THE TIME ANALYSIS OF 110 M HURDLE EVENTS

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The purpose of this study was to clarify the pattern of speed changes during the 110m hurdle events. One hundred and five subjects were divided into A group, B group and C group according to record. The speed of each section, the speed ratio compared with a maximum speed and the time ratio were calculated. The results showed that the speed changes of A group has similarity to the previous reports for top hurdlers, though the speed of each section decreased gradually in B group and C group. The correlation coefficient of the latter half, especially in the section from the 7th hurdle to the 9th hurdle, were higher than that of the first half and also the speed in these sections were related to the record particularly. It was found that the speed change of B, and C group were different from that of top-level, and that these results could be applied to the training programs for the Middle-level hurdlers.

KEY WORDS: time analysis, middle-level hurdler, speed, technique

INTRODUCTION: Since 1970s' the analysis to which it pays attention with the speed has been done in international games of the Olympics and the world championship, etc. The hurdle event has the rule at intervals. The time required for 11 sections were measured by using ten touching down time from long ago. This is a reference of a technique, a strategy, and training. It is necessary to compare very own technique and top runners' to acquire the technique of top-level. There is less report about middle-level hurdlers technique, whereas there are many report about top-level. Therefore, the purpose of this study was to clarify the pattern of speed changes during the 110 m hurdle events.

Photo 1   The Photograph of the National championship 2004 (Final).

METHODS: The adoption data is 105 among 119 people of the total of the player who participated in the Japan Amateur Athletic Federation official recognition race. These were divided into A Group (N = 37 and mean value. 15.09 ± 0.27 sec) as for the person of 14.50-15.49 seconds, B Group (N = 43 and 16.00 ± 0.31 sec) as for the person of 15.50-16.49 seconds, and C Group (N = 25 and 16.92 ± 0.29 sec) as for the person of 16.50-17.49 seconds. The races were videotaped from rear side of the lane by 30 Hz with digital video camera (SONY DCR-TRV50). 0.033 was multiplied by the number of scenes, and the time required of each section was calculated. The speed of each section, the speed ratio compared with a maximum speed and the time ratio were calculated. The significance level of the statistical work was assumed to be 5%.
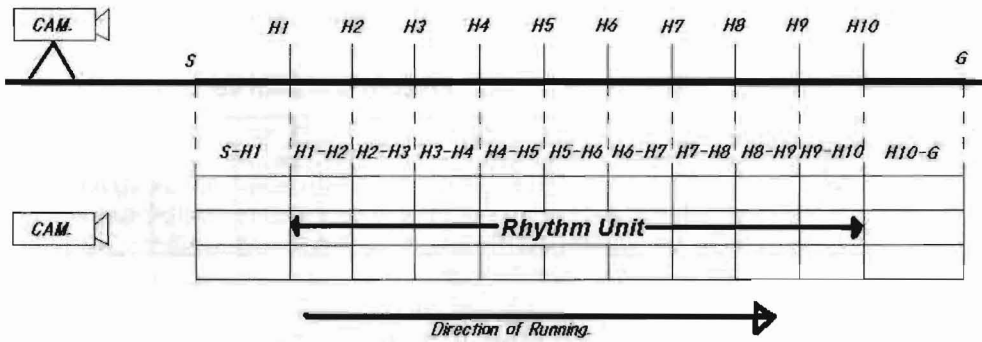
Figure 1 The Definition of the section.

RESULTS AND DISCUSSION: Table 1 shows the speed of each section. There were significant difference between groups in the speed of all sections (Table 2). It can be said that hurdlers will be demanded that they put on a high speed by 13.72 m from the start to the 1st hurdle as much as possible to set a better record. A group showed the maximum speed for the rhythm unit in the H3-H4 section, and it changed from the H4-H5 section to the deceleration. On the other hand, B group and C group have decelerated from the H1-H2 section to the goal. Moreover, it is A group alone that showed the support of early report, and doesn't apply to B group and C group though there are a lot of reports of showing the maximum in H3-H4 section speed.

Table 1 The speed of each section in each group.

