

Throwing – The Journey through Movement

This, again, is not an article as such but a sharing of some more of the discussions with my coaching colleagues worldwide from the sport of Track & Field Athletics. It starts with more discussion and illustrations of the role of movement in the whole scheme of things. Following this, some elements of Throwing events are highlighted as further illustrations of how movement development can become a major influence on outcomes. Use this series of ideas, thoughts and discussion points as they were first intended – to allow you individually or in groups to 'question your assumptions' on all the elements and layers of the events you are coaching. Put them on the table and discuss them, change them, alter the order they come in, change the analogies, re-prioritise them, make them better. Work out as many answers as you can because every athlete you will coach will adapt in a different way, at a different speed, in a different order of some components. There will be slow learners and faster learners, early maturers and later maturers, athletes with higher physical literacy and athletes with poorer mechanical and metabolic attributes. Question everything in a positive manner, none of this is personal and everyone can learn from everyone else – why? – because there is never only one way of doing anything. This exercise, and others like it, form the foundation for improving Coach and Coaching Development.

The aim is to spend more time on efficiency and progression and less time on limitations and problems.

More Background on Movement

During the ongoing discussions on Coach and Coaching Development over the last few years, there has been some deep mining of the information as the event specifics were considered. The reason for this specific examination was a simple one. While it is vital to know the answer to the question, 'Where are they now?', it is also vital to never lose sight of the destination of the journey. I have always suggested that from a mechanical (movement) perspective the final destination is the technical model (event-specific actions and postures) in the context of competition. Obviously, there are also situations where the end product is not high performance in competition but overall health and well-being for the participant. Regardless of the final destination, movement efficiency, consistency and resilience will play a major role.

If, and it is a very big 'if', there is to be a calculated shift towards a movement-based strategy to try to eradicate or at least reduce some of the prevailing limitations (inconsistent technical models, poorer physical literacy, increasing injuries, lower work capacity, etc.), the following figure (Fig.1) might be of interest as an overview.

A cornerstone point of view is that we, as coaches and teachers, need to see this movement pathway not as a linear, 'paint by numbers' process but a reservoir of colours with which to paint the most appropriate picture for the athlete. There is no such thing as an 'average' or 'normal' person. Individuality is the key to just about everything in the quest for progress and the sooner we approach the journey with flexibility and adaptability in our prescription for the athlete, the better.

"The fact that there is not a single, normal pathway for any type of human development (biological, mental, moral, or professional), forms the basis of the 3rd principle of individuality. There are many equally valid ways to reach the same outcome." Todd Rose – 'The End of Average'

Figure 1 illustrates the complexity of the movement palette and how the manipulation of the components can form the major building blocks for the event-specific journey about to unfold.

