SAFETY OF WBV
THE IMPACT AND EFFECTS OF HIGH-FREQUENCY MACHINES

A HYPERVIBE WHITEPAPER
Whole Body Vibration (WBV), pioneered nearly three decades ago by scientists involved in the European space program, is a unique method of exercise that offers a wide range of health and fitness benefits.

At that time, a vibration machine was designed with the intention of combating the negative effects of a zero-gravity environment on bone and muscle tissue. The hypothesis was that if reduced exposure to gravitational force (G-force) caused a harmful impact on the body, then increased exposure to G-force would produce positive effects — a concept that proved true in more ways than originally expected.

Since WBV technology became accessible to consumers in the 1990s, there have been multiple types of units on the market. These vary in terms of design and features, such as the type of platform, available range of frequency, amplitude, and G-force.

G-force is what drives the development of strength in our muscle and bones, and what allows us to achieve upright posture, maintain balance, and perform everyday activities such as walking and climbing stairs.
The two main types of platforms are lineal (straight vertical displacement) and pivotal (vertical displacement that alternates side-to-side around a center point).

While WBV in general offers potential benefits, it is important to understand the distinction between these two designs, and why a pivotal design has the ability to produce superior results. We’ll cover this in depth in a later section of this paper.

Frequency refers to the number of times per second that the platform moves, while amplitude refers to the degree to which the platform moves. These two features vary based on the type of unit, and are correlated with the level of benefit that can be expected.

G-force refers to gravitational force in relation to the gravitational pull of the earth, which is 1G. This is also a critical feature to understand, as the amount of G-force that a WBV unit is capable of generating is associated with different levels of benefits.

Bearing all of these variables in mind, let’s now explore some of the key myths surrounding the safety of WBV, and what you should know before beginning a vibration treatment regimen.
MYTH #1

WBV poses the same threat to the body as occupational vibration

This claim is squarely false, owing to the intermittent and controlled nature of WBV as a treatment, typically conducted in a standing position. Contrast this with the prolonged and random nature of the vibration experienced in occupational settings, which is typically experienced in a vulnerable seated position.

Individuals employed in industries that require the operation of vehicles or equipment that generate high levels of vibration — including construction workers, truckers, train conductors, and pilots — are exposed to these stresses in an ongoing manner over a prolonged period of time, which can eventually contribute to injuries.

The fact that the literature also uses the same terminology when referring to WBV as an occupational hazard and as a treatment is very misleading. The ISO (International Organization for Standardization) publishes standards pertaining to the occupational hazards of WBV, but which does not include guidelines for WBV as a treatment.

The exposure limits mentioned in the vibration directive are, therefore, not correctly determined for a WBV training condition and most likely underestimated.

As such, it is critical to understand that the parameters of WBV treatment differ greatly from the vibration experienced by industrial workers, and that the effects of short-term WBV are not equal to the forces produced by heavy vibrational equipment.

Furthermore, position has a significant influence on the way in which the body absorbs and dissipates the vibrational forces. Specifically, in standing — as opposed to sitting, which is typical in an occupational setting — the legs play a key role in minimizing the amount of force that is absorbed by the trunk and head.

A key study conducted by NASA researchers supported this position, citing that the degree of vibration stimulus is generally overestimated in subjects receiving WBV, and that the ISO occupational standards “may not be useful for assessing adverse health effects from infrequent WBV.”

One common and significant issue associated with consistent occupational exposure to vibration is the development of low back pain and associated pathologies. Considering this, it is important to note that WBV has been studied and is demonstrated to be a safe and effective treatment for this condition.

Scientific evidence shows that whole body vibration in excess of allowed ISO 2631-1 levels can relieve back pain in chronic lower back pain sufferers.

DR. JÖRN RITTWEGER
INSTITUTE OF AEROSPACE MEDICINE


MYTH #2

Higher G-force machines are unsafe and should be avoided

Increased G-force in a WBV machine is generated by increased amplitude and/or increased frequency.

Amplitude can be adjusted by the user, as it is dependent on foot position. On a pivotal platform, the further the feet are placed from the axis, or center of movement, a larger amount of displacement will occur — as the legs are moved alternately in an up-and-down fashion, as the platform moves from side-to-side.

Frequency is the number of times that the platform vibrates per second, which also contributes to the amount of force that is produced and transmitted to the body. **Hypervibe offers the ability to control both of these parameters** by adjusting the settings on the unit, as well as by adjusting body position via foot placement. This allows the individual to maintain safety, while experiencing the various benefits of a pivotal unit with these features.
There have been a number of claims that high G-force should be avoided due to danger of injury or adverse effects. This myth has been dispelled by a wide body of research, which has supported that higher G-forces are not only safe, but actually produce positive outcomes in more vulnerable, high risk subjects.

This is an area of particular concern regarding the safety of high G-force WBV — specifically for individuals with osteoporosis and the frail elderly. Among several relevant studies, one conducted by Dr. Antonius Rohlmann of Charité University in Berlin was concerned with the load placed onto the spine from high G-force machines, and the effects this load might have for someone with osteoporosis. His team found WBV to be perfectly safe for this population.

The forces produced during WBV are usually lower than those produced during walking. Therefore, the absolute magnitude of the forces produced during WBV should not be harmful, even for people with osteoporosis.

**DR. ANTONIUS ROHLMANN**  
CHARITÉ UNIVERSITY

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In a geriatrics study, clinically “frail” subjects performed a total of 152 minutes of vibration exercise with up to 8G’s over an 8-week period. According to the ISO standards for occupational vibration, this level of vibration would not be safe for 1 minute, even in normal subjects.

