

# Physical Activity Promotion Following ACLR

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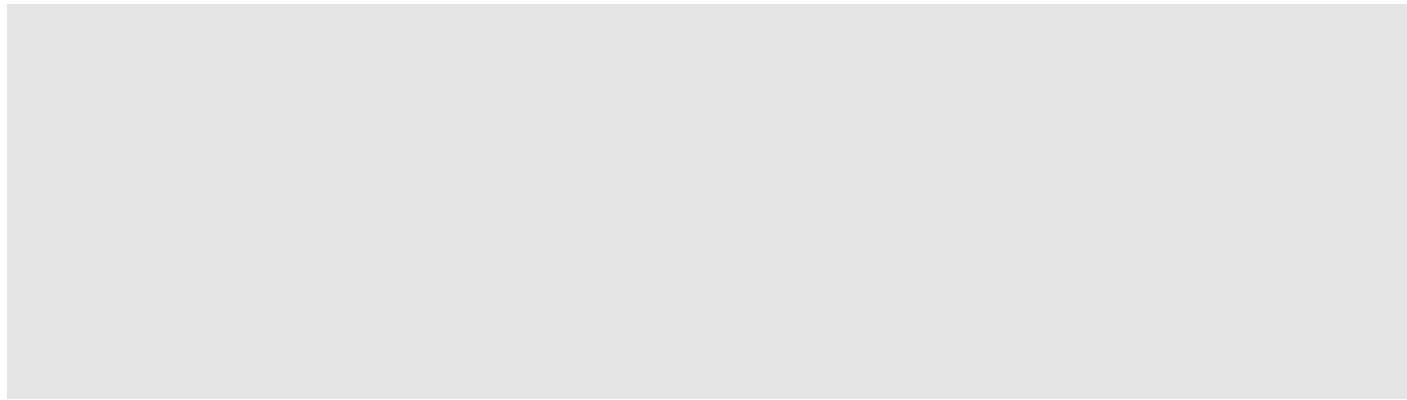
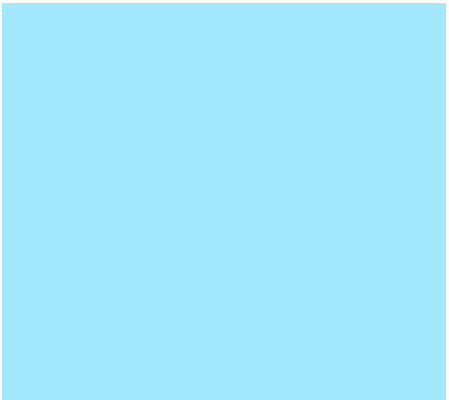
Capstone Project Spring 2022

# Objectives

- Clinicians will understand deficits in physical activity among individuals following ACLR & healthy age-matched peers.
- Clinicians will recognize and understand the need for implementation of general physical activity promotion following ACLR in a clinical setting.
- Clinicians will understand the recommendation for implementing general physical activity promotion in a clinical setting.
- Clinicians will demonstrate how to apply clinical recommendations in everyday practice using recommendations, evaluating, & creating specific recommendations that fit the need of each individual patient.

(Bloom's Taxonomy 2022)

# Introduction



# Definitions

- **Physical Activity:** any bodily movement produced by skeletal muscle that requires energy expenditure. Can include household tasks (cleaning, laundry cooking), occupational, sports, yardwork, conditioning, etc.
- **Exercise:** subcategory of physical activity that is planned, structured, repetitive, & purposefully focused on improvement or maintenance of one or more components of physical activity
- **MVPA:** moderate to vigorous physical activity
- **PA:** physical activity
- **ACL R:** Anterior Cruciate Ligament Reconstruction

(Dasso 2019)