Fig.1 - The Pathway of a Movement Vocabulary

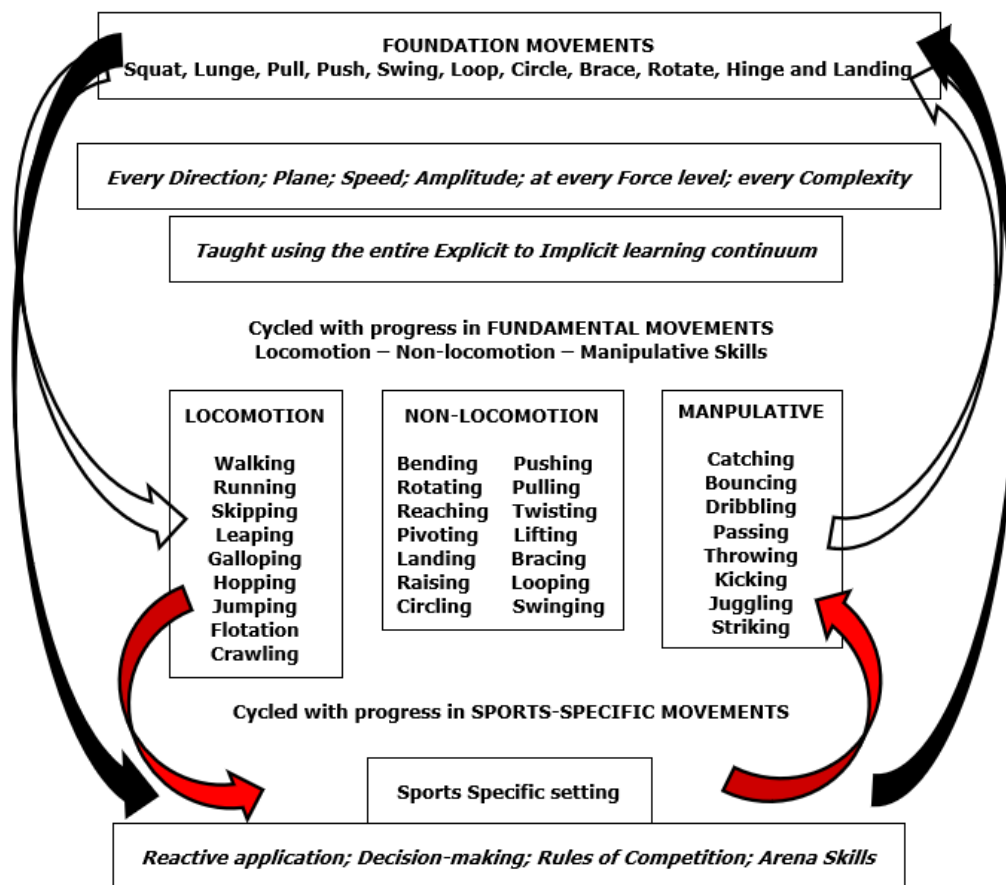


Fig 1 - There is continuous cycling between Foundation, Fundamental and Specific Movements. Only the emphasis on each alters. This emphasis is determined by the reaction of the athlete to the stimulus of the training session.

In the case of the movement palette, there is a never-ending cycling between the different layers of movements (Foundation, Fundamental and Sports-Specific) and we would do well to consider building mechanical efficiency, consistency and resilience in the broadest of terms before narrowing the focus to the sports-specific layer. In the early stages of the journey to physical well-being, there are many opportunities to enhance the sports-specific journey without actually spending too much time directly executing the exact postures and actions of the competitive technical model. The Foundation movements support the learning and progression of the Fundamental Movements just as they support the learning and progression of the Sports-Specific movements. The Fundamental Movements support and stimulate both the Foundation and Sports-Specific movements and so the jigsaw is slowly pieced together.

