcomes. More specifically, previous research on the duration of adventure-based education and therapeutic programs has supported the premise that longer more substantial programs lead to greater learning and growth in participants (Cason & Gillis, 1994; Hattie et al., 1997; Russell, 2003).

Rather than testing any specific directional hypotheses, we sought to examine the relationships between a number of participant-and course-level predictors on participant development. Specifically, the purpose of this study was to test the roles that a participant’s age, sex, previous similar experiences, personal perceptions of empowerment, group perceptions of challenge of terrain, group functioning, instructor rapport, and course length played in perceived gains in communication, leadership, small group behavior, judgment in the outdoors, outdoor skills, and environmental awareness.

Methods

Participants and Setting

All study participants were enrolled in NOLS courses between July and October of 2004. A variety of courses were offered by NOLS during the data collection period, yet all of these courses targeted both the generic NOLS course objectives described previously and objectives specific to the content area of the course.

Measures

To measure the targeted NOLS outcomes, the objectives were operationalized and converted to a measurement instrument. The initial instrument was named the NOLS Outcome Instrument (NOI) and was generated in a graduate measurement class in the Department of Parks, Recreation, and Tourism at the University of Utah. This version was subjected to expert review by faculty members with expertise in measurement, senior staff and directors at NOLS, and by several NOLS field instructors. The instrument was pilot tested three times through an iterative process using both classical test theory and congeneric measurement theory to assess the viability of the proposed instrument. All questions were scored on a ten point Likert-type scale anchored by 0 (not like me) and 9 (like me). The version

of this instrument used in this study had 29 items and was designed to measure six distinct constructs: communication, leadership, small group behavior, judgment in the outdoors, outdoor skills, and environmental awareness.

Communication was defined by NOLS as communicating effectively in a small group setting including discussion leading, feedback provision, and expressing ideas, and was measured by a four-item subscale. A sample question was, "I express my ideas clearly." This subscale exhibited adequate internal consistency with a Cronbach's alpha of .76 for the data in this study.

Leadership at NOLS was defined as taking initiative, responsibility, and decision making roles and was measured by a five-item subscale. A sample question was, "I take initiative in completing group tasks." This subscale also exhibited adequate internal consistency with a Cronbach's alpha of .82 for the data in this study.

A five-item subscale measured small group behavior, which was adopted as a more generic term for NOLS' Expedition Behavior. Small group behavior was defined as being a positive and productive group member. A sample question was, "I place emphasis on group goals above personal goals." This subscale exhibited adequate internal consistency with a Cronbach's alpha of .79 for the data in this study.

The National Outdoor Leadership School defined judgment in the outdoors as the ability to recognize potential hazards and make good decisions in the backcountry. It was measured by a four-item subscale. A sample question was, "I can identify potentially dangerous areas in wilderness settings." This subscale exhibited adequate internal consistency with a Cronbach's alpha of .85 for the data in this study.

Outdoor skills was defined by NOLS as competencies for backcountry travel and living and was measured by a five-item subscale. A sample question was, "I am competent in my wilderness navigational skills." This subscale exhibited adequate internal consistency with a Cronbach's alpha of .86 for the data in this study.

Finally, environmental awareness tapped two concepts that proved to be so closely related considering them independent was not prudent. Environmental awareness combined perceived knowledge of environmental stewardship practices and regulations, and an appreciation for the environment. It was measured by a four-item subscale. A sample question was, "I understand the purpose of Leave No Trace with respect to wilderness travel." This subscale exhibited adequate internal consistency with a Cronbach's alpha of .76 for the data in this study.

A "lie scale" was also imbedded in the NOI in an effort to detect artificially elevated change scores. The lie scale consisted of two items that addressed outdoor skills that were mutually exclusive on most NOLS courses: assessing avalanche slope stability and prediction of tides and currents.

To assess the NOI's ability to capture six distinct latent variables, a correlation matrix was calculated for the six subscales. The between subscale correlations, with one exception, were moderate to low and fell below the *a-priori* cut-off of .70. The correlation between pretest levels of outdoor skills and judgment was higher than desired ($r = .78, p < .05$) and did not support the premise that these two subscales were measuring distinct constructs (see Table 1).

