Level 3 Coaching Course
Research Paper

Technical Training Adaptations of Beach Events For Track & Field Athletes

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1. Introduction

Athlete development, team representation and raising the standards of competition is a continuing challenge for coaches. So is offering young athletes variety in training while dealing with competition from a myriad of different interests to ensure pathways toward future development and enjoyment of sport in general, both physically and socially. This paper will explore some technical training adaptations for beach events in order to offer athletes from track and field a pathway into life saving and conversely a way to expand the talent base of the sport of life saving in general.

As a sport, Life Saving is a family and lifelong pursuit, or at least that is the historical evidence. However over the past decade this lifelong interest in the sport has begun to wane and athlete and member retention has become a serious issue. This is especially evident in the beach events where, having always been the barely tolerated sibling to water events, they now struggle to maintain a presence in the sport. This is highlighted by the loss of the belt and reel events at many carnivals and even at some State levels. Beach events have never been accepted to the level that such running and agility skills are in other sports, nor have they been developed to the levels that they could attain, at least equally with water events, including their ability to provide a higher profile for the entire sport itself.

2. Benefits of Implementation

Because of the proximity to spectators, beach events are ideally suited to interaction with the public. This interaction can ultimately cement a club or sport in the mind of the public by engaging them and sparking an interest that can be developed over time into a genuine following. Unfortunately, as well as the lower level of interest from within the sport, beach events suffer from a lack of competitive standards and excellence when compared to other athletic pursuits such as soccer, basketball or football in the public imagination. Receipts of government funding highlight this as Life Saving itself does not hold the special recognition of sports such as athletics. Because of this it does not project a popular attraction for a wider group of spectators engendering extensive interest by the general public (not just the life saving membership), ultimately drawing interest and a public following. This then leads to high levels of sponsorship and government funding as seen in swimming.

By comparison, while Track and Field Athletics is certainly *'down'* in Australia by World standards, any sport that can field an 8 event program with events running an average of 1 minute or less over five hours and attract a capacity crowd of 87,000 paying spectators, at an average of $90.00 per ticket, for four nights in a row during the working week is clearly not *'out'* or anything like it. This was the incredibly surprising experience of the organisers of the Commonwealth Games in Melbourne. This also demonstrated the undying interest of the public in a purely speed and skill event where they can follow winners and losers, albeit a parochial following. Still, it reinforces the deep interest of the public in lauding sporting achievements, especially those that they can get involved in 'up close and personal' as they can within a track or on a beach.

In an effort to inhabit the beach events with a higher profile and beach competitions with a higher standard, recruitment of trained and even elite athletes is needed to arrest the depletion of the current ranks in Life Saving. The drain of these ranks over the last few years has become a flood in favour things such as basketball and soccer. This also affects the ranks of patrol members too; as many would be members and competitors may not like the idea of swimming and paddling but are happy to run as an option.

Much of this depletion is caused by a lack of interest in the lower standard of competition, the travelling distance to compete as well as the time taken to run a carnival, all comparing badly with the proximity and time efficiency of the other modern competitors for talent.

As far as a source of recruitment goes, Track and Field athletes are a ready pool of talent. The two sports are similar in skills and while Track & Field is entirely competition focused and one of the big three of international competition, it lacks the social and environmental benefits of Life Saving. Add to this athletics meets are run over long periods, often in remote locations. With the similarities in technique and the scarcity of support brought about by the downturn in athletics generally, there is a real opportunity for recruitment of many of these athletes into Life Saving at least as an addition to their own sport.

In order to successfully recruit a track and field athlete there needs to be an in depth understanding of their individual motivations and personalities, as well as a clear understanding of the technical modifications and adaptations to running and biomechanical style that need to be made to ensure success in the beach events. This paper will explore some of these adaptations and modifications.

2. Methodology

Research was conducted and analysed into the physical permutations of biomechanical movement and mental and physiological developments of the sport and it's application to coaching.

