EVALUATION OF THE ABILITY TO KEEP THE BALANCE IN SKI TRAINING OF STUDENTS OF THE RZESZÓW UNIVERSITY

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Abstract:

Sports training are an entirety of the teaching process covering all stages of the sports development of children, young people and adults. The training process is aspiring for taking the maximum physical by athletes efforts. Analysis of abilities to keep the balance subjected to ski training of the group of students of Rzeszów University of the Department of the physical education during 10 -day winter camp in Krynica Zdrój in 2011 / 2012 was a purpose of the research. At the work were presented findings of 20 students after the 20 year of age from the Department of the physical education of the Rzeszów University. At the end of the skiing training, with which were embraced students of Rzeszów University of the Department of the physical education were in the coronal plane minimum values will achieve medium parameters compared with initial. Reducing the scope of deviations can attest to a positive effect of training ski to the group of examined persons.

Sports training are an entirety of the teaching process covering all stages of the sports development of children, young people and adults. The training process is aspiring for taking the maximum physical by athletes efforts.

In the skiing the ability to keep the body in the balance is taking place in the continuous move, during changes of the position of the body during the ride. Feeling the balance in the downhill skiing is facilitating learning the correct technology of the ride what is an important factor to have a success (Sadowski G., Kaleta K., Januć W., 1984).

The one of determinants keeping one's balance in the skiing and making needed moves for the change of the position is proper ski position in the time of the ride and the tail of the base of the skier, resulting from placing skis towards oneself(Lesiewski J., Olszewski K., Wołk R., 2006).

During the ride the skier is overcoming irregularities of the area and the direction often changes and the position of the body is still changing with. It is making it difficult to keep the balance, but it is necessary to keep it. The skier is struggling against loss of the balance with the depreciation of shocks and balancing. The depreciation is reducing the effect of the force of shocks through diffractions of legs. Balancing causes transferring the centre of gravity and the fulcrum of the body (Parlak J., 1994).

Keeping the stable posture includes the wide range of the issues concerning the motor inspection, of spatial imagination and with the influence of different powers on the body . It seems to be right, we should begin that deliberations about above issues from specifying the date the balance and the stability. It is possible to define it as the property psychomotor, relying on the ability to keep the unstable balance of the body or the held object. The balance of the body manifests itself in static positions (static balance) and in the move - (dynamic

balance). Exist two manners of the forming of the balance: using equivalent exercises, and improving the vestibular and motor analyser(Sadowski G., Kaleta K., Januć W., 1984).

The stability is a wider issue than the balance. It is possible to define it as problems of leading out the body of the steady-state. The stability of the body is bigger, when it is harder to disturb the steady-state of the body and it means an ability to recover the steady-state. In case of the man a stability is an ability for active restoring of the position of the body in the space, lost by working of destabilizing factors, with which they can be the own motor activity of the organism or outside powers appearing as a result of the contact with surroundings (Błaszczyk J. W., 2004).

The balance and the stability are playing an important role in sport, because competitors often use from both of these features of putting the body in order to achieve the desirable outcome of one's action (Grimshaw P., Lees A., Fowler N., Burden A., 2010).

We should emphasize that the ability to keep the balance is possible thanks widely comprehended motority, which it is possible to define as the entirety of signs, states of the organism, conditioning, behaviours, whole of structures, psyches, motor needs of the man, processes and the real effects associated with the motor activity of the man. This definition refers to forms of moving of man in the space as the effect of changes of positions of the body or its parts (Raczek J., 2010).

The motorness of the man is being considered with taking into account: the mobility, the physical fitness, the motor efficiency and motor talents. With motorness comes, i.e. multilayered abilities and dynamic systems of relationships and relations between various components are connected of cohesive whole. Motor abilities are are showing the complexity of the set of components forming the specific group of the ability and the fact that they aren't developed at the same degree in each person. The following motor abilities are distinguished: motor abilities keep-fit (weight, high-speed and endurance), coordinating abilities (abilities of sense of direction, reaction, diversifying, balance, rhythm of the join of moves, adapting and switching) and suppleness (Osiński W., 2003).

Specifying the subject we should also explain what the motor coordination is. It is ability to make folded moves spatially and temporarily. It is also possible to describe it as the ability to switch from one objectives on other. This feature is controlling other movements of the man. Thanks to it an agility, an ability of precise and fast rule of the body and an agility manifest itself (moves of hands, feeling time, space, move, motor memory, balance (Barankiewicz J., 1998).

