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# FlexPLI vs. EEVC WG 17 PLI Benefit Estimation

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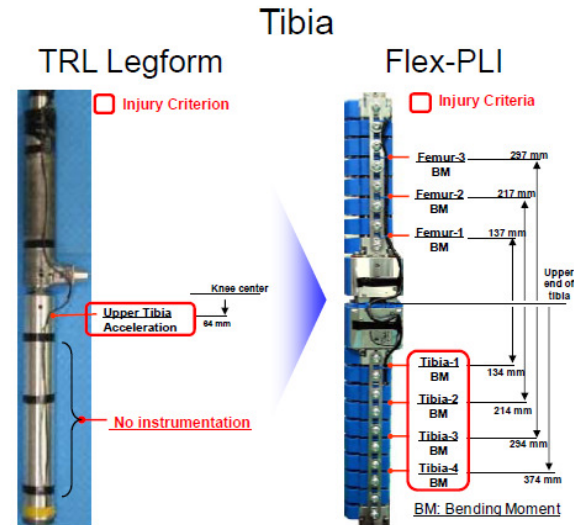
(Federal Highway Research Institute)

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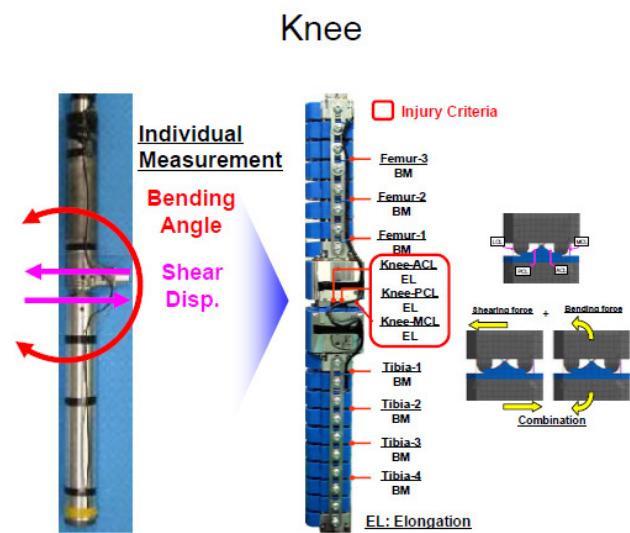
# Enhanced injury assessment



- EEVC WG 17 PLI tibia fracture risk assessment by acquisition of upper tibia acceleration
- FlexPLI tibia fracture risk assessment by acquisition of four tibia bending moments along the whole tibia
- EEVC WG 17 PLI knee ligament rupture risk assessment by individual acquisition of shear displacement (ACL/PCL) and bending angle (MCL)
- FlexPLI knee ligament rupture risk by acquisition of ligament elongation (ACL/PCL and MCL) due to combined knee loading (knee bending and shearing)



Source: GTR9-2-07r1



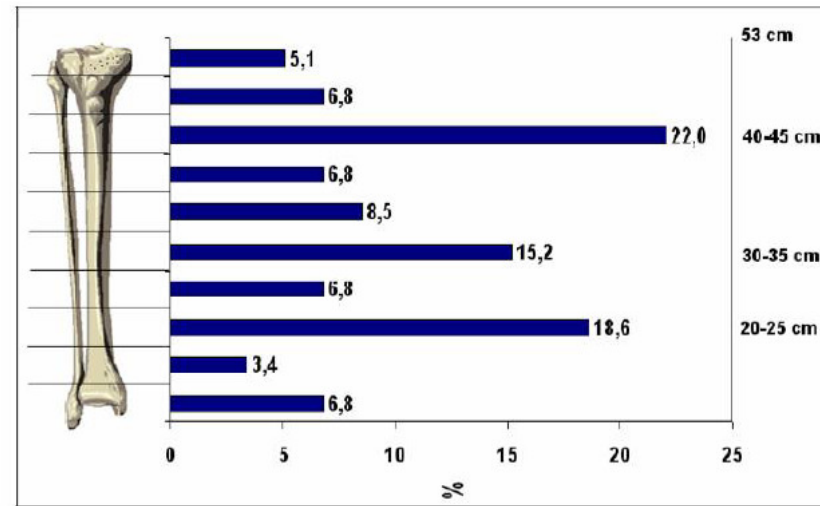
Source: GTR9-2-07r1

# Enhanced injury assessment



- The cause of lower leg fracture is frequently located above the fracture location itself (Otte et. al., 2007)
- More than 80% of all lower leg fractures are expected to be due to indirect loading (in 47,5 % the fracture is located above the bumper and in 35% below the bumper) (Otte et. al., 2007)