Measurements were obtained and interpreted regarding pressure and speed of footfalls and ways in which the physical development of track and field athletes can be modified and adapted to sand running and beach flag events.

The aim of this paper is to provide coaches with methods of adapting and utilising the natural abilities and training dynamics of track and field athletes to the sport of life saving.

4. Research Parameters

Research was undertaken in different areas.

- Analysis of track runners converting to beach running who have been successful at different levels with reasoning and theories as to why.

- A study of traditional (surf) beach runners and their adapted running style compared to traditional track runners including a comparative study of times and running efficiency.

- A study of pressure and force transmitted through the feet of track athletes including kinematic, kinetic and electromyographic characteristics.

- Psychological aspects of training track athletes expressed in both positive and negative adaptive tendencies.

- Finally research into the physiological and biomechanical adaptations to gain best performance and results from track athletes on sand.

5. Research Results and Analysis

(i) Baseline of a Track Athlete

Track and Field athletes have, from a very early age, worked on win and loss factors made up of critical time differences, where time fractions as low as 1/1000 of a second can mean the difference between winner and loser. To improve performances athletes rely on minute alterations to style, technique or fitness. They are highly trained, self disciplined and capable with a well developed commitment to training and improvement.

For recruitment to surf sports there needs to be an understanding of the track athletes motivation, drive and enthusiasm along with those traits that must be dealt with by the coach that are negative but still able to be successfully adapted.

Table 1. Positive and Negative Perceptions of Sprinters converting to Life Saving Beach Events

Adaptable Positives	Adaptable Negatives
Self Discipline and training prowess including a highly developed ability to isolate muscle movements and concentrate on desired changes.	Tendency to 'pull and glide' rather than 'grip and drive' leads to the classic difficulty of track runners sprinting on sand causing 'over speed' traction difficulties.
Track athletes are mentally goal oriented and able to differentiate between disappointment and adaptation requirements.	Coordination difficulties arising from the adaptive difficulties between competing on flat smooth running surfaces as opposed to soft, uneven, undulating sand.
Track athletes possess excellent natural fine and gross motor skills.	Height and power, having a generally tall athlete profile means that styles and techniques must be adapted from the current instructions prepared for traditionally 'shorter' beach competitors.
High standards of discipline and style with a developed efficiency and economy of movement.	Track athletes are 'high maintenance' having been used to and require continual feedback on performances.
Height and power, successful track athletes generally possess tall, long limbed profiles that allow long stride length and powerful acceleration styles.	Need to overcome the 'timing' issues. T&F athletes have been bred to challenge PB's. With no timing and no beach consistency between events, improvement is difficult to quantitatively measure to their satisfaction.
Possess high levels of flexibility and body control that can be readily adapted to any explosive sport.	'Record' mentality, like the PB, the record is something to be continually sought or measured against. Conditional and environmental differences preclude records in life saving so the coach needs to generate a different goal pattern for each individual.

Table 1: *Information obtained from interviews and questionnaires of a cross section of seventeen predominately track athletes who regularly compete in SLSA events. All athletes have made the transitional adaptation from Track to Beach, some permanently, others as an additional sport.*

All athletes are holders of multiple State and National championships in both Track & Field and Surf Life Saving so can be considered as elite level respondents. Surveyed athletes are between 14 and 19 years of age so fit directly into the 'transitional loss' demographic group of both sports.

(ii) Comparative Speed Research (Track vs Beach)

Research was undertaken with track and beach runners both trained and untrained over several age groups and with different training ages. The study was conducted on a synthetic track over *90 metres* with electronic timing facilities. Wind either assisting or opposing was measured and times corrected in accordance with standard IAAF guidelines.

Athletes were run in a competitive format in pairs and in matched groups taking into account ages, developmental differences and gender. They were grouped into similarly matched developmental and ability rated pairs to counter age development differentials. Times were collected for three runs of each pair with ten minutes recovery between runs, the times were tabulated and averaged with any abnormal times due to accident or stumbles discarded and repeated, the median time was used as the most consistent result.

