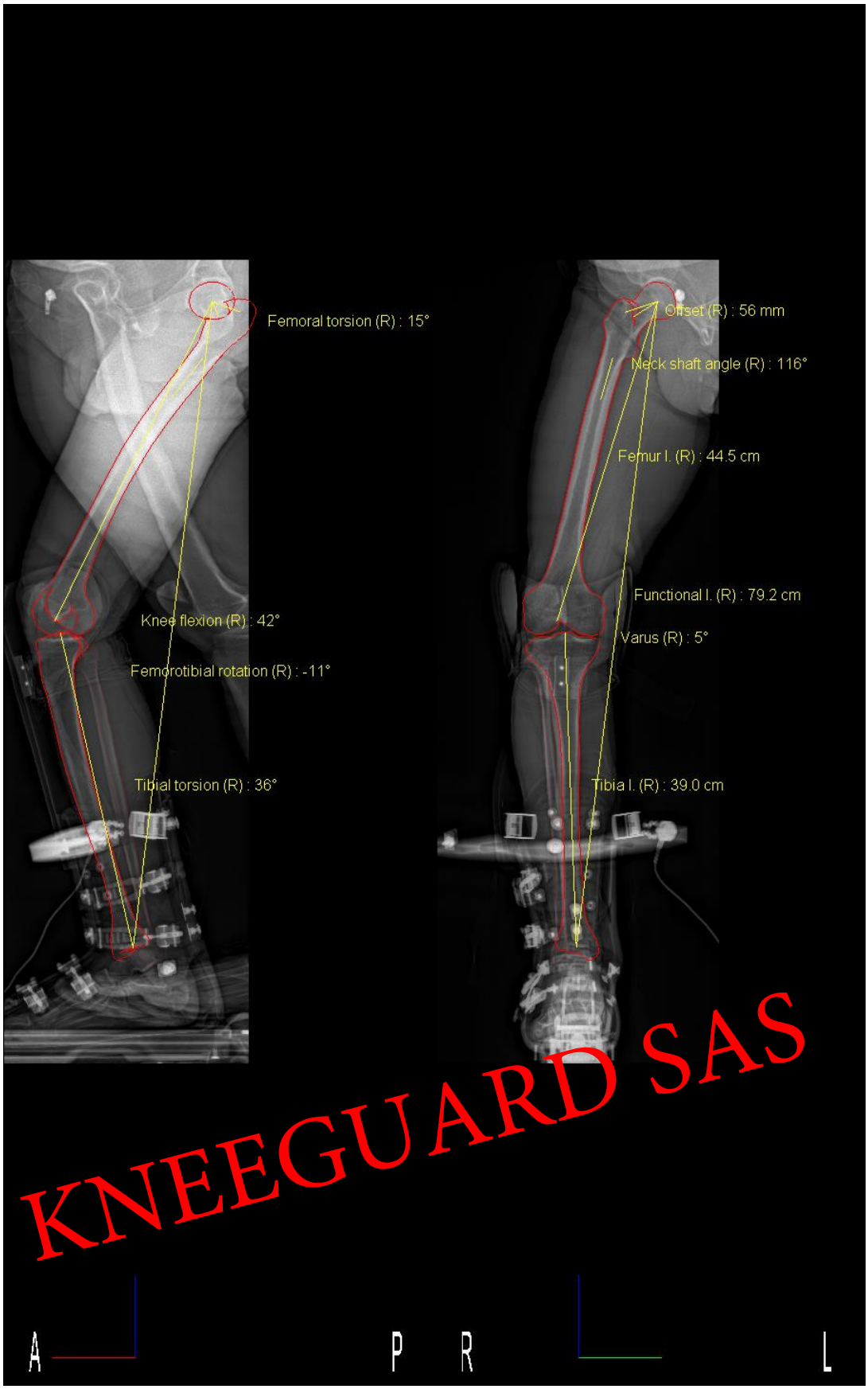
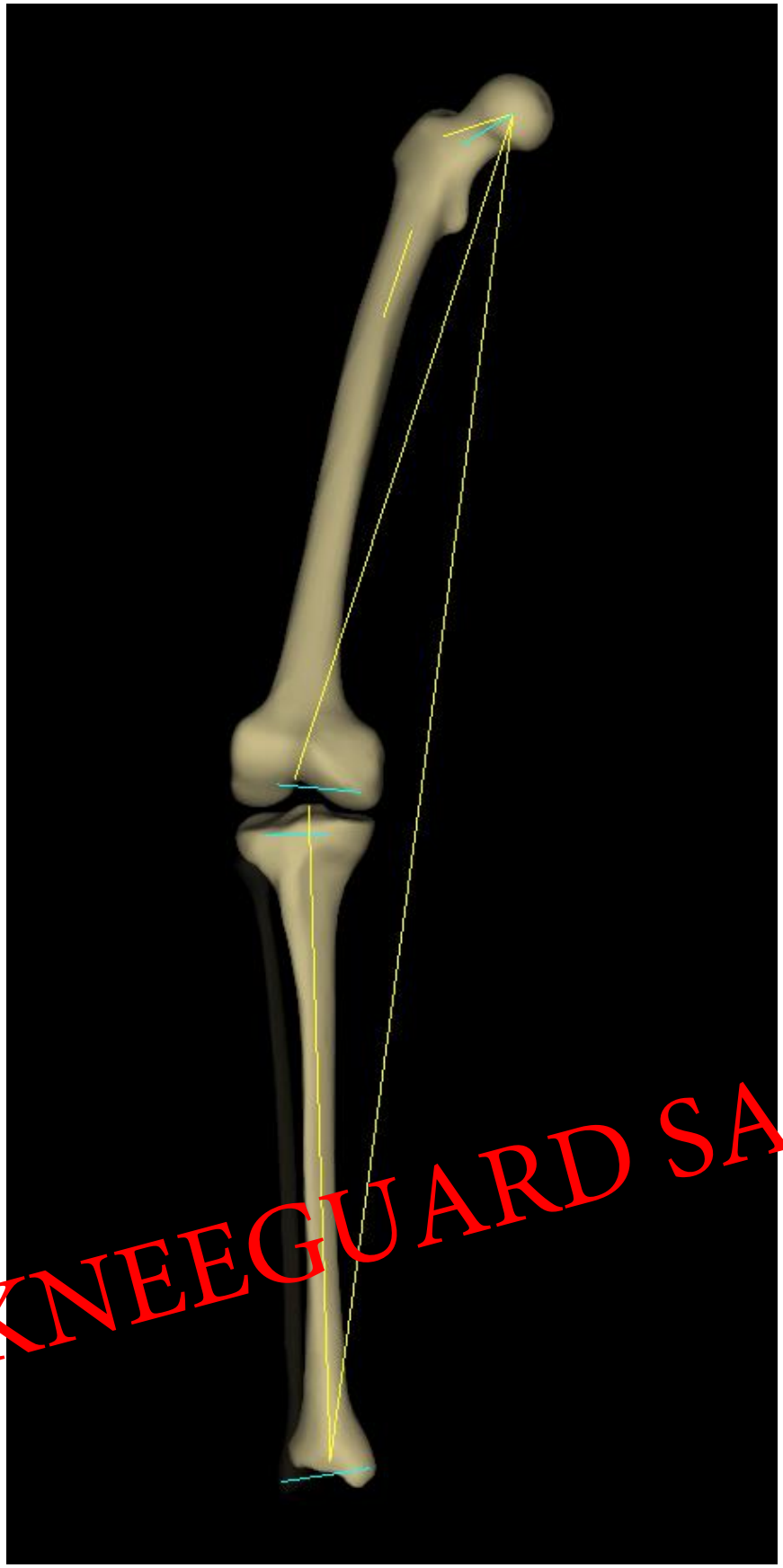
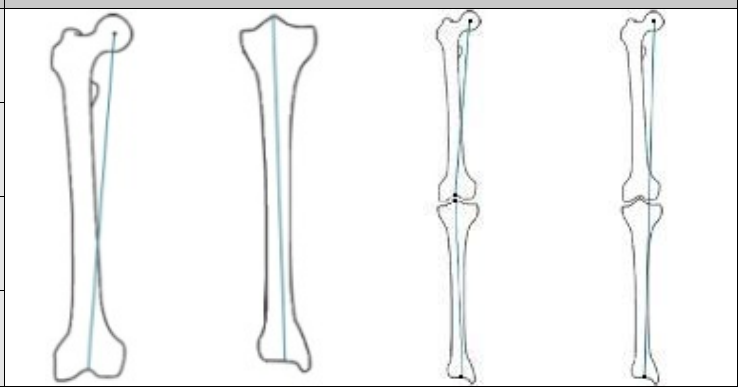


