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# Exploring the Effects of Adventure Activity Programs in Educational Contexts

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**Abstract:** *Adventure camp activities have become increasingly popular with children and teens, allowing them to develop their gross motor skills through outdoor experiences and motor challenges. These experiences not only promote the development of motor skills among the school population but also have a positive impact on cognitive and emotional development. Studies show that engaging in such activities increases coordination, balance and muscle strength, essential for well-developed motor skills. The presented research aimed to identify the influences of adventure activities that propose games of coordination, balance and sustained effort. The sample included 228 students aged between 11 and 14 years who were given initial and final tests on standardized tests: Star Excursion Test, Denisiuk Test and the Ruffier Test. The research period was 21 days and included three series of 7 days each. Within it, the Development through Education and Adventure experimental program was implemented and included suspended obstacle course games, slackline, adventure trails, balance games, imposed and freecycling trails, climbing and hiking. In research tests, descriptive statistical analyses reveal significant results within each group for $p<0.05$ and $r<0.08$. The operational methodological approach of the research, through the proposed activity program, optimizes the level of coordination capacity, general motor skills and effort capacity. Theme and content addressed to contribute to the identification of the motor benefits of this type of recreational activities in the school environment and contribute to the broad context of research on behaviour and their effects.*

**Keywords:** *general motor skills, adventure activities, school recreational activities.*

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## Introduction

Formal education operates within a hierarchical educational system. This is present in both general university studies and specialized programs. Courses are designed for the development of professional and personal skills throughout life. The emphasis on curricular performance reduces the time allocated to creativity and curiosity. It also limits the maximization of social and professional potential. The educational environment can be standardized, family-oriented or diverse. Depending on the context, it is coordinated by teachers, family members or trainers. Training new generations requires strong involvement from teachers and parents, as formal education alone is insufficient for success. Extracurricular activities, which contribute to physical and mental health, are crucial (McKenzie et al., 1997; Piercy et al., 2018). Consistent physical activity during youth promotes long-term active behavior (Mahoney, 2000) and helps social integration, even post-education (Armenta, 2011; Iordan et al., 2021). These activities also boost fitness and academic performance (Tanasă et al., 2022).

Experiential learning programs are rapidly developing as alternatives to traditional education, especially as technology encourages sedentary behavior (Agard et al., 2021). Schools are thus urged to adapt and promote physical activity programs beyond the formal curriculum, particularly in primary education (Ooko et al., 2015; Pelemiš et al., 2024).

Although programs can be implemented in various environments, the natural element plays a fundamental role in generating positive effects. Educational activities require interaction with the external natural environment, which includes elements of real or perceived risk. While the outcomes remain uncertain, they can be shaped by the actions of participants and the circumstances involved (Ewert et al., 2011, 2014; Akçakese et al., 2024). Awareness of the extracurricular curriculum, which incorporates experiential, physical, and nature-based components, ensures balance and fosters proactive behaviors in the long term (Goodway et al., 2014; Nikšić et al., 2022).

The growing interest in these programs, both at the school level and among adolescents, has accelerated scientific research into their recognized benefits on multiple levels. Teachers and parents, as the main partners of researchers, understand not only the importance but also the necessity of identifying new ways to implement healthy behavior models among future generations (Poitras et al., 2016; Bunjaku, 2024; Choi et al., 2024). Research findings and innovative ideas in this area highlight the mutual and sustained collaboration between teachers and specialists in developing extracurricular

activities (Piercy et al., 2018; Hong et al., 2024). Recreational activities are fundamental for psycho-physical balance, facilitating energy recovery and optimizing overall health. Integrating moments of relaxation and recreational activities into the daily routine represents an essential investment in personal and social well-being, and the scope of experiential and adventure education is continuously expanding through programs implemented and analyzed globally. (Schmittwilken, et al., 2024).

A successful implementation model includes introducing these behavior-modeling tools as early as preschool (King et al., 2020) and continuing through primary school (Lucenko al., 2024). The 6–12 age range is considered ideal for developing psychomotor abilities (Rodríguez-Negro et al., 2019) and foundational motor skills (Telama, 2005; Nikšić et al., 2022).

