BALANCE DEVELOPMENT THROUGH ADVENTURE ACTIVITIES IMPLEMENTED IN THE PHYSICAL EDUCATION LESSON

Dezvoltarea echilibrului prin activităţi de aventură implementate în cadrul orei de educaţie fizică

GANEA Virgil
Faculty of Physical Education and Sport, Babes-Bolyai University, Cluj-Napoca
* Corresponding author: ganead@yahoo.com

Abstract
Background. Adventure activities have been part of the physical education lessons of other countries for a long time now, yet they are still missing from the Romanian curriculum, despite the fact that it has been proved they help in the character development of the participants.
Objectives. This paper analyses the effects of a modul based on initiatives and low rope activities (activities specific to adventure education) on the development of the dynamic and static balance on a group of 10-12 years old students.
Methods. The adventure education module was implemented on students learning at a private school in Cluj – Napoca between November 2016-March 2017 during an extra hour of physical education that they had every week. The control group had an extra hour of physical education every week as well but they have done tipical physical education activities instead. The testing of the students was done before and at the end of the program for both groups, usingJohnson'sModified BASS Test for Dynamic Balance.
*Results.*The results have shown a semnificative increase in the dynamic balance of the experiential group while no semnificative results were recorded for the control group. Furthermore, theaverage score of the static balance of the experiential group has shown a significantly greater increase compared to the control group.
Conclusion. We can conclude that this type of adventure activities (initiatives and low rope activities) help with the development of both dynamic and static balance when used with students age 10-12 years old, and as such they have their place in the arsenal of the physical education teacher at least for the development of those abilities.

Keywords: balance, initiatives, low rope activities, adventure education

Introduction

Adventure education is a form of education based on practical experiences. Priest (1999) has said about it that is that branch of education that targets the development of inter and intra-personal relationships using activities that pose a challenge and have an element of risk. This method of education has been used since 1941 when Kurt Hahn opened the first Outward Bound School (McKanzie 2003; Hattie, Marsh, Neill & Richards 1997) and is now implemented in many countries around the globe (Ewert&Sibthorp, 2014), finding its place in the curriculum of a large number of schools, both state owned and private.In a study done on schools from Colorado, more than 40% of them had an adventure education program and most of them had it implemented as part of the physical education curriculum (Evans 2000, apud Johnson 2012) .

Research done in the field of adventure education has shown that 62% of the teenagers that took part in such programs had something to gain from it (Cason & Gillis 1994). After analyzing the research done up to that moment, Hattie, Marsh, Neill & Richards (1997) managed to identify 40 differentoutcomes liked to this form of education and they grouped them in 6 categories: academics, leadership, self concept, personality, interpersonal skills and adventuresome.

The choice of activities is very important in the efficiency of the adventure education programs (Walsh&Gollins 1976**;** Ewert&Sibthorp 2014) but research does not show what activities are best for reaching certain outcomes.Furman (2011) was saying that adventure programs use activities like canoeing, cycling, skiing, rafting, horse riding, caving and mountain or rock climbing, and most often backpacking, however all those activities are impossible to implement in the curriculum of most schools.Rohnke (1989) considers that a goodadventure programis created of various activities grouped into icebreakers, deinhibitizers, trust activities, games, initiatives, low and high rope elements. The rope courses use a series of towers, cables, platforms and obstacles to create a physically challenging environment for the participants (Priest and Gass 1997). Rohnke, Rogers, Tait & Wall (2007 apud Gillis & Speelman 2008) said that rope courses have originated in the military training done in 1941. Apperently they were especially used with sailers as they were simulating

working conditions aboard ships (Martin, Cashel, Wagstaff & Breuning, 2006 apud Gillis & Speelman 2008). The *low rope activities* are suspended courses that take place at low hight above the ground and as such the safety measures can be covered with a few mats and spotting. In the absence of specialised staff, these activities are safer to use in a school environment compared to the high rope courses. *Initiatives* are problems that chalange the participants and need to be solved with the help of all the team (Fletcher & Kunst, 2006) and usualy have more than just one possible solution. The easiest initiatives are usualy timed and the participants need to find a solution that will give them the best possible time.Some initiatives qualify as low rope activities as well. *Icebreakers and trust activities* are ussualy used at the beginning of a course with participants that do not know eachother well to create a bond between participants.