The final version of the NOI was printed onto optical scanner forms and formatted into a retrospective-pretest posttest format to address the issues of response shift bias commonly evident in training programs such as courses offered by NOLS (e.g., Howard, 1980; Howard et al., 1979). The recent research on response shift bias has focused on using a retrospective pretest to address response-shift bias in leadership training (e.g., Rohs, 1999; Rohs & Langone, 1997; Toupence & Townsend, 2000). These concerns led to a previous study on the NOI to explore the use of a retrospective pretest instead of a conventional pretest. The

TABLE 1 Correlations between Pre-Course Levels of NOI Subscales*

	Communication	Leadership	Expedition behavior	Judgment	Outdoor skills	Environmental awareness
Communication	1.00					
Leadership	.63	1.00				
Expedition behavior	.47	.56	1.00			
Judgment	.38	.58	.51	1.00		
Outdoor skills	.25	.47	.37	.78	1.00	
Environmental awareness	.26	.36	.31	.59	.67	1.00

*All correlations are significant at $p < .01$.

Note: N may be slightly less than 596 as pairwise deletion of missing data was used in this analysis.

use of a retrospective pretest for the NOI subscales was generally supported (Sibthorp, Paisley, Gookin, & Ward, 2005).

In addition to the NOI, several other items and subscales were used to measure the predictor variables in the model. The empowerment variable was measured using the three personal empowerment items from the Characteristic of the Experience Scale (Sibthorp, 2001) and was scored on the same 10 point Likert-type scale as the NOI. An example item was, "I had important responsibilities on this course."

The previous experience variable was measured with a single question that asked, "Had you done anything like this before your NOLS course?" followed by an open-ended question that asked "If yes, what?" The authors reviewed these responses and verified that the respondent's interpretation of "like this [NOLS course]" was consistent with the perception of the researchers. Where the narrative was inconsistent with the dichotomous (i.e., yes/no) response, or when the participant provided a description of their experience without answering the yes/no response, the researchers' definition (i.e., a four-day or longer expedition or numerous shorter experiences) was accepted as a "like" experience. The participants directly reported the sex and age variables.

While several single item indicators were used to measure complex constructs, these were treated as aggregate variables and were averaged for each course. The group functioning variable was measured on a ten-point Likert-type scale with a single item stating: "Our group worked well together even when the instructors were absent." This response was then averaged per course to create course-level indicators of each group's perceived cohesion or level of functioning. A single item indicator that stated, "I had a close relationship with at least one of my instructors," measured the instructor rapport variable. This specific wording was chosen as NOLS courses always have multiple instructors and occasionally have instructors who are only present for portions of the course (e.g., for the climbing camp, but then leave the course). As with the other course-level predictors, this variable was averaged for each course producing an average level of instructor rapport with that group. The challenging terrain variable was measured with a single item indicator that stated, "I thought the course terrain was challenging." As with the other aggregate variables, this variable was then averaged per course to create course-level indicators of the level of challenge presented to the group by the terrain.

Finally in addition to the quantitative analyses, 29 participants were interviewed by the researchers to assess their interpretation of the retrospective format and their perceptions of change in their responses.

Procedures

The sample was drawn from the 120 NOLS courses operating at four of the North American branches (i.e., Rocky Mountain, Pacific Northwest, Southwest, Vernal) between July and October of 2004. Upon course completion and as part of the standard course debrief, the study participants were asked to complete the questionnaire containing the six NOI subscales as both a retrospective pretest and a posttest, the predictor variables in the hypothesized model, and some demographic variables. All responses were anonymous, collected at four of the branches, and sent back to NOLS headquarters.

Data Analysis

After the data were cleaned and screened, difference scores were calculated by subtracting the retrospective pretest from the posttest scores. The use of difference scores is commonly considered problematic with conventional pretests, but this procedure was correct for calculating change or growth when using a retrospective pretest (Howard et al., 1979).

