

**Musculoskeletal Anatomy by Self-examination: A Learners´ Satisfaction Survey at the 2018 PANLAR Meeting**

**Anatomía musculoesquelética por autoexamen: encuesta de satisfacción de **participantes** durante el congreso PANLAR 2018**

Running title: Satisfaction survey of MSK anatomy by self-examination

Título corto: Encuesta de satisfacción sobre anatomía musculoesquelética por autoexamen

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**Abstract****Background:**

In rheumatology, musculoskeletal (MSK) anatomy is the basis of the physical examination. Living MSK anatomy methods, plus ultrasonography, are eminently suited for rheumatology training. The authors developed a learner-centered pedagogy, MSK anatomy by self-examination (MSKASE), which combines self-inspection, palpation, and perception, to supplement current MSK anatomy learning methods.

**Objective:**

To survey the learner satisfaction with MSKASE in three workshops held at the 2018 PANLAR meeting.

**Methods:**

MSKASE exercises include a description of critical anatomical items, their self-identification by inspection, palpation, and perception, the effect of motion or muscle contraction on these items, and a review of their clinical significance. We evaluated seventeen exercises for learner satisfaction; six dealt with the shoulder and elbow, five with the hand and wrist, and six with the lower extremities. The lecturing instructor invited the participants to complete at the end of the workshops a voluntary, anonymous survey of their reaction to MSKASE using a simple questionnaire and a visual analog scale (VAS). The results were expressed with descriptive statistics.

### Results:

A total of 280 meeting attendees participated in the workshops, 100 in the first, 120 in the second, and 60 in the third. Ninety, 100, and 37 participants, respectively, completed the survey. Rheumatologists, other professionals, and trainees, irrespective of the anatomical regions, expressed satisfaction with the method of over 80%. Additionally, we summarized informal comments made by the participants.

### Conclusions:

The participant's rating of MSKASE was high, and formal studies of the method appear warranted.

## **Resumen**

### Introducción:

La anatomía musculoesquelética (AME) es la base del examen físico reumatológico. La AME, en asociación con la ecografía, son esenciales en la formación de reumatólogos. Los autores desarrollaron una pedagogía centrada en el alumno, la AME por autoexamen (AMEA), que combina la autoinspección, palpación y percepción, para suplementar pedagogías estándar de AME.

### Objetivo:

Determinar la satisfacción de los participantes con AMEA en tres talleres realizados en el Congreso PANLAR 2018.

### Métodos:

Los ejercicios de AMEA incluyen una descripción de elementos anatómicos críticos, su autoidentificación por inspección, palpación y autopercepción, el efecto del movimiento o la contracción muscular en éstos y una revisión de su importancia clínica. Evaluamos diecisiete ejercicios para determinar la satisfacción de los participantes; seis de hombro y codo, cinco de mano y muñeca y seis de extremidades inferiores. Antes de los talleres, los participantes fueron invitados a completar una encuesta voluntaria y anónima de satisfacción con el nuevo método

utilizando un cuestionario y una escala visual análoga. Los resultados se expresaron con estadística descriptiva.

#### Resultados:

Un total de 280 asistentes participaron en los talleres, 100 en el primero, 120 en el segundo y 60 en el tercero. Noventa, 100 y 37 participantes, respectivamente, completaron la encuesta. Reumatólogos, otros profesionales y residentes, independientemente de las regiones anatómicas, expresaron una satisfacción con el método mayor del 80%.

#### Conclusiones:

En esta sencilla encuesta, la satisfacción de los participantes con AMEA fue alta y estudios formales sobre su utilidad parecen justificados.

### **Abstrato**

#### Fundo:

Na reumatologia, a anatomia musculoesquelética (MSK) é a base do exame físico. Os métodos vivos da anatomia MSK, em associação com a ultrassonografia, são eminentemente adequados para o treinamento em reumatologia. Os autores desenvolveram uma pedagogia centrada no aluno, anatomia MSK por autoexame (MSKASE), que combina autoinspeção, auto-palpação e autopercepção, como um auxílio aos métodos atuais da anatomia MSK.