The activities are followed by a period of processing where the participants are encouraged to consider how can the learned lessons be applied in other contexts (Goldenberg, Klenosky, O'Leary & Templin 2000).The advantage of the rope courses is that they are flexible and can be adapted to the space and equipment available and to the outcome targeted **(**Goldenberg, Klenosky, O'Leary, Templin 2000**;** Moote, Wodarski 1997**).**Research shows thatrope courses are able to develop self–efficacy, attitudes about the physical condition and group dynamics, and to a certain degree they also help in the development of self-esteem or self concept, personality, behavior and academics(Gillis &Speelman, 2008).These outcomes will make rope courses a great asset for the educational system.

In the US, rope rourses have been implemented in public schools since 1971, through Project Adventure, a nationally awarded education currciculum (Bisson 2009).

Study

The main task of the study was to check if a program of adventure education based on initiatives and low rope elements can help in the development of balance for a group of middleschool students. For this we had to answer to a few research questions:

1. Do the students taking part in the program have a better balance as measured by our instrument, at the end of the program compared to the beginning of the program?
2. Do the students taking part in the program show a bigger improvement in their balance as compared to their collegues not taking part in the program?

The test selected for the measurement of balance is the *Johnson Modification of the BASS Test of Dynamic Balance.* The test is frequently used in the field for the measurement of dynamic balance (Hobbs 2008**),** and there are reasons to believe that it is a good measurement for static balance as well (Tsigilis, Zachopoulou&Mavridis, 2001). In the book „Companion Guide to Measurement and Evaluation for Kinesiology" David Tomchuck (2011) presents the test as measuring both balance components.

The test consists in a set path made out of 11 markings, 2.5 cm x 2.5 cm, that needs to be crossed by the subject while fallowing certain rules. The path is laied down acording to Fig.1. The subject needs to place himself with one foot on the first marking and then try to traverse the path while stepping on each sequent marking with the alternate foot. On each step he needs to try to cover the marking completly with the front of his sole, keep his heel of the ground and hold his balance for 5 seconds (Wood, 2008). The subject takes 5 points for every marking completly covered and up to 5 points (1 for every second) for holding his balance on every step. He will not recieve the 5 points for covering the marking if he is unable to stop on the marking in a balance position. The timing of the balance stops if the subject toutches the ground with any other part of his body beside the front of the sole of the balancing foot, moves his support foot from its location, places the second foot on the support leg, or goes past 5 seconds. If the subject makes a landing error, he needs to regain his position and try the balance section as well (Tomchuck 2011). Some researchers have modified the scorring system and have agreed to give 3 points to the subject if he covers partially the marking with his sole and does not make a landing error (Tsigilis, Zachopoulou&Mavridis,2001).

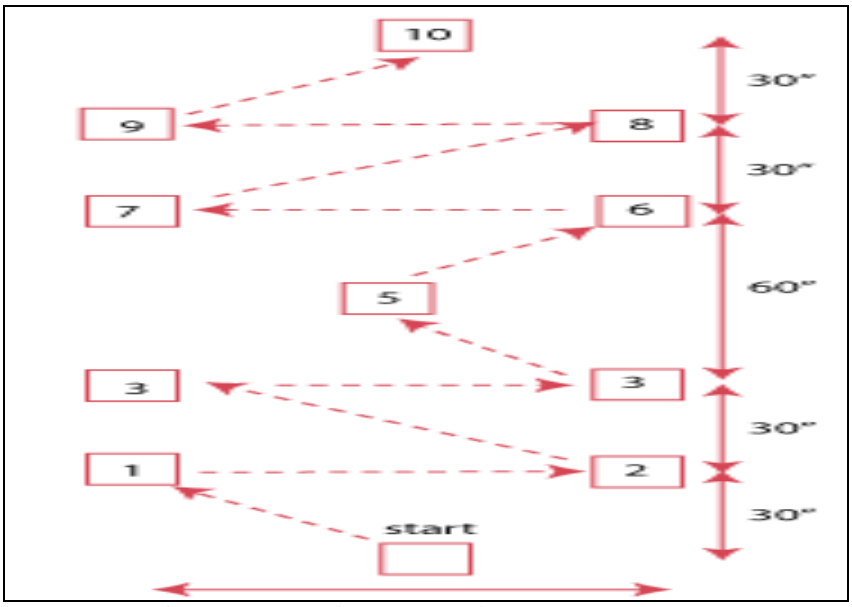

Fig.1 Layout for Johnson Modified Bass Test for Dynamic Balance (Wood, 2006)

