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**COORDINATION MOTOR ABILITIES OF SPORT  
MANAGEMENT STUDENTS**

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***Abstract***

Coordination abilities can be seen as a prerequisite for individual performance. Sport management studies demand particular performance limits in sport practice and the students should be able to fulfil them. The research study concerns about the level of coordination abilities of sport management students. The question is if the level of coordination abilities of the sample differs from population performance. The purpose of the study is to describe coordination abilities in the given period of 5 years (2010 – 2014). The research study analysed data of 154 SM students. The evaluated indicators were: 1-leg standing stork test, balancing with a plate, Iowa-Brace, and 10 flexibility exercises. An absolute frequency of occurrence of individual scores was evaluated and compared to population performance. Significance of difference ( $p < 0,05$ ) was tested by one-sample Wilcoxon signed rank test (two-sided). Results suggest that the level of balance abilities was better in the participating SM students, compared to population performance. Concerning flexibility and general coordination, the men performance was better, compared to population, but there was not a significant difference in women. Therefore the findings cannot be generalized. The study is considered to be pilot for further analysis of motor abilities in SM students, enlarged in number of indicators and time span.

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## **1. Introduction**

Optimal motor preparedness is together with optimal function of musculoskeletal system an essential precondition for effective involvement of the deep stabilization system and effective movement. A predictive value of balance, coordination and precision is important in acquisition of a specialized sport skill. This is in agreement with the findings of several recent researches focused on performance precondition as one of key factors related to motor learning. Cagno et al. (2014) investigated coordination and motor learning in gymnasts. Orth, Davids and Seifert (2016) aimed at climbing and Zago et al. (2015) displayed better balance control of high-level karatekas through an increase base of support. All the mentioned disciplines are demanding in postural stability and all implies specific sport skills acquisition. Each specific skill is pre-determined by several motor abilities. And each motor ability can be applied in various skills (sport disciplines).

## **2. Problem Statement**

### **2.1. Demands of Sport Management studies**

Sport Management profile characterizes graduated as specialists in the field of management and marketing of sports, leisure and recreation. Their future employment concerns the fields of:

- management and marketing (sports clubs, unions and organizations),
- sports leisure centres,
- travel and tourism (experience-based) - travel agencies (outdoor programmes, fitness-wellness programmes),
- institutions and facilities offering recreation and sports products,
- wellness consulting, and health resort.

The curriculum lays emphasis on both theory and practice. Theory includes bio-medical, sport science and economic-managerial disciplines. Concerning practice, sports are divided into 3 modules of fitness-wellness, outdoor sports and sport games. In the field of practice Půža & Komeščík (2012) emphasize, in accord with the current trend in leisure, recreation and tourism, focus on sport activities, which are based on positive and meaningful experiences, proving one's own physical and mental strength, taking load, and resulting in satisfactory performance.

Sport subjects place great demands on SM students in limits of assignments they have to pass. Optimal functional preparedness of the musculoskeletal system of SM students was investigated by Hrusa & Hrusova (2014) as an essential precondition for an effective involvement of the deep stabilization system (stabilization of spine and major joints), and effective movement (locomotive function). Together with muscle function, an optimal motor preparedness is necessary for SM students to cope with their sport study load.

### **2.2. Coordination as a performance precondition**

Optimal balance ability can be considered a basis both for daily life (fall prevention – Grenacher, 2012), and for athletic life (acquiring and developing specific motor skills, injury prevention, and sport performance – Lesinski, Hortobaghyi & Muehlbauer et al., 2015; Altavilla, Tafuri & Raiola, 2014)

In this research the focus is on an importance of balance, flexibility and coordination as complex performance preconditions. Měkota & Novosad (2007) defined the importance of coordination abilities in the following aspects: accelerating and higher efficiency of the process of new motor skills acquisition, stabilization and fining the acquired skills, level of utilizing condition abilities, and influence on aesthetic feelings, enjoyment and satisfaction. The feelings result from dynamic, rhythmic, harmonious, and full-amplitude motion of fine coordination.

A predictive value of coordination or balance in skill acquisition in motor learning was verified for example in gymnasts (Cagno et al., 2014), climbers (Orth, Davids & Seifert, 2016), in soccer players (Trecroci et al., 2015), karatekas (Zago et al., 2015) and skiers (Mladenovic et al., 2015). The influence was in precision in skill acquisition and thus achieving better performance results.

### **3. Research Questions**

The research study concerns about the performance precondition of sport management university students. The research question asks if the level of coordination abilities of the sample differs significantly from population performance.