Fig.2

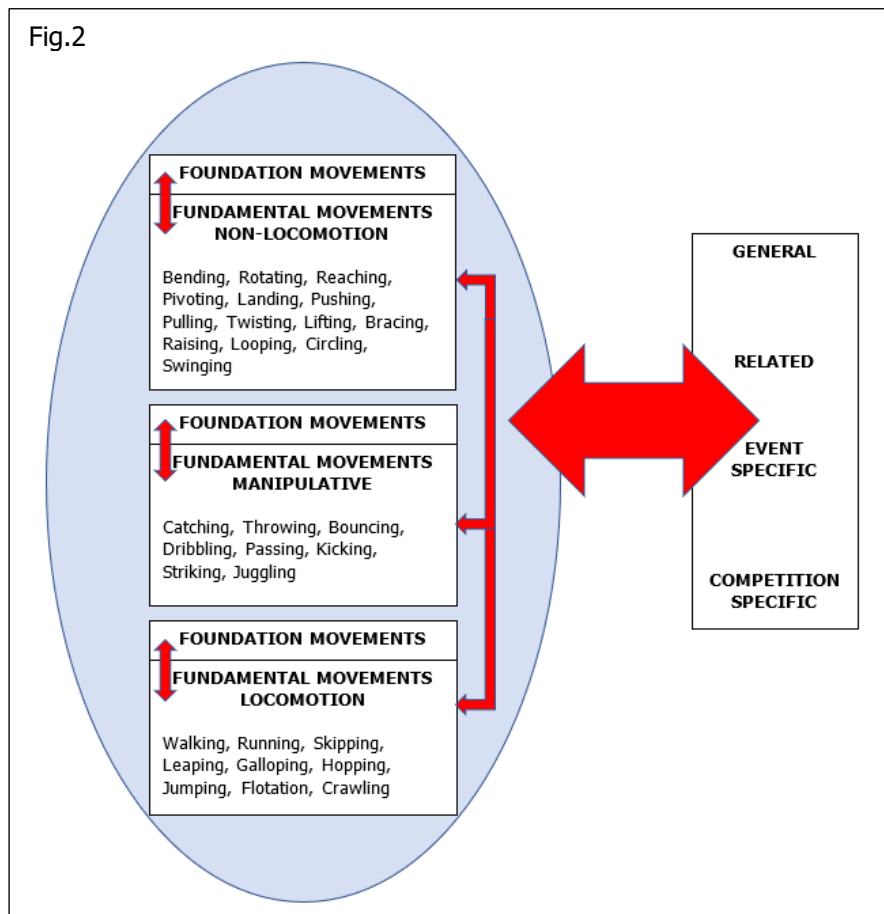


Fig.2 – Linking the Foundation and Fundamental Movements with each other.

The Foundation Movements of Squat, Lunge, Pull & Push (including Raise, Loop, Circle, Swing), Brace, Rotate, Hinge and Landing continuously cycle in and out of the Fundamental Movements as all progress along the General to Specific pathway. This is not, and never will be, a linear journey and progress can only be considered when the athlete has progressed from efficiency to consistency to resilience in each and every part of the journey.

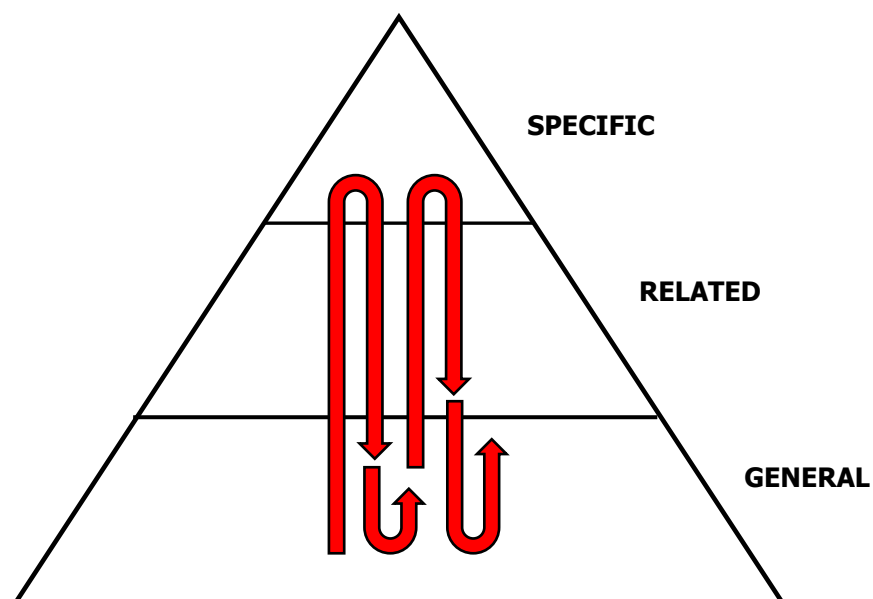


Fig.3 – Another view of the journey. Cycling through the G-R-S journey. A unique pathway is determined by the adaptation of the athlete to the tasks at hand. Typical of the early stages with an emphasis on General and Related but enough Specific to keep things in context.

When such a pathway is created each of the components should be easy to recognise in a weekly schedule as the coach assembles activities for each section. This examination or checklist is another means by which the coach can keep an eye on the balance of the program. All of the components seen on the left-hand side of Fig.2 need to appear regularly ('train all things, all the time') but the key coaching tool is how each of the components is emphasised at any given time. The balance between the Foundation movements and the three Fundamental movements (Locomotion, Non-Locomotion and Manipulative) is a coaching decision based upon the needs and adaptation rate of each individual athlete.

