

BME 473

Applied Biomechanics  
Course Project

# Performance Mouth Guards

Presented by Hunter Vickers and Devin Mosley

# Outline

1. Movie clip
2. What are mouth guards?
3. How they work
4. Previous investigations
5. Our new investigation

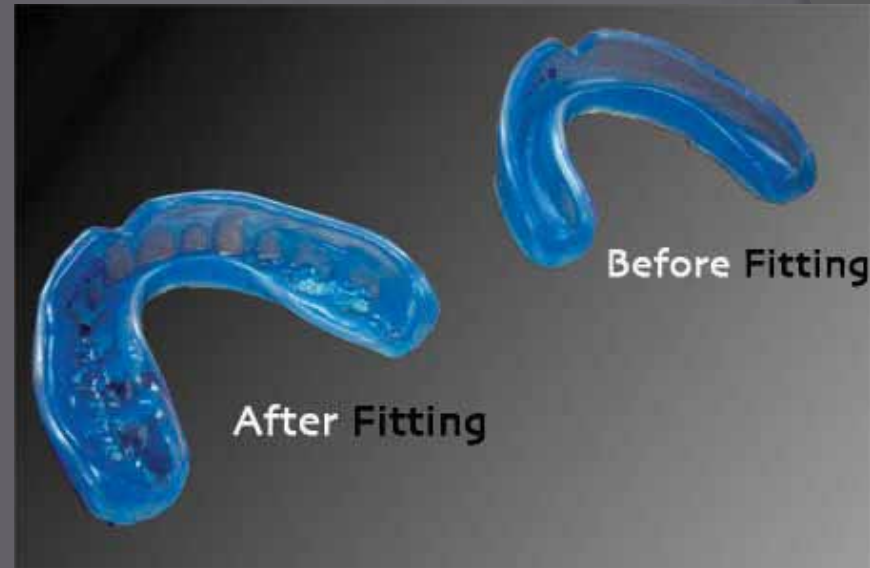
# Under Armour Performance Mouthpiece



# Traditional



# Boil and Bite



# PERFORMANCE





Jon Gruden (Retired NFL Coach)



Washington Redskins lineman Kedrick Golston

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PURE POWER UNLEASHED

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Scott McCarron, PGA Tour Player

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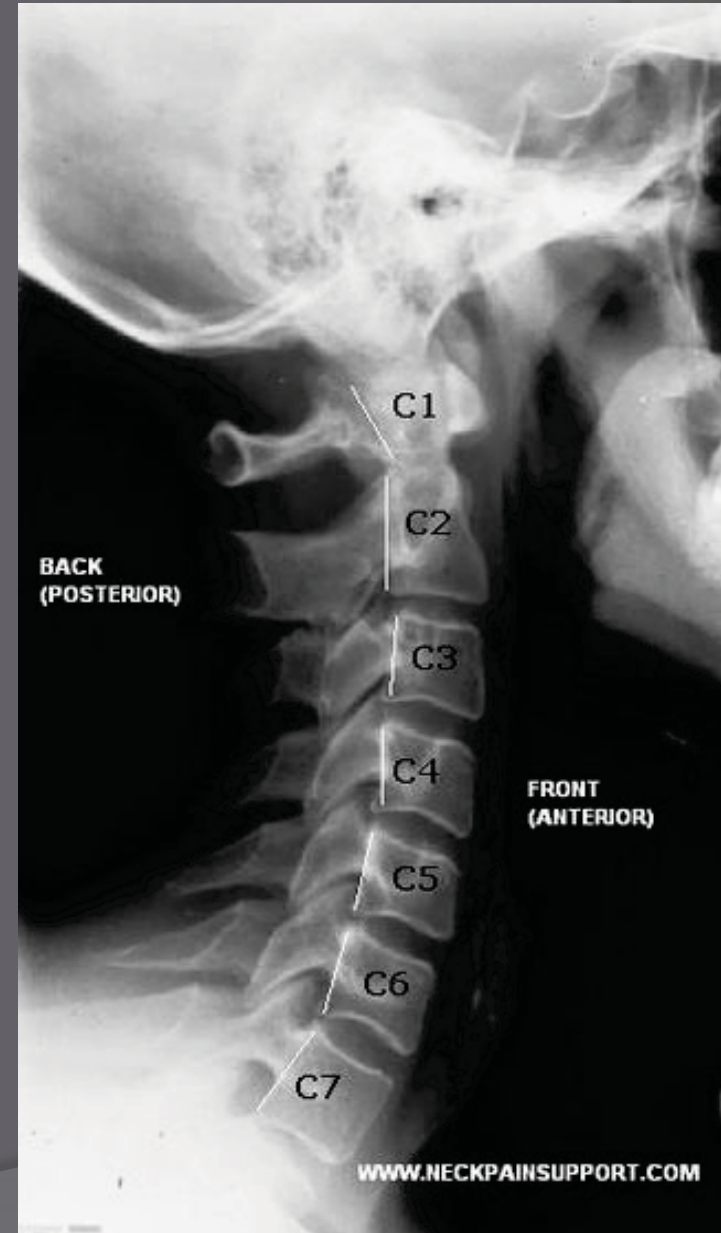
PGA Tour Player  
Scott McCarron



