



University of Michigan  
Medical School

# Assessment of musculoskeletal examination skills of 4th year medical students using a novel OSCE

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## Background

- Musculoskeletal disorders and diseases are a leading cause of pain, physical disability, and health care expenditure in the United States<sup>1</sup>
- University of Michigan medical students participate in integrated musculoskeletal sequences during their preclinical years, but there are few opportunities to receive formative or summative assessment of their diagnostic and physical exam skills
- Many M4 students and PGY-1s do not feel confident in their ability to examine and diagnose musculoskeletal disorders (Figure 1)

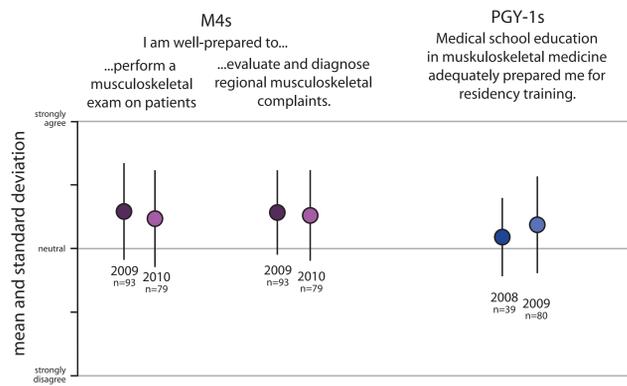


Figure 1. Survey of 2009 and 2010 graduating UMMS M4s and PGY-1s regarding attitudes toward musculoskeletal education.

- In order to more objectively evaluate the effectiveness of the UMMS musculoskeletal in preparing students to care for patients with musculoskeletal disorders, we assessed a cohort of M4s from the Class of 2012 using a novel objective structured clinical examination (OSCE)

## Methods

- IRB exemption was obtained.
- Three station OSCE (shoulder, back and knee) based on the "Hypothesis-Driven Physical Exam"<sup>2</sup> developed by multidisciplinary group of musculoskeletal specialists
- For each station, volunteer M4 students were provided a clinical vignette with three plausible diagnoses to consider, and were instructed to **anticipate physical examination maneuvers or findings that would discriminate between the different diagnoses**
- They then examined a professional patient simulating findings associated with only **one** of the diagnoses, and afterwards were instructed to choose their favored diagnosis based on their exam findings
- Their physical exam was directly observed by a trained faculty member who scored their **performance of physical examination maneuvers that would discriminate between the three possible diagnoses for each station** (0 = not done, 1 = done with errors 2 = correctly done). Each encounter was videotaped and independently scored by another faculty member
- Afterward, feedback was provided to students at the end of the OSCE (formative assessment)

## Analysis

- Student data was anonymized and demographics compiled
- Inter-rater reliability for each maneuver was estimated using type-2 intra-class correlations (ICC) with .70 used as a benchmark for good reliability, and .80 for excellent reliability.
- Percentages of perfect scores for anticipation (A) and performance (P) of each maneuver were calculated
- Pearson's correlation between Anticipation and Performance scores was computed for each maneuver

## Results

Demographics	
No. students (% of 2012 graduating class)	45 (30.4%)
Age (years; average ± SD)	26 ± 1.4
Females (%)	23 (51%)
Future specialty	
- Musculoskeletal – Orthopaedics/PM&R	3 (6.6%)
- Internal/emergency/family medicine or pediatrics	17 (37.7%)
- Other	25 (55.6%)
Previous elective musculoskeletal experience:	
-None	26 (57.7%)
-Research only	1 (2.2%)
-Clinical only	13 (28%)
-Research and clinical	5 (11.1%)

Table 1. Demographics of M4 participants

- Inter-rater reliability was good to excellent for scoring of 6 exam maneuvers: Disc (ICC = .81), SI (ICC = .85), Impingement (ICC = .69), GH arthritis (ICC = .76), ACL (ICC = .87), OA (ICC = .87). Rater scores were averaged for each student

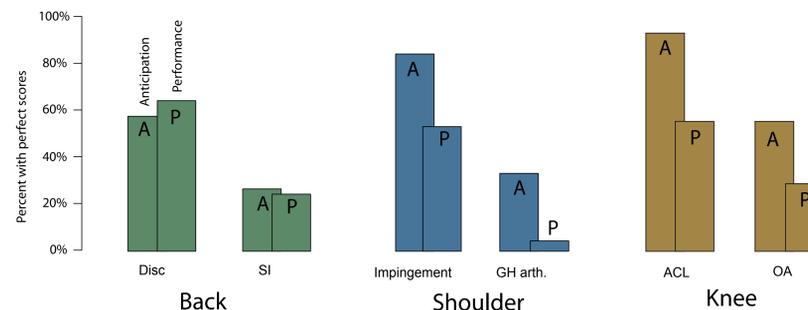


Figure 2. Rates of perfect scores in discriminatory exam maneuvers for each station

- For the shoulder and knee stations, students could anticipate the necessary discriminatory exam maneuver for each diagnosis (A) more frequently than they could actually perform the maneuver (P) (Figure 2)
- Students who anticipated the discriminatory maneuvers more correctly tended to perform those maneuvers somewhat better (Figure 3). A notable exception was the ability to perform maneuvers needed to diagnose a torn anterior cruciate ligament (ACL).

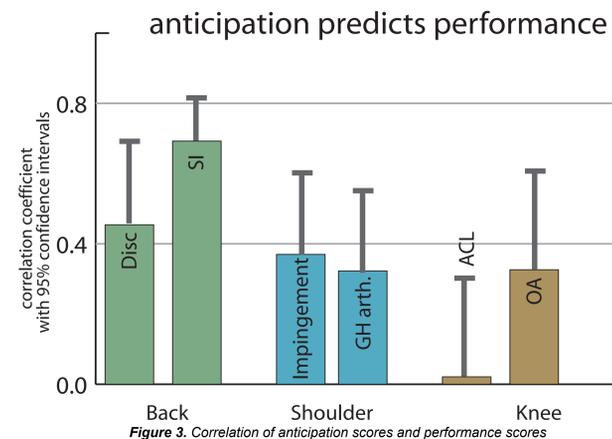


Figure 3. Correlation of anticipation scores and performance scores

## Conclusions

- A substantial percentage of graduating M4s are not able to perform core examination skills needed to diagnose common disorders of the shoulder, back and knee
- Accurate anticipation of a discriminatory exam maneuver correlates with their ability to perform the maneuver; however, students were more able to anticipate the maneuver than to actually perform it. Thus, direct observation is critical to ensure competence of students in evaluating musculoskeletal disorders
- Physical exam scores based on observation and a structured checklist are reliable between trained raters

## Future Directions

- This data will be used as part of ongoing evaluation of the longitudinal musculoskeletal curriculum at the University of Michigan medical school
- Future assessments of musculoskeletal examination skills can be compared to these data as a benchmark for improvement

## Notes and References

- This research was supported by a grant from the Gilbert Whittaker Fund for the Improvement of Teaching, provided by the University of Michigan Center for Research on Learning and Teaching (CRLT)
- IRB type 1 educational exemption was obtained: HUM00054327
- Contact Dr. Seetha Monrad (seetha@med.umich.edu) for questions or reprints
- <sup>1</sup>Musculoskeletal diseases: leading cause of disability and health care cost. Available at <http://www.usbjd.org/about/index.cfm?pg=fast.cfm>. Accessed February 2011.
- <sup>2</sup>Yudkowsky R, Otaki J, Lowenstein T, et al.: A hypothesis-driven physical examination learning and assessment procedure for medical students: initial validity evidence. Med Educ 2009, 43: 729-740.