Caffeine or Ketones Added to Pre-workout: Impacts on Jump Performance

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BACKGROUND & PURPOSE

Multi-ingredient pre-workout supplements (MIPS) are commonly used in an attempt to improve exercise performance. The countermovement jump (CMJ) is often employed by coaches to assess lower body power and athlete fatigue prior to a workout in an attempt to better autoregulate the training session due to the CMJ's low fatiguing but highly sensitive nature. Previous literature has suggested that commonly included MIPS ingredients such as caffeine may impact CMJ and power metrics. But little is known about ketone supplementation, which is increasingly popular. Given the popularity of MIPS amongst athletes, the purpose of this study was to assess how the addition of caffeine and exogenous ketones may impact CMJ metrics.

METHODS

Sixteen resistance-trained (≥3 days per week for ≥ 6 months) males (n=14) and females (n=2) (20.2±1.4yrs, 78.0±9.9kg, 177.4±7.5cm) were recruited for this single- blind randomized crossover investigation consisting of four laboratory visits each separated by 2- 7 days. For each visit, participants arrived at the laboratory having abstained from vigorous physical activity and caffeine for 12 hours and alcohol for 48 hours. During the initial baseline visit, following the collection of height and weight, participants consumed a non-stimulant MIPS mixed in 12oz of water. They then rested for 30 minutes before performing two maximal effort CMJ on an electronic vertical jump platform separated by one minute of rest. The highest CMJ of the two trials was used for analysis. After this, participants completed a single trial of 4 consecutive vertical jumps to determine their explosive leg power factor (ELPF; air time/ground contact time).Visit 1 supplementation consisted of a non-stimulant (NS) MIPS. Visits 2-4 were randomized to 5mg/kg caffeine, 20 g exogenous ketone, or both in addition to NS Variations in peak CMJ and ELPF between conditions were assessed via a one-way repeated measures analysis of variance (RMANOVA). Significance was set at p≤0.05.

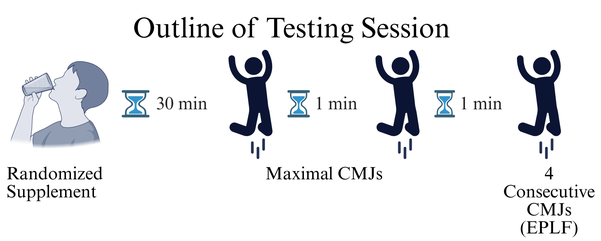

Figure 1. Outline of Testing Session.

RESULTS

No main effect of condition was seen for either peak CMJ (23.3± 4.57in; p=0.155) or ELPF (2.04±2.43; p=0.225). Differences between conditions were insignificant (MIPS: 23.4 ± 4.52 in; MIPS+C: 23.7 ± 4.93 in; MIPS+K: 22.9 ± 4.94 in; ALL: 23.2 ± 4.27 in)(**Figure 2.**) or ELPF (MIPS: 1.61 ± 0.62; MIPS+C: 1.75 ± 0.66; MIPS+K: 1.6 ± 0.6; ALL: 1.56 ± 0.66) (**Figure 3.**). However, moderate partial eta-squared effect sizes were noted for CMJ (0.091) and ELPF (0.116) indicating the small sample size likely played a role in these findings.

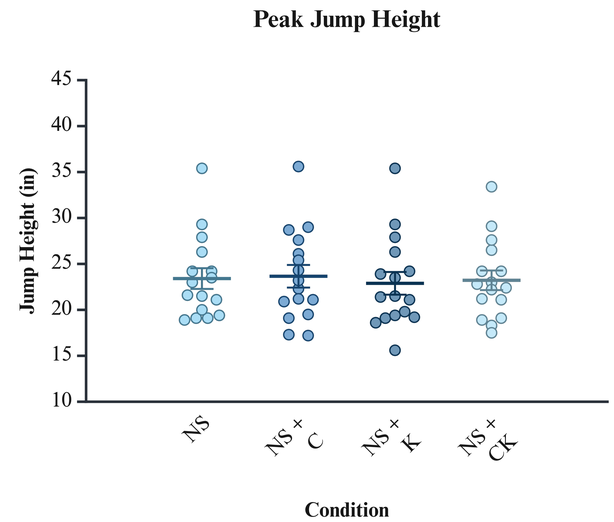

Figure 2. Peak jump height (in) during each supplement condition. Values are reported as mean ± standard error.

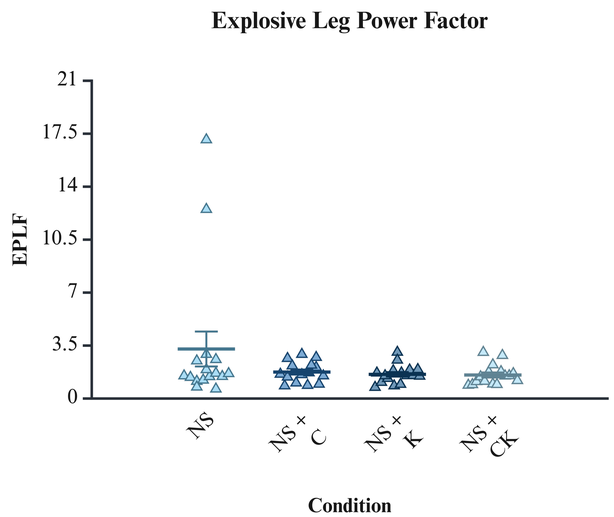

Figure 3. Explosive leg power factor (air time/ground contact time) for each condition. Values are reported as mean ± standard error.

CONCLUSION

These data suggest that the addition of 5 mg/kg of caffeine or 20g of exogenous ketones, either alone or combined, to a non-stimulant MIPS does not impact measures of CMJ or ELPF performance in a laboratory setting. However, as moderate effect sizes were seen for main effects of condition, the reduced sample size of the current investigation likely impacted these findings. Future studies should expand on these findings with larger sample sizes and varied populations.

Practical Applications

Strength coaches and practitioners may not need to consider if caffeine or exogenous ketones are included in an athlete's chosen MIPS taken prior to testing if these similar assessments are being used. However, it remains unknown how these results may apply to other performance tests, longer testing batteries, workouts, or different populations.

References

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Table 1. Participant Characteristics

N	Male (14)	Female (2)	Total
Age (yrs)	20.1 ±	20.5 ± 2.1	20.2 ± 1.4
Height (cm)	179.1 ± 6.2	165.5 ± 3.5	177.4 ± 7.5
Weight (kg)	79.8 ± 9.4	66.0 ± 1.4	78.0 ± 9.9
BMI (kg/m^2)	24.8 ± 2.6	24.1 ± 1.5	24.8 ± 2.5