



Movement observations – At what point in time do highly skilled movers adjust?

In recent times I've become increasingly intrigued as to when and how highly skilled movers detect that they need to make an adjustment in order to find impact and deliver the club in the way they wish, in short when does the human GPS initially adapt to help find impact. In many ways, humans have their own version of a biofeedback system similar to that of the 3D system, both provide sensory feedback in realtime and how accurate and quick the system functions is individual and system dependant. Biofeedback in definition means life-feedback and in my observations the most skilled movers have the quickest, most accurate feedback system that allows them to make highly accurate and precise adjustments when they inherently detect that the club is not moving through space in the way it needs to achieve the club delivery required for the task. Therefore, this allows us to explore multiple questions that relate back to this deeply innate movement perception:

1. Are there inherent patterns that every human/player has and how do they relate back to the GPS in the downswing
2. Can you completely remove these dominant, inherent pattern(s)
3. What role does anatomy and physiology have in helping the GPS.
4. What point in time do most highly skilled movers first make the adjustment to find impact.
5. What segment do highly skilled players typically adapt first and how does this relate back to how the other segments move.
6. Is increasing movement options always helpful

Let's look at each of these questions and attempt to understand them and this observation in more depth.

Are there inherent patterns that every human/player has and how do they relate back to the GPS in the downswing?

I have been extremely fortunate to work with many highly skilled players, many of which have won on both the PGA and European Tours as well as win major championships. Some of the players I have known since they were junior players therefore I have been extremely privileged to see how they have developed from junior golf through to today. Over the past year I have been reflecting on these players and one theme very quickly appeared, they all had one deeply inherent movement as a junior which they still have today. Therefore, despite many hours of coaching (often from different coaches with very different philosophies), much maturation, tremendous changes both anatomically, physiological, neurologically and being surrounded by multiple feedback systems and information, this deeply inherent movement they had as a younger player is still evident in their

movement today. Now, this move can be seen as both helpful and unhelpful therefore what can we acquire from this? What I am attempting to do now especially with younger developing players is to understand what works for them and why. This is where the data becomes so powerful and equally comes with much responsibility, knowing what to adjust, what to leave and how does this player move to create their 'match'. Understanding what the player's dominant movement is and how they respond elsewhere to this is vital in highlighting the influence behind this dominant move. Therefore if it is mainly due to anatomical constraints then typically improving this will provide the opportunity to move differently and move away from this dominant move. However, this comes with a large assumption attached to it. Of all the systems around the human, anatomy is the most stable and predictable as well as for many the easiest one to change, however it is often the least influential on movement as until the player become aware of the new movement ranges and options they have invariably the response can be extremely variable as listed below:

- Improving the anatomy makes the player move worse as their perception and spatial awareness was coded based around their old anatomy therefore a large mismatch has now been created due to the new movement options and joints being spatially and relatively in a different place.
- The player improves as they have the intuitive ability to make the adjustments based on the new movement affordances they now have.
- No change as they simply revert back to existing patterns.

What I have observed is typically two tangible influences help determine this, how the player sees the world and whether they are in pain as human typically move in a way to best avoid pain. Depending on these two influences, essentially the player will decide to make any adjustments post an anatomical intervention unless a coaching command is provided. So, how does this connect back to the inherent move? Before I make any suggestion to a player, I consider four initial questions:

- If we remove the dominant pattern, how/will this influence how they move elsewhere to create their match?
- Could their dominant pattern possibly lead to pain?
- If we remove their dominant pattern, how does this relate back to how they see the planet?
- Can they make the association to their dominant move to how it creates adaptation elsewhere and how by removing this are they able to relate this back to impact?

Depending on the answers to the above questions alongside the player's initial question/session objective this will guide me to either remove this pattern or leave it. I have seen many players deskilled through coaching where coaches have removed this pattern without really understanding the story behind it and relevance to it. We typically teach based on our own failings and experiences of what prevented us from being successful therefore what is/was important to us based on our own insecurities and fears are invariably not shared by the player. Coaching and movement is about removing thought, not adding it....

