CONTRIBUTION OF EACH PLAYER DURING SRUMMAGING

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Introduction

The scrum is an important phase of the game for allowing to restart the play after a minor infringement but also for physical and psychological domination of the opposition Quarrie and Wilson (2000). Milburn (1990) has showed that during a scrum, the front row produces 38% of the total pushing force, the locks 42%, loose-forwards 20%. He also recommended for optimal force production to have a low body position with aligned trunk-head-neck and a large angle at the hip [Milburn 1990]. However, [Quarrie and Wilson, 2000] find only low correlation between force production and ankle, knee and hip angles. But the variation of body angles, especially for the head and trunk, and force with time during a pushing phase are unknown. The aim of this study was to combine quantitative kinematic and mechanic analysis during different scrum configuration in order to better understand the contribution of each player during active phase of pushing.

Methods

Seven pro-level young male rugby forwards (18±0.5 yr.) participated to the experiments.

Scrumming force measurements were collected using a specific scrum simulator (M-Rex, Thales, France) equipped with three 6-axis load cells behind each shoulder pads. (figure 1). The scrum simulator was fixed in a horizontal position while scrummaging forces were measured.

Figure 1: Subjects, Vicon cameras and scrum simulator positions during the tests.

Mechanical data were correlated with 3D kinematic analysis (Vicon, Oxford, UK) of each player during the different tests.7 reflective markers were positioned on each player to assess trunk angles.

Players were asked to perform individually 3 maximal voluntary push forward on the simulator lasting 5 s with 2 min rest between trials. Then, pushing phases were performed with three players at the same time (figure 2) with two rows configuration for sequence 1+6+4 and 3+5+7 and one row configuration for sequence 1+2+3 (each number corresponds to the position of the players) .

Results

The sum of individual forces is higher than sequence forces (figure 2). The forces reported are the maximum force registered during the active phase.

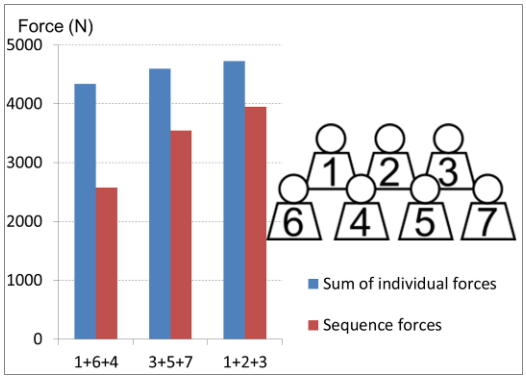

Figure 2: Sum of individual forces (blue) and force during 3 players sequences.

In addition, kinematic analysis showed that variation of thorax angle with horizontal axis is linked to stabilisation of propulsion force.

Discussion

There is a force loss between the sum of individual force and collective force which is significantly higher when configuration is in two rows. Kinematic analysis may indicate the contribution of each player by interpreting their motions with force and time.

This is a first step toward the development of a comprehensive biomechanical model of scrum.

References

Quarrie and Wilson, J Sport Science, 18:237-246, 2000.

Milburn, J Sport Science, 8:47-60, 1990.