And so keeping the correct balance by the man is a locomotion, requiring the thorough cooperation of all sections of the body. It is possible to suppose that the malfunction of even one of them affects the quality of the control of the balance of the body.

PURPOSE OF THE WORK

Analysis of abilities to keep the balance subjected to ski training of the group of students of Rzeszów University of the Department of the physical education during 10 -day winter camp in Krynica Zdrój in 2011 / 2012 was a purpose of the research.

MATERIAL AND TESTING METHODS

At the work were presented findings of 20 students after the 20 year of age from the Department of the physical education of the Rzeszów University. Two measurements concerning the ability to keep its balance were taken. First results were registered at the beginning of lasting the camp, second in final. Both measurements were conducted in the same conditions. The time of the measurement amounted to 30 seconds: first with opened eyes, second with eyes shut in the same position. In standing position a dynamometrical platform was used for the evaluation of keeping the balance.

Ski Training program was modeled on the training program of affiliating Instructors and Coaches of the Skiing - SITN.

The examination assessing the postural stability of students was performed with the portable dynamographical lorry . The platform allows for the measurement of the objective parameters associated with the evaluation of the balance and the walk: measurement of powers (Fx, Fy and Fz), and of moments (Mx, we, Mz) in statics and dynamics, measurement of the parameter of a lever of feet on the platform (COP) and of all its consequences. At this work they considered:

1. COP-X averages (COP-X Average) - average position of the x coordinate of a lever, tilt front-back,
2. averages COP-Y (COP-Y Average) - average position of the y coordinate of a lever, side tilt,
3. field of the 95% Ellipse- surface area of the ellipse outlined by the moving COP point on the surface of the base, expressed in square centimetres.
4. total length of the path COP- total road which a lever of feet was examined while examining, expressed in centimetres(Sobera M, 2010).

Parameters were calculated with the software for analytical BioAnalysis with AMTI drawn up by the company. the Platform is based on a measurement of the migration of the point of the resultant of reaction forces of base.

RESULTS

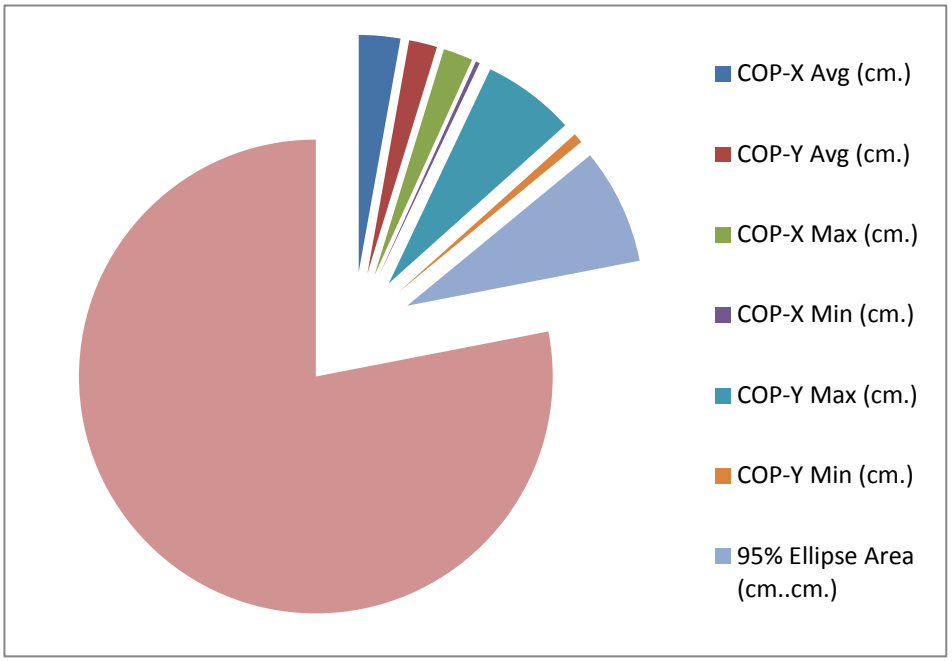
In examinations conducted by the author on the group of students from Rzeszów University of the Department of the physical education, the analysis of the results showed differences which are appearing between values of parameters of opened eyes and values of parameters of closed eyes.

