COUNTERMOVEMENT JUMP PERFORMANCE OF INTERNATIONAL SIXES LACROSSE PLAYERS ACROSS A PERFORMANCE CYCLE

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NSCA

BRITISH LACROSSE

INTRODUCTION

Sixes lacrosse (SL) is the newest format of lacrosse, which has recently been selected for **inclusion at the 2028 Los Angeles Olympics**. The physical performance of men's lacrosse athletes has been explored, however, to date the **physical performance of international men's SL is unknown** [1]. Moreover, with the importance of **monitoring physical performance** in preparation for competition, understanding performance changes during this period is crucial for practitioners.

Jump height is commonly used as a proxy for lower limb power, however, investigating the countermovement jump (CMJ) **force-time curve using force plates can provide more detailed analysis of an athlete's readiness for competition** [2]. Gathercole et al., [2] highlights the inclusion of **CMJ mechanics, strategy and outcome metrics** provide a wealth of information for practitioners to base decisions of training. Therefore, the **purpose of this study** was to **assess the changes in CMJ metrics** of **international men's SL** athletes during a **six-month period** leading into an international SL competition.

METHODS

Eighteen international men's SL players (age; 25 ± 4 years, height; 182.2 ± 7.1 cm, mass; 86.9 ± 8.6) participated within the study and were monitored over a six-month period (January-July 2022), up to the 2022 World Games. At each training camp, **three CMJ repetitions** were performed, with arms akimbo, at the commencement of training after a standardised warm up. CMJ force-time data was collected using Hawkin Dynamics (HD) dual force plates and analysed using HD software through a tablet connected via Bluetooth.

CMJ measures were selected for further analysis based on acceptable reliability from within session coefficient of variation percentage (CV%) and intraclass correlation coefficients (ICCs) and interpreted based on the associated 95% confidence intervals (CI). **Data was bootstrapped to 1000 samples, following which a series of repeated measures analysis of variance (ANOVA) with Bonferroni post-hoc analysis and Hedge's *g* effect sizes (ES) were used to determine changes in CMJ metrics**, using JASP statistical software. Alpha error probability was set at 0.05, ES were interpreted as 0.00–0.19 = trivial, 0.20–0.59 = small, 0.60-1.19 = moderate, 1.20-1.99 = large and ≥2.00 = very large.