The data from participants with “lie scores” greater than 10% (i.e., 1 point on the 10 point scale) were removed from subsequent analysis. Due to the content of several of the courses later in the fall, some flexibility was given to courses that according to the course logs had potentially taught about either currents or avalanches due to the specific location and weather of the course.

Hierarchical Linear Modeling (HLM) version 6.0 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004) was used to analyze the data. In each model, level 1 was the participant level and included all participant-level predictors (i.e., age, sex, previous expedition experience, and personal empowerment). Level 2 was the course level and included all course-level predictors (i.e., the group’s aggregate reports of challenge level of course terrain, group functioning, and instructor rapport; and course duration). Initially null or empty models were analyzed for each of the six outcome variables, which included no predictor variables at either level. If a significant amount of variance was attributed to the course level, then the predictors were subsequently added to the models. In the interest of parsimony, non-significant predictors were then removed from the models prior to final reporting in the results section. Because no interaction terms were hypothesized, none were included in the models. Initially all models included a residual variance (e.g., u_{1j}) for the variability of the regression slopes (e.g., β_1). However, if these did not explain a significant portion of the variance, they were subsequently constrained to zero by removing them from the model (Raudenbush & Bryk, 2002).

Results

Six hundred and sixty three participants from 66 of the 120 targeted NOLS courses completed the questionnaires. The sample was 63% male. Ages ranged from 14 to 62, with an average of 20.6 years and a median age of 19.1 (i.e., distribution was positively skewed). The researchers had no reason to believe that this sample was not representative of the typical NOLS student as the demographics compared favorably to those of typical participants. Twenty two different types of courses ranged from youth-oriented “adventure” courses to whitewater rafting courses to outdoor educator courses for mountaineering. These courses were run at four NOLS branches and ranged in length from 14–94 days with most courses being 30 days in length. All courses, regardless of activity base, branch, or length targeted the NOLS outcomes of leadership, communication, small group behavior, judgment in the outdoors, outdoor skills, and environmental awareness. More than 90% of the students enrolled in the 66 courses returned useable questionnaires.

TABLE 2 Descriptive Statistics for NOI Subscales

	Retrospective pretest mean (std dev)	Posttest mean (std dev)	Mean difference (std error)	η^2 (eta squared)
Communication	5.89 (1.40)	6.74 (1.18)	.855 (.04)	.497
Leadership	6.03 (1.40)	7.15 (1.09)	1.13 (.04)	.566
Small group behavior	5.84 (1.37)	6.95 (1.11)	1.10 (.04)	.586
Judgment in the outdoors	5.23 (1.52)	7.26 (1.04)	2.03 (.06)	.714
Outdoor skills	5.10 (1.70)	7.51 (1.01)	2.41 (.07)	.707
Environmental awareness	4.18 (1.72)	6.61 (1.36)	2.43 (.08)	.666

Note: scale range is 0 (not like me) to 9 (like me); all difference scores are significantly greater than 0 ($p < .01$).

Before the initial models were tested, some basic data cleaning and screening were necessary. Inspection of missing data revealed no discernable pattern. If only the score for a single item was missing from a composite variable (i.e., 3 to 5 items), the missing value was replaced with the mean of the other items designed to measure the variable in question. Inspection of the responses to the embedded lie scale necessitated the removal of 53 participants from the sample. In addition, 14 participants were removed because they appeared to have followed the directions incorrectly as indicated by a consistent loss of skills across five of the six targeted program outcomes. This process left a viable sample size of 596 cases for subsequent analyses. However, actual sample sizes for the analyses were often slightly smaller as missing data were handled on an analysis by analysis basis.

Participants reported substantial and significant perceived gains overall in the targeted course outcomes with eta-square values ranging from .497 to .714 (see Table 2). Worth noting is that the largest perceived gains were reported in the areas of outdoor-related skill development for these NOLS students. HLM was subsequently used to better explain the perceived gains in the six outcomes. Overall, these models offered proportional reductions in error in predicting individual perceptions of outcomes that ranged from a high of $R_1^2 = .181$ for outdoor skills to a low of $R_1^2 = .01$ for small group behavior. The ability to accurately predict group level outcomes was less impressive. These scores ranged from a high of $R_2^2 = .141$ for outdoor skills to a low of $R_2^2 = 0$ for small group behavior.

