St. Elizabeth HEALTHCARE

2025 SPORTS MEDICINE CONFERENCE

Event sponsored by:

Smith+Nephew

All speakers, Adam Metzler, MD, Brandon Kohrs, MD, Jeff Chapek, MD, Aloiya Kremer, MD, and Travis Huffman, MD disclosed that they have nothing to disclose.
All planners, Tasha Riddell, Megan Myers, Dawna Morris-Panko and Karen Tepe have disclosed that they have nothing to disclose.

MAINTAINING MUSCLE AS AN AGING ATHLETE: NUTRITION AND TRAINING

Dr. Aloiya Kremer

St. Elizabeth PHYSICIANS

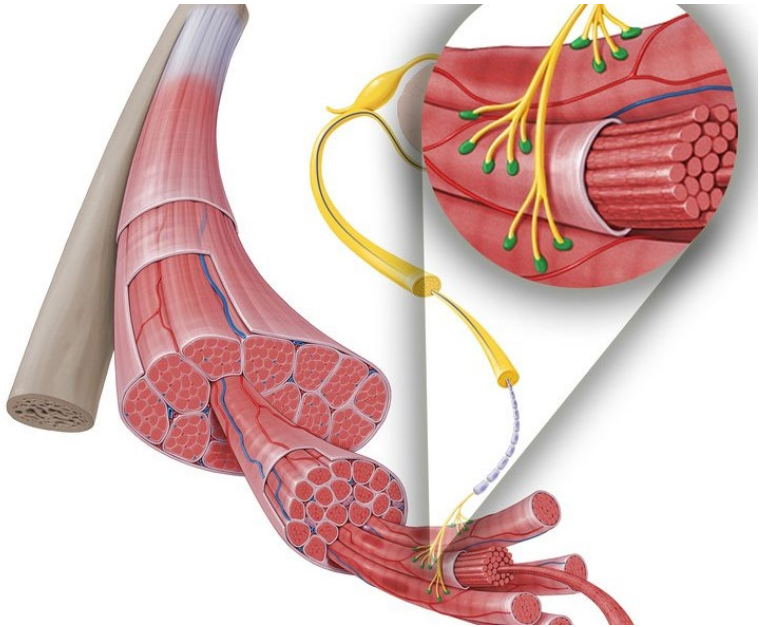
INTRODUCTION

With age, muscle fibers decrease in mass AND number

- **Starting ~age 30: 3-5% muscle loss per decade**
- **Accelerates after age 60**
- **30%+ muscle mass loss by age 80**

WHY DO WE LOSE MUSCLE?

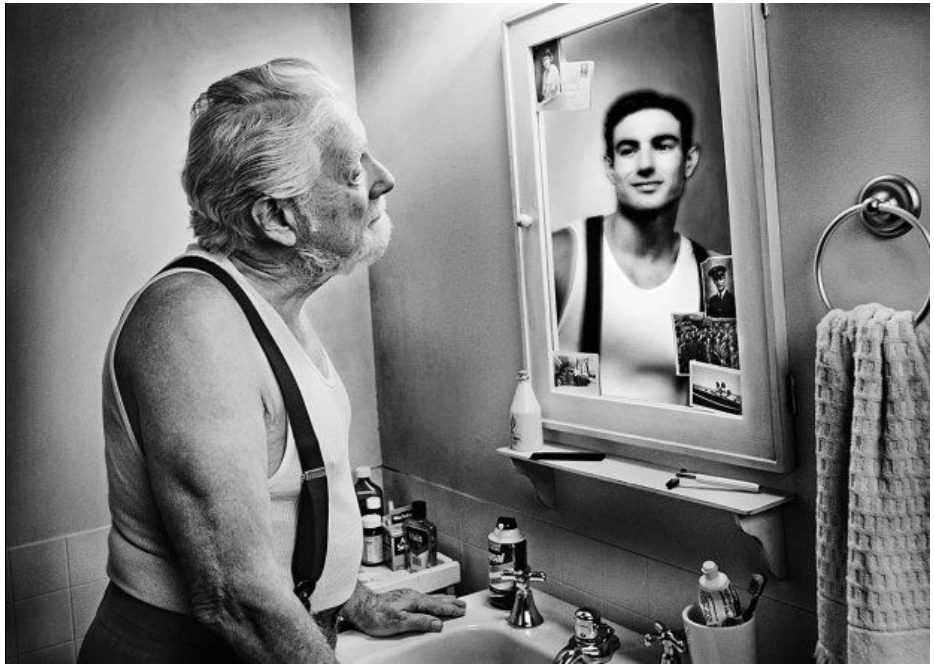
- **Nerves become less efficient at activating muscle fibers at the NMJ**
  - ✓ **Muscle size and strength decreases**
- **Hormones:**
  - ✓ **Testosterone decreases with age → decline in muscle protein synthesis and maintenance**
  - ✓ **Growth hormone decreases → decline in muscle building and repair processes**
  - ✓ **Post-menopausal estrogen decline→ muscle and bone density loss**



WHY DOES IT MATTER?

Aesthetics

- Can be a motivating factor
- People don't like to see themselves aging
  - ✓ Beauty, skincare, supplement industries



WHY DOES IT MATTER?

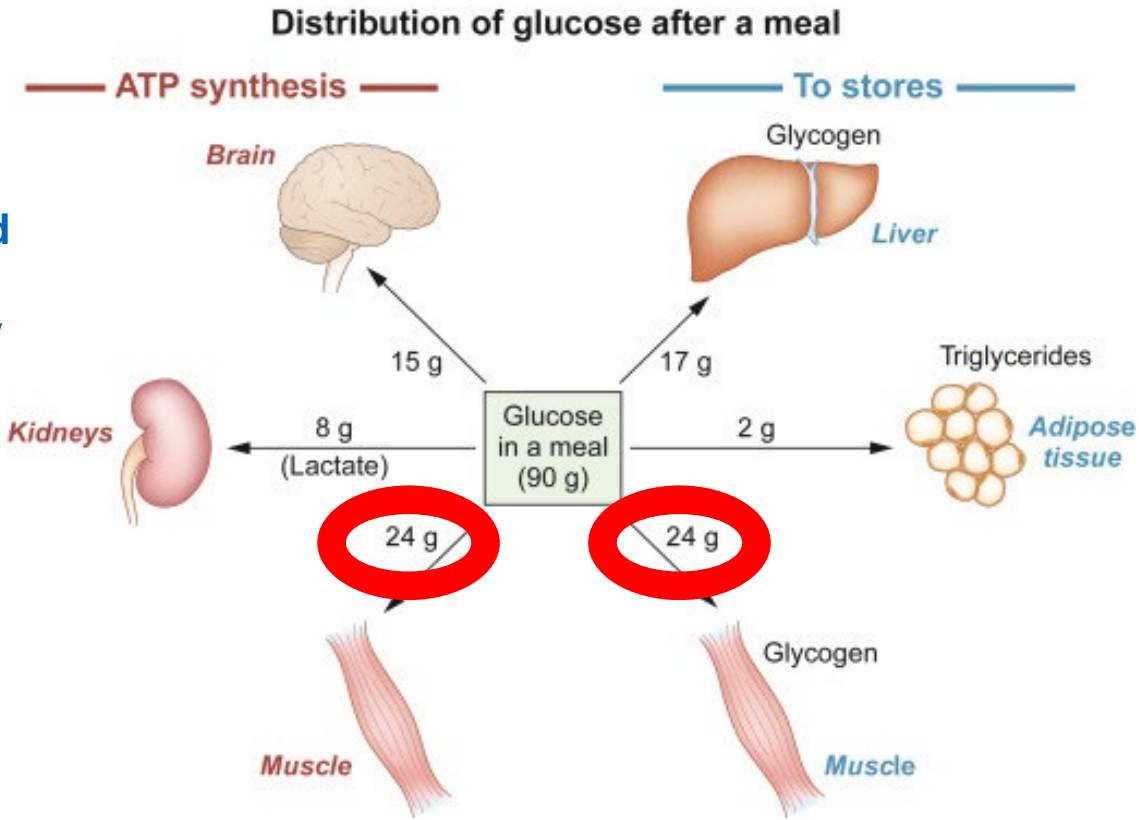
Pain

- People don't like to feel themselves aging
  - ✓ Core, gluteal weakness → back pain
  - ✓ Weaker muscles around joints → OA pain

WHY DOES IT MATTER?

Metabolic Health

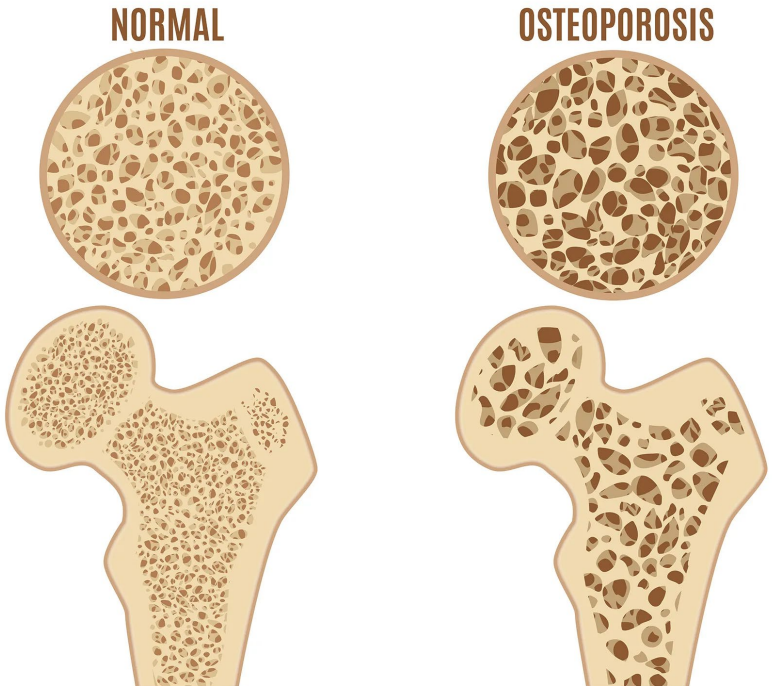
- **Muscle wasting is associated with an increased risk of CV disease, T2DM, and mortality**



WHY DOES IT MATTER?

Bone Density

- **Wolff's Law: Bones adapt and strengthen in response to the stresses placed upon them.**
- **Less muscle → less bone density → Falls, fractures**

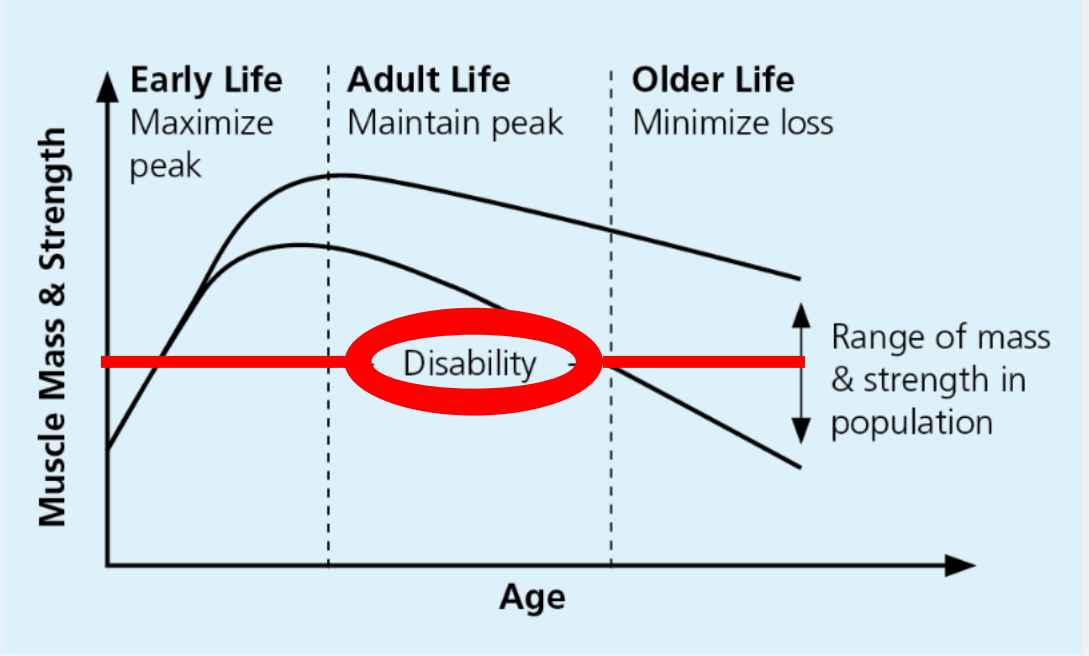


WHY DOES IT MATTER?

Function

&

★ Independence

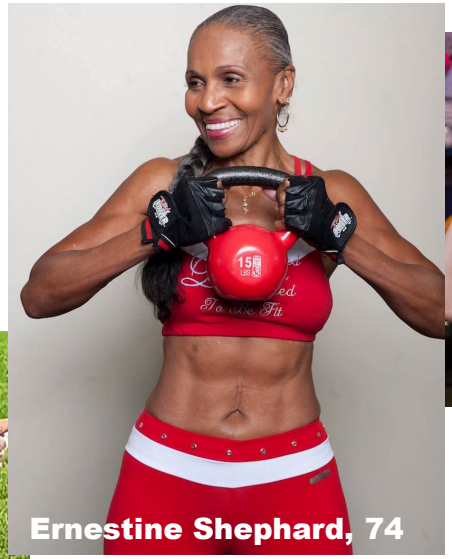


Adapted from WHO/HPS, Geneva 2000 [3]

WHAT'S THE GOOD NEWS?

We Can Combat This

Muscle can be maintained and gained as we age



HOW?

Exercise

+

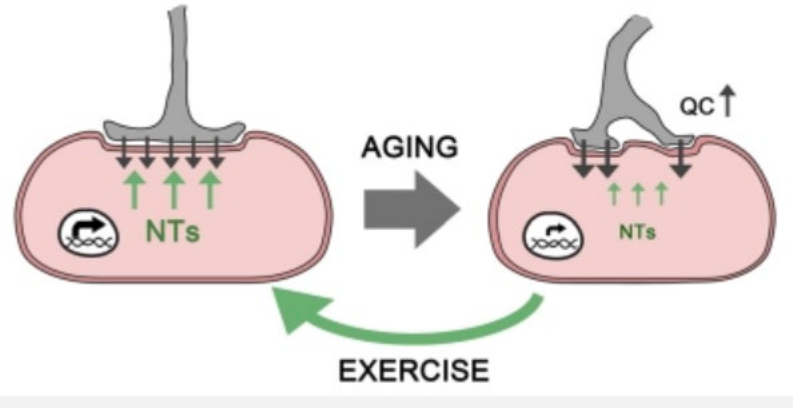
Nutrition

[HRT if indicated]

EXERCISE

EXERCISE

- Exercise can rejuvenate the neuromuscular junction and improve motor function
- Both endurance and resistance training stimulate physical adaptations of the presynaptic nerve terminal of the NMJ & increase in neurotransmission
  - ✓ A response of the NMJ to support the increased demands upon the system



Exercise improves structure AND function of the NMJ

NTs = neurotrophins (proteins that signal nerves to survive and grow)

EXERCISE

<25% of Americans meet the recommended physical activity guidelines

ACSM RECOMMENDATIONS FOR STRENGTH TRAINING IN OLDER ADULTS

Strength Training

Strength training, for example, working with weights or resistance bands, makes you stronger and helps your overall health. Plus, strength training can make daily activities like lifting laundry baskets or yardwork easier and safer.

What?

Hand weights, resistance bands, weight machines or your own body (for example, wall push-ups or chair sit-to-stands)

How often?

2 or more days/ week
*Rest day in between

How hard?

Start with light effort. Build up to medium or hard effort.

How much?

10-15 repetitions to start (for each major muscle group). Build up to 8-12 reps of challenging effort. Repeat 1-3 times.

EXERCISE

~~Use it or lose it~~

Challenge it or lose it

HOW TO CHALLENGE MUSCLE

Microtears → repair → hypertrophy

- Progressive overload
- Vary reps/sets, work:rest time
- Reps to failure (weight can be light)
- Without weights/equipment: time under tension (ex – pulse squats), isometric holds (ex – squat and hold, high plank and hold)

EXERCISE PRESCRIPTION

- Motivational interviewing
- FITT principle

Exercise is Medicine® | AMERICAN COLLEGE of SPORTS MEDICINE

Name: _____ Date: _____

2018 Physical Activity Guidelines for Adults:

- 150-300 minutes/week of moderate-intensity activity or 75-150 minutes/week of vigorous activity (somewhat hard to very hard) or a combination of both
- Muscle strength training 2 or more times a week

Aerobic Activity *(check)*

Frequency (days/week): ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

Intensity: ❑ Light (casual walk) ❑ Moderate (brisk walk) ❑ Vigorous (like jogging)

Time (minutes/day): ❑ 10 ❑ 20 ❑ 30 ❑ 40 ❑ 50 ❑ 60 or more

Type: ❑ Walk ❑ Run ❑ Bike ❑ Swim/Water Exercise ❑ Other _____

Steps/day: ❑ 2,500 ❑ 5,000 ❑ 7,000 ❑ 9,000 or more ❑ Other _____

What about aerobic activity?

- Moderate activity is at a pace where you can talk but cannot "sing." Examples: *brisk walking, light biking, water exercise* and *dancing*.
- Vigorous activity is done at a pace where you can't say more than a few words without pausing for a breath. Examples: *jogging, swimming, tennis* and *fast bicycling*.
- You can exercise for any length of time. For example, you might walk:
  - 30 minutes 5 days/week or
  - 20 minutes daily
  - 5 minutes here, 10 minutes there. Just work your way up to 150 total minutes/week.
- Your ultimate goal is to gradually build up to 7,000-9,000 steps/day.

Muscle Strength Training *(check)*

Frequency (days/week): ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

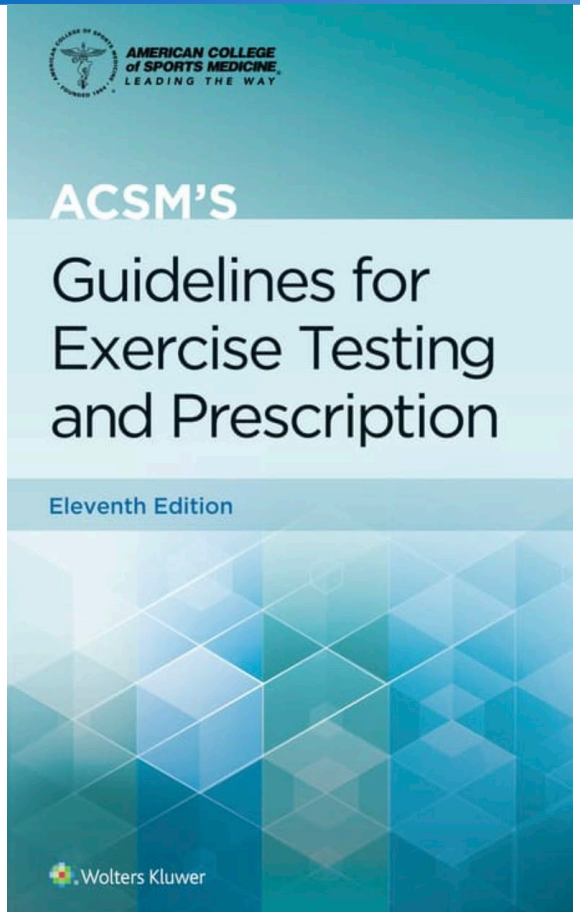
What about strength training?

