AFFECTS OF INERTIA ON THE CONTACT AREA

Introduction

In this paper I want to discuss the affects of inertia on the contact area and how its understanding can potentially help to better prepare our teams and educate our athletes. A catch phrase we hear a lot and a coaching cue we use often is 'line speed'. A term originating from rugby league, with the idea that getting off our line and up into the faces of the attack enhances our effectiveness defensively. The idea that taking time and space away from the attack is important but what I think is of equal value are the affects of inertia.
'Fast ball' is something many coaches are trying to achieve with their organisation patterns and attack frameworks. In a similar line of thinking to 'line speed', taking time and space away from the defence should greatly enhance your effectiveness in attack. I think there is a miss conception that the speed of the ruck (fast ball) is what enhances effectiveness. 'Fast ball' will normally be created by a ball carrier *going forward*, effective support, and a quick clearance – conversely the defence is, *moving backwards* (negative inertia), don't have time to organise defensively and because of the negative inertia they struggle to get line speed. I believe the key factor here is that 'fast ball' generally creates 'negative inertia' and this is what positively affects the contact area. Many coaches talk about 'front foot ball' and this terminology is probably better in teaching players the impact of negative inertia.

The other phenomenon which I would like to include in this discussion is 'self preservation'.

Dictionary:

1. Protection of oneself from harm or destruction.
2. The instinct for individual preservation; the innate desire to stay alive.

We have an internal action suppressor that automatically stops us from doing anything that may harm our body. I believe this intuition tells us before contact which party is more likely to win and then inhabits the opposing party. Although nearly impossible to measure some conclusions can be made from the 'Tabs Channel' experiment. I also believe that once players become aware of the self preservation phenomenon they can then learn to (try and) ignore the internal suppression mechanism and inturn become more effective.

What is Inertia?

Newton's first law of motion states that "An object at rest tends to stay at rest and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force." Objects tend to "keep on doing what they're doing." In fact, it is the natural tendency of objects to resist changes in their state of motion.

Another way to explain it in relation to rugby would be; once a mass (player) is in motion s/he wants to stay in that direction of motion until acted upon by an unbalanced force (another player)

What is meant by an 'unbalanced force' is a force greater then itself moving directly against it *or* a force that changes the direction of the original motion.

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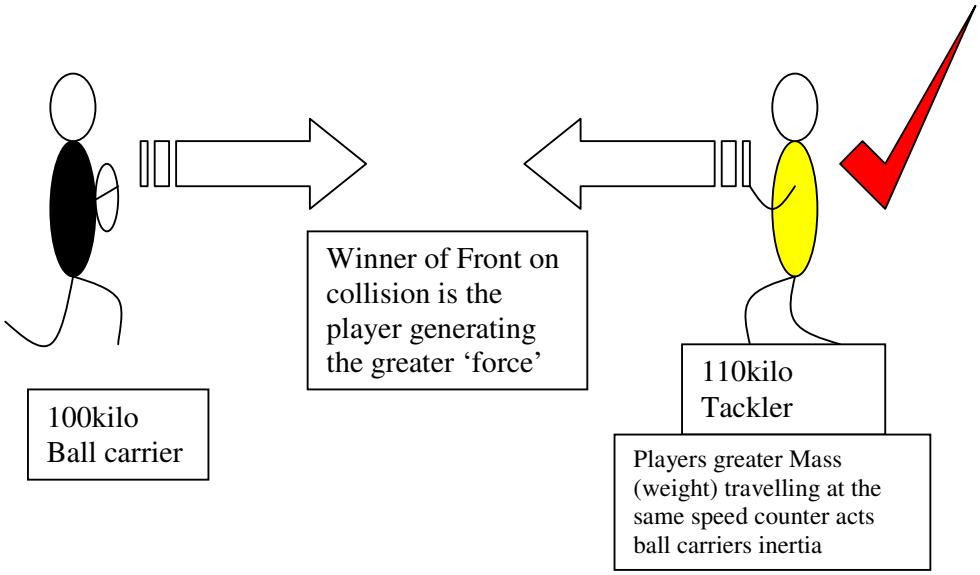
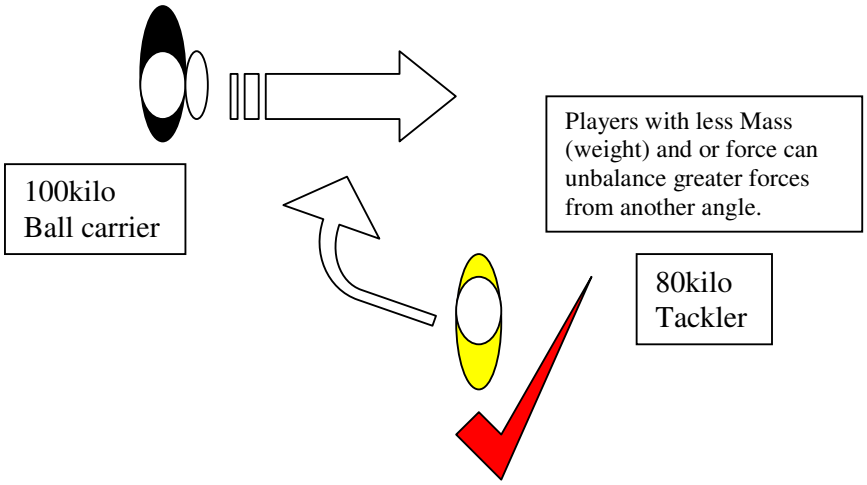