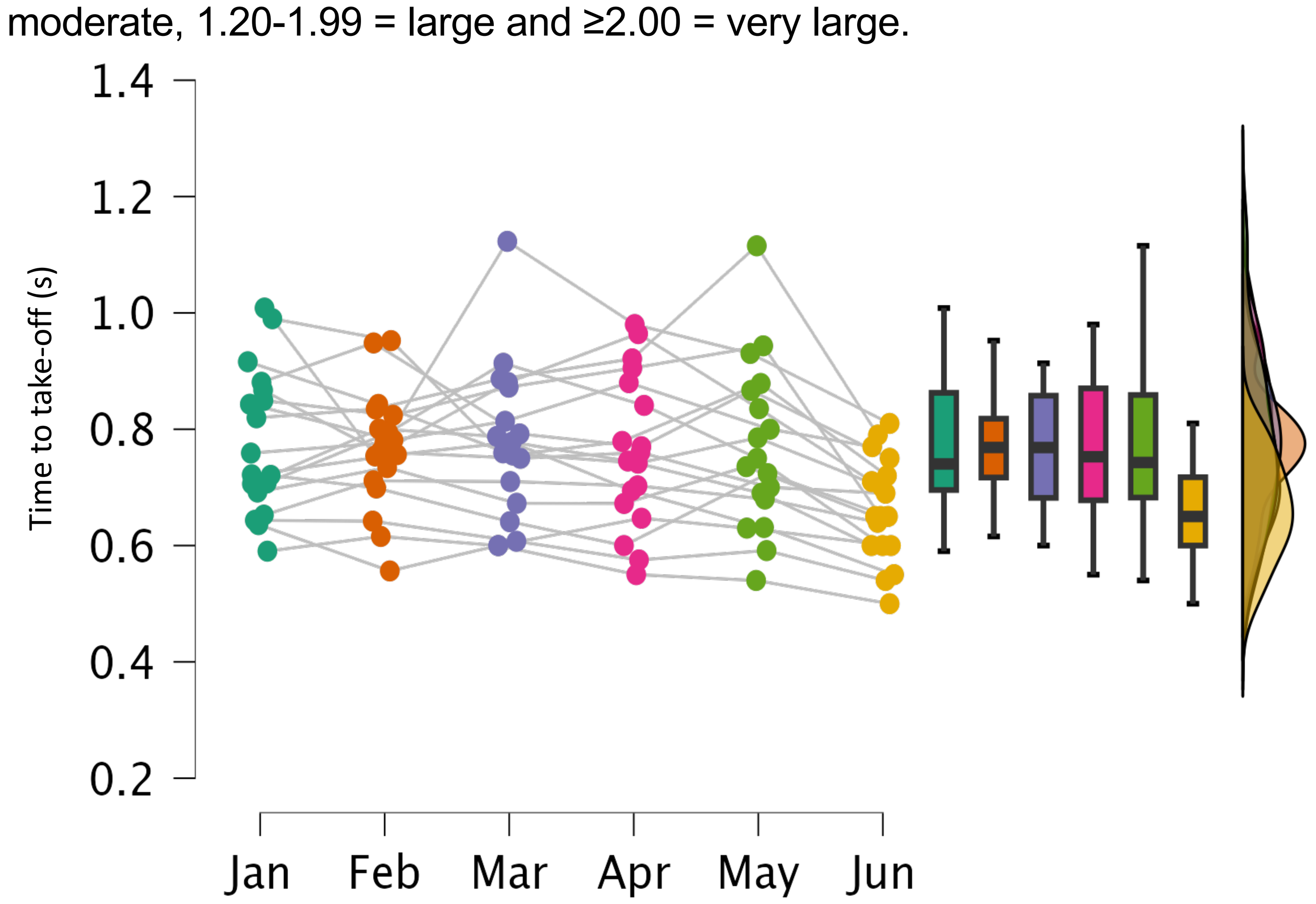

Figure 5: Individual, box and whisker and raincloud plot for time to take off.

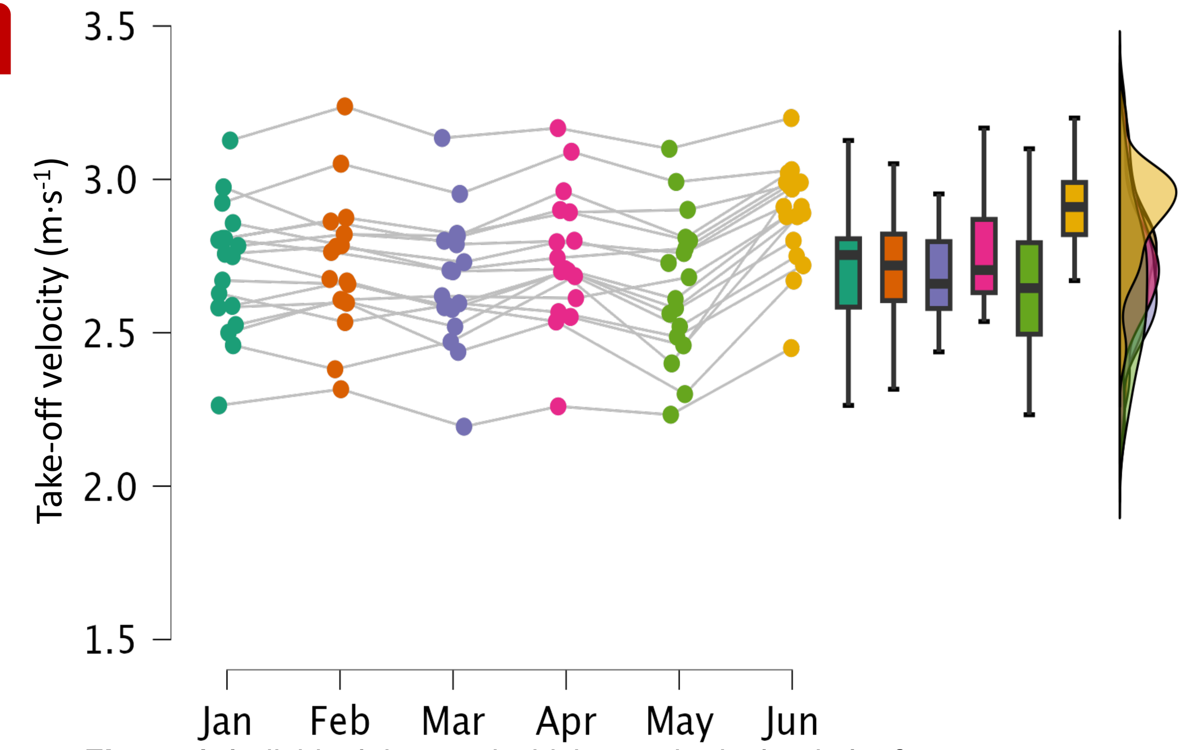

Figure 1: Individual, box and whisker and raincloud plot for take-off velocity.