- You don't have to go to a gym. Try elastic bands, do body weight exercises (chair sit-to-stands; floor, wall or kitchen counter push-ups; planks or bridges) or lift dumbbells. Heavy work around your home or yard also builds strength.
- Strengthen your legs, back, chest and arms. To start, try 10-15 repetitions using light effort. Build up to medium or hard effort for 8-12 repetitions. Repeat 2-4 times, 2-3 days/week.
- Give yourself a rest day between each strength training session.

Prescriber's Signature:

How will you get started **this week?**

EXERCISE PRESCRIPTION



EXERCISE PRESCRIPTION

Letter of medical necessity:

https://www.exerciseismedicine.org/irs-213-exercise-medical-treatment-healthcare-providers/

A template for Letter of Necessity for Reimbursement

[Include clinical practice letterhead]

[Date]

Letter of Medical Necessity for Reimbursement 2024

To Whom It May Concern:

[Patient Name] is under my care for the new diagnosis of [Insert new diagnosis]. As part of overall treatment for this condition, I recommend [Patient Name] begin a prescribed physical activity program through [Insert type of organization or fitness class requiring an expense]. Pursuant to Section 213 of the Internal Revenue Service Code (1), the cost of this physical activity program would not be incurred by the patient if not for the new diagnosis and my recommendation. This physical activity expense is new for the patient and not one that was in place prior to now. I recommend that this new physical activity expense be covered for [Can insert number of months, only if a specific time period is recommended].

Sincerely,

[Insert provider's signature, name and credentials and contact information]

1. Section 213 of the IRS Code generally allows a deduction for expenses paid during the taxable year for medical care if certain requirements are met. Expenses for medical care under section 213 of the Code also are eligible to be paid or reimbursed under an HSA, FSA, Archer MSA, or HRA.

HOME WORKOUTS

STRENGTH WORKOUT: 30 Minute Strength Training for Seniors And Beginners

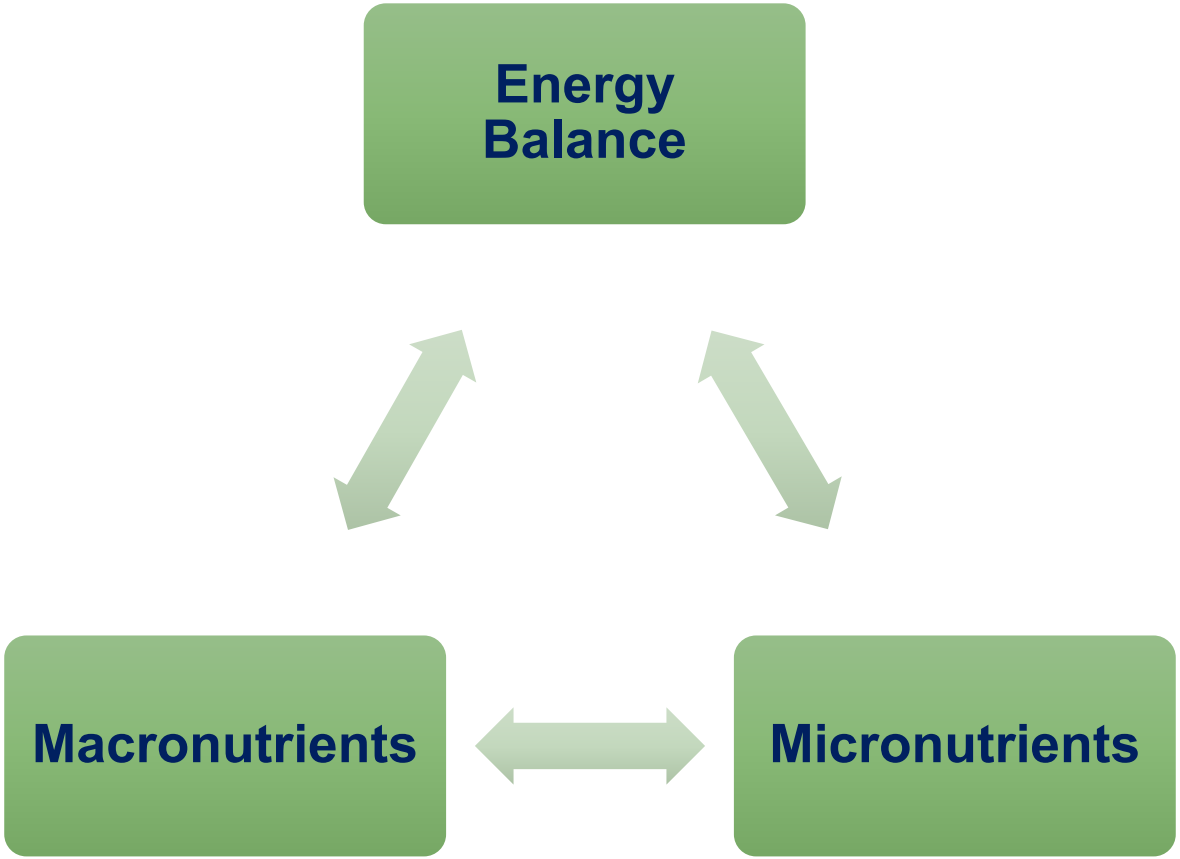
385K views • 1 year ago

yes2next

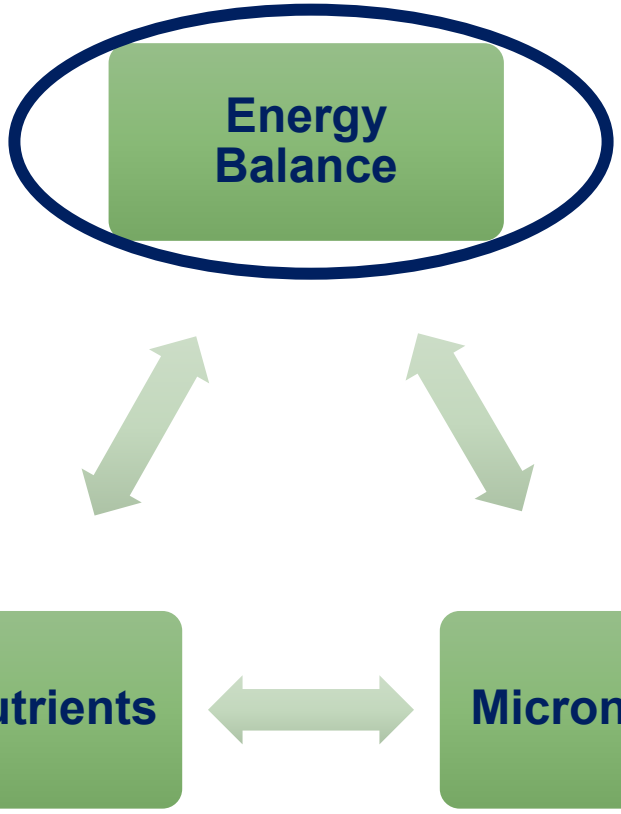
Hey Everyone Welcome Back To Another Video! **STRENGTH WORKOUT**: 30 Minute **Strength Training** for Seniors And ...

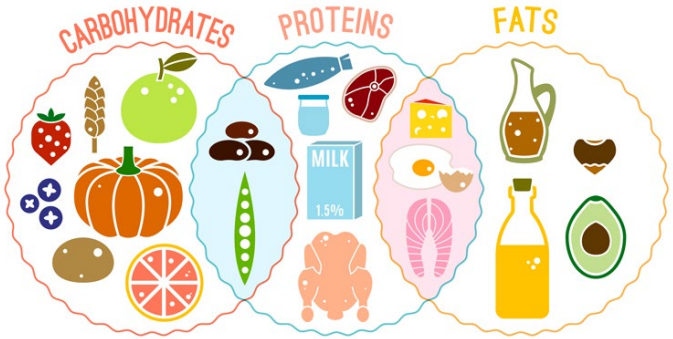
6 chapters Introduction | Warm Up | Exercise Set 1 | Exercise Set 2 | Exercise Set 3 | Cooldown

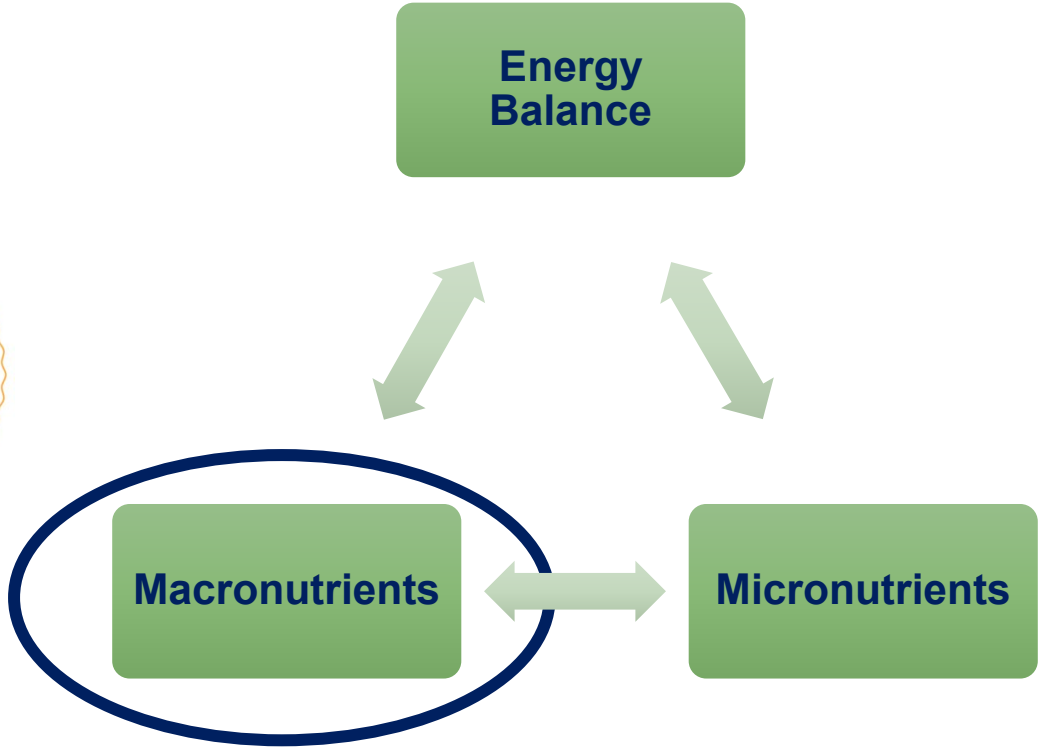
NUTRITION

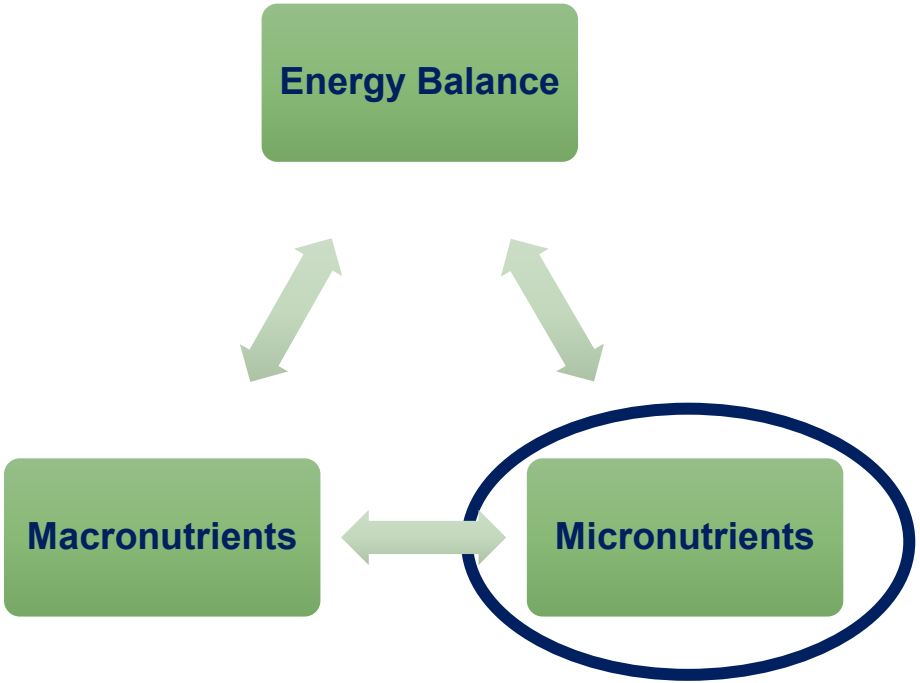

Energy Balance
Macronutrients
Micronutrients

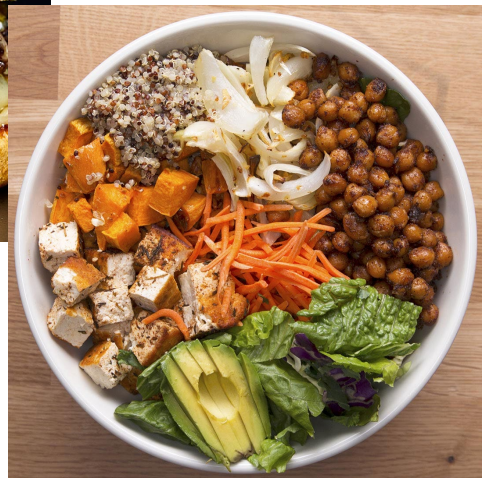

CALORIES IN
CALORIES OUT


Energy Balance
Macronutrients
Micronutrients


CARBOHYDRATES
PROTEINS
FATS
MILK
1.5%


Energy Balance
Macronutrients
Micronutrients





- Vitamins and minerals
- Food QUALITY

FOCUS FOR AGING ATHLETES

CALORIES
&
PROTEIN

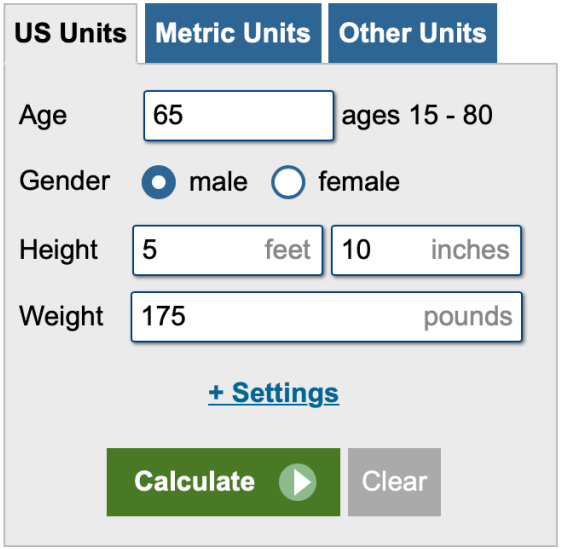
CALORIES

BMR x activity level

Link: Calculator Tool

BMR Calculator

The *Basal Metabolic Rate (BMR) Calculator* estimates your basal metabolic rate—the amount of energy expended while at rest in a neutrally temperate environment, and in a post-absorptive state (meaning that the digestive system is inactive, which requires about 12 hours of fasting).



Result

BMR = **1,585** Calories/day

Daily calorie needs based on activity level

Activity Level	Calorie
Sedentary: little or no exercise	1,902
Exercise 1-3 times/week	2,179
Exercise 4-5 times/week	2,322
Daily exercise or intense exercise 3-4 times/week	2,457
Intense exercise 6-7 times/week	2,734
Very intense exercise daily, or physical job	3,012

Exercise: 15-30 minutes of elevated heart rate activity.
Intense exercise: 45-120 minutes of elevated heart rate activity.
Very intense exercise: 2+ hours of elevated heart rate activity.

PROTEIN

U.S. recommended dietary allowance (RDA) for protein is **0.8 grams per kilogram of body weight for adults aged 18 and older**

Many studies recommend **1.2 - 1.6 g/kg for adults >65**

- **1.6 g/kg/day** is preferred for aging athletes to maintain muscle mass

PROTEIN

150 lb patient (68 kg) = 109 g protein/day

175 lb patient (79 kg) = 126 g protein/day

200 lb patient (91 kg) = 146 g protein/day

225 lb patient (102 kg) = 163 g protein/day

CASE EXAMPLE

65 yo 5’10” 175 lb male, pickleball 2x/week

Calories: 2,179
Protein: 126 g

CASE EXAMPLE

BMR x activity level

BMR Calculator

The *Basal Metabolic Rate (BMR) Calculator* estimates your basal metabolic rate—the amount of energy expended while at rest in a neutrally temperate environment, and in a post-absorptive state (meaning that the digestive system is inactive, which requires about 12 hours of fasting).

US Units | Metric Units | Other Units

Age: 65 ages 15 - 80

Gender: (•) male ( ) female

Height: 5 feet 10 inches

Weight: 175 pounds

+ Settings

Calculate | Clear

Result

BMR = **1,585** Calories/day

Daily calorie needs based on activity level

Activity Level	Calorie
Sedentary: little or no exercise	1,902
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Exercise: 15-30 minutes of elevated heart rate activity.
Intense exercise: 45-120 minutes of elevated heart rate activity.
Very intense exercise: 2+ hours of elevated heart rate activity.

