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The Effects of an Adventure Education Pilot Study on Social Emotional Learning, Resilience, and Physical Activity among High School Students

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ABSTRACT

Background: Research on the effects of adventure education lessons on social emotional skills (SEL), psychological outcomes, and physical activity (PA) is limited.
Purpose: This study assessed the effectiveness of adventure education lessons in improving high school students' SEL competencies, resilience, and PA.
Methods: 95 10th grade students (mean age = 15 ± .56) enrolled in a 90-minute adventure education class 2–3 times a week for 15 weeks during the winter/spring semester of 2022. Questionnaires measured SEL, resilience, and PA at pre- and posttest, while open-ended questionnaires were collected at the end of the semester. Data analysis involved descriptive statistics, paired t-tests, and constant comparison techniques.
Results: Results indicated significant increases in the total SEL scale ($t = -2.00$, $p = .050$), self-awareness ($t = -2.07$, $p = .043$), self-management ($t = -2.67$, $p = .010$), resilience ($t = 5.69$, $p < .001$), and vigorous PA ($t = -4.13$, $p < .001$) levels over time. Qualitative analysis revealed adventure education promotes communication, teamwork, and building transferrable skills leading to intra- and interpersonal growth.
Discussion: High school students saw improvements in SEL, resilience, and physical activity after participating in a semester-long adventure education curriculum.
Translation to Health Education Practice: The adventure education is useful in improving students' SEL skills, developing resilience, and promoting PA.

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Background

Research shows that students today struggle to maintain motivation and engagement in school settings, resulting in decreases in their academic performance. By the time students reach high school, 30–40% feel disengaged from school, and 30% experience multiple high-risk behaviors that interfere with success in school and social life.[1] Many students experience a decrease in SEL competencies from elementary school to high school.[1] Poor SEL skills can lead to struggles in maintaining interpersonal connections, that can cause adolescents to withdraw from social situations and reduce opportunities to improve these skills.[2]

Developing and promoting students' social emotional learning (SEL) skills and competencies in schools is instrumental to enhancing students' success in school and their personal life.[3] SEL is defined as a process through which students are learning and practicing how to better manage their emotions, set and achieve positive goals, feel and show empathy for others, maintain positive relationships, and make responsible decisions.[4] SEL consists of five domains: social awareness, self-awareness, self-management, responsible decision-making, and relationship skills.[4] These domains are critical for improving life success in student populations. There is a need to create and sustain positive and healthy school environments for the effective development of social and emotional learning skills and the evaluation of these skills and other healthy behaviors.

Adventure education is an integral part of a school's physical education program that aims to improve students' SEL skills. In the adventure education lessons, students have opportunities to engage in team-building activities, such as ropes courses, obstacle courses, rock climbing, hiking, camping, team-building games, and other outdoor experiences to help improve both physical activity and social emotional learning skills.[5] These activities allow students to learn and practice how to play leadership roles and how to make responsible decisions. More importantly, the adventure-typed team building activities deliberately encourage students to use these social emotional learning skills in order to accomplish multiple learning tasks successfully.

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Research shows that adventure education programs can play an essential role in developing and improving students' SEL skills and competencies.[2] A study examined the effects of a 6-week immersive adventure education program on academic performance and dropout rate among 96 inner-city high school students in grades 9–10 who were at risk for dropping out. The results indicated that the intervention students (n = 54) significantly improved their academic performance on verbal tasks and decreased high school dropout rates compared to the control group (n = 36) from pre- to posttest.[6] Another study examined the effectiveness of a 12-week adventure education intervention and found that 40 students in the intervention group (two 45-min adventure lessons/week) significantly improved self-awareness, emotional control, and decision-making skills from pre-to posttest, compared to control group. The study showed that adventure education programs are conducive to improving SEL skills in students. Similarly, in a study of SEL-based intervention named SPARK, 49 fourth and fifth graders engaged in 11 weekly SEL lessons in terms of group games, activities, and discussion over the course of 15 weeks. The students in the intervention group significantly improved their communication skills and emotional regulation, which are directly related to improving mental health and psychological well-being.[7] The study also found that the SPARK intervention significantly improved students' resilience.[7]

Resilience is the ability to bounce back after traumatic events, or to thrive when faced with stress and obstacles.[8] Those who are resilient have the ability to cope with stressors, regulate emotions, and solve problems.[9] SEL provides students with the skills to strengthen their resilience by promoting emotional regulation and decision-making. A research study examined 90 adolescents who participated in a 10-day immersive adventure education program including daily team building activities.[10] The participants had a variety of opportunities of working together to develop and build their SEL skills such as self-regulation of emotions and behaviors, social awareness, social relationship skills, and making responsible decisions. The adolescents exhibited a significant increase in resilience from pre- to posttest, compared to the control group (n = 90).[11]

Programs that improve resilience can also be effective at increasing participants' physical activity levels. Many students, who are not regularly engaged in physical activity, fear typical physical education classes (e.g., playing dodgeball, running track etc.), and rarely have positive experiences with physical activity. However, adventure education programs help to promote physical activity in challenging yet engaging and cooperative settings, which are more accepting of students from various skill levels. Adventure education programs have been successful in increasing physical activity levels for a wide variety of populations, from adolescent students to adults.[5] Incorporating physical activity into adventure education interventions allows students to best foster the development of SEL competencies. Within these adventure programs, students are able to experience authentic challenges and learn to navigate them in a safe and developmental setting. These programs incorporate physical activity into these challenges in this safe setting, and students are able to translate these skills into the real world.[10] Programs that are able to incorporate both physical activity and SEL skills will be able to see greater results due to the positive correlation between the two.

Purpose

The purpose of this study was to examine the effectiveness of a semester-long Adventure Education intervention in improving SEL competencies, resilience, and physical activity among high school students. We hypothesized that students who participate in this program will show improvements in their SEL, resilience, and physical activity from pretest to posttest.

