ANALYSIS OF EFFICIENCY OF DIFFERENT TYPES OF SPRINT START IN YOUNGER GIRLS

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Viktor Šnajder, Dragan Milanović, Emil Hofman

Faculty of Physical Education, University of Zagreb, Zagreb, Croatia

Abstract

The objective of the research was to test the efficiency of standing, loye and crouch start for 15m sprints in the fifth grade female pupils. Although crouch start is the part of the curriculum of physical education for that age, there is a strong belief that girls at that age from the motor and technical point are not prepared for its performance.

The results of the research show that the high setting gave the fastest start for the 15m sprint, followed the results from the loye start and the poorest results were achieved from the crouch start. However, since on the command 'get set' keeping balance is difficult to maintain during the standing start, for mass practice at school for this age group the loye start is more appropriate although the results might be poorer.

Keywords: *standing start, loye start, crouch start, younger children, efficiency analysis*

Zusammenfassung:

ANALYSE DER EFFEKTIVITÄT VON VERSCHIEDENEN ARTEN DES STARTS BEI JÜNGEREN KINDERN

Das Ziel dieser Forschung war die Kontrolle der Effektivität vom Hoch und Tiefstart im 15mLauf bei den Schülerinnen aus der fünften Klasse der Grundschule. Obwohl der Tiefstart ein Teil des Sportunterrichtcurriculums für diese Altersgruppe ist, es überwiegt die Meinung, daß die Schülerinnen in diesem Alter noch nicht motorisch und technisch bereit sind, diesen Start richtig auszuführen.

Die Ergebnisse dieser Forschung zeigen, daß die Schülerinnen die besten Resultate beim 15m-Lauf aus dem Hochstart erreicht haben, danach aus dem Loyestart, und die schlechtesten Resultate ergaben sich beim 15m-Lauf aus dem Tiefstart. Bei einem Hochstart ist es aber schwierig, die Gleichgewichtshaltung nach dem Befehl 'Fertig' zu behalten. Deswegen wird für diese Altersgruppe der Loyestart empfohlen, mit dem zwar etwa schlechtere Resultate erreicht werden. Dieser Start ist aber für den Unterricht geeignet.

Schlüsselwörter: *Hochstart, Loyestart, Tiefstart, jüngere Kinder, Analyse der Effektivität*

Introduction

The physical education curriculum for the fifth grade pupils within track and field events includes sprint from the crouch start. However, many physical education teachers and coaches argue that pupils are not capable of that start at that age. They claim that pupils react slowly to the start command, the speed at the start is low since in order not to stumble they try to attain the upright position. Consequently, they are not able to achieve higher velocity during the first strides of starting acceleration. This is the evidence of their underdeveloped motor ability necessary for the adequate execution of a crouch start. Incorrect execution of movements leads to an incorrect technique which is later difficult to correct. Due to that fact, the children of this age should use simpler or better to say easier start types, in other words, loye and standing start.

The Problem

The crouch start was first practiced at the Olympic Games in Athens in 1896. Up to then the postures exercised in sprinting events were more like the standing and crouch starts employed today.

The basic reason for utilizing the crouch start is to achieve maximum speed as soon as possible. However, the execution depends to a large extent on motor abilities and the technique of starting off from blocks, i. e. the posture of a sprinter during the first strides of acceleration.

A well performed low start in elite sprinters is manifested in firm pressure on the starting blocks, short starting reaction and quickly leaving the starting blocks. This is the way to efficiently overcome inertia by leaning forward, by proper coordination of arms and legs, and the achievement of maximum velocity as soon as possible.

The first strides of the starting acceleration bring about the pronounced movement dynamics as a consequence of the changed stride length and stride rate. These two parameters change the kinematic stride structure (Tidow & Wieman, 1995). The supporting phase is decreased, and the flight phase, that is stride length is prolonged.

The standing and loye starts do not require highly developed motor and technical abilities, and are consequently easier to perform. However, even elite sprinters achieve poorer results when using these starts to start the race.

Most of the authors (Cappenolle, 1987; Čoh, 1987; Fe-

senko, 1966; and Ozolin, 1986) discused in their studies the techniques of elite sprinters; however, they hardly touched upon the problem of sprint characteristics in children and beginners. The research in that area would be of enormous importance for physical education teachers working with children, beginners in sports schools.

Šnajder (1991, 1993) studied exactly these problems. He has investigated sprinter characteristics in persons who are not specifically engaged in sprint or who have only started with track and field, such as students of physical education or pupils in elementary schools who have just started training in sports schools.

Ionov (1972) studied the efficiency of the three forms of start (crouch, loye and standing start) in two groups of sprinters who were different as regards their achievement. The running time for 10, 20 and 40m sprints was measured and the author found that the crouch start gave the fastest results for all the three races in the better group, the loye start gave poorer results and the poorest results were achieved from the standing start. However, in average sprinters the advantage of the crouch start over the other two was negligible. The author assumed that the lower the performance quality of a sprinter, the less important the advantage of the crouch start over the other two.

