

1) The following statement would benefit from further clarification that these tests are ex vivo and don't account for biologic repair, but this might be representative of the in vivo situation since cartilage doesn't repair easily.

45 Mechanical testing of articular cartilage explants suggests the fatigue life of cartilage is exhaustible  
46 within a number of loading cycles relevant to the human lifespan, at stress levels well below the  
47 ultimate strength of the material (Weightman et al., 1973, 1978; Chen et al., 1999; Bellucci &  
48 Seedhom, 2001; Sadeghi et al., 2017; Riemenschneider et al., 2019).

2) Consider rewording

60 These hypotheses are difficult to test with standard approaches to CALCULATE?? knee joint loading in  
61 biomechanics, which are based primarily on resultant knee joint moments from inverse dynamics  
62 and model-based estimates of joint contact forces.

3) It is unclear how the meniscus is geometrically included in the model based on figure 1 or the description.  
Please add more detail to understand how the material property cartilage regions are defined.

140 participant's average value from the gait analysis data. The moduli for the femoral cartilage,  
141 uncovered tibial cartilage, and covered tibial cartilage, were 8.6, 4.0, and 10.1 MPa, respectively  
142 (Shepherd & Seedhom, 1999). The modulus of the medial meniscus was 1.3 MPa and the  
143 meniscus covered the outer 46% of the tibial plateau (Danso et al., 2015; Bloecker et al., 2013).  
144 The cartilage and meniscus were assumed to be near-incompressible, with Poisson's ratio  $\nu = 0.45$ .  
145 The unloaded cartilage thickness (tibial + femoral) was 5.0 mm (Liu et al., 2010).

4) Please clarify the  $i,j$  indexing. Why not a single index? Is this an  $x,y$  grid location of the element? The double index notation is somewhat confusing because you are only dealing with contact pressure/ strain, but the notation is very similar to the 3D strain/strain tensors used in FEA (example notation usage [https://en.wikipedia.org/wiki/Plane\\_stress](https://en.wikipedia.org/wiki/Plane_stress))

135 where  $\sigma_{ij}$  is the contact stress of element  $ij$ ,  $E_{ij}$  is the composite modulus,  $y_{ij}$  is the spring

5) A figure would be very helpful to understand the curve fitting parameter explanation in section 2.5 Cartilage Failure Probability