#### Objetivo:

Para determinar a satisfação do aluno com a pedagogia MSKASE em três workshops realizados na reunião PANLAR de 2018.

#### Métodos:

Os exercícios MSKASE incluem uma descrição de itens anatômicos críticos, sua auto-identificação por inspeção, palpação e percepção, o efeito do movimento ou contração muscular sobre esses itens e seu significado clínico. Avaliamos dezessete exercícios; seis lidaram com o ombro e cotovelo, cinco com a mão e punho e seis com as extremidades inferiores. Antes das oficinas, os participantes foram convidados a preencher, ao final das oficinas, uma pesquisa voluntária e anônima sobre sua reação a esse novo método por meio de um questionário e

uma escala visual analógica. Os resultados foram expressos com estatística descritiva.

#### Resultados:

No total, 280 participantes da reunião participaram dos workshops, 100 no primeiro, 120 no segundo e 60 no terceiro. Noventa, 100 e 37 participantes, respectivamente, completaram a pesquisa de satisfação. Reumatologistas, outros profissionais e estagiários, independentemente das regiões anatômicas, expressaram satisfação com o método em mais de 80%. Além disso, resumimos comentários informais feitos pelos participantes.

#### Conclusões:

A satisfação dos participantes com MSKASE foi alta, e estudos sobre sua utilidade parecem justificados.

#### **Key points**

- Participants in musculoskeletal anatomy by self-examination (MSKASE) seminars expressed a high degree of satisfaction with the new pedagogy.
- MSKASE differs from peer-examination by the perception of self and the lack of intimacy barriers.
- Trainees can use self-examination to understand complex areas, learn landmarks for blind procedures, and obtain useful hints for ultrasound studies.
- MSKASE appears suitable for remote learning, which is an advantage in COVID-19 times.

**Keywords:** Musculoskeletal system, Surface anatomy, Self-examination, Learner-centered method, Learner satisfaction

**Palabras clave:** Examen musculoesquelético, anatomía de superficie, autoexamen

**Palavras-chave:** Sistema musculoesquelético, anatomia de superfície, autoexame, método centrado no aluno, satisfação do aluno

## **Introduction**

The teaching of anatomy in medical school was already in a flux state and may now be in crisis due to the COVID-19 pandemic. Larger student classes and a scarcity of suitable cadavers for dissection led to pedagogies such as realistic anatomical models, plastinated specimens, 3-D reconstructions based on cadaveric samples, computed tomography (CT) imaging, magnetic resonance imaging (MRI) virtual dissection, and medical simulation (1-4). Live anatomy teaching advanced by model body painting, peer cross-examination (5-7), and the use of ultrasonography (US) (8). Of these pedagogies, the latter two eminently applied to postgraduate teaching in musculoskeletal (MSK)-based subspecialties such as neurology, physical therapy, rehabilitation medicine, rheumatology, and sports medicine (9-11). The COVID-19 pandemic gives an additional impulse to virtual teaching and creates a need for innovative pedagogies. While cadaver dissection remains the acknowledged bedrock of the medical sciences and may lead to the best results (12), there are indications that students indeed prefer 3-D visualization methods as compared to cadaver dissections and books (3). Old textbooks of surface anatomy recommended self-examination to practice what students learned in the dissection sessions [13]. However, as a flexible ancillary learner-centered method at the medical school and postgraduate levels, MSK anatomy by self-examination (MSKASE) has only recently been proposed (14). Self-examination allows an exquisite perception of reachable MSK parts, including some nerves and arteries. Also, the method has the embedded strength of self-perception. This unique feature of MSKASE may help understand the effect of motion in complex areas, enhance spatial appreciation, and as a result, increase recollection (15). A potential additional benefit is that the exercises may be taught and assessed by video conferencing. In this survey, the authors did not compare the new method to other methods. Their goals were much more limited, to glimpse the participant's satisfaction with a unique pedagogy that differs from all others in that it is directed to self.