The Objectives of the Research

The objective of the research was to establish the efficiency of the three basic starts (crouch, loye and standing start) in fifth grade girls in order to either accept or reject the objection of physical education teachers about the inappropriateness of the crouch start in girls of that age. If the results of the research justified the belief voiced by many teachers that the crouch start is inappropriate for that age group other easier forms of start might be suggested for the physical education curricula for this age group. The aim of the research will be obtained:

- by establishing result differences and the significance of these differences for 15m sprint from three different starts;
- by establishing the differences and the significance of the difference of stride length of each start;
- by establishing the differences and the significance of the difference of number of strides for 15m run following each start.

Methods

The sample of subjects

The investigation of the appropriateness of the three different starts and the related start accelerations in younger age groups was carried out on a sample of 30 fifth grade girls who regularly attended the physical education classes. The girls were prepared for the test by a five-hour training procedure for learning the techniques of different starts.

The Sample Variables

In order to establish the efficiency of the three different starts and the related start accelerations, the girls ran the 15m long track in such a way that each girl executed three starts from each of the stated positions, following the field competition rules. The measured aspects of the race were as follows:

- running time in a 15m race from each of the stated starts;
- the stride length following each start;
- number of strides taken in 15m race following each of the start positions.

The running time was measured by three electronic stop watches. The length of the stride was measured by a centimeter band from the contact surface of the forward foot (take-off foot) to the footprint of the other foot on the ground. The number of strides was established from the video tape taken during running of the girls from the whole group. The girls taking the standing and loye start had their take-off foot at the same place as in the starting block when performing the crouch start. In this way the length of the track was the same for all the three starting positions.

Methods of Data Processing

The analysis of the collected data was performed by the analytical procedures implemented in the statistical package SPSS, IBM-PC version. The programmes used were DESCRIPTIVES (for testing and describing the data) and ONEWAY (for the univariate variance analysis) and T-test (for the univariate t-tests for the dependent and independent variables.)

First, a series of univariate analyses was performed (ONEWAY) to test the hypothesis on the quantitative differences of the dependent variables (running speed from the crouch, loye and standing start; the first stride length in all the three starts; and the number of strides for 15 m race from all the three starting positions).

Second, a series of univariate t-tests for the dependent variables was carried out in order to analyze the quantitative differences among sub-group variables.

The significance of the results was tested at the 0.5 level.

Results

Minimum and maximum results, arithmetic means and standard deviations of the running results for the 15m sprint from the three different starting positions have been presented in Table 1. On the basis of the analysis of the results obtained and the differences of arithmetic means of the measured variables distinct differences have been noticed. In the case of the 15m sprinting track seemingly slight differences might be significant. It is obvious that the girls achieved the poorest result from the crouch start position (3.68secs.), and the best results from the standing start position (3.48secs.). The results from the loye start position were between the other two (3.60secs.).

Table 2 presents the data regarding the first stride length

from the three start positions in the same group of pupils. Immediately the differences among the arithmetic means of the results achieved are noticeable. The first stride lengths achieved from the standing and loye start are very similar (67.66 and 65.27 cm), that is the difference is small while the first stride length from the crouch start is evidently shorter. The longer first stride length from the standing and loye start positions is the evidence of faster acceleration and consequently supports the idea of their higher efficiency in relation to the crouch start position in this group of girls.

Table 3 presenting the number of strides the girls sprinted over the track from three different start positions shows the relations to be almost the same. The smallest number of strides on the average was necessary when the girls started from the standing position (12.60) and the largest number of strides when they started from the crouch position (13.02). From the loye start position the girls achieved the medium number of strides (12.92). A smaller number of strides from the standing start is the result of the higher speed, since the flight stage is longer, but also of the economical running and the low energy consumption.

The shorter length of the first stride from the crouch start caused the larger number of strides on the rest of the track. The consequence is the poorest result from this specific start position.

All the decisive indicators - the longest first stride, the smallest number of strides, and finally the best result, favour the standing start over the crouch start in this group of pupils.

Because of the analysis of quantitative differences among specific sub-groups of variables (running speed for 15 m, the length of the first stride and the number of strides over the 15 m track from the three start positions) a series of multivariate t-tests has been carried out for dependent variables. The achieved results imply the statistical significance of the results at the level of significance of 0.05 according to the Student 6-distribution, with the significance criterion of 1.70.

In Table 4 the data regarding the significance of differences of the results achieved for 15 meter sprint from all the three positions can be found. The results imply that all the differences are statistically significant which is the definite confirmation of the advantage of the standing start over the other two in the group of girls of that age.