# Current Rehabilitation Following ACLR

- Resolving impairments
- Returning to sport/activity
  - Most NOT returning



# Current Rehabilitation Following ACLR

- No current emphasis on PA
  - No protocols
  - No planned implementation



# Overview

**Deficits Following ACLR**

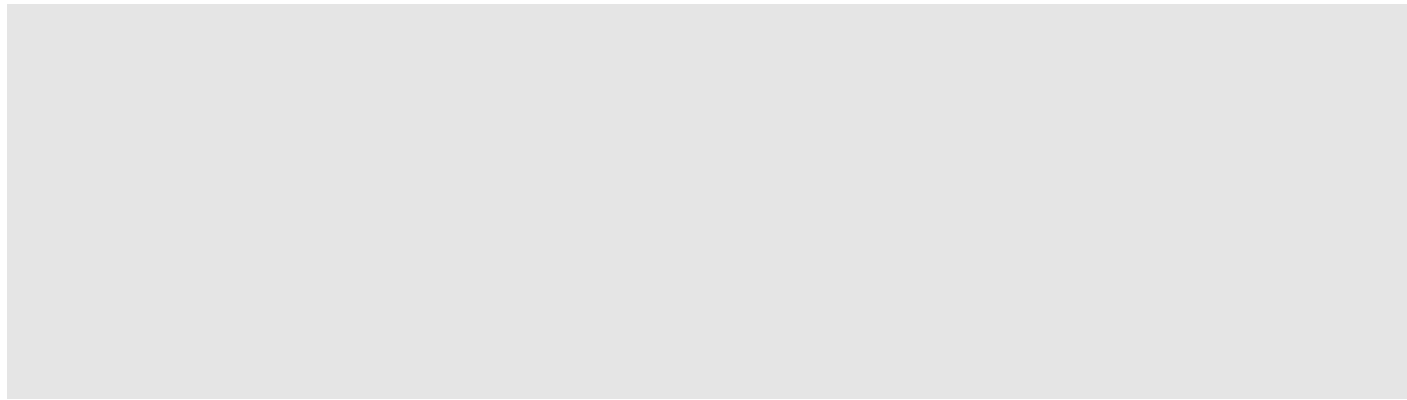
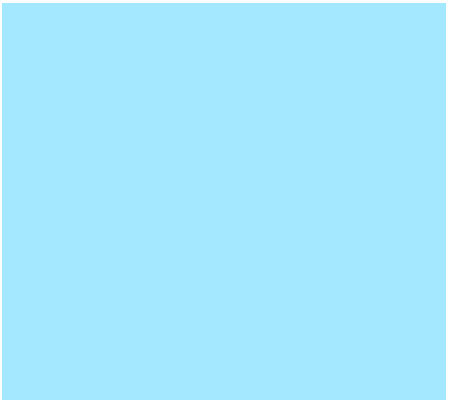
Effects of Deficits

Recommendation

Implementation



# Deficits Following ACLR





# Deficits Following ACLR

- Reporting
  - High level of knee function
  - Low pain
- Objective measures of PA NOT significantly related to
  - Self reported knee function
  - Time since surgery
  - Involved quad strength
    - Overestimating behavior

(Kuenze PA 2019)

# Deficits Following ACLR

- Less time in MVPA & lower step count
  - 24% of ACLR met 10,000 steps/day
  - 15 minutes less PA/day
    - 5500 minute less/year
  - 1611 fewer steps/day
    - 600,000 less steps/year
  - 43 less minutes of MVPA ambulate/cadence (>100 steps/min)



(Bell 2017, Lisee 2021)

# Deficits Following ACLR

- PA increased at 2 to 4 months
  - NO increase 4 to 6 months
- Between 6-12 months
  - Adolescents
    - 24% lower step count
    - 33% less time in MVPA
      - Unmet PA guidelines



(Wellsandt CSM 2022, Kuenze Adolescent 2022)

# Deficits Following ACLR

- Average 8 years later
  - 13.5 minutes less PA/day
    - Females 10.8 less minutes/day
    - Females 2.54 times less likely daily PA