Perceived gains in communication significantly varied by course ($\tau = .133, \sigma^2 = .656, \chi^2 = 184.2, df = 65, p < .001, ICC = .169$), which accounted for approximately 16.9% of the variance. Of the potential course-level predictors, both length of course ($t = 3.63, p < .001$) and average rapport with instructor ($t = 2.02, p < .05$) explained a significant amount of the variance. Significant participant-level predictors of communication included previous experience, sense of empowerment, and age. Higher gains were reported by participants without previous expedition experience ($t = 2.18, p < .05$), those who experienced greater empowerment on their courses ($t = 2.98, p < .01$), and younger participants ($t = -4.27, p < .001$).

Perceived gains in leadership significantly varied by course ($\tau = .219, \sigma^2 = .806, \chi^2 = 213.5, df = 65, p < .001, ICC = .214$), which accounted for approximately 21.4% of the variance. Of the potential course-level predictors, only length of course explained a significant amount of the variance ($t = 3.54, p < .001$). Significant participant-level predictors of leadership included sex, previous experience, sense of empowerment, and age. Higher gains were reported by males ($t = 2.35, p < .05$), participants without previous

expedition experience ($t = 2.67, p < .01$), individuals who experienced greater empowerment on their courses ($t = 2.64, p < .01$), and younger participants ($t = -3.78, p < .001$).

Perceived gains in small group behavior significantly varied by course ($\tau = .142, \sigma^2 = .763, \chi^2 = 170.4, df = 65, p < .001, ICC = .157$), which accounted for approximately 15.7% of the variance. Of the potential course-level predictors, only length of course ($t = 2.68, p < .01$) explained a significant amount of the variance. Significant participant-level predictors of small group behavior included sex, previous experience, sense of empowerment, and age. Higher gains were reported by males ($t = 2.23, p < .05$), participants without previous expedition experience ($t = 2.34, p < .05$), individuals who experienced greater empowerment on their courses ($t = 2.92, p < .01$), and younger participants ($t = -2.41, p < .01$).

Perceived gains in judgment in the outdoors significantly varied by course ($\tau = .176, \sigma^2 = 1.53, \chi^2 = 131.9, df = 65, p < .001, ICC = .103$), which accounted for approximately 10.3% of the variance. Of the potential course-level predictors, only perceived level of group functioning ($t = 2.74, p < .01$) explained a significant amount of the variance. Significant participant-level predictors of judgment in the outdoors included previous experience and sense of empowerment. Higher gains were reported by participants without previous expedition experience ($t = 4.31, p < .001$) and by participants who experienced greater empowerment on their courses ($t = 2.97, p < .01$).

Perceived gains in outdoor skills significantly varied by course ($\tau = .347, \sigma^2 = 2.14, \chi^2 = 157.2, df = 65, p < .001, ICC = .140$), which accounted for approximately 14.0% of the variance. Of the potential course-level predictors, only perceived level of group functioning ($t = 2.79, p < .01$) explained a significant amount of the variance. Significant participant-level predictors of outdoor skills included previous experience and sense of empowerment. Higher gains were reported by participants without previous expedition experience ($t = 5.84, p < .001$) and by individuals who experienced greater empowerment on their courses ($t = 2.25, p < .05$).

Perceived gains in environmental awareness significantly varied by course ($\tau = .383, \sigma^2 = 3.05, \chi^2 = 143.4, df = 65, p < .001, ICC = .126$), which accounted for approximately 12.6% of the variance. Of the potential course-level predictors, only course length ($t = 2.06, p < .05$) explained a significant amount of the variance. Significant participant-level predictors of environmental awareness included previous experience and sense of empowerment. Higher gains were reported by participants without previous expedition experience ($t = 2.53, p < .05$) and by individuals who experienced greater empowerment on their courses ($t = 2.74, p < .01$).