While it is suggested that all elements of Fig.2 are vital to the journey to adulthood for every child (multi-sport, multi-movement) it is likely that the chosen sport(s) might not include all of the listed components. For example, those embarking on a journey that has Cricket or Golf components might see a little more emphasis being placed on Striking movement patterns in the overall scheme of things. However, the longer one can include all the components of this movement vocabulary the better. There will be plenty of time in the mid to late teenage years for the 'specialisation' to occur and a narrower focus in activity selection.

Whether you are in an Athletics Club or a Golf Club or a Football Club environment the journey should look very similar in the early stages where the emphasis will be on a wide and deep movement vocabulary with a smattering of sports-specific included. Again, note that this is an 'emphasis' equation to be manipulated on a day-to-day basis.

The wonderful part of this type of journey is that no one should ever be stuck at a certain point. Whenever progress is stalled (and it will be as the learning process demands finding solutions to problems) in one element so another challenge can be created to find the answer. For example, if the basic Lunge movement (triple flexion & extension) is not progressing well then it can be faced in another environment as part of the learning process. Putting the Lunge puzzle into another situation can often create a breakthrough such as using Leap and Land activities, Step-Up activities, Skipping for distance activities, Stepping and Pushing activities, Split-position Medicine ball Throws, etc.

With Foundation movement, Fundamental movement and Sports-specific movement toolboxes in the coach's possession and each containing scores of progressive activities, it is likely that the learning environment can be effective no matter what the interpretation by the individual athlete.

On the other hand, if the only tool you have is a hammer then everything looks like a nail.
Maslow, 1966

Continuing the Discussion – Track & Field Athletics

While these broad arguments continue to be examined and practical processes sought to move from the theory to direct practice during the session, so the specifics of the sport have their time in the sun. This piece of 'sharing' arises from the ongoing chats with fellow Throws coaches. The following information is but a small part of the healthy brainstorming taking place so not all the illustrations are contained here. For example, one element of the technique for Shot and Discus is listed here (Figs.6 to 15) as a means of showing the link between technical development and movement development – in this case, the landing of the foot prior to the throwing stance and the acceleration of the Hip into the throwing action.

Throwing Actions

Let me use another example of how this 'movement' theme can cross all sorts of elements and learning environments. Figs.4 and 5 illustrate the links between different movement patterns and some or all of the Throwing events.

