

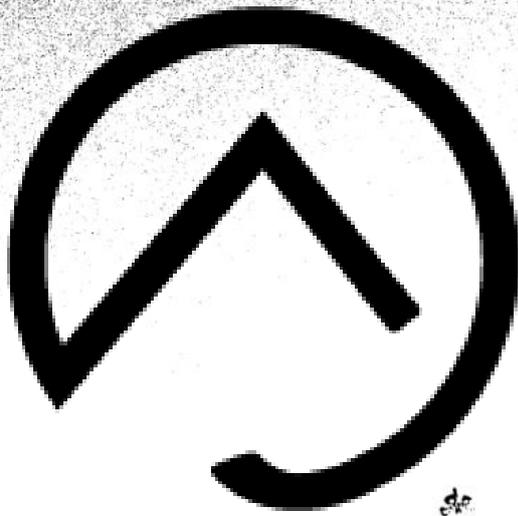


# Journal of Outdoor Activities

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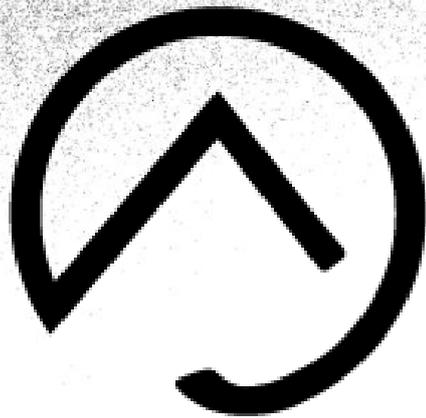
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# Journal of Outdoor Activities



**RESEARCH PAPERS**



# **Grading skiing alphabet as a criterium for selection of the right didactical method of teaching of skiing of younger school age beginners**

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## **ABSTRACT**

Different didactical methods can be chosen for teaching of skiing of beginners of younger school age (7-10 years). The choice depends mainly on children's skills but also on the snow and terrain conditions. We created grading skiing alphabet which consists of seven basic skills. According to a success rate in completing these skills children (7-10 years) were divided into groups which were taught using different methods – with parallel ski position (better skills) and with stemmed ski position (worse skills). Three-day skiing course was finished by skills slalom. This is a qualitative research descriptive case study. Participant observation was the main method and we also used scale for assessment of skills. The results showed that more children were put into a group taught by stemmed ski position method. Proportions of boys and girls in different groups were very similar. According to the age of children we found that younger age children (7 years) were able to perform the skills of grading skiing alphabet better and that is why the proportion of parallel/stemmed ski position groups was relatively equal, which was not case with the older children (9-10 years). Final skills slalom was finished by all children from parallel ski position groups. From the stemmed ski positions groups only a small percentage of children were not able to finish the skills slalom.

## *Key words*

skiing, younger school age (7-10 years), skiing grading alphabet, methods of teaching of skiing

## **SOUHRN**

Pro lyžařskou výuku začátečníků mladšího školního věku můžeme zvolit různé vyučovací postupy, záleží zejména na dovednostech dětí a také na sněhových a terénních podmínkách. Byla vytvořena lyžařská „rozřazovací abeceda“, která obsahovala sedm základních obratnostních prvků. Podle kvality provedení jednotlivých prvků byly děti z 1.– 4. tříd zařazeny do skupin vyučovaných přes paralelní nebo přivrátané postavení lyží. Třídenní lyžařský kurz byl zakončen

obratnostním slalomem. Jedná se o případovou studii deskriptivního charakteru s povahou kvalitativního výzkumu. Základní metodou je participantní pozorování a dále jsme použily dichotomní škálu pro hodnocení dovedností. Z výsledků vyplývá, že více dětí bylo zařazeno do skupiny vyučované postupem výuky přes přívrtné postavení lyží. Poměr zastoupení chlapců a dívek v jednotlivých skupinách byl velmi podobný. Z hlediska věkového složení se ukázalo, že mladší děti zvládaly lépe jednotlivé prvky rozřazovací abecedy, a tudíž byl v 1. třídě poměr zastoupení paralelní / přívrtné skupiny poměrně vyrovnaný, na rozdíl od 3. a 4. třídy. Závěrečný obratnostní slalom splnily všechny děti, které se učily přes paralelní postavení lyží, ze skupiny přívrtné jen malé procento dětí tento slalom nesplnilo.