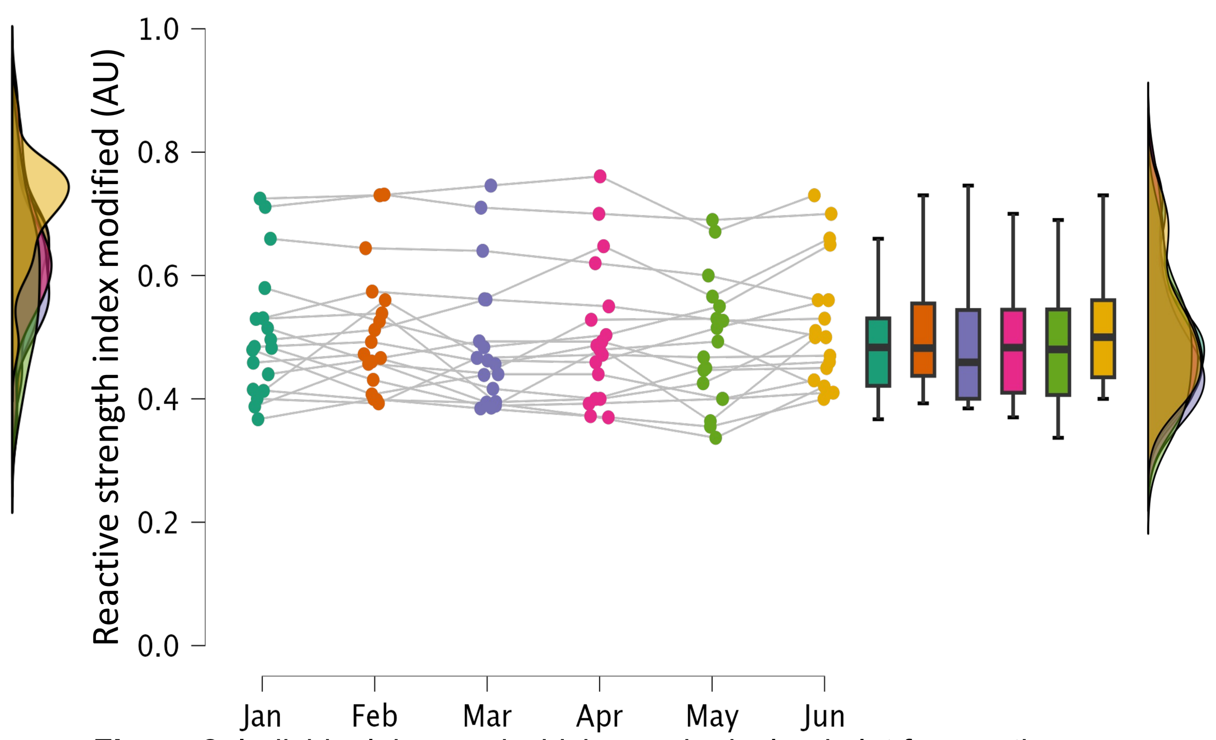

Figure 2: Individual, box and whisker and raincloud plot for reactive strength index modified.