The first meta-analysis of extracurricular activity programs, particularly in adventure education, was published in 1994 by Cason and Gillis. This study analyzed 43 papers published between 1970 and 1994, focusing on adolescents aged 11 and older. Researchers identified 19 measurable benefits and calculated an average effect size of ES = 0.31, indicating a 62.2% improvement for adolescents participating in EA-specific activity programs compared to those who did not participate (Cason et al., 1994).

A 2019 meta-analysis by Joonyoung Lee and Tao Zhang from Texas reviewed 255 articles published between 1976 and 2018 to examine the interaction between adventure education and physical education and its effects. The study found that integrating specific activities into physical education curricula positively impacts physical and psychological outcomes (Lee et al., 2019). However, at the national level, no meta-analysis has been conducted to consolidate the evolution, effects, or spread of these programs, and the available literature on the topic is still limited. Adventure educational activities usually involve challenges, games played at high or low altitudes, or personal development experiences, and it is important that the geographical distribution is balanced to allow access to as many students as possible (Stoica et al., 2019a). These activities contribute to group and individual transformations by directly and deliberately exposing participants to new situations. This process is achieved by synchronizing four key functions: educational, social, motor, and recreational (Stoica et al., 2019b).

Studies show that active education activities significantly improve personal development and cognitive skills (Camarda et al., 2010). In modern society, recreational activities play a crucial role in preparing individuals for social and professional integration. Therefore, incorporating them into

school through non-formal education and continuing them in lifelong learning is essential for balanced development (Lee, 2019).

These activities enhance social skills and facilitate social integration, promoting non-cognitive capacities through outdoor or adventure-based programs (Seppo, 2011). Participation in non-formal adventure education, combined with formal physical education, can harness new insights and improve social engagement (Leanza et al., 2016; Susan et al., 2018).

To improve physical education, it is vital to diversify the curriculum by using various natural environments (Bădău et al., 2018). Adventure education, characterized by its voluntary, accessible, and active nature, contributes to self-efficacy and stress reduction.

The target audience of this program includes individuals with specific somatic, psychological, and motor characteristics. The program incorporates six distinct activities and evaluates participants through a series of five standardized tests, administered both at the beginning and the conclusion of the program. The research aims to examine the impact of adventure activities on motor skills, coordination, and physical endurance in students aged 11 to 14 by implementing an experimental program featuring adventure education and recreational activities in nature during a school camp. The program's content and structure were tested using three standardized assessments at the beginning and end. The practical-methodical approach sought to validate the hypothesis that integrating adventure education (AE) activities into an initial program model can enhance participants' motor and functional capacities. The research focuses on improving motor abilities through AE programs, understanding motor variability based on physical and functional characteristics, and validating an innovative program to modernize and diversify recreational activities.

## Materials and methods

### *Subjects*

The sample of students participating in the research involved two stages: informing parents or legal guardians of the purpose and program of the research and signing the consent agreement for participation in the study as well as the confidentiality of the use of the results obtained from the samples and tests applied. The students are enrolled in schools in the southeastern area of Romania. The study involved 228 students aged between 11 and 14 years, comprising 100 boys and 128 girls. For each series, two groups were formed: Group 1 (G1), consisting of 50 students aged 11-12 years, and Group 2 (G2), consisting of 64 students aged 13-14 years. This

research did not involve a control group. Data were collected by direct observation and recording of each subject's data after completing the proposed standardized tests using markers, measuring tapes, a stopwatch, and a heart rate monitor.

***Procedure of the intervention***

The experimental program included five activities: slackline, obstacle course, rope routes at varying heights, a climbing board, and a hexagon with balance games. The program lasted 21 days and was divided into three periods of 7 days each. A total of 76 students participated in each series. The schedule for the 7 days was structured as follows: on the first and last days, initial and final tests were conducted, while the activity program was implemented on days 2 through 6.

