Developing Physical Competence: the cornerstone of LTAD – Part One

Australia has, over the last quarter-century, 'punched above its weight' in the world of elite sports. Armed with an influential National Institute / Academy structure and a national desire to 'win', it has led the world in many aspects of comparable sporting endeavour. Just as other nations are focusing human, physical and financial resources towards their sporting continuum and expecting similar results, Australia is rapidly finding out that its strategy has ignored a limitation that continues to blight athlete development and, of course, impacts on elite performance issues.

Those who have paid attention to the theories of long term athlete development (LTAD) (Balyi, 1999) will admit that little is being done to effectively integrate these theories into the national psyche or indeed the national sporting and education strategy. Available for more than a decade, the information provided by Balyi has given us the clearest indication of the relationship between maturation and sports performance.

Even with the best of intentions many development entities (Institutes, Academies, Clubs, Schools, Talent Squads etc.) continue to operate without any reference to the principles of LTAD. As recently as August 2005, after nearly a decade of work, Balyi made the following statements about the current situation in athlete development around the world.

"Young developmental players under-train and over-compete"
"Adult competition schedules are imposed on young players"
"Adult training programs are imposed on young players"
"General motor skills are not learned before age 11 for females and 12 for males"
"Training is geared for outcomes and not for 'process' for the developmental players"
(Balyi, 2005)

After scores of presentations, conversations and email exchanges on this subject with practitioners and administrators both in Australia and around the world, I had initially been heartened by the common reply, "Yes, we do LTAD, we have a plan". In reality, when looking behind this façade of acceptance, we actually see very little other than a regurgitation of Balyi's language and vocabulary. Accepting these theories is a 'must' and we should all be thankful for their existence but unless we form a practical, functional plan at the coaching end of the spectrum we will continue to flounder.

A typical LTAD plan on the internet usually includes some reference to the training stages as outlined by Balyi. The 'Fundamental' stage of training is usually described as:

> *"...FUN with the emphasis on basic movement literacy and fundamental movement skills."*

Simply stating *"…emphasis on basic movement literacy and fundamental movement skills"* does little to arm the coach with specific practical information for the next training session. In fact, the coach is still left with questions such as, …What is the current physical competence of my athlete? What exercises should I choose for the athlete with a limited training age? How do I develop 'total structural strength', 'total structural stability' and 'total structural flexibility' as this 'physical literacy' is pursued? What physical competence does my athlete need to carry out the sports-specific skills effectively and consistently?

The issue facing the world is how to colour in these theories with practical, exercise-based decisions for the developing athlete. Understanding the theory is fine but we still don't have the tools to express these theories in actual training activities. What is needed, alongside plans and strategies, is a progressive exercise syllabus that transports the developing athlete along a coordinated pathway of attainment towards the required structural strength, stability and flexibility. It needs to be a scheme that can be integrated with technical and tactical development and at the same time give the athlete an exercise starting point and a comprehensive exercise journey. This journey should reflect the individual training age of the athlete and relate directly to their unique requirements.

The central issue is that all skill learning requires that physical competence be present and that this competence be expressed as "efficiency of movement throughout the entire kinetic chain regardless of the skill being executed" (Giles, 2000). This is often described as 'all-round athleticism' or 'physical literacy' and should form the cornerstone to the progressive development of the athlete. Running, jumping, throwing, kicking, catching and hitting activities require the body to express force, reduce force and retain stability (often multi-directional and multi-plane) in a precise, sequenced manner throughout the activity. For

example, as the young athlete encounters running drills in the shape of the 'Mach' series they will have to provide certain physical qualities to execute the drills correctly. Their ankle, hamstring and hip flexibility will be placed under scrutiny as they attempt to copy the demonstration given by the coach. Their ability to hold the 'Tall Hips' position will demand that they have the required hip extension and stability capability, some degree of single-leg strength and gluteus activation to call upon. Their upper body posture will demand a high degree of trunk stability if they are to remain in the correct stance. It would seem sensible to create competence in these areas before attempting to apply them to the running drills.

Simply repeating a skill without this physical competence will not only slow skill acquisition down but may see the development of unwanted compensatory movements as the body struggles to find the physical answers to the task. This is particularly relevant during the adolescent period when the athlete goes through considerable cognitive and emotional changes. Add these changes to the ever-complex bio-motor development and skill learning may well falter.

Understanding the relationship between physical competence and skill development is crucial if the coach is to establish a progressive pathway for the athlete. The essence of this model is to keep the physical competence developing just ahead of the skills being executed at each training stage. In this way the athlete will always have an available efficiency of movement to impart to the skills as they become more complex or as they are executed more intensively. Precise technique, permanently embedded in muscle memory, able to withstand the effects of speed and fatigue, must be the aim of the program.