### *Klíčová slova*

lyžování, mladší školní věk, lyžařská rozřazovací abeceda, metodika výuky lyžování

## **INTRODUCTION**

Big part of publications about skiing is mainly focused on methodology of teaching skiing skills. In practice ski teachers miss a tool which would help them to grade children before they start the teaching according to their entering skills. Most of the times in practice grading of children is based on ski instructor's or teacher's experience. At school skiing course the children are graded and put into groups before the teaching starts. It is usually done by asking them to perform turns on a moderate slope. Beginners are usually put into one group irrelevant of their skills. Our goal was to find a way how to grade beginners and divide them into groups of those with better skills and those with worse skills. Each group could be then taught by using different methods. Children with better skills can be taught by faster teaching method using parallel ski position. Children with worse skills can be taught by using slower method of stemmed ski position.

Most of the skiing methodologies are divided into general skiing training phase and following specialized skiing training phase. Goal of general skiing training is to get used to skiing equipment and to learn the basic skiing skills. Matošková et al. (2016) state it is the basis for learning how to ski downhill and turn on skis. It's aim is to learn basic skiing skills and obtain complex skiing perceptions (feel for glide, feel for snow, feel for speed, etc.). The basic exercises used in this phase are manipulation with skiing equipment, moves on skis on the spot, falling and standing up, turnarounds and climbing, skiing downhill on the fall line, traversing on both skis and on one ski, braking and stopping, step turns, skating, riding ski lifts and chair lifts, passing the terrain bumps, easy jumps on the snow hill and snow plow turns. Lukášek (2008) and Vilím (2009) focus on feel for skis, controlling the skis, walking on skis, turnarounds, squats, etc. They perform all these on the spot and then gradually start to perform them when moving on skis. Games with and without skis are also part of general skiing training phase. Specialized skiing training phase follows general skiing training. Its goal is to learn more advanced skiing skills. Vilím (2009) includes skiing down the hill on the fall line in basic skiing position, skiing down the hill in the snow plow position,

riding ski lift, traversing, sliding, skating and step turns into specialized skiing training phase. Methodical committee of Department of basic skiing of Czech ski federation (2017) includes following exercises – skiing downhill on the fall line and traversing, sliding, step turns, skating, riding ski lift, snow plow turns and wave. They divide snow plow exercises into static and dynamic. Some of these exercises are part of the general skiing training according to Matošková et al. (2016). They divide specialized skiing training into three parts – common basics, specialized training for carving turns and specialized training for skid turns. In common basics they focus on improving the basic skiing skills learned in general skiing training phase and they practice different skiing positions, basics for turns and they include basic turns which follow snow plow turns – uphill ski stem turns, open stance turns and parallel turns. They perform various training exercises for both carving and skid turns.

Snow plow turns are considered the easiest and safest way of turning for beginners by most of the methodologies. For most skiing schools this is the necessary basics. Teaching of skiing is started by them by Psotová, Příbramský et al. (2006), Reichert & Musil (2007) or Mical, Nohejl et al. (2016). Drahoňovský & Novák (2011) continue from snow plow turns to uphill ski stem turns. By learning and improving this basic skill and by using higher speed skis don't have to be put into stemmed position and skiers naturally move to parallel turns.

Advocates of „stemless technique“ follow general skiing training by teaching skiing in parallel ski position in specialized skiing training phase. Some authors (for example Lukášek, 2008) and some skiing schools or organizations (carv.cz or detibezpluhu.cz) think there is no point in learning the skills and moves that have to be unlearned later. They consider snow plow as an element needed only to solve difficult situations but in the optimal conditions they consider it useless and even counterproductive during teaching. They only teach snow plow as one of the methods of safe stopping.

Based on studying the literature about teaching skiing for children we came up with seven skills which form „skiing grading alphabet“. All its parts in different variations are part of most skiing methodologies and are considered training exercises suitable for beginners. All proposed skills test our chosen criteria: balance, skilfulness with skis, orientation in space, coordination and complex moment activity. Skiing grading alphabet is performed on the spot on flat and even surface. It consists of these skills:

- a) fixing into ski binding
- b) static skiing position
- c) alternate lifting of skis (left, right)
- d) lifting the skis with hold on one foot (left, right)
- e) turnarounds following right and then left hand on the spot
- f) movement to the cone
- e) „scooter“

## **METHODOLOGY**

The aim of our paper is to verify suggested skiing grading alphabet for beginners (aged 6-10) as a useful tool for grading children in order to use different didactical methods of teaching skiing at „Half day skiing school“ in Kubova Hut’.

