

HILTI

Study into benefits of Hilti EXO-T

Tool balancer for reducing fatigue

Introduction

The physical demands of heavy-duty drilling and demolition can cause fatigue, muscle pain and injuries for construction crews. **This puts a strain on construction businesses due to lower productivity, sick leave and workforce turnover.**

The EXO-T, a wearable construction tool balancer from Hilti, is designed **to help reduce fatigue, shoulder strain and lower back pain during repetitive, heavy-duty wall-facing jobs.** It does this by providing active weight distribution for easier handling of breakers and rotary hammers.

Putting the EXO-T to the test: chiseling use case

But just how effective is the EXO-T when it comes to reducing the strain? The Technical University of Darmstadt (TUD) in Germany set out to answer this question by asking professionals of varying ages, experience levels and heights to chisel into a concrete block using a Hilti TE-70-ATC rotary hammer weighing around 12kg.

The test was set up for each participant based on their individual body proportions. It involved **working at both shoulder and elbow height – once using the EXO-T**

and once without. The aim was to provide an objective assessment of the participants' muscle activity and heart rate by measuring:

1. the electrical activity of participants' arm and shoulder muscles, and
2. the participants' heart rate using electrocardiogram (ECG).

Study participants also answered a subjective, question-and-answer-based assessment of their perceived exertion.

Test set-up

- No. of participants: 15
- Average age: 39
- Average height: 183 cm
- Duration of each test scenario: 20 mins
- What was tested? Muscle activity and heart rate



Results: EXO-T reduces muscular strain and heart rate

The outcome of the wall-breaking test showed that the EXO-T **significantly reduced muscular strain on the arms and shoulders**. Both the mean and dynamic electrical activity of the

biceps, lateral triceps, and deltoid muscles on the worker's dominant side were significantly reduced when working on areas at elbow and shoulder height (see table below).



	Biceps	Triceps	Deltoid	Lumbar, erector spinae
Mean reduction in electrical activity when wearing the EXO-T (MVC%)				
Elbow height	8.37	9.01	2.57	0.68
Shoulder height	7.92	9.3	7.02	0.26
Dynamic reduction in electrical activity when wearing the EXO-T (MVC%)				
Elbow height	12.46	10.27	5.59	4.19
Shoulder height	11.78	11.84	9.35	2.11



**I felt more control
by focusing on
contact pressure.**



The ECG also revealed a significant reduction in the mean heart rate, which could lead to a lower rate of fatigue of the cardiovascular system. In particular, **the mean heart rate during the last 30 seconds of the observed task was significantly reduced by $p < 0.05$.**

Users of the EXO-T also felt this, with the subjective assessment showing participants perceived significantly lower exertion after each scenario when working with the EXO-T. Most participants agreed or fully agreed that they prefer using the EXO-T.



Less force is required. There was noticeable relief.

It feels easier with the EXO-T

The participants' perceived exertion (using the Borg RPE scale) fell significantly when they wore the EXO-T.

At elbow height (MVC%):

From 14.4 to
12.73

At shoulder height (MVC%):

From 16.2 to
13.53

Conclusion

The test results show that by reducing muscle strain and cardiovascular activity, the EXO-T has the potential to contribute to workforce wellbeing, reduce injuries and lower the incidence of health issues and sick leave caused by physically demanding work.



It's helpful at shoulder height – the work is less strenuous.



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