	S-H1	H1-H2	H2-H3	H3-H4	H4-H5	H5-H6
A Group	4.93±0.12	7.70±0.23	7.82±0.30	7.83±0.34	7.80±0.27	7.79±0.28
B Group	4.81±0.15	7.50±0.34	7.45±0.42	7.35±0.45	7.40±0.46	7.32±0.47
C Group	4.73±0.11	7.13±0.23	7.09±0.23	7.07±0.24	6.94±0.26	6.91±0.24
	H6-H7	H7-H8	H8-H9	H9-H10	H10-G	
A Group	7.64±0.31	7.64±0.28	7.56±0.28	7.45±0.32	8.93±1.08	
B Group	7.25±0.44	7.14±0.47	7.10±0.45	7.05±0.44	7.95±1.45	
C Group	6.88±0.21	6.79±0.26	6.65±0.25	6.73±0.23	6.87±0.41	

Table 2 There are significant differences among the three groups. Upper stand shows the difference of mean value and, lower stand shows HSD.

	S-H1	H1-H2	H2-H3	H3-H4	H4-H5	H5-H6	H6-H7	H7-H8	H8-H9	H9-H10	H10-G
A vs B	0.12*	0.20*	0.37*	0.48*	0.40*	0.47*	0.39*	0.50*	0.45*	0.40*	0.99*
HSD	0.02	0.032	0.038	0.041	0.04	0.041	0.04	0.04	0.035	0.042	0.147
A . vs C	0.20*	0.57*	0.73*	0.76*	0.86*	0.87*	0.75*	0.85*	0.91*	0.72*	2.07*
HSD	0.02	0.043	0.052	0.056	0.055	0.056	0.054	0.054	0.048	0.057	0.201
B vs C	0.08*	0.38*	0.36*	0.29*	0.46*	0.40*	0.36*	0.35*	0.46*	0.32*	1.08*
HSD	0.02	0.041	0.049	0.053	0.052	0.053	0.051	0.051	0.046	0.054	0.19

* = If the difference of mean value > HSD, then significant. ($p < 0.05$).

Table 3 shows the correlation coefficient of record and each section. The middle level correlation was seen from the S-H1 section in B Group, and this respect is different from A Group and C Group. Therefore, it is thought that the success or failure of the approach running causes the success or failure of the record in B Group. The correlation coefficient exceeds 0.900 in the section from the 7th hurdle to the 9th hurdle according to all data, and it seems that the speed in this section is especially related to the record. The correlation coefficient of the latter half (since the H5-H6 section) is higher than that of the first half (To

the H4-H5 section), and it is thought by the record that these variables have a strong ties to the records.

Table 3 Correlation coefficient of record and each section.

	S-H1	H1-H2	H2-H3	H3-H4	H4-H5	H5-H6	H6-H7	H7-H8	H8-H9	H9-H10	H10-G
A ll data	-0.597*	-0.789*	-0.876*	-0.852*	-0.878*	-0.907*	-0.901*	-0.915*	-0.920*	-0.838*	-0.731*
A Group	-0.377*	-0.154	-0.611*	-0.700*	-0.535*	-0.639*	-0.700*	-0.676*	-0.595*	-0.602*	0.009
B Group	-0.503*	-0.575*	-0.694*	-0.691*	-0.565*	-0.741*	-0.685*	-0.814*	-0.691*	-0.683*	0.301*
C Group	-0.040	-0.610*	-0.702*	-0.458*	-0.519*	-0.418*	-0.709*	-0.611*	-0.626*	-0.772*	0.204

$* =$ significant ($p < 0.05$)

Figure 4 shows the speed change rate compared with maximum speed section. According to Susanka (1988), it is assumed that the speed is maintained if subjects ran in 97% of the maximum speed or more. According to this standard, A group is maintaining maximum speed in seven sections of the rhythm unit. It can be said that they run as near as the maximum speed from the beginning of the rhythm unit. It can be thought that the decrease of the speed is suppressed to the minimum so that the influence of the hurdling operation given to the interval running may become small. The H1-H2 section was a maximum speed section in B group. It is thought that maximum speed is maintained to the H6-H7 section. However, getting depressed at the speed afterwards is larger than A group. Therefore, because a technical defect in running in the section of the first half at hurdling or intervals accumulated, the latter half is thought to be a rapid decrease of the speed. The H1-H2 section was a maximum speed section in C group. Moreover, C group decelerated by the speed of about 1% in each section. Though it makes an effort to keep the rhythm of three steps in this group, the influence goes out to the following hurdling to extend the stride length forcibly and hurdling doesn't go well. It is thought that the speed decreases repeating the vicious circle.
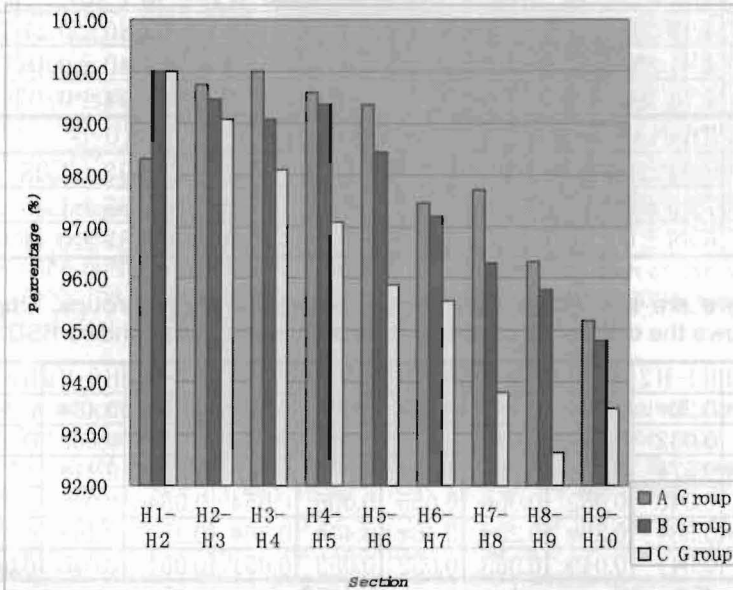
Figure 4 The speed change rate compared with maximum speed section.