> ***You must have the physical competence to do the technical stuff and the technical qualities to do the tactical stuff…in that order. Movement Dynamics, 2005***

As we enter the second half of this first decade of the new millennium many organisations at different layers of the sporting continuum around the world appear oblivious to the limitations born of their athlete's lack of physical competence. Physical literacy or 'movement vocabulary' is a priority in the development of the young athlete yet its omission causes repercussions throughout the athlete's life. The chase for skill, speed, strength, power, agility and endurance dominates the coaching plan as the crusade for 'a winner at all ages' continues. Trying to find 'a winner at all ages' is the main limitation of current strategies. Vital functional development is missed when this plan is pursued. The eradication of all limitations to future elite performance must take place. Many lower limb injuries / disorders can be reduced / controlled by a sound functional development program. Many techniques are fragile due to unacceptable limitations in function. All these functional and athletic qualities should be developed by following a sequence clearly associated with maturation.

Whether the aim is repeatable excellence or ongoing participation at a recreational level, the athlete's development plan must contain a model that eradicates the limitations to future performance. Too often a limitation secured in the developmental stages raises its head at the most inopportune time in the athlete's career. At the senior level of elite performance, the occurrence of injury or the failure of a skill under pressure can often be traced back to a mismanaged developmental stage.

During my work inside Australia's State Institute and State Academy network and during my duties in talent recruitment in professional football, it became clear that recruits, as well as existing scholarship holders already in national teams, were presenting with limitations in physical competence. After conducting the Movement Dynamics Physical Competence screening alongside the standard physiotherapy screening it became obvious that *"Athletes in their mid to late-teens are presenting with increasing limitations in their Athletic, Functional and Training Development." (Movement Dynamics, 2005)*

The limitations

The extensive testing undertaken with the developing athlete over the last decade has allowed us to rank order the limitations in order of their importance to the training scheme. **Flexibility**, or lack thereof, ranks number one on the list and is described as the limitation with the greatest negative influence on progress across all exercise streams and progressions. For the field and court athlete there is no greater impediment than poor running mechanics and the lack of functional flexibility, particularly in the anterior and posterior hip areas, is proving to be catastrophic in both injury prevention and performance production in running activities.

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The second culprit is the limitation of an **inefficient running action** for both acceleration and maximum velocity. Heavily influenced by the flexibility limitation this facet of the required physical qualities also impedes the development of agility and running endurance due to the lack of running efficiency.

Third on the list is the **lack of ability in force reduction** as illustrated in the athlete's lack of ability to land efficiently during jumping activities or 'brake' during change of direction work or simply control the forces accrued and experienced in their sports-specific actions and postures. With 'force production' having the upper hand in strength training, at the expense of 'force reduction' and 'force stabilisation', it is highly recommended that the coach consider the following scheme:

> ***Exercise selection and progression must see force production, force reduction and force stabilisation developed via multi-joint, multi-direction and multi-plane activities. (Movement Dynamics, 2005)***

Fourth ranked limitation is a more generic one and can be described as **poor** e**xercise technique**. Across all exercises seen in the screening battery and also those exercises chosen for inclusion in the training program that are not in the test battery, the quality of movement and control is poor. For example, the simple push-up has vital coaching points that simply must be executed if the pushing aspect of the exercise is to be effective within the entire kinetic chain. Another classic limitation that is actually compounded by coaches is seen in the simple squat movement. When hip mechanics or, more importantly, ankle range is limited one often sees the heels coming off the ground as the athlete nears the 'parallel thigh' position. What is the typical response to this situation?.....raise the heels onto blocks! By doing this we are ignoring the cause of the problem and allowing the athlete to progress along the physical performance pathway with a permanent limitation. Many other exercises suffer the same disfigurement during the formative years as coaches employ the 'circuit training' type of session. The athletes are invariably told to work within a time limit and invariably rush through their technique. They simply repeat poor technique at speed with stability and control non-existent. As a guide, coaches should consider the following mantra when selecting the training type:

> ***Think – static to dynamic, slow to fast, simple to complex, unloaded to loaded as the prime tools of progression (Movement Dynamics, 2005)***

Tables 1 and 2 illustrate limitations in Athletic and Functional development of both male and female athletes in their early to mid-teens. A proportion of the tests conducted on the 14-16-year-old athletes were applied to senior professional players for comparison (Table 3). Relative to the database assembled over the last 10 years of screening, the expectation is for the athlete in question, junior or senior, to be able to score 5 across all variables.

Table 1 ~ Results of a 20 test battery of Athletic Competence in 117 14-16-year-old athletes in Field and Court sports.