CASE EXAMPLE

175 lb = 79 kg

79 kg x 1.6 g/kg/day = 126 g protein/day

SAMPLE DAY OF EATING

Breakfast: Toast with butter, 2 eggs, coffee

Lunch: Grilled cheese and tomato soup

Snacks: Handful of nuts, pretzels, banana

Dinner: Pork chop, mashed potatoes, green beans

Dessert: Vanilla ice cream

SAMPLE DAY OF EATING

Breakfast: Toast with butter, 2 eggs, coffee (310 calories, 17 g protein)

Lunch: Grilled cheese and tomato soup (600 calories, 18 g protein)

Snack: Handful of nuts, pretzels, banana (400 calories, 7 g protein)

Dinner: Pork chop, mashed potatoes, green beans (500 calories, 28 g protein)

Dessert: Vanilla ice cream (150 calories, 2 g protein)

Total: 1,960 calories, 72 g protein
[Goal: 2,179 calories, 126 g protein]

219 calories short, would lose ~1 lb every 16 days
57% of protein goal met

PROTEIN

“Good source of protein”

- **1 gram of protein/10 calories**

Nutrition Facts

Varied servings per container

Serving size **4 oz. (112g)**

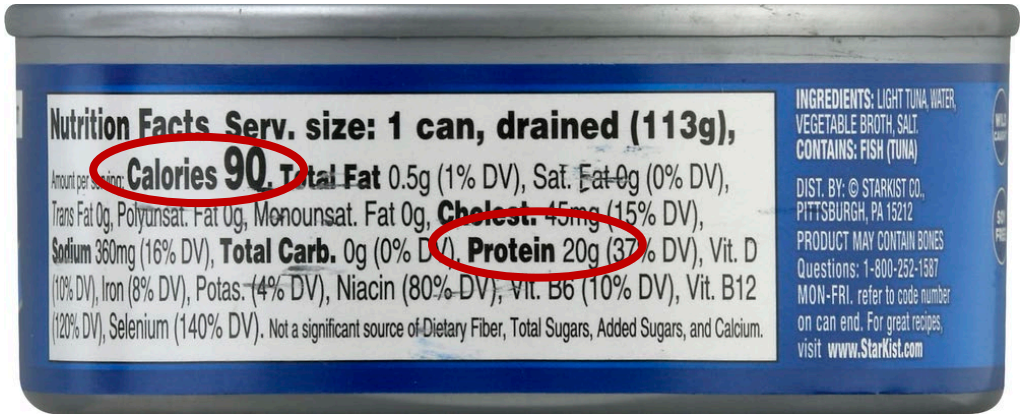
Amount Per Serving

Calories **140**

	% DV*
Total Fat 4g	**5%**
Saturated Fat 1.5g	**8%**
Trans Fat 0g	
Polyunsaturated Fat 0.5g	
Monounsaturated Fat 2g	
Cholesterol 65mg	**22%**
Sodium 40mg	**2%**
Total Carbohydrate 0g	**0%**
Dietary Fiber 0g	**0%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 25g	**50%**
Vitamin D 0mcg	0%
Calcium 0mg	0%
Iron 0mg	0%
Potassium 370mg	8%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.


WILD CAUGHT
StarKist
PAREVE
Chunk Light
TUNA
IN WATER


Nutrition Facts. Serv. size: 1 can, drained (113g),
Amount per serving: Calories 90. Total Fat 0.5g (1% DV), Sat. Fat 0g (0% DV), Trans Fat 0g, Polyunsat. Fat 0g, Monounsat. Fat 0g, Cholest. 45mg (15% DV), Sodium 360mg (16% DV), Total Carb. 0g (0% DV), Protein 20g (37% DV), Vit. D (10% DV), Iron (8% DV), Potas. (4% DV), Niacin (80% DV), Vit. B6 (10% DV), Vit. B12 (120% DV), Selenium (140% DV). Not a significant source of Dietary Fiber, Total Sugars, Added Sugars, and Calcium.
INGREDIENTS: LIGHT TUNA, WATER, VEGETABLE BROTH, SALT.
CONTAINS: FISH (TUNA)
DIST. BY: © STARKIST CO., PITTSBURGH, PA 15212
PRODUCT MAY CONTAIN BONES
Questions: 1-800-252-1587
MON-FRI. refer to code number on can end. For great recipes, visit www.StarKist.com

Nutrition Facts

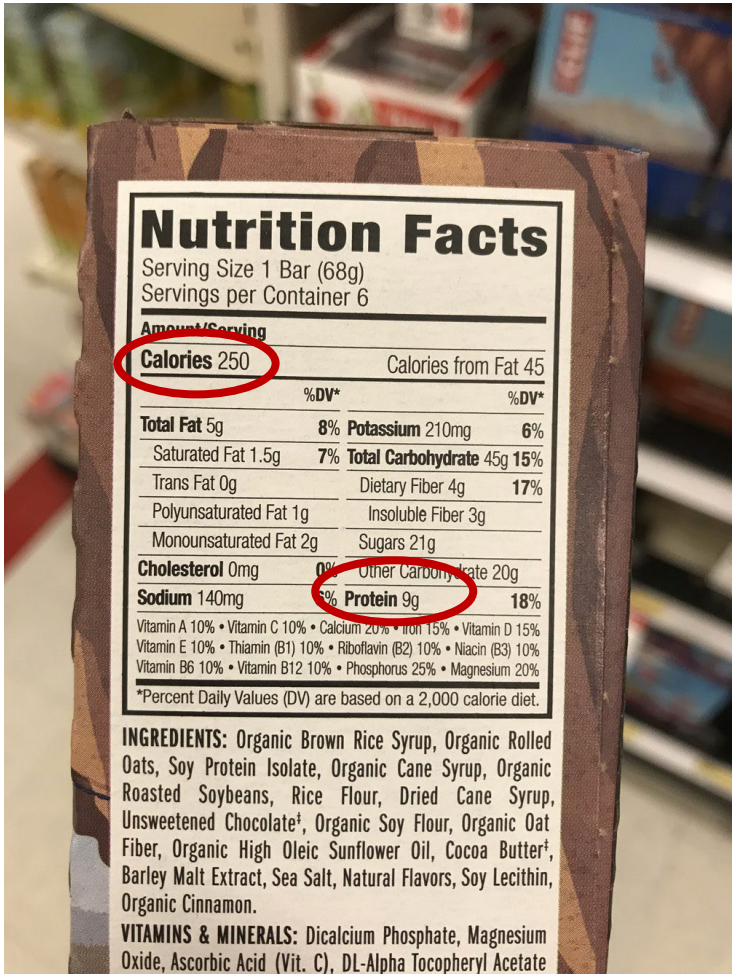
12 servings per container

Serving size **1 egg (50 g)**

Amount per serving

Calories **60**

	% Daily Value*
Total Fat 4g	**5%**
Saturated Fat 1g	**6%**
Trans Fat 0g	
Polyunsaturated Fat 1g	
Monounsaturated Fat 2g	
Cholesterol 170mg	**57%**
Sodium 65mg	**3%**
Total Carbohydrate 0g	**0%**
Dietary Fiber 0g	**0%**
Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 6g	**13%**
Vitamin D 6mcg	30%
Calcium 28mg	2%
Iron 1mg	6%
Potassium 69mg	2%



Nutrition Facts

Serving Size 1 Bar (68g)
Servings per Container 6

Amount/Serving

Calories 250 — Calories from Fat 45

	%DV*		%DV*
Total Fat 5g	8%	**Potassium** 210mg	6%
Saturated Fat 1.5g	7%	**Total Carbohydrate** 45g	15%
Trans Fat 0g		Dietary Fiber 4g	17%
Polyunsaturated Fat 1g		Insoluble Fiber 3g	
Monounsaturated Fat 2g		Sugars 21g	
Cholesterol 0mg	0%	Other Carbohydrate 20g	
Sodium 140mg	6%	**Protein** 9g	18%

Vitamin A 10% • Vitamin C 10% • Calcium 20% • Iron 15% • Vitamin D 15%
Vitamin E 10% • Thiamin (B1) 10% • Riboflavin (B2) 10% • Niacin (B3) 10%
Vitamin B6 10% • Vitamin B12 10% • Phosphorus 25% • Magnesium 20%

*Percent Daily Values (DV) are based on a 2,000 calorie diet.

INGREDIENTS: Organic Brown Rice Syrup, Organic Rolled Oats, Soy Protein Isolate, Organic Cane Syrup, Organic Roasted Soybeans, Rice Flour, Dried Cane Syrup, Unsweetened Chocolate‡, Organic Soy Flour, Organic Oat Fiber, Organic High Oleic Sunflower Oil, Cocoa Butter‡, Barley Malt Extract, Sea Salt, Natural Flavors, Soy Lecithin, Organic Cinnamon.

VITAMINS & MINERALS: Dicalcium Phosphate, Magnesium Oxide, Ascorbic Acid (Vit. C), DL-Alpha Tocopheryl Acetate

Barebells
FUNCTIONAL FOODS™

PROTEIN BAR COOKIES & CREAM

NATURAL AND ARTIFICIAL FLAVORING

20 *grams* OF PROTEIN

no ADDED SUGAR

INGREDIENTS: MILK PROTEIN BLEND (CALCIUM CASEINATE, WHEY PROTEIN CONCENTRATE, WHEY PROTEIN ISOLATE), GLYCERIN, MALTITOL, BOVINE COLLAGEN HYDROLYSATE, POLYDEXTROSE, COCOA BUTTER, WATER, SOY PROTEIN ISOLATE, DRY WHOLE MILK, SUNFLOWER OIL, UNSWEETENED CHOCOLATE, TAPIOCA STARCH, NATURAL AND ARTIFICIAL FLAVORS, COCOA PROCESSED WITH ALKALI, SUNFLOWER LECITHIN, SUCRALOSE.

CONTAINS: MILK, SOYBEANS.

MANUFACTURED FOR BAREBELLS FUNCTIONAL FOODS LLC, 3865 GRAND VIEW BLVD, LOS ANGELES, CA 90066, US

MADE IN CROATIA.

MAY CONTAIN: WHEAT, PEANUTS, TREE NUTS AND GLUTEN.

EXCESSIVE CONSUMPTION MAY CAUSE A LAXATIVE EFFECT (DUE TO MALTITOL).

Nutrition Facts

12 servings per container

Serving size 1 bar (55g)

Amount per serving

Calories 200

	% Daily Value*
Total Fat 7 g	**9%**
Saturated Fat 3 g	**16%**
Trans Fat 0 g	
Cholesterol 10 mg	**4%**
Sodium 75 mg	**3%**
Total Carbohydrate 20 g	**7%**
Dietary Fiber 3 g	**10%**
Total Sugars 1 g	
Includes 0 g Added Sugars	**0%**
Sugar Alcohols 5 g	
Protein 20 g	**40%**

Vit. D 0.2mcg 0% • Calcium 140mg 10%

Iron 0.5mg 2% • Potassium 130mg 2%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Nutrition Facts

About 15 servings per container

Serving size **1 oz (28g/about 32 pieces)**

Amount per serving

Calories **170**

	% Daily Value*
Total Fat 15g	**19%**
Saturated Fat 2g	**9%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 45mg	**2%**
Total Carbohydrate 6g	**2%**
Dietary Fiber 3g	**9%**
Total Sugars 1g	
Includes 0g Added Sugars	**0%**
Protein 6g	**7%**

Vitamin D 0mcg 0% • Calcium 40mg 2%

Iron 1.3mg 8% • Potassium 200mg 4%

Vitamin E 20% • Phosphorus 10%

Magnesium 15% • Zinc 10%

Copper 35% • Manganese 25%

* The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

INGREDIENTS:

PEANUTS, ALMONDS, CASHEWS, BRAZIL NUTS, PECANS, PEANUT OIL, SEA SALT.

CONTAINS: PEANUT, ALMOND, CASHEW, BRAZIL NUT, PECAN.

MAY CONTAIN: OTHER TREE NUTS.


Nutrition Facts
About 6 servings per container
Serving size 1/2 cup (113g)
Amount Per Serving
Calories 90
% Daily Value*
Total Fat 2.5g 3%
Saturated Fat 1.5g 8%
Trans Fat 0g
Cholesterol 10mg 3%
Sodium 350mg 15%
Total Carbohydrate 5g 2%
Dietary Fiber 0g 0%
Total Sugars 4g
Includes 0g Added Sugars 0%
Protein 13g 26%
Vit. D 0mcg 0% • Calcium 100mg 8%
Iron 0.1mg 0% • Potas. 130mg 2%
*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.
INGREDIENTS: CULTURED SKIM MILK, CREAM, SALT.
Contains Milk
Grade A | Pasteurized
Daisy Brand | Dallas, TX 75251 | (877) 292-9830 | daisybrand.com | 39-221
*No significant difference has been shown between milk derived from rBST-treated and non rBST-treated cows
24 OZ (680g)
2% Milkfat


YOGURT
OS
NONFAT
YOGURT
0%
MILK
FAT
NON
GMO
Project
VERIFIED
nongmoproject.org
Nutrition Facts
5 servings per container
Serving size 3/4 cup (170g)
Amount per serving
Calories 100
% Daily Value*
Total Fat 0g 0%
Saturated Fat 0g 0%
Trans Fat 0g
Cholesterol 10mg 3%
Sodium 60mg 3%
Total Carbohydrate 7g 3%
Dietary Fiber 0g 0%
Total Sugars 7g
Includes 0g Added Sugars 0%
Protein 18g 36%
Vitamin D 0mcg 0% • Calcium 190mg 15%
Iron 0mg 0% • Potassium 180mg 4%
*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.
INGREDIENTS: CULTURED NON FAT MILK, YOGURT CULTURES: S. THERMOPHILUS AND L. BULGARICUS.
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Food and Amount		Protein
100gr TEMPEH		18 grams
1 cup (cooked) LENTILS		18 grams
½ cup shelled EDAMAME		13 grams
1 cup canned BLACK BEANS		15 grams
1 cup canned KIDNEY BEANS		13 grams
100g FIRM TOFU		12 grams
1 cup canned CHICKPEAS		12 grams
2 Tbsp NUTRITIONAL YEAST		8 grams
3 Tbsp HEMP SEEDS		10 grams

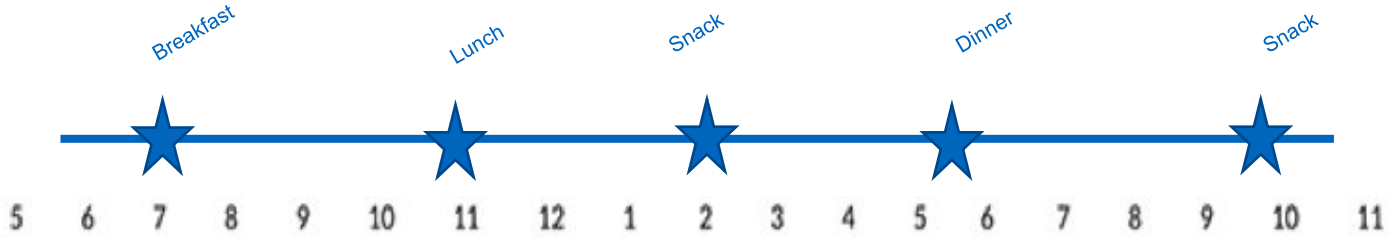
>

Procedures	Consumer Labs (*paid service*)	USP	BSCG	Informed Choice	NSF
# of Screened WADA Banned Substances			254+	200+	270+
Random GMP* Audits	√	√	√	√	√
Toxicology Assessment	√	√	√	√	√
Testing of Raw Materials	√	√	√	√	√
Label Verification	√	√	Only if part of "Certified Quality" program		√

*Good Manufacturing Practices

USADA recognizes the NSF Certified for Sport program as meeting the essential criteria for a third-party certifier and as a program available to athletes to reduce their risk if they choose to use supplements.

NUTRIENT TIMING



Protein every 3-5h for MPS

SAMPLE DAY OF EATING

Breakfast: Veggie scramble with toast (390 calories, 20 g protein)

Lunch: Chicken & quinoa salad with a roll (650 calories, 33 g protein)

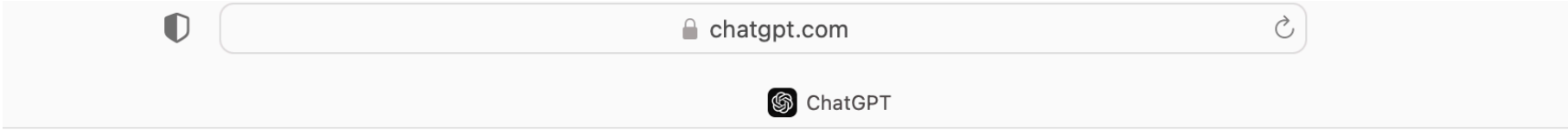
Snack: Cottage cheese with sunflower seeds (150 calories, 14 g protein)

Dinner: Salmon, sweet potato with butter, steamed broccoli (600 calories, 40 g protein)

Dessert: Greek yogurt with walnuts and berries (350 calories, 23 g protein)

Total: 2,140 calories, 130 g protein
[Goal: 2,179 calories, 126 g protein]

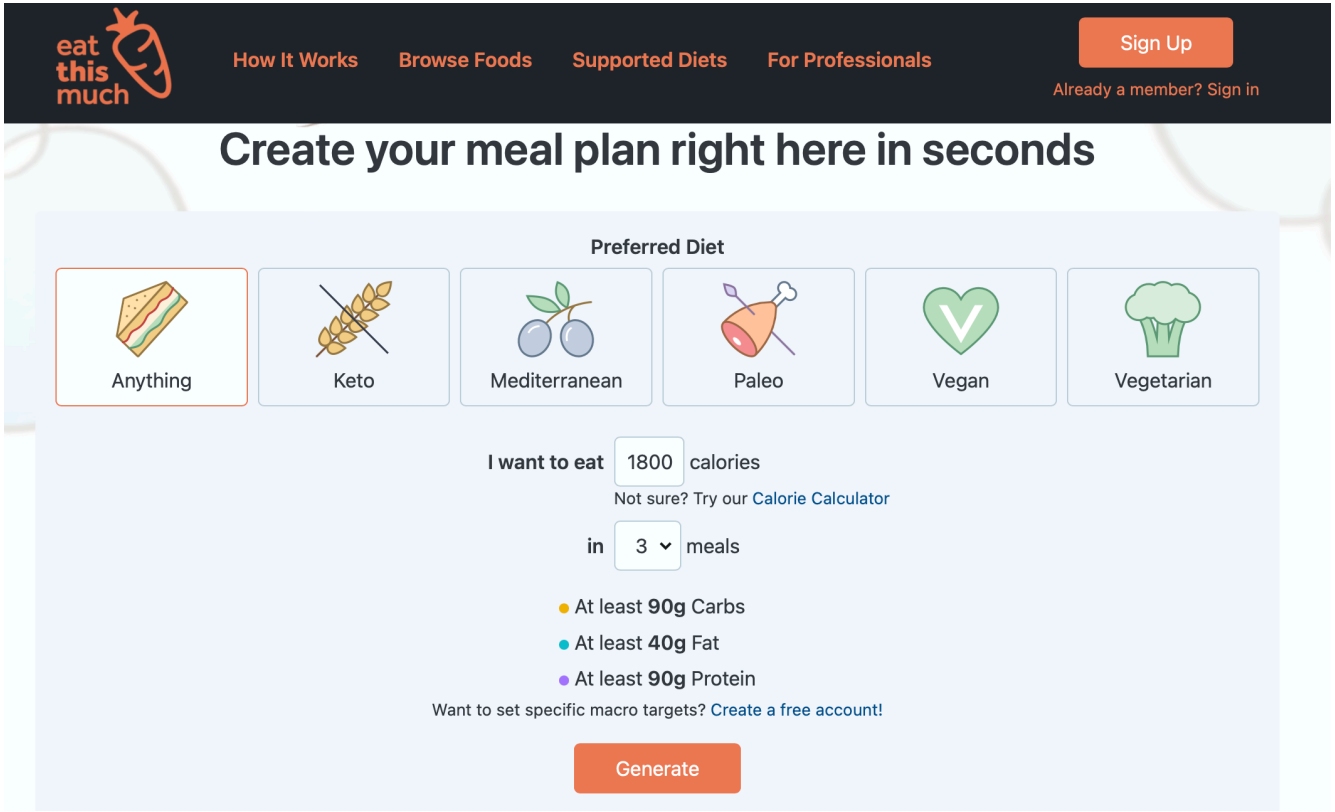
RESOURCES FOR MEAL PLANNING



make a meal plan for 2200 calories and 130 grams of protein without protein powder

Sure! Here's a 2200-calorie meal plan with **130 grams of protein** that doesn't rely on protein powder. The focus is on whole foods to meet both the caloric and protein requirements.