The same pairs of athletes were then run over a measured 90 metre beach track which was flat and level with large grain size sand with a soft average depth of 27cm over a firm base. Timing was by hand with no wind correction but under the following atmospheric conditions:

Time: 10 - 11 a.m.
Wind: slight breeze (< 5kmh) variable between 80 and 115 degrees across the track (using a jumps directional windsock)
Tide: No interference with beach track due to tide
Temp: 16 - 18 C

Table 2: Comparative Speed Research between Track and Beach Athletes

Athlete	Age Yr - Mth	Gender M or F	Beach / Track	Training Age (years)	Track Times	Beach Times
1	15 - 9	F	T	9	11.28	12.32
2	15 -11	F	B	3	12.87	13.29
3	14 -10	M	T	7	11.07	12.32
4	14 - 7	M	B	4	12.88	13.98
5	17 - 3	F	T	8	11.31	12.07
6	17 - 6	F	B	3	13.89	15.67
7	18 - 4	F	T	10	10.98	12.01
8	18 - 7	F	B	6	12.83	13.93
9	22 - 3	M	T	13	9.98	10.93
10	22 - 7	M	B	5	11.09	11.97

Table 2: Athletes identified by number; Age expressed in years and months (y-m); Beach or Track signifies a predominately track trained runner or traditional beach runner; Training age represents years that athlete has been training for the events in some formal way.

Conclusion

As represented in the comparative times it can be seen that in all circumstances trained track runners are substantially faster than traditional beach runners. For visualisation purposes each second in speed can be viewed as between 7 and 9 metres of distance on the sand. This is demonstrated in the results of athletes 5 & 6, the time difference representing a difference in distance well over 20 metres in a 90 metre race.

(iii) Kinematic, Kinetic and Electromyographic Characteristics of Sprinting Stride and Force Expended on the running surface.

For the adaptation of pure track sprinters into beach runners the main effect of their style and efficiency of running that needs to be studied by the beach coach is their ability to impart force onto the running surface. In sprinting this is countered very effectively by the equipment (spiked footwear) and specialised surfaces on which the competition is carried out (either synthetic specially laid rubberised compounds or 'mondo' rubberised and carpeted matting designed exclusively as a running surface.

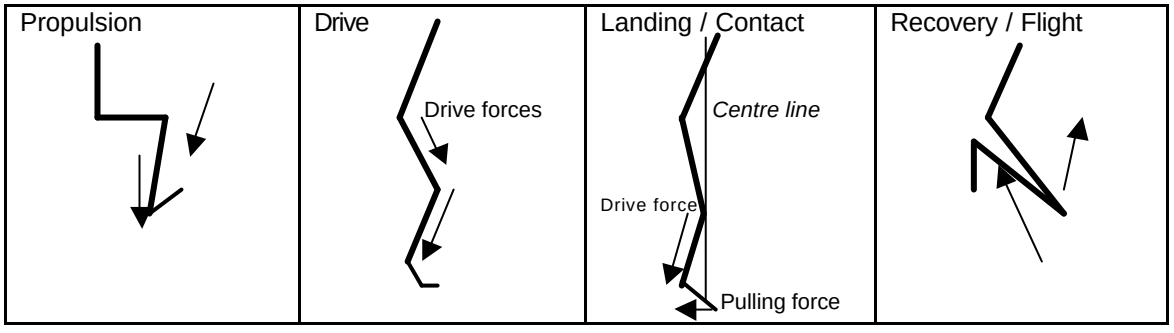
When converting to beach running, the 'softness' of the surface and 'give' means sprinters have to make specific adaptations to their running style (especially the angles and direction of foot plants) to avoid the classic 'wheelspin'. This becomes apparent at the contact point when the foot is placed on the sand and excessive 'pulling' force is exerted. This leads to the foot loosing traction and slipping out from under the athlete, causing them to stumble or fall.