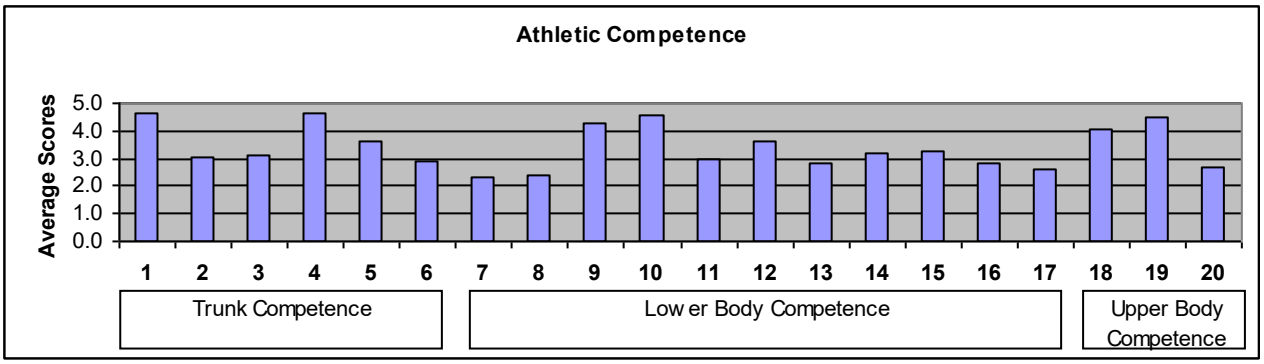


Table 2 ~ Results of a 17 test battery for Functional Competence in 117 14-16-year-old Athletes in Field and Court sports

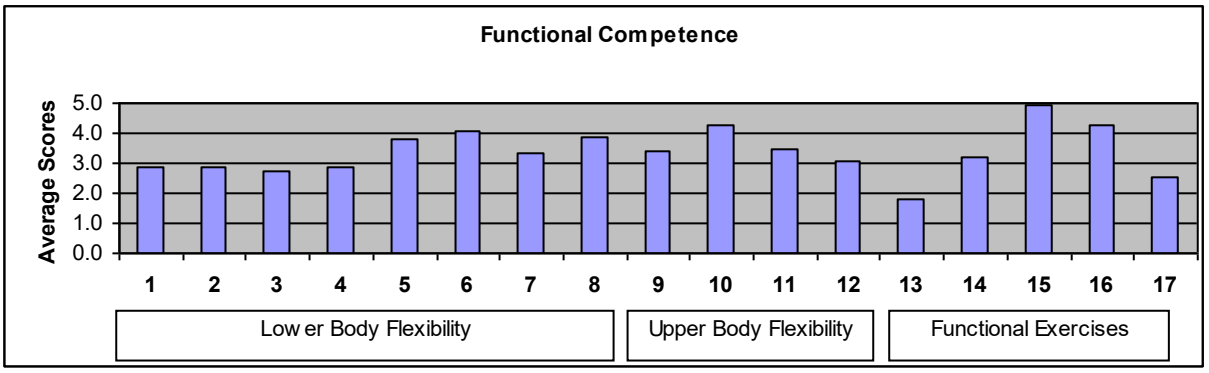
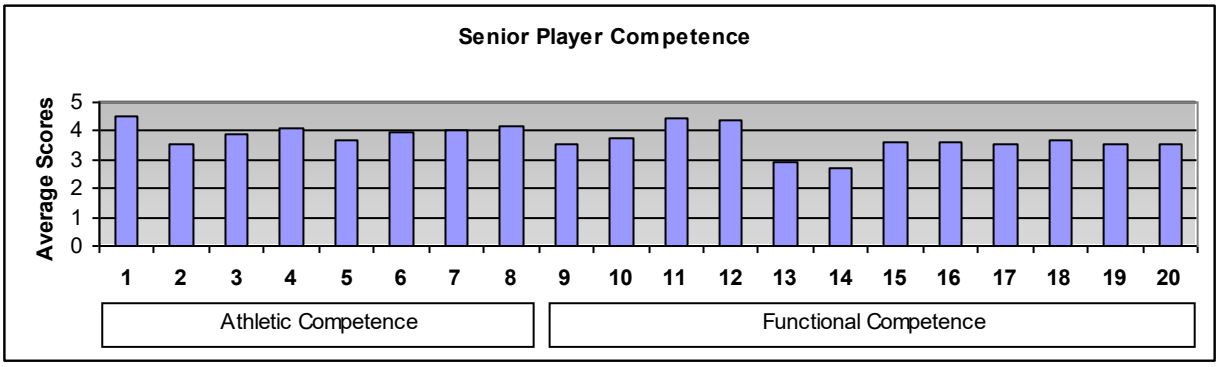


Table 3 ~ Results of a 20 test battery of Athletic and Functional Competence in twenty-five 18-32-year-old male professional football players.