(Toomey 2022, Kuenze Sex Diff 2019)

# Key Points – Deficits

- Reported high knee function  $\neq$  objective measures
  - Overestimating
- Less time in MVPA & lower step count
- Between 6-12 months & up to 8 years following ACLR
  - Less time in MVPA
  - Especially females

(Kuenze PA 2019, Bell 2017, Lisee 2021, Wellsandt CSM 2022, Kuenze Adolescent 2022, Toomey 2022, Kuenze Sex Diff 2019)

# Overview

Deficits Following ACLR

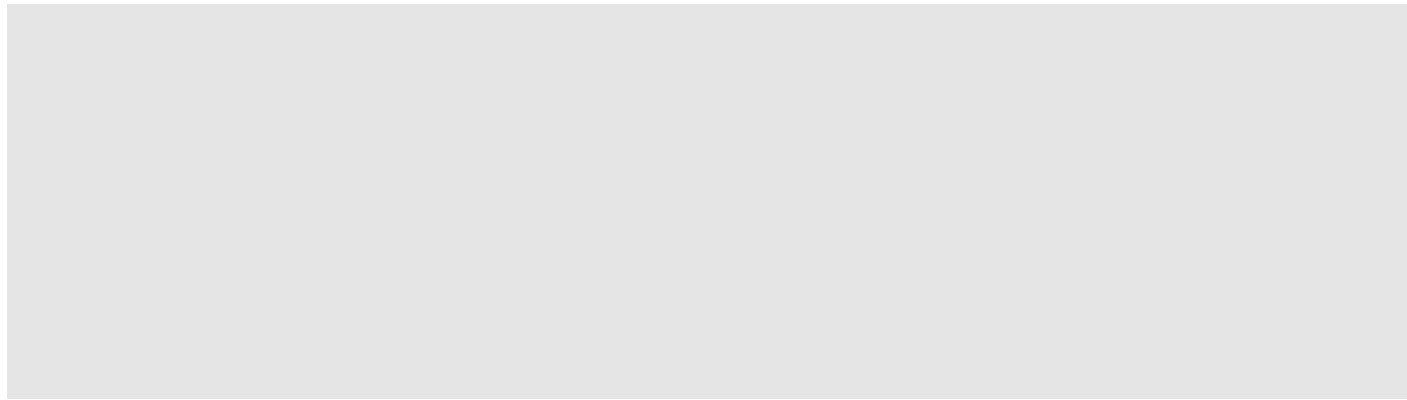
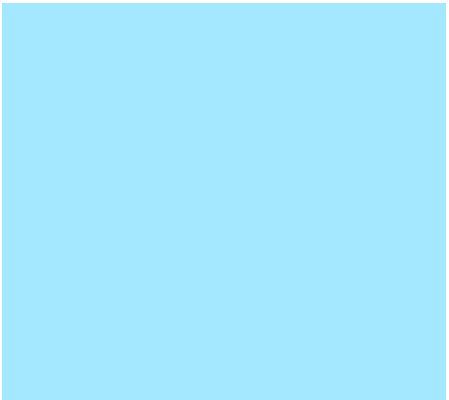
**Effects of Deficits**

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# Effects of Deficits



# Effects of Deficits

- Less daily time spent in MVPA = worse KOOS knee function
  - Difficulty with
    - Squatting
    - Running
    - Jumping
    - Kneeling
    - Twisting/turning



(Toomey 2022)



# Effects of Deficits

- MSK injury
  - Primary cause reduced PA
- Majority knee injuries
  - Adolescents
  - Early adulthood
- Ceasing PA at young age effects habits later
  - Need to intervene
  - Form habits for the rest of life

(Arden 2011, Whittaker 2021, Jose 2011)

# Effects of Deficits

- 10 years following injury
  - Highest risk post traumatic osteoarthritis



(Toomey 2022)

