Sports Medicine Research at CHCO

David R. Howell PhD, ATC

Lead Researcher, CHCO Sports Medicine Center

Assistant Professor & Director of Clinical Research, CU Orthopedics

Research Mission

Through the research program at the Sports Medicine Center at Children's Hospital Colorado, we seek to positively influence clinical practice through high quality scientific work with clinical relevance.

Through this work, we strive to be an established center of excellence for research in pediatric sports medicine

Research Team Members

Lead Researcher: David Howell

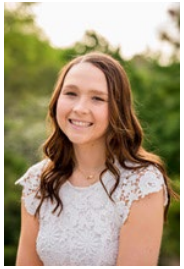
Physician Researchers: Jay Albright, Curt VandenBerg, Aubrey Armento, Julie Wilson, Greg Walker, Emily Sweeney

Research Assistants

Hannah Rossing

Claire Giachino

Savannah Troyer



Madi Brna

Samantha Magliato

PhD Students

Mathew Wingerson

Kate Smulligan

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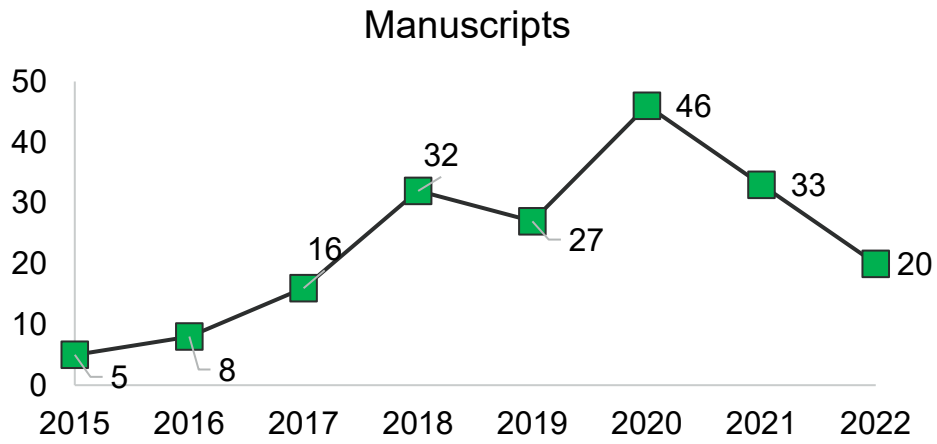
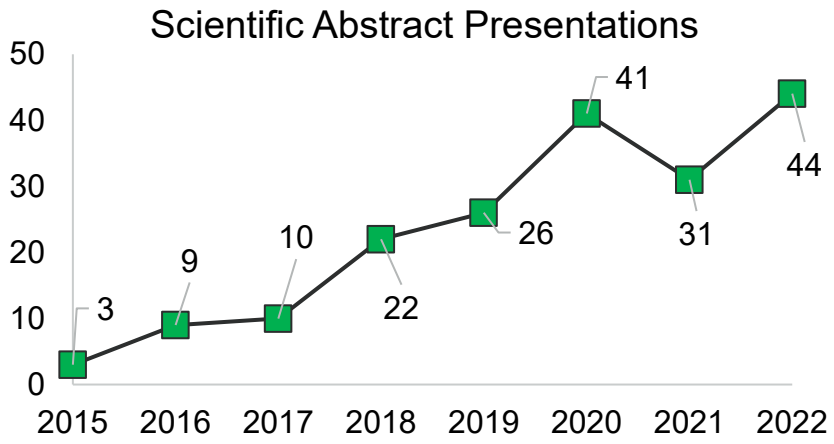
Objectives

1. To describe the growth in research productivity in the past five years.
2. To describe the several active areas of research among our sports medicine research group.