Results from the Movement Dynamics test battery indicates that the senior players are also operating with a series of athletic and functional limitations. It can be assumed that the limitations seen at the senior level are established early in the career of the player and never eradicated.

Balyi's reference to 'adult training programs being imposed on young athletes' is, in my experience, true. The problem of this watered-down adult training bias is usually one of choice where the coach capitulates to the desire for immediate results and appeases the modern 'fast-tracking' approach. The desire for outcomes rather than process in the early stages of an athlete's development creates this unfortunate environment. It can also be argued that this emphasis is caused by the limited knowledge base of the coach concerned. With most early level coach education courses highlighting sports-specific skill and the components of competition it is unlikely that the coach will have the knowledge to investigate the development of 'physical literacy'. Little is done to arm the coach with the knowledge of how to develop the required physical qualities to carry out these sports-specific skills. We are left with a biased program of competition and sport-specific skills and little else.

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Those athletes that do make the transition from junior to senior participation are likely to have suffered from this 'fast tracking' and take with them severe limitations to ongoing performance improvement. With size and early maturation being the dominant factor in performance in the early teens it is not helpful to concentrate on these outcomes. The cultural shift required is a considerable one and it must be seen as a strategic issue for all NGB's who wish to improve the lot of the developing athlete.

When tests are conducted to assist talent identification we see the 10/40m speed test, the Vertical Jump and the "Beep" test predominating. Little is done to evaluate the movement efficiency of the athlete, a vital component in the execution of these tests. Maximum strength values are still used as a measure of success with the developing age athlete even at the Training to Train stage and exercises that give us force production appear, wrongly, to be more attractive than those that train function. In recent times a S&C coach at a local High School broadcast the fact that a number of his 15-year-old athletes had gained entry to the "350 Club" where their maximum strength in Squat, Bench Press and Deadlift were assessed. What of their functional ability? What about their physical literacy?

> ***…exercises that give us force production appear, wrongly, to be more attractive than those that give us function.***

Coaches are implored to 'get the basics right'. Establishing what the basics are is the purpose of this article. "Physical literacy', a 'movement vocabulary', 'physical competence' are the cornerstones to a positive journey in athletic, functional and training development.

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Developing Physical Competence: the cornerstone of LTAD – part two

Where do we go from here?

The first step is to recognize that we do not have a 'world's best practice' environment for the developing athlete. This limitation demands that we review our coach education to ensure that we not only have coaches who understand the theory of LTAD but coaches who are also able to deliver best practice at each stage of development. Coupled with this is the vital area of competition throughout the developmental stages. We would do better if the emphasis were placed on developmental characteristics rather than results in the arena. Both can exist but not with the current over-emphasis on 'winners at all ages'.

Pleasingly the Australian Rugby Union has adapted the recommended principles to their National Talent Squad (NTS) (14-17 years) and their Academy Squad (17-21 years). The strength and conditioning coaches associated with this squad are charged with eliminating the athletic, functional and training shortcomings that currently exist. The ARU Skill Coaches work to integrate the skill qualities with this emphasis in mind. Both the players and the coaches are assessed on the ability to eradicate the limitations in a two year period. The intention is for the players to enter their next stage of development (Academy – 17-21 years) with high levels of 'physical literacy' combined with skills at the repeatable excellence level.

The ARU has approached the schools system to ask for their assistance in developing the required physical qualities alongside their inevitable quest for trophies. It is at this junction of outcomes and process that the greatest investment is required. The request to schools is that they try to achieve a minimum of Level 3 across all competencies by the time the player enters the NTS system. This, although being a reasonable start to the journey to 'physical literacy', is still a compromise and we would do well to have legislation in place that does more than 'coax' schools to assuming their responsibilities.

Continuing the strong reference to the professional sporting environment we can turn to the Brisbane Broncos Rugby League Club for a further illustration of an integrated player recruitment system. Upgrading their elite player development process to embrace the concepts of physical competence, the Broncos have commenced a series of key partnerships with the schools systems. Investing in the 'generation yet to come', they have resourced these key stages with quality personnel and coach education resources.

Just as literacy and numeracy are the cornerstone of our children's early education format, so 'physical competence' should assume its rightful place. Success in sport is but one outcome of a successful strategy in this development issue. One can also see the benefit to the overall community if we have a generation of young people entering their adulthood with a sound musculo-skeletal system. A recent study in the UK (CIPD, 2005) indicated that nearly 56% of absence from the workplace was caused by musculo-skeletal disorders. This causes an unnecessary burden on both the financial and health sectors of our community.

