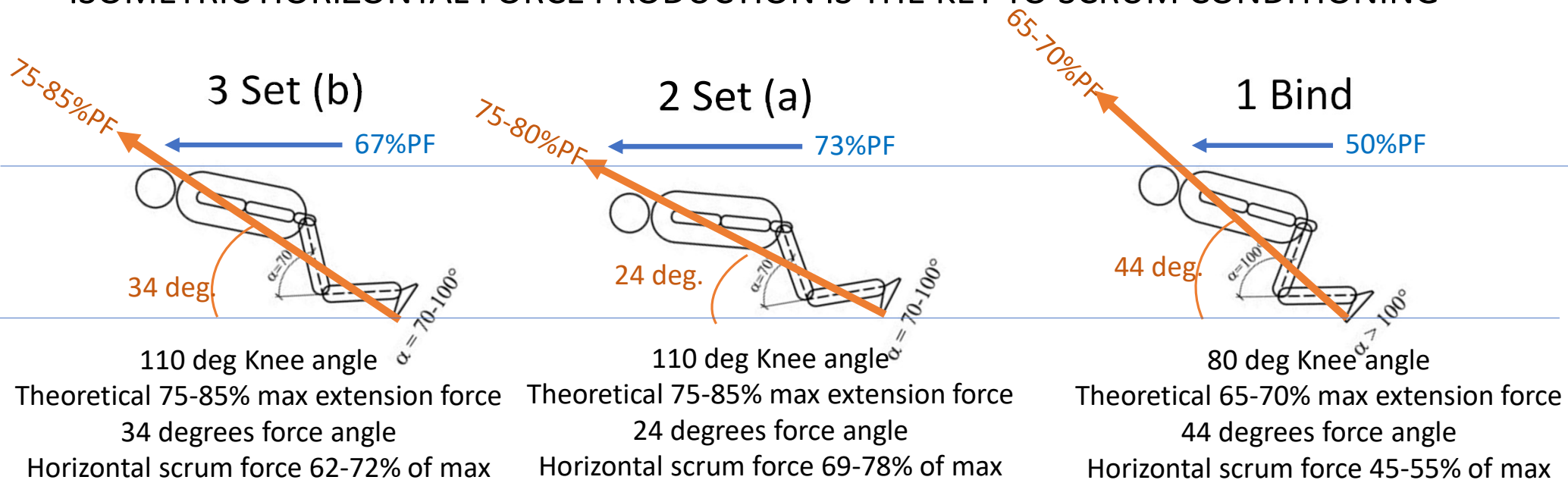
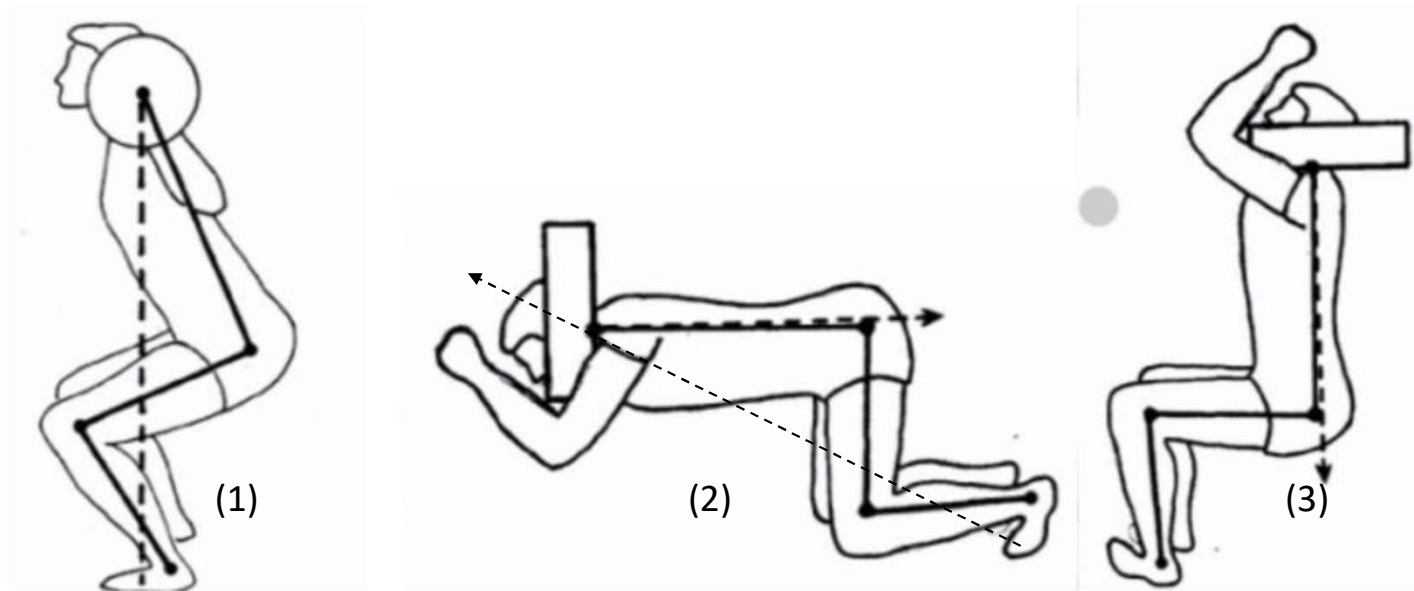