The applied tests included:

- Star Excursion Balance Test: To assess changes in dynamic balance.
- Denisiuk Test: To evaluate differences in general coordination.
- Ruffier Test: To measure the level of physical fitness.

Each activity was conducted once per day and repeated twice daily, in both the morning and afternoon sessions. The activities were described as follows:

- Slackline: participants balanced on straps (55 meters total) between trees with instructor help, completing the course 4 times; - Obstacle course: 12-station route with jumping, crawling, reaction drills, object carrying, backward running, attention games, and target shooting, completed 3 times; - Rope routes and zip line: participants navigated rope passages with ladders, bridges, a net, and finished with a 50-meter zip line, completing the route 3 times; - Climbing board: participants climbed two marked routes and one free route, completing 6 correct climbs; - Hexagon with balance games: participants navigated 6 interconnected balance challenges (30m total) involving beams, ropes, tires, and cables, repeating the activity 6 times.

***Results***

The three standardized tests were used to assess motor abilities, with a focus on evaluating dynamic balance, general coordination, and functional capacity during both the initial and final testing phases.

Table 1. Statistical analysis TI-TF on the Star Excursion Balance Test – G1

| Samples | X | SD | Std. Error Mean | 95% Confidence Lower | Upper | t | df | p | r |
|---|---|---|---|---|---|---|---|---|---|
| Boys - T.I. – r.f. | .68 | .86 | .12 | .43 | .92 | 5.54 | 49 | .000 | 0,79 |
| Boys - T.F. – r.f. | 1.12 | 1.9 | .26 | .57 | 1.66 | 4.16 | 49 | .000 | 0,59 |
| Boys - T.I. – l.f. | .72 | .96 | .13 | .44 | .99 | 5.25 | 49 | .000 | 0,75 |
| Boys - T.F. – l.f. | 1.2 | 1.87 | .26 | .66 | 1.73 | 4.52 | 49 | .000 | 0,64 |
| Girls - T.I. – r.f. | .4 | 1.12 | .14 | .12 | .68 | 2.89 | 63 | .005 | 0,36 |
| Girls - T.F. – r.f. | -.78 | 11.74 | 1.46 | -3.71 | 2.15 | -.53 | 63 | .596 | -0,07 |
| Girls - T.I. – l.f. | .46 | 1.06 | .13 | .2 | .73 | 3.50 | 63 | .001 | 0,43 |
| Girls - T.F. – l.f. | .28 | 2.3 | .28 | -.29 | .85 | .97 | 63 | .333 | 0,12 |

r.f.=right foot; l.f.=left foot

There is a robust and significant correlation between the initial and final measurements for both legs in boys (r=0.79 and p=0.000 for the right leg and r=0.79 and p=0.000 for the left). In the case of girls, we identified a moderate and significant correlation only for the left leg (r=0.43 and p=0.001). There are significant variations in performance between the initial and final measurements, with clear differences between boys and girls, in the case of group 1, students aged 11-12

Table 2. Statistical analysis TI-TF on the Star Excursion Balance Test – G2

| Samples | X | SD | STM | 95% Confidence Lower | Upper | t | df | p | |
|---|---|---|---|---|---|---|---|---|---|
| Boys - T.I. – r.f. | .54 | .58 | .08 | .36 | .72 | 6.14 | 49 | .000 | 0,93 |
| Boys - T.F. – r.f. | 1.45 | 1.42 | .21 | 1.02 | 1.88 | 6.78 | 49 | .000 | 1,02 |
| Boys - T.I. – l.f. | .27 | .87 | .13 | .007 | .53 | 2.07 | 49 | .044 | 0,31 |
| Boys - T.F. – l.f. | .72 | 1.75 | .26 | .19 | 1.26 | 2.74 | 49 | .009 | 0,41 |
| Girls - T.I. – r.f. | .2 | 1.02 | .13 | -.06 | .46 | 1.51 | 63 | .135 | 0,20 |
| Girls - T.F. – r.f. | 1.06 | 1.51 | .19 | .67 | 1.45 | 5.44 | 63 | .000 | 0,70 |
| Girls - T.I. – l.f. | .1 | .79 | .1 | -.1 | .3 | .97 | 63 | .335 | 0,13 |
| Girls - T.F. – l.f. | -.11 | 2.09 | .27 | -.65 | .42 | -.43 | 63 | .667 | 0,05 |