Where to start?

As with all quality coaching one needs to consider both the start and destination of the journey. It is strongly suggested that the journey commence with a thorough screening to determine the individual status of each young athlete. The developing athlete deserves some individual instruction along the way and assessing their physical status should form the first step of the journey. The principles of maturation clearly guide us to the fact that all children will present at differing stages of development within a certain training stage. Just because a group of children are chronologically in the same age group does not necessarily mean that they are all at the same stage of maturation. There can easily be a four year difference in the physical, emotional and cognitive development of individuals in the same chronological age group.

The Movement Dynamics screening process establishes a relationship between the clinical physiotherapy screening and the results of both Athletic and Functional competence tests. The process sees the Athletic and Functional tests being conducted first with the results being forwarded to the physiotherapist. The limitations seen in the Athletic and Functional tests act as a guide to the physiotherapist as they conduct

their screening. In the majority of physiotherapy screening the following comments predominate for the mid / lower body:

- "Concern about lumbar spine control and Lower limb mechanics'.
- "Poor recruitment and control of gluteals'.
- 'Poor hip / lumbar dissociation'.

As an example these limitations are listed as:

- Gluteus Maximus activation and tightness
- Gluteus Medius activation and tightness
- ITB tightness
- Limitations in ankle range
- Pelvic / lumbar instability
- Lower back pain
- Hip Flexor tightness
- Low slump test scores
- Limited VMO recruitment

These issues correlate with the low scores seen in the Movement Dynamics exercise screening process. The physiotherapy screening highlights the technical flaws seen in the thoracic, lumbar, hip, knee and ankle chain during the following exercises:

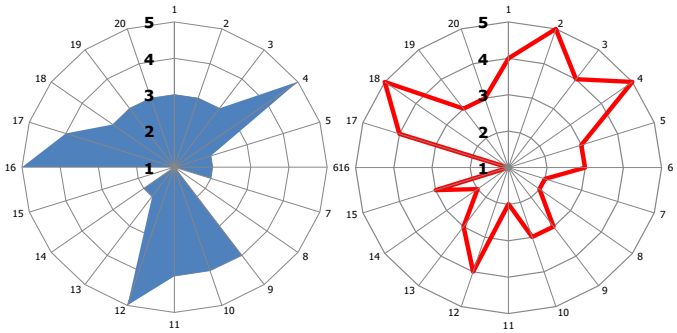
- Bodyweight Squat
- Overhead Squat
- Lunge series
- Single Leg Squat
- Forward and Lateral Hop and Stick routines
- Trunk Extension endurance
- Trunk Flexion endurance
- Horizontal Bridging series
- Push Up series
- Static and dynamic balance activities
- Step Up series

When one associates the listed exercises with the sports specific skills that are being taught it is likely that skill development will be limited due to the lack of physical competence. Running, Jumping and Kicking activities, for example, will be severely impeded if the physical limitations are allowed to influence learning.

This clinical and functional evidence should warn us that the physical competence of the athletes is limited. The decisions to be made are coaching ones and the coach must be able to set out an exercise prescription that allows these limitations to be eradicated.

Table 4 illustrates the difference in physical attainment of two players of the same chronological age after screening them using the Movement Dynamics Competence test battery.

Table 4 ~ Player A & B – Athletic and Functional test results



Is the same program suitable for both players?

