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## Clustering technical approaches of world class pole vaulters

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## INTRODUCTION

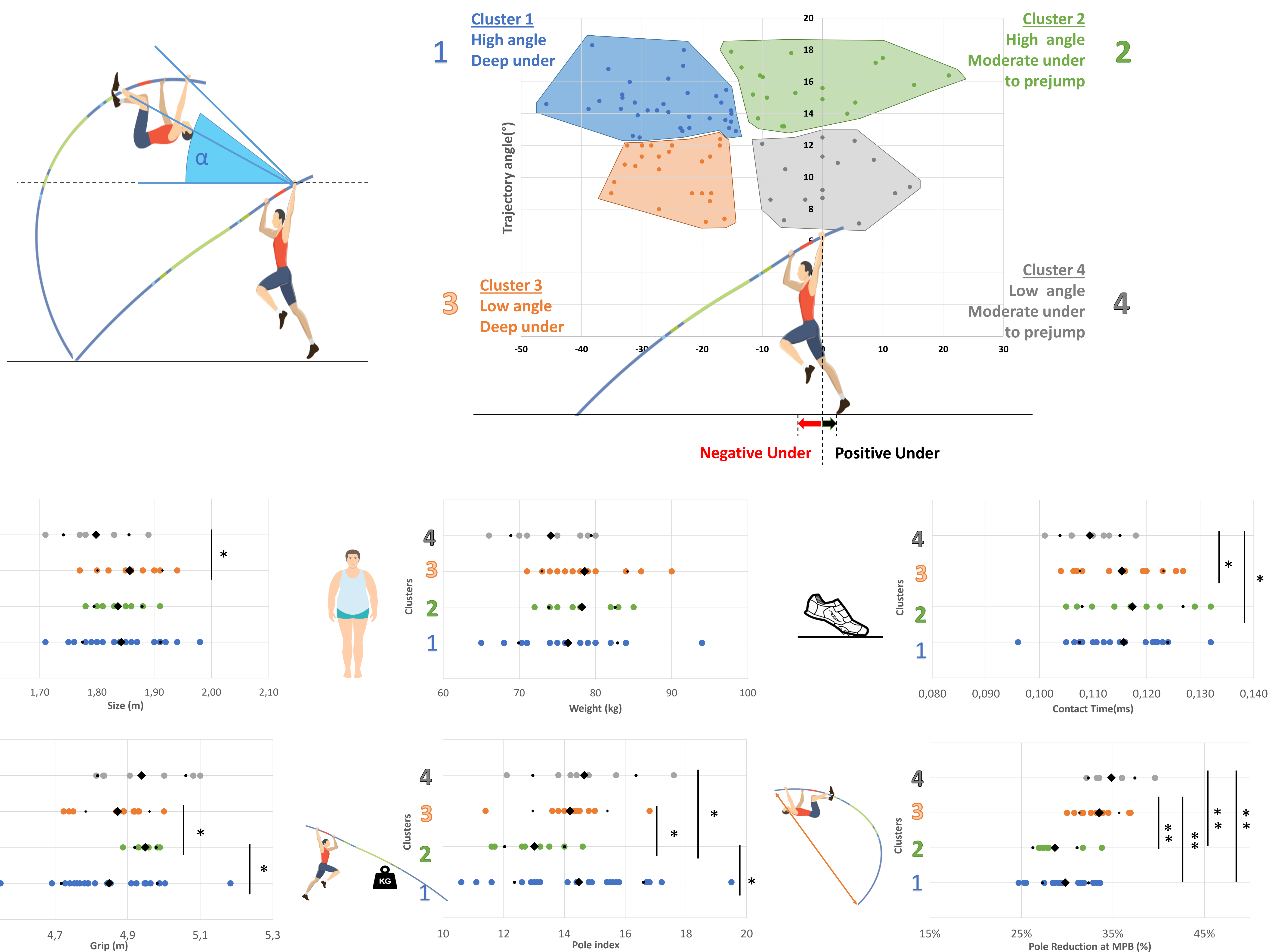
Pole vault performance has been mainly biomechanically investigated to point out performance determinants such as speed, grip, size of athletes or take-off (TK) angle. From this, ideal technical approaches of pole vaulting for performance has been described. Today, observations of top vaulters raise questions about this classical technical model. The aim of this study was to identify potential technical profiles using measurements taken during official competitions and to examine these profile's characteristics.

## METHODOLOGY

During competitions occurred in France, biomechanical analysis was performed from run-up to the bar clearance between 2012 and 2023. Best jump from men over 5.00 meters was extracted from database (n=98), in order to identify non-overlapping subgroups using the k-means clustering method based on trajectory angle and take-off position.

## RESULTS

K-means method pointed out 4 clusters with distinct behaviors and comparison of these clusters highlighted several differences in mechanical parameters collected.



## CONCLUSION

This study pointed out that different pole vault styles can be highlighted at world class level based on technical parameters. We observed that each cluster produces performances with similar speed and energy net gain level as input but had various behaviors when interacting with the pole (TK phase, pole bending and trajectory). Therefore, it is of interest to describe more accurately these technical approaches for teaching this discipline and improving coaching process.