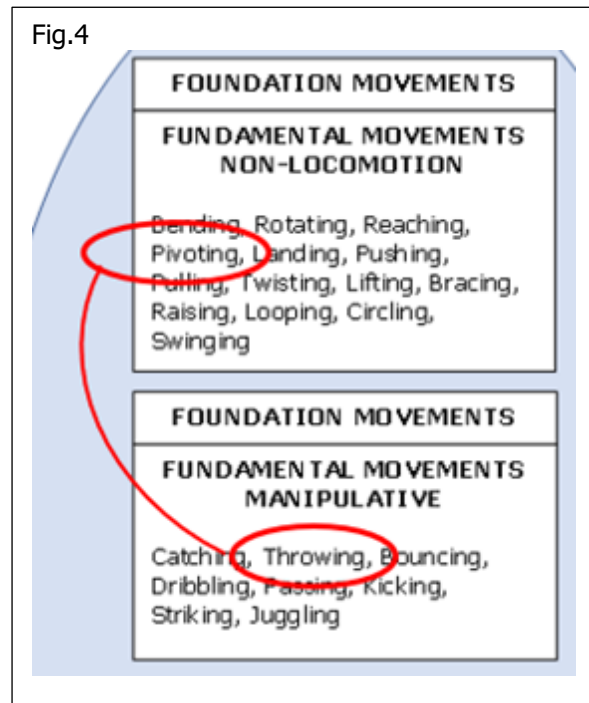


Fig.4 – The link from Pivoting to Throwing

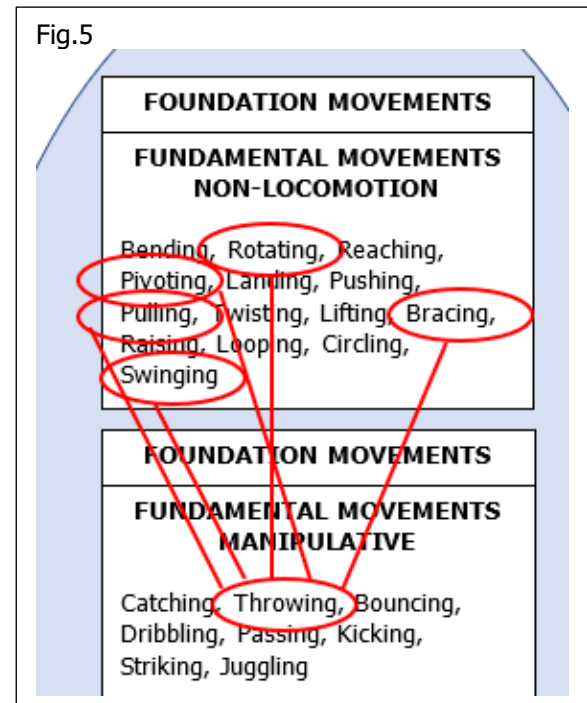


Fig.5 – Multiple links to Discus Throwing

An Illustration

In the Throwing events of Shot, Discus, Hammer and Javelin throwing I see time and time again a certain foot placement and action causing many problems to each of the throws. One of the Keystones for the right-handed thrower is to be able to pivot or rotate (see Fig.4) on the right foot so as to present the right knee in the direction of the throw and accelerate the right-hip forward and up. This means landing with the foot in an appropriate position and with the heel free to start the pivoting / rotating action to get the right-hand side to lead the force transfer through the hips and beyond.

In the Glide Shot Put and Javelin events, the right foot often lands quite flat before the pivoting action gets it moving. In the rotational Shot Put and Discus landings, it is usual to see the heel remaining further off the ground as a means of increasing the speed of rotation. Regardless of these event-specific idiosyncrasies, the key is to arrive with the foot in an appropriate place, at an appropriate time, and relative to what needs to happen next (the transfer of forces all the way to the release).

Interesting to discuss whether the 'Heel Out' action is a consequence of other actions or also a 'cue' to help the other actions. I have found it useful to use the 'Heel out' cue to trigger a more effective hip drive as well as seeing it as a result of good hip drive. I am not smart enough to solve this equation – both ways work for me.

Fig.6 – Glide Shot Put - Examples of 'appropriate position' of the right foot. Note the 'Chin, Knee, Foot' alignment. The Heel, Knee and Hip journey has started!



Fig.7 – Glide Shot Put - Examples of this 'active' right foot as it keeps moving. Done correctly it will keep the Knee trying to stay ahead of the upper body action.



Fig.8 - Rotational Shot Put – Right Heel stays high throughout the pivot and keeps moving. Note Crouser's 'Heel out' before the shot is finally released. The hip and heel journey have been optimised!



Fig.9 - Discus – Right Heel stays high throughout the pivot and keeps moving the Hips ahead of the Trunk - ahead of the Shoulder - ahead of the Arm. (the mighty Sandra Perkovic)



Fig.10 - Javelin – Foot landing is generally between 90° to 45° to the direction of the throw - Aligns Knee in direction of throw - Foot keeps moving and drives knee; knee keeps moving drives hip forward. Trunk and Shoulder and Arm delay behind this Hip drive creating 'torque'. Hip drive sees rear heel turning outwards well before release.



If this complex pattern is timed correctly the forces will travel from the floor, through the ankle, knee and hip in a way that **leads** the actions of the still 'wound-up' trunk, shoulder and throwing arm. This timing, in turn, creates a form of 'torque' between the lower body and upper body and can be equated to a stretch-shortening cycle or storage of elastic energy between the two parts. This is often analogised as the 'make a bow' action of most throws. Maybe there is a slightly different description / interpretation for the Hammer throw but there is still a late arm action compared to the Hip drive and extension taking place in the legs and trunk before the arms are brought in.

Fig.11 - The 'Bow'.