RESOURCES FOR MEAL PLANNING



RESOURCES FOR MEAL PLANNING

Instagram

eleatnutrition Follow Message ...

1,208 posts 97.2K followers 989 following

Eleat Sports Nutrition

eleatnutrition

Angie Asche MS, RD, CSSD
🍏Consulting elite athletes nationwide
📖Author: Fuel Your Body
■ Nutrition expert @centrfit... more
www.eleatnutrition.com/links

RESOURCES FOR MEAL PLANNING

Sports medicine

- Initial consult; calorie and protein targets; nutrition label education

Registered dietitian

- Meal plan
- Special considerations (ex - renal disease, obesity)

SUMMARY

- Maintaining and building muscle becomes more difficult starting in our 30s due to aging neuromuscular junctions and hormone changes
- Special attention to meeting nutrient demands and intentionally stressing the musculoskeletal system is required to maintain and gain muscle mass
- A customized approach accounting for gender, age, height, weight, activity level, and medical comorbidities is essential

THANK YOU

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M.R. Deschenes, D.A. Judelson, W.J. Kraemer, V.J. Meskaitis, J.S. Volek, B.C. Nindl, F.S. Harman, and D.R. Deaver, "Effects of resistance training on neuromuscular junction morphology", *Muscle & Nerve*, vol. 23, pp. 1576-1581, 2000. http://dx.doi.org/10.1002/1097-4598(200010)23:10<1576::AID-MUS15>3.0.CO;2-J

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SHOULDER PAIN & RECREATION SPORTS: GETTING BACK TO ACTIVITY

Dr. Brandon Kohrs

OrthoCincy™
Orthopaedics & Sports Medicine

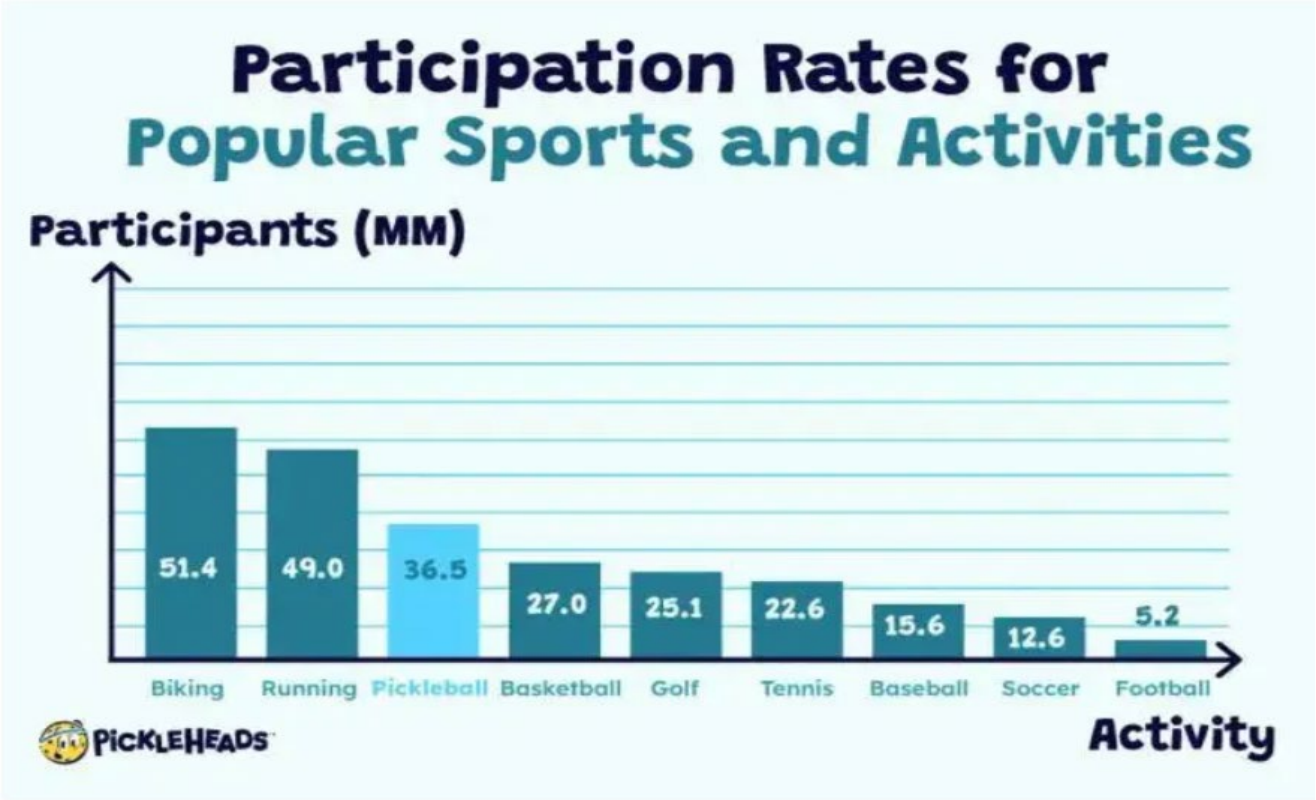
GOALS: HAVE MORE PEOPLE LIKE THIS

https://www.rethinkingyourfuture.com/Portals/9/EasyDNNnews/694/img-pickleball.jpg

AND LESS PEOPLE LIKE THIS

https://pictona.org/wp-content/uploads/2020/07/falling-risk-1024x683.jpg

SPORTS OVERVIEW: WHAT ARE PEOPLE DOING?



https://www.pickleheads.com/blog/pickleball-statistics

PICKLEBALL STATISTICS

City	# of Pickleball Locations
New York, NY	58
Houston, TX	51
Seattle, WA	48
Atlanta, GA	44
Denver, CO	43
Chicago, IL	43
Las Vegas, NV	41
Cincinnati, OH	41
Austin, TX	40
San Diego, CA	39

https://www.pickleheads.com/blog/pickleball-statistics

OVERVIEW:

- Prevention
- What are they coming in for?
- HPI
- Physical exam
- Anatomy
- Common injuries
- Non operative treatments
- Operative treatments

https://img.freepik.com/premium-photo/senior-black-man-shoulder-pain-injury-nature-after-accident-workout-training-sports-health-elderly-male-athlete-with-fibromyalgia-inflammation-tendinitis-arthritis-painful-arm_590464-156812.jpg

HOW TO KEEP THEM OUT OF MY OFFICE?

Why do these athletes get Injured?

- Increase in activity above baseline
- No days off
- No conditioning
- No warm-up or cool down
- Bad nutrition
- Bad technique
  - ✓ Work with a coach, a therapist, or trainer

Work out that core

https://i.pinimg.com/originals/9a/fb/1b/9afb1b08a0f1dadf76bf54bba329152d.jpg

HOW TO KEEP THEM OUT OF MY OFFICE

https://generationiron.com/wp-content/uploads/2017/12/Let-These-Guys-Be-The-Reminder-To-Never-Skip-Leg-Days.jpg

- **Muscle imbalance**
  - ✓ Abnormal motion & position of scapula can increase risk of injury
- **Work out pecs & delts**
  - ✓ Skip scapular stabilizers/rotator cuff tendons
  - ✓ Push/pull exercises
- **Lack of flexibility**
  - ✓ Flexibility decreases with age
- **Stretch**
- **Vascularity**
  - ✓ Increases with frequent exercise
  - ✓ Poor vascularity increases risk of injury

AGING ATHLETE COMING TO AN OFFICE NEAR YOU!

https://thumbs.dreamstime.com/b/fork-road-man-wonders-where-to-go-as-comes-to-38877974.jpg

FORK IN THE ROAD

- **Overuse - Inflammatory**
  - ✓ Played tennis all day woke up next day sore
- **Trauma - Structural**
  - ✓ Looking for one specific event
  - ✓ Playing tennis, served, severe shoulder pain
  - ✓ Falls

https://i.imgflip.com/6ruusu.jpg

WHY DO WE DIFFERENTIATE?

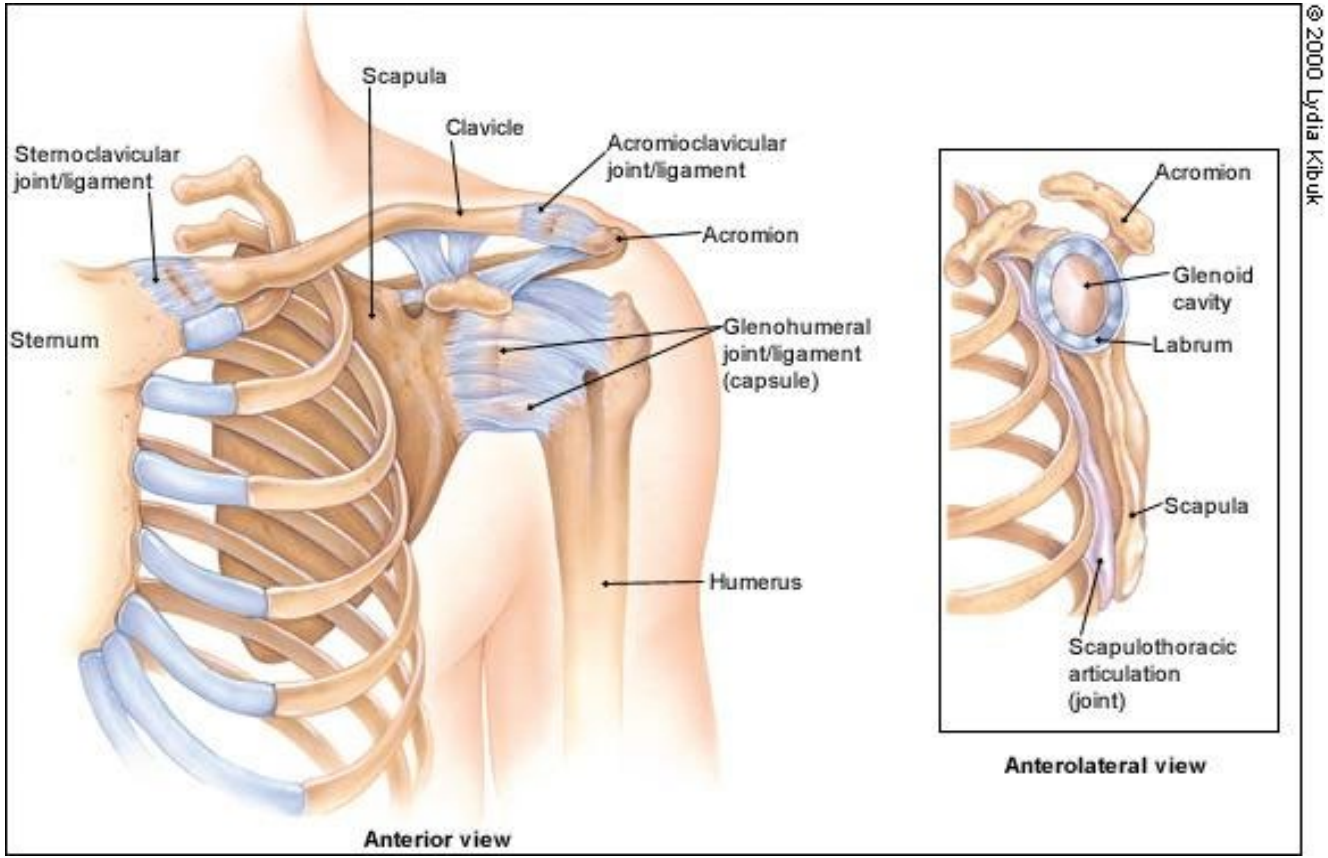
- Rotator cuff tears are common in this population
  - ✓ Age >60: 28% have full-thickness tear
  - ✓ Age >70: 65% have full-thickness tear
- You could be treating a chronic degenerative rotator cuff tear
- No injury likely start with non operative treatments
- Be careful of just treating MRIs

https://www.orthobullets.com/shoulder-and-elbow/3043/rotator-cuff-tears

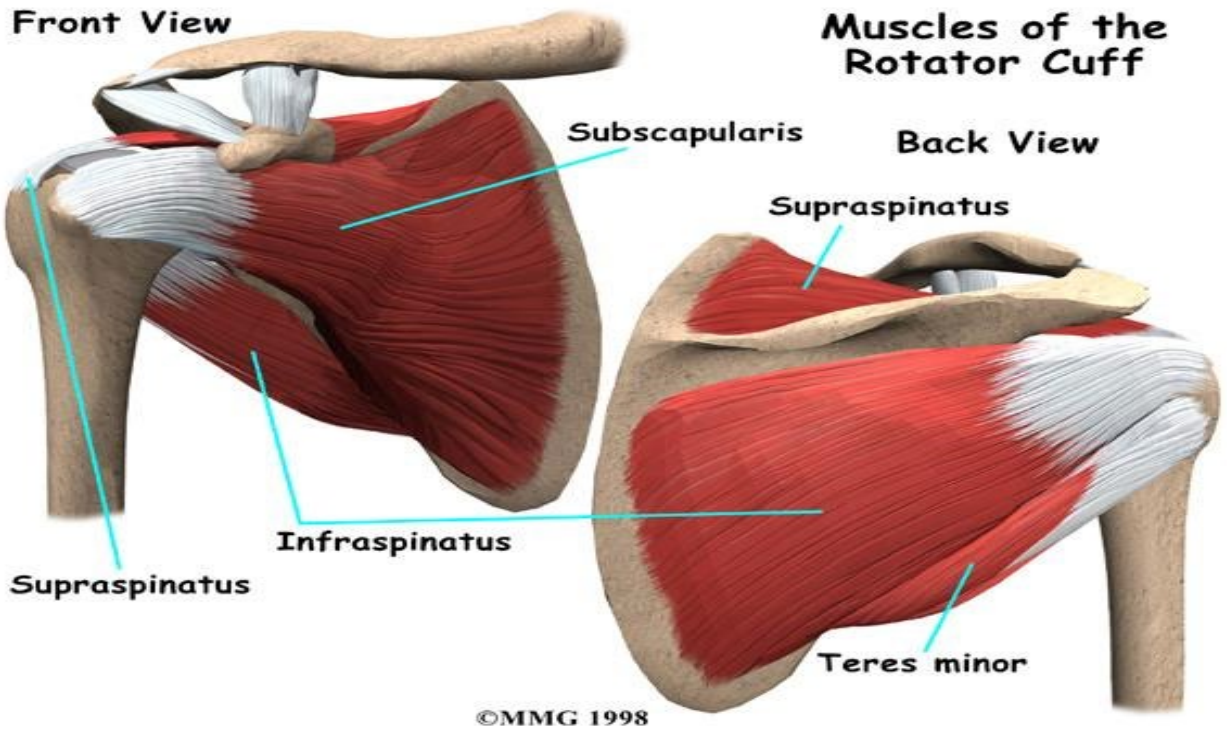
ANATOMY-GLENOHUMERAL JOINT

- **Shallow (“golf ball sitting on a tee”**
  - ✓ **Inherently unstable (maximizes ROM)**
- **Static Stabilizers**
  - ✓ **Glenohmeral ligaments, glenoid labrum & capsule**
- **Dynamic Stabilizers**
  - ✓ **Predominantly rotator cuff muscles**

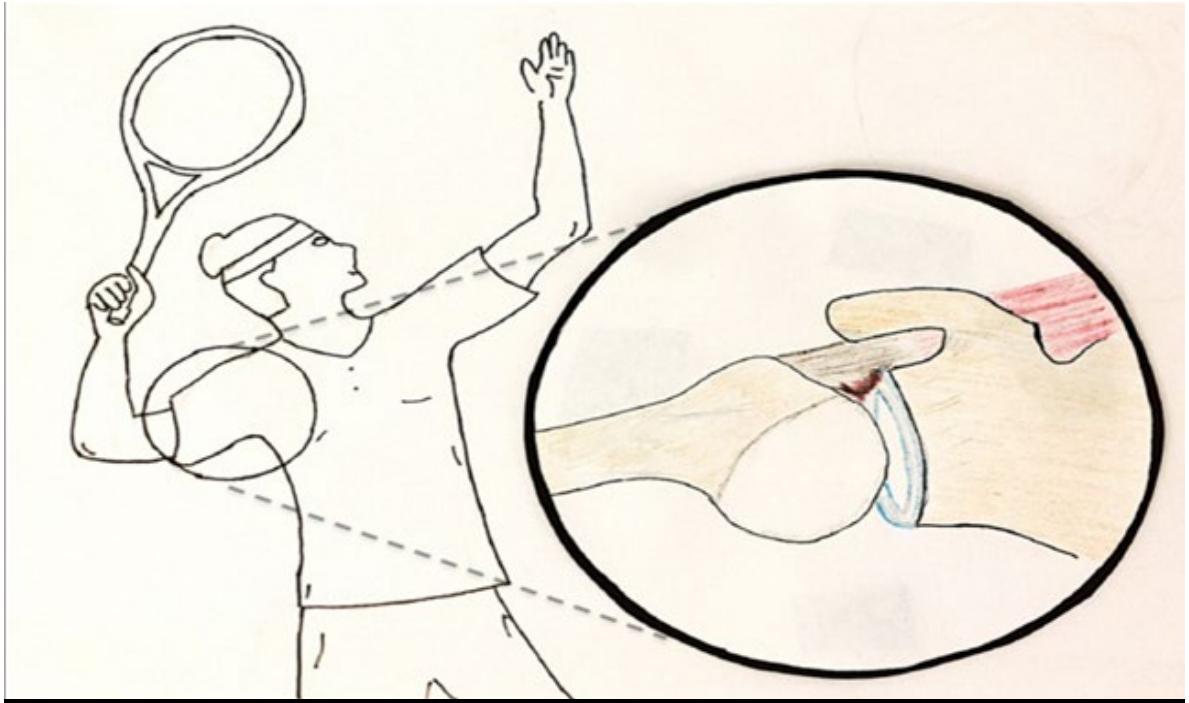
STATIC STABILIZERS-LIGAMENTS/LABRUM



DYNAMIC STABILIZERS



MECHANISM



See this image and copyright information in PMC

Fig. 1 With repetitive abduction and external rotation, the overhead athlete can develop internal impingement leading to partial-thickness tearing of the posterosuperior rotator cuff and labrum

https://pubmed.ncbi.nlm.nih.gov/32827301/

OFFICE VISIT

OFFICE VISIT: X-RAYS ARE INVALUABLE

X-Rays

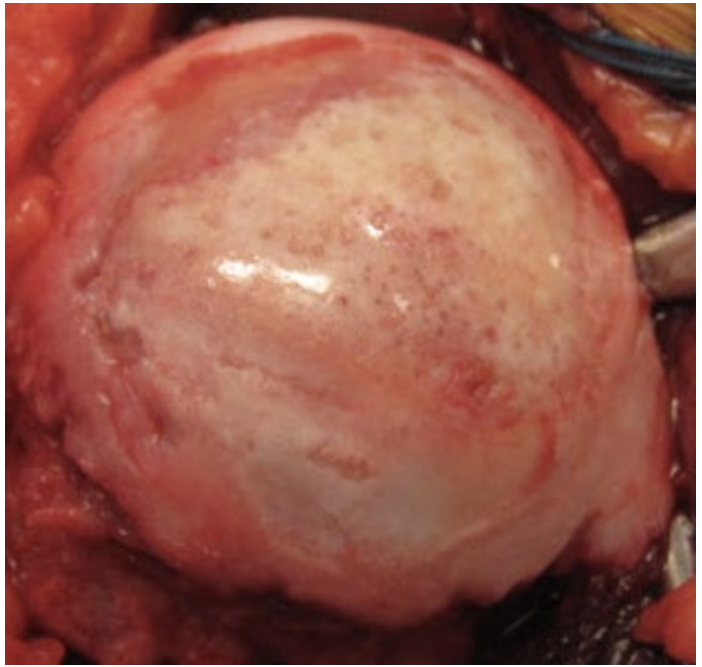
- A picture is worth a thousand words!

