

# OUTPUT VBT - BACK SQUAT

## INTRO

To investigate the concurrent validity of the Output V2 IMU for measuring mean and peak velocities during the back squat, the system was compared to a Linear Positional Transducer (GymAware). It is essential that a system has good validity and accuracy for evidence-based practice which is vital for any practitioners using the Output Capture system. Given the portability and practicality of the system, this will ensure that wherever and whenever practitioners are, they will be able to accurately measure mean and peak velocities.

## METHODOLOGY

A GymAware was used as the ground truth for this validity investigation, as it is considered as the gold standard Linear Positional Transducer. The Output V2 IMU was placed on the barbell for the investigation while performing the back squat reps. All participants in the study completed back squat reps of varying speeds. A total of 1029 reps were recorded for the investigation. The Pearson Correlation Coefficient ( $r$ ), Adjusted  $R^2$ , Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) were used to complete the analysis.

## RESULTS

The results can be seen in Table 1 below. All measurements were plotted in a correlation plot and can be seen in Figure 1 and 2.

MEAN VELOCITY		PEAK VELOCITY	
$r$	0.955	$r$	0.953
$R^2$	0.912	$R^2$	0.907
MAE	0.059 m/s	MAE	0.107 m/s
RMSE	0.082 m/s	RMSE	0.124 m/s

Table 1 - Results for mean velocity and peak velocity

## CONCLUSION

These results show a strong correlation and excellent agreement between Output V2 IMU and GymAware. A limitation of this investigation is the number of participants that were included. Further investigation could be carried out to validate Output V2 IMU across a wider cohort of participants of varying ability. However, given the high correlation and excellent agreement, it is expected that this accuracy will carry over to practical application of Velocity Based Training (VBT)

assessment. Therefore, enabling practitioners to accurately measure mean and peak velocities, without the usual laboratory constraints, using the Output V2 IMU.

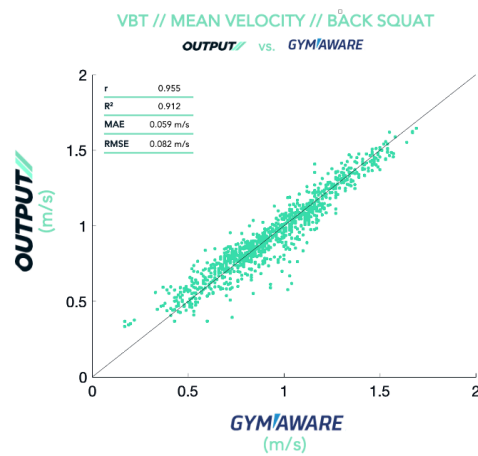


Figure 1 - Correlation Plot for Mean Velocity

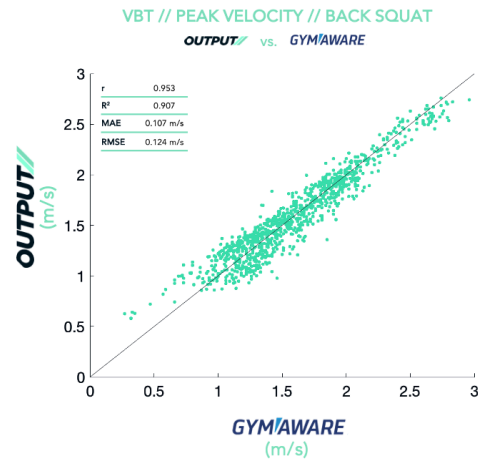


Figure 2 - Correlation Plot for Peak Velocity

## VELOCITY COMPARISON