ISOMETRIC HORIZONTAL FORCE PRODUCTION IS THE KEY TO SCRUM CONDITIONING



Discussion points:

1. Ability for toes to anchor the full force into the ground is important. A flatter foot to achieve more foot (studs) contact with the ground will result in a higher shank angle which will likely increase the angle of the force trajectory and reduce horizontal force production
2. Ability to stay balanced at contact will arguably require one to sit on their heels with a more vertical than horizontal force trajectory
3. Arguably the thigh angle has to have a reasonable vertical angle to allow the second row to bind effectively to transfer their force to the prop
4. Dropping into position 2 (a) may paint an unbalanced picture to the referee i.e., collapsing the scrum
5. The same physics rules apply to the horizontal plane (looking downwards on the scrum from rear to front) i.e., force alignment
6. The need to hook the ball (channel and room for hooker)
7. Are there Biomechanical differences between a squat type horizontal push and a scrum type horizontal push (push vs walk)
8. Is the role of the front to push or to be pushed (arguably both), what implications does this have?



Images of the differences between the back squat and scrummaging position. Image (1) is the traditional back squat, while image (2) is the scrummaging position. Image (3) is what the scrummaging position would look like if it were to be replicated in the vertical direction. This illustration shows how they differ and bring into question the effectiveness of the back squat for scrum conditioning (Ross, 2004, Squat or ScrumTruk: which is best for quadriceps training for athletes? https://myoquip.com.au/Squat_or_ScrumTruk.htm).

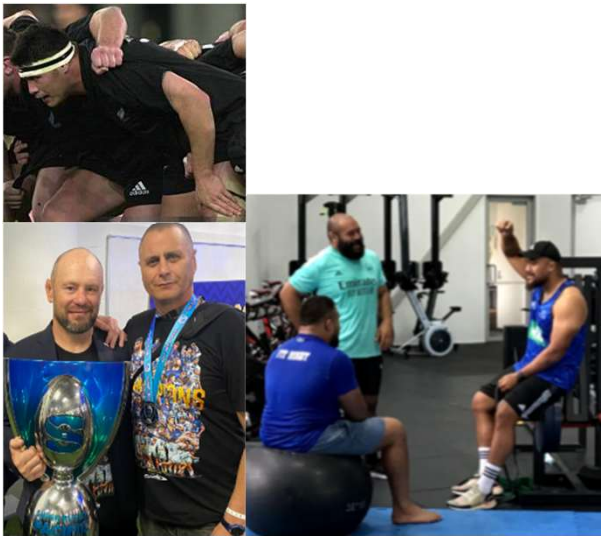
- Horizontal force is important in the rugby union scrum
- It is not easily simulated with traditional weights vertical training methods.
- The barbell back squat is typically a KPI measure for scrum strength
 - Squat = vertical eccentric to concentric movement vs Scrum = horizontal isometric to concentric movement