## **Methods**

The authors were invited to hold three clinical anatomy workshops at the 2018 PANLAR (Pan American League of Associations for Rheumatology) Meeting in Buenos Aires, Argentina. The workshops were free and open to all. This fortunate circumstance allowed the authors to evaluate the satisfaction with MSKASE by 102 rheumatologists, six other MSK anatomy-related subspecialists; 50 rheumatology trainees; and 60 unstated subspecialty trainees. Each of the three workshops, held on consecutive days, had a duration of 1 hour and 45 minutes. At the beginning of each session, attendees were invited to fill, following the workshop, a de-identified simple evaluation form, which included their specialty, level of training (trainees or specialists), and perception of the method. Demographic characteristics, such as age and sex, were not inquired about. The three instructors proposed the survey content, which was an extension of a pilot survey at the Anatomy Department, National Autonomous University of Mexico (UNAM), which failed because only eleven students participated. The instructors used a six-component questionnaire and each response. The components were: 1. Attendees' perception that learning materials were helpful. 2. Attendees' perception that the method helps incorporate knowledge of clinical anatomy. 3. Attendees' perception that there was adequate time for the exercises. 4. Attendees' perception that the acquired knowledge and skills are relevant. 5. Attendees' perception that he/she would be able to apply the acquired knowledge and skills. 6. Attendees' perception that they would recommend peers to attend a similar MSKASE seminar. For each component, a five-point Likert scale was used to capture the amplitude of attendees' perceptions. Based on the distribution of the patients' responses, scale responses were further reduced into three categories, as follows: strongly disagree/disagree, neutral, and agree/strongly agree (Figure 1). Finally, a visual analog scale (VAS) was used for an overall rating of workshop satisfaction (Figure 2). Results were expressed with descriptive statistics. To balance the presentations, each of the three instructors led one of the seminars. The other two assisted the participants in identifying in their bodies the anatomical items being discussed. The instructors (CH-D, MÁ S) had a 3-year training in clinical anatomy from 2007 to 2010 under the direction of JJC. They gained substantial experience conducting through the Americas clinical

anatomy seminars based on instructors' and trainees' cross-examination. Thus, although the teaching method was not formally standardized, the three instructors' shared training and experience likely resulted in a uniform teaching style.

Table 1 indicates the shoulder and elbow, wrist and hand, and lower extremity items or functions and their clinical relevance discussed in the workshops. None of these exercises require privacy in their execution. To give some examples,

*Exercise 1* explores a possible neck or cervical spine source of shoulder pain. To this end, the participants bent the neck forward, backward, to the sides, and rotated the head. In muscle contracture, bending or turning the neck contralaterally would cause the pain. In contrast, homolateral motions would trigger radicular, facet joint, or uncovertebral joint pain. If these motions did not cause the pain, then the various shoulder maneuvers will likely establish its origin. *Exercise 2*, which in clinical practice would follow *Exercise 1*, is the full abduction of the extended extremity in the scapular plane. Pain in the mid-range of elevation suggests a rotator cuff tendinopathy. Pain beginning near-total elevation indicates that the faulty structure is the acromioclavicular or the sternoclavicular joint. The defective structure is indicated by tenderness on pressing one of these joints. *Exercise 8* explores by palpation of the four bone eminences where the transverse carpal ligament inserts. These landmarks, plus the identification of the tendon of palmaris longus and flexor carpi radialis, allow a safe blind steroid injection in the carpal tunnel syndrome. *Exercise 12* detects the origin of the hip abductor muscles. In the standing position, participants place the first web space (between the thumb and the index) of one hand between the greater trochanter and the pelvic rim, index to the front, and thumb to the back. Then, participants take a few steps or stand on one leg at a time. The index will feel the tensor fasciae latae, the web gluteus medius, and the index gluteus maximus.

## Results

Approximately sixty participants were expected at each workshop; however, 100 attended the first, 120 the second, and 60 the third, which took place the last day of the meeting as its ending event when many attendants had left.