example: 100kilo player running directly down the field at 16km per hour, it will take either a player of greater mass (110kilos) travelling at the same speed or a smaller player travelling a faster speed to create a great enough 'force' to stop player head on.

OR



100 kilo player running directly down the field at 16km per hour, it can take a lighter player to create an unbalanced force to stop this player side on. Our anecdotal evidence suggests that a smaller or slower player can affect a side on tackle to a greater mass (bigger player) with far more likelihood then full frontal tackle.

'Common sense corner': players are not square blocks in science experiments that collide with each other in a controlled environment. They are individuals with different skill sets, under differing levels of fatigue, concentration and with a range of physical abilities. What I'm trying to highlight is a 'trend' in the game which of course has exceptions but the evidence would suggest its understanding could be of value to teams.

'Tabs Channel' – Field experiment no.1

I wanted to test my hypothesis that who ever had the advantage of inertia would win the contact area. I watched many games of Union and rugby league trying to collate some usable data but because of the many variables during a game it was difficult. What was evident in both codes though was whoever got 'front foot ball' or 'a quick play of the ball' would invariably get over the advantage line and would *tend* to win the contact area. On those occasions when the contact was not won by the ball carrier with 'front foot ball' it was often due to a 2nd tackler's effort.

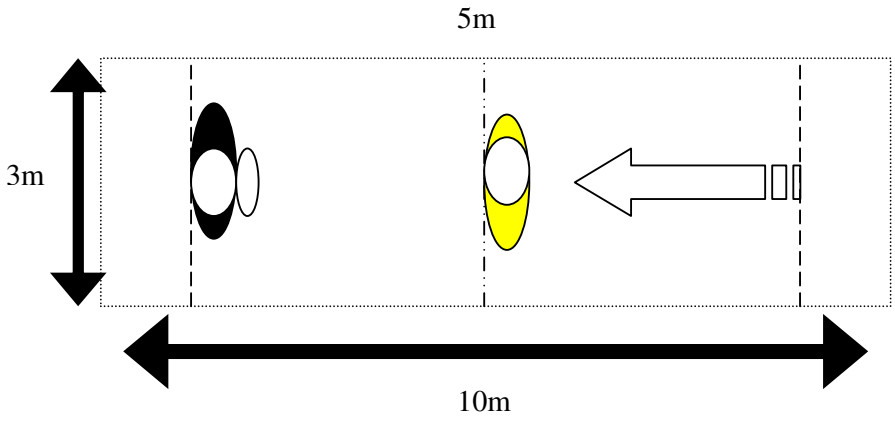
I tried to create a closed environment with as few variables to gather usable data.