### **Research question**

Can suggested „grading alphabet“ be used as a criterium for dividing the children into groups to apply different teaching methods?

### **Observed group**

Observed group consisted of children (1st – 4th grade) of TGM elementary school in Vimperk. From total of 173 children 142 took part in skiing training. Parents of 105 children agreed to take part in our experiment, i.e. 74 % of the children who took part. Children were between 6 and 10 years old and had no or very little previous experience with downhill skiing – they were beginners. The experiment was approved by Ethical committee of UK FTVS in Prag.

### **Research design**

It is a qualitative research case study based on description. Main method used was participant observing of skiing skills included in „grading alphabet“ and also observing of actual performing skiing skills and verifying of methods of teaching. Team of five qualified and experienced ski instructors (2 women and 3 men) was chosen to perform the observation. Average age of instructors was 45 years. All of them were current holders of skiing teaching licences and had many years of experience with teaching children in skiing schools. Before we started our experiment the team of instructors was trained for 2 days. They were introduced to all elements of grading alphabet and with suggested didactical methods of teaching and with final skills slalom. They learned how to record the results into prepared forms and how to use the scales to evaluate and assess all the elements.

The dichotomic scale (yes/no) for assessing the elements of the grading alphabet was created. The level of skill which had to be performed for children to be assessed positively was defined for each of the elements. Also the level of skill which is not good enough and the assessment is negative was defined. It was decided that in order to be included into a group of more skillful children who were taught by using paralell ski position children had to successfully perform 4 out of 7 elements. If they had 3 or less positive assessments of elements they were put into a group taught by using stemmed ski position. It was also defined that maximum time to perform all the elements of grading alphabet is 20 minutes.

Skills slalom was designed to test the success of teaching methods and division of children into two groups. The goal of slalom was not to evaluate correct skiing technique but to assess successful or not successful performance of basic skiing skills. Elements which were checking basic skiing skills were put into the slalom – balance, transfer of weight from one ski to the other, stability, performing of turns and safe stopping. The elements of slalom were start by skating, passing two slalom gates,

underpassing of the gate, passing of other two slalom gates and safe stopping at the end. Two levels of assessment were designed to assess the slalom – pass/fail. For successfully passed assessment children had to perform the whole slalom (7 elements) continuously without falling. For unsuccessful fail children had to fail to perform from one to seven elements or fall. If they failed with their first attempt they could try second attempt. If they successfully completed all the elements they were classified as passed. If they did not complete all the elements or fell down they were classified as failed.

## Course of experiment

At the beginning of the first day children were introduced to safety instructions. A short warm-up exercise „molecules“ was performed under a guidance of instructors who then performed a skiing grading alphabet with the children. After evaluating the results children were divided into two groups and the teaching of skiing was performed using the two set methods in the groups. Training continued for second and third day as well. At the end of the third day children performed skills slalom. The training was always done between 9:00 and 11:00 in the morning.

### Appendix: Description of chosen skills included in skiing grading alphabet:

#### 1. Fixing into ski bindings

Instructor performs slowly one by one fixing both boots into ski bindings. Children stand on the even surface and after being told „to fix into skis“ they imitate what the instructor did. They have to put the tip of the boot into the tip of the binding and then push the heel of the boot into the binding to fix it. They have to do it without using the poles to help their balance.

**Characteristics of assessment:** instructors assess the ability to fix the boots into the bindings – coordination and balance on the spot

*positive assessment:* child is able to fix both skis, child is able to fix at least one ski

*negative assessment:* child is not to fix the skis without help

#### 2. Static skiing position

All the children in the group have their skis fixed and stand on the spot. instructor demonstrates basic static skiing position, i.e. skis are in parallel position on the bases between hip and shoulder width apart, legs are bent in all joints, hands are bent in elbows in front of the body, head facing the front. After being told to children try to imitate the basic static skiing position and keep the skis so they do not spread into sides. They remain in this position until instructor assesses this skill – cca 10-15 sec.

**Characteristics of assessment:** instructors assess the ability to take up the correct skiing position and remain in this position so that the skis do not spread into sides.

