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# JUMPING REACTION TIME AND POWER OUTPUT OF YOUNG FEMALE BASKETBALL PLAYERS

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**ABSTRACT.** ***Introduction.*** Human muscle power is important regardless of what one is or does. The link between muscle power and reaction time may have its roots in agility. Understanding the links between these may help the overall improvement of the power output in different actions either in day to day activities or in sport competitions. ***Objectives.*** The aim of this paper was to determine if the jumping reaction time correlates with the power output for young female basketball players. ***Materials and Methods.*** The participants in this study were young female basketball players (N = 8), aged from 13 to 14 years that underwent two tests: the jumping reaction time test and the power output test using the MGM-15 carpet. ***Results.*** There was a negative correlation between the reaction time of jumping and the power output. ***Conclusion.*** There is a correlation between the jumping reaction with a visual sign and the jumping power output of the subject.

**Keywords:** *basketball, reaction time, muscle power, jumping*

**REZUMAT. Timpul de reacţie pentru săritură şi puterea la baschetbalistele junioare. Introducere**. Puterea musculară este importantă indiferent de domeniul de activitate. Legătura dintre puterea musculară şi timpul de reacţie îşi are originea în agilitate. Înţelegerea legăturii dintre acestea poate ajuta la îmbunătăţirea globală a puterii în diferite activităţi, fie în viaţa de zi cu zi, fie în competiţii sportive. **Obiective**. Scopul lucrării de faţă este de a determina dacă timpul de reacţie pentru săritură se corelează cu puterea în cazul jucătoarelor de baschet. **Materiale şi metode**. Participantele în acest studiu au fost jucătoare de baschet (N=8) cu vârsta de 13 şi 14 ani care au fost supuse la două teste: timpul de reacţie pentru săritură şi evaluarea puterii folosind covorul MGM-15. **Rezultate.** A fost o corelaţie negativă între timpul de reacţie şi putere.

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**Concluzie**. Există o corelaţie între timpul de reacţie la un stimul vizual şi puterea produsă a subiecţilor.

**Cuvinte cheie**: *baschet, timp de reacţie, putere musculară, săritură.*

## Introduction

Human muscle power is important whether one is an elderly person or a cyclist, a dancer, or a child with cerebral illnesses. The speed of movement determines the ability to generate muscle power. This will decide the velocity of contraction of the active muscles, and in turn generate the power through the power–velocity relationship of skeletal muscle (Sargeant, 2007).

If an individual has adequate muscle mass, if the speed of movement is limited, for example, by osteo-arthritis then, the power generated in dynamic tasks may be limited. This may lead to instability of body posture and gait. The ability to resist fatigue, in other words the reserve of power-generating capability, will be low at slow movement speed. The nature of the task itself, including the external forces that need to be overcome and the equipment being used, may constrain the speed of movement (Zoladz et. al. 1999).

Understanding the capability for generating and sustaining muscle power in the performance of 'whole-body' tasks, including human locomotion, crucially requires information on the speed of movement interpreted in relation to the optimum speed for maximum power for that movement.

The power developed by the muscles is different from the traction force of the muscle contraction. Power measures the muscle labor in a given period of time. The power is dependent not only to the force of contraction of the muscle, but also to the length and the number of contractions in a minute (Johnson & Bahamonde, 1996).

Agility may be characterized by measuring the time from an external stimulus given to a subject, such as light or sound, to the response of his/her body. Whole body reaction time in jump is generally used as an index of agility in sports science (Kai et. al., 2012).

The activity of the primary motor cortex consists of two components, one responsible for the preparation of movement and one for the execution of it. In the movement execution period, transmission of both muscle contraction and the resultant physical energy is required.

Kai et. al. (2012) revealed a high correlation between jumping reaction time and the light stimulus to movement initiation. They also found that the processing velocity was shown to reflect the whole body reaction time in jumping. The outcome suggests that improvement of body performance can be achieved not only by muscle stretch and elastic energy recruitment training but also by faster neural processing.

## Objectives

The aim of this paper was to determine if the jumping reaction time correlates with the power output for young female basketball players.

A secondary objective of this paper was to identify whether or not the results of two testing equipments, the MGM-15 Jumping Carpet and AMTI Netforce, can be correlated regarding the jumping action of a subject.

## Methods

*Subjects*

The participants in this study were young female basketball players (N = 8), aged from 13 to 14 years that underwent two tests: the jumping reaction time test and the power output test using the MGM-15 carpet.

*Methods and the Steps of the Research*

We used the MGM-15 Jumping Carpet for test. The test consists of 15 jumps on both legs that must not be bent during the execution. The software from the MGM-15 Jumping Carpet laid out, among others, one measurement for each subject named Average Unit of Power.

P.U. (Average Unit of Power) – it is measured during the jumps on both legs and offers data regarding: (a) the level of conditional training in sport performance; (b) information regarding the relation between force and speed.

The second test used was a simple visual reaction for jumping using the AMTI Netforce platform. The subject was supposed to perform a vertical two-legged jump when a visual signal was given. The platform recorded the time, in milliseconds, from the presence of the visual signal to the actual jump. The subjects had to repeat this test 3 times and the average times for each of them was recorded.

## Results

**Tabel 1**. Average values of reaction and power for each of the subjects

| Subject | Average Jump_Reaction | Average Power_Output |
|---|---|---|
| 1 | 0.467 | 3.2 |
| 2 | 0.552 | 2.85 |
| 3 | 0.491 | 4.18 |
| 4 | 0.698 | 1.77 |
| 5 | 0.423 | 4.69 |
| 6 | 0.364 | 3.79 |
| 7 | 0.542 | 4.32 |
| 8 | 0.381 | 5.34 |

A Pearson product-moment correlation coefficient was computed to assess the relationship between the jumping reaction time and power output of young female basketball players. There was a negative correlation between the two variables, r = -0.775, n = 8, p = 0.024. Overall, there was a strong, negative correlation between jumping reaction time and power output. Increases in jumping reaction were correlated with decreases in power output.

**Table 2.** Correlation test between the jumping reaction test and the power output test

Correlations

| | | Jump_Reaction | Power_Output |
|---|---|---|---|
| Jump_Reaction | Pearson Correlation | 1 | -.775* |
| | Sig. (2-tailed) | | .024 |
| | N | 8 | 8 |
| Power_Output | Pearson Correlation | -.775* | 1 |
| | Sig. (2-tailed) | .024 | |
| | N | 8 | 8 |

*. Correlation is significant at the 0.05 level (2-tailed).

## Conclusion

Considering the results of our statistical analysis we can state that there is a correlation between the jumping reaction with a visual sign and the jumping power output of the subject. The fact that the correlation is negative suggest that the faster the jump is performing, with regards to the appearance of the visual sign, the higher the power output is.

The existence of the correlation between the two variables also confirms, to some degree, the possibility of using the two equipment's incorporated in our study, the MGM-15 Jumping Carpet and the AMTI Netforce, to evaluate the jumping in sports.

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