"I'll give you a thousand words for it."

WHAT DOES AN OFFICE VISIT LOOK LIKE?

≠

GLENOHUMERAL ARTHRITIS



PHYSICAL EXAM EXAMPLE

https://www.meme-arsenal.com/memes/e7a9b030dfb2be7d7e31522a07d90b41.jpg

NON OPERATIVE TREATMENTS

Outside of acute traumatic complete rotator cuff tear, would treat most shoulder pathologies non operatively

- **Oral steroids**
- **Short course of anti-inflammatory**
- **Formal physical therapy**
- **Cortisone injections**
  - ✓ **Can delay surgery by 3 months**
  - ✓ **Can decrease success rates of surgery**

Includes labral tears, dislocations without complete rotator cuff tear, slap tears, shoulder strains, impingement, rotator cuff tendonitis, partial rotator cuff tears, shoulder arthritis, chronic rotator cuff tears

OPERATIVE TREATMENTS

- **Rotator cuff tears - full thickness acute tears**
  - ✓ Chronic tears that continue to struggle despite non op
- **Advanced arthritis that has failed non op**
  - ✓ Total shoulder replacement
  - ✓ Reverse shoulder replacement
- **Acute traumatic proximal bicep rupture - usually treated non op in this population**
  - ✓ Would consider operative depending on goals
- **Bad displaced fractures?**

Review > J Shoulder Elbow Surg. 2018 Aug;27(8):1526-1534. doi: 10.1016/j.jse.2018.03.009. Epub 2018 May 4.

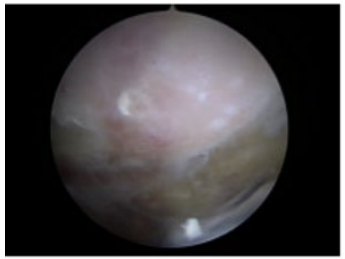
Operative versus nonoperative treatment of proximal humeral fractures: a systematic review, meta-analysis, and comparison of observational studies and randomized controlled trials

Reinier B Beks [1], Yassine Ochen [2], Herman Frima [3], Diederik P J Smeeing [4], Olivier van der Meijden [5], Tim K Timmers [6], Detlef van der Velde [4], Mark van Heijl [7], Luke P H Leenen [8], Rolf H H Groenwold [9], R Marijn Houwert [2]

Affiliations + expand

PMID: 29735376 DOI: 10.1016/j.jse.2018.03.009

OPERATIVE TREATMENTS- ROTATOR CUFFS



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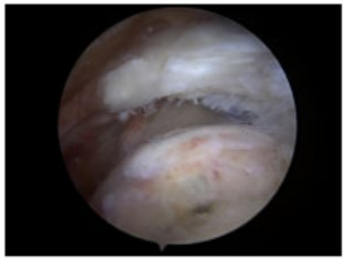

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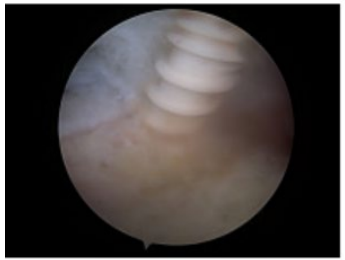

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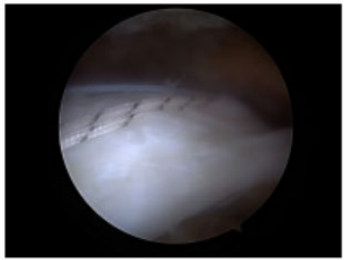

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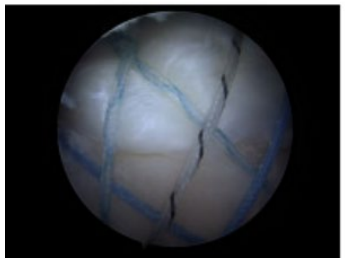
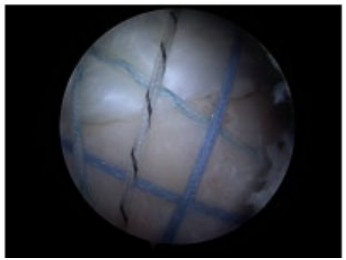




GREAT JOB DOCTOR! WILL IT HEAL?

> Am J Sports Med. 2019 Jan;47(1):173-180. doi: 10.1177/0363546518810763. Epub 2018 Nov 28.

The Rotator Cuff Healing Index: A New Scoring System to Predict Rotator Cuff Healing After Surgical Repair

Jieun Kwon [1], Sae Hoon Kim [2], Ye Hyun Lee [1], Tae In Kim [3], Joo Han Oh [4]

Affiliations + expand

PMID: 30485753 DOI: 10.1177/0363546518810763

ROHI Score

- **Predictors of success from rotator cuff surgery**
  - ✓ Age <70
  - ✓ Acute tear
  - ✓ Small tear
  - ✓ Non retracted
- **Good bone quality**

WHEN WILL I RETURN TO SPORT?

- Takes 2-3 mos for rotator cuff tissue to heal
- 4-6 weeks in sling
- Start therapy for passive ROM in 3-5 days
- Passive motion 6 weeks
- Active motion 6 weeks
- Strengthening 6 weeks
- 3-5 months of formal PT
- 6-12 months until full recovery

If all goes well… Return to sports

- ✓ 97% return to swimming at 8 months
- ✓ 56% return to normal at 12 months
- ✓ poorer forward elevation

Orthop J Sports Med. 2020 Jun 17;8(6):2325967120922203. doi: 10.1177/2325967120922203

Return to Sport After Arthroscopic Rotator Cuff Repair in Middle-Aged and Elderly Swimmers

Yohei Shimada [*,†], Hiroyuki Sugaya [*,‡], Norimasa Takahashi [*], Keisuke Matsuki [*], Morihito Tokai [*], Takeshi Morioka [*], Yusuke Ueda [*], Shota Hoshika [*], Hiroshige Hamada [*], Satoshi Inoue [§], Eiko Hashimoto [*], Nobuyasu Ochiai [†]

Author information · Article notes · Copyright and License information

PMCID: PMC7301663 PMID: 32596404

RETURN TO SPORTS

Review > Curr Rev Musculoskelet Med. 2020 Dec;13(6):734-747.
doi: 10.1007/s12178-020-09675-3.

Rotator Cuff Injuries in Tennis Players

Rami G Alrabaa [1], Mario H Lobao [2], William N Levine [2]

Affiliations + expand

PMID: 32827301 PMCID: PMC7661672 DOI: 10.1007/s12178-020-09675-3

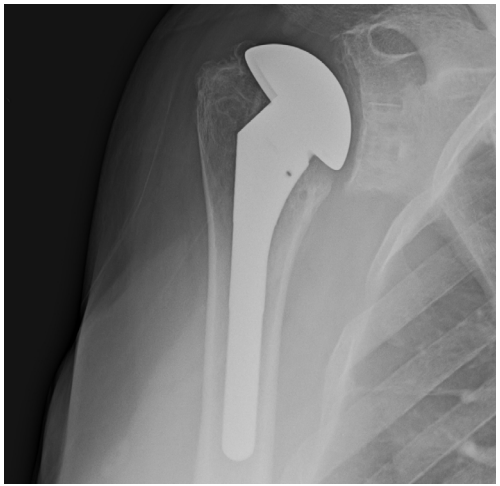
- Can get back to sport even in elderly
- Going to be difficult to return to baseline form
  - ✓ Different hitting motion
  - ✓ 6-9 months return to overhead sports
  - ✓ Return to golf 4-6 months

https://contents.mediadecathlon.com/p1785089/k$a59ad28c46e5c8562c5094f2d927e278/sq/Adult+Tennis+Racket+TR500+Green.jpg

WHAT IS TOTAL SHOULDER ARTHROPLASTY (TSA)

Replacement of humeral head (metal) and glenoid resurfacing (plastic)

cemented all-polyethylene glenoid resurfacing



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REVERSE TOTAL SHOULDER ARTHROPLASTY (RTSA)

SHOULDER REPLACEMENTS- RETURN TO PLAY

Review > World J Orthop. 2016 Sep 18;7(9):519-26. doi: 10.5312/wjo.v7.i9.519.

Return to sports after shoulder arthroplasty

Christine C Johnson [1], Daniel J Johnson [1], Joseph N Liu [1], Joshua S Dines [1], David M Dines [1], Lawrence V Gulotta [1], Grant H Garcia [1]

Affiliations + expand

PMID: 27672564 PMCID: PMC5027006 DOI: 10.5312/wjo.v7.i9.519

- Total & Reverse both show return to play
- Total showed 75-100% return to play
  - ✓ Other studies have shown patient motivation a big factor
  - ✓ If return to sport was reason for replacement, then more likely to return to sport
- Reverse 75-85% return to play
- Return to play by 6 months
- Some studies show 30% returned with limitations

SUMMARY

- Injuries will become more common in the aging athlete as participation increases
- HPI is essential in differentiating mechanism to determine acute versus chronic injury
- Physical exam confirms diagnosis
- Advanced imaging is adjunct
- Treat most injuries non operatively
- Maintenance exercises help to decrease recurrence risk
- Surgery does have a high rate of return to play

Brandon Kohrs, DO

OrthoCincy Orthopaedics & Sports Medicine

THANK YOU

SOURCES NOT PREVIOUSLY LISTED

- http://www.orthobullets.com/shoulder-and-elbow/3076/reverse-shoulder-arthroplasty
- http://www.startradiology.com/internships/General-Surgery/Shoulder/x-shoulder/
- https://imgflip.com/memetemplate/52870092/sad-person
- https://static.hudl.com/users/prod/6117211_366ab4bd9405413898cb955c9c441e36.jpg
- https://www.aaronharriscmt.com/files/2019/07/deltoid.png
- https://www.jacksonorthopaedicsurgery.com/conditions-we-treat/shoulder/shoulder-replacement/
- https://www.orthobullets.com/shoulder-and-elbow/3043/rotator-cuff-tears
- https://www.rcnky.com/articles/2015/04/30/accolades-roll-thomas-more-athletes-coaches
- https://www.slideshare.net/KshitijChaudhary1/indications-for-surgery-in-adult-spondylolisthesis
- https://www.zimmerbiomet.com/en/products-and-solutions/specialties/shoulder/trabecular-metal-reverse-shoulder-system.html
- https://www.orthobullets.com/shoulder-and-elbow/12171/total-shoulder-arthroplasty

GETTING BACK IN THE GAME AFTER A CARDIAC ISSUE

Dr. Travis R. Huffman

St. Elizabeth PHYSICIANS

CASE #1

54 yo male w/ hx of HLD, family hx of premature CAD, presented 1 month prior with substernal chest pressure during a half marathon, subsequently found to have anterior STEMI, emergently taken to cath lab for revascularization

- Cardiac catheterization with occluded proximal LAD s/p percutaneous revascularization with DES
- Moderate disease in his mid LCx, not hemodynamically significant by FFR of 0.85
- LVEF post MI 35-40%

Future athletic goals: 

- Full marathon
- Possible ultra-marathon

CASE #2

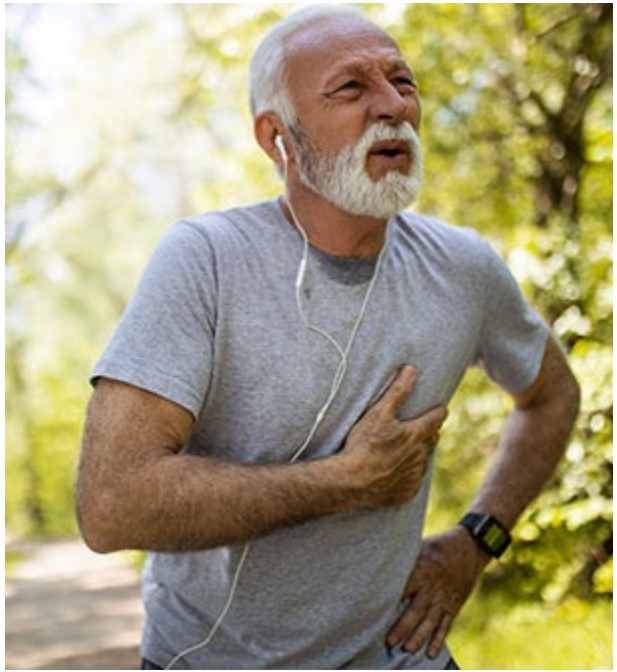
28 yo female presented initially with new onset dyspnea during CrossFit workouts, found to have degenerative mitral valve disease w/ significant mitral valve prolapse & severe mitral regurgitation, now s/p mitral valve repair

- **LVEF >65% pre-op**
- **Pre-op coronary angiography without any significant CAD**

Future athletic goals: 

- **Return to full effort CrossFit workouts**

OBJECTIVES



- Review paradox of exercise in regard to Cardiovascular (CV) events
- Assess & determine risk for returning to competition after CV event
- Management of culprit disease as well as residual disease
- Creating treatment plan to achieve patient's goals
- Shared-Decision making in determining eligibility for participation with guidelines as foundation

SUDDEN CARDIAC ARREST (SCA) - GENERAL POPULATION

- Risk of Sudden Cardiac Arrest/Death (within 1 hour of symptom onset) has an estimated incidence 500-1000 per million per year in the general population

- ~ 5-6% of these deaths occur during sports or sports related activity (during or within 30-60 minutes after vigorous exercise)

- Incidence of exercise-associated SCA in the middle-aged is estimated at 22 per million per year.

SUDDEN CARDIAC ARREST (SCA) - ATHLETIC POPULATION

- Sudden cardiac arrest/death (SCA/D) in young athletes is quite rare, with wide variation in reported incidence due to lack of standardized reporting

- Estimated incidence is ~1 in 80,000 athlete-years in high school athletes & 1 in 63,000 athlete-years in college athletes

Highest risk athletes:

- Female incidence of SCA much lower than males at <1: 120,000
- Black athletes at higher risk than white athletes, IRR 3.3
- Division 1 male basketball athletes at highest risk
  - ✓ Estimated incidence of 1: 5,200 athlete years

COMMON ETIOLOGIES OF CARDIAC ARREST IN ATHLETES

- Leading causes of SCA/D in athletes varies with age
- Genetically medicated/inherited diseases predominant younger patient (18-35)
  - ✓ Hypertrophic Cardiomyopathy
  - ✓ Idiopathic Left Ventricular Hypertrophy (LVH)
  - ✓ Myocarditis
  - ✓ Long QT
  - ✓ Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)
  - ✓ Wolff-Parkinson-White (WPW)
- Acquired heart disease predominate in master's athletes (>35 years of age) followed by inherited conditions
  - ✓ Coronary artery disease
  - ✓ Myocarditis

PARADOX OF EXERCISE

Exercise paradoxically increases risk of a sudden cardiac event, however, routine moderate to vigorous exercise demonstrates a cardioprotective benefit, thereby reducing overall incidence of major adverse cardiac events in the long-term.

SHORT TERM RISK = LONG TERM GAIN

FUNCTIONAL CAPACITY AND SURVIVAL

Exercise capacity and mortality among men referred for exercise testing

Jonathan Myers [1], Manish Prakash, Victor Froelicher, Dat Do, Sara Partington, J Edwin Atwood

- A body in motion stays in motion (~Newtons First)
- Best illustrated by Myers et al. Published in NEJM in 2002.
  - ✓ Reviewed consecutive exercise stress tests in men
  - ✓ Compared exercise capacity in men that had normal stress tests and/or no known CV disease vs those with an abnormal stress test and/or known CV disease
- End point was overall mortality
  - ✓ Study reported a 12% per MET decrease in mortality regardless of the presence/ absence of CV disease or normal/abnormal stress test

Demonstrates exertional capacity as independent risk factor for all-cause mortality

EXERCISE MATTERS

Conditions Myocardium: Improved outcomes in patients who exercise when presenting with Acute MI, as well as improves Post MI outcomes

- **Improved Metabolic Health**
- **Weight**
- **Lipid Profile**
- **Insulin Sensitivity**
- **Psychosocial Benefits**

In highly active persons, including master's athletes but not limited to, resumption of exercise post-event improves outcomes & overall well-being

Sports cardiologist role is to help patients resume exercise in a safe manner, and not to disqualify patients solely on the basis of past CV events

CASE #1

54 yo male w/ hx of HLD, family hx of premature CAD, presented 1-month prior w/ acute anterior STEMI during half marathon prep race for planned full marathon later in year

- Cardiac catheterization w/ occluded proximal LAD s/p percutaneous revascularization w/ DES
- Moderate disease in his mid LCx, not significant by FFR of 0.85
- LVEF post MI 35-40%

Current medical therapy:

- DAPT, HI statin
- BB, ARNI, SGLT2i, MRA
- 8 medications, some of which are taken multiple times per day 😟

MANAGEMENT OF CAD/POST-MI PATIENTS

- Hallmark is optimal medical therapy!
- Recurrent events risk highest immediately post indexed event, w/ risk of SCA/D estimated at ~1.4% in first 30 days & declines progressively thereafter

Medical Therapy

- Antiplatelet therapy
- Lipid lowering therapy & blood pressure control for secondary prevention
- Guideline directed medical therapy for cardiomyopathy
  - ✓ Reduce mortality & risk of hospitalization

CARDIAC REHABILITATION

Cardiac Rehabilitation is a comprehensive program, typically lasting for 12 weeks & a total of 36 sessions

Rehab Focus:

- Exercise training & safety
- Heart healthy habits
- Diet/weight loss strategies
- Structured support

Cardiac Rehabilitation Indications:

- ✓ Recent myocardial infarction
- ✓ Acute coronary artery syndrome
- ✓ Chronic stable angina
- ✓ Congestive heart failure
- ✓ After coronary artery bypass surgery
- ✓ After a percutaneous coronary intervention
- ✓ Valvular surgery
- ✓ Cardiac transplantation

INITIATING EXERCISE POST MYOCARDIAL INFARCTION (MI)

- **Participation in monitored exercise training reduces risk of CV mortality & hospital admissions in patients with recent acute MI at ~12-month follow-up**
  - ✓ **26% reduction in CV mortality**
  - ✓ **18% reduction in hospitalizations**
- **Despite evidence for benefit, only appx 1 in 4 eligible for CR will enroll in a program**

Recommendations for Cardiac Rehabilitation and Education
Referenced studies that support the recommendations are summarized in Online Data Supplement 49.