Table 1. Changeability of basic parameters of statistical women at the beginning of lasting a ski camp. Examination I - free standing opened eyes.

Parameters	Max	Min	Avg	SD
COP-X Avg (cm.)	2,197	-1,581	0,085	4,791
COP-Y Avg (cm.)	1,494	-6,586	-3,545	9,002
COP-X Max (cm.)	1,57	0,277	0,73	1,592
COP-X Min (cm.)	-0,219	-2,438	-0,79	2,168
COP-Y Max (cm.)	4,92	0,603	1,866	6,08
COP-Y Min (cm.)	-0,525	-3,455	-1,132	2,999
95% Ellipse Area (cm..cm.)	6,149	0,55	1,941	5,553
Length	60,697	29,91	44,488	34,092

The largest result of the average position of the x coordinate of a lever took out 2.197 however minimal -1.581. The arithmetic average has a value 0.085. A standard deviation is a number 4.791. In the average position of the y coordinate of the centre of gravity the maximum result is 1.494 as for minimal -6.586. The arithmetic mean estimated the value -3.545. The standard deviation is fluctuating on the level 9.002. Max COP-X result which is running along the x pivot amounts to the maximum result 1.57 and minimal 0.277. Avg is shown in the number 0.73. In the standard deviation we received the result 1.592. COP-X maximal value i.e. the minimal COP coordinate along the x pivot is -0.219 however minimum value is -2.438. The arithmetic average is -0.79 and standard deviation 2.168. The maximal value in COP-Y Max is a number 4.92. The minimum value is 0.603. In the Maximum COP coordinate which is running along the x pivot an arithmetic average is 1.866 however the

standard deviation is being estimated on the level 6.08. The highest result in the minimal position of COP coordinates along the y pivot it -0.525 lowest -3.455. Avg has a value -1.132 and standard deviation 2.999. A field of the ellipse of the 95% of the confidence is a place, in which 95% of data is within this ellipse. The highest result has a value 6.149 however lowest 0.55. A number 1.941 determines the arithmetic average. The standard deviation is fluctuating on the level 5.553. The maximum result of the total length of the path is a value 60.697 as for minimal is taking 29.91. The arithmetic average is being presented in the number 44.488. SD i.e. the standard deviation was adjusted in the value 34.092.



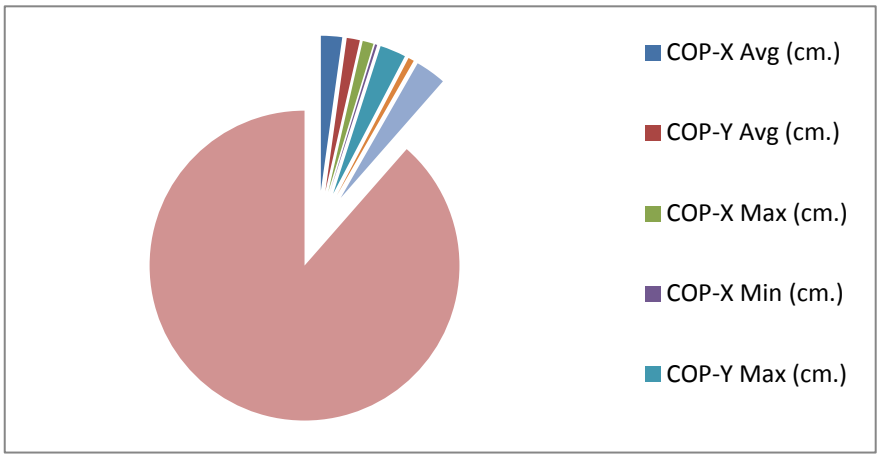
Graph 1. Changeability of basic parameters of statistical women at the beginning of lasting a ski camp. Examination I - free standing opened eyes.

Table 2. Changeability of basic parameters of statistical women at the beginning of lasting a ski camp. Examination II - free standing closed eyes.

