# CONTRIBUTION OF INLINE SKATING TO LEARNING BASICS OF ALPINE SKIING

# DOPRINOS ROLANJA U UČENJU OSNOVA ALPSKOG SKIJANJA

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## SUMMARY

Aim of this research was to determine contribution of inline skating to learning basics of alpine skiing. We included 139 participants, who were attributed to two groups - control and experimental. Participants of the experimental group (n=72) were included in 10-days program of learning inline skating while participants pertaining to control group (n=67) did not participate in any kind of sport or recreational program. Before and after inline skating, all participants were tested on six elements of alpine ski technique. Participants of the experimental group had better results on elements of alpine ski technique (4.09 vs. 3.29; p=0.00). Our results suggest inline skating aids better learning of alpine skiing.

*Key words*: inline skating, alternative sport, alpine ski knowledge

## INTRODUCTION

In order to be as efficient as possible in learning alpine ski basics, recreational skiers need to have adequate equipment, appropriate ski terrains, and most of all good ski instructors who will teach alpine skiing according to verified/tested program of alpine ski school. Programs of alpine ski schools should be tailored to the participants needs as well as to conditions in which ski school takes place. Although different countries world-wide use different programs for learning alpine ski basics, all are logically and sequentially structured, meaning that each element of the alpine ski school which is learned represents the basis for the next one (Cigrovski & Matković, 2015). Regardless of the program used, all participants need to adopt specific motions, necessary for controlling movements while on skies which are important during alpine ski turns (Tate, 2007). Recreational level alpine skiing is a seasonal

sport during winter months in alpine ski centres. Mentioned centres usually offer structured programs of alpine ski learning, but in order for the participant to be as efficient as possible it is important to be adequately prepared for skiing (Wojtyczek, Pasławska & Raschner, 2014). Besides conditional trainings, people are encouraged to participate in sports with similar movements as alpine skiing few months prior to going skiing (Roman, Miranda, Martinez & Jesus, 2009). Trainings for competitors in alpine skiing regularly include alternative sports, which burden athletes similarly as skiing trainings. Inline skating is one of the possible ways to train offseason (Kroll, Schiefermuller, Birklbauer & Muller, 2005). It is expected that movements during inline skating improve alpine ski technique (Ropret, 2010). All of the mentioned suggests how knowledge of inline skating could improve learning of alpine skiing. If mentioned correlation would be proven than inline skating could be included in preparation period as a conditioning training for participation in alpine skiing. The aim of our research was to determine the contribution of inline skating on learning basics of alpine skiing in recreational alpine skiers.

## METHODS

139 volunteers participated in the investigation after being thoroughly informed about the study procedures and giving informed consents. Their average age was 22.18±1.34 years. All were motorically capable, healthy people, with basic knowledge of alpine skiing. By the method of random choice they were assigned to either experimental (n=72) or control group (n=67). Experimental group of participants were included in inline skating lessons in SkiBoo Sport academy, while control group did not participate in any kind of sport program. At the beginning and after study end (after 10 days of inline skating school) they were tested on six (traversing, uphill turn, basic turn, snowplough, parallel turn and short turn) previously chosen elements of alpine ski technique. Each participant demonstrated all six elements of ski technique, and traversing and uphill turn were performed in left and right side. Participants were graded on a scale one to five by the independent judges. Standardized judging procedure was used (Cigrovski, Matković, B., & Matković, R.B., 2008). Inline skating program lasted 10 days and included two levels. Level one included basic elements of inline skating-basic skating, braking, basic sliding step, pushing with both feet, basic A turn, breaking with basic A turn and level two included transition elements, trainings for self-skating (skating across the street and sidewalks, turning while pushing off by the outer leg, parallel turn, braking in T position, and braking during parallel turn. Both levels were completed during 5 day cycles, and similar conditions were insured for all participants (same number of participants pro group (10), daily hours of learning inline skating (1 hour), hours of practice per day (1 hour), quality of skating equipment, experienced inline skating instructors and appropriate terrain for skating). Obtained results were analysed by statistical package "SPSS for Windows 14.0". Obtained distributions were tested by Kolmogorov-Smirnov test (K-S). Calculated were basic descriptive parameters for six elements used to test alpine ski technique. Significance of difference for the grades obtained on elements of ski technique between the control and experimental groups was determined by Mann-Witney U test. Results were significant with $p<0.05$. Significance of difference between ski knowledge of participants of the two groups was determined by T-test on level of significance $p<0.05$.