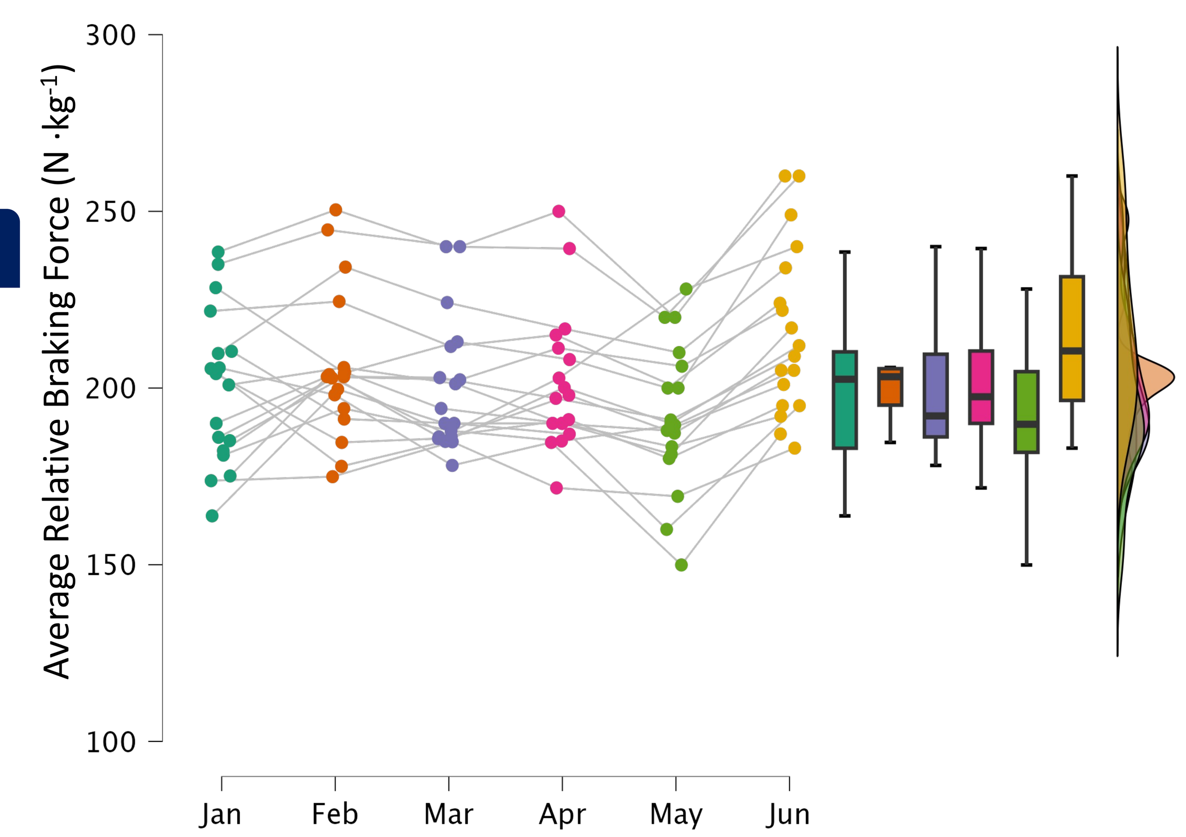

Figure 3: Individual, box and whisker and raincloud plot for average relative braking force.