Research Productivity

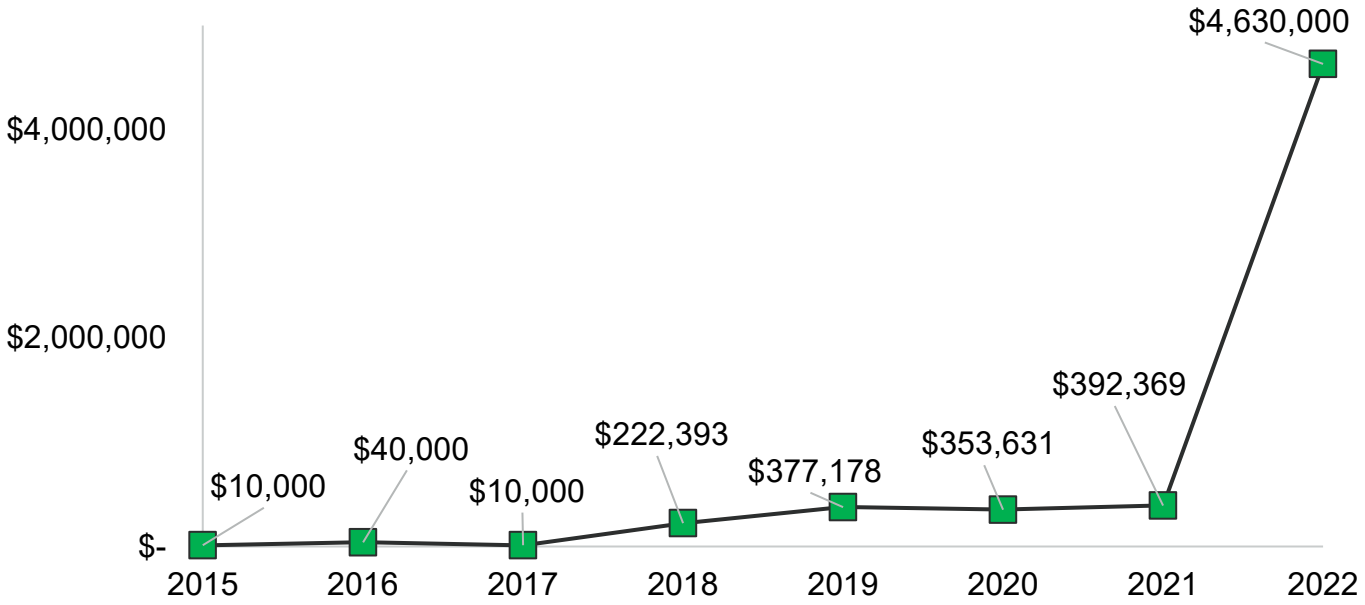


Total = 174 (Past 5 years)



Total = 200 (Past 5 years)

Extramural Grant Support



Total = $6 million (past 5 years)

Current Extramural Grant Support

Smith+Nephew

PI: Jay Albright, MD
"Werewolf FLOW 50 During ACL Reconstruction: A Randomized Control Trial"

AMSSM
AMERICAN MEDICAL SOCIETY FOR SPORTS MEDICINE

PI: Emily Sweeney, MD
"Back in the Game: An Immediate Functional Progression Program for Adolescent Athletes with Spondylolysis: A Multi-Center Randomized Pilot Trial"

Ludeman Family Center for Women's Health Research
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

PI: Aubrey Armento, MD
"Menstrual profiles and cardiovascular disease risk among female adolescent athletes with and without menstrual irregularities"

NIH Eunice Kennedy Shriver National Institute of Child Health and Human Development

PI: David Howell, PhD | Co-I: Julie Wilson, MD
"Modulating Exercise Dosage to Improve Concussion Rehabilitation: A Randomized Clinical Trial"

DEPARTMENT OF THE AIR FORCE
59TH MEDICAL WING (AETC)
JOINT BASE SAN ANTONIO - LACKLAND TEXAS

PI: David Howell, PhD | Co-I: Julie Wilson, MD
"Tele-Rehabilitation to Improve Mild Traumatic Brain Injury Recovery and Reduce Subsequent Injury Risk"

CCTSI Colorado Clinical and Translational Sciences Institute (CCTSI)
UNIVERSITY OF COLORADO DENVER | ANSCHUTZ MEDICAL CAMPUS

PI: David Howell, PhD | Co-I: Julie Wilson, MD
"Understanding How Sleep Health Affects Recovery from Adolescent Concussion"

Areas of Expertise

- Female athlete & bone health
- Gymnast health & low back pain
- ACL techniques and outcomes
- Early youth sports specialization
- Concussion assessment and intervention

Aubrey Armento, MD

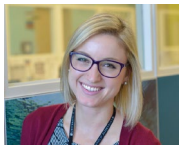
Adolescent Female Athletes

Table 3. Multivariable Regression Results for PROMIS Outcomes Among Female Adolescent Athletes With and Those Without Menstrual Dysfunction, Adjusted for Age and Body Mass Index