**RESULTS**

In Table 1 are presented results of descriptive statistics during initial evaluation of experimental and control groups

Table 1 Descriptive statistics of initial evaluation of ski knowledge

| Groups | | N | M | Std. Error M | SD | KS test |
|---|---|---|---|---|---|---|
| experimental | traversing left | 72 | 3.90 | 0.07 | 0.60 | 0.00 |
| | traversing right | 72 | 3.90 | 0.06 | 0.57 | 0.00 |
| | left uphill turn | 72 | 3.45 | 0.10 | 0.85 | 0.00 |
| | right uphill turn | 72 | 3.25 | 0.09 | 0.83 | 0.04 |
| | snowplough | 72 | 3.52 | 0.09 | 0.81 | 0.04 |
| | basic turn | 72 | 3.20 | 0.10 | 0.89 | 0.02 |
| | parallel turn | 72 | 3.20 | 0.10 | 0.89 | 0.01 |
| | short turn | 72 | 2.82 | 0.11 | 0.98 | 0.00 |
| control | traversing left | 67 | 3.86 | 0.07 | 0.59 | 0.00 |
| | traversing right | 67 | 3.85 | 0.06 | 0.56 | 0.00 |
| | left uphill turn | 67 | 3.39 | 0.10 | 0.85 | 0.02 |
| | right uphill turn | 67 | 3.18 | 0.09 | 0.81 | 0.02 |
| | snowplough | 67 | 3.45 | 0.09 | 0.80 | 0.04 |
| | basic turn | 67 | 3.17 | 0.11 | 0.90 | 0.01 |
| | parallel turn | 67 | 3.14 | 0.10 | 0.88 | 0.04 |
| | short turn | 67 | 2.76 | 0.11 | 0.94 | 0.00 |

Results show slightly better average grades for all analysed elements of alpine ski technique for the participants of experimental group (Table 1).

Table 2 Difference between experimental and control group in skiing knowledge during initial testing

| Elements of ski technique | Mann-Witney U test | Sig. |
|---|---|---|
| traversing left | 2306.00 | 0.64 |
| traversing right | 2300.00 | 0.62 |
| left uphill turn | 2324.00 | 0.70 |
| right uphill turn | 2297.00 | 0.62 |
| snowplough | 2301.00 | 0.63 |
| basic turn | 2349.50 | 0.78 |
| parallel turn | 2331.00 | 0.73 |
| short turn | 2334.00 | 0.74 |

Results show that there were no differences between the average grades given to participants of the two groups; so at the beginning of this investigation there were no differences in the knowledge of alpine skiing between the groups (Table 2).

Table 3 Descriptive statistics of final evaluation of ski knowledge

| Groups | | N | M | Std. Error M | SD | KS test |
|---|---|---|---|---|---|---|
| experimental | traversing left | 72 | 4.47 | 0.06 | 0.52 | 0.00 |
| | traversing right | 72 | 4.41 | 0.06 | 0.56 | 0.00 |
| | left uphill turn | 72 | 4.05 | 0.07 | 0.64 | 0.00 |
| | right uphill turn | 72 | 3.99 | 0.08 | 0.69 | 0.01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | snowplough | 72 | 4.21 | 0.08 | 0.68 | 0.02 |
| | basic turn | 72 | 3.96 | 0.08 | 0.75 | 0.00 |
| | parallel turn | 72 | 3.95 | 0.08 | 0.72 | 0.00 |
| | short turn | 72 | 3.66 | 0.11 | 0.94 | 0.02 |
| control | traversing left | 67 | 3.86 | 0.07 | 0.59 | 0.00 |
| | traversing right | 67 | 3.85 | 0.06 | 0.56 | 0.00 |
| | left uphill turn | 67 | 3.39 | 0.10 | 0.85 | 0.02 |
| | right uphill turn | 67 | 3.18 | 0.09 | 0.81 | 0.03 |
| | snowplough | 67 | 3.45 | 0.09 | 0.80 | 0.04 |
| | basic turn | 67 | 3.17 | 0.11 | 0.90 | 0.02 |
| | parallel turn | 67 | 3.14 | 0.10 | 0.88 | 0.01 |
| | short turn | 67 | 2.76 | 0.11 | 0.94 | 0.00 |

After 10 days of inline skating school we once again evaluated performance of six elements of alpine ski technique, results are presented in Table 3. Participants of the experimental group achieved better results in all elements of ski technique. K-S test showed that results distributions during final testing do not meet the specified criteria.

Table 4 Differences between experimental and control groups during final testing

| Graded elements | Mann-Witney U test | Sig. |
|---|---|---|
| traversing left | 1086.50 | 0.00 |
| traversing right | 1166.00 | 0.00 |
| left uphill turn | 1382.00 | 0.00 |
| right uphill turn | 1147.00 | 0.00 |
| snowplough | 1151.00 | 0.00 |
| basic turn | 1242.50 | 0.00 |
| parallel turn | 1184.50 | 0.00 |
| short turn | 1222.00 | 0.00 |

Results presented in Table 4 suggest significant difference between participants of experimental and control group. Participants of experimental group achieved higher average grades on all tested elements of ski technique (Table 3), suggesting that inline skating school exerted positive effects on learning alpine skiing.

Table 5 Descriptive statistical parameters for final evaluation of alpine ski knowledge for participants of experimental and control groups

| Groups | N | M | Std. Error M | SD | KS test |
|---|---|---|---|---|---|
| experimental | 72 | 4.09 | 0.06 | 0.54 | 0.41 |
| control | 67 | 3.29 | 0.09 | 0.80 | 0.53 |

Overall 72 participants participated in inline skating school and achieved better average final marks for ski knowledge (Table 5).

Significance of between the groups difference (4.09 *vs.* 3.29) was tested by independent T-test.

