

SPECIFIC AND NON-SPECIFIC TIMING ABILITIES OF ELITE POLISH HURDLERS

by

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The sense of rhythm of lower limbs of elite Polish hurdlers was diagnosed with the use of the Vienna Test System. The research project was conducted on 13 male and 10 female elite athletes with the control group consisting from 17 female and 21 male students of Academy of Physical Education aged 20-23 years who never practiced any sport discipline professionally. The experimental subjects were elite Polish hurdlers with European Championships medallists, Olympic Games and World Championships participants. Authors determined that there is no sexual dimorphism between hurdlers in timing performance evaluated with the use of specific and non-specific rhythms. There are also no statistically significant differences in timing abilities between elite Polish hurdlers and students of physical education. The acquired results suggest great attention and caution during evaluation of professional elite athletes co-ordination.

Key words: rhythm, hurdlers, dimorphism

Introduction

Bauman and Reim (1994) define rhythm as the ability to perceive and sense imposed pattern and the adjustment of own activities to a given external pattern. Others, like Raczek (1991) define rhythm as the ability to capture, reproduce and perform dynamic movement changes in a sequential cycle. This phenomenon is expressed in the adjustment of movements to a set rhythm (external pattern) or perception of intentional inner rhythm (internal pattern). Rhythm is expressed in time (acceleration or deceleration), force (contraction or relaxation), space (range and direction) and form (the time-force-space complex). Raczek and Mynarski (1998) indicate that

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the dominant role in case of rhythm is directed towards processing of auditory, kinesthetic and visual information what determines motor effectiveness in many sport disciplines. The above-mentioned definitions directly suggest that rhythm is an indispensable ability in many sport disciplines, especially in hurdles. Hurdles are one of the most difficult track and field events, requiring not only a high level of general motor preparation but a whole complex of co-ordination aspects, including the sense of rhythm. Many coaches confirm that rhythm is very important in hurdles (especially in the 110 m hurdles), however until now there is very little research confirming this statement. There are many questions regarding the ability to maintain stride length and frequency, as well as the ability to adjust these measures. Is it possible to select subjects for hurdle training on the basis of co-ordination and its measurable components? Can evaluation of some co-ordination aspects help in planning and designing the training programs?

On the basis of above mentioned considerations and extensive literature review, the authors formulated the following research hypothesis:

1. Sexual dimorphism exists in area of sense of rhythm in students and hurdlers.
2. Sport experience and level of performance influences the level of ability to adjust rhythm sequences.
3. It is possibility to examine the specific and non-specific rhythm sequences with the use of laboratory methods supported with computer technology.

Material and methods

The research project was conducted on 13 male and 10 female elite Polish hurdlers in the Laboratory of Motor Control Department at the Academy of Physical Education (APE) in Katowice and in Spała (May-June 2001) during preparation camps of Polish national teams. The control group consisted from 17 female and 21 male students of APE aged 20-23 years who never practiced in any sport discipline professionally. The experimental subjects were elite Polish hurdlers with European Championships medalists and Olympic Games participants. The main diagnostic tool consisted of a computer rhythm test ("TAPPING") which is a part of the Vienna Test System (VST) which is acknowledged in Europe as one of the best computer tests used in the process of diagnosing psychomotor, neuropsychological and physiological functions determining physical fitness.

Structure of the test

The task the subject has to accomplish is to adapt his tap-rhythm to a given rhythm of sounds. This acquired tap-rhythm should then also be kept during the whole “guided” phase (with sounds). The sounds are produced with sound generator and their frequency was set at 833 and 417 ms, which corresponds to 72 or 144 beats/min. For the input of the tap-rhythm special pedals are used. In the practice phase, each subject has to adapt his tap-rhythm, which is input with the buttons of the subject panel and/or a pedal, to a given rhythm of sounds. If a subject manages to perform three proper taps (i.e. within accepted range of error) he is allowed to follow the subsequent, main test phase. The precise description of this test was published earlier (Waśkiewicz et al. 1999). The structure of the rhythms were specific for high hurdling and followed: 3 times left – 1 time right and 3 times right – 1 time left and lasted approx. 1 s what is similar to the velocity of one stride sequence between the hurdles. In non-specific conditions the sequence was performed twice slower. The combinations were randomized and mixed with 6 other tapping exercises. Each subject performed 24 registered tests (each test consisted from 10 practice taps then 40 evaluated).