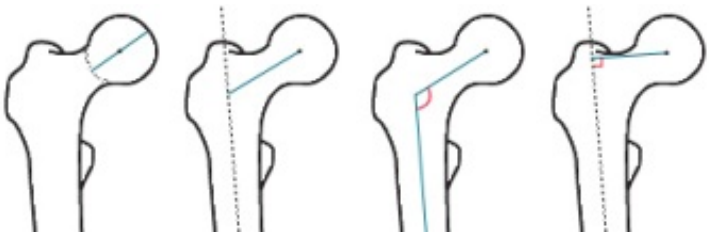
Non-diagnostic image

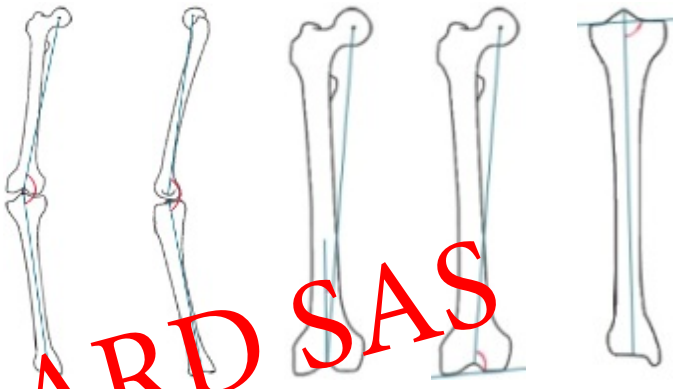


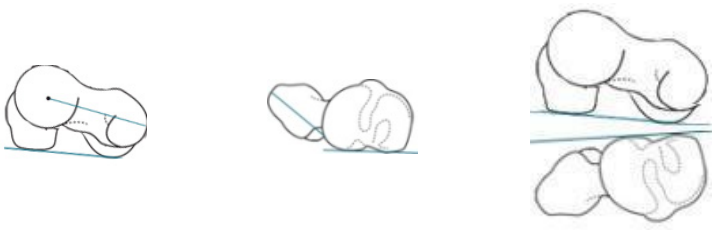
Non-diagnostic image
Warning: the displayed object is a 3D model and is not intended to be an accurate representation of bone morphology.

Knee parameters

Lengths (3)	*Right*	*Left*	
Femur length	**44.5 cm**	**-**	
Tibia length	**39.0 cm**	**-**	
Functional length	**79.2 cm**	**-**	
Anatomical length	**83.5 cm**	**-**	

Femur (3)	*Right*	*Left*	
Femoral head diameter	**47 mm**	**-**	
Neck length	**62 mm**	**-**	
Neck shaft angle	**116°**	**-**	
Femoral offset	**56 mm**	**-**	

Knee (4)	*Right*	*Left*	
Valgus/Varus	**Varus 5°**	**-**	
Knee flexion/Knee extension	**Flexion 42°**	**-**	
HKS	**8°**	**-**	
Femoral mechanical angle	**84°**	**-**	
Tibial mechanical angle	**99°**	**-**	

Torsions (4)	*Right*	*Left*	
Femoral torsion	**15°**	**-**	
Tibial torsion	**36°**	**-**	
Femorotibial rotation	**-11°**	**-**	

(3) Parameters calculated in 3D.
(4) Parameters calculated relative to bi-condylar plane.

