Resisted and Assisted Methods of Speed Development.

When attempting to increase the running speed of athletes, the two factors that have the greatest influence upon increasing maximal running speed are that of stride rate and stride length (Baughman et al, 1984, & Korchemny 1988 & McFarland 1984). Mero et al (1981) and Mero & Korni (1985 & 1986) have suggested that stride rate is the most important factor in developing maximal running speed. These researchers have demonstrated that in supramaximal running (greater than 100%), stride rate is increased due to a decrease in ground contact time leading to an increase in horizontal velocity. They suggest that this. type of training may result in an adaptation of the neuromuscular system to a higher performance level.

In the attempted improvement of the athlete's acceleration phase, Mero (1988) has shown a high correlation between force production in the propulsion phase and running velocity emphasising the importance of strength during the acceleration phase of sprinting. Studies performed by Mann and Sprague(1980),Mann(1981) and Chapman et al (1984) on kinematic evaluations on sprint performance all concluded that the hip extensors (hamstrings and gluteals produce the greatest muscle moments (force production) when analysing hip, knee and ankle joint moments. It was hypothesised that sprint ~g with a resistance (towing a sled) would therefore increase the strength in the hip extensor muscle groups that are most involved in force production whilst performing an acceleration run.

Currently there has been little work done in the area of identifying which of these training methods may best develop the speed components for an athlete, or what combinations of these methods result in a greater effect on speed development than by conventional speed training regimes (unassisted or unresisted speed training). The purpose of this study was to determine whether the use of resisted training (speed sled), over-speed or supra-maximal training (speed belt), or a combination of both methods affects the development of speed over 20m, 40m, and 60m, greater than a control group.

METHODS

Subjects were Rugby Union players from ACT under21 Training Squad.
They were involved in regular training throughout the study which included Representative training on Tuesday and Thursday evenings. They performed the training at the beginning of these sessions.

The training programs for all subjects are shown in Table 2. The distances run were set according to the distances to be tested. The subjects performed all sprints at maximal intensities that were preceded by an adequate warm up and a series of run throughs

Sets x distance (rest period)

3 x 20m (3) 3 x 40m (4) 1 x 60m
3 x 40m (4) 3 x 60m (5) ,
6 x 40m (4) 1 x 60m (5)
6 x 60m (5) 4 x 20m (3)
4 x 40m (4) 1 x 60m
3 x 20m (3) 3 x 40m (4) 3 x 60m (5)

The Resisted and Assisted/Resisted groups used a Speed sled device with a weight that was approximately 15% of their own body weight (nearest 1.25kg). Although no formal resistances have been established through scientific studies, anecdotal evidence suggested that this weight was appropriate. Pre testing of this weight supported the conclusion, and no major breakdown of technique, due to excessive resistance, occurred throughout the study.

The Assisted and Assisted/Resisted groups trained with either the 15m or 7m Speed Belt device, which is a long rubber rope with a harness at either end. The front person (who throughout the study remained constant) stretched the belt out a given distance and ran at a constant pace. Prior testing was used to establish the speed required to tow the subjects at 104-106% of their maximal velocity over each of the distances.

DISCUSSION

From the table below the following information can be deducted from this study:

1. Resisted and Assisted/Resisted methods were the most successful in improving 20m & 40m speed.
2. Unassisted or unresisted training did not have a positive effect upon either 20m or 40m but there was a significant improvement over 60m. This can be accounted for if we look at the type of athletes that were used in this study. Rugby Union players frequently sprint anywhere from 5-40m in a game (position dependent) but 60m sprints are very rare so any training over this distance is going to have a positive effect upon 60m time as shown in this study.
3. The assisted group showed significant improvements over 60m only ($p<0.01$). This supports Mero and Komi's (1985,1986) research that assisted training decreases ground contact time and increases stride rate that is important during maximal velocity running but has less effect upon the acceleration phase of a sprint performance where longer ground contacts allow the athlete to generate greater forces required to increase the propulsion phase.
4. A combination of resisted and assisted

Table: 1 Paired Comparison T-Test for all groups from Pre to Post test.

Group & n	Test	Std Error	PROB>M
Control (n=8)	Pre-Post 20m	0.00963	1.0
	Pre-Post 40m	0.01505	0.2009
	Pre-Post 60m	0.04545	0.0053***
	Pre-Post 20m	0.02165	0.0094***
	Pre-Post 40m	0.06414	0.2102
	Pre-Post 60m	0.09242	0.0088***
	Pre-Post 20m	0.02983	0.2511
	Pre-Post 40m	0.04094	0.4289
	Pre-Post 60m	0.04684	0.0046***
	Pre-Post 20m	0.03775	0.0689*
	Pre-Post 40m	0.03367	0.0110**
	Pre-Post 60m	0.05140	0.0073***

Significance at P<0.01
Significance at P<0.05
Significance at P<0.1

Table 2 Pre to Post speed results for all groups over the 20m, 40m and 60m distance.

Group	Pre-Post 20m	Pre-Post 40m	Pre-Post 60m
Control	0	0.02	0.18
Resisted (n=7)	0.08	0.09	0.35
Assisted (n=5)	0.04	0.04	0.27
Resisted/Assisted (n=4)	0.11	0.19	0.34

PRACTICAL IMPLICATIONS

The results indicate that sprint training using these devices has a significant effect upon speed development over a variety of distances. The Assisted/Resisted group showed significant improvements over all 3 distances from pre to post testing, with the resisted group showing improvements over 20m and 60m that were also significant. The Control and Assisted group showed significant improvements over 60m only.

This data suggests that to maximise speed over distances from 0-60m, sprint training itself in no longer the optimal training method. Greater improvements can be gained by using resisted running or by using a combination of both resisted and assisted training methods. The improvements that were made with average differences from pre to post scores are summarised in table 4 below.

up to 3-4m over the 60m distance. Improvements of this magnitude in a 6 week training program are

only possible using specific speed devices such as the sled and the speed belt. When related to team sport performance, where the emphasis in competition is for short acceleration, clearly using a combination of both over-speed and resisted running may give athletes the best gains in improving speed (ie. Assisted/Resisted improvements over 20, 40 & 60m). This study looked at training distances that were not necessarily specific to many sports as it is uncommon in many team sports to have athletes maximally sprinting distances of 60m (Eg. Basketball, Netball, Soccer, Rugby Union, Rugby League, Baseball, Hockey, etc.). Most efforts in these sports are over much shorter distances (0-30m). It wouldbe possible to modify this program to a sport specific regime to maximise specific speed improvements, which would emphasise accelerations related to the individual sport.

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