Post-hoc comparisons were made for the significant antecedent predictors to determine if lower pre-course or higher post-course scores could be responsible for the difference in perceived gains. These tests were only applied to the participants' age, sex, and previous expedition experience. Sex and previous expedition experience formed natural dichotomies for comparison (e.g., male vs. female), and age was separated into four roughly equal quartiles for comparison: 17 years and under, 18 to 19 years, 20 to 22 years, and over 22 years.

The results of the post-hoc test for age demonstrated that the older participants started at higher pre-course levels regarding communication, leadership, and small group behavior ($p < .05$). The results for the post-hoc analysis of sex showed that males reported significantly lower pre-course levels of small group behavior than females ($p < .05$). The results of the previous experience post-hoc confirmed that pre-course levels of all of the targeted outcomes were generally lower for participants without previous expedition experience. These differences were statistically significant ($p < .05$) for leadership, judgment in the outdoors, outdoor skills, and environmental awareness.

Discussion

Although significant changes in levels of the targeted outcomes were observed, the purpose of this study was to examine the impact of individual and course characteristics on these changes in efforts to suggest broader mechanisms of participant development for adventure-based programming. More specifically, this study examined the impacts of a participant's age, sex, previous similar experiences, personal perceptions of empowerment, group perceptions of challenge of terrain, group functioning, instructor rapport, and course length on perceived gains in communication, leadership, small group behavior, judgment in the outdoors, outdoor skills, and environmental awareness.

Previous expedition experience and sense of personal empowerment on the course were universally related to perceived gains in the NOLS course objectives. The differences in previous experience may largely be explained by lower initial levels on the learning objectives allowing more potential for learning to occur on any given course. The findings regarding personal empowerment were consistent with both existing literature (e.g., Kimball, 1991; Wilson, 1995) and previous research (e.g., Sibthorp, 2003; Sibthorp & Arthur-Banning, 2004). Fostering a perception of ownership in, and responsibility for, the adventure-based programs seemed to increase perceptions of development. This variable appeared to be an important and potentially malleable factor that can be incorporated into adventure program design and implementation.

Two of the remaining participant-level variables, age and sex, were important predictors in two or more of the targeted outcomes. The difference in age can be explained by the younger students having lower initial scores on outcomes related to communication, leadership, and small group behavior. As these variables were measured, they are generally perceptions that can and should evolve over life experience (such as an extended small group living environment). Finding greater developmental gains by younger participants was generally consistent with the literature (e.g., Ewert & McAvoy, 2000). As a result, the lower pre-course scores for younger participants and larger on-course gains were not unexpected.

The sex differences were not straightforward to interpret as they stand in contrast to previous studies (Ewert & McAvoy, 2000; McKenzie, 2003; Russell, 2003). Males demonstrated larger gains in leadership and small group behavior than females, but males reported lower pre-course levels of small group behavior than females. Additional research is needed in this area.

Differences at the course level accounted for between 10.3 and 21.4% of the variance in perceived outcome gains. Despite a common set of course objectives, learning on individual courses varied. This finding is intuitively appealing, as anyone who has participated on a small group expedition knows the organic nature of each course varies, and supported the continued use of multilevel approaches to data analysis.

Of the course-level variables, course length was a significant predictor for gains in five of the six targeted outcomes. This finding was consistent with previous studies that examined course length (e.g., Cason & Gillis, 1994; Hattie et al., 1997; Russell, 2003). In general, this result made intuitive sense. The longer the trip, the more learning occurs. However, it also seemed logical that learning could level-off at some point, and this area could benefit from additional research.

The average level of group functioning was a significant predictor for gains in two of the outcome variables. Higher levels of group functioning was more related to program gains. The findings in this study supported the role that group dynamics can play in individual learning, but this role was only significantly related to perceived learning of judgment in the outdoors and outdoor skills. As with many facets of the participant experience, the role that

group dynamics and level of functioning played in the achievement of prescribed outcomes seemed dependent upon the goals. At least in these data, the links between group functioning and communication, leadership, small group behavior, and environmental awareness were not significant. Despite the proposed universal role that productive group dynamics are thought to play in adventure-based recreation programs (e.g., Ewert & McAvoy, 2000; McAvoy, Mitten, Stringer, Steckart, & Sproles, 1996), their specific role and contribution may be more important to the development of certain skill sets than others. Ringer (2002) suggested that the evolving group development can and should change the program goals as a program progresses. Given these findings and the limitations of our operationalization of group functioning, we fully concur with previous researchers that more examination of the role that group dynamics play in outcome achievement in adventure-based recreation programs is warranted.