Can you completely remove these dominant, inherent pattern(s)?

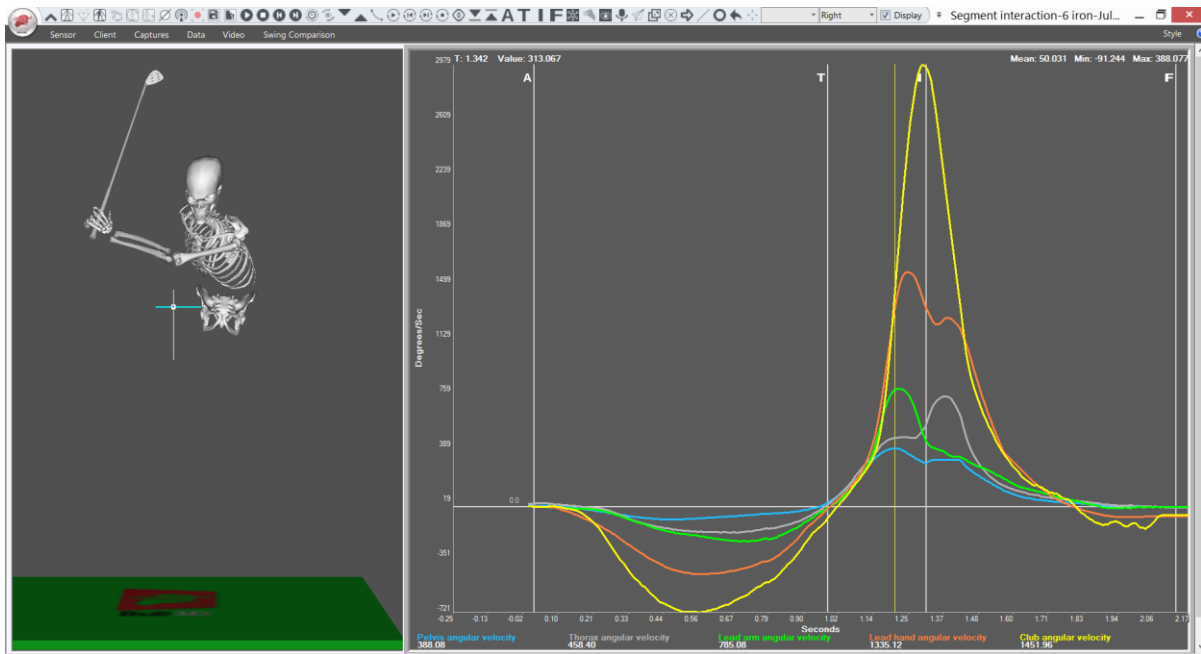
In my experience, rarely. What I've observed over time is these dominant moves can be reduced but not removed. When players are typically moving their best these movements are often reduced and not as overtly obvious to see, however when they move their poorest, these patterns often reappear and become very disruptive and unhelpful. There are multiple influences behind this, biochemical, environmental, life events etc.... however typically the biggest influence behind this is human mood. The mood the player is in will invariably control how they move and feel. Therefore patterns are never removed, they become either dormant or redundant however rarely removed which is why one day they can appear without notice and on other days they can be disabled and inactive.

What role does anatomy and physiology have in helping the GPS?

Improving anatomical and physiological function can be very divisive. For many, much of the improvement to their movement connects to this and significant gains can be made by improving postural awareness, symmetry, joint range, muscle elasticity and for the large majority of players improving these areas leads to huge improvements. However, for some changing their anatomy can lead to much disruption and be very unhelpful. For example, if a player has lived in a certain posture for a long time, say 25 years, their movement and neural code has been developed around this adaptive posture therefore re aligning them and making them more neutral can lead to substantial interference and distraction as they simply have no idea how to move and perform from this position. Information destabilises the system and not all players respond well to changes in anatomy therefore when working with very established players that have coded their movement and developed their GPS to such accuracy that changing their frame can have very harmful effects on their spatial awareness and proprioception that they lose movement accuracy despite improving movement awareness. Relating and connecting this back to question 6 above - Is increasing movement options always helpful for most humans yes however for some no. Perhaps a good example would be Colin Montgomerie that saw almost every shot has a fade, therefore proving him with more options may have been very distracting for him. I am very fortunate to work with a PGA tour player who is exceptionally skilled, he has two ball flights, small draws and large draws. He attempted to move away from this recently to include a fade and it was so unhelpful for him.....