# So, what's going on?

- 1-Teeth Clenching
- 2-Restricted Airways
- 3-Release of Performance Sappers(cortisol and lactic acid)
- 4-Stress, Fatigue and Distraction

The dentist takes an impression of your teeth and sends it directly to Bite Tech's lab where your Mouth Guard is constructed and personalized.



# Previous Investigations



## The Effects of Mouthpiece Use on Gas Exchange Parameters During Steady-state Exercise in College-aged Men and Women

*Results-*wearing a performance mouthpiece would inhale 29 percent more oxygen and exhale 21 percent more carbon dioxide compared to a person not wearing the mouth piece.

## The Effects of Mouthpiece Use on Cortisol Levels During an Intense bout of Resistance Exercise

*Results-* reduce the amount of the cortisol by 51 percent at 10 minutes post-exercise in the participants wearing the mouthpiece versus those who did not.

Results:

The use of the mouthpiece elicited an average of 2 mph increase in pitching velocity among all subjects



An advertisement for Armourbite mouthpieces and mouthguards. At the top, a man in a dark polo shirt with 'TOM HOUSE PITCHING COACH UNIVERSITY OF SOUTHERN CALIFORNIA' on it is shown. Below him, the text reads 'WHAT IS ARMOURBITE?'. The ad lists three benefits: 'INCREASED STRENGTH (Up to 20% Stronger)', 'INCREASED ENDURANCE (Up to 20% Less Tired - Less Build Up)', and 'IMPROVED REACTION TIME (Up to 1.5% Faster)'. It also includes a 'BUY NOW!' button and two images of the products: 'ARMOURBITE MOUTHPIECE FOR NON-CONTACT SPORTS' and 'ARMOURBITE MOUTHGUARD FOR CONTACT SPORTS'.

Results-Vertical Jump increased by 2 centimeters

WaNT-Peak Power was 12 Watts/Kg for those who wore performance mouth gaurd vs 11.4 W/kg for those who did not

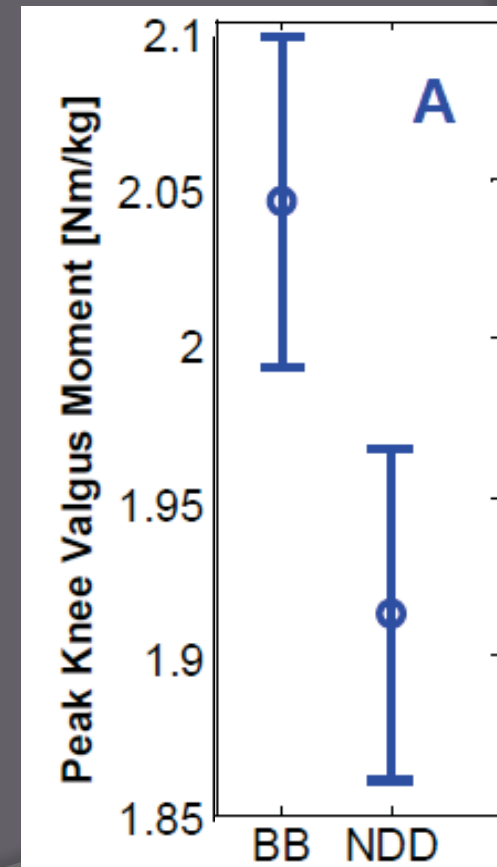


# ACL TEAR

## *EFFECT OF A NEUROMUSCULAR DENTISTRY-DESIGNED MOUTHGUARD ON PEAK KNEE VALGUS MOMENTS DURING SINGLE LEG LANDING*

Peak knee valgus moments (pKVM) have been identified as a potential risk factor for ACL injury.

A 170lb person is equivalent to 80 kg, which would result in a decreased pKVM of 12Nm.