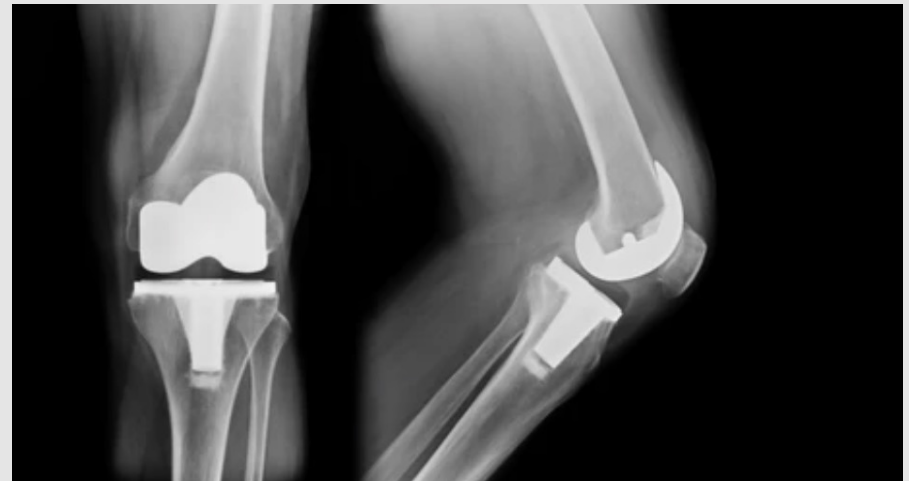
# Post Traumatic Osteoarthritis (PTOA)

- Greater burden with collateral ligament injuries
  - Greatest between 15-35 years
    - 6-fold greater risk for knee OA overall
    - 8-fold OA risk within 11 years
    - ACL + concomitant injury = greatest risk

(Wellsandt 2022, Whittaker 2021, Snoeker 2020, Whittaker Presentation)

# Post Traumatic Osteoarthritis (PTOA)

- Risk for total knee arthroplasty (TKA)
  - 20 times greater in 3<sup>rd</sup> decade
  - 7.5 times greater in 4<sup>th</sup> decade
- Did not believe increased risk
  - Only 2%



(Abram 2019, Whittaker Presentation)

# Difficulties with Returning to Sport (RTS)

- RTS limited in assessing PA
  - 81% return to any level of sport
  - 65% return to preinjury level
  - 55% return to competitive level
    - If not returning, will they remain active?

(Kuenze 2021 ACL, Arden 2014)

# Difficulties with Returning to Sport (RTS)

- 14% youth ACLR RTS meet criteria
- Not meeting criteria = 4-fold increase in re-tear
- Following injury:
  - 8% of youth drop out
  - 20% don't return
  - Significant increase in adipose

(Toole 2017)

# Difficulties with Returning to Sport (RTS)

- 2 years after surgery, those returned
  - 66% still playing sport
  - 41% playing preinjury level
  - 25% playing lower-level sport

(Arden 2015)

# Physical Inactivity Consequences

- Chronic disease & premature mortality
- Higher knee pain intensity
- 8 years following ACLR lead to
  - Increase mortality risk
  - Cardiometabolic risk
  - Obesity markers

(Biswas 2015, Skou 2018, Toomey 2022)



# Psychosocial Aspects

- Activities directly influenced by
  - Attitudes
  - Priorities
  - Perceptions
- Will influence
  - Current exercise behaviors
  - Future exercise behaviors



(Wiese-Bjornstal 2010 and Pickens 2005)

# Key Points - Effects

- Less MVPA = poorer self reported outcomes
- Less MVPA = increased risk of chronic disease & premature mortality
- **Huge** increased risk for PTOA & TKA
  - Unaware of risk
- Many not RTS
  - Those returning, not staying

(Toomey 2022, Biswas 2015, Skou 2018, Wellsandt 2022, Whittaker 2021, Snoeker 2020, Whittaker Presentation, Abram 2019, Kuenze 2021 ACL, Arden 2014 & 2015)

