TECHNICAL ANALYSIS OF ASIAN TOP SPRINTER - CHAN SING CHUNG

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INTRODUCTION

Chan Sing Chung is a Hong Kong elite disabled sprinter with Cerebral Palsy . He achieved three gold medals in 100 m, 200m and 400m sprints in 1994 FESPIC and won the prize of MBE of British government recently . His best result of 100m is 12.05s which is close to the world record of 11.75s. In order to help him to improve his technique and break the world record, two high speed video cameras was used to film his performance during his training sessions and provide technical analysis to his coach. This paper presents the analysis and report of that intervention.

METHODS

Two video cameras with a frequency of 50 Hz and shutter speed of 1/500s were situated at the side of the track perpendicular to the plane of motion. One camera was opposite the start block and the other was opposite the 30m point. We used panning film technique to record his motion. The filmed range is about 6m. Three trial runs were filmed at this training session. Each analysis, the start posture, the first five strides and two strides at the range of 27 to 33m away from the starting point were used. The video materials were then processed by Peak Motion Performance System. The data was compared with existing data from Ku Wai Ming and Wong Man Long, the Hong Kong elite able-bodied sprinters.

RESULTS AND DISCUSSION

Table 1. The comparison of starting technical parameters (mean volume) between Chan and Wong.

	Just before start				Takeoff		First five meters				
	α1(deg)	α2	α3	α4	T(s)	Vhs(m/s)	T5m(s)	L1(m)	L2	L3	L4
Chan	111	94	121	30	0.25	2.90	1.17	0.93	0.91	1.06	1.28
Wong	102	93	115	26	0.29	3.34	1.15	0.55	1.03	1.27	1.30

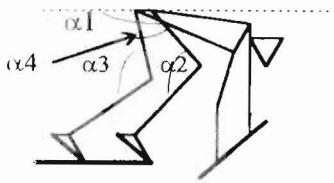
α1: Angle of forward inclination of trunk; T: Starting time;

α2: Fore knee angle; Vhs: Horizontal velocity at takeoff;

α3: Back knee angle; T5m: Time during the first five meters;

α4: Lateral angle between thighs; L1-L4: The length of 1st to 4th stride.

Fig. 1 Stick figure showing the joint angles during starting.



With reference to table 1,

The length of the first stride is longer.

His horizontal velocity at takeoff is small. It may be caused by his week extensional muscles of legs.

Chan's start technique is reasonable except the two points.

Table 2. The time parameter of Chan Sing Chung and Ku Wai Ming

Name	trial	ST(s)		FT(s)		ST:FT		SF (1/s)		SL (m)		AS (m/s)	
		L	R	L	R	L	R	L	R	L	R	L	R
	1st	0.10	0.10	0.14	0.14	1:1.4	1:1.1	4.17	4.17	1.98	1.97	8.25	8.21
Chan	2nd	0.12	0.12	0.12	0.12	1:1	1:1	4.00	4.55	1.96	1.76	7.84	8.00
	3rd	0.10	0.12	0.14	0.12	1:1.4	1:1	4.17	4.17	1.94	1.94	8.08	8.08
	Mean	0.107	0.113	0.133	0.127	1:1.3	1:1.1	4.11	4.30	1.96	1.89	8.06	8.10
Ku	Mean	0.095		0.12		1:1.25		4.65		2.14		9.95	

ST: Supporting time; L: Left leg takeoff; SF: Stride frequency;

FT: Flight time; R: Right leg takeoff; SL: Stride length;

AS: Average speed.

With reference to table 2,

Chan's supporting time was comparatively long. This phenomenon exits in both legs. This may due to the strength of his legs and the problem of neuromuscular coordination.

Chan's flight time was fairly good. There is no great difference when compared with the data of Ku Wai Ming. There was no obvious technique difference between Chans' legs.

Chan should reduce the supporting time so that the ratio of ST and FT falls between 1:1.2 and 1:1.4 which are reasonable.

Chan's stride frequency, stride length and average speed were less than Ku. If he wants to achieve the result of 12.00s, his average speed must exceed 8.5m/s in 30-40m distance. Also, the parameters of SF and SL should be improved.

Table 3. The angular parameters of Chan and Ku.

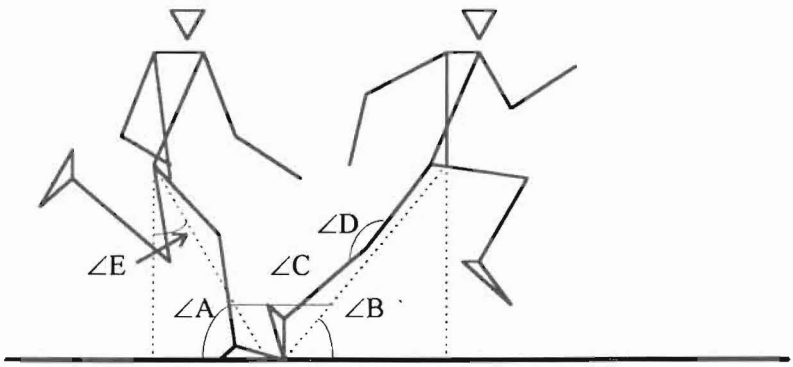
Name	Trial	∠A(deg.)		∠B(deg.)		∠C (deg.)		∠D (deg.)		Vsua (deg/s)		Vpa (deg/s)	
		L	R	L	R	L	R	L	R	L	R	L	R
Chan	1	64.3	63.7	60.1	62.8	55.6	53.5	156.6	150.5	556	535	442	430
	2	60 9	62.2	54.4	58.3	64.7	59.5	154.9	150.4	539	496	425	378
	3	65.6	64.0	58.5	54.9	55.9	61.1	152.6	146.9	559	509	445	396
	Mean	63.6	63.3	57.7	58.7	58.7	58.0	154.7	149.3	551	513	437	401
Ku		55.2		61.0		63.7		158.0		672		530	

∠A: Touchdown angle; ∠D: Knee angle at takeoff;

∠B: Takeoff angle; Vsua: Average angular velocity of supporting angle;

∠C: Supporting angle; Vpa: Angular velocity of pawing.

Fig.2 Stick figure showing the joint angles at touchdown and takeoff



With reference to table 3,

The touchdown angle (<A) was comparatively large.Although this technique can reduce the resistance at touchdown, it is the main reason to cause his stride length less than Ku.

The take-off angle (<B) and knee extension angle (<D) are reasonable.

Supporting angle (<C) and the supporting angular velocity (Vsua) were small. This made the stride frequency and speed becoming small.This may due to the low muscle strength of legs.

The pawing angular velocity (Vpa) was small.This will increase his supporting time and reduce his speed. This may due to the problem of neuromuscular problem and also the hip and thigh muscles were not strong enough.

CONCLUSIONS AND SUGGESTIONS

From the data, we observed that there was no obvious difference in technique between two legs. This is abnormal in disabled sprinter. This may due to the technique of the normal leg (left) was affected by the disabled leg. Since it is difficult for him to control the disabled leg smoothly, we suggest that he should concentrate technique training on the normal leg and the neuromuscular control training on the disabled leg.

His pawing techique at touchdown was not good enough. A special strength training program for the muscles of hip and ankle extensions should be employed.

Moreover, he should increase his knee extension angle during touchdown. Hence, the pawing technique will be improved and the stride length will be increased.

The ability of rapid extension of legs should be strengthen by strength training program.

REFERENCES

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