COR	LOE	Recommendations
1	A	1. In patients who have undergone revascularization, a comprehensive cardiac rehabilitation program (home based or center based) should be prescribed either before hospital discharge or during the first outpatient visit to reduce deaths and hospital readmissions and improve quality of life.[1-4]
1	C-LD	2. Patients who have undergone revascularization should be educated about CVD risk factors and their modification to reduce cardiovascular events.[5-7]

EXERCISE INTENSITY POST-MI

How intense is too intense?

- Cardiac rehabilitation standard is moderate intensity continuous training
- However high intensity interval training (HIIT) has demonstrated an improvement in functional capacity w/ increased VO2 max & GLS, w/ very low rates of adverse events
  - ✓ 1 major cardiovascular event in >17,000 training sessions

ESTABLISHING A TIMELINE

- **Functional stress testing for patients post PCI can be considered 1-2 weeks post event (>3-4 weeks in patients post CABG to allow sternum to heal)**
  - ✓ **Helps establish baseline, as well as guide exercise training during cardiac rehab & beyond**
- **No vigorous competitive activity for at least 3 months**
  - ✓ **Class IIB; Level C**
- **Allow lesions to heal, anti-inflammatory properties of statin therapy to mitigate future events**
  - ✓ **Some recommend delay of vigorous activity for 2 years, based off plaque regression demonstrated on imaging studies in patients on high intensity statin therapy**

EVALUATING PATIENT RISK

High Risk Features

- Initial presentation (sudden cardiac arrest, VT, Syncope, MI, CHF)
- LVEF <50%
- Residual CAD with >50% stenosis
- Angina or anginal equivalent at low levels of exercise
- Exertional syncope
- Increased scar burden on Cardiac MRI
- Ventricular arrhythmias
- Decreased functional capacity
  - ✓ Difficult to compare at times to patients' pre-event baseline, but marked discrepancy in pre vs post event is 'red-flag'

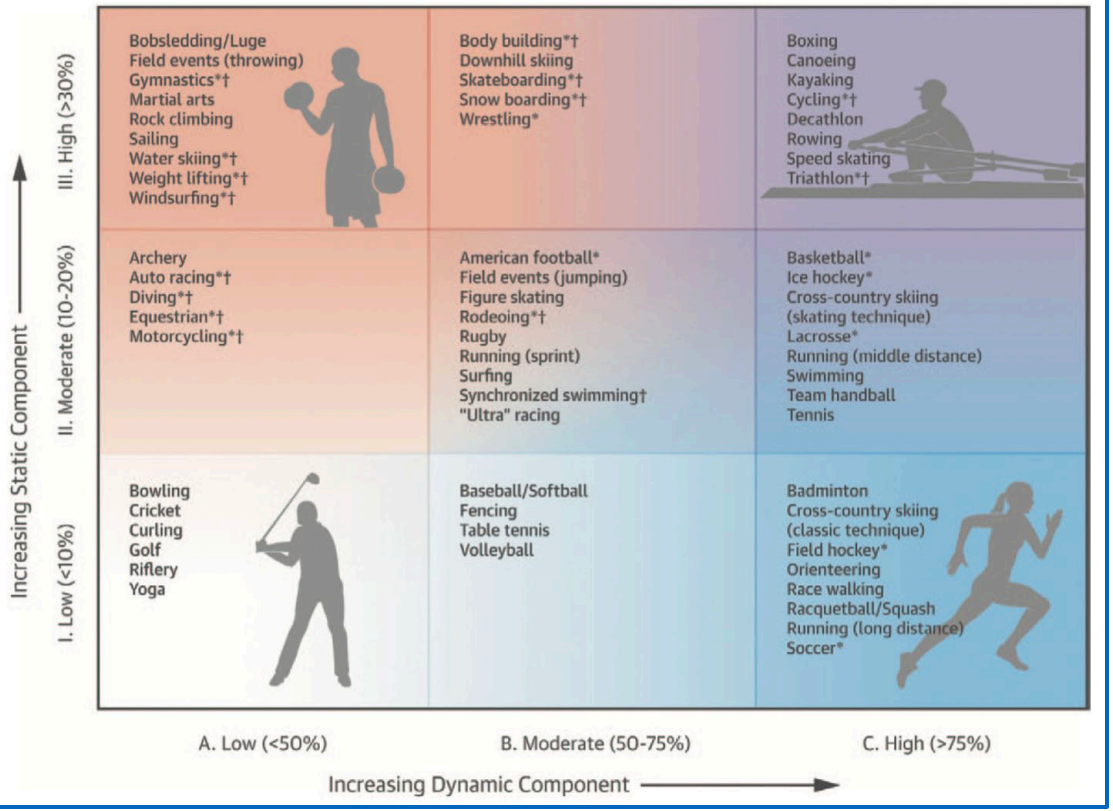
MEDICATION RISKS

Antiplatelets/Anticoagulant Risk

- Less of factor in adult population, but sports w/ high probability of physical contact or injury (Mountain biking, Hockey, Soccer), should be participated in with great caution until completion of antiplatelet therapy

CLASSIFICATION OF SPORTS

- Classification of sports by dynamic/static component
- Exercise results in significant physiologic changes
  - ✓ Cardiac output can increase 5/6-fold during maximal exertion in high dynamic states
- Class IIIc events w/ highest CV load



MANAGEMENT OF RESIDUAL CAD

Case #1 with anterior STEMI, LAD revascularized, had moderate residual disease, not hemodynamically significant during indexed event (FFR 0.85), has no residual chest pain

3-Month ETT:

- **Exercise stress testing with ischemic ST changes at peak exercise, completed 6 minutes on Bruce Protocol with max output <10 METS, test terminated due to fatigue.**
- **No chest pain, mild non-limiting dyspnea**

Is lesion culprit? Should it be fixed regardless

- **Multiple RCT's demonstrate no benefit in reducing ischemic events in patient's w/ asymptomatic CAD (ISCHEMIA TRIAL/COURAGE TRIAL), but demonstrated improvement in QOL w/ trend toward benefit in functional capacity**

MANAGEMENT OF RESIDUAL CAD

- Questions of whether FFR cut-offs can be applied to athletes
  - ✓ FFR is ratio of pre/post stenotic flow
  - ✓ <0.80 is determined to be hemodynamically significant
- Smith et al demonstrated supranormal coronary flow reserve in endurance athletes compared to non-endurance athletes, suggesting flow ratio cut-offs could possibly underestimate hemodynamic significance in endurance athletes
- Cook et al demonstrated significant improvement in coronary flow dynamics w/ increased exertional capacity in patients pre & post PCI
  - ✓ All lesions were hemodynamically significant

MARRYING RISK/GOALS

Reviewing Risk in Case #1

- LVEF <50%
- Residual CAD, ischemic cardiomyopathy w/ LVEF 35-40% post PCI
- Decreased functional capacity on Bruce protocol

Patient goals are to participate in high intensity/ high dynamic athletic events, including possible ultra-marathon

- Guidance? Recommendations?
- Limitation to low dynamic, low to moderate static activities
- Unfortunately, in some cases, risk > benefits

Bruce Protocol VO2 Max Treadmill

Stage	Speed (mph)	Treadmill Grade (slope)	Time
1	1.7	10%	3
2	2.5	12%	6
3	3.4	14%	9
4	4.2	16%	12
5	5.0	18%	15
6	5.5	20%	18
7	6.0	22%	21

The Bruce protocol is the most widely adopted protocol and has been extensively validated.

ETERNAL OPTIMIST

3-6 months Post Event Risk

- Repeat echocardiogram w/ LVEF >50%
- Continued poor exertional tolerance. Repeat angiography was performed which demonstrated a moderate LCx lesion w/ FFR 0.79. Underwent PCI
- 3 months later functional testing demonstrated no ischemic changes on ETT, completed > 10 minutes on Bruce protocol w/ >12 METS output

Now What?

- Establish training regimen (incorporate exercise Rx; Dr. Kremer)
- Establish reasonable goals
- Completion of event > performance
  - ✓ Half marathon carries less risk; RACER Study Group

RACER STUDY GROUP

Cardiac arrest during long-distance running races

Jonathan H Kim [1], Rajeev Malhotra, George Chiampas, Pierre d'Hemecourt, Chris Troyanos, John Cianca, Rex N Smith, Thomas J Wang, William O Roberts, Paul D Thompson, Aaron L Baggish; Race Associated Cardiac Arrest Event Registry (RACER) Study Group

Affiliations + expand

PMID: 22236223 DOI: 10.1056/NEJMoa1106468

Reviewed 10.9 million runners

- **59 had cardiac arrest, 42 of which w/ sudden cardiac arrest**
- **Incidence for cardiac arrest was 1 per 184,000 participants**

Among those who had cardiac arrest, risk factors included:

- **Race distance, 3-5x higher incidence in full marathons vs half marathons**
- **Males > Females**
- **Most common etiology was HCM**
- **In 5/8 runners who survived cardiac arrest secondary to ischemic heart disease as etiology, none had angiographic evidence of acute plaque rupture**
  - ✓ **Etiology surprisingly suspected to be supply/demand ischemia**

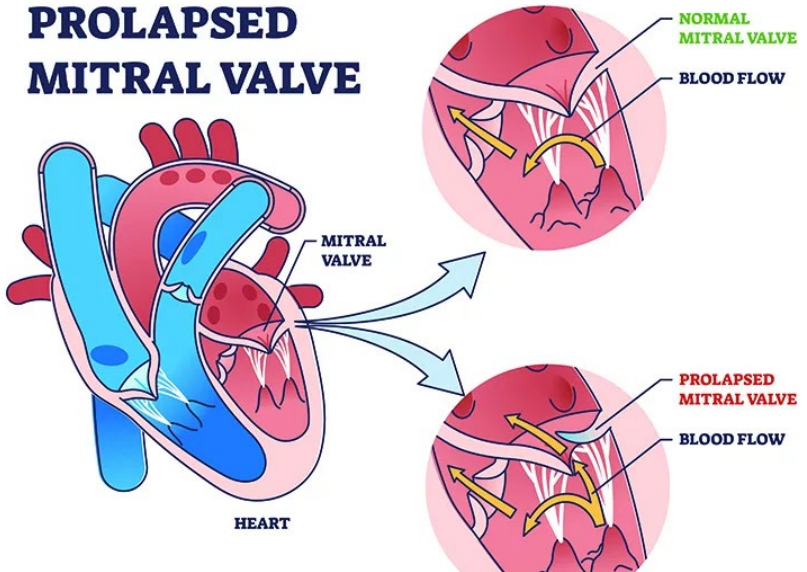
CASE #2

28 yo female presented initially w/ new onset dyspnea during CrossFit workouts, found to have myxomatous mitral valve disease w/ severe mitral regurgitation now s/p mitral valve repair

- **LVEF >55%**
- **Pre-op coronary angiography w/out any significant CAD**

Future athletic goals:

- **Return to full effort CrossFit work-outs**



VALVE DISEASE

Case #2 w/ myxomatous MV resulting in early valve destruction

- Completed CR w/out issue
- Completed functional testing w/ >100% predicted VO2 Max on CPET
- Echo after exercise stress w/ normal LVEF, well functioning repaired MV w/out residual regurgitation or stenosis
- Asymptomatic w/ moderate to vigorous activity but has yet to return to maximal effort CrossFit work-outs

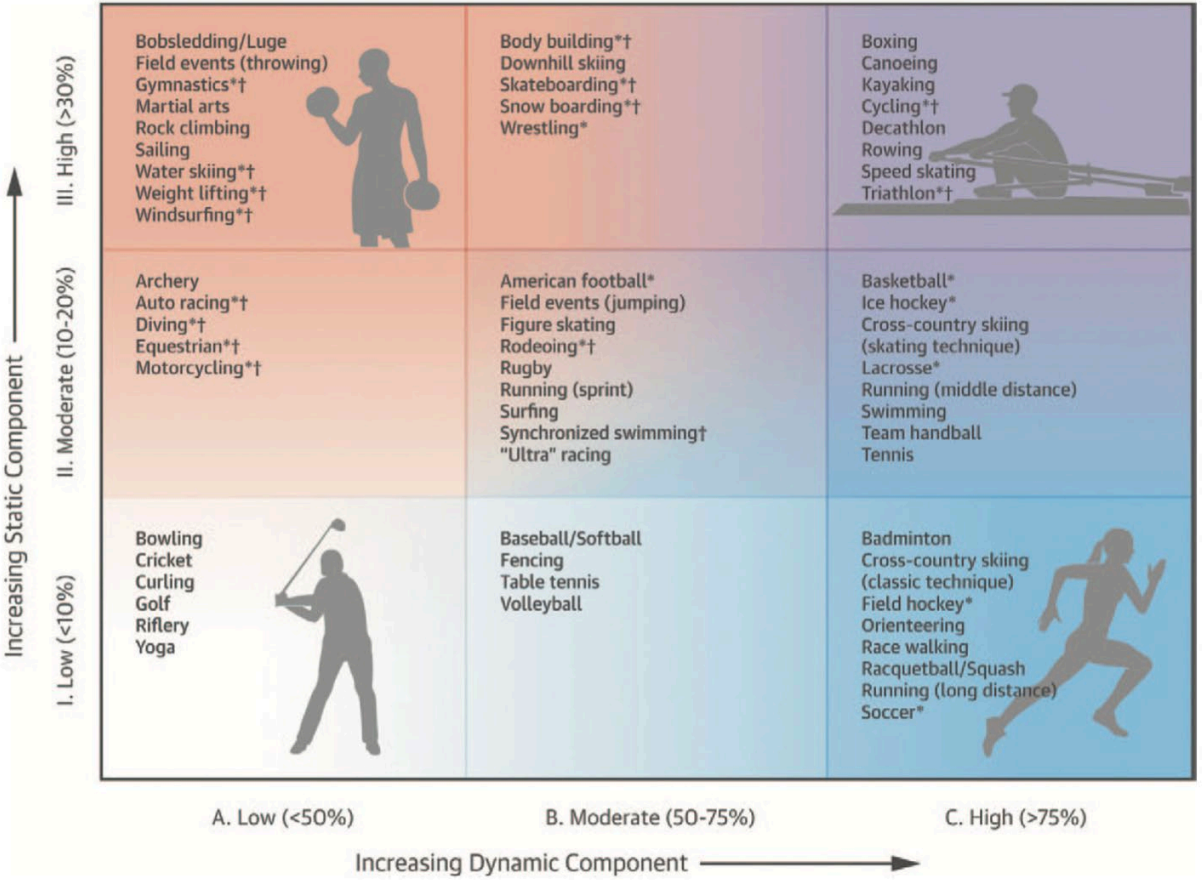
REVIEW OF RISK FACTORS

- Normal LVEF
- No ischemic heart disease
- Excellent functional capacity
- No arrhythmias
- No anticoagulation (baby aspirin)

Seems great, right?

- Athletes who have undergone mitral valve repair for MR or surgical aortic valve repair, have no or mild residual AR or MR & have normal LV systolic function MAY be considered for participation in sports at discretion of managing physician if low likelihood of bodily contact (classes IA, IB & IIA)
- (Class IIa; Level of Evidence C)

BOWLING, FENCING, SURFING



SHARED DECISION MAKING

2015 ACC/AHA Eligibility & Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Preamble, Principles & General Considerations Scientific statement provide construct to help guide eligibility decisions

- **Guidelines were constructed specifically to be conservative**
- **Eligibility can be determined on case-by-case basis**
- **Patient must acknowledge paucity of data in specific cases & is willing to undertake the risk of participating in specific activities**

SPORTS CARDIOLOGY ADVICE

RCT's to help guide return to CrossFit

- NO!!!!

Discussion:

- Participation is reasonable w/ active symptom monitoring, annual sports cardiology evaluation to re-assess risks & imaging of valve
- Patient must acknowledge an awareness that all risks/circumstances can NOT be accounted for
- Avoid significant physical contact sports with prior sternotomy

PRACTICAL APPROACH

- Cardiac rehab & monitored exercise training
  - ✓ Consider tailored HIIT
- Maximum effort testing at 3 months
  - ✓ ETT/CPET
- Assessment of LVEF +/- stress imaging (valve cases)
  - ✓ Cardiac MRI has role in myocarditis & ischemic heart disease to assess scar burden
- Graded training program to meet individual goals
- Holter monitoring w/ full exercise out of hospital for arrhythmias
- Appointment to discuss goals & to assess/discuss risks prior to returning to competition
- Return to competition
  - ✓ Usually no sooner than 6 months, preferably 1 year after major cardiac event

OBJECTIVE REVIEW

- **Despite significant cardiovascular & psychosocial benefits of exercise, vigorous exercise carries a paradoxical risk of acute cardiac events**

- **Management of the athlete post event is predicated on:**

  - ✓ **Optimal medical therapy**
  - ✓ **Assessing risks**
  - ✓ **Managing residual disease**
  - ✓ **Marrying patient goals with acceptable risk**
  - ✓ **Shared decision making**

Travis Huffman, DO, FACC
St Elizabeth Healthcare

THANK YOU

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RETURN TO PLAY POST TOTAL HIP/KNEE REPLACEMENT

Dr. Jeff Chapek

OrthoCincy™
Orthopaedics & Sports Medicine

OUTLINE

- Basic science of implant fixation
- Similarities and differences between total hip and knee arthroplasty (THA / TKA) recovery
- Recovery timeline
- Key activities / when to return
- High impact activity
- Limitations

LINDSAY VONN COMEBACK

IMPLANT BASIC SCIENCE

- Whether a hip replacement (THA) or knee replacement (TKA) the goal is immediate rigid fixation
- Historically this was achieved with bone cement (PMMA) for both
- Hips were first to adopt a “press-fit” method of fixation, but knees are catching up
  - ✓ In 2018, 95% of THA were press-fit; compared to about 5-10% of TKA
  - ✓ In 2024, 25-30% of TKA were press fit…# increasing…influenced by robotic TKA

WHY IS IMMEDIATE FIXATION IMPORTANT? (IF PMMA)

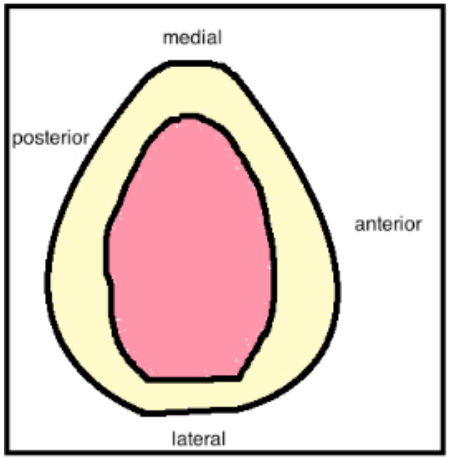
Micro-motion → stress on the cement mantle → fatigue cracks → mantle failure → gross loosening (pictured)

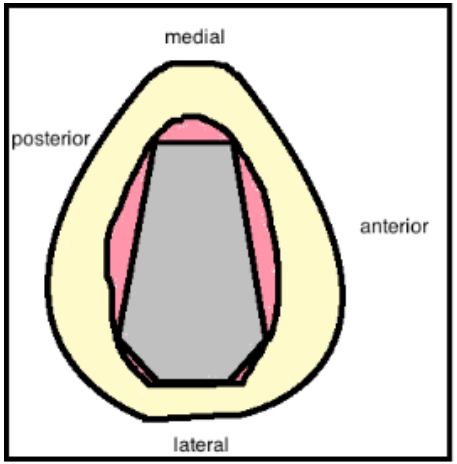
HOW TO ACHIEVE BEST INITIAL RIGID FIXATION

- PMMA has the best initial fixation (compared to press-fit)
- Acts as grout by producing interlocking fit between surfaces
- Achieved by good cement technique
  - ✓ Cleaning and drying the bone
  - ✓ Mixing cement in an air vacuum to prevent bubbles
  - ✓ Pressurizing the cement into the bone
  - ✓ Placing cement on backside of components for cement-cement interface during insertion (do not want blood or fat touching back of implant)

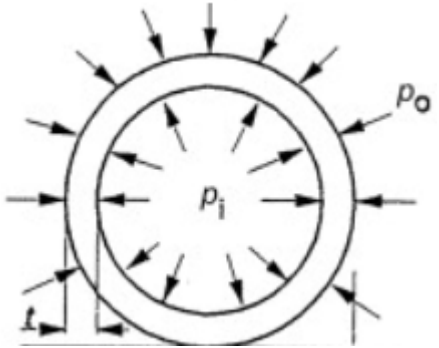
WHAT IS ‘PRESS-FIT’?