# Overview

Deficits Following ACLR

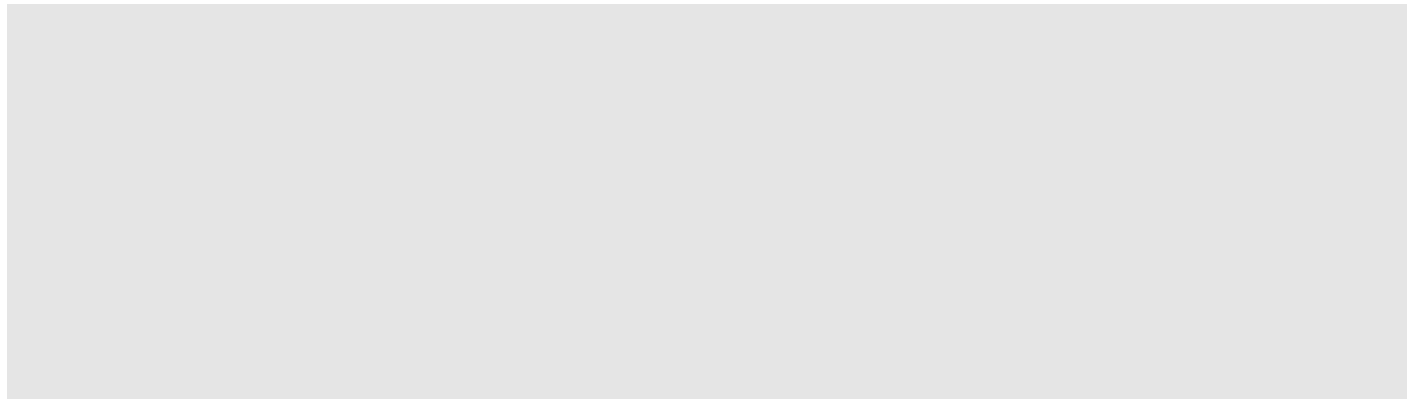
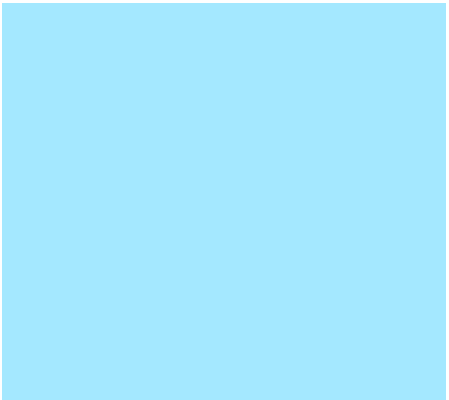
Effects of Deficits

**Recommendation**

Implementation



# Recommendation



# Recommendation

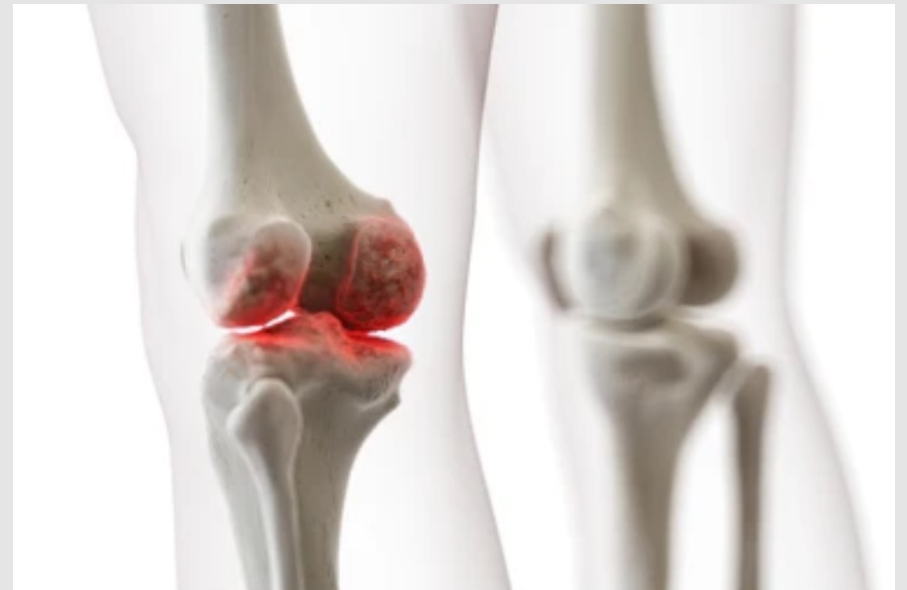
- Secondary prevention model
  - Identify & slow down onset of OA
    - Intervene & educate
      - Crucial time frames



