

HOW DOES BEAST COMPARE?

ACCELEROMETER BASED WEARABLE DEVICE vs TETHERED UNIT LINEAR ENCODERS

Technology based on tethered units, such as Tendo Power Analyzer, Gymaware, T-Force, etc are considered as being the golden standard and are highly adopted by professionals to measure performance while lifting weights. Beast Sensor and other wearable technology aims to fulfill a similar scope, while being more affordable, and easier to used technology.

In this document, we compare these two technologies highlighting the advantages and disadvantages for each, with the aim of helping to understand which one best fits needs depending on specific goals of strength tracking.

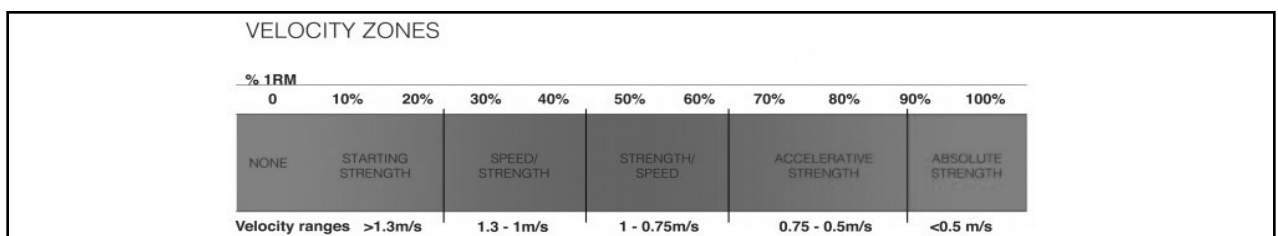
Some parameters relevant for a decision are highlighted in the following table:

	BEAST SENSOR (WEARABLE TECH)	TETHERED UNIT (LINEAR ENCODER)
ENTRY LEVEL PRICE	249 EUR/USD	> 1600 EUR/USD
SETUP TIME	10 seconds	Needs to be positioned and attached for each exercise
SIZE	Max dimension 4 cm, weight: 30 grams	Max dimension 20 cm, weight > 1 kg
VARIETY OF EXERCISES TRACKED	high	Some exercises are difficult to track due to cable
DATA CONSISTENCY	error: 5-6%	error: < 0.5 %

It is clear that switching from a tethered unit to an accelerometer enhances its portability and as a result of a more affordable pricing option along with the ease of use, it makes for a product that can be owned and used not only by trainers and coaches, but also great for athletes and fitness enthusiasts.

These advantages come with some drawbacks though, as the data consistency and accuracy with accelerometer technology is slightly lower than in the case of the linear encoder.

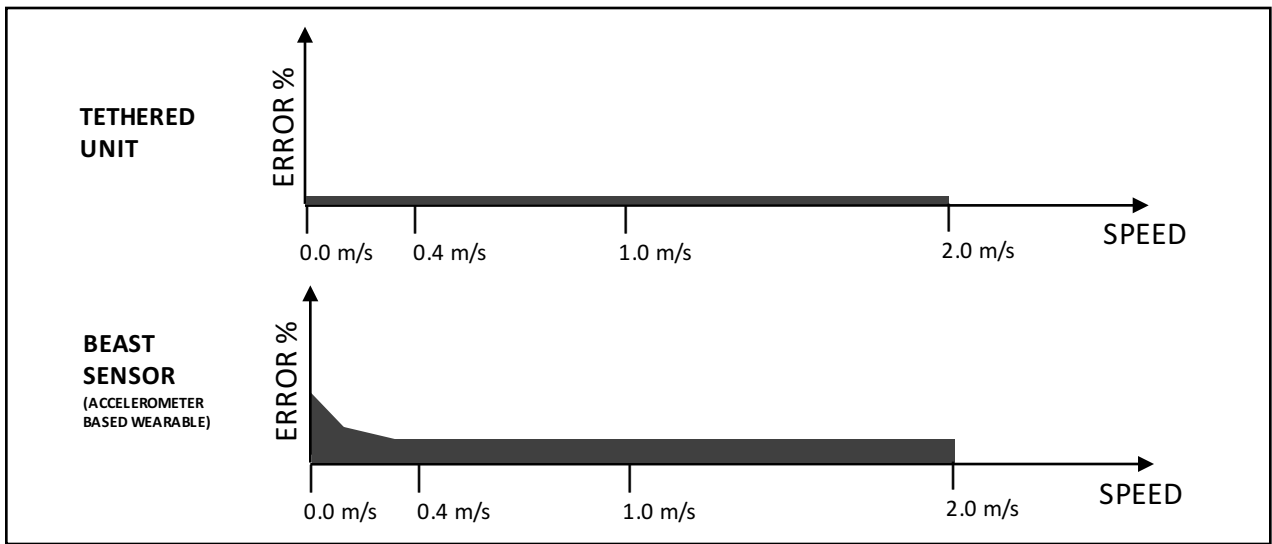
Let's look in detail at how different accuracy impacts the quality of the decisions a trainer or athlete might take after analyzing his repetitions. Both linear encoders and accelerometers measure the vertical speed of the lift, and based on it help you targeting the correct training zones. Medium to high speeds are used to train power and explosiveness, while slow speed is generated by heavy loads used in order to train maximum strength. How speed of the lift is correlated with the % 1RM can be seen by the table below¹