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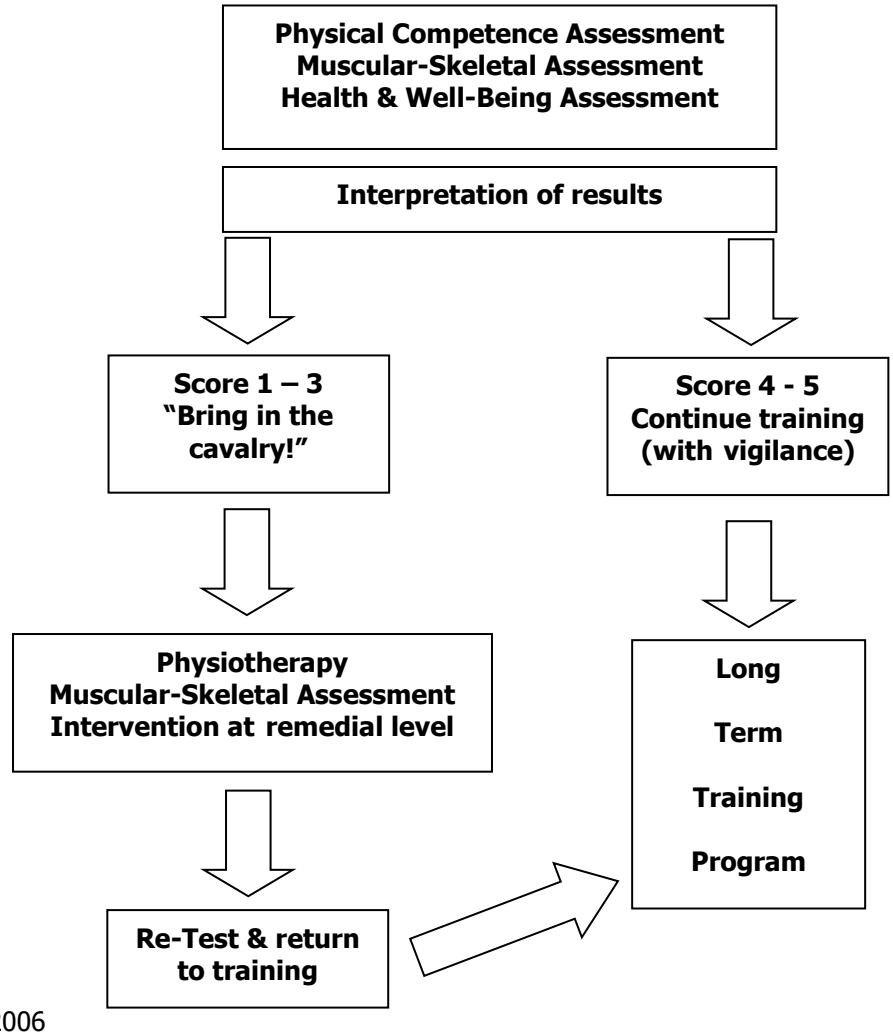
Exercise selection for each of these players is obviously going to be very different as each of them is showing deficiencies across varying elements of the competence continuum.

The intervention process is a relatively simple for all concerned and is only limited by the knowledge and experience of the practitioners involved in the process.

- Score low (1 – 3) and Sports Medicine intervene.
- Score satisfactorily (4 – 5) and Athletic Development can continue (with vigilance, especially around Peak Height Velocity (PHV).

Fig. 1 ~ The Integrated Approach



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Exercise selection

Exercise Selection:
"Find it, activate it, and then apply it".

One glaring omission from coach education modules is the sound understanding of the complexity and relationship of individual exercises and exercise groups as they influence physical literacy. Understanding exercise integration and effect will go a long way to assisting the coach in providing exercises in the correct order. When a lack of competence is established after screening, the coach is faced with the task of eradicating this limitation. Where does he or she start? For example, if a limitation is observed in the simple squat movement (triple flexion / extension) what exercise is suitable as a starting point for the athlete? What are the main coaching points of this exercise? How does the coach progress this introductory exercise? In the case of the aforementioned trunk / lumbar / hip / knee and ankle chain limitations the coach may well approach the problem using the 'find it, activate it, and then apply it' plan:

Example:

'Find it' / 'Activate it' – static Gluteus Maximus / Gluteus Minimus contractions, leading to mini-band exercises.
'Apply it' – single leg squat stance exercises, early lunge exercises.

As an example, Table 6 illustrates the journey of physical competence that must be undertaken before the advanced skills of 'speed agility and quickness' are contemplated.

With acceleration and agility being high on the 'wish list' for most coaches of field and court coaches it is likely that a commitment will be made to these qualities. It often needs to be explained that unless the early windows of opportunity for speed and agility development have taken place (Fundamental, Training to Train stages) progress may well be slow. From a physical competence viewpoint speed and agility development is dependent upon a commitment to the underpinning qualities, as outlined in Table 6, before the specific work can be satisfactorily undertaken. Failure to develop these underpinning qualities can lead to inefficiency in the traits being sought.

Table 6 ~ The building blocks of acceleration and agility (Movement Dynamics, 2005)

Agility & Acceleration (SAQ®type)