Parameters	Max	Min	Avg	SD
COP-X Avg (cm.)	2,078	-1,757	0,084	4,699
COP-Y Avg (cm.)	1,287	-6,599	-3,551	8,932
COP-X Max (cm.)	1,072	0,193	0,532	1,234
COP-X Min (cm.)	-0,218	-1,096	-0,542	1,023
COP-Y Max (cm.)	2,544	0,55	1,054	2,001
COP-Y Min (cm.)	-0,575	-2,098	-1,076	1,768
95% Ellipse Area (cm..cm.)	3,003	0,485	1,328	3,596
Length	83,266	32,354	48,594	50,179

The maximum result of COP-X Avg i.e. the average position of the x coordinate of a lever was 2.078 however minimal -1.757. The arithmetic mean was on a level 0.089 and as regards the standard deviation - 4.699. In COP-Y Avg the maximum result is 1.287 and minimal -6.509. The arithmetic average estimated the number -3.531. SD is fluctuating on the level 9.002. Max result COP-X which is running along the x pivot amounts to the maximum 1.072 - minimal 0.193. Avg i.e. the arithmetic average is showing digit 0.532. In the standard deviation it is result 1.234. COP-X maximal value is -0.218 and the minimum value -1.096. Avg is -0.542 and standard deviation 1.023. The largest result got in the maximum COP

coordinate along the y pivot is a number 2.544. Minimum value 0.55. In COP-Y Max an arithmetic average is 1.054 however the standard deviation is being estimated on the level 2.001. The maximum result in the minimal position of COP coordinates along the y pivot is -0.575 lowest -2.098. A number -1.076 is presenting the arithmetic average and standard deviation 1.768. The highest result in field ellipses of the 95% of the confidence are a result, with the value 3.003 however lowest 0.485. A number 1.328 determines the arithmetic average. SD i.e. the standard deviation is on a level 3.596. The maximum result the path long it 83.266 as for the minimal value it is 32.354. A number 48.594 is presenting the arithmetic average . The standard deviation was adjusted in the result 50.179.



Graph 2. Changeability of basic parameters of statistical women at the beginning of lasting a ski camp. Examination II - free standing closed eyes.

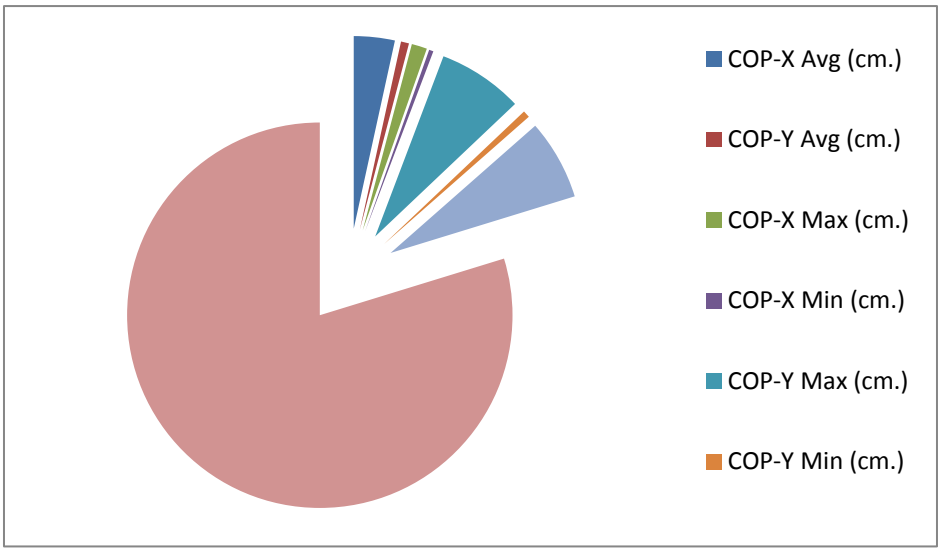
It is possible to observe that the total length of the path in the examination I with opened eyes was much lower than in the II examination where eyes were closed. In the field of the ellipse, where the 95% of data is in the range of this ellipse higher results were achieved in the examination I with eyes opened than in the II examination with eyes closed. Average positions of x coordinates and y of a lever were higher in the examination and at OO. standard deviation in the course of putting the COP point in the coronal plane and fibular was higher in the examination and at OO.

What is matching authors of works of person in charges of observation of examinations of the balance performed in conditions of the visual inspection (with opened eyes), as well as without the control of the eyesight (test with closed eyes). The visual inspection allows for getting the more stable posture. Turning the eyesight off is increasing swinging the body about 20-70 % what depends on the century of the examined person and the survey method. The control of the balance and the size of swinging the body are subject to influences of acoustic, visual and sensory stimuli, a kind of ground is also significant (hard, soft) and degree of the tiredness(Ocetkiewicz T., Skalska A., Grodzicki T., 2006).