Table 1 The results of running the 15 meter track (sec).

	N	MIN	MAX	A.S.	S.D.
CROUCH START	30	2.9200	4.4500	3.6850	.3736
LOYE START	30	2.8700	4.2800	3.6072	.3715
STANDING START	30	2.7553	4.1467	3.4850	.3406

Table 2 The first stride length (cm)

	N	MIN	MAX	A.S.	S.D.
CROUCH START	30	31.6667	75.0000	50.6111	11.3671
LOYE START	30	46.6667	90.0000	65.2778	12.1223
STANDING START	30	38.3333	88.3333	67.6667	11.7493

Table 3 The number of strides in 15 meter sprint

	N	MIN	MAX	A.S.	S.D.
CROUCH START	30	11.6667	15.0000	13.0222	.7875
LOYE START	30	11.6667	15.0000	12.9222	.8563
STANDING START	30	11.0000	14.3333	12.6000	.9485

Table 4 The significance of the differences between the results of 15 meter sprint from three different start positions

	N	A.S.	S.D.	t	2 - Tail
STANDING START	30	3.4850	.341	-6.96	.000
CROUCH START	30	3.6850	.374		
STANDING START	30	3.4850	.341	-3.62	.001
CROUCH START	30	3.6072	372		
STANDING START	30	3.6850	.374	2.89	.007
CROUCH START	30	3.6072	.372		

Table 5 The significance of differences of the first stride lengths from different start positions

	N	A.S.	S.D.	t	2 - Tail
S.S. LENFS	30	67.6667	11.749	9.97	.000
C.S. LENFS	30	50.6111	11.367		
S.S. LENFS	30	67.6667	11.749	1.66	.107
C.S. LENFS	30	65.2778	12.122		
S.S. LENFS	30	50.6111	11.367	-8.28	.000
C.S. LENFS	30	65.2778	12.122		

Table 6 The significance of differences of the number of strides from different start positions

	N	A.S.	S.D.	t	2 - Tail
S.S. NUMSTR	30	12.6000	.948	-3.86	.000
C.S. NUMSTR	30	13.0222	.788		
S.S. NUMSTR	30	12.6000	.948	1.47	.107
C.S. NUMSTR	30	12.9222	.856		
S.S. NUMSTR	30	13.0222	.788	-3.13	.000
C.S. NUMSTR	30	12.9222	.856		

In Table 5 the results of testing the significance of differences of the first stride length following the three start positions have been displayed. The results imply that while the difference between the standing and the crouch start and the crouch and loye start is statistically significant, the difference between the standing and the loye start is below the level of significance.

The similar results have been displayed in Table 6 suggesting the significant difference in the number of strides in running over the 15 meter track from the three start positions. The difference between the number of strides after the standing and crouch start is statistically significant, as it is after the loye and crouch start. The difference is not statistically significant when the girls started off from the loye start.

The results show that although the crouch start is the most efficient for achieving the best results in running over the short tracks in elite sprinters, the same is not true in girls in the fifth grade of the elementary school. Correct performance of the crouch start is for them much too difficult, since it demands great energy from the very start signal. Owing to the weak musculature and low starting speed, the girls cannot run with adequate forward lean, and soon after the start signal they assume the upright position and start sprinting at rather a slow speed. This hypothesis has also been confirmed by the results of this research. Hence, standing start is the most appropriate for their age since they achieve best results on short tracks exactly from that starting position.

However, is the standing start the most appropriate position for running short tracks? The problem arises when the runner on the signal 'get set' must assume an absolutely motionless starting position, which is difficult to maintain in the standing start position because of the imbalance. However, having in mind relatively small quantitative differences between the results of the standing and loye start in this particular population, we believe that the loye start would be more adequate to practice in the school environment. There are some other reasons to support this suggestion. First, this starting position meets the criteria of the track and field rules, second no starting blocks are necessary, and consequently more pupils can start running together, which is an advantage in the school environment. Finally, this position is very similar to the crouch start position and the pupils can easily adopt it when they are ready.

Although the girls achieved slightly poorer results from the loye start in comparison with the standing start, the results are better than from the crouch start position and consequently for this age group the loye start seems to be the most appropriate position.

Conclusion

On the sample of 30 fifth grade girls the efficiency of crouch, loye and standing start was tested. The different efficiency level of these three start positions in the stated population regarding the first stride length, the number of strides over 15 meter track and the results of running over the 15 meter track supports the thesis that for this population standing start is the most efficient one. However, because of the track and field rules demanding an absolutely motionless position on the signal 'get set', the loye start is recommended, since although slightly less efficient, it is much more appropriate for the mass practice in the school environment.

On the whole, the results of the study confirm the adverse estimation of some physical education teachers and coaches concerning the crouch start in sprint in the fifth grade girls.

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