### **4. Purpose of the Study**

The purpose of the study is to describe coordination abilities of Sport Management university students in the given period of 5 years (2010 – 2014) and to compare the results to population performance as to general coordination, flexibility, and balance. The comparison was done for men and women group separately. A partial purpose of the study is to verify the selected measures and procedures for further project of enlarging the descriptive research in university students both in terms of number of indicators and time span.

### **5. Research Methods**

The problem is framed in an empirical, descriptive research design with quantitative and qualitative analysis.

#### **5.1. Participants**

The research sample comprised 154 university students of Sport Management (105 men/49 women, age 20 – 27). The students of 2<sup>st</sup> years were tested in 2010 – 2014 as a part of an anthropomotoric seminar during their studies. Sport Management (SM) is a 3-year accredited bachelor study in the field of leisure and physical activities. The graduates are supposed to be specialized in providing professional services, offering specific sport products, management in PE schools and sport institutions, and organizing leisure, sport and tourist events for clients in travel and tourism. Concerning sport practice, the subjects of SM studies are distributed in three modules: fitness-wellness, outdoor sports and sport games.

## 5.2. Measures

Motor abilities were evaluated with focus on coordination as a complex performance precondition. The abilities themselves were evaluated through associative measures of their manifestations in the selected indicators. 4 indicators concerning general coordination (Iowa-Brace test battery), flexibility (10 flexibility exercises test battery), and balance (1-leg standing stork test – static balance, balancing with a plate – dynamic balance) were used. Motor test procedures were standardized, norm-referenced, and provided valid data for quantification and statistical analysis (Měkota & Blahuš, 1983).

The level of general coordination abilities was diagnosed by Iowa-Brace test battery (modified and standardized by Štěpnička, 1976). The modified test battery includes 10 items of coordination-demanding tasks and the result was a cumulative score (2 points per an item). The level of flexibility abilities was diagnosed by a battery of 10 flexibility exercise focused on major joints and common muscle imbalances (a cumulative score of 2 points per an item). Concerning static balance the 1-leg (dominant) standing stork was tested on 2 cm wide balance beam. Dynamic balance was indicated by a balance test with a plate placed on the participant's head, changing positions of standing-kneeling-sitting. All the indicators have standardized procedures (Měkota & Blahuš, 1983; Komeščík, 2006).

## 5.1. Analysis

The level of coordination abilities of SM students was described based on an analysis of results in the selected 5 indicators in the 5 years motor testing (2010 – 2014). The level of coordination abilities of the sample was compared to population performance. The statistical significance of difference ( $p < 0,05$ ) was tested by one-sample Wilcoxon signed rank test. Data were analysed by IBM SPSS Statistics 24. As the test of statistical significance of difference was two-sided, a qualitative criterion was needed to refer to decide concerning increased or decreased performance of the sample compared to population. An absolute frequency of occurrence of individual scores was used to describe the participants' performance in detailed qualitative analysis. The description focused on 4 selected indicators (1-leg standing stork test, balancing with a plate, Iowa-Brace test battery, and 10 flexibility exercises battery) and on group of men ( $n = 105$ ) and women ( $n = 49$ ) in comparison to population performance.

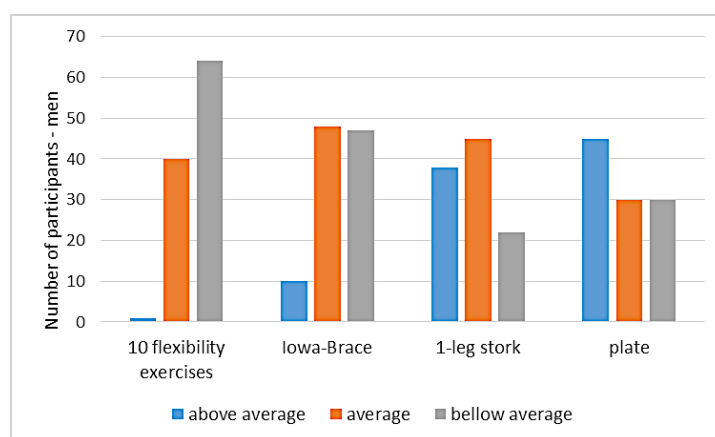
## 6. Findings

Normality was disproved (K-S,  $p < 0,05$ ) and the scores were analysed by non-parametric test of statistical significance of difference (Wilcoxon signed rank test,  $p < 0,05$ ). The level of coordination abilities of Sport Management students differ significantly ( $p < 0,05$ ) from population performance in majority of indicators. The significance of difference was tested by a two-sided test. A further evaluation was done based on a qualitative analysis, based on the central tendency (median) with regard to increased or decreased performance of the sample (also with respect to men/women) compared to a population performance.