TABS INERTIA CHANNELS

The field experiment is carried out in a 10m by 3m channel. Both players begin 1metre from their own end. It was designed this narrow so as to restrict lateral movement. As I wanted as much usable data we had to have them colliding as often as possible☺. Players were categorised into equal levels of force generators. E.g. Big bloke's together and little blokes together. Would also consider putting 110kilo slow bloke with 95kilo fast bloke. Unfortunately this was a very subjective process but I didn't have the resources to accurately test players force. Another crucial factor was there contact ability. Putting novice players with elite players would have caused totally different results.

The 3 patterns:

1. Ball carrier stationary vs Defender with Inertia. The defender would accelerate to the half mark at '¾ speed'. From the 5metre mark they were told 'you must affect a tackle'. The Ball Carrier was allowed to move forward only after the Defender had reached the half way mark.
2. Ball carrier accelerates to the half way mark at ¾ speed at which point the defender is now allowed to move forward from the stationary starting position.
3. Ball carrier and Defender both leave at the same time. Channel is reduced to 6m in length.



BALL CARRIER STATIONARY vs. DEFENDER with INERTIA

No. of Ball Carries	Ball carrier Won	Defender Won	Draw
37	15	25	2
Hypothesis: defender with Inertia should win the contact area			

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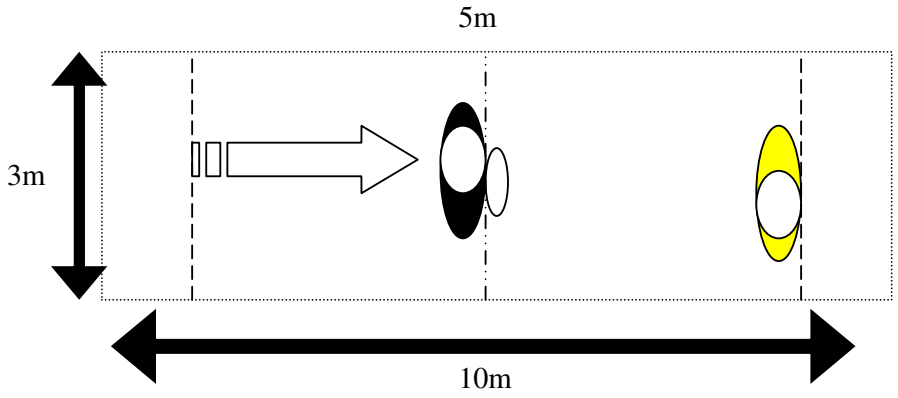
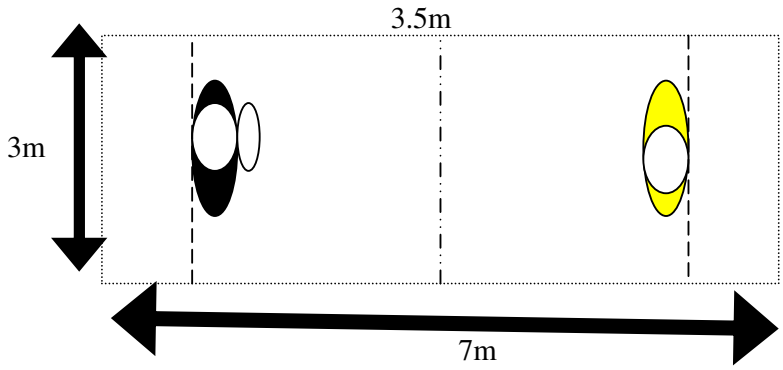


BALL CARRIER with INERTIA vs. STATIONARY DEFENDER			
No. of Ball Carries	Ball carrier Won	Defender Won	Draw
43	27	12	4
Hypothesis: ball carrier with Inertia should win the contact area			



BALL CARRIER STATIONARY vs. STATIONARY DEFENDER			
No. of Ball Carries	Ball carrier Won	Defender Won	Draw
46	25	20	1
Hypothesis: Player with Inertia should win the contact area *			

* Would have been good to be able to record and measure the speed of both players. Although very subjective I felt that there was a strong correlation between the players that got to half way the quickest and those that won the contact area.

Self Preservation

The results from Tabs Channel – Patterns 1 & 2 supported the hypothesis that Inertia does affect the contact area. I believe 'Self Preservation' becomes a factor when opposing players have Inertia and it would seem that a discussion regarding this phenomenon is worthy.