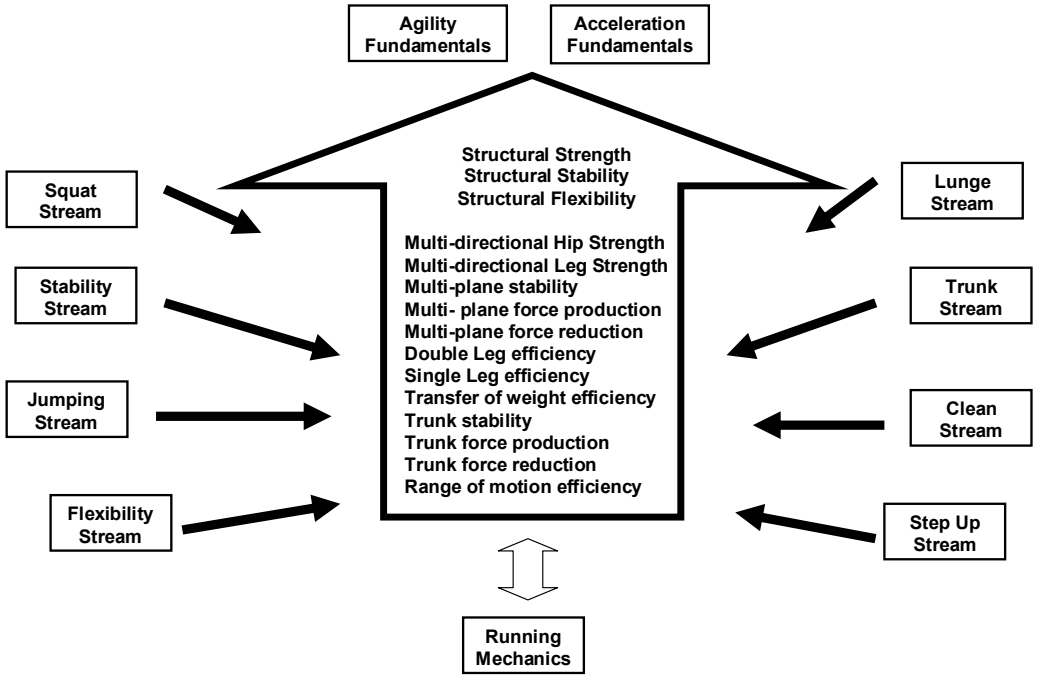


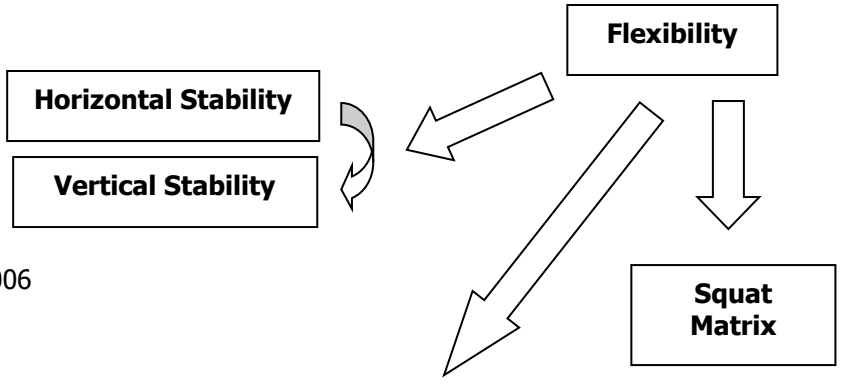
Table 6 illustrates the progressive process required to arrive at a point where activities such as the Speed, Agility and Quickness (SAQ®) system can be attempted. There is a deal of physical competence development required before any of the exercises contained in the SAQ® plan can be attempted with any degree of effectiveness.

By developing competence in Total Structural Strength, Total Structural Stability, Total Structural Flexibility and Total Body Awareness the athlete will gain the qualities outlined in the diagram i.e. multi-directional hip strength, multi-directional leg strength, multi-plane force production etc. These components of agility and acceleration are derived from a sustained adaptation across several integrated exercise streams i.e. Jumping stream, Step Up stream, etc. These exercise streams are described by Movement Dynamics as progressive exercises that follow the process of 'simple to complex', 'slow to fast', static to dynamic', unloaded to loaded'.

Together these physical competence attributes are used to explore the fundamentals of Agility and Acceleration models. Finally all these competencies and physical properties are applied in the SAQ® type of exercise plan now with some degree of effectiveness.

This example of exercise stream integration illustrates one of the required tools of the coach who has to consider how to develop physical competence in the athlete. It is recommended that thought is given to reviewing the education process of all coaches involved in strength and conditioning. No longer is it sufficient to expound the virtues of the "2nd Pull" or "speed, agility and quickness" or other advanced concepts of training without the physical literacy / physical competence to support them. Table 7 illustrates the journey that starts with exercises that are generic and slowly focuses in on the physical attributes required for Speed and Agility in a skill setting.