The study was done with a group of children aged 10-12 year old studying at a private school in Cluj Napoca in 2016-2017. From the 3 classes involved in the study, one of them was randomly chosen to be the control group while the other two took part in the program of adventure education. As a result of this process of selection the experiment group ended up with 29 students, 13 girls and 16 boys, while the control group ended up with 14 students, 6 girls and 8 boys.

The students from both groups were tested at the beginning of the school year, in September 2016 and then again at the end of the program of specific activities, in March 2017.

The modified BASS test was done inside the school's gym. The path was marked on the floor with the help of a ruller and whiteboard markers and then appropriate size markings were cut from paper duct tape and placed at the corect locations according to Fig.1. The distances between marks were measured acording to Tomchuck (2011). A second identical course was layed out to make the practice session more efficient. The test and the scoring system were explained and a demonstration was done by one of the PE teachers. The students were than allowed to practice and students showing a lack of understanding were taken for further clarifications. After the practice session, each students had one official trial to try to score as high as he/she could. When there were mistakes in the patern or procedures, the students were asked to repeat from the last step. In order to ensure the corect recording of the score, the tests were filmed. The author was then able to check the video and adjust the score based on the landing or balance errors that escaped in his initial scoring. To make the balance count as accurate as possible, and to keep the students aware of their balance time, ametronome application was used from an Ipad , and the count was kept outloud during the test.

For this study the experiential group took part every week in 1 hour of adventure activities. This was done during one of their physical education lessons, that was introduced as additional to the 2 compulsory ones. The program started in November and ended in March and was only interupted during the school holidays as it was impossible to bring the students in for the activities. Meanwhile the control group had an additional lesson of Physical Education as well but the students took part in regular physical education activities instead.

The program of adventure activities consisted in *low rope activities, specific games and initiatives*. Since the participants knew eachother quite well and those activities are less physical, Ice breakers and trust activities have not been included in the program. The *specific games* have been used to warm up the students and prepare them for the activities. Some initiatives can be less physical demanding so in order to create our unit a selection was done from the activities available in the specialised literature. For the activities selected we than had to consider the resources required and we addapted them to the space and the resources available. Some activities had to be eliminated from the

program because they required a bigger space than the one availble to us or used specific materials that we could not improvise. Finaly the experience of the author has allowed him to create new activities to be added to the program.

Results

The data resulted from the test was analised with SPSS 2.0.

Out of the 29 students from the experiential group, 2 did not have a pair of scores, missing either the initial or the final test. In the control group a similar situation appeared and so the number of students in this grouped droped to 12.

The literature showed that there are two possible ways of scoring this test . One option supports the idea that not covering a mark completly is penalised and scored with 0 (Tomchuck, 2011) while the other considers that covering the mark partially should not be penalised completly and should be awarded a score of 3 (Tsigilis, Zachopoulou&Mavridis,2001). Since it was impossible to acces the original source for the Johnson modified BASS test, a decision was made to score the test both ways and to compare the results. Acording to Safrit & Wood (1995, apud Tsigilis et al. 2001) and to Tomchuck (2011) the test is assesing an aspect of static balance as well, so beside the final score of the test, a partial score was calculated for each participant adding the number of seconds of balance from each mark. Because this score of static balance is not affected by the stepping errors it stayed the same on both scoring alternatives.

The Sahpiro-Wilk test for normality showed us that the distribution of differences is normal for both the experiential and the control group in all the scores. The normality is not affected by what scoring alternative is used. The Skewness scores were also found to be acceptable.