There was a significant difference between performance of the participants (SM students) and the population in the indicators of balance, both static and dynamic. Static balance was indicated by 1-leg standing stork test and dynamic balance was indicated by balancing with a plate. In both mentioned

indicators of balance abilities, the difference was significant both in men and in women and it was positive, so the participating SM students had higher performance compared to population. Flexibility was indicated by a battery of 10 flexibility exercise. The participants differed significantly only in men group (not women). Compared to population performance, men scored higher. A general coordination was indicated by Iowa-Brace battery and the difference was similar as in flexibility. The performance of the sample differed significantly only in men group, whom scored higher.

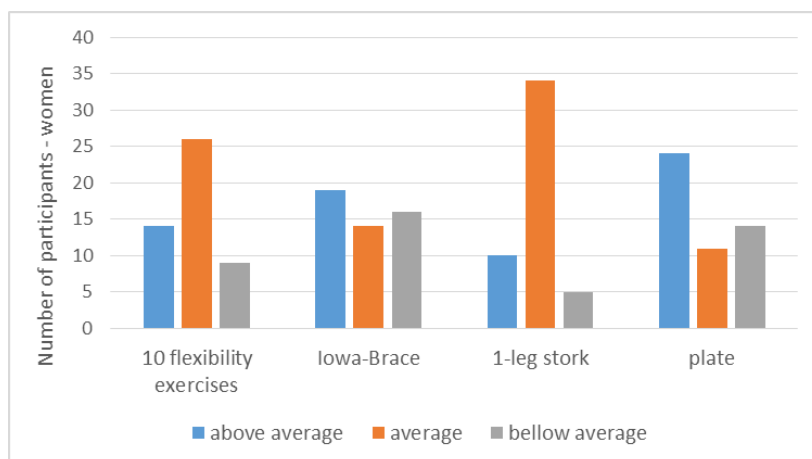
Overall results suggest that the level of balance abilities was better in the participating SM students, compared to population performance. Concerning flexibility and general coordination, the men performance was better, compared to population. However, there was no significant difference in women. Therefore the findings regarding general coordination and flexibility cannot be generalized to SM students. An absolute frequency of occurrence of individual scores ( $n = 154$ ,  $n \text{ men} = 105$ ,  $n \text{ women} = 49$ ) is presented in picture 01 for men and in picture 02 for women. The performance is scaled and depicted in picture 01 and picture 02 with regard to achieving a score not different from population performance (“average”), better (“above average”) or worse “below average” than the population performance.



**Figure 01.** Comparison of SM students to population performance - men

Best results within the sample were found generally in the balance with a plate test (both men and women slightly above-average), then in the 1-leg standing stork test (both men and women average), and Iowa-Brace test (men slightly above-average, women average). Poorest results were in forward bend, the performance was below-average compared to population, in both men and women.

Inter-gender intra-sample comparison suggests better results of men in the battery of Iowa-Brace and the battery of 10 flexibility exercises, both of them being evaluated by a cumulative score of 10 items.



**Figure 02.** Comparison of SM students to population performance - women

## 6.1. Discussion

Inter-gender intra-sample comparison suggests better results in men compared to women, which corresponds to findings of Horvat, Babic and Miholic (2013) about significant gender differences in motor abilities (coordination, strength, agility, accuracy, balance) of boys and girls (6 – 7 years). However, the only variable the girls showed better results in, was flexibility. This was not verified in the sample of SM students in the battery of 10 flexibility exercises.

Performance in sport is related to inter-individual variability. Its existence implies that there is not any optimal movement pattern. Buton et al. (2013) also explains intra-individual variability, which shows that an individual must link their actions with relevant environmental information to achieve consistent performance. This is particularly important in sports with high level of anticipation and variability of external factors, such as in outdoor sports that are included in the curriculum of sport management studies.

Optimal motor preparedness is together with optimal function of musculoskeletal system an essential precondition for effective involvement of the deep stabilization system and effective movement. Hrusa and Hrusova (2014) evaluated function of musculoskeletal system of SM students concerning local stabilizers, global stabilizers, flexibility and posture. The findings suggested that the SM students have optimal function of musculoskeletal system. The findings of this study enlarge the evaluation as to balance abilities, which were even of higher level, compared to population. However, concerning general coordination and flexibility the findings of this research cannot be generalized in terms of optimal performance.

## 7. Conclusion

The level of coordination abilities of Sport Management students differ significantly ( $p < 0,05$ ) from population performance in majority of indicators. Overall results suggest that the level of balance abilities was better in the participating SM students, compared to population performance. Concerning flexibility and general coordination, the men performance was better, compared to population, but there was not a significant difference in women. Therefore the findings regarding general coordination and

flexibility cannot be generalized to SM students. The study is considered to be a pilot for further analysis of motor abilities in Sport Management students. The project is recommended to be enlarged both in the number of indicators and the time span.

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