Table 3. Changeability of basic parameters of statistical women at the end of a ski camp. The III examination - free standing opened eyes.

Parameters	Max	Min	Avg	SD
COP-X Avg (cm.)	3,337	-0,585	0,747	4,146
COP-Y Avg (cm.)	-0,656	-6,961	-3,456	7,849
COP-X Max (cm.)	1,256	0,24	0,609	1,318
COP-X Min (cm.)	-0,358	-3,337	-1,159	3,44
COP-Y Max (cm.)	6,961	0,593	2,597	7,571
COP-Y Min (cm.)	-0,574	-5,666	-2,014	6,552
95% Ellipse Area (cm..cm.)	6,544	0,709	2,661	7,047
Length	77,513	32,158	48,755	43,653

The result of COP-X Avg i.e. the average is introducing itself to the position of the x coordinate of a lever in the number 3.337 but minimal is taking out -0.585. Avg i.e. the arithmetic average is on the level 0.747. A standard deviation is a value 4.146. In the average position of the y coordinate of the centre of gravity a number-0.656 depicts the maximum result as for minimal -6.961. The arithmetic average estimated the value -3.456. The standard deviation is fluctuating on the level 7.849. Max which is running along the x pivot amounts to the maximum result COP-X 1.256 and minimal 0.24. Avg i.e. the arithmetic average is 0.609. In the standard deviation was noticed 1.318. COP-X maximal value of i.e. the minimal COP coordinate along the x pivot it -0.358 as for minimum value is -3.337. The arithmetic average is taking out -1.159 and SD 3.44. Maximum number in COP-Y Max is 6.961. The minimum value is 0.593. In the Maximum COP coordinate which is running along the x pivot an arithmetic mean is a size 2.597 however the standard deviation is being estimated on the level 7.571. The highest result in COP-Y Min. is -0.574 lowest -5.666. Avg i.e. the arithmetic average has a value -2.014 and standard deviation 6.552. A field of the ellipse of the 95% of the confidence is a place, in which 95% of data is within this ellipse. The highest result has a value 6.544 however lowest 0.709. A number 2.661 determines the arithmetic average i.e. Avg. The standard deviation is fluctuating on the level 7.047. The maximum result of the total length of the path is a value 77.513 as for minimal is taking out 32.158. A number 48.755 depicts Avg . A standard deviation is a value 43.653.

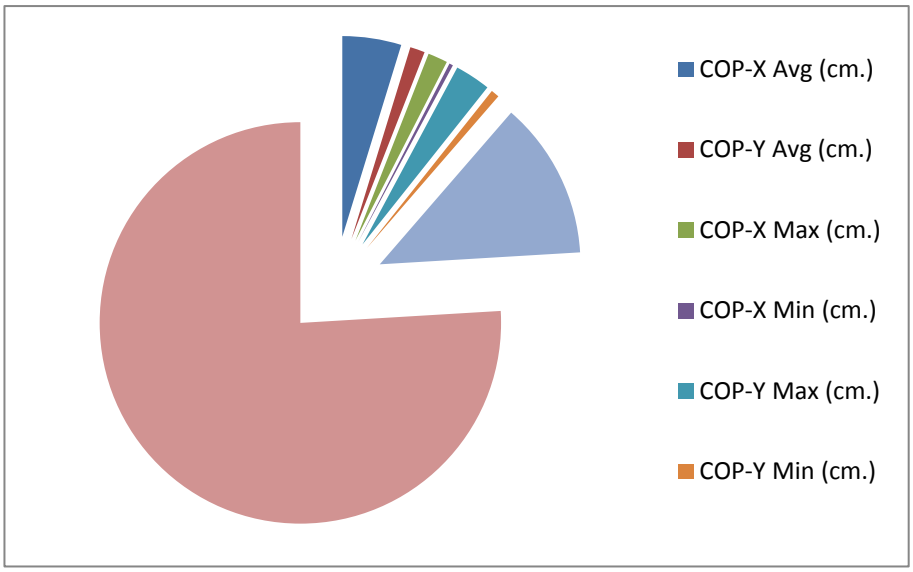


Graph 3. Changeability of basic parameters of statistical women at the end of lasting a ski camp. The III examination - free standing opened eyes.

