Spatiotemporal Analysis of the Lineout in Rugby Union

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Summary

In rugby union, the lineout is a decisive phase of play where players must quickly interpret a complex dynamic scene and coordinate collectively within a very short timeframe. This study aims to analyze spatiotemporal coordinations between thrower and receiver during lineout. Kinematical data from professional players were collected during training sessions using optoelectronic and markerless motion capture systems. Results highlighted duration of the throwing phase, ball capture height, as critical determinants of performance. These findings are further discussed and some perspectives such as the presence of defensive players are suggested.

Introduction

The lineout is a crucial phase of play in rugby union, with its outcome playing a decisive role in the team overall performance. Indeed, at international level, approximately 50% of tries scored result from lineout possession [1]. The throw is an important part of the lineout. It can be decomposed in two phases: the preparation and the ejection. While previous research has predominantly focused on the biomechanics of the lineout throw [2, 3], spatiotemporal interactions of the thrower with offensive players have not yet been investigated during this action. Thus, the aim of this study is to identify performance factors among spatiotemporal coordinations during the lineout.

Methods

Eight professional athletes competing at the highest French national level (Top 14 Championship), voluntarily agreed to participate in this study (two throwers, six line-players). Kinematics of the thrower were recorded using a 10-camera optoelectronic system (Arqus cameras, Qualisys, Göteborg, Sweden) at 100 Hz. Concerning players in the line, a synchronized 10-camera video system (Miqus Video, Qualisys) sampled at 100 Hz, combined with Theia3D software (Theia Markerless, Kingston ON, Canada), was used. The experiment was conducted during training sessions. The testing protocol included two teams composed of one thrower and three line-players. Each team performed 40 lineouts, and a total of 20 lineouts were analyzed, including 10 successful and 10 unsuccessful trials, according to the technical staff's classification. Kinematical parameters related to the throw and the lineout players, were analyzed, based on the success of the lineout, using paired t-tests.

Results and Discussion

The duration of both the throwing phase and the preparation phase significantly influenced lineout success ($p < .05$, Figure 1). The success of the throw depended on the duration of the preparation phase. Indeed, the thrower had to execute the gesture within a specific time window to ensure optimal synchronization with the jumper.
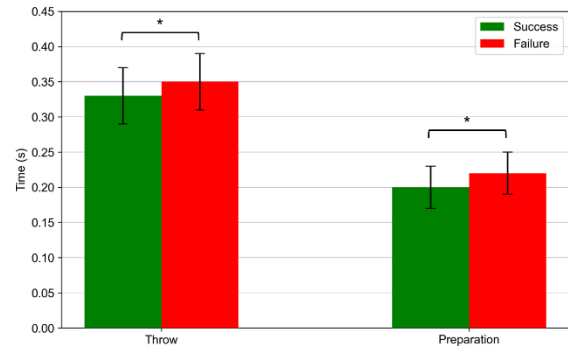

Figure 1: Duration of the throw and the preparation phase according to the lineout success.

The ball capture height was also identified as a key performance factor ($p < .05$). Balls were captured higher for successful lineouts ($3{,}81 \pm 0{,}22$ m for successful trials vs $3{,}56 \pm 0{,}23$ m for failed trials). High ball captures subsequently limit the chances of interception by the defensive team. However, no kinematic parameter of the throw and no synchronization variables seemed to influence lineout success.

Conclusions

In the current study, spatiotemporal interaction dynamics were investigated and performance determinants during lineout were identified. Future research should investigate these parameters during lineouts integrating both defensive and offensive players in order to observe the influence of the defense and thus adapt training session accordingly.

Acknowledgments

References

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