(Whittaker Presentation and Palmeri-Smith 2017)

# Physical Activity Benefits

- Overall MSK health & cartilage health
- Preserve articular tissue integrity
  - Addressing movement adaptation
    - Normal joint loading
- Control of adiposity



(Whittaker OA 2021)

# Physical Activity Benefits

- Lifelong MSK health & mobility
  - Active for life, NOT sport specific
    - Minimize long term consequences
    - High levels of PA
      - Protective against OA

(Truong 2020, Hafer 2019)

# Importance of Promotion

- Captive audience
- Repetition
- Extended period of time
  - Make significant change
  - Form habits





# Activity Promotion

- Promotion of PA at crucial time points
  - 4 to 6 months post ACLR
    - No optimal PA
    - Guideline not harmful
  - 3 to 10 years
    - Highest risk for PTOA

(JOSPT CSM Wellsandt 2022, Ezzat 2018, Toomey 2022)

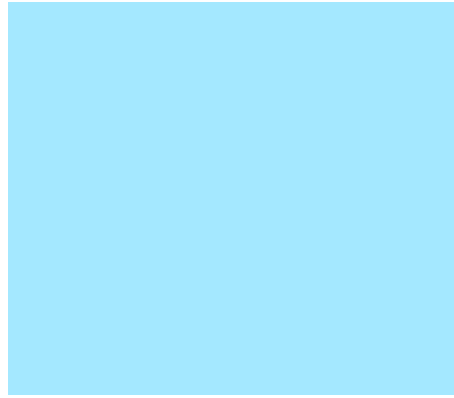
# Activity Guidelines - Adults

- **Aerobic**
  - 150 to 300 minutes moderate activity/weekly OR
  - 75 to 150 minutes vigorous activity/weekly
- **Muscle strengthening: 2 days/week**
  - Major muscle groups



(Health and Human Services)

# Physical Activity – Adults



# Activity Guidelines – Children and Adolescent

- 60 minutes or more of MVPA daily
  - **Aerobic:** 60 minutes MVPA 3 days/week
  - **Muscle Strengthening:** 60 minutes or more 3 days/week
  - **Bone strengthening:** 60 minutes or more 3 days/week



(Health and Human Services)



# Physical Activity- Children & Adolescents



# Step Count

- Step Count Recommendations
  - 7000-8000 steps/day → achieve guidelines
  - Objective measure = feasible goal

(Tutor-Locke 2011)

# Education

- Future risk
  - Work specific
    - Manual labor
      - Increase risk of OA
  - Sport Specific
    - High impact
      - Increase risk for hip and knee OA

(Whittaker OA and Cart 2021)

# Education

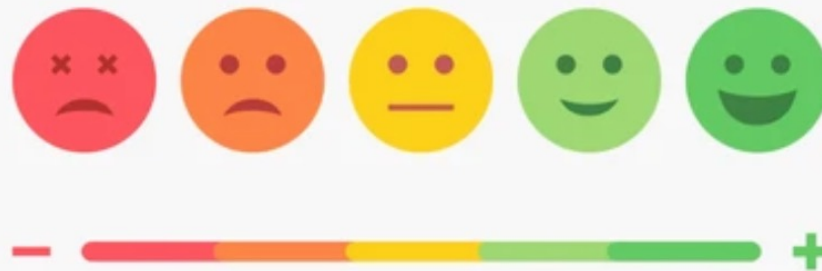
- Discourage early sport specialization
  - Young ages
- Promote proper work & sport mechanics
  - Minimize future risk

