The European Proceedings of
Social & Behavioural Sciences
EpSBS

Future Academy ISSN: 2357-1330

https://dx.doi.org/10.15405/epsbs.2019.02.49

ICPESK 2018
International Congress of Physical Education, Sports and Kinetotherapy. Education and Sports Science in the 21st Century, Edition dedicated to the 95th anniversary of UNEFS

EDUCATING BALANCE IN ALPINE SKIING WITH A SIMULATION PLATFORM

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Abstract

This paper has the purpose of enhancing the efficiency of practical lessons for the UNEFS students attending the skiing course. The reason for this topic is that not all students manage to understand the technical mechanisms in order to execute certain specific exercises they have to perform. The main hypothesis is that, by using a platform on which the technical mechanisms of keeping one’s balance can be simulated, the student teaching program will yield better results. The paper is based on a pedagogical experiment conducted over 14 lessons on 16 subjects aged 19 to 20 years, at the “Virgil Teodorescu” Training Centre in the Parang Mountains, between 26 January and 07 February 2017. The research was approached from the perspective of four aspects involved in enhancing balance of alpine skiing athletes: types of balance, forces acting on the skier, intrapersonal communication, movements in space and time. In order to fulfil the objectives of the research, we established a training program and specific means for the program. This paper presents the obtained results, and the conclusions have confirmed the research hypothesis, according to which students acquire more rapidly the specific technical mechanisms, the grades they received during the testing phase supporting this assertion.

Keywords: Skiing, balance, simulation ground. .

https://dx.doi.org/10.15405/epsbs.2019.02.49
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Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

The experience gained over time in the training of UNEFS students, beginners in alpine skiing, has shown us that, year after year, there are students who encounter difficulties in learning the basic technical procedures of this sport. This is reflected, at the end of the course, by the low grades of some students who have difficulties in passing the practical examination.

This reason has prompted us to tackle this issue, with the primary objective of increasing efficiency of student training in the practical lessons of learning alpine skiing.

If we try to define alpine skiing, we can say that it means crossing a trail with snow skis on a descending slope, without losing balance (Formenti, Ardigo, & Minetti, 2005).

It is known that the skier is in balance when the vertical axis passing through the centre of gravity projects into the support base.

In order to maintain balance, alpine skiers have to perform certain specific motor actions, which, through repetition to automation, turn into specific technical procedures (Cârstocea, Stroe, Pelin, & Kacso, 2001).

To be more effective in educating balance, we felt it necessary to address the issue from the perspective of four dimensions:

- The dimension of balance forms;
- The magnitude of the forces acting on the skier;
- The dimension of intrapersonal communication;
- The spatiotemporal dimension of specific movements.

1.1. The dimension of balance forms in alpine skiing

If we analyse the balance of the skier in alpine skiing events, we notice the following balance forms (Caracaş, Hidi, Vasilescu, & Pisică, 2016):

- Static balance, when the skier is in the basic position ready to take the start, starts the race, is not slipping on the snow;
- Dynamic balance, when the skier starts skiing on the snow; dynamic balance can be linear or rotational:
  - Linear balance, when the ski centre does not move faster, the speed and direction remaining unchanged;
  - Rotational balance, when there is no angular acceleration of the skier's body or when it rotates at a constant angular speed.

1.2. The magnitude of the forces acting on the skier

In alpine skiing, especially in slalom events, balance has a dynamics that is determined by the relationship between the movements of the skier and the forces acting on him/her. The main forces acting on the balance of the skier are (Lipsyte, 2009, p. 224):

- internal forces – the muscle contractions of the skier;
- external forces:
  - frictional force;

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- braking force;
- gravitational force;
- centrifugal force;
- centripetal force;
- air resistance force;
- resistance force at the ski pivoting.

Experience has shown us that most of the difficulties occur in the learning of detours, i.e. in the stages of starting and driving skis in bypass, when the centrifugal force acts and must be neutralised with centripetal force.

In these phases, the failure to maintain balance is due to the emergence of intrapersonal communication barriers or to the mismanagement of the spatiotemporal characteristics of specific motor actions.

Maintaining balance along the route is due to the skier's ability to manipulate the forces acting on him/her through good segmental coordination and the whole body in relation to the other forces.