Table 4. Changeability of basic parameters of statistical women at the end of a ski camp. The IV examination - free standing closed eyes.

Parameters	Max	Min	Avg	SD
COP-X Avg (cm.)	3,815	-0,816	0,65	4,817
COP-Y Avg (cm.)	-0,958	-7,326	-3,954	7,82
COP-X Max (cm.)	1,275	0,205	0,603	1,18
COP-X Min (cm.)	-0,247	-2,135	-0,644	1,687
COP-Y Max (cm.)	2,301	0,666	1,085	1,474
COP-Y Min (cm.)	-0,536	-2,453	-1,193	2,239
95% Ellipse Area (cm..cm.)	10,195	0,502	1,993	8,879
Length	61,038	35,349	48,115	33,909

The maximum value of COP-X Avg i.e. the average position of the x coordinate of a lever took out 3.815 however minimum number is -0.816. The arithmetic average was on a level 0.65 and as regards the standard deviation depicts 4.817. In COP-Y Avg to a maximum was written down -0.958 and at the minimum -7.326. The arithmetic average i.e. Avg estimated the number -3.954. The standard deviation is fluctuating on the level 7.82. The largest result COP-X Max which is running along the x pivot amounts to 1.275 and minimal 0.205. The arithmetic average is presenting the number 0.603. SD received the value 1.18. Maximum number in the minimal COP coordinate along the x pivot it -0.247 next minimum value -2.135. Avg i.e. the arithmetic average is taking out -0.644 and standard deviation 1.687. The maximum result got in COP-Y Max is presenting number 2.301. Minimum value 0.666. In the maximum COP coordinate which is running along the y pivot an arithmetic average is a size 1.085 however the standard deviation is being estimated on the level 1.474. The maximum result in the minimal position of COP coordinates along the y pivot is taking out -0.536 and lowest it is a number -2.453. A value -1.193 is presenting the arithmetic average and standard deviation 2.239. The highest result in ellipses fieldof the 95% of the confidence is a result, with the value 10.195 however lowest 0.502. A number 1.993 determines the arithmetic average . SD i.e. the standard deviation were registered on the level 8.879. The maximum result the path long is a value 61.038 as regards the minimum number 35.349. A result is presenting Avg i.e. the arithmetic average 48.115. The standard deviation depicts the value 33.909.



Graph 4. Changeability of basic parameters of statistical women at the end of lasting a ski camp. The IV examination - free standing closed eyes.

At the end of a ski camp 2 consecutive measurements which are depicted in table 3 as the III examination were performed - OO and in table 4 as the IV examination - OZ. the total length of the path was higher in the III examination with eyes opened except for the minimum value which was bigger in the IV examination - OZ. in the field of the ellipse the maximum value and the standard deviation were lower in the III examination with OO. Arithmetic average, minimum value in COPX Avg and COPX Max was smaller in the IV examination with closed eyes. In the course of putting the COP Avg point in the fibular plain the higher result was written down in the III examination with opened eyes, as similarly as at the beginning of the camp.

THE SUMMARY AND DISCUSSION

From conducted examinations results, that majority of parameters in the examination and at the beginning of lasting the camp at OO and III examining at the end of the camp with OO had an upturn. Comparing the II examination made at the beginning of lasting the camp with for the IV examination which was taken at the end of the camp with OZ, it is possible to notice that the majority of parameters is also growing. It is confirming that the time intended to the skills training in the downhill skiing is diversifying the level of keeping its balance at the eye check to a large extent opened as well as closed. Maximum values of parameters in the group of women, seem to be an effect specialist (directed) of sports training what can be connected with a specificity of sports disciplines taken by the students. The literature included in the article is confirming the rightness of the thesis, that the increase in parameters isn't caused by the worse stability of the control of the balance of the body but the effect of the participation in the specialist training camp. Examined students were characterized by a higher physical fitness as well as were embraced with program describing the downhill skiing. Participants in examinations conducted under direction contributed the considerable contribution to explain functioning of the arrangement of the balance of the man M. Golem and K. Kochanowicz in Poland, at K. Bretz in Hungary, W. Bołoban in the Ukraine, W. Korenberg in Russia(Sztetner-Roszkowska A., Roszkowski L., Niźnikowski T., 2007).