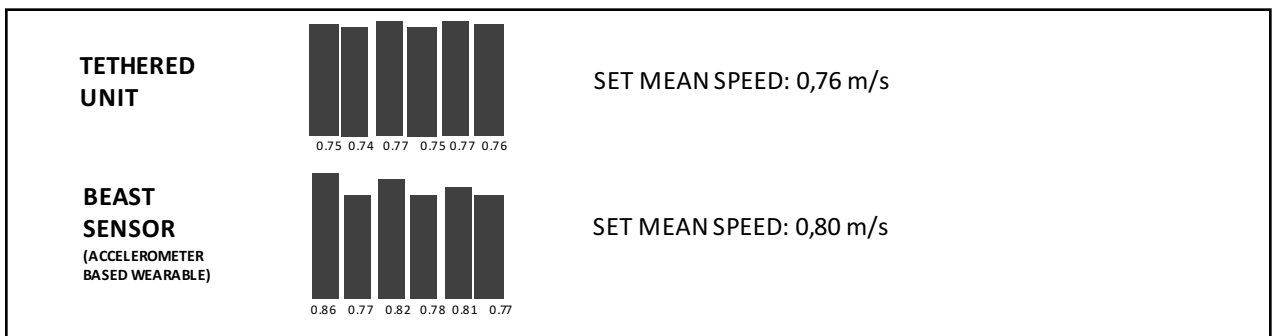
How do these differences in accuracy impact the readings of speed in accelerometers vs linear encoders?

The following results are a qualitative comparison between the two, where for each speed reading the related error of measurement consistency is quantified:

1. ref: <https://www.elitefts.com/news/bryan-mann-talks-velocity-based-training/>

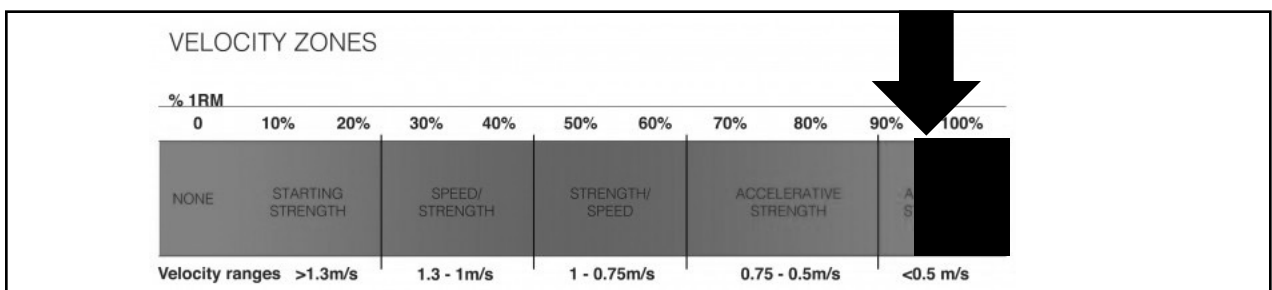


As you can see, while below 0.4 m/s, the error for Beast Sensor wearable gets higher, above 0.4 m/s the error is only slightly higher compared to linear encoders- but, as you can see the readings are consistent when considered as the average performance output of a set:



There is a clear limit of the algorithms effect on the accelerometer's readings, because when a very heavy weight is lifted, it is difficult to accelerate it quickly, resulting in accelerometers being less able to measure.

It is worth noting that this error affects only one part of the "absolute strength" area, as highlighted in the figure below.



CONCLUSION:

If you are looking for a technology to practice velocity based training and to optimize and track your loads, both a linear encoder and accelerometer based wearable devices will fit your needs and let you know if you are in the correct training zone.

If you often train >90% 1Rm, you might want to look into choosing a tethered unit as they have better accuracy when training in the "absolute strength" zone. This is because in this zone, your speed is often very slow, with little to no acceleration. Given that training above 90% and when pushing for a 1RM that puts you more at risk for injury, a tethered unit will provide with more accurate readings training in this "dangerous" zone.

Accelerometer based technology like Beast Sensor, on the other hand, might help the less expert lifters to avoid this dangerous zone by predicting 1RMs without the need of hitting that zone. It is also a good solution for any level of expertise trying to gain experience with tracking strength training, from fitness enthusiast to pro and semi-pro athletes, while for practicing barbell sports and focusing most of the time on moving very high weights a linear encoder might give a better tracking experience².

2. ref: <http://www.hammershed.com/podcast/episode-43-velocity-based-autoregulation-with-brandon-se-nn/>