KNEEMAX® and lower limb radiography 3D with EOS IMAGING technology

Material:

- Ski binding FISCHER RC4 Z 13 - FREEFLEX DIN: 4-13 set to 12
- Ski boot FISCHER SOMA RC4 - 140-98, size 27.5, a tighten setting is applied by the volunteer, as one can observe in race, but without a Booster® strap.
- The force sensor is a miniature in-line load cell working in traction and compression up to 4448N ,the force sensor is a FUTEK LCM300 1000lb with a USB215, scanning speed 300Hz and the Sensit software.
- A thin sheet of PTFE material is positioned on the internal face of the carbon shell and a high molecular polyethylene film 240µm (3M) on the collar to improve the sliding of both parts.

The volunteer wears a KNEEMAX® carbon epoxy composite shell 5mm thickness on the right leg.

The knee is then moulded, in-situ, with a system which allows an injection pressure. Each plastic bag, positioned on both lateral face of the knee joint, is filled at a pressure <150 mbar with silicone shore A < 15. After a curing time of between 2 and 8 minutes, the anatomical fitting is finished.

The shell is connected to the ski boot through one sensor which measures the force applied by the femoral condyles to the shell during a rotation. The ski boot is engaged in a ski binding with a high setting to avoid any release during the experiment. The bench test is fixed to the EOS FLOOR, to avoid any displacement.

The right leg is radiographed.

Equipment for the radiography:

- Radiography 3D with EOS IMAGING technology http://www.eos-imaging.com/en/health-professionals-2/publications-3/lower-limb-2.html
- The technology EOS® captures whole body images of a standing patient in a single scan without any stitching or vertical distortion. Frontal and lateral digital images of any length can be obtained simultaneously, with an outstanding image quality. http://www.eos-imaging.com/en/eos-products-3/eos-in-brief.html

The capture and the analysis of displacement, angle, of the bones was realised by the HEALTH centre ROSETTI http://centredesante.pep06.fr/en/ with the collaboration of Mrs Chrystelle Flambart who is in charge of the EOS department.

EXPERIMENTATION

- Natural standing position with ski boots (flexion =32°)
- Effort of the volunteer in quasi statics rotation and standing position, an effort will be hold during the radiography, as we can measure, with the sensor, and in live the effort applied by the volunteer to the shell, we will determine a 1e effort's level.
- External and internal rotation.

Hypothesis,

- Muscles of the volunteer are contracted to maintain the position with a "constant effort".
- One considers a rigid shell for the 3 different efforts (down the threshold of the knee joint resistance!!!).
- One assumes that the whole effort is transmitted to the sensor through the strap connected to the shell and the collar.

Results and discussion

Due to the long-time of the test, approximately 12 seconds, for the acquisition, it was impossible to make 3 efforts at different levels.

During the duration of each test one can observe that the effort is decreasing, one assumes the inner boot is compressed and the strength value decreases on the strap.

The peak of the effort recorded is lower than one can get during a release of the ski binding, (file external rotation). The reason is the time, if the effort is applied during millisecond; the transfer of the effort from the femoral condyles to the shell is higher than for a quasi-static effort.

The strap are preloaded, manually by the volunteer, at approximately 80-100N but the sensor is reset at 0N to get exactly the force transmitted by the shell to the ski boot. On the graphic [fig 1] one can observe a decrease to a sub-0 force applied to the strap that means all the components, ski boot and inner boot, relax.