I believe there was a certain speed were 'Self preservation' become visible. On occasions when the one player accelerated hard to the half way mark the stationary player clearly became focused on just getting the ball back, or not getting smashed. There is also plenty of anecdotal evidence to support 'self preservation'. Take a look at any rugby game, there will be at least one occasion per game were an unlucky customer is passed the ball behind the advantage line, flat footed, with the defence roaring forward on to him/her. This player will either move laterally to avoid heavy contact, or put his head down and focus on just getting the ball back. He will very rarely accelerate hard into a player travelling with (inertia) greater force.

On occasion when a player jogged to the half way mark instead of accelerating to ¾ speed, the opposing stationary player *seemed* to gain confidence and would accelerate forward at a greater speed then normal**

**I would like to if given the resources actually find out if there was a specific speed at which the self preservation mechanism kicks in. This would require digitally recording and tracking speeds of each collision. What would be interesting would be to see if a control group who didn't understand the self preservation phenomenon performed differently from a group who were told that the phenomenon existed and they were asked to try and overcome the internal mechanism.

Conclusions

Hypothesis is correct, but…

The data suggests the hypothesis that 'Inertia does affect the contact area' is correct. There is also plenty of anecdotal evidence to add weight to the argument. An example of this is Stirling Mortlocks effectiveness from Lineout ball. Australia is (illegally) running onto the ball before the lineout finishes. Conversely the defensive line can only leave once the lineout is completed. Mortlock has already won the Inertia battle by this point, and the Self preservation mechanism kicks in (my personal experience on this testifies). The barnstorming runs he makes from lineout's are not as common from scrums.

Analysis of the 2007 RWC has 32% of tries originating from Lineout's. This is close to twice as many tries compared to the 2nd most popular source which was the scrum on 18%. A percentage of these tries would have of cause been mauled over from close range, but that would have been a minority of the tries. Which then begins another branch argument, is the lineout the most effective attacking platform because of the 'Inertia battle'?

The self preservation discussion is one of interest but probably very difficult to measure. I am in communication with a very wise academic Jimmy Holbeck who is currently half way through his Doctorate on decision making. His knowledge of the decision making processes will be interesting to read when completed and may shed some light on how/when and why we self preserve.

Flaws of Sample

The Tabs Channel although useful was flawed. Even though I tried to reduce as many variables as possible there was still a great level of subjectivity involved. The definition of 'winning the contact area' in this experiment was – 'After the point of contact which player gained ground'. This was good and simple in terms of physics but some players even though they recoiled in contact still got clean ball, so in a practical rugby context maybe that definition can be tweaked to be more relevant to the game. Another floor was the differing abilities of players. I don't know if I did it unconsciously but there were times when the players with inertia seemed to also be the ones with the best contact skills. At club level and U18 level there can be quite a contrast in contact abilities within the same team so this is another variable difficult to eliminate. But in saying that, an age group academy, or elite team would have similar levels of ability and would probably produce a more accurate result. I tried to accumulate as much data as possible. To achieve this I set up the Tabs Channel on 4 occasions. Players for some reason only like to collide with each other a certain amount of times before they start getting broken, bored or just pullout. Ideally it would be better to have 100's of collisions (1000's even) so as to get an accurate sample but this is not practical at my level.

Relevance

On review of the data and the hypothesis that 'Inertia has an affect on the Contact Area' I believe three key points are raised. Firstly Inertia does have an affect on the contact area (as proven in the 'Tabs channel'). Secondly was the collection process of the data accurate?

Thirdly and most importantly was the finding significant and does it have any 'real' relevance to the game in full context?

The study done in 2003 by the ARU regarding the contact area has 'real' relevance. The data was taken from the Super 12 in game situations; it included every impact for the entire Super 12 so the sample amount was over 9000. Its findings were significant, accurate and have confirmed many key components in winning/controlling the contact area. It would be interesting to find if in review of this study, did inertia have an affect on those results?

Although an interesting and intriguing journey, I don't know if I would place much emphasis on it next season. Practically and due to the limited resources, of time, and players it would be more valuable at Club level to focus on other aspects of the game.

The phenomenon of 'self preservation' is very intriguing and possibly one of the few occasion on a rugby field were we can visibly see intuitive decision making and potentially measure it.