*positive assessment:* child is able to keep firm position – skis parallel, bent knees, skis do not spread into sides, skis do not slide

**negative assessment:** child is not able to keep position on the skis, skis spread to sides, child is not able to keep balance, child falls

### **3. Alternate lifting of skis (left, right)**

All the children stand on the spot with skis fixed. Instructor demonstrates the exercise first – he/she alternatively lifts right and left foot with ski. Then the exercise is done by all the children together following instructor's commands of counting – one, two, three, four. On each command each child lifts his/her foot, gradually alternate left, right, left, right. Skis are lifted into the height of tongue of the boot on the other foot (approximately half the height of the calf). Movement is fluent, without stopping and holding. Body should not considerably deviate from the vertical axis. Child can not fall.

**Characteristics of assessment:** instructor assess the ability to keep the balance alternatively on right and left foot on the spot and transfer of body weight from one foot to the other

**positive assessment:** child is able to keep the balance during lifting of both right and left foot, child is able to keep the balance during lifting of either only right or only left foot

**negative assessment:** child is not able to independently lift neither right nor left foot, when trying to lift the foot child is considerably leaning to the side or falling

### **4. Lifting the skis with hold on one foot (left, right)**

All the children stand on the spot with skis fixed. instructor demonstrates the exercise with both right and left foot. Then on instructor's command all children in the group perform the stand on one foot and lift the other foot (right and left) with hold (instructor counts to three). Until the instructor counts to three children have to hold the foot lifted. Each child can have two attempts on each foot.

**Characteristics of assessment:** instructor assesses the ability to keep the balance and transfer of body weight from one ski to the other

**positive assessment:** child is able to lift both right and left foot and hold it above the ground until the instructor counts to three, child is able to lift and hold either right or left foot above the ground until the instructor counts to three

**negative assessment:** child is not able to independently lift and hold neither right nor left foot or is not able to hold it lifted until the instructor counts to three, child falls during attempt to lift one foot

### **5. Turnarounds following right and then left hand on the spot**

Children stand in one line next to each other with skis fixed and with enough space between them. Instructor demonstrates the exercise and on his/her command each child steps forward from the line and performs a 360° turnaround by putting skis into scissors position repeatedly. The turn is done first following right hand and then left hand.

**Characteristics of assessment:** instructor assesses the ability to put skis into scissors position, to keep the balance and transfer of bodyweight from one foot to the other, coordination of moves

**positive assessment:** child successfully performs turn to both right and left without falling, child successfully performs turn to either right or left without falling

**negative assessment:** child is not able to perform the turn neither to right nor left

## **6. Movement to the cone**

Children stand in one line next to each other with sufficient distance from each other with skis fixed. Each child has a cone in front of him/her 4 metres away. instructor demonstrates the exercise and on his/her command children try to move to their cones fluently on skis, move around him and come back. Each child has two attempts, first attempt is to move around the cone from right and second attempt is to move around the cone from left. All the children start to move at once without any time limit.

**Characteristics of assessment:** instructor assesses the ability to complete the movement to the cone and back with skis fixed, ability to put the skis on the edge, to keep the balance and transfer of the bodyweight from one foot to the other, coordination of moves

**positive assessment:** child successfully and fluently completes the whole distance without falling, child manages to complete the whole distance with a small hesitation

**negative assessment:** child is not able to complete the distance, falls, can not keep on the skis

## **7. „Scooter“**

Children stand in the row behind each other with only one ski fixed. Instructor demonstrates the exercise and on his command one child after the other tries to get to a cone (which is 6 metres away) and back by using pushing off of one leg (without ski) and gliding on the other one (with ski). The movement is similar to the one done on the scooter. Then children swap their skis and do it with the ski fixed to the other foot.

**Characteristics of assessment:** This is the most difficult skill from the alphabet. instructor assesses the ability to keep balance in both front/back and lateral directions, coordination of moves, push off and glide, orientation in space

**positive assessment:** child successfully manages to fluently ride on both right and left ski without falling, child successfully manages to ride on either right or left ski

**negative assessment:** child is not able to ride on neither right nor left ski

## RESULTS AND DISCUSSION

After completing all seven elements of skiing grading alphabet by all the children the results were evaluated (table 1) and based on the results the children were divided into groups (table 2). Division into the groups was made according to designed criteria. Children who successfully performed at least 4 elements were put into a „paralell“ group because they demonstrated a certain level of entry skiing skills. Children who successfully performed 3 or less elements of the grading alphabet were put into a „stemmed“ group.