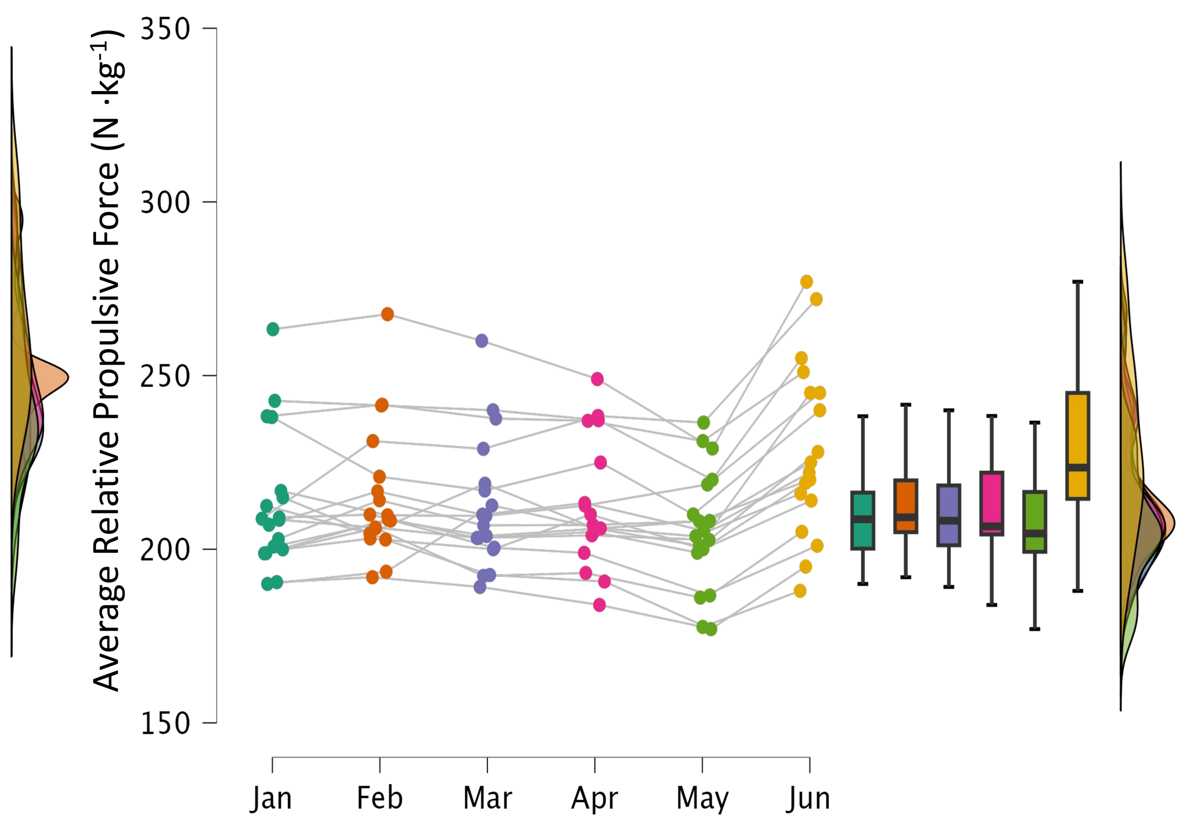

Figure 4: Individual, box and whisker and raincloud plot for average relative propulsive force.

Table 1: Mean ± SE for CMJ measures across the six-month observation period.

	J	F	Mr	A	My	Ju
Jump height (m)	0.38 ± 0.03	0.39 ±0.04	0.36 ± 0.02	0.40 ± 0.05	0.38 ± 0.04	0.44 ± 0.03
Take off velocity (m·s⁻¹)	2.75 ± 0.08	2.78 ± 0.09	2.72 ± 0.09	2.80 ± 0.09	2.72 ± 0.09	2.83 ± 0.09
System weight (N)	855.22 ± 22.93	843.96 ± 22.31	847.81 ± 25.23	853.59 ± 21.76	856.71 ± 20.42	857.86 ± 20.81
Jump momentum (kg·m·s⁻¹)	246.39 ± 24.28	240.61 ± 24.29	240.53 ± 25.22	250.02 ± 21.40	247.55 ± 20.30	262.21 ± 20.67
Time to take off (s)	0.78 ± 0.05	0.77 ± 0.03	0.79 ± 0.04	0.79 ± 0.06	0.81 ± 0.07	0.75 ± 0.05
mRSI (AU)	0.50 ± 0.04	0.53 ± 0.04	0.49 ± 0.05	0.53 ± 0.05	0.49 ± 0.05	0.55 ± 0.05
CM depth (m)	-0.37± 0.03	-0.34± 0.02	-0.35± 0.03	-0.36± 0.04	-0.36± 0.04	-0.34± 0.03
Average relative braking force (N·kg⁻¹)	191.56 ± 6.45	199.75 ± 7.80	190.86 ± 6.45	194.19 ± 5.98	209.11± 6.38	263.87 ± 12.96
Average relative propulsive force (N·kg⁻¹)	209.73 ± 5.95	216.17 ± 6.46	211.19 ± 6.92	213.05 ± 7.90	222.00 ± 9.24	263.53 ± 12.09

mRSI = modified reactive strength index, CM = countermovement, J = January, F = February, Mr = March, A = April, My = May, Ju = June.

REFERENCES

1. Ripley, N.J., Wenham, T. & Collier, M. *German Journal of Sport and Exercise Research*, 2024.
2. Gathercole, R.J., Stellingwerff, T., Sporer, B.C. Effect of Acute Fatigue and Training Adaptation on Countermovement Jump Performance in Elite Snowboard Cross Athletes. Journal of Strength and Conditioning Research (2015) 29(1):p 37-46.

RESULTS

Table 1 presents the **mean and standard error (SE) for bootstrapped CMJ measures over the sixth-month period,** these measures which were found to have **good-excellent absolute reliability and poor-excellent relative reliability.** A significant, yet **trivial decrease was observed in system weight** (SW) between January to February, however, across all other months there were trivial, non-significant changes in SW. Non-significant, **trivial-moderate** changes were observed for **jump height (JH), jump momentum (JM), take-off velocity (TOV), time to take off (TTTO), modified reactive strength index (mRSI) and countermovement depth (CM-D). Large** and significant increases in **average relative braking (ARBF) and propulsive forces (ARPF)** was observed in June in comparison to all months, with non-significant, trivial-moderate changes between all other time-points.

CONCLUSIONS

The purpose of this study was to assess the changes in CMJ metrics of international men's SL athletes during a six-month period (Figure 1–6). Across the sixth month period, **CM-D and TTTO decreased**, while **TOV and SW increased**. CMJ performance was optimised as the athlete's approached competition, with **increases in JH, JM, TOV, and SW while CM-D and TTTO decreased**.

