LIFTERS AND JUMPER CONTRIBUTIONS TO RUGBY LIFT PERFORMANCE– A PRELIMINARY STUDY ON ELITE PLAYERS

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Introduction

Rugby is played worldwide by both amateur and professional players. During a game, the ball re-introduction is critical for performance as during the 2015 rugby world cup, 50% of the tries were directly following it. To help the jumper to quickly catch the ball during its flight, two players can lift him. As the lift involves 3 players, its performance understanding is challenging, and trainers may also want to estimate each player contribution. Only one study [1] investigated it based on a 2D approach on videos. However, this approach was questioned [2] by highlighting the movement asymmetry wetween forward/backward lifters through vertical ground reaction forces measurement.

The aim of this study was to investigate the link between lift performance and ground reaction forces profiles of the three players during a rugby lift.

Methods

One elite threesome (one jumper and two lifters) volunteered for this study. They performed two series of ten lifts in a motion analysis room equipped with 15 optoelectronic cameras (Vicon, 100Hz) and 5 forceplates (AMTI, 1200Hz). A full markerset was used for each rugbyman but only the ones stuck on the jumper's iliac crest were used in this preliminary study.

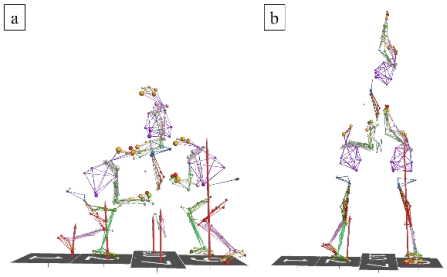

Figure 1: Markers (color circles) and ground reaction forces (red arrows) before the lift (a) and at the end of the lift (b). Forward lifter on the left, backward on the right.

Between the two series, forward and backward lifters were switched defining two configurations (C1 and C2). The lift beginning was set as the lowest position of the jumper's pelvis and its end as its highest position. The jumper speed was assessed by differentiating the position of one marker of the jumper's pelvis. To characterize repartition between the three players, each of their impulse was computed as the integral of his vertical ground reaction force during the whole lift. Force data were divided by each player weight.

Results

According to the table 1, the average performances, considered as the average jumper velocity, between the two configurations were different (20%) even if the jumper impulses were the same. Ground reaction forces and impulses were higher for the backward lifter in C1 configuration and for the forward one in the C2 configuration.

Mean (SD)	J. speed (m/s)	VGRF max (N/N)		Impulse (s)		
		F	B	F	J	B
C1 N=10	2,0 (0,1)	1,9 (0,1)	1,7 (0,1)	137 (7)	40 (2)	90 (7)
C2 N=9	1,7 (0,1)	1,6 (0,1)	1,9 (0,1)	93 (5)	40 (1)	151 (12)

Table 1: mean and standard deviation of the jumper speed, vertical ground reaction forces and impulse for each player (J: jumper, B: backward lifter, F: forward lifter), over all lifts for each configuration (C1 and C2).

Discussion

Within a configuration the force and speed parameters were similar, but they changed when the lifters switched. Those players were trained enough to be repeatable but output varied with their position. The configuration with the best performance occurred when the backward lifter created the highest impulse value. This was not the case for the forward one, even when the total of the two lifters impulses was higher. This tendency is aligned with coach feelings. Impulse computing seems to give a help for separating each contribution but it is not the only parameter contributing to performance. However, it is only an example over one threesome which may have a specific technic and should be confirmed over various teams.

References

1. Bourgain et al. 2021 - Estimation of the vertical ground reaction forces during rugby lineout lift: a preliminary study Computer Methods in Biomechanics and Biomedical Engineering
2. Smith et al. 2017 - An examination of the jump-and-lift factors influencing the time to reach peak catch height during a rugby union lineout. Journal of Sport Science