The action / force starts at the floor, moves through the ankle and lower leg, through the rotating knee and into the rotating and climbing hip region – all the time while the trunk, throwing shoulder and arm remain delayed as they wait for the 'torque' to be set up. When the shoulder and throwing arm can wait no longer they are released in a whiplash effort into the delivery. In the world of Golf, using the Golf Biodynamics software, this delay is measured and its existence (known as 'lag') signifies a well-executed Golf swing. If it does not exist then it can be described as a severe 'energy leak' in the action.

Should this progressive journey and transfer of forces have a poor start in terms of the placement of the foot and/or the subsequent coordination of the energy transfer from floor to foot to knee to hip, there will likely be massive energy leakage, force transfer failure, and premature action of the throwing shoulder and arm. Here we are, again, dealing with the coaching skills of understanding consequences. If the movement pattern in its simplest form sees actions and postures occurring at the right time, in the right place with the right amount of force the chances are that it will be efficient. Once this accuracy becomes consistent the pattern can be promoted in complexity or amplitude or speed or intensity or all of these. The key is to choose the task that has the least chance of failure with which to start the journey (the simplest form).

The Trunk, Shoulder and Arm will quickly gain the upper hand as the lower limbs fail in their duty and the entire pathway from toenails to fingernails will be compromised.

Here are some examples of such a 'poor start' to the pathway.

Fig.12- Glide Shot Put – Foot landing on heel and facing backwards. Right-foot stays inactive. Right foot and Heel overtaken by Trunk, Shoulder and Hand action.



Fig.13 - Glide Shot Put – Foot landing on heel and facing backwards. Stays inactive. Trunk, Shoulder and Hand leading the action.



Fig.14 - Glide Shot Put – Nearly there! Right foot facing backwards, Heel hard to the floor. Trunk moves significantly yet right foot and right knee are falling further behind. Arm action commences before legs can deliver their force to the hips and trunk.



*Fig.15 'Lag', 'Delay',
'Torque'*



Fig.15 – 12-year-old with a major movement vocabulary journey behind her. Not much left to do with the Legs and Hips – 'Torque' has been set up; arm can take advantage of all that has gone before.

To allow these patterns to unfold it is vital that nothing gets in the way to stop them happening or slow them down or alter the sequence of force transfer from the toes to the fingernails.

Movement Vocabulary

So where does the movement vocabulary come into the equation? Running, rotating or gliding onto a single leg landing; then rotating one side forward into a split stance; doing this while delaying rotation with the trunk and shoulders; doing this while holding an implement, is a very complex movement pattern. It is made up of hundreds of related and coordinated connections from toenails to fingernails. It sees different directions, speeds, planes and amplitudes being coordinated into a sequence that ends with the throwing hand(s) moving at optimal speed in the right direction.

The argument is this. By building up an array of movement competencies that are generally associated, relatively associated and specifically associated with the desired competition-specific action, the learning journey is enhanced. All the components and segments of the desired movement that are experienced along the way, with differing levels of association, can be recalled and utilised as positive building blocks to the throwing action being learned.

"The key to accelerating a player's rate of DEVELOPMENT is to accelerate the player's rate of LEARNING." Wayne Goldsmith

In a nutshell, if all they ever experience is grip, stance and throw tasks (movement patterns) then the learning journey is going to be long and arduous. If they can recall a host of general, related and specific movement solutions, previously learned and stored, then the new tasks will be a little easier to learn.

Thus, the permanent interplay between new motor routines and those stored in long-term memory explains that motor memory can be both robust to maintain persistent motor routines over time or adaptto create new routines (Tallet, 2012)

Motor representations are formed and stored in the brain, just like our memories of people and events. (Harland, Stapp, & Sainberg, 2019)

Similar contexts and tasks benefit from similar solutions. (Clearfield, Diedrich, Smith, & Thelen, 2006)

The brain is able to store, protect and reactivate this memory, quickly instructing the muscles to perform the task so that it can be performed seemingly without thinking. (Howard, Wolpert & Franklin, 2015)

The researchers believe it's due to something called reconsolidation, which is a process whereby existing memories are recalled and modified with new knowledge. (Wymbs, Bastian, & Celnik, 2016)

If the throwing activity demands that the athlete be competent in Lunge, Single-Leg landing, Pivoting, Hip Extension, Dynamic Split Stance, Bracing, Rotating, Bending, Pushing, Swinging, Slinging, and all the hybrids and connections of them all – why not give them the tools to do this? Why not build a vocabulary of answers to all the puzzles that their sports-specific journey will confront them with?

