The Significance of Knee Pain on Stair Ascent and Descent
Nelson, F; Galinato, A
Henry Ford Hospital, Detroit, MI; Wayne State University Medical School, Detroit, MI
fnelson1@hfhs.org

ABSTRACT INTRODUCTION:
Our hypothesis was that pain on stair ascent was an indicator of patello-femoral arthritis (PFA) whereas pain on stair descent would be more likely due to tibio-femoral arthritis (TFA). Stair ascent has been shown to be associated with a more lateral distribution of patellar force on the trochlea. The force on the tibial-femoral surface is higher with knee flexion angles seen in stair descent1.

Knee pain comes from pain receptors that are known to be in the synovium and bone. Cartilage is aneural albeit the margins of the meniscus also have pain receptors. Forces acting on the patello-femoral joint vary from 0 to 400% of body weight with normal ambulation and steps. The forces include the patello-femoral compression force, quadriceps force, and patella ligament force.

During low-flexion activities such as normal ambulation, the tibial forces are primarily impulsive. The force on the patello-femoral joint during normal ambulation is between 0-0.8 times the subject’s body weight. During high-flexion activities such as stair ascent, the overall force on the joint is high2. The peak force during stair ascent has been shown to be 2.5-3.0 times the subject’s body weight and occurs at a flexion angle of 60 degrees3. Although more lateral distribution of force on the trochlea is the most common patello-femoral disorder the mechanism of pain perception is not clear. There is, however, conjecture as to the tissues involved.

METHODS:
With IRB approval a standard history for each patient was obtained prior to physical exam or review of radiographic testing. The same history was obtained whether it was a new patient visit or a follow-up visit as long as the joint surfaces affected were not known to the examiner. In order to capture the information without bias, one of the initial questions determined if there is worse knee pain for up or down steps. BMI, age, and race were also recorded for each patient.

After nine months, 199 records were reviewed retrospectively. Medical records and imaging studies were scored blindly to determine the likely location of degenerative knee change. Based on imaging and examination notes evidence of patello-femoral, medial compartment, lateral compartment, or any combination was recorded blinded from the history of pain with steps.

We analyzed the data by looking at two by two tables of location This analysis combined isolated cases of a specific location plus cases where the specific location 50 was combine with other locations and by pain. We classified pain as going upstairs if a subject responded up, up/down, or up>down. We classified pain as down as down if a patient responded down, or up/down. We note a patient could be classified as both up and down. The locations considered were patella-femoral, medial tibial femoral, or lateral tibial femoral. Since more than 1 site could be indicated for each patient the total percentage was always greater than 100%. We used a chi-squared test for the analysis. We stratified the analysis on either BMI or age. For BMI, we used 4 classifications: normal (<25), overweight (25-30), obese (30-40), and morbidly obese (>40). We used 3 age classes: <50, 50-70, and >70.

RESULTS SECTION:
There was one significant result for the BMI analysis. For morbidly obese subjects with medial joint arthritis, there was more pain going upstairs (85% vs. 50%). This was reversed going downstairs (36% vs 60%) but did not reach statistical significance.

For patients less than 50 years of age with medial joint arthritis, there was significantly more pain going upstairs in the medial positions (77% vs 47%) downstairs and less pain going downstairs. (35% vs 67%). For patients less than 50 years of age with patello-femoral arthritis, there was significantly more pain going downstairs (100% vs 36%) and less pain going upstairs (14% vs. 77%). For patients in the 50-70 year old age group, there was less pain in the patella (43% vs 63%) going downstairs which was statistically significant. This was reversed for going upstairs (72% vs. 60%) but this was not significant.

DISCUSSION:
Contrary to our hypothesis there was significantly more pain going upstairs with medial arthritis and more pain going downstairs with patello-femoral arthritis for people less than 50 years old. However, in the 50-70 year old age group, there was significantly less pain in the patella (43% vs 63%) going downstairs. High BMI also played a role in up versus down steps pain.

This can be a useful clinical piece of information for dealing with individuals who have knee pain but no radiographic evidence of disease. These findings can also direct research into understanding the specific tissue (capsule, bone, synovium, etc) origin of pain and the effects of age, BMI, and changing knee mechanics on that pain.

This study is limited in that we did not have a large enough of isolated lateral TFA patients to see if there were differences in stair ascent and descent pain between lateral and medial TFA. Nothing in the imaging analysis would assure the source of pain be it bone, synovial, or meniscal. Sorting out patients with meniscal extrusion would not necessarily define those as being individuals as having a predominantly meniscal origin of pain. This would require a far better record of the precise location of pain.

SIGNIFICANCE:
The relationship of joint pain to mechanical forces as well as tissue pain responders in knee OA would help clarify the diverse responses to any given treatment modality. Approaching knee OA as an organ in failure due to mechanical forces and biochemical imbalances should be an effective tool in intervention research.

ACKNOWLEDGEMENTS:
The authors are indebted to the statistical analysis performed by Meredith Mahan

REFERENCES:
The authors are indebted to the statistical analysis performed by Meredith Mahan.