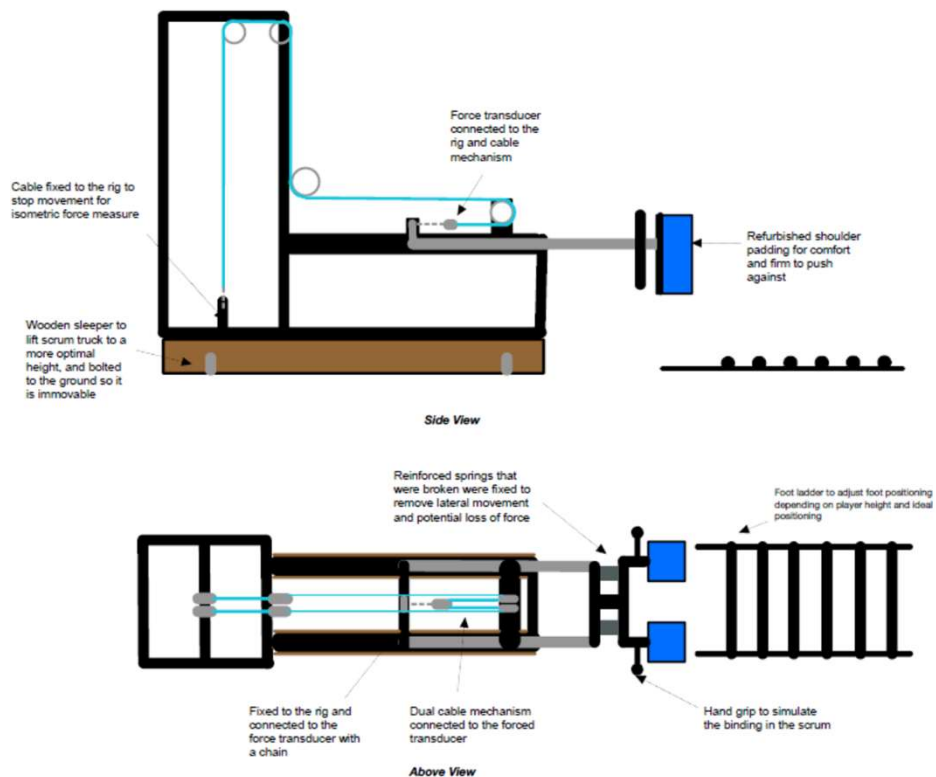
Research design

- Pilot study employing observational research design with 15 professional rugby forwards.
- Aim to assess the relationship between 1 repetition maximum (1RM) squat and scrumtruk (ST) peak and average isometric force production.
- Peak isometric scrumtruk force and 10 second average maximal scrumtruk force was decided on after much consultation as this was considered to best represent real-life scrum force requirements.
- Measures were included as part of normal training, with all participants performing the same training program.
- Project timeline:

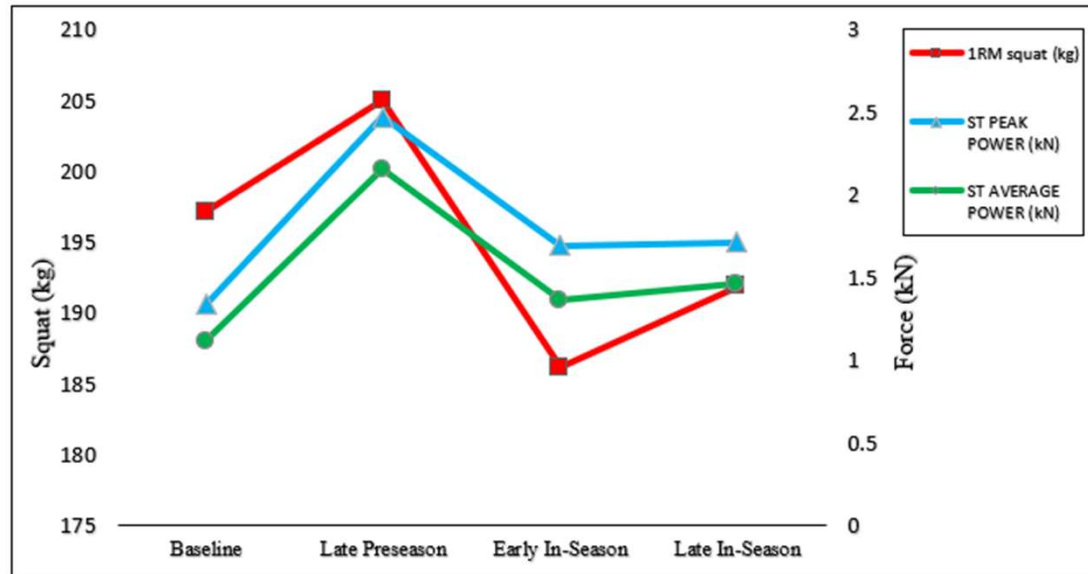
↓	↓			↓			↓
Baseline	Late PS			Early IS			Late IS
<i>Dec</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>

Different data collection points throughout the season. Baseline being the first-time data was collected, late preseason (PS) at the end of the preseason building phase, early in season (IS) collected at the earliest and most convenient chance, and late in season at the end of the season.