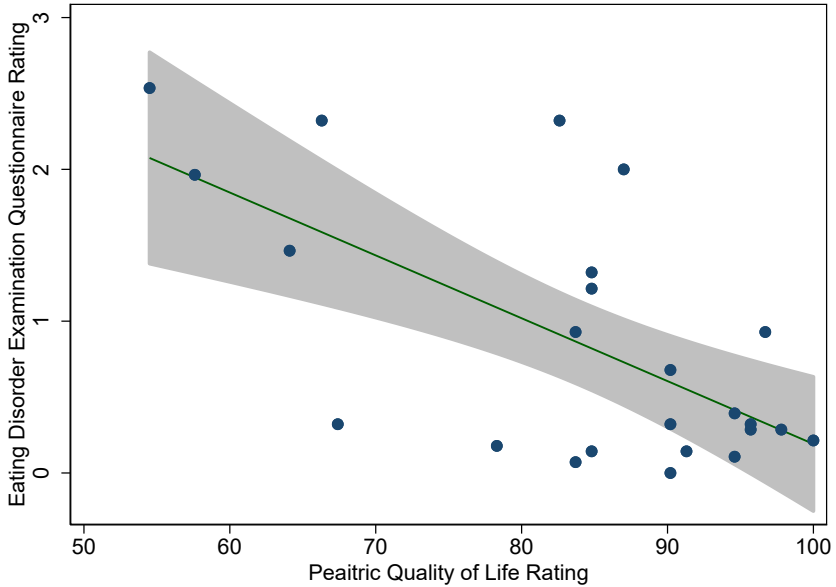
PROMIS Outcome	β Coefficient	Standard Error	95% CI	*P* Value
Mobility	0.03	0.15	−0.26, 0.32	.84
Anxiety	1.72	0.80	0.13, 3.31	.034[a]
Depressive symptoms	1.05	0.75	−0.44, 2.54	.16
Fatigue	2.41	0.59	1.25, 3.58	<.001[a]
Peer relationships	0.15	1.04	−1.92, 2.22	.89
Pain interference	1.34	0.65	0.04, 2.64	.043[a]

Menstrual dysfunction was associated with impaired quality of life measures, including anxiety, fatigue, and pain interference

Disordered Eating Behavior



Aubrey Armento, MD



More severe disordered eating behavior was strongly associated with lower quality-of-life (r = -0.65; p<0.001)

Armento et al., In Prep

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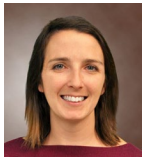
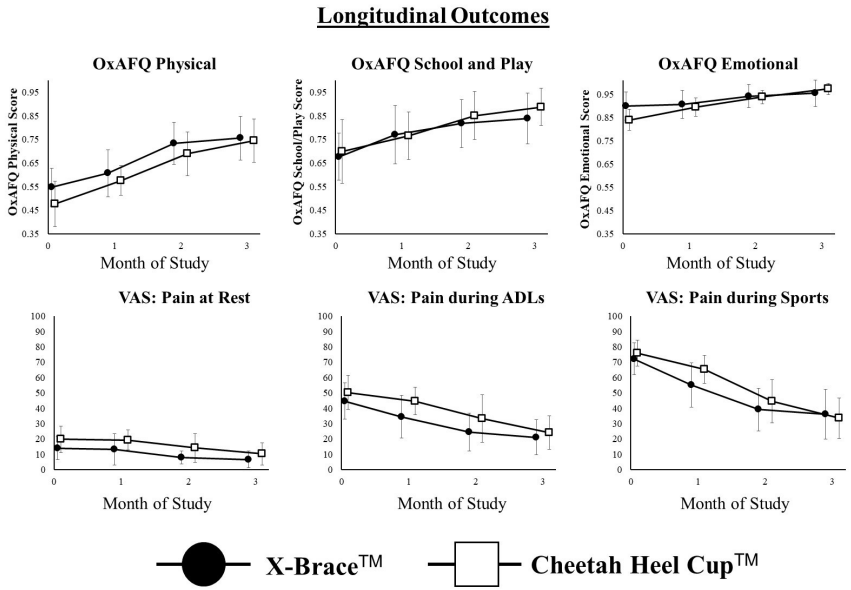
Gymnastics Research



Emily Sweeney, MD



Randomized Clinical Trial demonstrated improvement in outcomes among gymnasts with Sever's disease with two different types of braces