Table 6 Between groups difference in alpine ski knowledge

| | t | df | Sig. |
|---|---|---|---|
| Final grade for skiing | 6.96 | 137 | 0.00 |
| | 6.86 | 113.90 | 0.00 |

There were statistically significant between the groups differences in achieved ski knowledge (p=0.00, Table 6).

**DISCUSSION**

Alpine skiing is a specific motor activity (Hoppeler & Vogt, 2009). Unlike alpine ski competitors who need specific conditioning prior to alpine ski season, recreational skiers are usually not well prepared for the specific requirements during skiing (Stöggl, T., Schwarzl, Müller, Nagasaki, Stöggl, J., Scheiber, Schönfelder & Niebauer, 2016). Conditioning training incorporate exercises of muscles and joints that will be active during skiing. Besides, conditioning trainings are directed to safe and faster acquisition of skiing knowledge as well as prevention of potential injuries during falls or clashes (Ekeland & Rødven, 2009; Hébert-Losier & Holmberg, 2013). For the alpine ski program to be efficient few criteria need to be fulfilled, primarily conditions in which program takes place, quality of ski instructors, quality of program, motivation of both ski instructors and alpine ski school participants and participants' abilities to acquire knew activity (Barth & Bruhl, 2006; Lešnik & Žvan, 2010; Rausavljević, Vidamšek & Pišot, 2012; Cigrovski & Matković, 2015). Last mentioned correlates with participants' motor abilities, which can be influenced by proper/adequate conditioning trainings. Rienhoff, Hopwood, Fischer, Strauss, Baker i Schorer, (2013) showed that knowledge of one sport can aid learning of other similar one. Alpine ski programs for beginners are usually thoroughly and meticulously planned (Lešnik, & Žvan, 2010; Žvan, Lešnik & Supej, 2015). They are based on six or seven days stay in winter ski resorts, with predefined hours during which participants are learning new motor activity. Much of the attention is paid to creating the ideal program of alpine ski schools but a lot less is known about the ways recreational skiers are preparing for skiing season. Results of our study suggest inline skating contributes learning of alpine skiing. Namely, at the beginning of our research participants did not differ in the knowledge of alpine skiing, but after completing 10 days of inline skating school, once again graded performance of elements of alpine ski school revealed significant differences between participants of experimental and control group. Results show better average grades for all analysed elements of alpine ski technique for the experimental group, participating in inline skating school. Kroll, Schiefermuller, Birklbauer & Muller, (2005) suggested that inline skating turns look a lot like ski turns during competitive alpine skiing. It can be expected that adjustment to skies and ski turns will be much faster and easier if recreational skiers have a knowledge in inline skating. We have shown that recreational level inline skating contributes to learning alpine skiing in younger motorically capable people. Similar results were obtained by Roman, Miranda, Martinez & Jesus, (2009) in a group of children age 7 to 13. Participants of the mentioned research were involved in inline skating school prior to learning basics of alpine skiing and this improved acquisition of alpine skiing knowledge, probably due to similar movements used during inline skating and skiing. Participants of our investigation were young adults, previously active in sports, so it would be interesting to test the results on other populations of young people. If the results

would be comparable among different populations, inline skating could be more broadly used in a preparation period for alpine skiing. According to Muehlbauer, Kuehnen & Granacher, (2013), involvement in inline skating two to three times weekly for 90 minutes contributes significantly to balance and strength, which are also important during initial phases of inline skating as well as mastering skiing knowledge. Moreover, inline skating contributes development of cardiovascular capacities, which are important in injury prevention during falls and clashes (Hébert-Losier & Holmberg, 2013; Philippe, Ruedl, Feltus, Woldrich & Burtscher, 2014).

## CONCLUSION

Inline skating is a practical activity which can easily be incorporated in every day timetable. If beginners in alpine skiing would use inline skating in the preparation period for alpine ski school it might help them to be more efficient in learning basics of skiing but also advance faster in elements of alpine ski technique. This is also the most practical application of our study results intended for recreational alpine skiers to use inline skating as a conditioning training for alpine skiing.

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**SAŽETAK**

*Cilj ovog istraživanja bio je da se utvrdi doprinos rolanja usvajanju osnova alpskog skijanja. Istraživanjem je obuhvaćeno 139 ispitanika, koji su bili podijeljeni u dvije grupe - kontrolnu i eksperimentalnu. Ispitanici eksperimentalne grupe (n=72) učestvovali su u školi vožnje rolera u trajanju od 10 dana, a ispitanici kontrolne grupe (n=67) za to vrijeme nisu bili uključeni u sportske ili rekreativne programe. Prije i nakon provođenja škole vožnje rolera, svi ispitanici su podvrgnuti testiranju pomoću šest elemenata tehnike alpskog skijanja. Eksperimentalna grupa ispitanika imala je značajno bolje rezultate u elementima tehnike alpskog skijanja (4,09 vs. 3,29; p=0.00). Rezultati ovog istraživanja ukazuju da vožnja rolera može pomoći boljem usvajanju znanja iz alpskog skijanja.*

**Ključne riječi:** vožnja rolera, alternativni sport, znanje alpskog skijanja