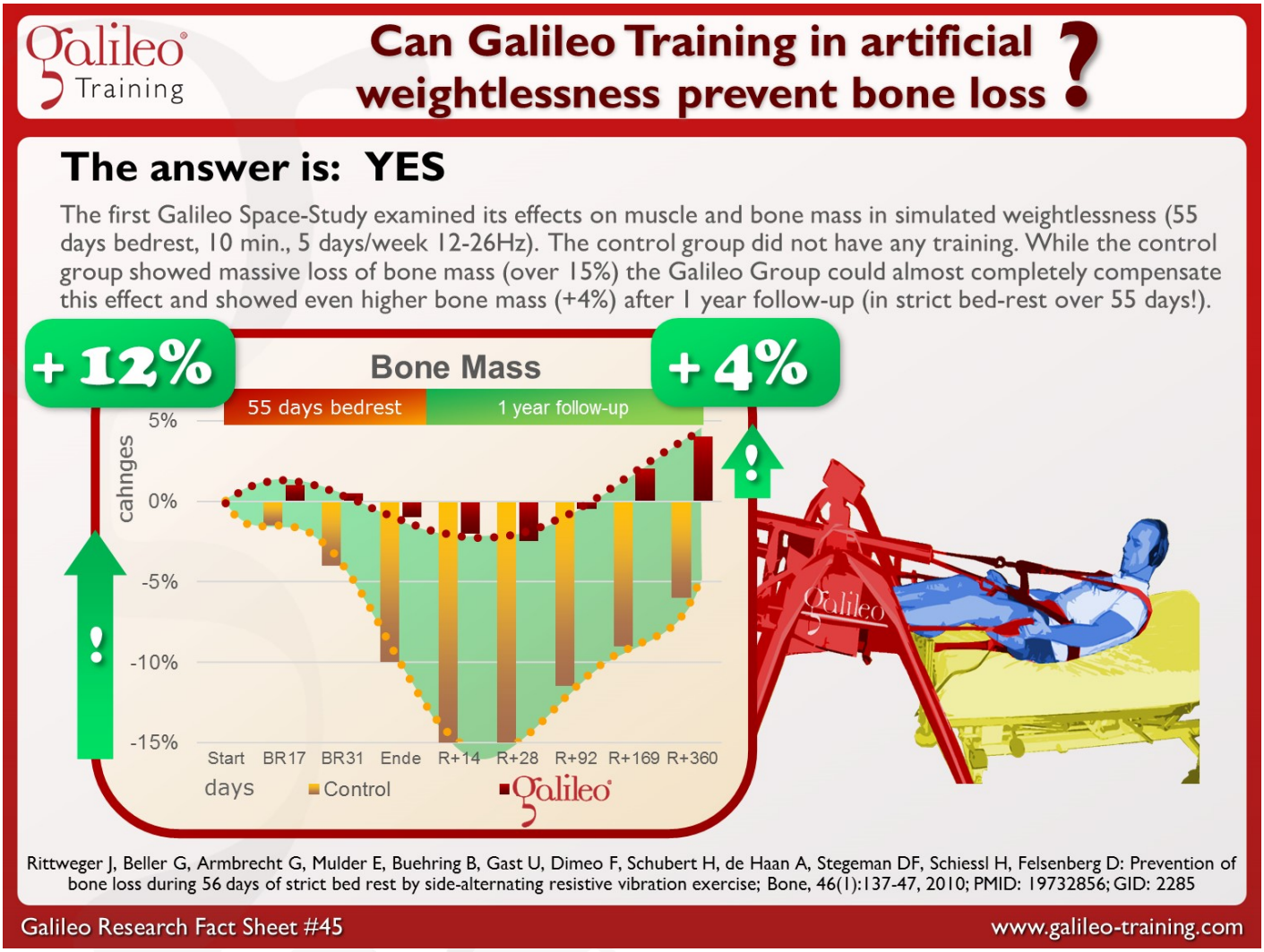

More results of the first Berlin Bedrest Study (BBR) – this time about bone loss.
(During the BBR healthy men had to stay in bed for 55 days including all every-day activities like taking a shower or going to the toilet. The study was designed to observe the effects of the disuse of the lower leg due to the bedrest (simulated weightlessness) on muscles and bone of the legs). In this analysis the loss of bone mass in the Spongiosa was documented (the fine bone structure close to the joints where the bone looks like a sponge). Due to the large bone surface at this region of the bone, bone loss happens first and fastest. The control group lost at this region until the end of the actual bedrest phase 10% (compared to about 4% of the total bone mass in the lower leg). The Galileo Group could even increase the bone mass during the bedrest phase slightly. Interestingly (and typically for bone loss processes) bone loss continued up to 3 weeks after the end of the actual bedrest phase (so when the individuals were walking again without any restrictions (in this case up to 15% bone loss). This is also one of the explanations why there was a slight loss of bone mass even in the Galileo group but only at the measurement at the very last day before standing up again:

The Galileo Training was stopped 4 days before because there where simply to many measurements to be done. The same day when they stopped Galileo Training the bone loss started. Even more astonishing however is what happened one year after the study: While the control group had not even recovered completely the Galileo Group had actually gained 2% of bone compared to the start of the study. This is very unexpected because in healthy fit young male no additional gain of bone mass was expected at all.

Comment of the head of the project Prof. Felsenberg: “Up to now Galileo Training is the most effective to compensate muscle and bone loss during bedrest”.

Bone. 2010 Jan;46(1):137-47. doi: 10.1016/j.bone.2009.08.051. Epub 2009 Sep 2.

Prevention of bone loss during 56 days of strict bed rest by side-alternating resistive vibration exercise.

Rittweger J[1], Beller G, Armbrecht G, Mulder E, Buehring B, Gast U, Dimeo F, Schubert H, de Haan A, Stegeman DF, Schiessl H, Felsenberg D.

Abstract

Bed rest is a recognized model for muscle atrophy and bone loss in space flight and in clinical medicine. We hypothesized that whole body vibration in combination with resistive exercise (RVE) would be an effective countermeasure.

Twenty healthy male volunteers underwent horizontal bed rest for 56 days and were randomly assigned either to a group that performed RVE 11 times per week or to a group that underwent bed rest only (Ctrl).

Bone mineral content (BMC) was assessed by peripheral quantitative computed tomography (pQCT) in the tibia and the radius and by dual x-ray absorptiometry (DXA) in the hip and lumbar spine at baseline and at regular intervals during bed rest and a 12-month follow-up. RVE appeared to protect muscle size and function, and it also prevented bone loss (p-values between <0.001 and 0.01).

Bone losses were largest in the distal tibia epiphysis, where BMC declined from 421.8 mg/mm (SD 51.3) to 406.6 mg/mm (SD 52.7) in Ctrl, but only from 411.1 mg/mm (SD 56.6) to 409.6 mg/mm (SD 66.7) in RVE. Most of the BMC losses were recovered by 12-month follow-up. Analyses showed that the epiphyseal cortex, rather than spongiosa, depicted the most pronounced changes during bed rest and recovery.

These results suggest that the combined countermeasure applied in this study is effective to prevent bone losses from the tibia.

This underlines the importance of mechanical usage for the maintenance of the human skeleton.