Table 1 Evaluation and results of skiing grading alphabet

	1st grade	2nd grade	3rd grade	4th grade	Total number of children
7 points	4	1	0	4	9
6 points	6	5	6	3	20
5 points	3	2	3	0	8
4 points	3	1	0	0	4
3 points	12	10	5	6	33
2 points	8	3	8	6	25
1 point	0	1	0	2	3
0 points	0	0	2	1	3
Total number of children	36	23	24	22	105

Evaluation of the teaching in the groups based on qualitative initial observation of instructors is mentioned in the text.

From the total of 105 children who took part in the experiment 64 was taught using stemmed ski position and 41 was taught using paralell ski position. Although the two groups were not the same in numbers the ratios between boys and girls were almost identical in both groups. In the paralell group the ratio of boys/girls was 20:21 and in the stemmed group the ratio was 32:32. We can conclude that at this age there were no differences between boys and girls.

Table 2 Division of children into teaching groups

	1st grade		2nd grade		3rd grade		4th grade	
	paralell group	stemmed group						
1st instructor	8		5		5		4	
2nd instructor	8		4		4		3	
3rd instructor		7		5		5		5
4th instructor		7		5		5		5
5th instructor		6		4		5		5
Total number of children	36		23		24		22	

When we look at the division of children into the groups, we can see that in the older grades there are more children in the stemmed group. Expected advantage of the older age was not proved, although the older children have better power, speed and skillfulness skills, have more advanced motor skills, abstract thinking and they process the information quicker. It is shown by the ratios between number of children in paralell/stemmed groups in each of the grades. The ratio in the 1st grade is 44:56 %, in the 2nd grade 39:61 %, in the 3rd grade 38:62 % and in the 4th grade 32:68 %.

The results show that younger children performed the initial test (grading alphabet) better than the older children. Each older grade performed the test worse than the younger grade.

To certain extend this was confirmed by the results of a final skills slalom (table 3) where only 5 children were not able to perform successfully the skills slalom after completing the 3 day training in the skiing school. They were all pupils of the third or fourth grade.

Table 3 Results of the skills slalom

Grades	Paralell group		Stemmed group	
	passed (number of children)	failed (number of children)	passed (number of children)	failed (number of children)
1st grade	16	0	20	0
2st grade	9	0	14	0
3rd grade	9	0	15	2
4th grade	7	0	15	3
Total number of children	41	0	64	5

All children who were part of the group taught by using paralell ski position performed successfully the skills slalom. They were able to progress quicker during the course of the training, they learned new moves without problems and they were able to imitate the instructor well. The results show that all these children performed the skills slalom successfully and were able to learn basic skiing skills during the course of the training in half-day skiing school. Age or sex of the children played no part in these results. They were also able to perform the skills slalom on higher quality level compared to children from the group taught by using stemmed ski position. 5 children from this group (8 %) was not able to perform skills slalom succesfully and the training they did was not enough to learn the basic skiing skills. We assume these children had less developed motor and balance skills. They were lacking any considerable training in any sports activities. They struggled with all the moves. They progressed slowly, it took them longer to learn new moves, they had to train and practice the basic exercises and elements for much longer.

## **CONCLUSION**

The aim of this paper was to test skiing grading alphabet, which we believed we successfully did as well as to answer the research question whether the grading alphabet can be used as a criterium to divide children into groups with different teaching methods used in each of the groups.

Skiing grading alphabet we designed for skiing beginners of age between 6 and 10 years helped us in our teaching of skiing. Suggested skillfulness elements and assessment scale enabled us to divide children into teaching groups with application of different teaching methods. Assessment scale of grading alphabet consisting of 7 points was created. It is possible to use the alphabet as a part of warm up exercises before the start of teaching. All the pupils who reached higher points and were put into a paralell group learned the basic skiing skills and their training progressed quicker, it was more varied and children wanted to try out more difficult skills and exercises. Children who got less points in the alphabet and were put into stemmed group, progressed a bit slowly but at the end most of the children were able to succesfully finish the skills slalom. They improved a lot as they had to overcome fear and get used to skis in a short period of time. Even after a few failures at the beginning nobody gave up on skiing. Everybody was looking forward to next lessons and were very enthusiastic after every small progress. Pupils who were borderline (4 points) in the grading alphabet were put into paralell group. They all finished the whole course in this group, we did not have to move them to slower group. We believe that if we used the same teaching method for all the children we would not have achieved such a progress. More gifted children would be bored if we taught them using stemmed ski position and progress would be too slow for them. Less gifted children wouldn't be able to learn the basic skiing skills if we used paralell ski position for them. The progress would be too quick for them and their fear of speed would be likely increased.