r.f.=right foot; l.f.=left foot, STM= Std. Error Mean

In group 2 (ages 13-14), boys showed a significant increase in the right foot mean (from 0.54 to 1.45), with a stronger correlation in the final test (r = 1.02, p = 0.000) and greater data dispersion. Girls also showed a significant increase in the right foot mean (from 0.2 to 1.06) and improved

correlation, along with increased data variability. For the left foot, boys had moderate correlations, while girls showed insignificant results.

Table 3. Statistical analysis TI-TF on the Denisiuk Test

| **Samples** | X | SD | Std. Error Mean | 95% Confidence Lower | Upper | **t** | **df** | **p** | **r** |
|---|---|---|---|---|---|---|---|---|---|
| Boys - T.I. – G1 | -.22 | 1.3 | .18 | -.59 | .14 | -1.21 | 49 | .229 | -0,17 |
| Boys- T.F. – G1 | -.81 | 2.68 | .37 | -1.57 | -.04 | -2.13 | 49 | .037 | -0,30 |
| Girls - T.I. – G1 | .07 | 1.47 | .18 | -.29 | .44 | .403 | 63 | .688 | 0,05 |
| Girls - T.F. – G1 | -1.37 | 1.38 | .17 | -1.71 | -1.02 | -7.91 | 63 | .000 | -0,99 |
| Boys - T.I. – G2 | -.55 | 1.57 | .23 | -1.03 | -.07 | -2.34 | 49 | .024 | -0,35 |
| Boys- T.F. – G2 | -1.22 | 1.96 | .29 | -1.81 | -.62 | -4.12 | 49 | .000 | -0,62 |
| Girls - T.I. – G2 | .18 | 1.46 | .18 | -.19 | .56 | .97 | 63 | .335 | 0,58 |
| Girls - T.F. – G2 | -1.08 | 1.51 | .19 | -1.47 | -.69 | -5.52 | 63 | .000 | -0,72 |

Table 4. Statistical analysis of independent data - TI-TF on the Denisiuk Test

| **Samples** | **Tests** | **Levene's Test** | | **t- test for Equality of Means** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | p | t | df | p | Xd | SDd |
| G1 | TI | 1.066 | .304 | -.644 | 112 | .521 | -.191 | .296 |
| | TF | .496 | .483 | 2.403 | 112 | .018 | .821 | .341 |
| G2 | TI | 2.256 | .136 | -2.057 | 102 | .042 | -.478 | .292 |
| | TF | .918 | .340 | -1.113 | 102 | .268 | -.298 | .268 |

The analysis of the program's intervention level showed highly statistically significant results, measured by Effect Size, in the statistical comparison between groups for all samples, with $r < 0.8$ (Table 3). When statistically analysing the comparative results of the independent data in Table 4, we found that within G2, significantly favourable results were identified (Xd = -0.298, SDd = 0.268) in the final testing. The variances are homogeneous ($p > 0.05$ at Levene's Test), and the differences are statistically significant in both groups ($p=0.018$ at G1 and $p=0.042$ at G2).