6. Understanding Sprint Force Application.

Firstly it is necessary to define the phases of a sprinting cycle or stroke. It is generally accepted that the sprinters stride contains four phases or sections, *Propulsion, Drive, Landing and Recovery*.

- In *propulsion* the force of the stride is extended from the thigh and hip through the knee.
- In *drive* coordination is required between arm and leg with powerful hip flexion driving the thigh up and forward.
- In *landing* the foot should be coached to land under the perpendicular bodyline. If the foot lands in front of the body the landing phase easily becomes a braking phase, as body weight is transmitted down and forward of the centre of balance.
- In the *recovery* phase, it is essential to transfer energy from the ground, through the legs up to the hip and thighs. It is also essential to create the shortest lever possible in the leg. (Short levers move quickly, *picture an ice skater initiating a spin. With arms extended out to the side [laterally], the skater rotates slowly. When the skater begins to shorten-the-lever [by bringing the arms into the body], the skater rotates faster and faster until they are a blur with the shortest lever possible [arms wrapped tightly to the body].)* Correspondingly the shorter the leg lever in the recovery phase the faster the leg will return to the position of initiating the propulsion phase. ***See figure 1.***

Figure 1. Sprinting Phases



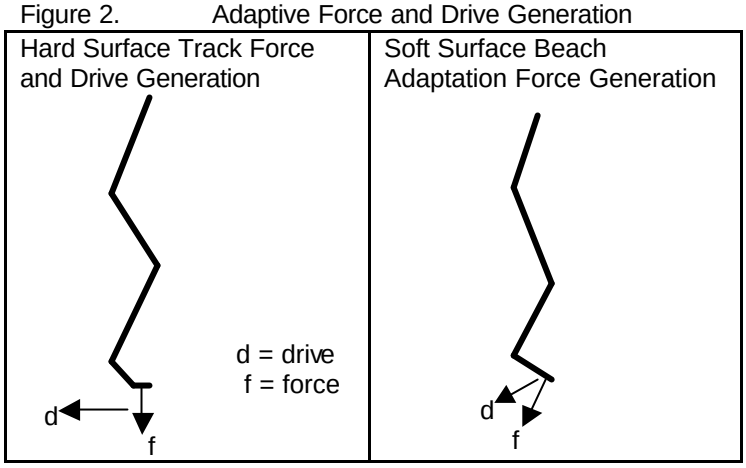
Elite sprinters in the *propulsion phase* develop an average force impulse 1.63 times greater than in the *landing phase*, the most favourable ratio being 1:1.75 of the force impulse of the landing phase. Coaches who are evolving a beach sprinter must be mindful that to obtain the *maximum speed conversion* from a track sprinter to running on sand this force generation requires some style adaptations to avoid loss of traction on the soft and slippery surface.

In adapting beach sprinters vertical forces have much greater values than the horizontal forces in the drive phase. Maximal vertical force varies in most junior sprinters representing 3.2 to 3.7 times their body weight being transferred into the running surface at the point of contact. This simply means that coaches must understand when recruiting or working with a predominately elite or even a good trained track sprinter on the beach, a 180 cm tall 60 kg female sprinter can easily be exerting between 192 and 222 kg of force on the contact point of her foot with the sand, which, depending on her foot size, could easily be an area of less than 10cm square, this force pressure defining the need for adaptation to improve stability and anchoring of her foot. Of course male sprinters exert an exponentially greater force because of their inherent builds and strength.

It is important for sprinters training on the track to ensure a high horizontal velocity of the foot of the 'swing' or 'free' leg in the drive phase, for an efficient sprinting stride and also the greatest 'grabbing' velocity of the contact foot in the drive phase (remembering track sprinters wear spiked shoes to overcome the loss of traction). Sprinters show horizontal velocity of the foot in the propulsion phase 2.11 times greater than the horizontal speed of the body. This is where the top level sprinter uses the swing of the leg to 'reload' the muscles of the hip and thigh ready for the alternate drive phase.