Skiing training should definitely be included in school curriculum in both elementary and high schools and in order to be able to perform quality training there it is very

usefull when children learn the basics of skiing very early (at the age of 6-10). Considering the limited amount of time allocated for physical education in today's school curricula it is necessary to look for such a teaching methods which would be appropriate but effective in short time period – i.e. tailor-made for children.

The description of chosen skills included in skiing grading alphabet is in the the appendix.

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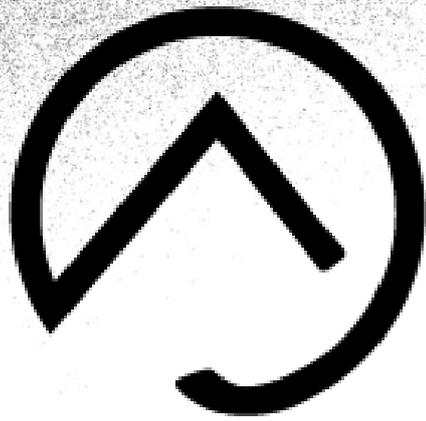
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# Journal of Outdoor Activities



**RESEARCH PAPERS**



# Adjustment of the correct sitting position on bicycle of recreational cyclists : inspiration for physical education at school

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## ABSTRACT

*Introduction:* In cycling we accept paradigm that the correct sitting position while riding a bicycle is a basic prerequisite for efficient pedaling. Many racing and recreational cyclists have sitting position set badly.

*Aim of Study:* The aim of our study is to describe the differences in adjustment of various sitting positions using the Retül technique in contrast to the original adjustment set by the rider himself.

*Material and Methods:* A research sample consisted of 42 recreational riders (18–50 years old) who were set up using the Retül technique and compared to the previous state of set-up.

*Results:* More than 80 % of riders had the sitting position set badly in main parameters (saddle height and handlebar drop, distance of the saddle and handlebar).

*Conclusion:* Conclusion: Overall, 83.4% of individuals had the sitting position set badly. After adjusting the correct sitting position on the bicycle, riders have created better conditions for the proper technique of pedaling a bicycle. We present recommendations for school physical education. The publication has been carried out within an internal grant PF UJEP 2018.

*Keywords:* cycling, Retül, sitting position

## SOUHRN

*Úvod:* V cyklistice je uznáváno paradigma, že správný posed při jízdě na jízdním kole je základním předpokladem efektivního šlapání. Mnoho závodních i rekreačních cyklistů má tento posed nastaven špatně.

*Cíl:* Cílem naší studie je popsat rozdíly v nastavení posedu za pomoci techniky Retül a samotným jezdce.

*Metody:* Výzkumný vzorek tvořilo 42 rekreačních jezdců (18-50 let), kterým byl posed nastaven pomocí pomoci techniky Retül a srovnán s předchozím stavem nastavení posedu.

*Výsledky:* Více než 80 % jezdců mělo posed nastaven špatně v hlavních parametrech (výška sedla, drop, vzdálenost sedla a řídítek).

*Závěr:* Po nastavení správného posedu na jízdním kole byly jezdcům vytvořeny vhodnější podmínky pro správnou techniku šlapání na jízdním kole. Uvádíme doporučení využití i do školní tělesné výchovy. Publikace byla podpořena interním grantem PF UJEP 2018.

*Klíčová slova:* cyklistika, posed, Retül

## INTRODUCTION

In cycling we accept paradigm that the correct sitting position while riding a bicycle is a basic prerequisite for efficient cycling (Ettema & Lora, 2009; Friel, 2009; Chavarren & Calbet, 1999; Schmidt, 1999; Wozniak, 1991). Correct sitting position on bike has a significant influence on cyclists health. It concerns especially articular mobility, correct muscle function and muscle dysbalance (Bertucci, Grappe, Girard, Betik, & Rouillon, 2005; Ettema & Lora, 2009; Wozniak, 1991). Many racing and recreational cyclists have this sitting position set badly, although there exists number of methods of its proper adjustment such as e.g. Body geometry fit, Guru fit bike, Retül (Vojtěchovský & Sekera, 2008).