Methods

Participants, setting, and study design

Recently, Michigan Department of Education (MDE) has connected SEL to Michigan's school improvement framework, and encouraged educators to implement SEL programs in their schools. MDE has developed specific indicators for each SEL domain regarding expectations of SEL skill progression for students in K-12.[12] The participants for this study were 95 10th grade students (50 girls vs 43 boys, 2 did not identify; mean age =15 ± .56), who enrolled in adventure education classes during winter/spring semester of 2022 at one high school. The breakdown of race/ethnicity is:55 Asian, 10 Caucasian, 16 Indian, 8 Bengali, 5 Middle Eastern, 1 Latino(see Table 1). The high school in this study is a public school located in a city within the suburban area in Michigan. Students in the high school are required to earn both their high school diploma, as well as an International Baccalaureate diploma. The students were required to take 90-min adventure education lessons, which meet two to three times a week since the school is on a rotational schedule of A and B days.

This study used a single group within subjects with pre- and posttest design (see Figure 1). After obtaining

Table 1. Demographic data.

	Pretest	Posttest
	n (%)	*n* (%)
Total Sample	95	89
Gender		
Female	50	44
Male	43	42
Nonbinary	2	3
Age	15 ± .56	15 ± .53
Race		
Asian	55 (56.8%)	56 (62.9%)
White	10 (10.5%)	7 (7.9%)
Indian	16 (16.8%)	12 (13.5%)
Bengali	8 (8.4%	5 (5.6%)
Middle Eastern	5 (5.3%)	7 (7.9%)
Hispanic	1 (1.1%)	1 (1.1%)

an approval of the study protocols by the Institutional Review Board (HUM00208514), the study began to take place from February 1st 2002. First, we asked the parents/guardians of all students who were enrolled in the adventure education classes during the winter/spring semester of 2022 to complete the consent form via Qualtrics within two weeks. Of all students (n = 142) who were invited to participate, 95 students' parents/guardian signed the consent form granting the permission for their son/daughter to participate in the study. Subsequently, 95 students were asked to complete the Social Emotional Learning Skills, Resilience, and Physical Activity Questionnaire via Qualtrics within a week and 95 students completed the initial questionnaire. The participating students attended two to three 90-minute Adventure Education classes per week over the course of the semester, starting from February 1st and ending on June 21st, 2022. Data collection from the semi-structured interview occurred during the last week of May coupled with conducting field observation of the Adventure Education lessons (n = 5). Immediately following the end of the semester, 95 students were asked to complete the same questionnaire via Qualtrics within a week.

Adventure education intervention

All participating students took the school-scheduled adventure education classes taught by a certified adventure education instructor. The instructor aged 34, received his undergraduate degree in Physical Education and Health from a major public university in Midwest. During the time of this study he was in his 12th year of teaching, 11 of those being 9th and 10th-grade physical education at a high school.

The adventure education lessons has been a part of the physical education program since the foundation of the school. The goals of the adventure education lessons are to develop teamwork, communication, cooperation, collaboration, risk taking, trust, and responsible personal and social skills through experiential learning coupled with interactive guidance and reflective debriefing by the instructor.

The instructor uses the structured lesson format to teach the adventure education lessons to all students in grade 9–10. A typical lesson structure consists of warm-up, adventure-based team building activities, and lesson debrief. These lessons are based off the book: *Adventure Education for Physical Education* written by Jane Panicucci and Lisa Faulkingham Hunt. He embeds the goals of the adventure education lessons into the entire process of teaching in each lesson. For example, the warm-up activities focus on getting the students move to increase their heart rates to prepare them for the rest of the class time (e.g., warm-up games) while instilling the spirits of cooperation, problem solving, teamwork, and communication. The adventure-based team building activities are the primary lesson focuses to emphasize teamwork, communication, and problem-solving for achieving a common goal. Usually, the instructor explains the objectives of the activity to the students and sets a few guidelines. Then, he purposely engages students in thinking divergently about how to complete the activity. For example, he states, "it would be beneficial to you all to strategize methods to try to effectively complete the task." The students begin with gradually exploring different ways to work on the joint task. Throughout the process of students' engaging in the team-building activities, the instructor guides students using the effective communication norms and rules to share ideas, listen to other's sharing strategies, and to try out new ideas for next task engagement. For example, the instructor initially presents the task to the students, and invites students to communicate ideas and strategies with each other on how to complete the task cooperatively and productively. When the task involves keeping a ball off the ground, the students would collectively strike the ball ensuring everyone touches it and communicate when and who should hit the ball. The students move around while staying alert and ready to strike the ball while communicating with each other to ensure the goal is accomplished. The instructor then gathers students together and guides them in discussing the joint team building task that they just engaged in, in terms of what works, not works, and how to approach it differently and make it more successful among the team. Following this brief discussion, the instructor usually provides students with the opportunity to further practice and engage in the team building activity while trying different group rules and

