Coordination skills to excell ski jumping technical skills

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Abstract

Objective of the study was to offer a new coordination skills test model for the modern ski jumping sport.

Methods and structure of the study. We made a theoretical analysis for the study knowing the modern ski jumping trampoline systems and based on our practical coaching service to the national ski jumping elite. We sampled for the coordination skills tests the 10-21-year-old male ski jumpers (n=124) qualified Junior Class athletes to Masters of Sport. The sample was tested by the following tests: static equilibrium rating test on an unstable T-shape balance plate fixed parallel or perpendicular to the wall to obtain the individual Sagittal Balance and Frontal Balance test data; and the following overall coordination skills rating tests with the spatial orientation test elements: figure-of-eight shuttle sprint test; and the specific low-limb coordination skills rating 10 hurdles jump test. The resulting test data were analyzed versus the ski jumping technique scores.

Results and conclusion. The coordination skills excellence practices were found highly beneficial for progress in the modern ski jumping sport trainings and competitions at every stage of an individual sports career. Competitive accomplishments in the modern ski jumping sport heavily depend on a harmonious progress in coordination skills, with a special priority in the coordination skills trainings given to the ski jumping practices on a few trampolines with different dimensions and profiles. Such trainings are known to develop high stress tolerance and solution-finding skills in practical ski jumping competitive settings.

Keywords: *ski jumping, coordination, simulation practices, flight phase, ski jumping technique.*

Background. Presently the ski jumping sport research community has accumulated a theoretically sound research data demonstrating the movement coordination and technical performance being closely correlated, as is the case for many other sports as well [5]. The modern ski jumping is commonly ranked among the sports disciplines that require "high movement coordination and body balancing skills". The ski jumping sport techniques require perfect control in a wide range of angular accelerations in a few jumping phases [7]. Perfect movement coordination in the ski jumping sport should be associated with high decision-making, stress tolerance, solution-finding and execution control skills customizable to the ever changing weather conditions. Generally, individual coordination skills are known to heavily contribute to the competitive performance in the modern ski jumping sport. Technical excellence trainings in the sport, therefore, should make a special emphasis on the competitive environment control with spatial/ strength/ timing aspects in every trained skill, and with the coordination skills considered as a basis for competitive progress [1]. The relevant study reports give enough information on the coordination skills training service goals, methods, models and tools in different sports, albeit in the ski jumping sport these issues still need to be developed on a more extensive and detailed basis.

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elite. We sampled for the coordination skills tests the 10-21-year-old male ski jumpers (n=124) qualified Youth Class athletes to Masters of Sport. The sample was tested by the following tests: static equilibrium rating test on an unstable T-shape balance plate fixed parallel or perpendicular to the wall to obtain the individual Sagittal Balance and Frontal Balance test data; and the following overall coordination skills rating tests with the spatial orientation test elements: figure-of-eight shuttle sprint test; and the specific low-limb coordination skills rating 10 hurdles jump test [6, 8]. The resulting test data were analyzed versus the ski jumping technique scores.

Results and discussion. Given in Table 1 hereunder are the averaged coordination skills test data versus ski jumping technique scores of the sample.

The T-shape bar tests found the 10-12 and 15-18-year-olds being most sensitive to the specific coordination skills training. This reportedly holds true for many other sport disciplines, including track and field sports, swimming and martial arts [3]. The 13-15-year-old ski jumpers are normally tested with the coordination skills sags due to the fast body growth process [6], since the pubertal age with the active body growth and neuromuscular apparatus transformations complicates adaptation to the rapid changes. It is very important in this period to avoid excessive physical trainings that should rather prioritize the coordination skills training elements – with their percentages in the total workloads being kept stable. The practices should be more diverse and free of unnecessary complications – being dominated, for example, by balance on a fitball when the body is kept upright with slow flexions in the knee joints. The ski jumping trainings in this period should be kept within a supportive format and run at high speed to maintain the attained technical skills.

By 15-17 years of age, the body growth normally stabilizes, and progress in the coordination skills goes back to norm. Based on the accumulated skill set till 17 years of age, the athletes would show fast progress in the vestibular balancing skills [7]; thus the 18-19-year-olds are highly sensitive to the coordination training elements. Practices on the balance plates may be complicated at that time by hand control excellence trainings with different appliances plus the acceleration technique excellence elements.