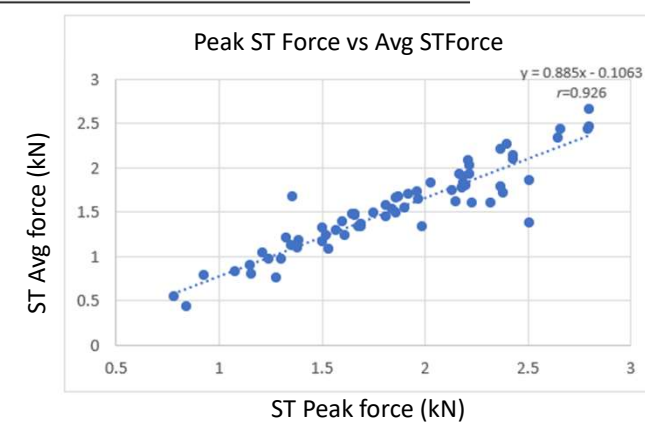
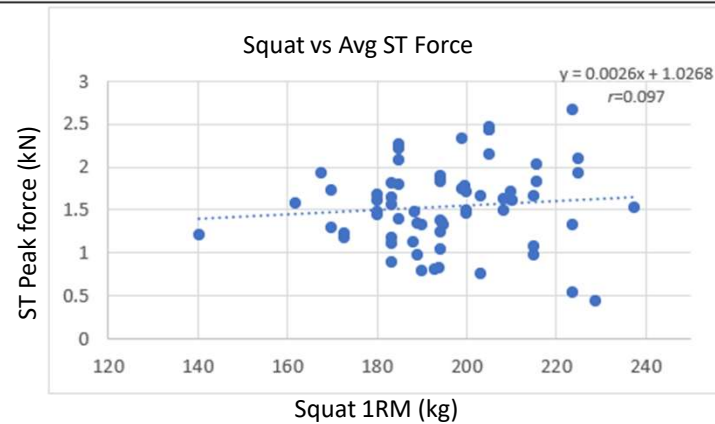
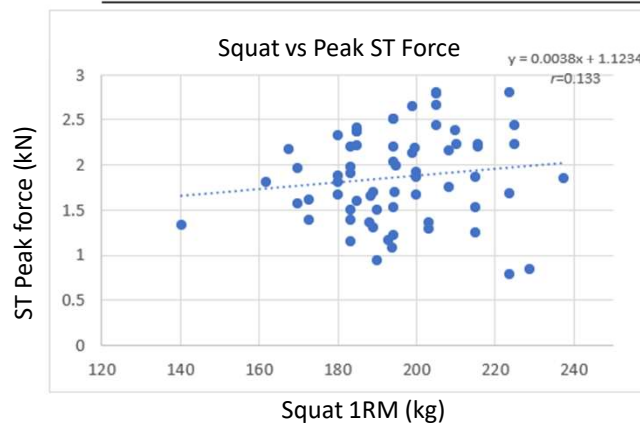
Changes in key measures across the season



	1 RM Squat				Peak ST				Average ST			
	kg	% Change	Effect Size	Magnitude	kN	% Change	Effect Size	Magnitude	kN	% Change	Effect Size	Magnitude
Baseline to Late PS	9	4%	0.43	Small (increase)	1.11	83%	3.54	Very Large (increase)	1.02	91%	2.93	Very Large (increase)
Baseline to Late IS	-4	-2%	-0.25	Small (decrease)	0.37	28%	1.04	Large (increase)	0.35	31%	0.88	Moderate (increase)
Late PS to Early IS	-19	-9%	-0.66	Moderate (decrease)	-0.76	-31%	-2.60	Very Large (decrease)	-0.77	-36%	-3.38	Very Large (decrease)
Early IS to Late IS	6	3%	0.23	Small (increase)	0.02	1%	0.06	Trivial	0.1	7%	0.31	Small (increase)

1RM Squat, Peak and Average (Avg) ST Force mean and $\pm$ standard deviation, and correlation coefficient among all positional sub-groups.

	Squat 1RM	Peak ST Force	Avg ST Force	Squat 1RM vs peak ST Force		Squat 1RM vs Avg ST Force		Peak ST Force vs Avg ST Force	
	Avg $\pm$ SD	Avg $\pm$ SD	Avg $\pm$ SD	Correlation R	Magnitude	Correlation R	Magnitude	Correlation R	Magnitude
Rep Props	201 $\pm$ 20	2.09 $\pm$ 0.34	1.78 $\pm$ 0.36	0.412	Moderate	0.471	Moderate	0.928	Strong
Props	200 $\pm$ 16	2.12 $\pm$ 0.38	1.74 $\pm$ 0.36	0.304	Moderate	0.407	Moderate	0.796	Strong
Front row	199 $\pm$ 19	1.87 $\pm$ 0.52	1.53 $\pm$ 0.48	0.121	Small	0.113	Small	0.915	Strong
Tight Forwards	197 $\pm$ 18	1.85 $\pm$ 0.51	1.52 $\pm$ 0.49	0.133	Small	0.110	Small	0.924	Strong
Forwards	195 $\pm$ 18	1.86 $\pm$ 0.50	1.54 $\pm$ 0.48	0.133	Small	0.097	Small	0.926	Strong



Conclusions

- There was only a small negative relationship between 1RM squat and peak and average scrumtrunk force in professional rugby players across a competitive season.
- Conditioners should consider the use of an (instrumented) scrumtrunk as an alternative training method to elicit more meaningful strength and force adaptations for scrum conditioning.
- Ensuring specific training methods for scrum force development throughout different periods of the competitive season should be employed as a means of increasing and maintaining scrum force improvements.