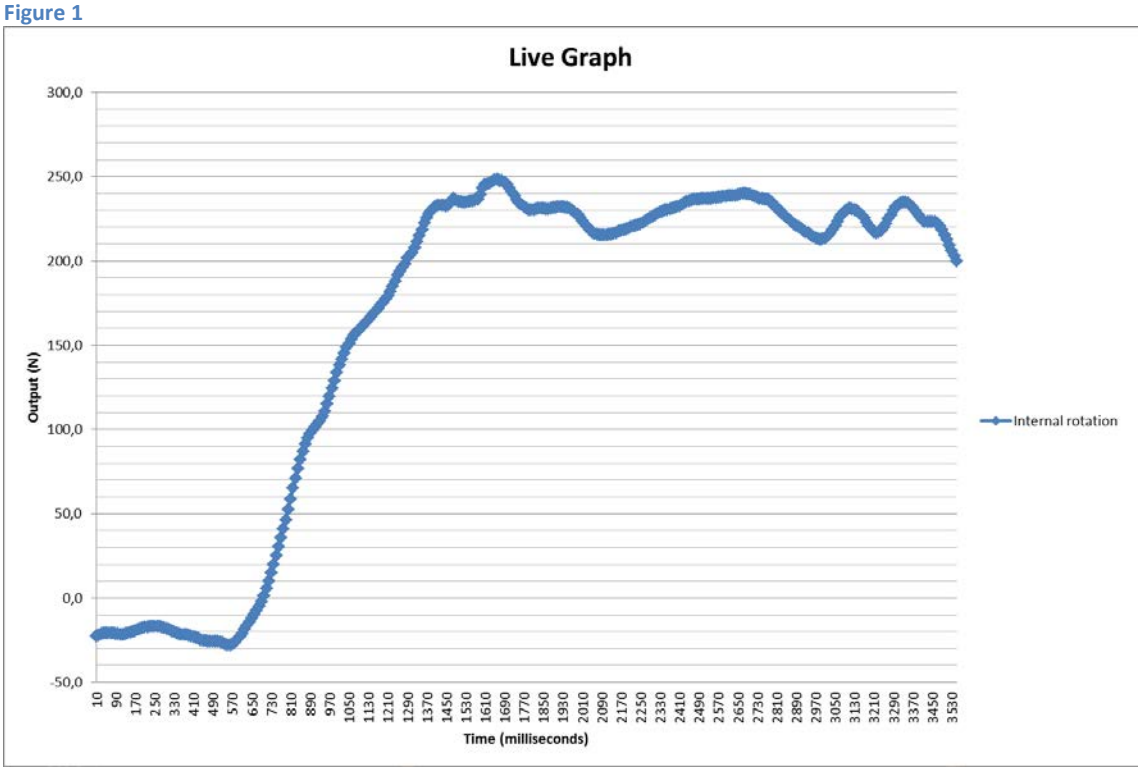
Limitation of the data, due to the strap is connected to the collar of the ski boot through the sensor; the volunteer must avoid any movement's forwards which can create a tension to the strap.

Due to KNEEGUARD has not an expertise in a medical evaluation, the analysis of the biomechanical data's and pictures are responsibilities of Professor Senner, Dr.Hörterer.

- File reference VARUS PRESSION 1,
  - NO EFFORT
- File VARUS (internal rotation) pression 1,
  - effort 270N


kneemax

Figure 1


Live Graph
Output (N)
300,0
250,0
200,0
150,0
100,0
50,0
0,0
-50,0
10
90
170
250
330
410
490
570
650
730
810
890
970
1050
1130
1210
1290
1370
1450
1530
1610
1690
1770
1850
1930
2010
2090
2170
2250
2330
2410
2490
2570
2650
2730
2810
2890
2970
3050
3130
3210
3290
3370
3450
3530
Time (milliseconds)
Internal rotation