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Sweeney et al., JAT, 2022

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Former Collegiate Gymnasts

Emily Sweeney, MD

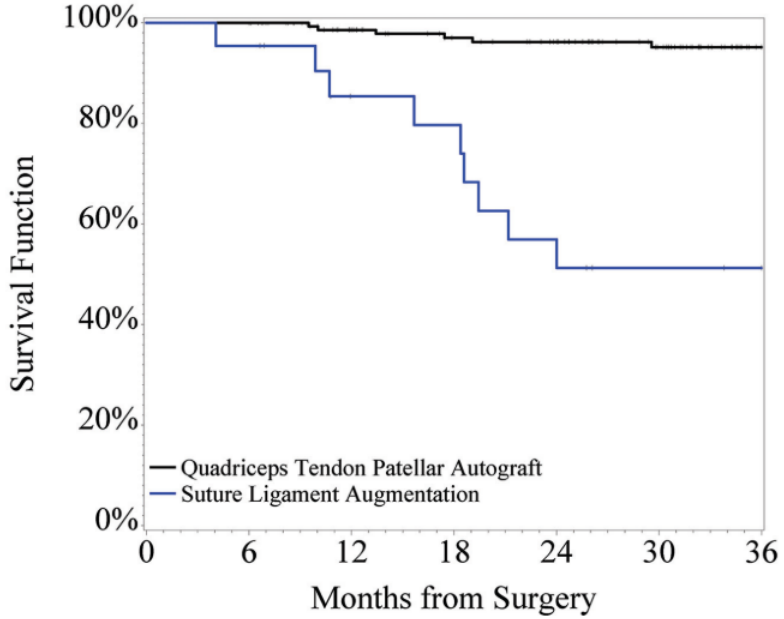
Variable	Median or n(%)
Current age (years)	32.4 [26.3, 41.2]
Age began gymnastics	4 [3, 6]
Age gymnastics became only sport	8 [6, 11]
Time-loss gymnastics injury in college (but no surgery/retirement)	320/461 (69%)
Gymnastics injury during middle/high school or college resulting in surgery	266/461 (58%)
Injury during collegiate gymnastics that resulted in retirement	94/459 (21%)
Sustained a concussion during gymnastics	195/459 (42%)
Disordered eating during college	157/459 (34%)
Sustained at least one stress fracture during college gymnastics	139/459 (30%)

Gymnasts specialize at a young age, are at risk for disordered eating, and a high proportion report sustaining a concussion during their careers

ACL Techniques and Outcomes

Jay Albright, MD

Lexi Gagliardi



The cumulative incidence of graft failure in the first 3 years after ACL reconstruction was higher in the suture ligament augmentation group vs the quadriceps tendon group (48.8% vs. 4.7)

Figure 3. Graft/repair survival.

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Gagliardi et al., Am J Sports Med, 2019

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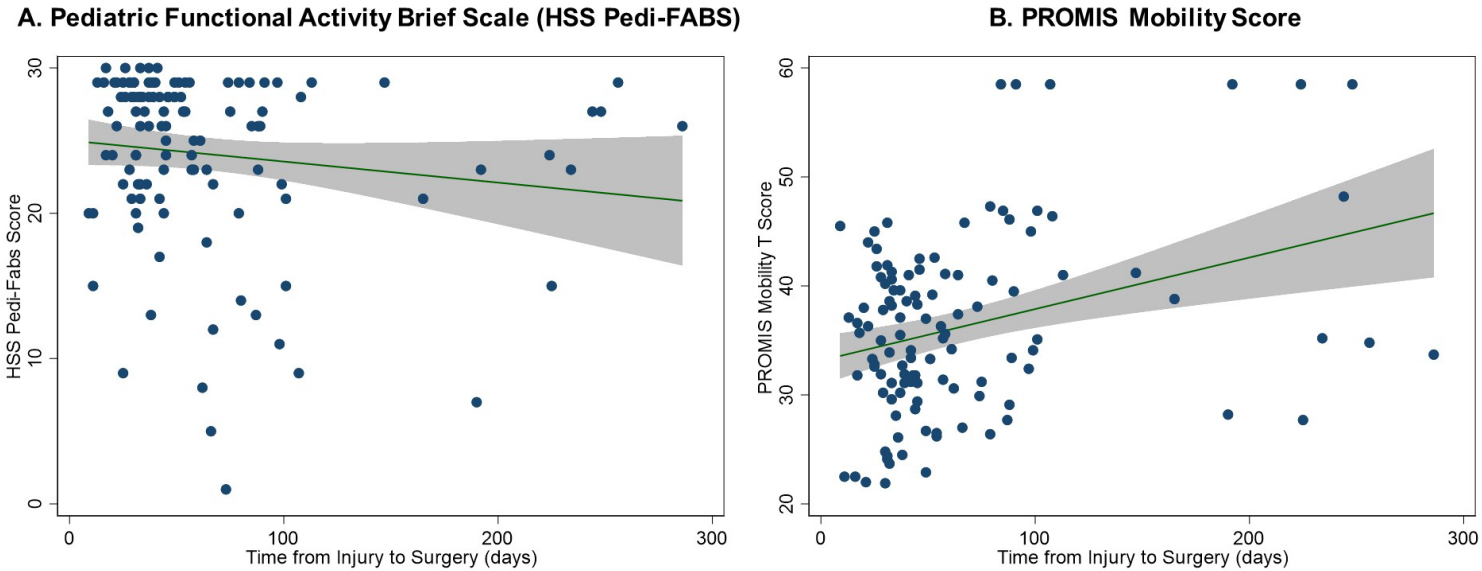
Access to ACL Surgery Time