Rapport with the instructors was a significant predictor for gains in communication, but was unrelated to the other outcome variables. One potential explanation is that instructor rapport may become less crucial as the group becomes more self-sufficient and self-supporting, and perhaps more empowered. Many of these courses culminate in a short independent student expedition where students travel without immediate instructor supervision to a final rendezvous point. As this expedition typically occurs at the end of the course, the primacy effect may have negated the importance of the instructors' rapport. Due to the problematic nature of interpreting non-significant findings, these variables also warrant further investigation.

The group's perception of the challenge level of the terrain was not a significant predictor in any of the tested models. With respect to terrain, students' perceptions of its level of challenge may take into account that they had developed sufficient skills to negotiate it successfully, which reduced their perceived level of its challenge. This finding may be especially true for extended trips when students become more fully acclimated to their new surroundings and more comfortable in negotiating what non-participants may consider to be quite challenging.

Limitations

Building and testing an etiological program model, as advocated by Baldwin and colleagues (e.g., Baldwin, 2000; Baldwin et al., 2004) limits the generalizability of a study's findings. The change mechanisms tested in this study apply primarily to programs similar in design and implementation to those operated by NOLS (i.e., expeditionary style adventure-based programs that combine small groups and instructor teams and target development in areas similar to communication, leadership, small group behavior, judgment in the outdoors, outdoor skills, and environmental awareness). In addition, all potential predictors were not operationalized in this study, and thus not included in the analysis. Given the significant amount of residual or unexplained variance remaining in all the models tested, assuming that some additional and important participant- and course-level predictors were not included in this study is reasonable.

Most participants were familiar with completing surveys and questionnaires, but many had not previously completed a retrospective pretest. This format necessitated additional explanation not consistently available in this field-based data collection. Without the proper instructions, a small number of participants appeared to be providing their posttest scores on the retrospective-pretest scale and their retrospective-pretest scores on the posttest scale. This premise was confirmed by talking with participants who were not given instruction and reported the questionnaire was confusing because the "after course" level was reported prior to the "before course" level for each question. This was done to aid in the recall of perceived

ability level and is the approach advocated in the literature (Lam & Bengo, 2003), but was confusing for the participants without adequate instruction. This problem was subsequently addressed in our study by providing more consistent verbal instructions. Nevertheless, the participants' lack of familiarity with a retrospective pretest design remains a limitation for studies employing this technique. In addition to the limitations regarding the questionnaire format, the substantial overlap between judgment in the outdoors and outdoor skills needs to be resolved if these two variables, as measured by the NOI, are to be considered discrete.

Given the length and complexity of the NOI as well as the questions designed to measure the predictor variables, single items were occasionally used as indicators of complex variables. Averaging these items over courses to create group- or course-level composites greatly oversimplifies complex variables such as group dynamics and instructor rapport with the group in the interest of brevity. This averaging was necessary due to the logistical constraints of our study, but future research should seek to design multi-item scales for some of the more promising course characteristics. This design would potentially reduce the amount of error in measurement and would allow for more statistical power to detect relationships and differences.

Finally, the lie scale employed in this study raised some issues. For instance, through participant interviews, it became clear that minimal exposure to or even mention of a topical area (e.g., avalanches) often led to a *perception* that learning had occurred. This limitation is likely related to the issue that the retrospective-pretest is intended to address: response-shift bias. As participants knew little about these content areas prior to the course, even minimal exposure led to perceived learning. This notion provides evidence of what may be the most substantial limitation of this study, which was that most of the variables in this study were self-perceptions and not directly linked to actual ability, knowledge, or behaviors. In future studies, self-reported perceptions of learning could be verified through relating participant perceptions to more objective measures like skill "tests" or behavior anchored rating scales completed by the instructors. Researchers interested in actual levels of attributes instead of participants' perceptions should seek to link more objective outcome ratings from instructors or parents to participants' perceptions of course characteristics and outcome gains.