For example, the Discus and Rotational Shot-Put examples in this document are specific to the ability to pivot on one foot and pivot on the other foot while transferring weight between the feet and transferring forces along the rest of the chain to the throwing hand.

Where in the journey did the athlete explore and adapt to all the pivoting / rotating actions and connections from toenails to fingernails that could be used to solve the technical model challenges they will be exposed to?

Session Management

The final phase of discussion (and ongoing) is the assembly of the session in a manner that allows the coordination of activities relevant to the training age of the athletes involved.

Discussion on the assembly of the session saw this model presented as a guide. (You may recognise this from the discussions on Running)

Warm-Up	General Throwing Patterns	Event Specific Throwing	Physical	General Throwing Patterns	Event Specific Throwing	Physical	Warm Down
Contains learning of new skills, consolidation of older skills, preparation for what is to come in terms of movement and tempo.	Reference to selected 'Keystones'. Applied in Games and Relays	Focus on the 'Keystones'. Applied in Games and Relays	New and old movement pattern learning of the Foundation Movements. Applied in Games and Relays	Repeat first cycle	Repeat first cycle	Repeat first cycle	

This format was designed for those in the 6-12 age groups where they experienced eight different sectors with 'Keystone' themes running through. Every main sector contains games and relays within which the chosen keystones are focused.

Populating the Session Sectors

The following Toolboxes offer illustrations of how to populate each of the session sectors.

General Throwing Patterns and Physical Sectors

There are many movement patterns that offer dual benefits whether they are pooled in the **Physical** sector toolbox or the **General Throwing Pattern** sector toolbox. For example in the Physical toolbox that is being discussed (see Progressive Exercise Syllabus / Lower Body) there are progressions such as Squat and Push, Lunge and Push, Step-Up and Push, Lateral Step and Push, Forward Step and 'Y' Push, Forward Step and Diagonal Push, etc. These activities are certainly part of the Physical journey when using bodyweight, medicine balls, dumbbells, sand-sacks etc. They can also be utilised in the General Throwing sector of the session if required where the 'Push' element can be the throwing action e.g. Squat and Push (two-handed and one-handed) a sand-sack for distance or Lunge and Push a medicine ball for distance. They offer an opportunity for the learner to experience the connection from toenails to fingernails and other related and specific 'Keystones' of the Throw.

Note: Physical Sectors to also include:

- **5in5** – 1. Squat, 2. Ground-based stability, 3. Lunge, 4. Ground-based stability, 5. Complex.
- **More 5in5** – 1. Balance & Vertical Stability, 2. Ground-based stability, 3. Squat & Lunge, 4. Pull & Push, 5. Complex.
- **Progressive Exercise Syllabus** – Flexibility, Body Shaping & Control, Lower Body, Upper Body, Running & Agility, Medicine Ball.
- **Additional Movement Puzzles.**
- **Connected Work** – Push, Raise, Swing, Circle, Loop, Throwing Journeys. **(SEE BELOW)**

Example - The Pushing Journey (There are others in the syllabus e.g. Raise, Pull, Swing, Loop, Circle)

Push – General (42 Progressions)
01 Push Up - In Place - Two Hands
06 Push Up - Lateral Step - Alternate
12 Push Forward - Forward Step - Alternate
13 Push Lateral - In Place - Two Hands
18 Push Lateral - Lateral Step - Alternate
19 Push Across - In Place - Two Hands
24 Push Across - Lateral Step - Alternate
25 Push Split - In Place - Palm Up - Alternate
30 Push Split - Lateral Step - Palm Down
31 Push Diagonal Y - In Place - Two Hands
36 Push Diagonal Y - Lateral Step - Alternate
37 Push Diagonal - In Place - Two Hands
42 Push Diagonal - Lateral Step - Alternate