(Whittaker OA and Cart 2021)



# Attitudes & Beliefs

- Attitudes
  - Psychological shift in emotions following injury
    - Accept long-term sport competency
    - Adjust to new reality
  - Reframe value of exercise & PA



(Truong 2020)

# Attitudes & Beliefs

- Once acceptance reached:
  - New appreciation for ability
    - Key to positive attitude toward exercise & PA
      - Prolonged adherence

(Truong 2020)

# Facilitating Adherence

- Social environments/groups
- Family or peer support
  - Greatest impact for continued exercise

(Ye 2020)

# Facilitating Adherence

- Exercise/activities fun & enjoyable
- Exercise/activities pain-free
- Positive attitude & framing toward exercise/activity
  - Adherence

(Ye 2020, Truong 2020)

# Addressing Barriers

- Lack of time
- Lack of motivation
- Lack of understanding
- Lack of confidence



(Ye 2020)

# Addressing Barriers

- Physical or psychological barriers limit engagement
  - Unexpected/prolonged recovery timelines
    - Persistent symptoms
    - Weight gain
      - Difficult in adolescents

(Truong 2020)

# Monitoring Knee Health

- Pay attention to knee health
  - Soreness
    - How many days?
      - 2+
      - 1-2
  - Swelling
    - Next day
    - Multiple days
  - Pain



# After Care Model

- Alternative model of care
- Promoting aftercare system once discharged
  - Resources
  - Pre-established check-in times
  - PA recommendations & examples
- Currently exist in cash-based

(Geidl 2019)



# Key Points – Recommendation

- Secondary prevention model
- Promote PA early in treatment course
  - Activity guidelines & step counts
- Educate on future risk
- Facilitate adherence
- Individual's attitudes & beliefs
- Aftercare model

(Whittaker Presentation, Palmeri-Smith 2017, Health and Human Services, Tutor-Locke 2011, Whittaker OA and Cart 2021, Truong 2020, Ye 2020, Geidl 2019)

# Overview

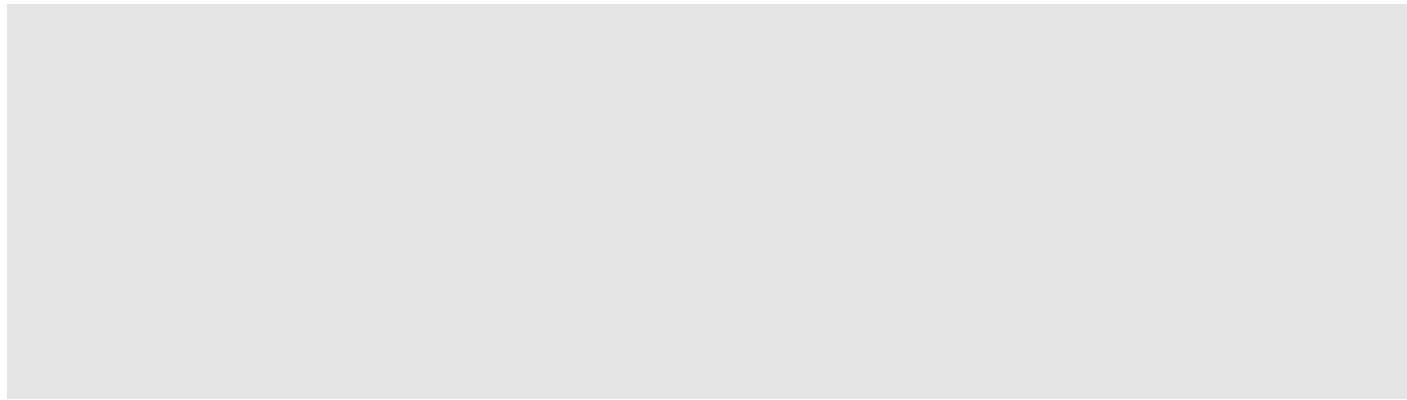
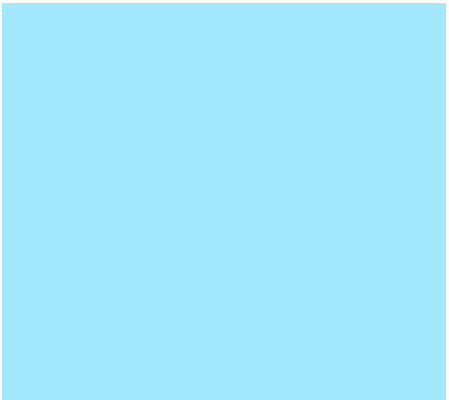
Deficits Following ACLR

