Association of exercise loading history with fall-induced hip fracture risk.

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**Influence of exercise history on fall-induced hip fracture risk.**
Hip fracture is a major public health problem. Thin superolateral cortex of the femoral neck experiences unusually high stress in a sideway fall, contributing to hip fracture risk. The aim of this study is to examine how exercise based loading history, known to affect the femoral neck cortical structure, influences fall-induced fracture risk. For this purpose, finite element models were created from the proximal femur MRI of 91 young athletic and 20 control females. Fall-induced superolateral cortical safety factors (SF) were estimated in the distal volume of femoral neck. Significantly higher (p < 0.05) SFs were observed from femoral necks with high impact (H-I), odd impact (O-I), and repetitive impact (R-I) exercise history, indicating lower fracture risk. The results indicate that it is advisable to include some impact exercise in a fracture preventive exercise program.

**Health figures: an open source JavaScript library for health data visualization**
Background
The way we look at data has a great impact on how we can understand it, particularly when the data is related to health and wellness. Due to the increased use of self-tracking devices and the ongoing shift towards preventive medicine, better understanding of our health data is an important part of improving the general welfare of the citizens. Electronic Health Records, self-tracking devices and mobile applications provide a rich variety of data but it often becomes difficult to understand. We implemented the hFigures library inspired on the hGraph visualization with additional improvements. The purpose of the library is to provide a visual representation of the evolution of health measurements in a complete and useful manner.

Results
We researched the usefulness and usability of the library by building an application for health data visualization in a health coaching program. We performed a user evaluation with Heuristic Evaluation, Controlled User Testing and Usability Questionnaires. In the Heuristics Evaluation the average response was 6.3 out of 7 points and the Cognitive Walkthrough done by usability experts indicated no design or mismatch errors. In the CSUQ usability test the system obtained an
average score of 6.13 out of 7, and in the ASQ usability test the overall satisfaction score was 6.64 out of 7.

Conclusions
We developed hFigures, an open source library for visualizing a complete, accurate and normalized graphical representation of health data. The idea is based on the concept of the hGraph but it provides additional key features, including a comparison of multiple health measurements over time. We conducted a usability evaluation of the library as a key component of an application for health and wellness monitoring. The results indicate that the data visualization library was helpful in assisting users in understanding health data and its evolution over time.