What point in time do most highly skilled movers first make the adjustment to find impact?

This has been a question I have become mildly obsessed with in recent times. This question was very serendipitous as I discovered it purely through good fortune as I started to observe a pattern occurring at almost the same time in most skilled movers. On reviewing hundreds of swing files/data, what became evident was when the pelvis reaches its maximum angular velocity is when the player intuitively adapts and adjusts. The image below is of a recent major champion who provides a wonderful visual reference of what point in time this typically happens. Shared below are some suggestions as to why this is and what happens next.



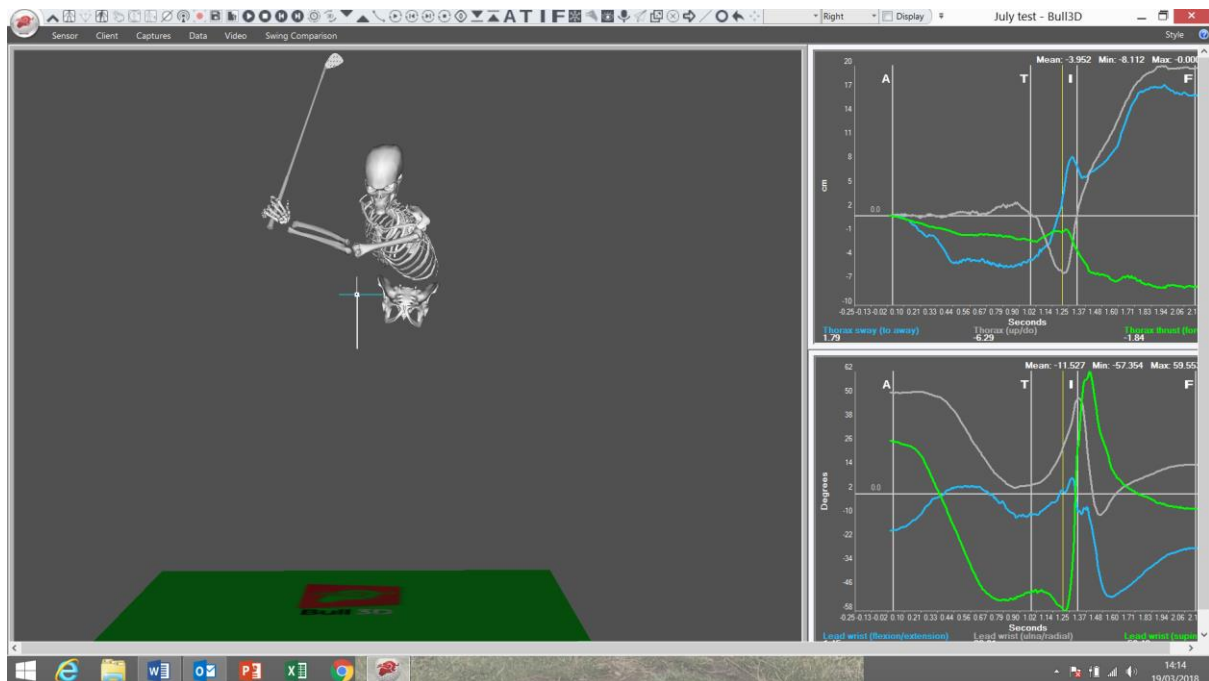
What segments do highly skilled players typically adapt first and how does this relate back to how the other segments move?

Ok, let's explore and look at some possible reasons for this being such a vital moment in time.