For these reasons a number of sprinters making the transition to beach sprinting need to have their contact phase adapted away from the track 'plantar flexion' (toes pointed upwards toward the shin) requirement for the most efficient contact phase transition to a more 'plantar pointed' *(see pic 1. toes at lower angles to the leg to provide for an 'insertion grab' in the sand surface)* style to both increase the area and angle of force at contact and thus decrease the forces being transferred in a parallel line to the slipping surface minimising the risk of 'wheelspin' stumbles and slipping. ***See figure 2 & pic. 1***

Figure 2. Adaptive Force and Drive Generation



Pic. 1 'plantar pointed' adaptation for track sprinters on sand.

Table 3: Kinematic, Kinetic and EMG Paramaters of the Sprinting Stride

Variables (Atheltes)	1	2	3	4	Mean
Stride Length (m)	1.910	1.970	2.010	2.050	1.985
Stride Frequency (Hz) ##	4.68	4.23	4.21	4.20	4.33
Grabbing velocity of foot (ms)	60	63	63	58	61
Contact / Landing Phase (ms)	236	205	286	210	234
Flight / Recovery Phase(ms-1)	-7.48	-9.10	-10.7	-	-9.37
Propulsion Phase (ms-1)	-	-	-9.8	-15.93	
Maximal force in Horizontal axis (N)	200.0	118.0	127.0	-	154.0

Table 3: Maximal sprinting velocity and force expenditure onto running surface in various phases of the sprint cycle. Source Milan Coh, Dolenec & Bojan Jost – University of Ljubljana – Slovenia

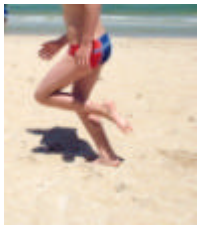
Stride Frequency relates to leg cycles per second, physiologically this cannot exceed 5 cycles per second in the human body.

Table 3 gives a clearer picture of the forces that can be exerted by sprinters on their running surface and the need to adapt the style of track sprinters to beach surface conditions, including different adaptations for different surfaces, less adaptive 'point insertion' for hard sand, such as below the high water mark and more adaptive 'point insertion' for surfaces that rarely receive any tide or water exposure and remain soft and friable. Equally differences between beaches with different grain compositions also requires some adaptation such as between small fine grained 'squeaky' sand with little firmness in the base to coarser grained sands with a firm base underneath also need to be considered by the coach in an effort to gain the best performances and safest running environment for their athletes.

7. Visual Comparison between styles of Beach and Track Sprinters

Pic. 1: A Track Sprinter running on sand

Leg horizontal movement and balance is clear as is the arm action of a trained sprinter which is high and crisp, in fact so high as to almost be out of picture. Toes of the horizontally moving leg are flexed and in the plantar flexion position.



Pic. 2: A traditional beach runner

Legs are low and limited in horizontal travel. The arm movement is low and inefficient developing little drive to assist in forward propulsion. Toes are loose and soft with no flexion apparent at all.

From this simple visual comparison the differences and desirability of recruiting track runners into the sport is obvious. Trained to compete at levels where mere hundredths of a second separates athletes at all levels of competition, not just National or State level meets, the discipline, professionalism and precision of styles needs to be incorporated into Beach training to improve standards and competition across the board in Life Saving events.

8. Beach Flags *(The other half of the equation)*

Having spent so much time extolling the virtues of recruitment and development of trained sprinters or the development of synergistic arrangements with Athletic Clubs (refer Summary and Recommendations) the other half of the beach competition as far as Surf Life Saving is concerned is the beach flag event. While specialist flagger's are the norm in local and carnival competition most coaches associated with developing elite competitors to be elevated into State and National Teams will know that the facility does not exist in the current 'teams' based events for interstate and international competition to select both a specialist sprinter and specialist flagger to the team.