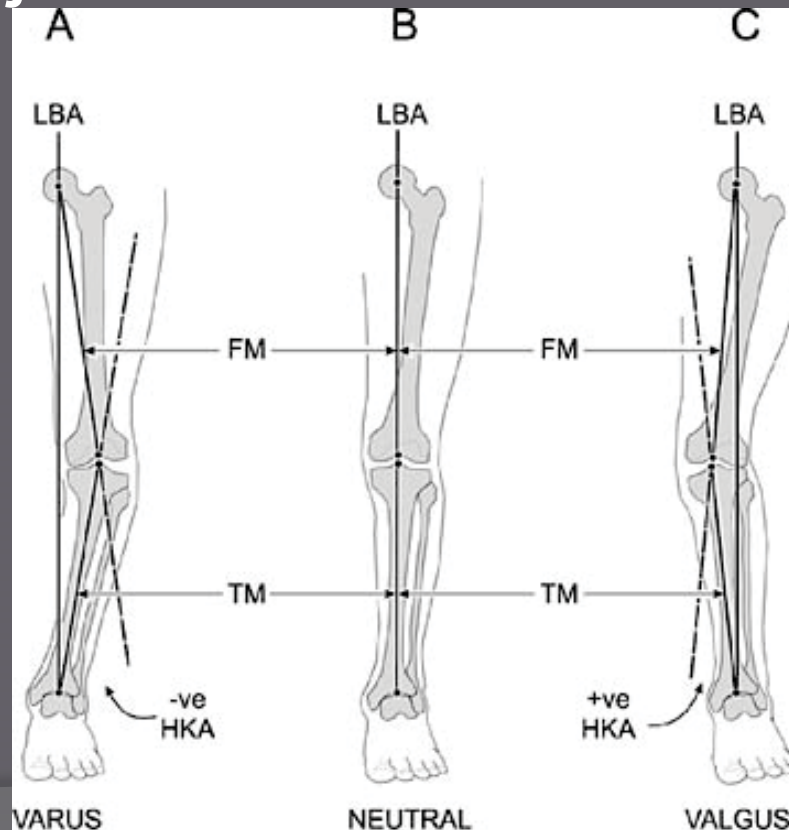
# Sport related injuries

- Over \$18 billion dollars spent on medical expenses
- Most Injuries:
  - Bicycling
  - Basketball
  - Baseball
  - Running



# Proposed Research Questions

- ⦿ Effects of valgus knee moments
  - Does it reduce the moment significantly?
- ⦿ Can ACL injuries be reduced?



# Research Criteria

- ⦿ 20 participants
  - Half athletic team participants
    - 5 Male and 5 Female
  - Half non-athletic team
    - 5 Male and 5 Female
- ⦿ Age range: 17 – 23
- ⦿ 5 week testing process