1. At this point in time the pelvis applies an eccentric braking force to allow the distal segments it precedes to speed up. Therefore how it breaks and in what direction it breaks in will determine how the more distal segments respond and adapt to find impact.
2. As I have described previously, the pelvis acts and behaves like a second brain therefore how it decelerates and adjusts is invariably connected to it intuitively knowing and being aware of where the club face is.
3. This is typically the last point in time the human can apply a force to the club via the hands therefore adjustments through hand and wrist can often happen simultaneously with the pelvis to co-ordinate and find a match at impact.
4. This is just the angular velocity of the pelvis, what it does not show is the pelvis position and orientation which is of great importance as where the pelvis is in space at this point in time will undeniably influence how it responds as well as control the myofascial activity and joint ranges/interaction to produce the adjustment.

In the graphs below, you will see clear change in wrist and thorax movement occurring essentially at the same time as the pelvis starting its deceleration (represented by the yellow vertical line on the graphs). The thorax starts to thrust away from the target and elevate most likely in response to the vertical force being applied (before a force can be applied a thought/perception had to be processed therefore thought comes before force). Alongside the thorax movement at the same point in time the lead wrist/forearm moves into high levels of supination again most likely due to the weight of the club and the combined influence of centrifugal and centripetal force. Therefore four very clear

adjustments all occur and happen at the same time, pelvis deceleration, change in thorax position and lead wrist orientation.



Therefore, what can we extract and gain from this:

1. What happens in transition reveals much about how a player moved through backswing and how they perceive the task of club delivery based on the adjustment they had to make at this point on time.
2. How they are moving around and adjusting for any anatomical and structural imbalances and constraints.
3. The Importance of set up and backswing. How the player stands at address and moves through backswing will control how they adapt and adjust as the reorganisation of the segments and club almost occurs immediately in downswing as the players GPS redirects in an attempt to find impact
4. Most skilled players adjust and adapt the other segments once the pelvis starts to decelerate and break.
5. Skilled movers adjust earlier, quicker and more accurately than lesser skilled movers. This appears through observation to almost always happen at the same time, just as they start downswing therefore in a hierarchical discussion, perhaps transition/start of downswing is actually more important as a move than impact due to the lack of awareness and influence players can have on and around impact.
6. Unless there is a very clear reason and objective, never adjust the pelvis in transition as the pelvis is invariably adapting and slowing down to allow other segments to speed up but also adapt. If the player stands well and moves well through backswing, then improving the pelvis move in downswing can be very helpful, ironically for lesser skilled movers invariably this whole cycle can be inverted as they rarely make the association between improved backswing and club delivery. However if the player has imbalances and constraints at set up

and through backswing, invariably they adjust the pelvis first to allow all adjustments to develop and a new coordinated pattern to emerge as the GPS navigate to find impact. Therefore adjusting the pelvis is invariably taking away what is making the swing work.

7. Relating this back to the main question embedded into this article, if the player has a dominant, inherent move that they have coded over much time, if we reduce this does this create such disruption and move them away from how they see the world that they no longer know how to adapt and adjust in order to complete the task. As mentioned earlier in this article, if the player is in pain and their question is pain avoidance/rehab then this is where these dominant moves most likely need to be addressed if they clearly correlate this to pain, as previously shared the last segment to adjust is typically the first one to get sore/injured therefore understanding what the joint is adjusting for is a much more responsible approach than simply looking locally at the joint which is in pain.

Therefore the short summation is – transition is vital as it reveal much about most things...

Human movement is an obsession of mine and I am both curious and intrigued as to why humans move in the way they do in golf, especially as they start downswing and why some players like Bubba Watson can make in essence any move in the backswing yet still produce any ball flight they wish whereas others have limited spatial awareness that their GPS adjust much slower, later and less accurate.

One of the biggest human addictions is thinking as this is where much human pain and suffering comes from, therefore perhaps within silence lays the answer. Therefore when working with a player and the system next, present the information, allow the player to perceive and once done ask them this question “Based on what you now know what would you adjust....?”

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