VIBROGYM research

Harmful consequences

Prolonged exposure to vibration, particularly on the shop floor, increases the risk of cognitive changes, acrophobia, low back trouble, visual limitations and epilepsy, among other things (Mester et al., 1999). This refers to years of exposure to vibration, however.
The frequency of the vibration plays a key role in the possible risks of prolonged exposure to vibration. The resonance frequency of vital organs is between 5 and 20 Hz.
The body's strategy in response to vibration frequencies of this kind is to attenuate the vibration as much as possible.
At vibration frequencies of between 5 and 20 Hz, what is known as the transmission factor is lowered to such an extent that the vibration cannot transmit itself throughout the body as long as the amplitude of the vibration remains within certain limits.
The vibration attenuation is no longer adequate above 24 Hz and it becomes more difficult to retain balance. This can be clearly seen in the graph showing the movements of the upper body during a vibration session: the anomalies in balance become increasingly greater above 24 Hz (see figure 14).
The danger of possible damage to vital organs is reduced, however, because the resonance frequency of those organs has been exceeded. Vibration with frequencies of between 5 and 20 Hz is not advised, therefore, on the basis of these results (Mester et al., 1999). Vibration equipment with these frequencies is dubious as a result.

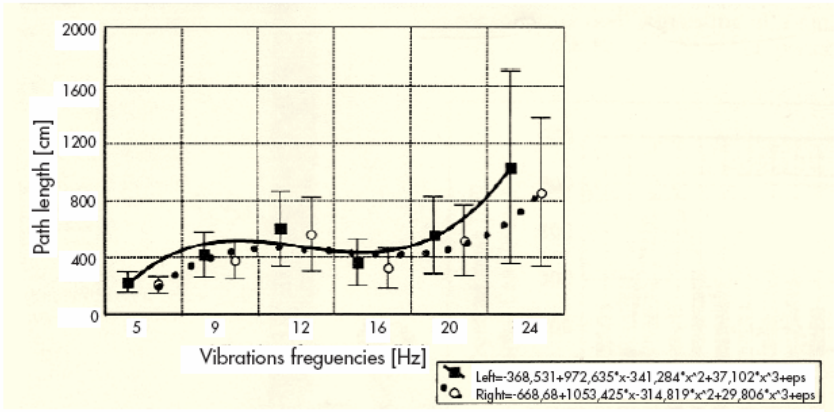

Figure 14: Movement of the upper body with increasing vibration fgequency. Movement increases strongly at approximately 20 Hz (from Mester et al., 1999).

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Drerup et al. (1999) studied the relationship between years of exposure to vibration and a number of relevant physical characteristics. No differences were found between a group exposed to vibration and a group that dissimilar work, but without vibration.

There were no differences in characteristics of posture, such as walking, standing and carrying, and no differences in the fluid contents of lumbar intervertebral discs.
Rittweger et al. studied the results of exhaustive whole body vibration, in order to establish the outermost limits of the exercise capacity with this training method (Rittweger et al., 2000). Thirty-seven test subjects twice underwent vibration until exhaustion on different days.

The test subjects carried out very slow squats during the vibration.

A battery of tests immediately followed exhaustion, including jump height (JH; immediately following exhaustion, 3 times with 5 seconds rest) and maximal contraction (MVC; 2 minutes after exhaustion). The most remarkable result was a decrease in jump height after vibration training, but this decrease disappeared on the last jump (approximately 20 sec after exhaustion).
The MVC (2 minutes after exhaustion) was lower following vibration training.
On the other hand, the EMG was higher. The response to the vibration was very individual. The reaction varied greatly from person to person. Some test subjects actually showed a higher jump after vibration training, which is confirmed by the significant correlation between the values measured for JH and MVCm for example, following both vibration training sessions.
This has implications for training with vibration. The response to vibration is strongly individual and a training program should therefore also be individual. The researchers also state that the fatigue after vibration is twofold.
In the first place, there is neuromuscular fatigue. The most important reason for this is a poor correlation between lactate after vibration training and loss of jump height on the one hand, and the rapid recovery after 20 seconds on the other hand. The second aspect of fatigue is slower to disappear; the MVC was still lower after 2 minutes.
This fatigue may have a more intramuscular cause. The conclusion of the research is that vibration training does not entail an acute risk. All values measured have returned to their original level after 15 minutes.