Selectors are constantly haunted by this vexing question, which athlete to take? Beach remains the big gamble, worth many points and also generally the hardest working competitor in the team when adding the relays, Cameron's and Life Saver Relay's, the team beach competitor can be asked to compete in up to six events.

Competition that demands two differing athletic disciplines can always leave selectors open for criticism from either or both camps. Due to the point scale and team event requirements a sprinter who can flag reasonably well is generally the way selection is made. Simply, more points are available for sprints including relay's than flags, this means that sometimes certain flag winners must be sacrificed for the greater good. Given this situation how do we make the best sprinter a better flagger.

As previously discussed, a specialist sprinters physiological attributes are quite individual and different from that of the traditional beach flagger. For many years the best specialist flaggers have proven to be generally shorter with fast explosive actions over short distances and the ability to take the knocks of a football player. Sprinters on the other hand are tall, slim, exceptionally well coordinated and balanced with excellent acceleration skills over longer distances and not at all used to people hitting them as they run. Because of their height and the length of long bones (the things that make them eminently suited to sprinting) they lack speed of rotation and the low centre of balance of the traditional flagger.

To get the sprinter to flag successfully at a National level is definitely a challenge for coaches but not in any way insurmountable. By harnessing their abilities and discipline and adapting their physiological gifts, sprinters have been proven to make exceptionally good flaggers, in some cases excelling in State and National Championships to emerge victorious against flag specialists.

The main adaptation for sprinters into flaggers is to understand the biomechanics of the turn as applied to the additional length of their bodies. Once this is under control and understood the rest is fairly simple. Added to this is the trained sprinters ability to control even small movements and placements with the understanding they have naturally of their body's movements and musculature.

The main adaptation required for a sprinter is to allow them to remain in balance while transiting the turn to the traditional 'start' position after which their training and acceleration abilities will naturally come into play.

With the additional length it is necessary to ensure that they are skilled at keeping a foot 'pinned' on the start line while moving their leg to the crouch position underneath them. Always keep them moving toward the flag utilising their natural flexibility to keep them crouched and 'rolled' as they push backward onto their foot.

Foot placement is very important for the sprinter, they must feel balanced and have their weight forward when they complete the turn and begin running toward the flags. A successful way of ensuring this 'balance' and a 'complete' turn toward the flag for longer boned competitors is to have the foot placement of the leading foot be made more centrally, that is toward the centre of the chest line. If done slowly it tends to be too closely spaced and is unbalance, however when the turn is completed it stops longer legged athletes from crossing over their feet or running out in a circle before completing the turn toward the flag to regain their balance. When completed at speed the rotational forces ensure reactive balance and when the rotation stops and sprint begins the feet are placed widely apart for balance and in the comforting 'sprinters start'.

Pic .1 Pic. 2 Pic. 3 Pic. 4 Pic. 5

Pic. 1: *A predominately track athlete having been coached to adapt to flag starts, as can be seen arms are well positioned and feet are 'pinned' to the line. The turning leg will be brought up as the body is rolled and pushed back toward the flag to compensate for the length of leg and need to avoid moving forward from the line as in the traditional jump start.*

Pic. 2: *The hands have been moved back to waist level, strength in the shoulders and athletic flexibility allows this to occur using the arm and upper body power to push the body up off the ground while maintaining the crouch position.*

Pic. 3: *As can be seen the body of the typically T&F tall and lean athlete has been rolled and pushed back over the hands to maintain the 'crouch' power position. The top of the head is now at the point of the elbows in pic. 2. Note the lead foot has remained 'pinned' to the line as the turning foot is brought up under the body as it moves back and over the turning foot toward the flag.*

Pic. 4: *The turning foot has been placed centrally (see central line) to allow for a balanced 'sprint' start position after completion of the turning phase.*

Pic. 5: *At the completion of the turn the athlete is now in the classic sprinters block start position just after the gun goes off. The arms are moving into position to assist with drive out of the crouch start position and both legs, rear and front, are poised to deliver progressive drive harnessing power from the gluteus, hamstrings, quadriceps and calf's, from a well balanced and firmly controlled position on the line.*

As seen below the centralised foot placement allows for a sprint start aimed directly at the flag providing the straightest direction toward the flag.