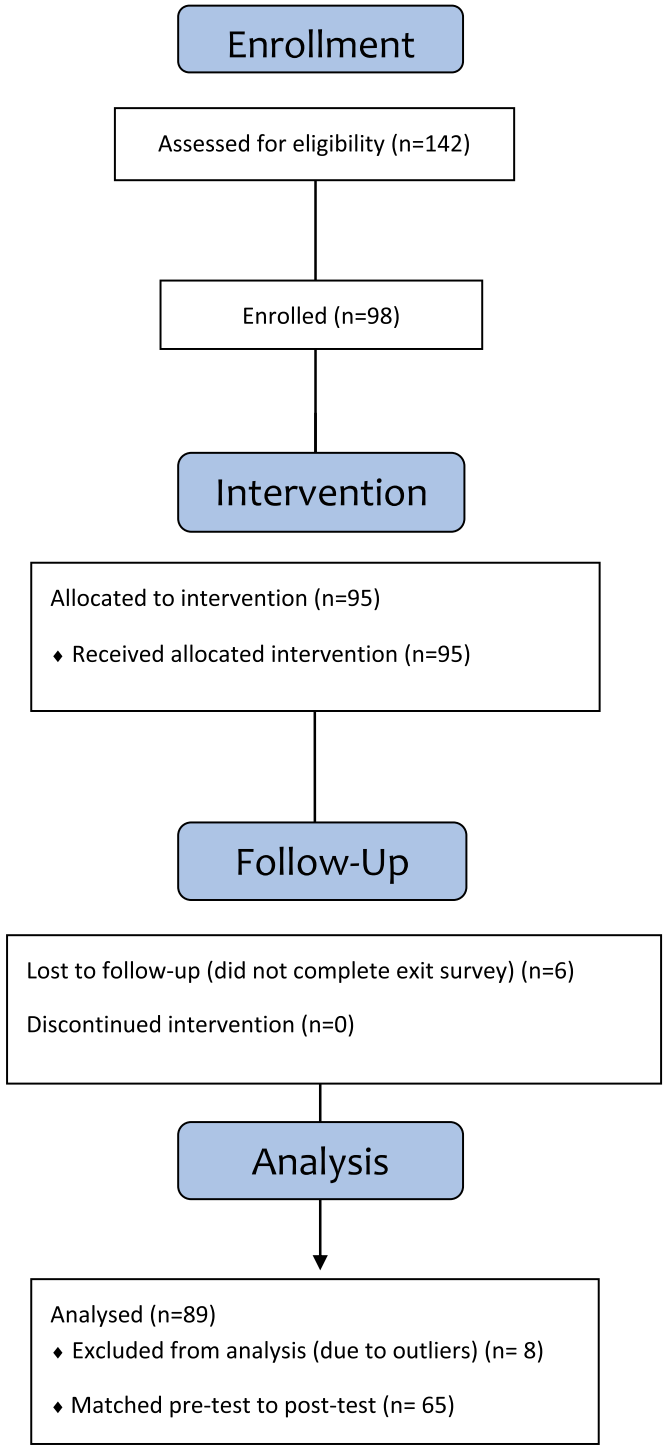

Figure 1. CONSORT diagram.

new ideas presented by each other. The lesson ends with gathering the students again and beginning a reflective debrief of the activity. The instructor summarizes the key points of the activity followed by asking thought-provoking questions such as, "What takeaways do you have?," "What worked and what didn't?," "is there anything you wish the class had done differently?"

Quantitative data collection

One week prior to and after the intervention, participants were given one week to complete an online survey via Qualtrics The questionnaire measured social emotional learning skills, resilience, and physical activity. Participants also provided demographic data such as age, gender, and race/ethnicity.

Social emotional learning

The Social Emotional Learning (SEL) Competency Questionnaire was used in this study for participants to self-assess their SEL competency. The questionnaire was designed based on Grades 9–10 SEL competences and indicators and modification from the Metropolitan Nashville Public School (MNPS) SEL I can statement.[12,13] It consists of five core domains of SEL: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making, with five items on each domain. Participants were asked to self-rate each statement on a 5-point rating scale, ranging from 1 = not true at all, 2 = rarely true, 3 = sometimes true, 4 = often true, and 5 = always true. An example item used to assess self-aware is "I understand my strengths and weaknesses." An example of an item used to assess self-management include "I am self-motivated to keep working toward my goal." An example item used to measure social awareness is "I understand how my verbal cues and body language impact other's emotions," and "I understand that people are different in many ways." An example item designed to assess the relationship skills is "I can get along with my classmates who are different from me." An example item used to assess responsible decision-making include "I can make responsible academic decisions." Each sub-scale (domain) score is the composite score of the five items' scores, ranging from five to 25 scores. The total scale score is the sum of all five sub-scales' scores. The higher score, the better social emotional learning skills and competency. The Cronbach Alpha coefficient of the total SEL scale was .88 at the pretest and was .87 at the posttest in this study, indicating a high degree of internal consistency.

Resilience

The 10-item Connor-Davidson Resilience Scale (CD-RISC-10) was used to assess the participant's ability to bounce back from the variety of challenges in life.[8] Example questions included "I am not easily discouraged by failure," and "I tend to bounce back after illness, injury, or other hardships." Statements are scored on a 5-point scale: 1 = not true at all, 2 = rarely true, 3 = sometimes true, 4 = often true, 5 = always true. The total scale score is the sum of the participant's response to each statement, range from 10 (least resilient) to 50 (most resilient). The CD-RISC-10 has been found to be a reliable tool in measuring resilience with a reported Cronbach's alpha equaling .87.[8]

Physical activity

The International Physical Activity Questionnaire (IPAQ) – Short Form is a 7-item survey with open-ended questions to measure intensity levels of physical activity.[14] Two items are designed to measure vigorous physical activity (VPA), moderate physical activity (MPA), and walking behaviors, respectively. Prior to responding to each intensity level of physical activity, participants were given guided parameters to define the specific intensity level of physical activity and asked to provide their experience in the last 7 days with each. Each intensity level of PA score is measured by the metabolic equivalent (MET) minutes per week. This is calculated by multiplying the minutes and days reported by an intensity factor for different levels of activity. For example, VPA MET-minutes/week were calculated by multiplying active minutes by 8.8, MPA MET-minutes/week were calculated by multiplying active minutes by 4.0, and walking MET-minutes/week were calculated by multiplying active minutes by 3.3. Total PA MET-minutes/week is the sum of VPA MET-minutes/week, MPA MET-minutes/week, and Walking MET-minutes/week. Past studies have shown strong internal consistency.[14]

Qualitative data collection

Open-ended questions

To better understand the students' feelings, thoughts, and perspectives of the adventure education lessons, the research team developed seven open-ended questions for students to answer prior to field observation. The seven open-ended questions include: 1) what parts of the curriculum did you like the most? 2) what parts of the curriculum did you like the least? 3) How do the adventure lessons, if at all, help you improve your self-management skills? 4) How do adventure education lessons, if at all, help improve your self-confidence and enhance your personal strengths? 5) What self-management skills, if any, have you learned most from adventure education lessons? 6) What social skills, if any, have you learned most from adventure education lessons? And 7) How, if at all, do adventure education lessons help you make responsible decisions? The open-ended questions via Qualtrics were sent to the instructor ahead of time to send out to his students immediately after our field observations. The students were asked to answer all seven open-ended questions via Qualtrics within two weeks after our field observation.