Table 7 ~ Integrating the exercise streams



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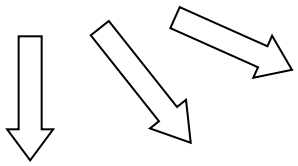

Strategic Issues

This development pathway is here to stay and it is quite reasonable to say that whoever gets the development process right will take the high ground. Not only will the end-product be an asset to the senior squad but in the fiscal world of transfers the product being offered will be of the highest quality. Gaining this high ground starts with 'questioning one's assumptions. The following are some questions that I put to organisations during an Operational review of their development pathway:

- Is it systematic and progressive?
- Is it 'best practice'?
- Does it cater for the variance in maturation rate?
- Are your human resources fully educated in all aspects of the player's development?
- Are they able to deliver what is necessary?
- How will you account for this professional development if required?
- Can you clearly ascertain the status of the player at each of their developmental stages?
- Is this process evidence based?
- Is the transition between development stages seamless?
- Are you developing the required Physical Competence one step ahead of technical development?

In many cases the first step is to recognize when the organisation does not have a 'world's best practice' environment for the developing player. This limitation demands that we review our coach recruitment and education to ensure that we not only have coaches who understand the theory of LTAD but coaches who are also able to deliver best practice at each stage of development. Coupled with this is the vital area of competition throughout the developmental stages. We would do better if the emphasis were placed on developmental characteristics rather than results in the arena. Both can exist but not with the current over-emphasis on 'winners at all ages'.

Following a full operational review one internationally renowned organisation has adapted the recommended principles to their 14-17 years development squad and their Academy Squad (17-21 years). The Athletic Development (S&C) coaches associated with this squad are charged with eliminating the athletic, functional and training shortcomings that currently exist. The organisations Skill / Tactical Coaches work to integrate the skill qualities with this emphasis in mind. Both the players and the coaches are assessed on the ability to eradicate the limitations in a two year period. The intention is for the players to enter their next stage of

development (Academy – 17-21 years) with high levels of 'physical literacy' combined with skills at the repeatable excellence level.

The process was not an easy one and took several years to assemble the required infrastructure in human, physical and financial terms. The first few years were devoted to a continuous 'upskilling' of all practitioners in the developmental pathway. This patient investment has created a pathway for both players and staff to reach their potential as well as securing long term resources for the good of the generations yet to come.

Just as literacy and numeracy are the cornerstone of our children's early education format, so 'physical competence' should assume its rightful place. Success in sport is but one outcome of a successful strategy in this development issue. One can also see the benefit to the overall community if we have a generation of young people entering their adulthood with a sound muscular-skeletal system. A recent study in the UK (CIPD, 2005) indicated that nearly 56% of absence from the workplace was caused by muscular-skeletal disorders. This causes an unnecessary burden on both the financial and health sectors of our community.

Conclusions

The ramifications of these issues are considerable with much responsibility falling on the shoulders of the decision-makers in both sport and education. For the educators there is the enormous responsibility of providing human, physical and financial resources towards the provision of a syllabus of 'physical literacy' development. As a parent I am somewhat satisfied with the available syllabus for developing my child's literacy and numeracy skills. The glaring omission is the lack of a syllabus for physical competence.

For the sporting community to make headway in this issue there needs to be a review of the development stages of the athlete to ensure the provision of 'best practice'. There are significant implications for the content of coach education courses and much can be done to establish a pattern of modules that allow the coach of the developmental age athlete the opportunity to develop a very sound understanding of these issues.

Professional sporting teams that operate Academies and other talent recruitment systems should also consider the difference between 'recruiting' a player and 'developing a player'. With the commercial aspect of professional sport impacting greatly on the performance decisions being made it is wise to consider a review of the practices currently in place within these organisations. It has been said that, 'whoever gets LTPD right in the professional sports will gain the high ground' (Giles, 2004). To shift the emphasis from recruitment to development will require a strategic response in terms of philosophy, infrastructure and human resources.

Those who oversee the extensive club environment of each sport would do well to consider the known theories of LTPD but, more importantly, how to implement them. Here, in the hub of the developmental world, lies the greatest opportunity for change. With a small population of only 20 million and a feverish competition between sports in the same limited talent pool, Australia may well need to question it's assumptions on athlete development.

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Movement Dynamics is a company headed by Kelvin Giles former UK National and Olympic Track & Field Coach, Inaugural Head Coach at the Australian Institute of Sport, Director of Performance for the Brisbane Broncos Rugby League Club, Director of Strength & Conditioning at the Queensland Academy of Sport and world renowned strategist on modern performance attainment models.

Coach to 14 Olympians he has developed the first progressive exercise system that transports athletes along the development continuum from the Fundamental Training Stage through to the Training to Win Stage. Experienced in operational reviews and infrastructure development for all layers of the sporting continuum he also consults with Coach Education entities worldwide and is adept at identifying and integrating the human, physical and financial resources necessary for change.