Table 5. Statistical analysis TI-TF on the Ruffier Test

| Samples | Tests | X | SD | Min | Max | CV | T | df | p |
|---|---|---|---|---|---|---|---|---|---|
| Boys G1 | T.I. | 8.4620 | 1.68776 | 4.60 | 13.00 | 19,95% | 35.453 | 49 | .000 |
| | T.F. | 7.2060 | 1.26578 | 4.60 | 9.80 | 17,57% | 40.255 | | .000 |
| Girls G1 | T.I. | 10.9625 | 13.68164 | 5.70 | 86.00 | 80,11% | 6.410 | 63 | .000 |
| | T.F. | 7.5781 | 1.45618 | 4.60 | 10.70 | 19,22% | 41.633 | | .000 |
| Boys G2 | T.I. | 8.1364 | 1.50365 | 5.70 | 11.60 | 18,48% | 35.893 | 49 | .000 |
| | T.F. | 6.9591 | 1.21757 | 4.70 | 8.90 | 17,50% | 37.913 | | .000 |
| Girls G2 | T.I. | 8.2767 | 1.10306 | 6.10 | 10.60 | 13,33% | 58.121 | 63 | .000 |
| | T.F. | 6.8933 | 1.01110 | 4.60 | 8.30 | 14,67% | 52.809 | | .000 |

In the case of the Ruffier test, the statistical analysis highlights a decrease in the mean between tests in both main groups (G1 and G1), the largest decrease is in girls in G1 (from 10.9625 to 7.5781) and the smallest in boys in G2 (from 8.1364 to 6.9591). All parameters are strongly significant and the most stable evolution was recorded by boys in G2.

Table 6. Statistical analysis of independent data - TI-TF on the Ruffier Test

| Samples | Tests | Levene's Test | | t- test for Equality of Means | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | p | t | df | p | Xd | SDd |
| G1 | TI | 3.715 | .056 | -1.283 | 112 | .202 | -2.50 | 1.948 |
| | TF | .980 | .324 | -1.433 | 112 | .155 | -.372 | .259 |
| G2 | TI | 3.547 | .063 | -.549 | 102 | .584 | -.140 | .255 |
| | TF | 3.009 | .086 | .300 | 102 | .764 | .065 | .218 |

In the statistical analysis of independent data in Table 6, the p values for all tests are greater than 0.05, which suggests that the variances between the groups are considered equal and validates the use of the t test for equality of means. In both tests, for both groups, we observe that the p values (0.202 for TI and 0.155 for TF) indicate that no significant differences were recorded. The mean difference values (Xd) are relatively small, and the standard deviations (SDd) suggest a moderate to low variability in the results obtained.

## Discussion

This research discusses the program's impact on motor development, the link between physical and cognitive-emotional growth, research methodology, the relevance of activities in schools, and the potential for further research and practical applications. These topics will be addressed in turn. As research has demonstrated (Bolger et al., 2020; da Silva

et al., 2022), the need for consistent and conscious physical exercise is essential for the development of anthropological characteristics, psychomotor skills, and cognitive abilities. These activities stimulate the motor systems through exercises that involve precise and controlled movements. They help improve coordination and balance while developing muscle strength, particularly in the upper body and stabilizing muscles. Progress is supported by the challenging and dynamic nature of these activities. Dedicated programs that take place outside regular school hours, such as school camps or weekend workshops, complement school curricula and help foster a proactive lifestyle and can have positive effects on the development of correct posture in athletes and the general school population (Hazar et al., 2020, Mocanu et al. 2021).

Motor challenge activities significantly contribute to cognitive development by enhancing the ability to plan, make decisions, and solve problems. Participation in such activities also increases emotional resilience, as students learn to manage stress and overcome fear (Burlui et al., 2021). Success in completing challenges boosts self-confidence and personal motivation. In the context of providing opportunities for the entire school population to engage in extracurricular activities, socio-economic success is facilitated, and moral and volitional capacities are developed (Kim et al., 2016; Tan et al., 2021; Chapman et al., 2023).

The standardized tests used, such as the Flamingo or Star Excursion Test, are well-recognized for their validity and reliability in measuring coordination and balance. However, these tests focus on specific aspects and can be complemented by practical observations, student self-assessments, or other tests tailored to the educational context, such as dynamic assessments based on real-time performance. A 21-day period is useful for observing short-term improvements, but to assess long-term effects, a longitudinal study would be necessary. This could include additional measurements taken 3, 6, or 12 months after the program's completion to analyze the sustainability of the results. Additionally, including a control group could improve the research design.