Remarkably, the outcomes of this study showed quite the opposite: 5

- Frail elderly could safely undergo and easily continue the exercise.
- No adverse effects were observed during the WBV regimen, and vibration exercise is accepted with high compliance by the elderly.
- By the conclusion of the study, 15 out of 19 who were dependent on wheelchairs before the experiment were able to stand and walk without any support.
- As such, vibration exercise is found to be at least as effective as regular exercise, and requires less effort and less time than traditional physical therapy.

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Importantly, adverse outcomes from using high-G pivotal type machines are rarely reported in the 600+ studies spanning nearly 30 years — whereas low G-force machines are not immune from adverse effects.

As one recent study found, “Three participants discontinued WBV therapy within 2 months after starting the study because of dizziness at night (1 participant in the 30-Hz WBV group), chronic shin pain (1 participant in the 90-Hz WBV group), and chronic plantar foot pain (1 participant in the 30-Hz WBV group) that they attributed to WBV.”

Discounting the positive effects of high G-force in favor of promoting units that generate only low G-forces falsely leads the consumer to believe that there are no significant benefits with a higher G-force machine or that there is danger of injury.

MYTH #3
All WBV machines carry the same degree of risk

There are several types of WBV units currently on the market — yet the two most common designs are lineal (also known as vertical or synchronous) and pivotal (also known as side-alternating, rotational, or sinusoidal).

Many popular machines are crafted with a lineal platform, which shifts the body in a primarily vertical direction: moving it as a whole, in an up-and-down fashion. Units with a pivotal platform, by contrast, operate around a center axis, meaning they tilt from side to side and move the legs and pelvis in an alternate fashion.

Pivotal platforms are considerate of the natural rotational movement of the pelvis. As a result of this design, forces on a pivotal machine are well absorbed by the lower body, and less vibration is transmitted to the trunk and head.
In a benchmark study conducted by NASA, researchers observed that up to 187% more vibration was transferred to the head of a user on a lineal type machine versus a pivotal type. As a result of this minimized head vibration, pivotal machines offer a higher level of comfort as compared to units with a lineal design.

In another study using a pivotal machine that generated 15G, researchers found that while 85% of that acceleration could be measured at the ankle, only 8% could be measured at the knee, and just 2% could be measured at the hip. This further demonstrates the effectiveness of the pivotal type motion at absorbing the forces in the lower body.

Importantly, due to the higher absorption of forces in the lower body, research has also shown greater muscle responses using a pivotal platform. Because of these factors, all Hypervibe machines are designed and engineered exclusively with pivotal platform movement, as discussed in greater depth later in this whitepaper.


THE BENEFITS OF PIVOTAL VS. LINEAL

PIVOTAL PRODUCES BETTER
- Blood Flow
- Bone Strength
- Muscle Activation

PIVOTAL SIMULATES A NATURAL WALKING MOTION

PIVOTAL CREATES UP TO 187% LESS HEAD VIBRATION

ONLY PIVOTAL DELIVERS
- High Frequency
  - Neurological Stimulation
  - Bone Density
  - Muscle Strength
- Low Frequency
  - Balance
  - Coordination
  - Relaxation
MYTH #4
Low G-force machines offer all the benefits of WBV

There is generally a lack, or sometimes a complete absence of, research supporting the use of low G-force machines with regard to outcomes achieved with high G-force machines such as Hypervibe. These include muscle function, neurological effects, circulation, body composition, hormonal regulation, balance, flexibility, and back pain, among others.

Simply put, G-force levels determine the degree of neuromuscular activation: rendering low G-force machines incapable of eliciting the same degree of amount of muscle stimulation, and therefore resulting in very limited use and application.

One key study revealed a threshold of approximately 2G’s for increased muscle activation, where any vibration stimulus below this level resulted in little change.  

In fact, the longest clinical trial of vibration therapy to date was a two-year randomized, double-blind, placebo-controlled trial performed on a low G-force machine, and funded by the USA National Institute on Aging. At the conclusion of the study, the researchers stated, “This trial of whole body vibration to improve bone density in elderly persons with osteopenia failed to demonstrate a statistically significant beneficial effect on the skeleton.”

The vertical acceleration threshold that is required to significantly increase the sEMG activity of the lower limb muscles is around 1.8G.

DR. KARIN LIENHARD
UNIVERSITY OF CALGARY

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While fewer studies have directly compared the outcomes associated with the use of high G-force machines versus low, one study compared the effects of a low G-force unit to a high G-force pivotal unit.

Results showed that subjects who received a 16-week course of WBV using the high G-force pivotal machine exhibited a measurable increase in circulation of growth hormone, as well as a decrease in cortisol. In addition, a significant decrease in bone resorption was noted on the high G-force pivotal machine.

The low G-force machine failed to demonstrate any effect. ¹¹

Hypervibe’s commitment to excellence is also reflected in the company’s structure. We employ a knowledgeable and talented team of trainers who are well versed in helping our owners design individualized exercise or physical therapy programs.

Once you purchase a Hypervibe, you will be invited to schedule an introductory call, where one of our trainers will walk you through the process of using your unit step-by-step. You will discuss your current health status, fitness level, and any concerns that you have.

Your trainer will then help you figure out the best program to start with, as well as explain how you will be able to gradually increase the intensity of your workouts or therapy regimen.

Having access to this type of support is critical to getting the most out of your unit, and will help you feel confident. Time and time again we have witnessed the many ways in which Hypervibe can transform your life — so now is the time to invest in your health and move one step closer to freedom and vitality!