PUSH – Throw Related – Two Hands (18 Progressions)
01 FWD Dip & Push
04 FWD Rotate Step Fwd & Push
05 SIDE – Rotate & Push
06 SIDE – Step Back – Rotate & Push
09 FWD – Step Back Push
11 FWD – Step Back – Step Skip
12 Half Reverse Step (AWAY) (3/4)
16 $\frac{3}{4}$ Jump FWD (Full)
18 Full Jump REAR (1.5)

PUSH – Throw Related – One Hand (18 Progressions)
01 FWD Dip & Push
04 FWD Rotate Step Fwd & Push
05 SIDE – Rotate & Push
08 SIDE – Step-Step Skip
09 FWD – Step Back Push
12 Half Reverse Step (AWAY) (3/4)
13 $\frac{3}{4}$ step FWD (Full)
17 $\frac{5}{8}$ Jump SIDE (1.25)
18 Full Jump REAR (1.5)

Example - General and Event Specific Throwing Patterns

Environment	Body Position	Action & Direction	Hands & Feet	Equipment
Rebound off a wall	From Seated (Feet ahead on floor or Knees bent)	Push forwards Push upwards	Two-Handed – Two Feet	Quoits Sand-Bags
Throw to partner(s)	From Kneeling (sitting on Feet)	Rotate and push forwards (L&R)	Two-Handed – One-Foot (L&R)	Sand-Socks
Throw for distance	From Kneeling High (Hips above Knees)	Rotate and push sideways (L&R)	One-Handed (L&R) – Two-Feet	Golf balls Tennis balls
Throw for height	From Split Stance on Knee (L&R)	Rotate and sling forwards (L&R)	One-Handed (L&R) – One-Foot (L&R)	Basketballs Medicine balls
Throw to a target <i>(Watch out! This is a very regressive activity which often sees the throwing action reverting back to a less effective pattern as the accuracy component takes over. Use it sparingly)</i>	From Split Stance (L&R)	Throw forwards overarm	Sling with Arms close to the body	Short sticks
	Pivot and throw	Throw forwards underarm		Longer sticks
	Squat and throw	Sling forwards	Sling with Arms long	Turbo-Javelins
	Lunge and throw	Sling backwards overhead		Mini-Javelins
	Jump and throw			Shot
	Hop and throw	Sling Horizontal (L&R)		Discus
	Walk and throw	Sling forwards diagonally from low to high (L&R)		Short Hammers
	Run and throw			Long Hammers
	Catch and throw	Sling backwards diagonally from low to high <i>(See Footwork – Below)</i>		

Footwork – Pivot (6 Progressions)
01 Pivot in place – Clockwise, Counter-clockwise (R&L) ¼ Turn; ½ Turn; ¾ Turn; Full Turn
05 Hop and Pivot – multi-directionally
06 Leap and Pivot – multi-directionally
Footwork – Heel-Toe (14 progressions)
01 Linear - Turn 180
04 Linear – Turn 360 - OHd
05 MB Shuffle
09 Single Arm Ground Swings
10 Single Arm Ground Swings to Parallel
14 One Arm Entry to Ground Swings to Parallel

The greater the width and depth of the vocabulary the better the coach will be able to create an appropriate, individualised exercise prescription and manipulate it on a minute-to-minute basis. The General throwing and General physical activities will offer opportunities to refer to or specifically

include some of the event-specific 'Keystone' actions and postures. The Related throwing and Related physical activities, again, will offer an opportunity for adaptation to the 'Keystones'.

As usual, this means of sharing is much harder to get results from than a progressive workshop series. It is always frustrating to only be able to use words to demonstrate these important coaching tools. My thanks to all those colleagues who have shown patience in listening and even more to those who have raised enough questions and added countless examples from which we can all learn. Some are only taking their first, faltering steps into this layer of pedagogy. Others are old hands who never stop learning. All have the humility to remain open-minded.

What about Jumps next?

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