A fact of direct taking back their works to issues of the physical culture requires the underline. The scientific evidence gathered by these Authors found wide practical implementation of the sports training, particularly towards improving coordinating abilities in competition sports about the folded structure of the movement. Largely scientific works were substantiated legitimacy of applying indicators exercising balances of the body, as the evaluation criterion of effectivenesses of different training programs, directed at raising coordinating fitnesses (Prusik K., 2004).

Comparing the examination I which was carried out at the beginning of lasting the camp by eyes opened for the III OO examination which was taken at the end, the author of examinations notices a ski camp a total length of the COP path grew longer as well as values of the surface area of the ellipse grew. What is confirming that the sight organ influences considerably to the ability to keep its balance in the examined trial. At the beginning of lasting the camp the lack of the visual inspection affected for extending the COP path. In the process it is possible to claim that increasing these values is affecting for worsening the control of the balance of the body in comparing to eyes of opened women provided with examinations. Increasing is usually providing the length of the COP path about worsening the control of the balance. Examinations of clinicians Fedak(Fedak D., Latała B., Otfinowski J., Zajdel K.,2010), Curzynek they prove that the rehabilitation and streamlining exercises influence for shortening sick persons the COP path (Curzynek M., Mraz M., Mraz M., Gawron W., Skolimowski T., 2008).

They also noticed, that athletes of some sports disciplines are making the high rank up with growing longer COP paths. at athletes a greater blood supply and an electric activity of

muscles can be a reason for extending the path. Muscles are intended for dynamic efforts at longer isotonic effort power of the muscle tone is starting fluctuating around the certain average value(Błaszczyk J., 2004).

At the end of the skiing training, with which were embraced students of Rzeszów University of the Department of the physical education were in the coronal plane minimum values will achieve medium parameters compared with initial. Reducing the scope of deviations can attest to a positive effect of training ski to the group of examined persons.

BIBLIOGRAPHY:

1. Barankiewicz J., 1998., *The lexicon of the physical education and school sport, WSIP, Warsaw*.
2. Błaszczyk J., 2004., *Clinical biomechanics, Medical PZWL publishing company, Warsaw*.
3. Curzynek M., Mraz M., Mraz M., Gawron W., Skolimowski T., *Structural stability In patients with vertigo and disquilibrium of systemie origin*, „Acta Bio-Optic et Informatica Medica", 4/2008, vol.14, p. 290-291.
4. Fedak D., Latała B., Otfinowski J., Zajdel K., *Evaluation of the influence of physiotherapy on a standing balance In a group of patients after cerebral stroke, determined on basis of posturographic examination*, „Acta Bio-Optica et Informatica Medica", 3/2010, vol. 16,p. 208-211.
5. Grimshaw P., Lees A., Fowler N., Burden A., 2010., *Biomechanics of sport, Scientific publishing company PWN SA, Warsaw*.
6. Lesiewski J., Olszewski K., Wołk R., 2006., *Downhill skiing, in: Theoritical basis of chosen winter disciplines, under ed. Kunysz P., AWF, Wrocław*.
7. Ocetkiewicz T., Skalska A., Grodzicki T., 2006., *Examining the balance using the balance lorry — evaluation of the repetitiveness of methods, p. 47*.
8. Osiński W., 2003., *Antropomotoryka*, AWF, Poznań.
9. Parlak J., 1994., *Biomechanics of the skiing, in: downhill skiing, under the ed. Sz Krasicki., AWF, Cracow*.
10. Prusik K., 2004, *The diversified physical activity and the level of the balance in age 7-12, PhD thesis. Gdańsk, AWFiS*.
11. Raczek J., 2010., *Antropomotoryka – theory of the motorness in the outline, Medical PZWL publishing company, Warsaw*.
12. Sadowski G., Kaleta K., Januć W., 1984., *General-developmental and special exercises in the cross-country skiing and convention, AWF, Warsaw*.
13. SITN, *School curriculum of downhill skiing 2005, SITN, Cracow 2005*.
14. Sobera M., 2010, *Characteristics of the process of keeping the balance of the body at children at the age of 2-7, Studies and Monographs No. 97, AWF Wrocław, Wrocław,*
15. *p 31-33*
16. Sztetner-Roszkowska A., Roszkowski L., Niźnikowski T., 2007., *Dynamics of the development of the static balance at children aged 6-8 practising the gymnastics, AWF Warsaw*.