Ninety (90%) participants in the first workshop returned the evaluation form, 100 (83%) in the second, and 37 (62%) in the third. Figure 1 is a bar graph that depicts the participant's perception statements per anatomical region based on the three-point reduction of the five-point Likert scale used. The authors felt that such reduction was advisable because most participants agreed or strongly agreed with the new method regardless of the anatomical region and lecturer. Figure 2 is a radar chart visualization that provides the global rating per anatomical region by specialists (102 rheumatologists and six other MSK-interested specialists), rheumatology trainees (50), and other trainees who did not mention the subspecialty (69). In all instances, regardless of the anatomical region -and therefore irrespective of the lecturer- and type of participants -professionals and trainees- the satisfaction rate was uniformly over 80mm out of a possible 100mm. The room's theater arrangement, with the podium at the front and the chairs arranged in rows, plus the unexpectedly large number of attendees in the first two workshops, created logistical problems during the lectures that the assistants solved rushing around the room between the chair rows.

## Discussion

As the survey results indicate, the participants' satisfaction with the novel, learner centered MSKASE method was rated highly for the three self-explored anatomical regions and by various specialists (mostly rheumatologists) and postgraduate trainees. While the effectiveness of the new method as compared with other living anatomy methods remains unproven, the results of the current survey suggest that given its general availability, lack of cost, and lack of intimacy barriers, MSKASE may be a useful adjunct to what is learned with other living anatomy pedagogies such as body painting (16), peer cross-examination (17), and peer-instructor cross-examination (18). Furthermore, with the COVID-19 pandemic, MSKASE could be a useful adjunct to imaging-based remote pedagogies.

Strengths of the current survey include a uniformly favorable perception of the method across specialties, training levels, and anatomical regions. Additionally,

participants commented favorably on the opportunity to repeat the exercises anywhere and anytime and the absence of intimacy barriers.

There are several limitations to this survey. First, the idea to assess the participants' satisfaction with the method occurred to the authors close to the meeting, precluding a formal application to IRB approval. However, since no personal information was requested, data were de-identified, and participation was voluntary, no ethical barriers were infringed. Also, the scarcity of time precluded an early involvement of an expert in education in the study design. Another limitation was the unexpectedly large participant to instructor ratio compounded by the theater-type arrangement of the room. Ideally, the instructor, an examining table, and a screen should be at the front and the participants' chairs arranged in a horseshoe layout with a maximum of three rows and at least 1m of free space between rows to facilitate the displacement of the instructors.

Despite these and other deficiencies, the results of the current survey are encouraging. They suggest that the method is well-received and worthy of further testing to aid current living anatomy pedagogies.

In summary, MSKASE is a novel learner-centered pedagogy that includes self-inspection, self-palpation, and self-perception. This method, which appears suitable for remote learning, was used for the first time at the 2018 PANLAR Meeting in Buenos Aires, Argentina. A voluntary, anonymous satisfaction poll conducted among a variety of participants revealed a high level of acceptance.

**Conflict of interest:**

The authors declare no conflict of interest in the development of this manuscript.

**Funding to declare:**

None

**Contributions to the manuscript:**

Cristina Hernández-Díaz, M.D., contributed to teaching the seminars and developing and editing the manuscript.

Miguel Ángel Saavedra, M.D., contributed to the development of the self-examination method, teaching the workshop and developing and writing the manuscript.

Virginia Pascual-Ramos, M.D., contributed to the development of the self-examination method, analyzed the results, and edited the manuscript.

Robert A. Kalish, M.D., contributed to the development of the self-examination method and edited the manuscript.

Juan J. Canoso, M.D., contributed to the development of the self-examination method, taught in the seminar, and wrote the first draft of the manuscript.

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## FIGURES TITLES AND CAPTIONS

### **Figure 1**

Title: Participants agreement statements according to the anatomical region as measured with 5 points Likert scale

Caption: The 5 points have been reduced to 3 points for convenience (see text)

### **Figure 2**

Title: Overall rating of the seminar according to the level of training and anatomical region

Caption: VAS rating in mm