Table 1. Explanation of abbreviations used in text

3 times left – 1 time right				3 times right – 1 time left			
Fast		Slow		Fast		Slow	
Left	Right	Left	Right	Left	Right	Left	Right
3L1RFL	3L1RFR	3L1RSL	3L1RSR	3R1LFL	3R1LFR	3R1LSL	3R1LSR

Results

The analysis of acquired results was initiated with testing procedures determining basic descriptive statistics, normality of dispersion and homogeneity of variance of calculated variables. Mean values and standard deviation are presented on figure 1. All data fulfilled statistical demands and was accepted as sufficient for further procedures. The authors also attempted to test the main experimental hypothesis, if gender and training status influences the level of timing abilities.

Table 2. Significant differences between particular variables describing timing abilities in sub-groups

Group	Variables	\bar{x}	SD	\bar{x}	SD	Difference	F	p
F_H	3R1LSR - 3L1RSR	284.300	187.367	435.400	243.379	151.10	5.615	0.042
M_ST	3R1LSL - 3R1LSR	393.786	221.321	277.857	178.321	115.93	12.762	0.003
M_ST	3L1RFL - 3L1RSL	443.405	215.426	315.190	188.814	128.21	5.120	0.035
M_ST	3L1RFR - 3L1RSR	456.310	225.227	347.381	198.565	108.93	6.176	0.022
M_ST	3R1LFR - 3R1LSR	428.786	182.831	277.857	178.321	150.93	7.370	0.013

As two-way ANOVA results show, there are no statistically significant differences between any of the tested sub-groups. All performed tests were below level of significance so the hypothesis about existence of sexual dimorphism in analyzed ability should be rejected. Also comparisons of students and elite Polish hurdlers appeared to be insignificant so the opinion about the predominance of experienced athletes in performed evaluation procedure should be also treated as unproved. During the next stage of analysis, the authors analyzed the subjects performance in their sub-groups, trying to find differences in specific combinations of calculated variables. These activities were rather unsuccessful because performed comparisons brought only 5 statistically significant differences (only 4,64% of all comparisons). They also seem to be rather accidental and have no logical explanation. Presented in table 2 differences were statistically significant, generally in the case of male students. Only one characteristic occurrence was that differences were significant three times between the limbs (right vs. left) and the differentiating factor was time (slow or fast). In one case the difference occurred in opposite manner because the significant difference was observed in slow mode between left and right limb. Only one difference was significant in female hurdlers comparing “slow right” limb in performed specific and non-specific tasks (table 2).

Discussion

The discussion of acquired results is rather difficult because of lack of at least similar data and experimental designs. The specificity of tested population decreases the probability of proper comparisons and efficient conclusions. The research was conducted on elite Polish hurdlers what even stronger underlines the surprising lack of significant differences between tested subjects. Some of the tested athletes had almost 10 years of sport experience but it was not enough to dominate over students of physical education. The design of the test suggested that the similarity of performed rhythm tasks should express the predominance of professional hurdlers. In

both cases, specific and non-specific, male and female athletes were at similar level as students. Less surprising is the lack of sexual dimorphism in timing performances. Differences observed in particular comparisons are therefore so unclear and illogical that the authors did not attempt to explain them nor formulate any conclusions.

The only reasonable explanation of the lack of significant differences may be the size of experimental groups, but on the other hand there is a limited amount of elite athletes in this particular sport event. If the authors tested a greater number of professional athletes, both male and female, the increasing number of subjects would be related with a decrease of their performance level.

Resuming, the results of the experiment are rather surprising, but they may be very important from methodological aspects. Probably the evaluation of co-ordination of elite athletes is impossible with existing, even precise and based on computer technology, testing procedures. The essence of hurdling and many other sport disciplines lays in more specific and sometimes unpredictable elements or its coherent complexes. The results of this experiment raise serious doubts about testing co-ordination in elite sportsmen in general with the use of laboratory methods. The measures tested in such conditions may be only the small predispositions of whole activity, which may be evaluated, only in environmental conditions (specific for each discipline).

Conclusions

On the basis of acquired results, the authors attempted to formulate following conclusions:

1. There is no sexual dimorphism between hurdlers in timing performance evaluated with the use of specific and non-specific rhythms.
2. There are no statistically significant differences in timing abilities between elite Polish hurdlers and students of physical education.
3. The results suggest great attention and caution during the evaluation of elite athletes co-ordination.

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