Taking into consideration, that cycling belongs to popular physical activities even in physical education, it is possible to use the acquired knowledge in physical education (Lirgg, Gorman, Merrie, & Hadadi, 2018). Students can be ranked predominantly among recreational cyclists.

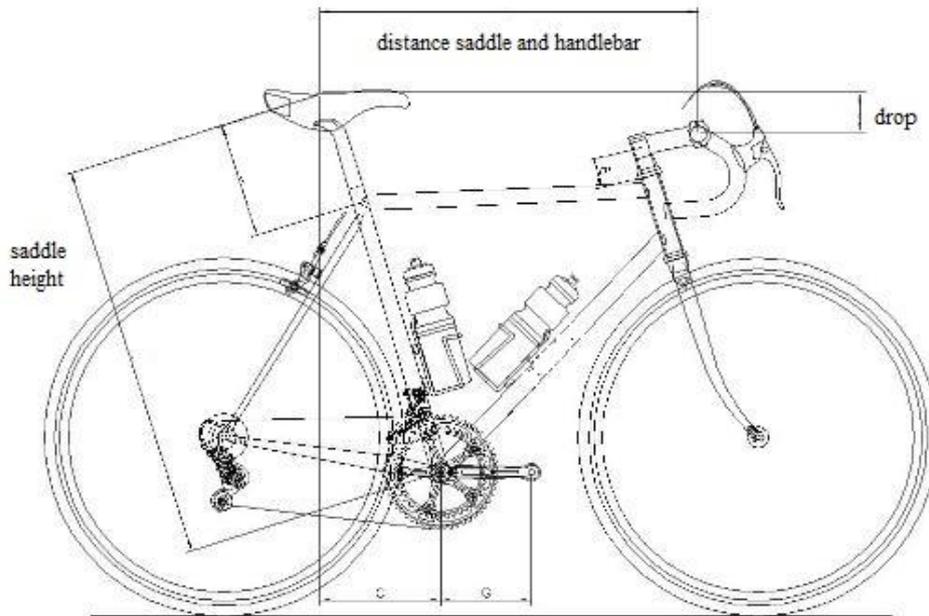
In our study, we focused on recreational cyclists, who decided to optimise their sitting position. The most frequent reasons of dissatisfaction with current sitting position were: health issues, purchase of new bicycle, improvement of performance at amateur races. The aim of our study is to describe the differences in adjustment of various sitting positions using the Retül technique in contrast to the original adjustment set by the rider himself and the main parameters will be: saddle height, drop, distance of saddle and handlebars.

## METHODOLOGY

The research sample consisted of 42 individuals (18-50 years old male recreational cyclists, 166-194 cm body height, 3-25 years cyclically active, 2200-20 000 km kilometers per year) who were examined during the period of 2011 – 2013. We measured their main parameters of sitting position on their bicycle, that is; saddle height, drop, distance of saddle and handlebar (see Fig. 1). Therefore, their current state of sitting position was measured.

Afterwards the set-up of the new sitting position on bicycle was adjusted using the Retül technique. The basic biometric data is used to adjust the sitting position: knee extension, plantar ankle flexion, anteroposterior knee position, torso slope. In addition to these five core values, it is also important for individual settings: athlete's flexibility test, strength a leg and torso stability, possible body disbalance, etc. Followed by a final evaluation specialist in cooperation with the cyclist (Retül, 2018).

After this process the parameters were measured again according to Fig. 1., i.e. new sitting position. Current and new sitting position were compared using descriptive characteristics, Wilcoxon pair test and effect size.



**Fig. 1** Measured parameters of the sitting position on bike (Bikemine, 2018)

## RESULTS

Based on descriptive statistical characteristics and pairwise comparison it can be stated that individuals had the biggest error of sitting position in saddle height. Here can be seen a high effect in terms of effect size. The average difference between the current and the new saddle height was  $1,3 \pm 1,5$ cm. Maximum difference was found 4,4cm (n = 2).

Furthermore, it is also possible to statistically detect substantive significant difference of the drop parameter. Average difference between the current and the new drop was  $0,6 \pm 1,9$  cm. The absolute difference was a maximum of 4,1 cm – detected only at one individual.

Overall, 83.4% of individuals had the sitting position set badly.