The figure-of-eight and 10-hurdles test rates were found to fast grow till 13 years of age, as this period is known as most beneficial for the coordination skills trainings [3]; with the coordination skills progress later on stabilized in the 13-16 and 19+ year-old groups. Our test data showed a gradual progress in special dexterity, movement redirection and spatial orientation skills, with progress in the test completion times among other things [2]. We recommend in this period the trainings to be complemented with the coordination ladder practices and acrobatic elements (trampolining, somersaults, flips, etc.). The coordination ladder practices will excel the movement coordination skills on the run, with faster responses, lower limb speed, techniques and balance improvement elements.

Vertical jumps on trampolines are known to develop the vestibular apparatus and body control skills in the aerial and landing phases, with special benefits from the coups and rotations in the flight phase. These

Table 1. Age-specific averaged coordination skills test data versus ski jumping technique scores of the sample

Age	Sagittal Balance, s	Frontal Balance, s	Figure-of-eight, s	10 hurdles, s	Ski jumping technique score
10 (n=6)	2,40±1,07	2,11±1,24	21,78±1,30	7,77±1,05	39,0±4,5
11 (n=9)	2,55±1,12	2,63±1,12	20,26±3,10	6,82±2,22	41,0±3,5
12 (n=19)	2,78±0,82	3,02±1,3	19,77±2,43	6,46±1,39	44,0±6,5
13 (n=16)	2,26±1,20	2,37±0,76	19,02±2,12	6,20±0,47	43,0±5,5
14 (n=21)	2,14±0,75	2,68±1,04	19,81±1,76	6,32±0,66	45,0±3,5
15 (n=21)	2,55±1,17	2,54±0,84	19,23±1,51	6,37±0,74	44,5±2,5
16 (n=7)	2,53±0,85	3,78±1,65	18,07±1,39	6,31±1,26	47,5±2,5
17 (n=5)	2,66±1,48	3,90±1,55	18,22±0,61	5,59±0,65	48,0±2,5
18 (n=8)	3,76±1,45	4,13±1,82	18,73±1,92	5,71±0,77	48,0±3,5
19 (n=3)	3,75±0,08	3,92±0,34	17,96±0,65	5,57±0,16	48,5±2,5
20 (n=5)	3,68±0,79	4,02±1,01	18,29±1,44	5,61±0,69	50,0±1,5
21 (n=4)	3,48±0,62	3,80±0,68	17,91±0,24	5,80±0,14	49,5±2,0

skills are particularly important for the acceleration, take-off, flight and landing skills in real ski jumping competitions. The athletes should focus on horizontal rotations around the body axis, with the practices completed with the landing stance ('raznozhka') repetitions to excel the coordination and balance in the pre-landing and landing phases.

In the active body growth period, active trainings with a special focus on the dynamic coordination and speed-strength training elements for the key muscle groups responsible for the movement pacing and timing in the take-off phase, are rather beneficial as verified by the 10-hurdles jump test. These test data are indirectly indicative of the individual coordination skills in the take-off phase and best aerodynamic stance taking with no loss for the take-off and flight speeds [4].

Progress in the above coordination skills in the ski jumping trainings will be facilitated by the relevant dynamic balance excellence practices – including, e.g., one-leg "pistol" squats with gradual growth in amplitudes (squat depth) critical for both the speed-strength and dynamic balancing qualities. Such trainings may apply special equipment and simulators including a 'trolley' plate on rollers. The trolley practices may be used to excel the static/ dynamic balancing skills critical for success on the acceleration rack and in the take-off phase, when the body mass center needs to be perfectly controlled for success.

To speed up progress, the above practices will simulate as close as possible the harmonized, sequential and efficient lower-limb muscle operations in the take-off phase. Individual executions in the trainings are recommended to be captured using video cams for further tests and analyses to timely detect and correct execution errors as provided by the feedback mechanism. These practices should help improve the take-off sequence with a special emphasis on the gradual progress in the muscular coordination skills and motor memory, to secure the motor skills being excelled to perfection and automated by multiple repetitions [2].

It should also be emphasized in the context of the above study data, that the ski jumping sport specific coordination skills are indispensable for the technical and competitive progress as verified by analysis of the coordination skills test data that was found to significantly correlate with the ski jumping technique scores, with the Spearman correlation ratio varying at 0.7-0.8.

Conclusion. The coordination skills excellence practices were found highly beneficial for progress in the modern ski jumping sport trainings and competitions at every stage of an individual sports career. Competitive accomplishments in the modern ski jumping sport heavily depend on a harmonious progress in coordination skills, with a special priority in the coordination skills trainings given to the ski jumping practices on a few trampolines with different dimensions and profiles. Such trainings are known to develop high stress tolerance and solution-finding skills in practical ski jumping competitive settings.

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