9. Summary

It must be remembered by the coach that when taking a trained athlete from another discipline and adapting their styles and skills they are learning new things that for them will be exciting and challenging. For the best results feedback is essential to these athletes, Feedback as in all coaching involves:

- Intrinsic feedback (the athletes muscle memory and feeling)
- Extrinsic Feedback (observations and instructions from the coach)
- Positive and Negative feedback (knowledge of the results of the training, success or failure)

It is important that the athlete develops intrinsic feedback so they can think for themselves; self correct and become more independent as they move through the learning stages.

Recruitment of track and field athletes can only be a positive effect for both clubs specifically and the sport in general. Active coaches are already doing this very successfully; unfortunately not enough coaches understand, are able, or prepared to involve themselves with moving out into another sport. It needs to be understood that recruiting is not poaching. We should not seek to take athletes from Track & Field into Life Saving never to return. It is eminently possible to co exist to the benefits of all, including the athletic clubs. Many clubs have an oversupply of members and little in the way of facilities, especially social and training events and facilities to house award nights and other club functions.

Life Saving clubs on the other hand often are scraping for members and have an oversupply of facilities, social functions and outings, Track & Field Parents would view carnivals as social outings with some sport thrown in. Athletic clubs have a supply of coaches that can be used to assist traditional beach and even water competitors and are open to synergistic arrangements with other clubs and sports in an effort to retain and develop their athletes. All that is needed is for coaches and clubs to close the gap is embracing the goals of each other. A commitment to interact with other sports especially athletics is all it takes in many cases, as you will find many members of life saving clubs are already involved with the local little athletics clubs.

10. The profile of the perfect Track & Field Recruit

Age Group 12 - 15, by this age junior athletes may become disillusioned with the direction of their future. With little in the way of intermediate competition in Australia it is only the very elite level that will be in a position to make a clean transition from little athletics to senior athletics. At this age friendships are important and they will be looking for activities that will cater for their needs socially, as well as offering some competitive edge and interest. These athletes will come with experience, discipline, high skill levels and a professionalism, that if recognised and valued, will become infectious throughout the club.

Females in this age group are less aggressive than boys but require more nurturing and understanding from the coach. There are also some interesting challenges in keeping them focused. Males are more self-sufficient but require more supervisory attention from the coach as well as a fair measure of 'life' guidance. Early developers, those most likely to still be involved in elite T&F sport at this age, will provide rapid successes for the coach and club as they will bring outstanding skills and abilities and well advanced attitudes in comparison to the current competitors who may well spread their time with water and competition in beach events as something they 'have to do'.

In the Track & Field athlete the ideal recruit is a multi event athlete (a pentathlete at this age). Generally they will have exceptional coordination skills and have experience in using all their energy systems. They will be flexible and are able to be easily trained and adapted technically to high-level competition in a number of events. Because of the wide skill levels required for jumping, sprinting, hurdling, distance running and throwing they are also strong and exceptionally well skilled at making technical adaptations quickly and efficiently. In a club situation they will often possess additional sought after skill sets as many are also likely to be excellent swimmers and throwing strength development is readily adapted to board and paddling events.

Other sports providing recruiting opportunities are obviously swimmers, for those who are not at the top and fully committed to the sport look for swimmers that have a long training history. Swimmers with a substantial pre pubescent training history have very well developed aerobic energy systems that remain with them as a physiological adaptation for life. Other sports such as Hockey (Field), Water Polo, Basket Ball, Volley Ball and Tennis are areas worth exploring as all these require exceptional fitness, fast and sharp reflexes, very well developed fast twitch fibres and flexibility. These athletes are often usually tall, strong and disciplined because of the natural selection criteria for upper level competition in these sports, all of which tend to lack a good social base and all of which are suited to cross training on the beach.

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