Field observations

Four investigators conducted field observations during the final week of May over the course of two days to understand how the instructor taught adventure education lessons. Prior to conducting field research, a researcher who had more than 20 years of qualitative research experience trained them how to take field notes

while conducting a field observation. First, the researcher presented what to observe and how to take field notes based on the natural flow of the lesson structure. For example, prior to the start of the lesson, investigator should observe and describe the physical environment and equipment set up. During the lesson, investigator should observe and write what the teacher presents and demonstrates a learning task to students, how overall students and/or specific students respond to it; what the teacher organizes the class into groups/partner to perform the task, how overall students and/or specific student respond to it; what and how the teacher observes and guides students' tasks engagement, and what and how students engage in the task with their group members and/or partners verbally and physically; and what and how the teacher guides students reflecting what they just do; and what and how students respond to the teachers' guiding questions. Next, the researcher presented lesson scenarios while guiding the investigators using the structured lesson observation describe above to conduct the field observation. Last, the researcher addressed all questions raised by the trainees to ensure trainees have a better understanding of how to conduct a field observation. After the training, each investigator observed at least two classes, where they took field notes regarding the date and time of the class, the number of students in attendance, the physical setting of the class (i.e., the equipment utilized), what and how the teacher presented, demonstrated, organized, and guided, and what and how students responded to each learning task by the teacher.

Semi-structured interview

One week after the field observation, we conducted a semi-structured interview with the instructor. One of the investigators held a 45-minute semi-structured interview via Zoom. The interview questions focus on gathering information about the instructor's educational and teaching background, how he developed the adventure education program, how he guided students engaging in team-building tasks, cooperative activities, and shared reflections in a typical adventure education lesson and throughout the program. The zoom interview was recorded for later analysis.

Data analysis

Quantitative data analysis

There were 95 participants who completed the pretest surveys, and 89 participants who completed the posttest surveys. We screened for outliers on the physical activity variables using the SPSS Explore with Tukey method. There were three outliers in the pretest sample and five outliers in the posttest sample. The skewness and kurtosis were checked for normality after the elimination of outliers. We did not observe patterns among the missing data or the outliers. We were able to match 65 participants for pre- and posttest data. We followed the principles of the intention-to-treat analysis, using the full pretest sample. Paired t-tests were performed to examine the effects of the adventure lesson intervention on SEL, resilience, and physical activity among the participating students from the baseline to the posttest. All data analyses were performed using IBM SPSS 27.0,[15] and the significance level was set at $p < .05$.

Qualitative data analysis

Responses to the open-ended questions were analyzed using the constant comparison technique, which was used to find common themes.[16] The constant comparison method is a qualitative data analysis technique that involves comparing data to identify similarities and differences. The process involves breaking down the interview data into smaller segments, coding these segments, and then comparing them to identify patterns and themes.[17] First, the responses were examined by two investigators. Initial categories were coded by grouping similar sentiments and then in the second round, similar codes were joined together. After all of the data was coded independently, we calculated the frequency of the codes used and identified key quotes that best represented these codes. The coding process was primarily conducted by two investigators and reviewed by two other investigators. Consensus meetings were held multiple times throughout the coding process and one investigator helped solve any disagreement. In addition, the qualitative interview with the instructor was analyzed using thematic analysis. The patterns that emerged from the interview were integrated with the themes found from the student responses to the open-ended questions. As a member check, the manuscript was sent back to the primary instructor to confirm the themes and to revise the manuscript based on his input.

Results

Intervention effects on social emotional learning, resilience, and physical activity

Table 2 displays the descriptive statistics of all study variables at pretest and posttest. Table 3 presents the results of the paired t-test examining the differences in participants' scores in the study variables from pretest to posttest. For the SEL outcome variables, there were significantly higher scores on the total SEL scale ($t = -2.004$, $df = 61$, $p = .050$), the self-awareness ($t = -2.069$, $df = 64$,

Table 2. Mean score of outcome variables from pre- and posttests.

	Pretest		Posttest	
	Mean	*SD*	*Mean*	*SD*
Total SEL	3.99	.34	4.07	.37
Self-Awareness	3.85	.45	3.96	.43
Self-Management	3.57	.51	3.75	.63
Social Awareness	4.19	.48	4.21	.46
Relationship Skills	4.15	.49	4.22	.43
Decision-Making	4.15	.42	4.20	.48
Resilience	4.15	.49	3.69	.62
Total PA	3360.0413	6929.14	2375.55	1735.46
Vigorous PA	604.42	696.13	1253.75	1478.89
Moderate PA	471.78	596.32	473.02	414.90
Walking	2396.92	6884.52	677.06	659.15

SEL = Social Emotional Learning, PA = Physical activity

Table 3. Results of paired t-test comparing mean scores from pre-to posttest.

Variable	*t*	*df*	*p*
Total SEL	−2.004	61	.050*
Self-Awareness	−2.069	64	.043*
Self-Management	−2.674	64	.010*
Social Awareness	−.260	62	.796
Relationship Skills	−1.176	64	.244
Decision-Making	−.788	63	.434
Resilience	5.686	64	.000*
Total PA	1.122	62	.266
Vigorous PA	−4.129	63	.000*
Moderate PA	−7.42	62	.461
Walking	2.072	64	.042*

SEL = Social Emotional Learning, PA = Physical activity

p = .043), and self-management (t = −2.674, df = 64, p = .010) subscales from the pretest to the posttest. There were no significant differences in the social awareness (t = −.260, df = 62,p = .796), relationship skills (t = −1.176, df = 64, p = .244), and decision-making subscales (t = −.788, df =63, p = .434) over time. As seen in Table 3, there was also a statistically significant improvement in resilience scores (t = 5.686, df = 64, p < .001) over time. Similarly, there was a significant improvement in vigorous PA (t = −4.129, df = 63, p < .001) over time. In contrast, there was a significant decrease in walking (t = 2.072, df = 64, p = .042). There were no significant differences in total (t = 1.122,df = 62,p = .266) and moderate PA (t = −7.42, df = 62, p = .411) scores.