The Boxplot graph showed that one candidate in the experiential group had a much bigger improvement in his static balance than the average, making this case stand out as an outlier. This case apeared as an outlier in the boxplot of the total score as well, but only in the scoring alternative that considered partial covering of the marks as a landing error. Outliers can easliy show up in studies with small number of participants (Popa 2008) but because we do not know if the student realy benefited from the program or was just not focussed enough during the initial test we decided to eliminate the case from the rest of the analysis.

The t test for the total BASS score showed a considerable increase in average of the dynamic balance of the experiential group for both scoring alternatives. For the scoring alternative that allows partial coverage to be scored (BASS3) the average difference was m=18.963, significant at $p<0.01$ ($t=6.016$, $df=26$). The 95% trust interval for the real average difference is between 12.484 and 25.442, witch means the increase in dynamic balance is real. The effect size calculated with Cohen's formula is d=1.18 witch acording to Cohen's instruction is considered big. For the other scoring alternative that does not consider partial scoring when steping (BASS0) the average difference was slightly smaller (m=15.462) but still significant at $p<0.01$ ($t=5.004$, $df=25$). In this case the effect size was d=0.98, still considered big by Cohen's recomandations. The control group did not have significant results for the score of the dynamic balance.When calculated using the mean difference between the experiential group and the control group divided over the cumulated standard deviation(Popa 2008), the effect size was the same for BASS3 (d=1.18) but higher for BASS0(d=1.10).

Table 1. Paired Samples T Test Results (final score – initial score)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Control group	BASS3[a]	,250	14,741	4,255	-9,116	9,616	,059	11	,954
	static balance	4,583	4,680	1,351	1,610	7,557	3,393	11	,006
	BASS0[b]	-2,500	17,563	5,070	-13,659	8,659	-,493	11	,632
Experiential group	BASS3[a]	18,963	16,379	3,152	12,484	25,442	6,016	26	,000
	static balance	10,846	9,698	1,902	6,929	14,763	5,703	25	,000
	BASS0[b]	15,462	15,754	3,090	9,098	21,825	5,004	25	,000

Note: *a: score calculated when partial cover of mark is rewarded with 3 points;*
b: score calculated when partial cover of mark is considered landing error.

For the static balance, both groups have showed significant results in the paired t-test as you can see in the Table 1. The independent t test has showed that in average the static balance has increased significantly more for the experiential group than for the control group (m=6.263, t=2.115, df=36, p=0.041). The efect size was calculated using Cohen's dfor independent samples and a score of d=0.74 was obtained. Acording to Cohen, values between 0.50 and 0.80 are considered a medium to big effect size.

Table 2. Independent Samples T Test Results for the static balance (experiential – control)

t-test for Equality of Means						
t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
2,115	36	,041	6,263	2,961	,257	12,269

Conclusions

From the results prezented above it is quite clear that the experiential group has progressed in regard to their dynamic balance and their static balance and we can state that the adventure education program through its games, initiatives and low rope activities had a contribution to this development. The big effect sizes (d=1.18 for BASS3, d=0.98 for BASS0) are a confirmation of the importance of this progress.

Compared with the control group the experiential group had significant improvements in dynamic balance and the improvements in the static balance were significantly greater at $p< 0.05$ (t=2.115, df=36, p=0.041) witch might lead us to say that adventure education is better for development of balance than the regular physical education activities.

However considering the conditions of this experiment we should be carefull about comparing the benefits of adventure education with those of regular physical education. The experiential group still had 2 regular physical education classes every week so we cannot give full credit for the balance development to the adventure activities. In the same time the small size of the control group (N=12) can makes us wonder if this group is reprezentative for the population and the comparison between groups is relevant.

For a better understanding of the benefits of the adventure activities towards the development of balance, a research where all the physical education lessons are replaced with this kind of activities would be required.

This being said however, we can still see reasons for introducing the adventure activities in the arsenal of the physical education teacher to be used, at least alongside traditional activities, for the development of balance. Considering the research done on the outcomes reached by adventure education activities, especialy over the development of inter and intrapersonal skills, the benefits will trancend the objectives of physical education and will help in the development of our students as human beings.

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