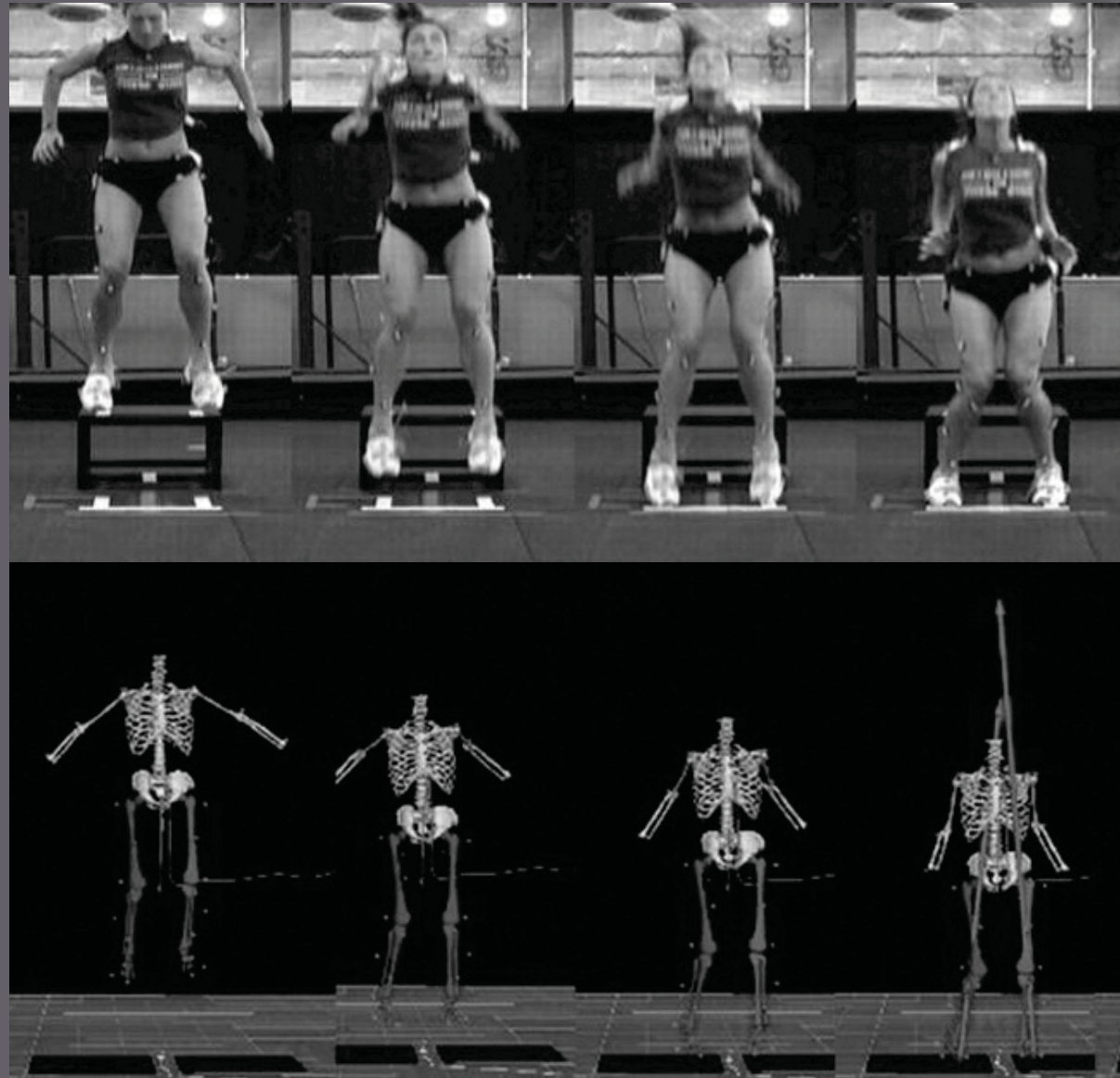


# Testing Criteria

- First week: Fitting
- Second week: All males perform task with mouth guard
- Third week: All females perform task with mouth guard
- Fourth week: All males perform task without mouth guard
- Fifth week: All females perform task without mouth guard

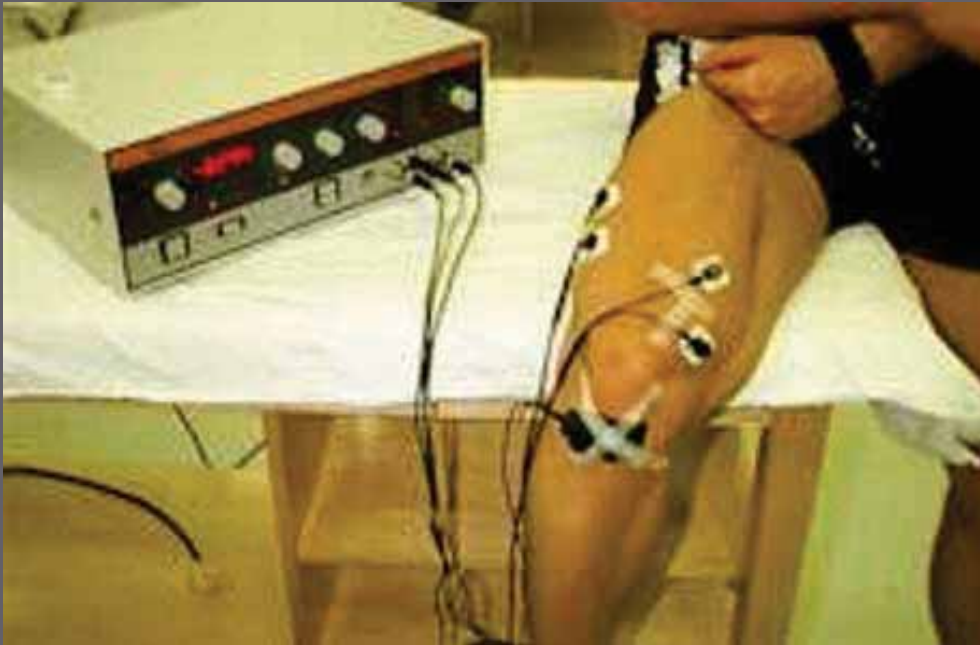
# Data Collection

- Jump off 46 cm (~1.5ft) box
- An 8-camera optical motion analysis system with reflective markers placed on the pelvis and lateral knee, ankle, and foot



# Data Collection

- An EMG would also be connected to the participant
  - This would help measure responsiveness



# Results/Benefits

- ⦿ Responsiveness
- ⦿ Understand if psychosomatics play a role
- ⦿ Bone injuries (breaks) will not be prevented.
- ⦿ Research would be used to help everyone, not just athletes



Questions?

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