Content analysis of the open-ended questions and the semi-structured interview with the instructor yielded three themes. We presented the results of the three themes below. Table 4 displays the top codes and exemplary quotes from students' responses to the seven open-ended questions.

Promoting healthy interpersonal interaction

The adventure-education lessons were able to build and promote interpersonal skills by emphasizing communication, cooperation, active listening, and taking leadership roles. When students were asked about which social skills they have learned most from the adventure education lesson, 63 (46.3%) responded with communication skills (see Table 4). For example, students commented:

> I have learned communication majorly through the activities we've done, we constantly have to communicate with our peers to further benefit our experience in the activity and fulfill the objective of the activity.

> I learned most about communication. As I am highly introverted, I don't often reach out to people and allow my voice to be heard (especially in large groups). Through the activities, I was able to break out of my shell and contribute more in order to achieve the common goal.

The second leading response behind communication was cooperation (see Table 4), with 31 participants (22.8%) responding to the importance of cooperation within the adventure education lessons. The following quote highlights how teamwork promoted cooperation:

> I learned a lot about cooperative skills from these lessons because the foundation of adventure challenges is based on teamwork and you need to build up your cooperative skills to successfully achieve goals as a team.

Students also emphasized the importance of active listening, with 29 students (21.3%) citing active listening as an integral social skill they have learned as presented in Table 4. Students commented on how active listening allowed them to achieve their goals:

> Active listening and communication were probably the most used things in adventure education lessons because without listening to teammates or queues you would not get anything done.

The students also talked about the role and importance of taking leadership roles that come along as part of the adventure education lessons. This taking leadership roles ultimately builds on their relationship skills with 19 (21.6%) of students stating how they have improved these skills, for example:

> Adventure challenge taught me better how to work in a group. I learned that while being a leader, I still need to be able to step down, let others find their way, and listen to other's ideas.

> The adventure education lessons require each individual to do their complete best in order to lead the team to success. Everyone must contribute, and some even need to 'back off' and control themselves in order to follow the rules and/or facilitate teamwork. It is also important that team members know their limits so as to help build a safe environment geared towards success.

Table 4. Top codes and exemplary quotes to student short response survey questions.

Short Response Survey Question	Top Three Codes	Exemplary Quotes
Q1: What part of the adventure lesson do you like the most?	• Team activities (33%) • Physical games (31%) • Communication (7%)	"I liked the ropes course training and ropes course the best. It allowed our group to trust each other a lot more and have fun, we all also learned a lot about each other and were better able to communicate through it and after it." – P64
Q1: What part of the adventure lessons do you like the least?	• Discussion (19%) • Team activities (16%) • Boring (6%)	"The parts I liked the least personally were the very long discussion which I know are necessary but were unproductive at times which made it longer than usual" – P15
Q2: How do adventure education lessons, if at all, help improve your self-confidence and enhance your personal strengths?	• Personal growth (18%) • Perseverance (17%) • Confidence (14%)	"Adventure education forces you to go to your growth zone while still avoiding your danger zone. " – P34 "They teach me improve my perseverance because these games design us to fail over and over again until we find a way to succeed." – P55
Q3: What self-management skills (e.g., self-control, self-monitor, and self-evaluation), if any, have you learned most from adventure education lessons?	• Self-evaluation (45%) • Self-monitoring (31%) • Self-control (30%)	"I found it was crucial to determine what I was capable and incapable of. For example, if I was unsure about my skills in a specific field, I would do my best to support the 'ace' player, rather than take the main action myself." – P68
Q4: How, if at all, do adventure education lessons help improve such self-management skills?	• Relationship skills (22%) • Responsible decision-making (17%) • Growth (14%)	"The adventure education lessons require each individual to do their complete best in order to lead the team to success. Everyone must contribute, and some even need to 'back off' and control themselves in order to follow the rules and/or facilitate teamwork. It is also important that team members know their limits so as to help build a safe environment geared towards success." – P47
Q5: What social skills, if any, have you learned most from adventure education lessons?	• Communication (46%) • Cooperation (23%) • Active listening (21%)	"I learned most about communication. As I am highly introverted, I don't often reach out to people and allow my voice to be heard (especially large groups). Through the activities, I was able to break out of my shell and contribute more in order to achieve the common goal. – P82
Q6: How, if at all, do adventure education lessons help improve such social skills?	• Forces communication (38%) • Increases peer interaction (35%) • Establishes common goal (18%)	Adventure education lessons . . . provides a guidance to be patient with those around us when someone is struggling but also allows us to be more accepting of the differences of our peers. It allows us to share decisions and come to mutual agreements to help us conquer the challenge of activity. – P36
Q7: How, if at all, do adventure education lessons help you make responsible decisions?	• Perspective taking (30%) • Improves social skills (17%) • Risk evaluation (10%)	All of the traits these challenges help you to practice involve becoming a more open-minded person. By considering everything from multiple perspectives, you can make more responsible decisions. – P28

When the instructor was asked about the benefits that students receive from participating in the adventure education lessons, he responded:

> A lot of like sports and activities that other . . . sport based PE program would teach, there's very limited opportunity for people later in life to participate in, and so like yes, exposure to a variety of activities in in traditional PE program is great. Life-long physical fitness, and things like that. I just see the value in communication and trust and team work to be so much more valuable because no matter what situation people are going to be in, in life, they are going to depend on their communication skills and their ability to work with other people. Whether this is in a professional setting or a personal setting. You're going to need interpersonal skills that's hopefully a byproduct of students time in my class. So I don't wanna put down a sport based PE program too much, but I just see so much more value in the curriculum that we do here.

Fostering self-growth through promotion of intrapersonal skills

Participants highlighted self-growth as one of the primary outcomes achieved due to the adventure education lessons promoting individuals' intrapersonal skills. Within these intrapersonal skills, two subcategories emerged. These subcategories were composed of self-awareness and self-management. Fourteen students (15.9%) responded that the adventure education lessons help promote their self-confidence that allows them to get out of their comfort zone and in turn grow as a person. Students talked about how teamwork and group involvement increased their self-confidence:

> They improve my self confidence because many of the games entail involvement from every single person and so it improves my self confidence when my contribution is necessary to the success of the game.