Increases in ARBF and ARPF in June could coincide with **resistance training strategies incorporated pre-competition (i.e., lower volume loads).** It may also be related to an **overall reduction in training volume as the domestic field lacrosse season finished in May**, potentially leading to a subsequent supercompensation effect.

PRACTICAL APPLICATION

The results of this study highlight the **fluctuations within a performance cycle in CMJ metrics** and the potential **interaction between fitness and fatigue**. Although the **changes in outcome are subtle** when the combined view of **all metrics** highlights the adaptive response to physical preparation.

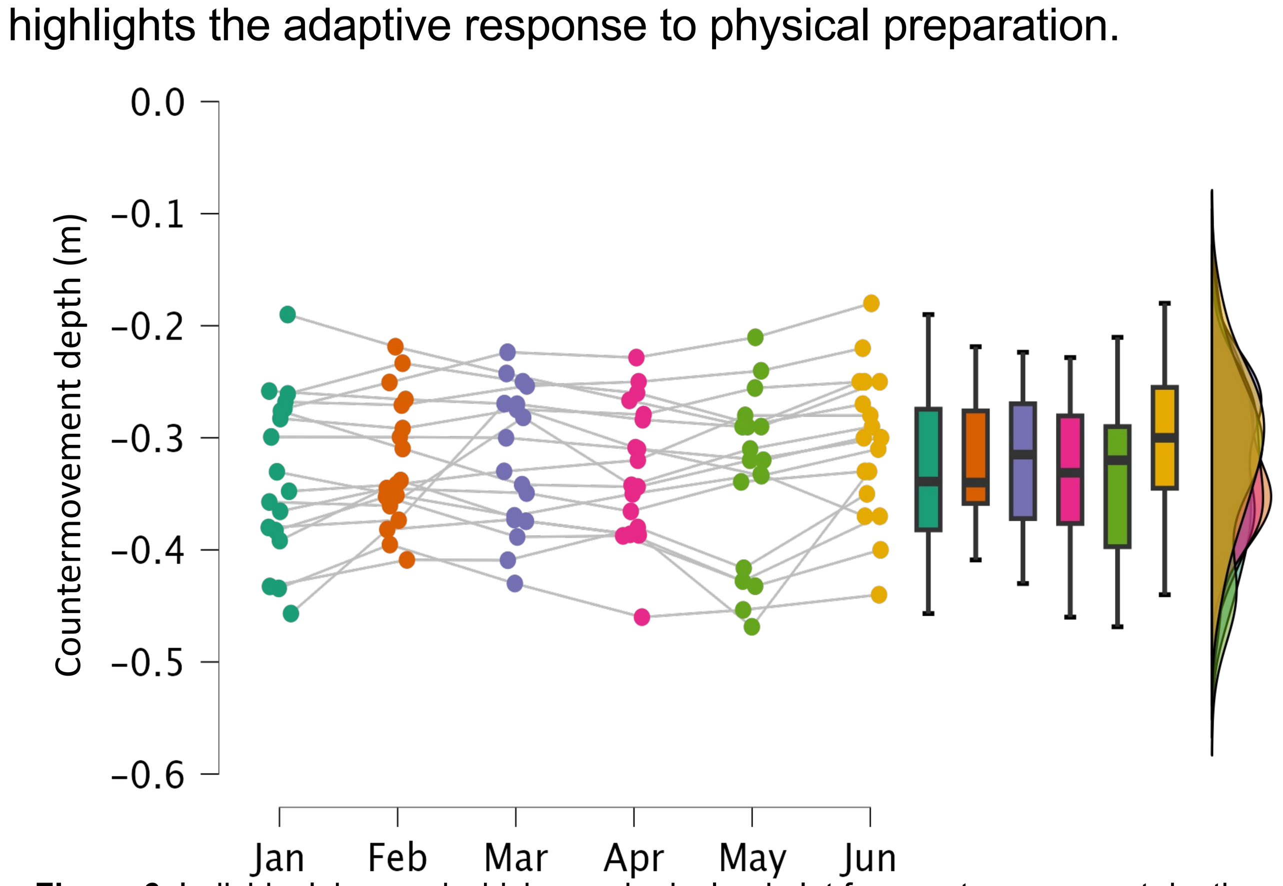

Figure 6: Individual, box and whisker and raincloud plot for countermovement depth.