RESERCHING ANCIENT BEHAVIOURS:

a biocultural approach to the study of MSM in a skeletal sample from Constância, Portugal (14-19th centuries)
INTRODUCTION

MUSCULO SKELETAL STRESS MARKERS (MSM)

Distinct skeletal traces that occur where a muscle, tendon or ligament inserts into the bone surface after recurrent use*

Bone hypertrophy

Enthesopathies

* Hawkey and Mebs, 1995
MAIN GOALS

⇒ To describe the patterns of bone lesions found in Constância’s ancient inhabitants

⇒ To analyse their nature and distribution by laterality, sex and age at death

⇒ To discuss their aetiology according to Constância’s subsistence patterns until the 19th century
MAIN GOALS

BIOCULTURAL APPROACH

Skeletal data
- MSM
- OA

Historical and ethnographical data
- Written documents
- Oral sources
- Material culture
GEOGRAPHIC LOCATION

Constância Village
“Who doesn’t row, has already rowed
If it wasn’t the father, it was the grandfather”
(Local Proverb)
ETHNOHISTORICAL BACKGROUND

Traditional boats

Boat Construction

Bateira

Abringel

Varino
“In 1867, 60% of the males aged 20/21 years old worked in the manufacture of boats, or were sailors, shipping goods throughout the rivers.” (Coelho, 1991)
THE NECROPOLIS

S. JULIÃO CHURCH
Construction: 14th Century
Destruction: 1811

NECROPOLIS
Construction: 14th Century
Destruction: 1833
MATERIAL AND METHODS

64 SKELETONS: 42 MALES + 22 FEMALES

(WITH SEX AND AGE AT DEATH ESTIMATED)
MATERIAL AND METHODS

MUSCULO SKELETAL STRESS MARKERS

ROBUSTICITY

ENTHESOPATHIES:
- a proliferative or osteophytic form (OF)
- a erosive or osteolytic form (OL)

(Mariotti et al., 2004)

Upper limb

Lower limb

36 MSM sites

13 skeletal elements
MATERIAL AND METHODS

DEGENERATIVE JOINT DISEASE

- **VERTEBRAE**
  - body - osteophytes
  - joint facets

- **PERIPHERAL JOINTS**
  - lipping
  - surface porosity
  - eburnation

Buikstra and Ubelaker, 1994

Upper limb

Lower limb
RESULTS: MSM upper limb

- MSM mean values are generally higher in middle aged males and females. High values were also found in the oldest female group.
RESULTS: MSM upper limb

**MALE HIGHER SCORES**

- MSM mean values are higher for the costoclavicular and conoideum ligaments (right side) and pectoralis major muscle (left side).
RESULTS: MSM upper limb

Osteolytic lesions at the site of insertion of the costoclavicular ligament. Symmetric lesion. “Kayaker’s clavicle”

Bone hypertrophy at the site of insertion of:
(a) pectoralis major m.
(b) teres major m.

S.13
Sk.4 - ♂, 35-50 y.o.
RESULTS: MSM upper limb

Bone hypertrophy at the site of insertion of deltoideus m.

S.13
Sk.3 - ♂, + 50 y.o.

Bone hypertrophy at the site of insertion of biceps brachii m.

S.33
Sk.32 - ♂, 35-50 y.o.
• MSM mean values are higher for supinator m. and rotator cuff capsule (right side) and conoideum ligament (left side)
RESULTS: MSM upper limb

- Rotator cuff capsule: osteolytic lesion at the insertion of the supraspinatus muscle
Higher dimorphism in females. Statistical differences for supinator m. (p=0.006, right side) and pronator teres m. (p=0.013, left side)

RESULTS: MSM upper limb

SEXUAL DIMORPHISM (%)
# Results: MSM Upper Limb

## Fishing Activity- Correlation with Rowing Movements

### Upper Limb - Right Side

<table>
<thead>
<tr>
<th>Males</th>
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<tbody>
<tr>
<td>2: LIGCO (CL)</td>
<td></td>
<td></td>
<td></td>
<td>rs(11)=0.731*&lt;br&gt;p=0.011</td>
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<td>4: DEL (CL)</td>
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<td>rs(6)=1.000**&lt;br&gt;p=0.004</td>
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<td>13: DEL (U)</td>
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<td>5: PEMJ (CL)</td>
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<td>11: PEMJ (U)</td>
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<tr>
<td>12: TEMJ (U)</td>
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<td>rs(9)=0.849**&lt;br&gt;p=0.004</td>
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<td>10: LATD (U)</td>
<td></td>
<td>rs(5)=0.884*&lt;br&gt;p=0.047</td>
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<tr>
<td>21: TRIB (C)</td>
<td>rs(5)=0.918*&lt;br&gt;p=0.028</td>
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<td>24: SUP (R)</td>
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<td>20: SUP (U)</td>
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<td></td>
<td>rs(10)=0.667*&lt;br&gt;p=0.035</td>
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<td>28: FP (F)</td>
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<td>rs(10)=0.783**&lt;br&gt;p=0.007</td>
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*Significance level: 0.05, **Significance level: 0.01
Between the deltoideus m. and costoclavicular ligament
RESULTS: MSM lower limb