Field specialists (Pelin, Stroe, & Runcan, 2001) believe that bypassing is composed of four phases:

- preparatory phase;
- outbreak;
- driving skis in bypass;
- end of bypass.

In each phase, the skier is subjected to external forces that tend to unbalance him/her. They succeed in neutralising these forces with the help of internal forces through the body, limb and ski positions, executing specific movements in time and space to maintain balance.

1.3. The dimension of intrapersonal communication in performing the skiing movements

It is known that, in the motor and technical manifestation of athletes, intrapersonal communication is essential and is mainly based on the proper functioning of the analysers, namely: the kinaesthetic analyser, which permanently modulates the contractions of different muscles, the visual, auditory and tactile ones.

The malfunctioning of these analysers may lead to the onset of intrapersonal communication barriers, such as blocks, interference, distortion or filtering. Communication barriers will lead to loss of balance or difficulties in keeping it. So, we can say that maintaining balance is the consequence of a neuromotor activity both reflective and conscious.

1.4. The spatiotemporal dimension of specific movements

From this point of view, we know that the skier performs all the movements of maintaining balance in time and space. This platform was made on a snow-covered flat ground, with a predetermined route which it had under the ridges.

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2. Problem Statement

From the perspective of the last dimension, we considered the space-time characteristics of the actions taken to maintain balance, but also the position of the segments and skis, as well as the centre of gravity (COG). In the case of our research, where the subjects are UNEFS students aged 19 to 20 years, the use of this teaching method can be done successfully, because their intellectual level is high, which allows the understanding of specialised notions.

Taking into account the theoretical aspects presented above, which are arguments for addressing this research, we considered that using a simulation platform is appropriate, because it allows us to explain, under more accessible conditions, demonstrate and repeat specific technical procedures.

3. Research Questions

The use of the simulation platform contributes to increasing efficiency in balance education in alpine skiing because:

- exercise conditions are accessible to all subjects, avoiding repeated falls and injuries;
- the causes that may lead to the emergence of communication barriers (distortion or interference) are eliminated;
- the simulation platform helps to easily understand the spatial-temporal features of the specific motor actions needed to maintain balance.

4. Purpose of the Study

The research objectives were:

- Understanding the technical mechanisms for maintaining balance for each phase of the bypass;
- Learning the technical mechanisms for maintaining balance throughout the established route;
- Correct execution of the technical mechanisms to maintain balance, in terms of time and space;
- Understanding the forces that act on the loss of balance and those that can neutralise their action (centrifugal force neutralised by centripetal force);
- Forming the ability to operate with the COG position.

5. Research Methods

The methods used in the research were: study of the specialised bibliography, pedagogical observation, test, pedagogical experiment, statistical-mathematical processing, graphical representation (Tüdös, 1993)

6. Findings

We considered that using a simulation platform is appropriate, because it allows us to explain, under more accessible conditions, demonstrate and repeat specific technical procedures. This platform was made on a snow-covered flat ground, with a predetermined route which it had under the ridges.

The route was provided with spatial landmarks that aimed to help subjects orient in space, mainly in perceiving detour phases. At the same time, these parts were meant to help them perform the movements at the right place and time, thus having a space-time function. Subjects who underwent training were 16 in number and were aged 19 to 20 years, all of them being considered beginners in alpine skiing. Tables 01, Table 02 and Figure 01 present the results obtained by the research subjects, namely the experimental group and the control group.

Table 01. The experimental group

Item no.	Linear balance		Rotation balance			Total	Average	Test grade
	Direct descent	Oblique descent	Simple pivoting	Swivelling	Downhill christiania turn			
1.	9	9	8	9	9	44	8.80	9
2.	8	10	9	9	10	46	9.20	9
3.	8	9	7	8	8	40	8.00	8
4.	10	10	9	9	10	48	9.60	10
5.	9	9	8	8	9	43	8.60	9
6.	10	9	8	9	9	45	9.00	9
7.	9	8	7	8	8	40	8.00	8
8.	9	10	9	9	9	46	9.20	9
9.	7	8	8	9	9	41	8.20	8
10.	10	9	9	9	9	46	9.20	9
11.	8	9	8	8	9	42	8.40	8
12.	9	9	8	9	8	43	8.60	9
13.	7	8	7	8	8	38	7.60	8
14.	8	7	8	9	8	40	8.00	8
15.	9	10	9	9	10	48	9.60	10
16.	8	10	9	10	9	46	9.20	9
Average	8.62	9.00	8.19	8.74	8.87		8.50	8.75