Schools can integrate these activities through field trips, camps, partnerships with adventure centers, or by utilizing local resources. Extracurricular programs like adventure clubs can involve teachers and the community. Funding can also be sought for infrastructure improvements. Age and gender differences impact progress, with younger children improving balance and coordination, and adolescents showing more progress in strength and endurance. Boys often excel in strength-based activities, while girls may perform better in balance and precision tasks. The

initial level of physical preparation influences progress, with less physically prepared students typically showing the greatest relative improvements. Regarding activities that emphasize collective outcomes, such activities promote empathy, communication, and mutual trust—factors that contribute to the development of social skills and resilience (Valcke et al., 2023; Pavlovic et al., 2023).

Teachers and instructors can be trained through specialized courses in adventure education, and school principals can support the implementation of these activities by allocating resources and establishing partnerships with specialized organizations. Moreover, these programs should be included in the school's educational strategy, either as extracurricular or optional activities. In contemporary society, marked by both positive and negative transformations, physical culture and health have gained growing significance. The demand for structured and high-quality leisure time from an early age arises not only due to shifts in lifestyle but also because modern living and working conditions increasingly pose risks to the body's functions and abilities, which can be rapidly and effectively altered.

## Limitations

In analyzing and generalizing the results of this study, it is important to consider all the factors that can affect the effectiveness of an adventure education program. The principle of voluntary participation, which is inherent to these types of programs, allows students to limit their involvement in the activities. This can impact the benefits they gain, as well as the effectiveness of transferring skills to real-world situations. The success of this transfer depends on the ability of the teacher and specialist to create the right context, guide the learning process, provide instructions along the activities, and offer moral support during moments when a student decides to stop at any point along the route.

The limitations that arise in carrying out and organizing this type of activity include limited accessibility (quote me), student motivation, or the lack of a regulated framework at least at the school level. Teachers and instructors can successfully implement outdoor and adventure education programs by adapting activities to the school context, integrating them into the curriculum, and collaborating with parents and the community. However, voluntary participation can address accessibility and diversity challenges that should be carefully managed to maximize educational impact and ensure inclusion of all students.

## Conclusions

The scope of adventure education is continually expanding through programs that are observed, analyzed, and implemented on a global scale. While these activities are rooted in recreation, they also cultivate values and skills that hold significant utility in daily life.

In the international educational space, adventure education programs represent a complex field with substantial implications for the development of curriculum and intervention tools. The innovative pedagogical approach facilitates not only the transfer and adaptation of validated educational models, but also the creation of an international framework of good practices in the field of experiential education. The international value of these programs follows their transfer and adaptability, which creates common methodologies and standards that can be integrated into educational systems. This ensures quality and efficiency at a global level. The implementation of adventure education programs transcends the simple replication of successful models. By facilitating the exchange of experience and promoting common quality standards, these programs contribute to the creation of a more adaptable, efficient and inclusive educational system.

International outdoor educational models like Outward Bound, Friluftsliv, and NOLS promote psychomotor and cognitive skills through direct experiences in nature, fostering leadership and adaptability. Implementing similar programs in Romania could enhance the holistic development of students. Teachers can integrate these practices through curriculum planning, differentiated approaches, and experiential learning workshops. This article explores adventure education programs globally and highlights the motor benefits of activities like school camps, emphasizing dynamic balance and coordination as key skills for physical performance and injury prevention. Modern educational programs align with European trends, integrating these skills to support students' physical, social, and emotional growth.

In conclusion, the statistically significant results obtained following the application of standardized tests confirmed that leisure time programs and recreational activities specific to adventure education can optimize motor skills, with a focus on educating dynamic balance, general coordination, and application skills, as well as optimizing functional capacity. Also, as a secondary but equally important conclusion, there is an urgent need to adapt them to the educational specifics of students and the educational context in our country.

## Declaration of conflict of interests

There is no conflict of interest for any of the authors regarding this paper.

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