When students were asked about what self-management skills they have learned most from the adventure lessons, 40 students (45.45%) responded with self-evaluation. Regarding how students need to evaluate themselves in order to determine one's capabilities students commented:

> I learned about self-evaluation and reflection. As the lessons required many different types of skills, I found it was crucial to determine what I was capable and incapable of. For example, if I was unsure about my

> skills in a specific field, I would do my best to support the 'ace' player, rather than take the main action myself. I also learned the importance of reflection – looking back on what happened, I saw what I could improve on in future activities and what physical shortcomings I should work on to overcome.

> I have learned self-evaluation throughout this course and what I can do better and help my peers along the way.

Twenty-seven students (30.7%) responded about increases in their ability to self-monitor. Examples of this are students responding that self-monitor led them to having increased awareness about who they are as individuals.

> I learned to self-monitor a lot more. Since we do so many initiatives and team work, I have to pull my own weight since I know what I do will affect everyone.

Twenty-six students (29.6%) responded that the adventure education lessons promote their ability to self-control that further improves their intrapersonal skills. Students highlighted how the ability to self-control allowed them to be more patient with themselves:

> The self-management skills that I have learned most from adventure education lessons is self-control because I learned how to patient with myself even when I was struggling to learn the skills required to complete an activity. At the beginning of the year, I was hard on myself when I did not understand anything but not I am learning to accept that it is okay to make mistakes and it helps us grow into better individuals.

When asked about the major goals of the adventure education lessons, the instructor highlighted encouraging his students to get out of their comfort zones:

> I would say community is probably one of the key things, communication, and just allowing students or encouraging students to go outside of their comfort zone. I talk to my classes all about the comfort zone, versus growth zone, versus danger zone, and how to at least at some point every class period go outside of their comfort zone.

Teaching decision-making skills

The students learned decision-making skills. The challenges were created to develop the students' abilities and skills, which they can then apply to various real-life situations. Twenty-six students (30%) stated that they felt their responsible decisions making skills improved. Students noted that the lessons taught them how to consider others, which facilitated growth in their responsible decision-making:

> Adventure education lessons help me make responsible decisions because they allow me to be considerate of everyone in the classroom and not just focus on meeting my own needs. It allows me to grow my perspective on those around me, allowing me to set boundaries if necessary.

In addition, 15 students (17%) noted that they were able to improve their decision-making skills due to improvement in their social skills. Examples of these responses include:

> Adventure education puts us in situations where we are meant to think of smart and reasonable decisions, that would come in the real world, these situations require us to use communication and teamwork skills and overall enhance our ability to make responsible decisions.

> They help me make responsible decisions by teaching all of the things like self-confidence, communication, self-evaluation and active listening and all of these require me to be responsible. In order to succeed in the adventure challenges, I have to be responsible with the decisions and choices I make with my classmates.

In addition, nine students (10%) noted that they were able to make responsible decisions due to their improved risk evaluation. Examples of this type of response include

> It helps us to make responsible decisions when you know that you are taking risks and have limited moves.

With one participant specifically noting how the adventure educational lessons allows them to choose their level of risk taking:

> I think adventure challenge allowed me to make decisions on whether or not I want to take risks, and this was exemplified by the growth zone and my comfort zone.

The qualitative data helps support the quantitative data as student emphasize their increase in interpersonal skills, intrapersonal skills, and decision-making skills. The quantitative data showed that there were increases in the total SEL scale, self-awareness, and self-management subscales over time. This ultimately matched with what students qualitatively reported as they saw themselves progress in those same aspects over the course of the semester-long adventure education intervention.

Discussion

This study aims to examine the effectiveness of a semester-long Adventure Education intervention in improving SEL competencies, resilience, and physical activity among high school students. The adventure education lessons improved students' scores on the total SEL scale and their self-awareness and self-management subscales. However, there were no significant

differences in the social awareness, relationship skills, and decision-making subscales. Students also had an improvement in resilience scores over time. Additionally, there was a significant improvement in vigorous physical activity over time, but no significant change in total and moderate PA over time among the participants.

As hypothesized, our quantitative findings confirm that the semester-long adventure education lessons are effective in improving overall SEL, especially, self-awareness and self-management skills. The adventure education approach aligns with the SEL framework, which emphasizes the development of relationship skills, self-awareness, self-management, responsible decision-making, and social awareness.

The qualitative findings indicate that the adventure education lessons enhanced students' emotional awareness, ability to perceive and understand their peers, and sense of personal accountability. Throughout the adventure education lessons, students participated in team-building activities that provided opportunities for them to understand their own emotions and consider others' emotions. Also, team building activities presented challenging and cooperative opportunities for each student to actively contribute their efforts to work together in order to accomplish the joint task. These challenging activities promoted their self-confidence as they recognized the crucial role they play in the success of the activity.

Our qualitative findings further show that students were able to advance their self-management abilities. Specifically, students noted their ability to recognize and regulate their emotions and behaviors in a constructive manner. Through engaging in challenging tasks provided in the lessons, students developed patience and honesty in dealing with themselves and others, recognizing that emotional awareness is essential for successful completion of the activities.

These findings are consistent with a study conducted by Orson et al.[18] They reported that adolescents (age 14–18) learned valuable lessons by overcoming emotional hurdles while participating in the Outward Bound, a specific type of adventure education program. Notably, some students reported the development of positive attitudes and mind-sets that helped them conquer self-doubt and distress. Students' ability to control, manage, and reframe their emotions ultimately allowed them to feel comfortable in their class environment and persist through engaging in challenging learning tasks and team building activities. In short, students' participating in challenging and cooperative team building activities throughout the adventure education lessons promoted their understanding of their own emotions and the emotions of others, self-confidence, and self-management skills.