- MSM mean values are higher in middle aged males and older females.
RESULTS: MSM lower limb

- MSM mean values are higher for quadratus femoris muscle (right side) and gluteus maximus muscle (left side)

MALE HIGHER SCORES

- Pectineus m.
- Gluteus maximus m.
- Longis, brevis, magnus m.
- Quadratus femoris m.

MSM mean score

Left
Right
RESULTS: MSM lower limb

- Bone hypertrophy at the site of insertion in the quadratus femoris muscle.
RESULTS: MSM lower limb

- Bone hypertrophy at the site of insertion of longis, brevis, magnum m.
RESULTS: MSM lower limb

- MSM mean values are higher for sacroiliacus ligament and gluteus maximus muscle (right side)
RESULTS: MSM lower limb

Robusticity in the gluteus maximus muscle insertion.
Symmetric lesion.

S.33
Sk.32 - ♀, + 50 y.o.
RESULTS: DJ D upper limb

Total percentage of affected individuals: 65.6% (42/64)

- Higher number of joint lesions in males, except for old female individuals
RESULTS: DJ D upper limb

- High frequency in both sexes and in middle/old aged individuals

sternoclavicular joint

acromioclavicular joint

S.13
Sk.4 - ♂, 35-50 y.o.

S.20
Sk.8 - ♂, 35-50 y.o.
RESULTS: DJD upper limb

DJD in the hand joints:

- Middle aged males and older females more affected
**RESULTS: DJ D lower limb**

Percentage of affected individuals: 67.2% (43/64)

- Higher number of affected joints in older males
RESULTS: DJ D lower limb

- Knee most affected joint in oldest groups

S.32
Sk.7- ♂, > 50 y.o.
### RESULTS: DJ D vertebrae

#### Percentage of affected individuals

<table>
<thead>
<tr>
<th>Vertebra type</th>
<th>Frequency of affected individuals</th>
<th>Number of cases (N)</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Vertebra osteophytosis</td>
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<tr>
<td>Cervical</td>
<td></td>
<td>17 (62)</td>
<td>27.4</td>
</tr>
<tr>
<td>Thoracic</td>
<td></td>
<td>16 (62)</td>
<td>25.8</td>
</tr>
<tr>
<td>Lumbar</td>
<td></td>
<td>12 (62)</td>
<td>19.4</td>
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<tr>
<td>Peripheral osteoarthritis</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cervical</td>
<td></td>
<td>18 (62)</td>
<td>29.0</td>
</tr>
<tr>
<td>Thoracic</td>
<td></td>
<td>17 (62)</td>
<td>27.4</td>
</tr>
<tr>
<td>Lumbar</td>
<td></td>
<td>24 (62)</td>
<td>38.7</td>
</tr>
</tbody>
</table>

- High frequency of vertebral osteophytosis in cervical and thoracic vertebra
- High frequency of joint lesions in cervical and lumbar vertebra
RESULTS: DJ D vertebrae

Vertebral osteophytosis in the cervical vertebra

S.7-8-9
Sk.4- ♀, >50 y.o.
Severe vertebral osteophytosis in the thoracic vertebra (T2-T10)

S. 33
Sk. 32- ♀, > 50 y.o.

RESULTS: DJ D vertebrae
**DISCUSSION**

- Age proved to be a contributing factor to increased MSM scores, with a greater age-related increase in females.

- However, other factors associated with the activity and with subsistence strategies may well have affected the pattern and distribution of bone lesions:
  
  **Fishing/Rowing** - symmetrical lesions at the site of insertion of costoclavicular ligament, "kayaker's clavicle". Positive correlation between some insertions sites from the upper limb. DJD in acromioclavicular joints.

  **Boat manufacture/Shipping goods** - severe DJD in hand joints. Vertebral osteophytosis and peripheral osteoarthritis in the cervical vertebra.
CONCLUSION

“(...) Familiarized With Hard Work Since Young Ages (...)
(Oliveira in Godinho, 1947: 23)

- Subjected to repetitive biomechanical stress
- Possible correlation with some Constância’s subsistence activities
- Importance of ethohistorical data to biological interpretation