“Square peg/ oval hole”





Initial fixation via hoop stresses



WHAT IS ‘PRESS-FIT’?

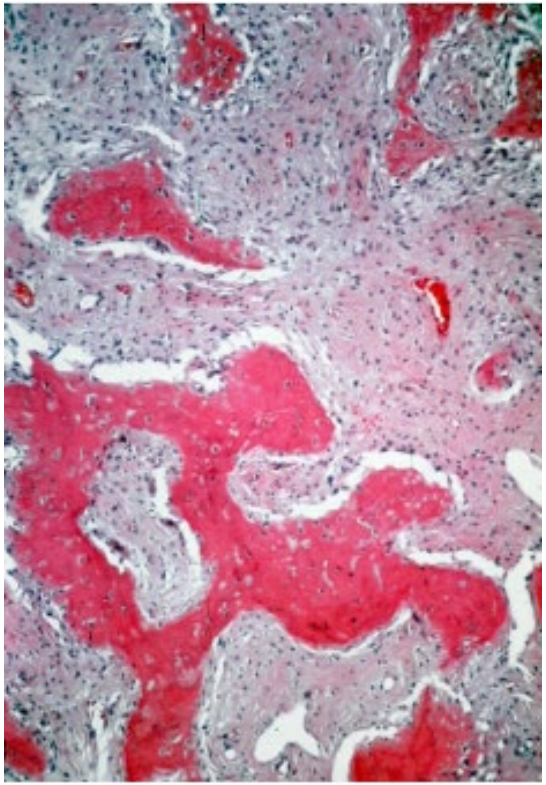
- **Implants coated to facilitate bony ingrowth**
- **The final implant machining + coating makes the implant “bigger” than the last broach**
- **Hydroxyapatite coating**

WHAT IS ‘PRESS-FIT’?

- Implant has different coating based on stem location
- Bone geometry and bone type changes as you move down the femur
- Changing the surface type closer to stem tip eases insertion without compromising fixation → decreases fracture risk

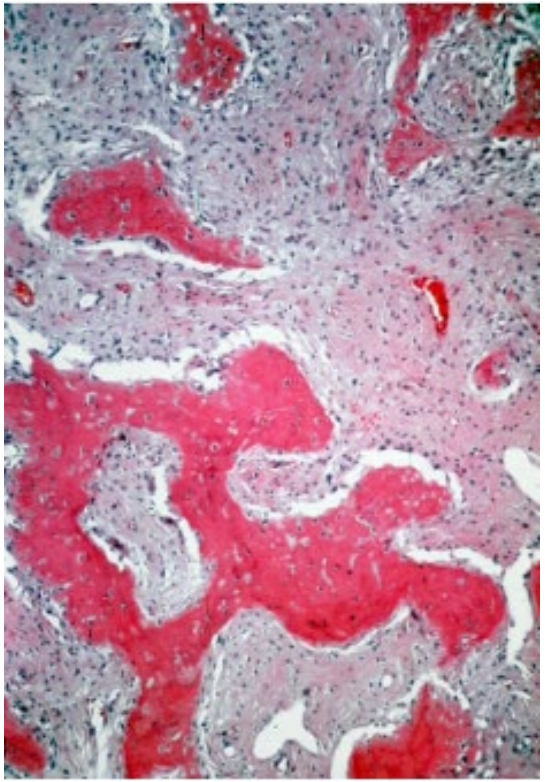
WHY IS IMMEDIATE FIXATION IMPORTANT? (IF PRESS-FIT)

- The goal is biologic fixation of implant to host bone
- Accomplished by osteoblasts (bone forming cells) migrating onto the porous implant and making bone
- Only occurs when implant has close contact to host bone and minimal motion
- If too much space or implant micro-motion → fibrous ingrowth → early loosening



WHY IS IMMEDIATE FIXATION IMPORTANT? (IF PRESS-FIT)

- Process of biologic fixation takes between 4-12 weeks to occur & strengthens up to a year from index procedure
- Early in recovery patients will rely entirely on components press-fit & stem geometry (including implant collar) to provide reliable “scratch fit” while biology does the work
  - ✓ This is the reason to initially restrict high impact activity of a press-fit implant
- PMMA is additional interface that can fail. Cemented components should permanently refrain from high impact activity (in my opinion)



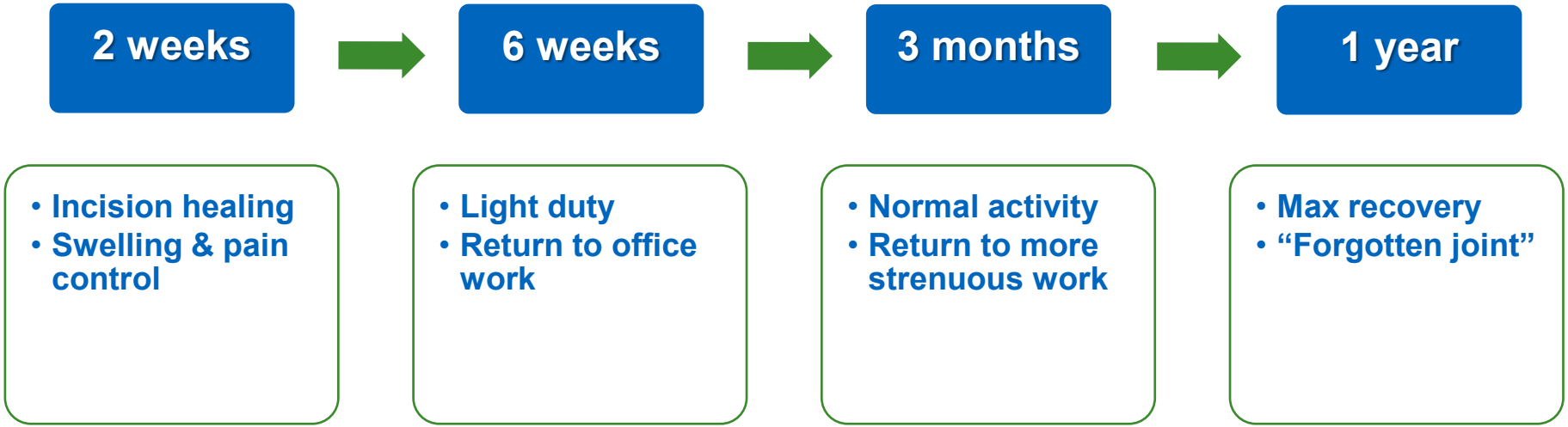
THA VERSUS TKA RECOVERY

In general, THA will rehab slightly faster than TKA, largely due to better pain control

Studies show recovery has large initial curve for both THA & TKA with greatest magnitude of improvement within the first 3 months

Important to remember these are AVERAGES, some patients recover quickly, some take up to 1 year

ROUGH RECOVERY TIMELINE



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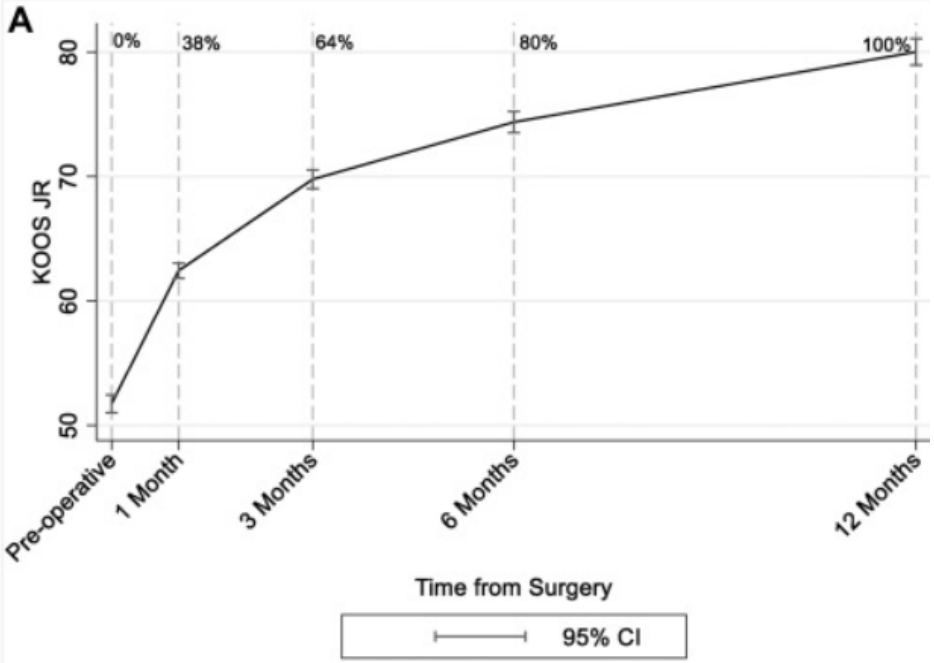
AAHKS AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS

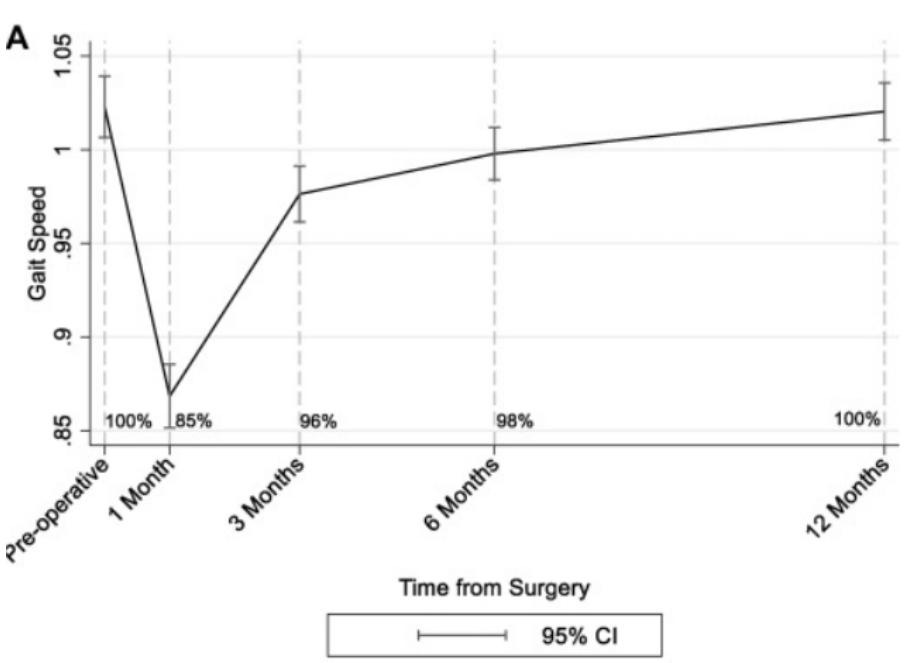
Recovery Curve for Patient Reported Outcomes and Objective Physical Activity After Primary Total Knee Arthroplasty—A Multicenter Study Using Wearable Technology

Jesse C. Christensen, DPT, PhD · Brenna E. Blackburn, PhD · Lucas A. Anderson, MD · Jeremy M. Gililland, MD · Christopher L. Peters, MD · Michael J. Archibeck, MD · Christopher E. Pelt, MD Show less

KNEE FUNCTION



GAIT SPEED



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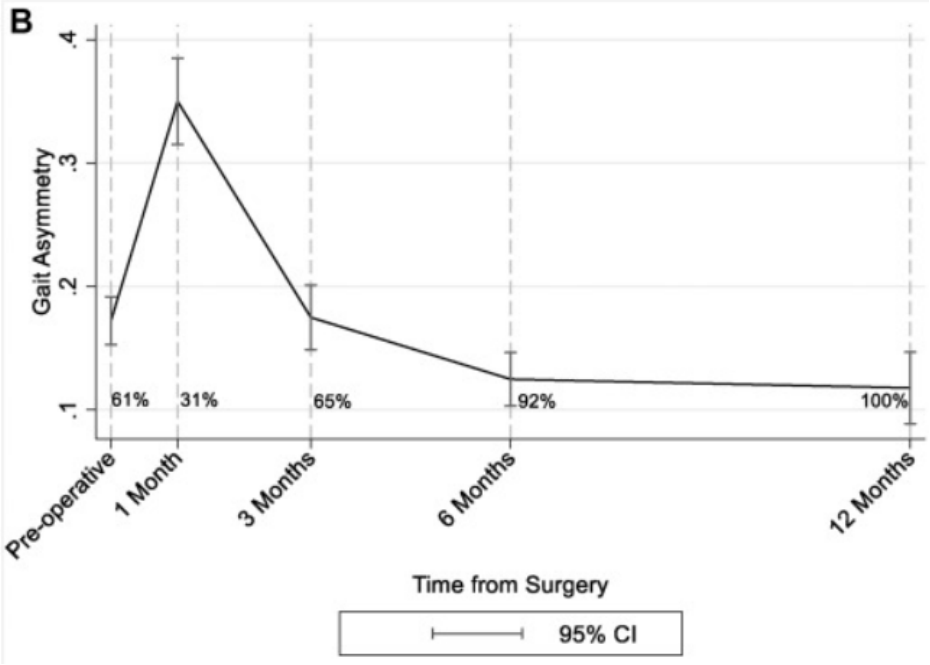
GAIT ASYMMETRY



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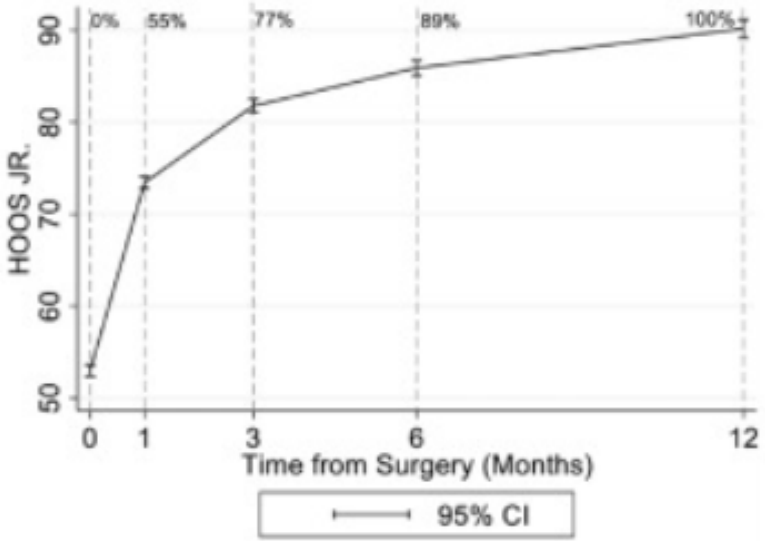
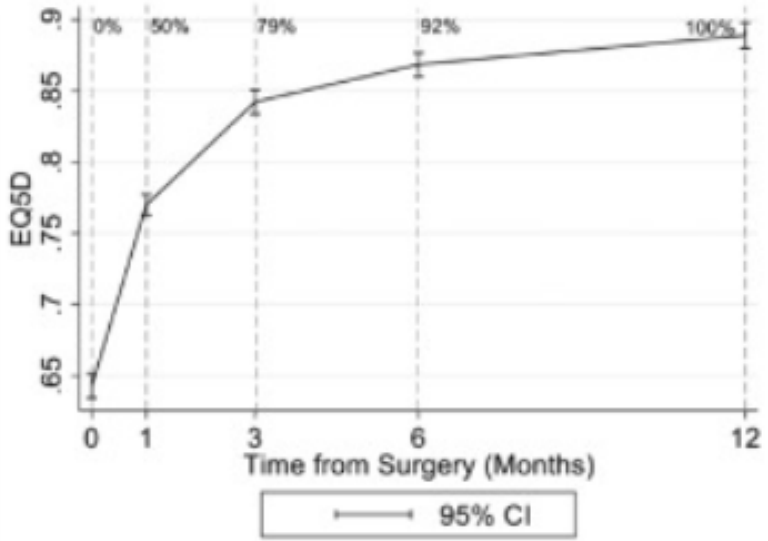
HIP JOINT FUNCTION