It is important to note that the quantitative findings do not show a significant improvement in social awareness, relationship skills, and decision-making skills. However, our qualitative findings indicate improved interpersonal skills, such as communication skills including active listening, cooperation, and taking leadership roles. Adventure education lessons provide students with great opportunities for shared discourse, which enables them to acquire important real-world interpersonal skills, such as communication, trust, and cooperation. These skills are essential for group problem-solving and achieving the lesson's objectives.[2]

The adventure education process involves sharing ideas, actively listening to others, and evaluating progress. Our qualitative findings indicate that the adventure education lessons improved students' decision-making skills, which can positively foster their ability to manage socially-interactive and cooperative tasks and contribute to a more positive school environment.

The instructor's approach of letting students have control over solving adventure education challenges probably helped improve their decision-making skills. The instructor provided the students with the challenge, learning tasks, and objective for the lesson, as well as brief rules, but did not offer solutions to resolving the challenge tasks. Instead, the students were encouraged and guided to come up with innovative methods to tackle the challenge tasks, and to revise their strategies. The instructor's oversight, without directly "telling the solution," empowered the students to exercise problem-solving skills and make autonomous decisions to tackle the challenge tasks.

Autonomy is a critical pedagogical tool, as previous research suggests. The extent to which participants experience and perceive autonomy during adventure education lessons is linked to their developmental outcomes which include competence, self-esteem, creativity and conceptual understanding.[19] Granting autonomy to students requires them to rely on themselves and their peers to explore possible solutions, to try out new ideas, and to make shared decisions on refined ideas to accomplish the task successfully. Through undergoing a process of experiential learning and problem-solving, students develop self-assurance in their capability for success, which translates to heightened confidence in decision-making within daily life.

Further, our results show that the adventure education lessons improved students' resilience over time. The ability to comprehend and regulate emotions is essential to cultivating resilience as it is closely

intertwined with both self-awareness and self-management.[20] Consistent with the recent studies,[20,21] adventure education lessons implemented over a semester can enhance resilience in individuals, particularly for those with low scores.[21,22] Both studies investigated impact of adventure education on resilience in college students.[20,21] One study[20] found that challenging tasks outside of students' comfort zone are crucial for improving resilience, while another study[21] found that engaging in intensive outdoor experiences for 3 weeks, such as an expedition phase of an adventure program, may enhance resilience.

In adventure education lessons, students learn to work collaboratively, share their ideas, and experiment with different solutions, ultimately leading to a successful outcome. Through engaging in challenging tasks and trying out divergent ways to solve problems, students develop self-assurance in their capability for success, which translates to heightened confidence in decision-making within daily life. Practicing positive thinking and reframing negative thoughts can help individuals approach challenges with a growth mind-set. Building a support system and positive relationships with others can provide individuals with emotional support and resources during challenging times.[23] The challenges faced and problem-solving processes that occurred may be helpful for developing and improving students' resilience.

Our qualitative findings provide support for the benefits of adventure education lessons in developing students' resilience. Previous research suggests that improvements in students' SEL skills, such as self-awareness and self-management can lead to greater resilience, particularly when using active forms of learning and establishing explicit learning objectives.[1] Building upon these findings, the instructor in the current study was intentional in communicating the explicit learning objectives for each activity, a factor that has been previously identified as beneficial for promoting students' SEL skills. Additionally, the instructor purposely encouraged students to try out divergent ways to solve problems, fostering creativity and promoting SEL development. This encouragement helped students build confidence in trying different methods to complete the tasks and be less afraid of failing, facilitating the development of resilience.

Through participation in the adventure education lessons, the students were able to achieve a significant improvement in vigorous physical activity over time. However, the results do not show significant differences in total and moderate PA scores. Further, students saw a significant decrease in walking. This decrease in walking may be attributed to the effects of engaging in vigorous physical activities, which may include fatigue and muscle soreness. The time allocated to engaging in more vigorous physical activity may also have replaced time that was previously spent walking. Previous studies have shown an association of social emotional outcomes with physical activity and note that there is a great deal of value in the youths' engagement in both SEL and PA.[24] Physical activity is very important, as it has been widely proven to build social skills and self-esteem, which is essential for social and emotional learning to occur.[25] Physical activity participation in schools is often found to be associated with positive outcomes including improvements in psychological well-being, academic performance and implementing a healthy lifestyle.[26]

The results of this study suggest that adventure education lessons can be an effective method for improving students' SEL skills, including self-awareness, self-management, and interpersonal skills. These findings have important implications for health education, as social-emotional skills are essential components of overall health and well-being.

Firstly, the development of self-awareness and self-management skills through adventure education lessons can be beneficial for promoting mental health. The ability to recognize and regulate one's own emotions and behaviors can help students to manage stress and anxiety and improve their overall emotional well-being.[27] These skills can also promote positive health behaviors, such as healthy eating and exercise, as students become more aware of how their emotions and behaviors impact their health.

Secondly, the improvement of interpersonal skills, such as communication, cooperation, and leadership, through adventure education lessons can have positive implications for social health. Effective communication skills are essential for building and maintaining positive relationships, while cooperation and leadership skills are critical for teamwork and problem-solving.[28] These skills can help students to navigate social situations, build strong support networks, and maintain healthy relationships.

Thirdly, the development of resilience through adventure education lessons can be beneficial for overall health and well-being. Resilience is the ability to bounce back from adversity and cope with stress and challenges. Developing resilience can help students to manage stress and overcome obstacles, promoting both mental and physical health.[22]

Overall, the findings of this study suggest that adventure education lessons can be a valuable tool for promoting social-emotional learning and overall health and well-being in students. Health education programs may consider incorporating adventure education lessons or

similar experiential learning activities as part of a comprehensive approach to promoting health and wellness in students.