Figure 5 shows the time ratio of each group. In H1-H2 section, A group showed the highest time ratio of the three and, B group showed the lowest time ratio. However, it reverses since the H5-H6 section to this relation, and the lowest in A group, highest tendency in C group is shown. Moreover, the rise of the rapid time ratio is seen in the C group The rise of the time ratio is gradual in a high-ranking group though the time ratio tends to rise in any groups as the race advances. In a word, it is thought that the time spent in each section of the race is

almost even in a high-ranking group, and the speed is steady. On the other hand, the time spent in each section of the race is biased in B and C group in the latter half, and it is shown that the speed reduction were skewed to the latter half.

CONCLUSION: The following are thought from the above-mentioned result. In A group, an almost similar tendency is shown the player at the international game participation level. It is thought that the hurdling technique is improved enough. In B group, the speed reduction was seen from the H2-H3 section, and the hurdling technique is thought to be more immature than A group. C group always decelerates to the final section. Moreover, the speed in the S-H1 section is the lowest between three groups. Therefore, for B Group, there is a problem with an immature hurdling technique in the first. And, for C Group, there is a problem with an immature hurdling technique in the first, and the dash speed next be trained
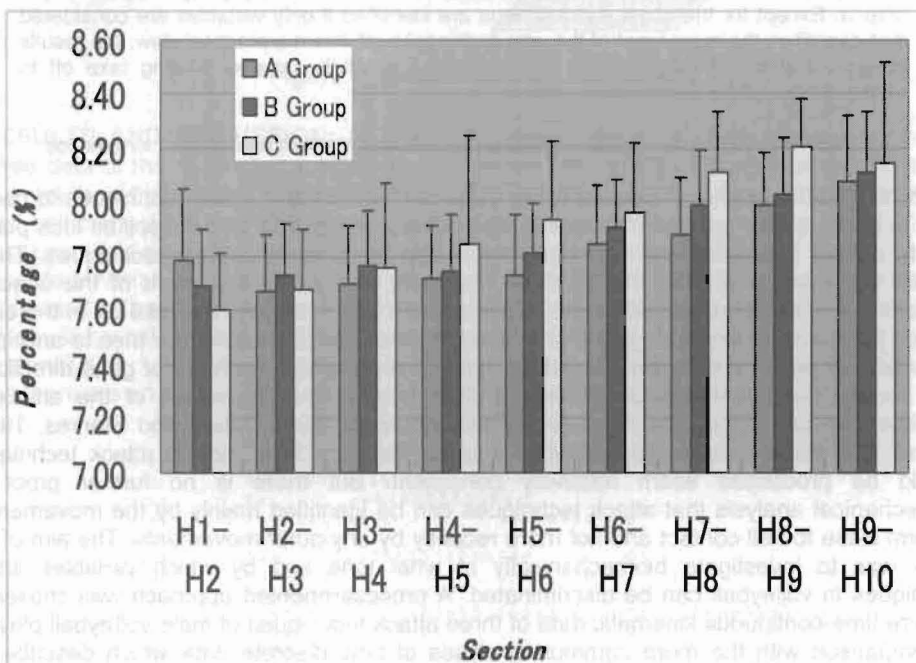

Figure 5 The time ratio is calculated using the time required in each section (RT) and Total Record (TR). Time ratio (%) = 100 (RT/TR).

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