Table 1 Descriptive Statistics of the measured parameters

	Valid n	Mean	Median	Minimum	Maximum	Lower Quartile	Upper Quartile	Std.Dev.
<b>Saddle height [cm]</b>	42,0	75,9	75,0	66,0	90,0	73,0	78,5	5,0
<b>Saddle height new [cm]</b>	42,0	77,2	77,3	67,5	90,0	73,0	80,5	5,1
<b>Distance saddle and handlebar [cm]</b>	42,0	66,4	67,7	54,2	76,7	60,7	72,0	6,7
<b>Distance saddle and handlebar new [cm]</b>	42,0	66,7	68,5	53,7	78,0	62,5	71,2	6,5
<b>Drop [cm]</b>	42,0	7,3	7,3	2,5	12,0	6,0	8,5	2,3
<b>Drop new [cm]</b>	42,0	7,9	8,4	1,0	12,4	7,2	9,0	2,4

Caption: Std. Dev. = Standard deviation

Table 2 Wilcoxon pair test & effect size

	N	T	Z	p-level	effect size
<b>Saddle height &amp; Saddle height new*</b>	42	57,000	4,443	0,000009	0,687 (high effect)
<b>Distance saddle and handlebar &amp; Distance saddle and handlebar new</b>	42	293,500	0,352	0,724727	0,054 (no effect)
<b>Drop &amp; Drop new*</b>	42	228,500	2,059	0,039471	0,316 (medium effect)

Caption: \* statistically significant difference

## DISCUSSION

We are aware that the parameters we examined can not be viewed only by itself but it must be taken in context with other (not examined) parameters that are taken into consideration while adjusting sitting position by the Retül technique we have chosen (Retül 2018). Certain role can be played by the workers experiences, who measures and finds data of individual and his sitting position or riding preference and health aspects (Vojtěchovský & Sekera, 2008).

We are not surprised that the minimum difference was found in the parameter of saddle and handlebars distance. From our own experience we know that the poor setting of this parameter is reflected by the pain of overloaded muscles around the neck or back area even during a short ride. Our experience is in line with professional literature (Ettema & Lora, 2009; Schmidt, 1999; Vojtěchovský & Sekera, 2008; Wozniak, 1991). Very surprising was the maximum difference at 1 of the individual which was 17,4 cm and was explained by the effort of „more racing“ sitting position. At the same time, this individual complained about back pain. However, this was an exception.

The difference in the saddle height parameter is found to be severe, although in absolute values it is in order of millimetre units. Wrong saddle height is difficult to subjectively detect for recreational riders and it will show up only after longer or repeated ride, eventually „ex post“ as presented by Ettema and Lora (2009) or Vojtechovsky and Sekera (2008). We can confirm this from our own experience.

Simultaneously with the previous paragraph (saddle height parameter), it is possible to consider the difference found in the drop parameter, which is related to the saddle height (Ettema & Lora, 2009; Vojtěchovský & Sekera, 2008). Most individuals did not pay attention to this parameter and kept the same original saddle adjustment after purchase of a bicycle.

We assume that parameters of saddle adjustment we examined (saddle height, drop, distance of handlebars and saddle) are relevant to the adjustment of student sitting position in physical education. In physical education it seems rather problematic (especially from economic and organisational aspects) to use „sophisticated systems“ such as Retül, alternatively Guru fit system or BG Fit. For this reason we are inclined to the opinions of experts (such as Cihlář, 1976; Král & Makeš 2002), that „classical methods“ of seating adjustment will be sufficient such as: saddle height determined by the slightly bent leg on the pedal at the bottom dead-point or calculated (if inside length of the leg that is from the crotch to the ground multiplied by 0,853); sagittal saddle position determined by starting the perpendicular from the front of the knee through the pedal axis in push-up position in the horizontal plane; visually judged by the height of the handlebar and their distance from saddle – taking into account the individual feelings of the rider. However, the teacher has to be properly educated in this area.

## CONCLUSION

We state that 83.4% of the individuals had the current sitting position set badly; the biggest mistake in adjusting the sitting position was the height of the saddle (the average difference between the current and new saddle height was  $1,3 \pm 1,5$  cm; a minor error was found in the drop parameter (the average difference between the current and the new drop was 0,3 cm); on the other hand, the parameter for saddle and handlebar distance was set correctly.

We recommend using the „classical methods“ of seating adjustment in physical education at school and in the case of student's interest in the racing form of cycling, refer them to „sophisticated systems“ such as Retül, Guru Fit System or BG Fit.

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