Conclusion

The aim of this study was to better understand the mechanisms through which adventure-based recreation programs foster participant development. One option seems to be to recruit participants who are more susceptible to change or who are not as well-versed in the program's targeted outcomes. For this type of program, this population would be younger, male, and without previous expedition experience. However, the practice of recruiting participants with lower initial levels of a program's targeted outcomes to potentially enhance a program's impact is almost never viable in practice. Nevertheless, such factors should still be collected and statistically controlled in efforts to determine the impacts of more malleable factors. One of the more widely examined of these factors is course duration or program length. As with previous studies, longer courses were perceived as having more impact than shorter ones. Thus, another way to make programs more developmental is to make them longer. Course duration is potentially malleable, but this finding is hardly surprising and only marginally useful as most program lengths are determined by factors other than desired level of impact.

A perception of personal empowerment was the one malleable factor that was universally related to all the targeted outcomes in this study. Empowering program participants to take responsibility and make decisions led participants to feel they learned more. This

approach can be implemented through use of on-program goal-setting, using a student leader-of-the-day, facilitating group decisions when possible, allowing students to travel unaccompanied by an instructor, and generally running programs with a less autocratic style.

The group's perception of its level of cohesion or functioning also seemed to play a role in perceptions of development. Although only significantly related to two of the targeted outcomes, the instructional team has some degree of control over this factor. Some of the group dynamic issues are established by the composition of group members on the course, and others can be actively managed by the instructors. Consciously and actively fostering and attending to the group's cohesion seems to be a valuable and viable way that instructors can make adventure programs more beneficial to participants.

The level of rapport members of an instructor team have with the group remains a viable way to foster increased perceptions of development. However, as operationalized in this study, rapport was only related to perceived gains in communication-related skills. While previous literature (e.g., Bocarro & Witt, 2003; Raiola, 2003) and the findings of this study still support, respectively, the premises that instructor rapport plays a role in recreation programming in general and in adventure programming specifically, further research is needed to better understand the role the instructor rapport has in participant development.

Therefore, based on this study what *should* be occurring inside the "black box?" Instructors should be empowering students to make decisions and take responsibility. They should also be attending to the group and any fractious group issues. They should be working to establish personal relationships and strong connections with their students. These factors should help to make adventure-based programs more worthwhile for participants.

Building and testing program models of developmental mechanisms in recreation programs, like the one tested in this study, seems like a promising and viable beginning to building program theory. Such models need to be extended to other similar programs and tested beyond the confines of a single organization. In addition, it remains likely that variables not directly attributable to the participants remain valid predictors of program outcomes. Ringer (2002), for example, advocated that the group is the most appropriate level for analysis for programs based on small group models. The continued use of hierarchical models (cf. Russell & Sibthorp, 2004; Sibthorp, Witter, Wells, Ellis, & Voelkl, 2004) seems especially promising as researchers will be able to examine the roles of additional course-level (e.g., instructor experience and educational philosophy) and program level (e.g., activity base, geographic location) variables on the targeted developmental outcomes including the investigation of hypothesized interactions within and between levels. However, approaches involving hierarchical models will necessitate a broad and coordinated data collection effort, which remains a major research barrier in the field of adventure-based recreation.

In addition, mixed methods or qualitative approaches may be able to offer further insight into the specific mechanisms behind significant indicators of growth or change. By utilizing an iterative process of qualitative-based model building and quantitative-based model testing, researchers should be able to better understand the complex nature of variable interactions on such programs.

Evaluation and testing of viable program models continues to offer one of the best options for understanding the complex and multivariate nature of recreation programming. Such mechanistic models offer not only insight into programs employing similar design principles or targeting similar outcomes, but also provide comparisons and contrasts for less similar programs. Efforts focused on building, testing, and revising program specific models and theories will allow researchers to better understand *how* participant development occurs through both adventure-based and more traditional recreation programs. Ultimately, such theories and models of etiology allow researchers to both contribute knowledge to

the literature and to better inform programming practice. This study represents key steps toward this goal.

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