Table 02. The control group

Item no.	Linear balance		Rotation balance			Total	Average	Test grade
	Direct descent	Oblique descent	Simple pivoting	Swivelling	Downhill christiania turn		Direct descent	Oblique descent
1.	8	7	8	8	7	38	7.60	8
2.	9	8	8	7	8	40	8.00	8
3.	6	7	8	7	7	35	7.00	7
4.	7	7	6	7	7	34	6.80	7
5.	9	8	7	7	8	39	7.80	8
6.	6	7	7	7	7	34	6.80	7
7.	9	9	8	9	9	44	8.80	9
8.	7	6	6	5	6	30	6.00	6
9.	8	9	8	7	7	39	7.80	8
10.	5	6	6	6	6	29	5.80	6
11.	8	7	6	8	8	37	7.40	7
12.	9	8	9	8	9	43	8.60	9
13.	5	5	5	5	5	25	5.00	5
14.	9	7	7	6	7	36	7.20	7
15.	8	7	7	6	7	35	7.00	7
16.	10	9	9	9	9	46	9.20	9
Average	7.93	7.37	7.19	7.00	7.31		7.30	7.37

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The tests performed by the subjects were: direct descent, oblique descent, simple pivoting, swivelling and downhill Christiania turn.

Subjects in the experimental group achieved better results than those in the control group for all tests. Arithmetic mean of the test results was superior for the experimental group. Arithmetic means of the experimental group were over 8.50, whereas those of the control group were below 8.00. The overall average of each subject was superior to that of subjects in the control group.

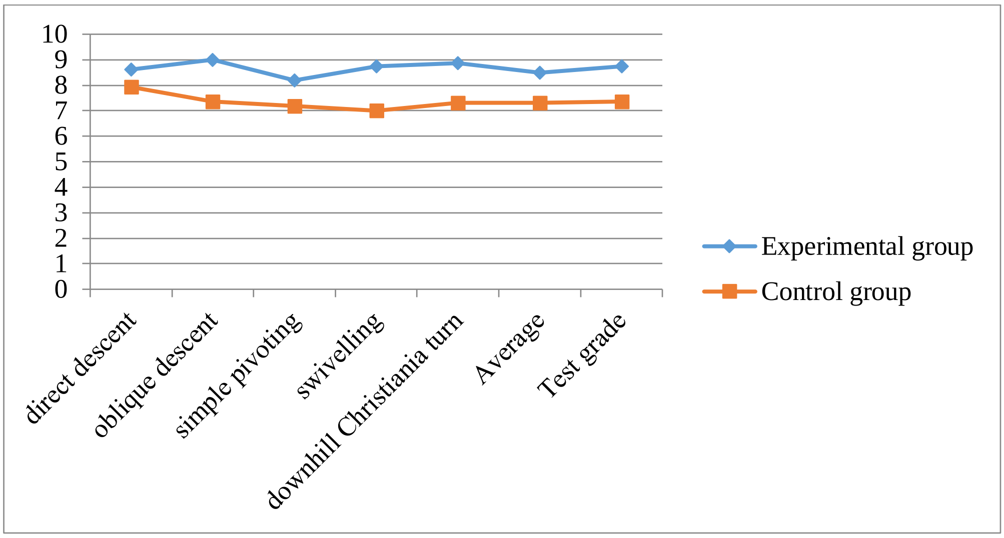

Figure 01. Results of the experimental group and control group

7. Conclusion

After analysing and interpreting the obtained results, we draw the following conclusions:

All subjects in the experiment group passed the practical examination at the ski course and there were no accidents during the teaching process.

The scores obtained by the experimental group students were 18% higher than the control group scores.

No intrapersonal communication barriers emerged during the training process.

All students in the experiment group were able to pass the exam, compared to the control group, where four students retired and had to repeat the exam.

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