Lower leg fracture distribution (tibia and fibula):



Source: Otte et. al. (2007)

- Thus, the FlexPLI is expected to having an improved injury assessment ability than the EEVC WG 17 PLI.
- If this hypothesis is correct, the FlexPLI should be able to better detect injury causing parts than the EEVC WG 17 PLI.

# Hypothesis

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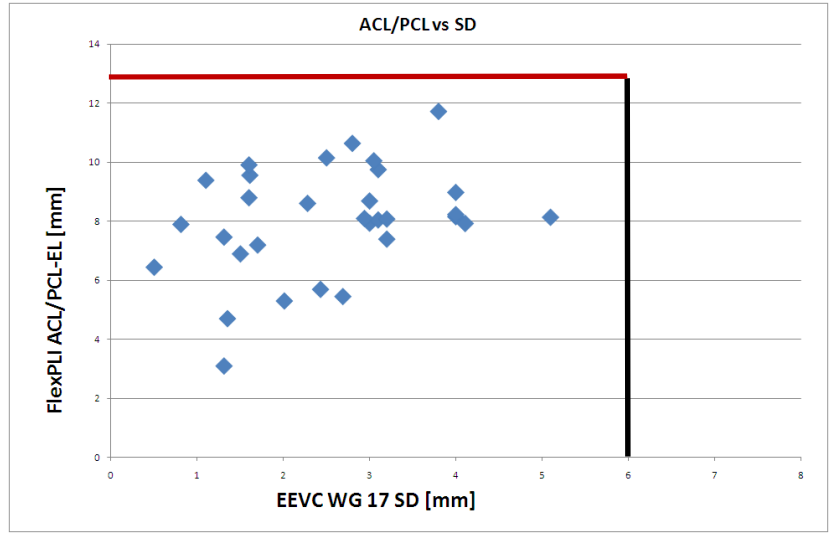
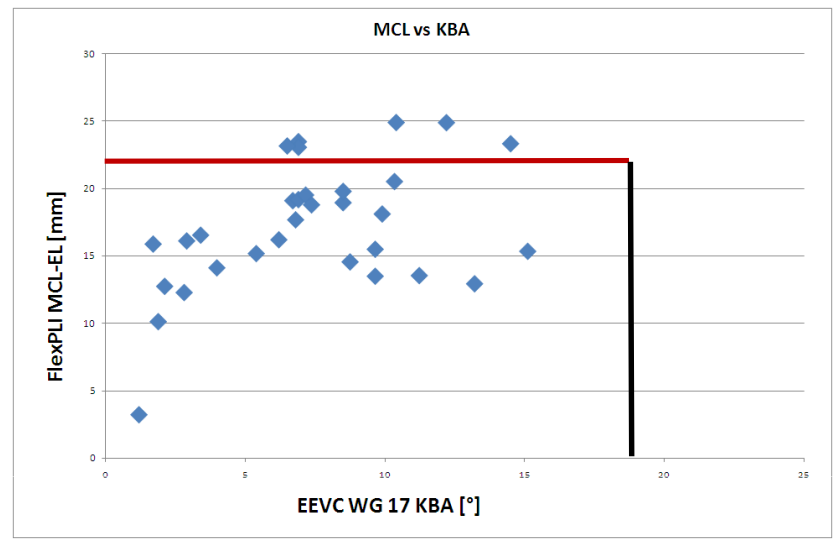
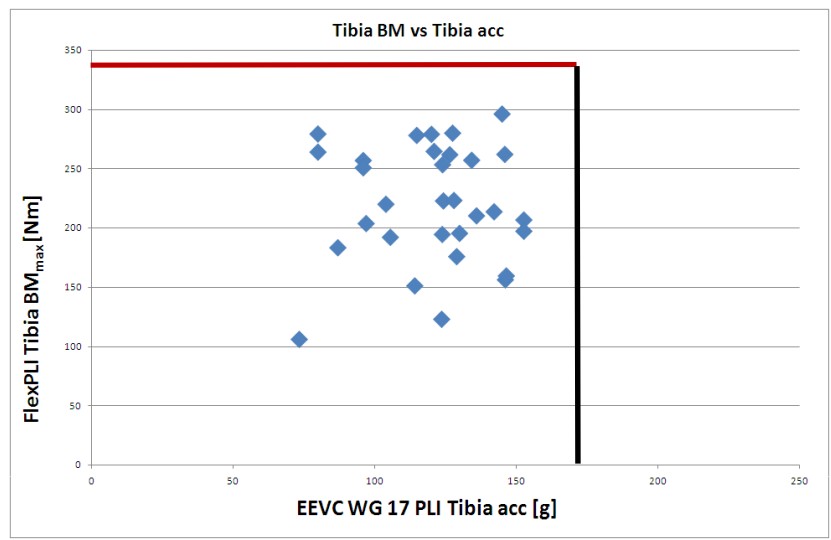
- **Hypothesis: EEVC WG 17 PLI correctly detecting injury causing vehicle parts. But: FlexPLI detecting injury causing parts in a broader range than the EEVC WG 17 PLI.**
- **Hypothesis: car frontends fulfilling the FlexPLI requirements should also pass the EEVC WG 17 PLI requirements. Car frontends fulfilling the EEVC WG 17 PLI requirements do not necessarily pass the FlexPLI requirements !**