Effects of Deficits

Recommendation

**Implementation**

# Implementation



# Implementation

- Within sessions & course of treatment
  - General PA guidelines
  - Address questions
  - Provide examples
  - Suggest ways to integrate daily

# Implementation

- Early on & continually in treatment course
- Use lost time within session
  - During warm up
  - Between sets
  - During cardio
  - During cool down/stretching

# Education

- Knowledge pertaining to:
  - Effects of PA
  - Suitable exercise, activities, & daily PA
  - Execution of PA
  - Self-directed load control & progression

(Geidl 2019)

# Examples of MVPA

- Brisk walking
- Dancing
- Cycling
- Yard Work
- Housework,  
lifting objects,  
cleaning
- Swimming
- Climbing
- Jumping/Games
- Yoga
- Running
- Recreational sports

(Ainsworth 2011)

# Physical Activity





# Active Participation

- Include patient in conversation & planning
  - Work WITH patient to develop goals

(Geidl 2019)

# Attitudes & Beliefs

- Acceptance & motivation
  - Where are they coming from?
  - Where are they in their journey?
  - Motivation level
    - Meet them there

# Facilitating Adherence

- Technology
  - Activity tracking devices (FitBit, Apple Watch, Health App, etc.)
    - Step count goal
      - Young people
    - Workouts
    - Activities
    - Monitoring symptoms



(Bravata 2007)

# Facilitating Adherence

- Facilitating Adherence
  - Fun & joyful activity
  - Group setting
  - Facilitating socialization & relationships
  - Personal interests
  - Address individuals' personal barriers

(Holt 2020, Geidl 2019)

# Facilitating Adherence

- Establish positive & trustworthy relationship
  - Respond to needs
  - Adjust
    - Problem solve as necessary



(Geidl 2019)

# Implementation

- Create & utilize After-Care Model
  - Check-in times following discharge
  - Provide resources
    - Community
    - Online
  - Examples of activities & exercises

(Geidl 2019)

# Implementation

- Utilize Assessments
  - Questionnaires
    - Interests
    - Limitations on movements & activities
      - Safe & effective PA options
    - Self-efficacy
      - Self-efficacy for Exercise Scale

(Shirley Ryan 2022)

# Key Points

- Create time early
- Educate
  - Examples, progressions
- Use resources, i.e. technology
- Attitudes & beliefs
  - Meet patient where they're at
- Facilitate adherence
  - Remove barriers
  - Individual interests
- After-care model

(Geidl 2019, Ainsworth 2011, Bravata 2007, Holt 2020)



# Overview

Deficits Following ACLR

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# Summary

- Deficits of MVPA in ACLR & healthy peers
  - Negative health effects
- Need to implement PA in PT course of treatment
  - Early, during, & beyond treatment
  - Addressing ALL aspect of patient
  - Facilitate adherence
  - Check in & problem solve as needed



# Resources

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