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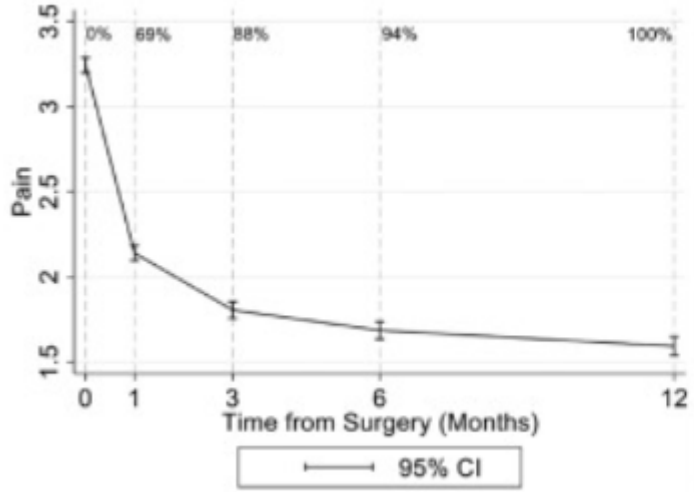
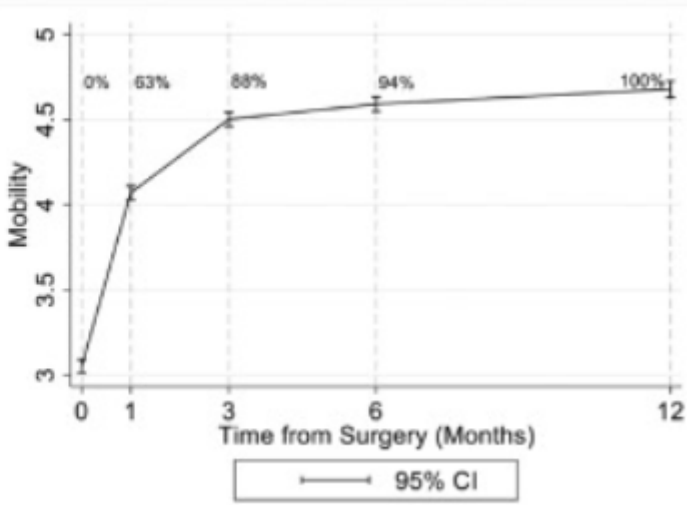
PAIN LEVEL



MOBILITY



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Activity Recommendations Following Total Hip and Knee Arthroplasty: A Survey of the American Association for Hip and Knee Surgeons

Eli Swanson, MD · Thomas P. Schmalzried, MD

- **Patient activity survey handed out to 657 AAHKS members who did a minimum of 50 THA/TKA per year. 139 were returned**
- **95% of respondents had no restriction on low impact activity**
- **High impact activity had more restrictions, but with considerable variability in responses**
- **THA restrictions were generally less than TKA almost certainly due to the press-fit versus cement discrepancy between THA and TKA (especially in 2007)**

THE JOURNAL OF ARTHROPLASTY
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Return to Cycling After Total Joint Arthroplasty

Adam S. Driesman, MD [a] · Roseann M. Johnson, BS [a] · Charlie C. Yang, MD [a] · Todd M. Miner, MD [a] · Douglas A. Dennis, MD [a,b,c,d] · Jason M. Jennings, MD, DPT [a,b]

- Single institution study. Online survey sent - 1,029 patient surveys returned
- Average age of patient population was 69 years, with an average of 4.08 years from time of most recent TJA surgery
- 94% able to return to cycling; 41.8% returned to cycling within 3 months
- Most cyclists were able to return to their previous level. Patients who had a revision TJA had significantly lower rates of return to cycling
- Return to cycling did not result in higher rates of revision

LOW IMPACT ACTIVITY RECOMMENDATIONS

General consensus that activities including walking (on flat or graded surface), swimming, golf, cycling (on flat surface), elliptical, and stair climbing are safe as early as 6 weeks

Can use above accepted activities and extrapolate them to other similar activities not listed (e.g. casual Pickleball)

WHAT ABOUT HIGH IMPACT ACTIVITY AFTER TJA IN 2025?

WHAT ABOUT HIGH IMPACT ACTIVITY AFTER TJA IN 2025?

Any activity, vocation, or sport (e.g. competitive Pickleball) with jumping or running would fall into the category of high impact activity

If press-fit components were used, after initial restriction for 6-12 months (varies by surgeon) these activities may be safe, although more data is needed

There is a risk of wearing the plastic spacer between implants, but with improved wear properties [of the plastic] this risk has decreased

- ✓ I would still be cautious if very young and very active as the risk of wearing through a liner is possible over a longer period of time (>30 years)*

*Majority of implants used in modern TJA have not been on the market/in vivo for even 10 years let alone 20 or 30. Most of the data is extrapolated from industry-sponsored, government mandated wear simulation studies.

WHAT ABOUT HIGH IMPACT ACTIVITY AFTER TJA IN 2025?

Any activity, vocation, or sport (e.g. competitive Pickleball) with jumping or running would fall into the category of high impact activity

If CEMENTED components were utilized:

- ✓ Recommend abstaining from sustained, repetitive, high-impact activity
- ✓ Probably fine in small amounts (e.g., running from a bear…or police)

There is variability from surgeon to surgeon on postoperative restrictions. You should listen to the treating surgeon and ask them about their restrictions and reasoning behind them.

WHAT ABOUT HIGH IMPACT ACTIVITY AFTER TJA IN 2025?

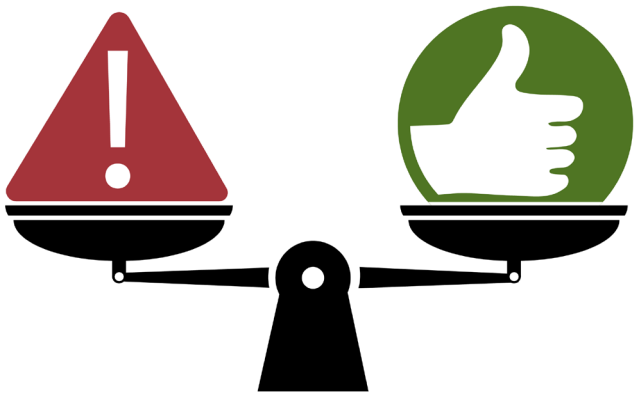
There is surgeon variability on high impact postoperative restrictions

- ✓ **Are they allowed at all?**
- ✓ **If so…when?**

You should listen to the treating surgeon and ask them about their restrictions & reasoning behind them if you have questions

Managing patient mobility expectations preoperatively is the best way to guarantee compliance and happiness postoperatively

WHAT IS AT STAKE?



The (unlikely) risk of returning to activity too quickly is more surgery…

- ✓ **Secondary to implant loosening, fracture, or component wear**

Revision surgery may be more complex, with a higher risk of complications including infection

Must weigh joys of certain activity, or financial need to return to more demanding work, against the potential negative impact on implant longevity

DRIVING AFTER TJA

- 6 weeks for right sided surgery
- When you are no longer taking narcotics for left sided surgery (unless you drive with 2 feet)
- Practice braking time in a parking lot (like a teenager just learning)

RETURN TO WORK

Low impact / office job

- ✓ OK to return when off narcotic medication

High impact work

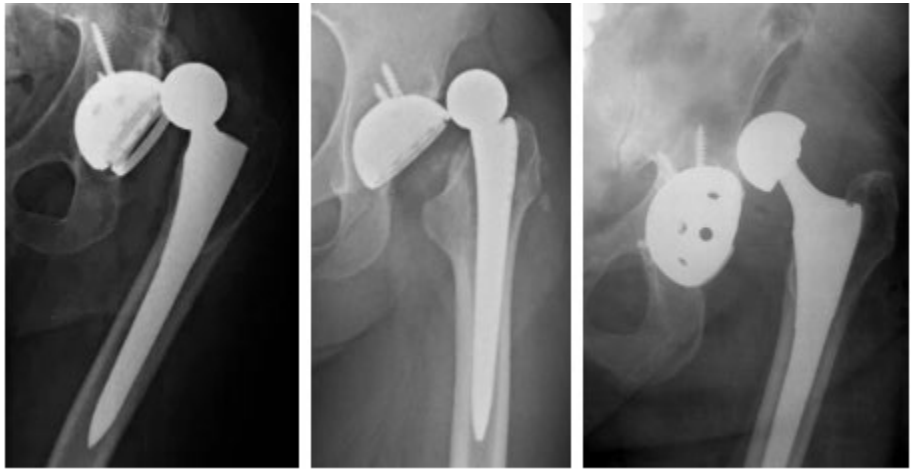
- ✓ Would recommend light duty for minimum 3 months, preferably 6 months
- ✓ Return to full duty 6-12 months

HIP STABILITY:
ANOTHER PIECE OF THE PUZZLE

- **Hip instability can lead to joint dislocation**
  - ✓ **Historically 1-5% risk; 90% occur w/in month of surgery**
  - ✓ **Modern THA risk under 1% for many reasons**
  - ✓ **Still occurs – especially in Reverse THA**

- **Dislocation Treatment**
  - ✓ **1st dislocation: closed reduction**
  - ✓ **Repeat offenders often need revision surgery**

- **Best treatment is prevention through hip ROM precautions**



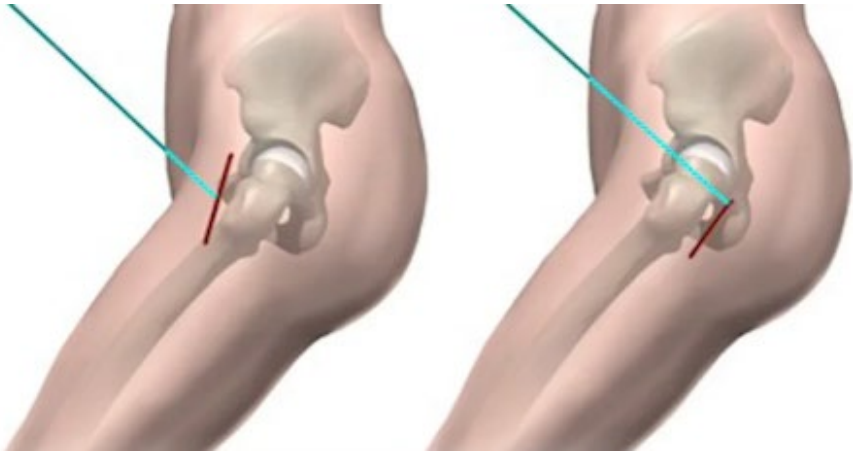
HIP STABILITY:
ANOTHER PIECE OF THE PUZZLE

- Risk is highest early, therefore surgeons will often use precautions for the first 6-12 weeks post surgery

- The type of precautions vary based on the approach
  - ✓ Posterior precautions: avoid F(90)ADIR
  - ✓ Anterior precautions: avoid extension/ external rotation past neutral

- Avoid high risk activity (e.g. yoga)

- Google AI provides a good (data-supported) summary



SEXUAL ACTIVITY AFTER THA

- Total hip arthroplasty (THA) can improve sexual satisfaction by reducing pain
- Fear of dislocation can lead to sexual difficulties following this procedure
- Landmark studies have used various methods to simulate hip implant position during sexual activity to determine both safe & unsafe positions

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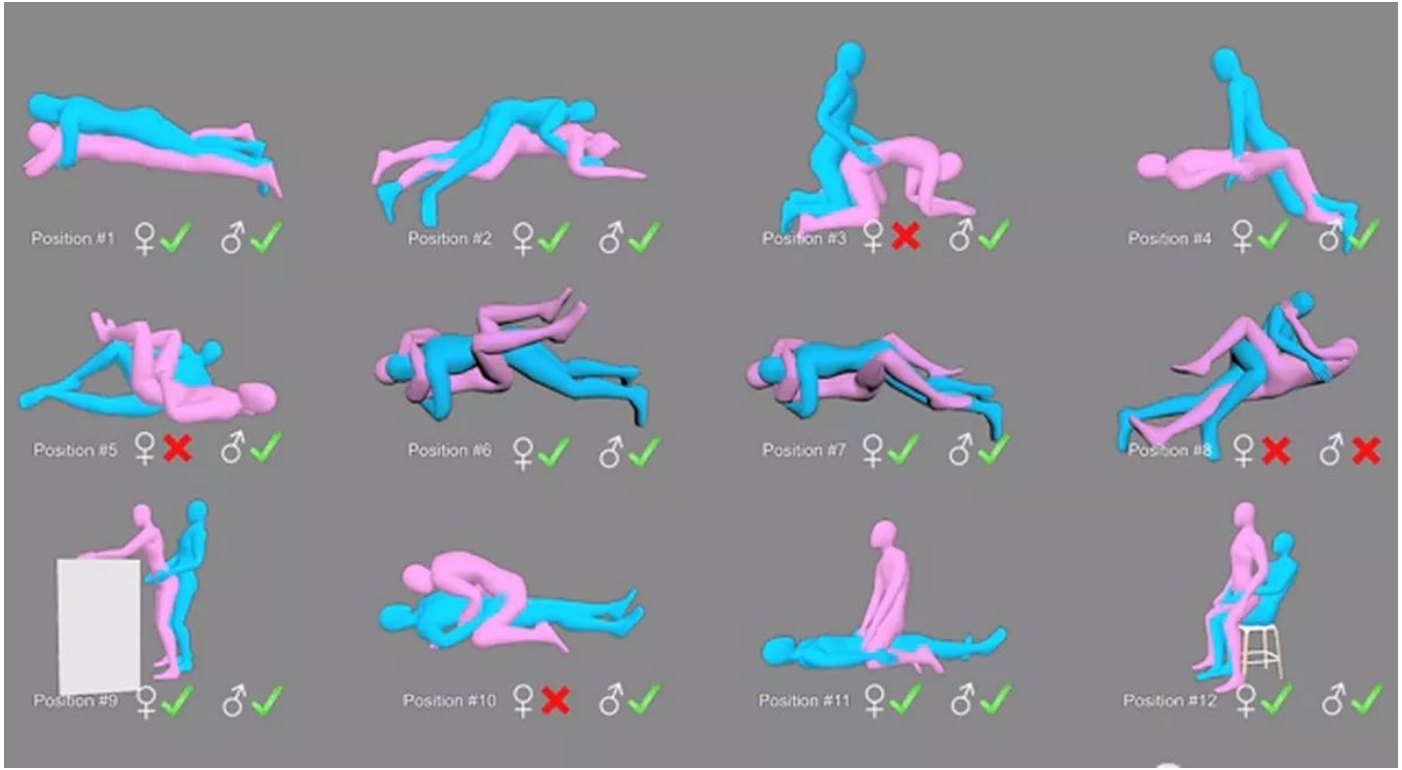
AAHKS AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS

Sexual Activity After Total Hip Arthroplasty: A Motion Capture Study

Caecilia Charbonnier, PhD [a] · Sylvain Chagué, MS [a] · Matteo Ponzoni, MS [b] · Massimiliano Bernardoni, MS [b] · Pierre Hoffmeyer, MD [c] · Panayiotis Christofilopoulos, MD [c]



THE JOURNAL OF ARTHROPLASTY
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Safe Sex After Total Hip Arthroplasty: Using Computed Tomography-Based Robotics to Evaluate "At-Risk" Sexual Positions

Samuel D. Stegelmann, MD [a] · Justin T. Butler, DO [b] · John L. Hiatt, MD [b] · Matthew W. Bullock, DO, MPT [c]

- This study expanded on the work by Chabonnier
- Robotic THA simulations using 3-dimensional renderings from 12 patients (6 F, 6 M) who received computed tomography (CT)-based robotic THA were used to assess for prosthetic and/or bony impingement among 12 popular sex positions
- Findings: the "at risk" position for women were generally free of any impingement when subjected to CT simulations
- 2 of the 11 positions (8 and 11) for men had some implant impingement in the posterior inferior position

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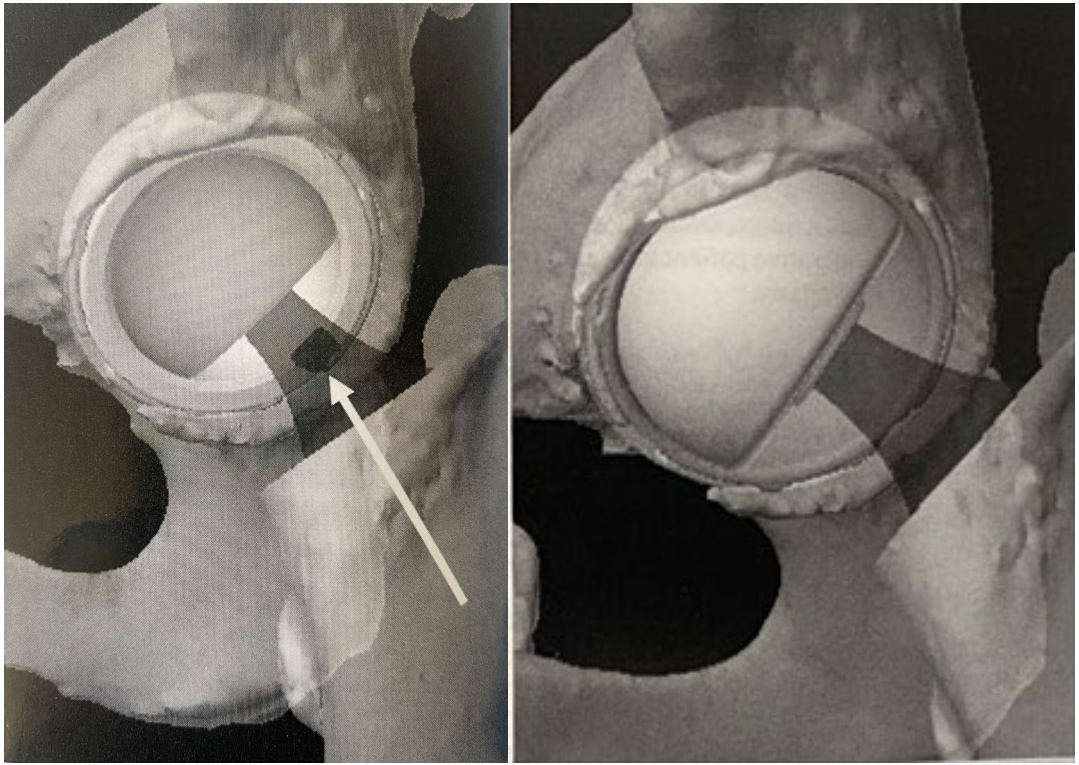

Jeffrey Chapek, DO

OrthoCincy Orthopaedics & Sports Medicine

THANK YOU

Additional resources
are available to patients from the

American Academy of Orthopedic Surgeons

www.orthoinfo.aaos.org

CITATIONS

1. Recovery Curve for Patient Reported Outcomes and Objective Physical Activity After Primary Total Knee Arthroplasty—A Multicenter Study Using Wearable Technology, Christensen, Jesse C. et al. The Journal of Arthroplasty, Volume 38, Issue 6, S94 - S102

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3. Eli A. Swanson, Thomas P. Schmalzried, Frederick J. Dorey, Activity Recommendations After Total Hip and Knee Arthroplasty: A Survey of the American Association for Hip and Knee Surgeons, The Journal of Arthroplasty, Volume 24, Issue 6, Supplement, 2009, Pages 120-126

4. Safe Sex After Total Hip Arthroplasty: Using Computed Tomography-Based Robotics to Evaluate “At-Risk” Sexual Positions, Stegelmann, Samuel D. et al. The Journal of Arthroplasty, Volume 39, Issue 2, 433 - 440.e4

5. Sexual Activity After Total Hip Arthroplasty: A Motion Capture Study Charbonnier, Caecilia et al. The Journal of Arthroplasty, Volume 29, Issue 3, 640 - 647