# Legform Back2Back Testing



## Euro NCAP SG Pedestrian Safety - EEVC WG 17 PLI & FlexPLI Back2back tests:

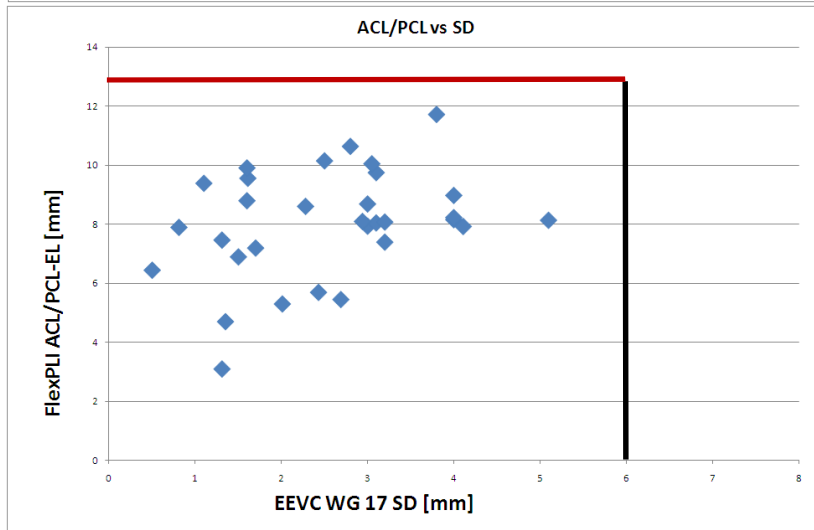
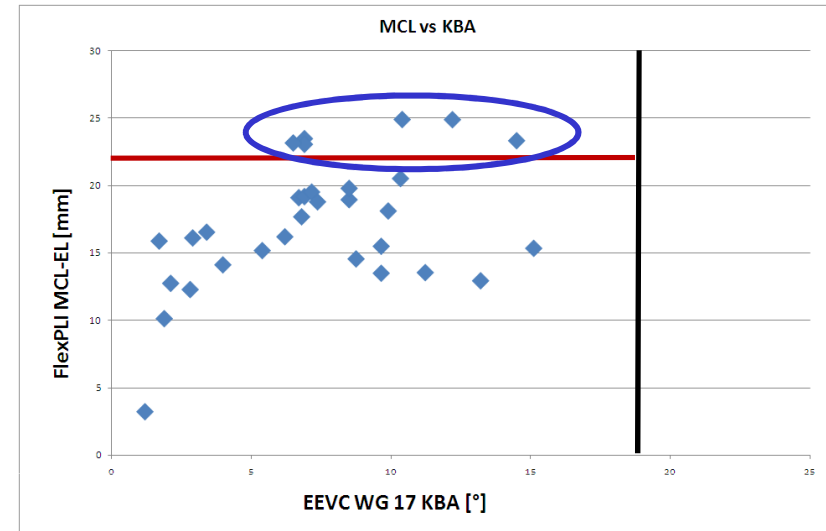
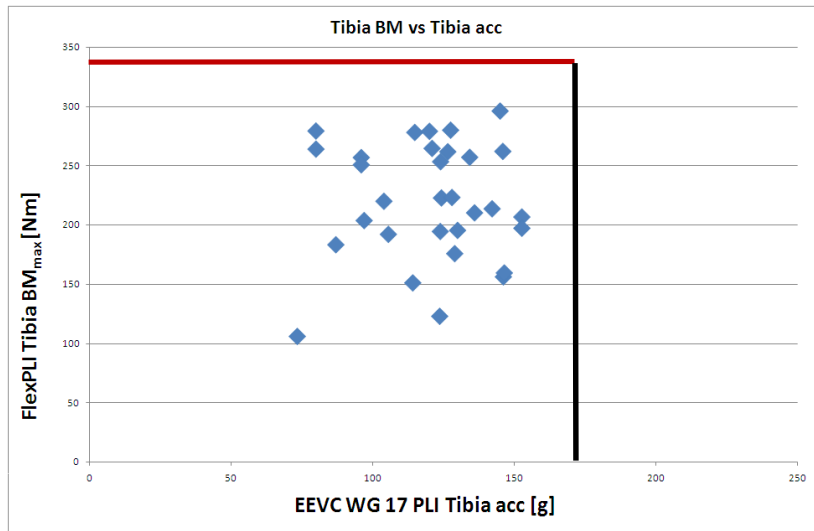


- Meeting the proposed **FlexPLI draft legal limits** leads to still meeting all current (EEVC WG 17 PLI) legal requirements
- BUT:**

# Legform Back2Back Testing



## Euro NCAP SG Pedestrian Safety - EEVC WG 17 PLI & FlexPLI Back2back tests:



- Meeting the proposed **FlexPLI draft legal limits** leads to still meeting all current (EEVC WG 17 PLI) legal requirements
- BUT:**
- Meeting the current (EEVC WG 17 PLI) legal requirements does not always lead to meeting the FlexPLI draft legal limits !!!

# Legform Back2Back Testing

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- Euro NCAP Back2back tests underline the assumption that car frontends fulfilling the FlexPLI requirements also pass the EEVC WG 17 PLI requirements. On the other hand, it has been shown that car frontends fulfilling the EEVC WG 17 PLI requirements do not necessarily pass the FlexPLI requirements !
- FlexPLI seems to better detect injury causing parts than the EEVC WG 17 PLI.

# Conclusions

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- German in depth accident data reveals the high relevance of lower extremity injuries in real world accidents.
- The injury assessment ability of the FlexPLI is superior to the injury assessment ability of the EEVC WG 17 PLI because
  - The FlexPLI is assessing the risk of knee ligament rupture due to combined knee loading while the EEVC WG 17 PLI is allocating individual measurements to (isolated) cruciate or medial collateral ligament rupture risks
  - The FlexPLI is addressing the risk of tibia fractures due to indirect loading below and above the impacting vehicle part
- The assumption that the FlexPLI better detecting injury causing parts than the EEVC WG 17 PLI is underlined by Euro NCAP back2back tests with both the EEVC WG 17 PLI and the FlexPLI, showing that the FlexPLI is detecting a higher percentage of potentially injury causing parts than the EEVC WG 17 PLI.





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# Thank you !