Several limitations associated with the study should be noted. First, all data was collected through self-report questionnaires, which may be subject to bias. Second, we are not able to determine causality due to confounding variables, such as participation in high school sports, which may have influenced our outcomes. Further research may benefit from using objective measures of physical activity and utilizing randomized controlled trials to make determinations of causality. Another limitation is the lack of a comparison group. Without a control group, it is difficult to determine whether any changes in social emotional learning, resilience, and physical activity were due to the adventure education lessons or other factors. The lack of a comparison group also introduces several threats to internal validity, including selection bias and history. Selection bias occurs when there are systematic differences between the groups being compared, which can affect the generalizability of the results. In this case, it is possible that students who elected to take adventure education lessons may have been different from those who did not in terms of their baseline levels of social emotional learning, resilience, and physical activity. History is another threat to internal validity that may be introduced by the lack of a comparison group. This refers to external events or factors that may have influenced the outcomes being measured over time. For example, if there were changes in school policies or programs during the study period that affected social emotional learning or physical activity levels among all students, it would be difficult to attribute any changes observed solely to the adventure education lessons. Additionally, the questionnaire item to participant ratio is an important consideration in research design, as it can affect the reliability and validity of the results obtained. The general rule of thumb is that for every item a study instrument has, there should be 8 to 10 study participants. In this study, the CD-RISC-10 resilience scale has 10 items, which means that ideally there should have been between 80 and 100 participants in the study. However, the actual sample size was smaller than this, which may have affected the reliability of the results obtained from this scale. Additionally, this study had a high attrition rate, which resulted in a smaller sample size for final analysis. The initial sample size was 142 participants, but only 89 participants had complete data for analysis. This high attrition rate may have introduced bias into the study results if there were systematic differences between those who dropped out and those who remained in the study. Additionally, the smaller sample size may have reduced the statistical power of the study to detect significant effects. Another limitation of this study was the combination of a small sample size and the use of Intention to Treat (ITT) analysis for data analysis. With a small sample size, the loss of 12 subjects could influence the alpha levels for the paired t-test results, which may affect the statistical power of the study to detect significant effects. Additionally, ITT analysis may not accurately reflect treatment efficacy because it includes participants who did not receive or complete treatment. In ITT analysis, all participants are analyzed according to their original group assignment, regardless of whether they received or completed treatment. This approach is intended to preserve randomization and avoid bias due to noncompliance or dropout. However, including noncompliant or dropout participants in the analysis can dilute treatment effects and introduce heterogeneity into the sample. Therefore, while ITT analysis is a useful approach for preserving randomization and avoiding bias in clinical trials, it may not be appropriate for all types of studies. In this case, with a small sample size and high attrition rate, ITT analysis may have limited the ability to detect significant effects of the Adventure Education intervention on SEL, resilience, and physical activity outcomes. Additionally, the lack of a process evaluation of fidelity for delivery of the Adventure Education curriculum, which could have led to a Type III error in the intervention study may have been a limitation.

Despite these limitations, this study provides evidence for the benefits of adventure education intervention on student social and emotional learning skills, resilience, and vigorous PA. To enhance the benefits of adventure education programs, future studies may consider integrating physical fitness activities into team-building exercises. This could provide students with the opportunity to engage in moderate-to-vigorous physical activity while using cooperation, problem-solving, and decision-making skills to achieve the objectives of the team-building activities. To facilitate the successful implementation of such a program, it may be beneficial to first introduce adventure education activities to promote teamwork, growth, and social and emotional learning skills, which would help bring the class together. Once students feel comfortable with each other and have developed their social and emotional learning skills, the program could gradually incorporate traditional physical education activities. This two-part program could not only allow students to enjoy physical education but also provide them with transferable skills that they can use in other classes and future endeavors.

The semester-long adventure education lessons can improve SEL competencies, resilience, and physical activity in high school students. Further, the adventure education lessons can improve students' intrapersonal and interpersonal skills and decision-making skills. This study suggests that adventure education lessons may focus on integrating moderate-to-vigorous physical activity into team building activities to ensure the students have improvements in their overall physical activity. Overall, this study has important implications on the use of adventure education in improving SEL skills and resiliency in high school students.

Translation to Health Education Practice

The Adventure Education intervention used in this study can be a valuable tool for Health Educators who are interested in promoting students' well-being through physical activity and SEL. The intervention was designed to improve students' SEL competencies, resilience, and physical activity levels. The results showed significant improvements in all three areas among high school students who participated in the intervention.

Health Educators can use the methods and results of this study to design similar interventions that promote SEL competencies, resilience, and physical activity among their respective populations of interest. They can adapt the adventure education curriculum used in this study to fit the needs of their students or develop new curricula based on adventure education principles. Additionally, they can use the findings from this study to evaluate the effectiveness of their interventions.

The role of Health Educators and Certified Health Education Specialists (CHES) is critical in designing, implementing, and evaluating health promotion programs such as adventure education interventions.[29] In this study, CHES played a key role in developing the intervention curriculum based on evidence-based practices related to SEL competencies and physical activity promotion. They also ensured that the intervention was culturally appropriate for the target population.

The National Commission for Health Education Credentialing Inc. Responsibilities that were applied in the design and administration of this study include:

(1) Assessing individual and community needs for health education: CHES assessed the needs of high school students for an intervention that promotes SEL competencies, resilience, and physical activity.
(2) Planning health education strategies: CHES developed an evidence-based adventure education curriculum that promotes SEL competencies, resilience, and physical activity.
(3) Implementing health education strategies: CHES implemented the adventure education intervention in high schools and ensured that it was culturally appropriate for the target population.
(4) Conducting evaluation and research related to health education: CHES evaluated the effectiveness of the intervention using quantitative and qualitative methods.

Competencies and sub-competencies that were applied in this study include:

(1) Assess needs, assets, and capacity for health education (1.1, 1.2)
(2) Plan health education strategies, interventions, and programs (2.1, 2.2)
(3) Implement health education strategies, interventions, and programs (3.1,3.2, 3.3)
(4) Conduct evaluation and research related to health education (4.1, 4.2, 4.3)

Overall, Health Educators and CHES can use the methods and results of this study to design effective health promotion programs that promote SEL competencies, resilience, and physical activity among their respective populations of interest. By applying the NCHEC Responsibilities, Competencies, and Sub-competencies in their work, they can ensure that their interventions are evidence-based and culturally appropriate for the target population.

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