Jay Albright, MD

Claire Giachino



After screening for different intrinsic/extrinsic factors, the two most prominent predictors of time from ACL injury to surgery are:
Public insurance (42-day delay) and better self-reported mobility (2 pt greater score)

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Giachino et al., In prep

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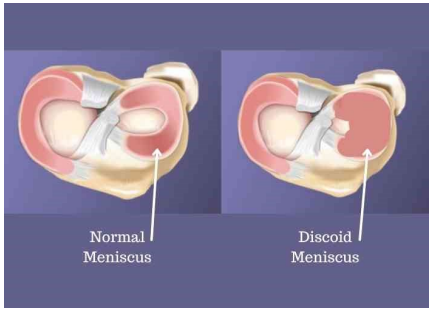
Surgical Research: Future Directions

Curt VandenBerg, MD

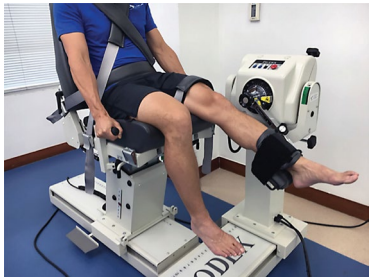
Welcome, Dr. VandenBerg

- Emphasis: cartilage health after surgery



Biomechanics integration

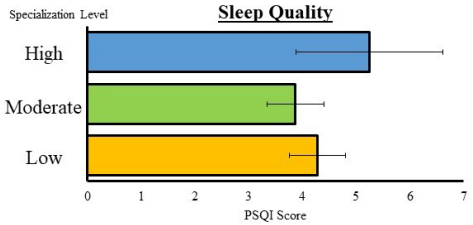
- Isokinetic and movement analysis investigations

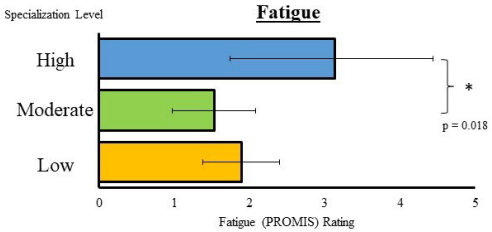


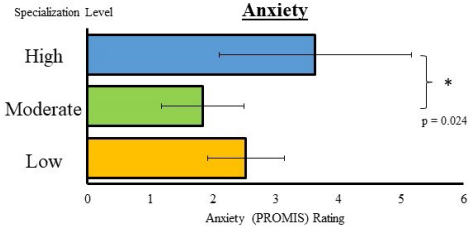
Early Youth Sport Specialization

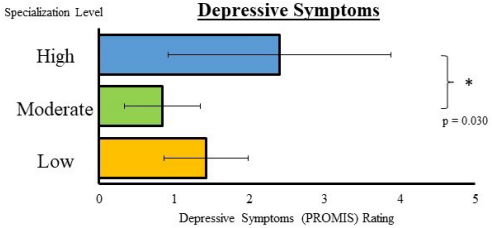
Greg Walker, MD

Kathryn Stockbower, MD









Highly specialized high school athletes report higher levels of fatigue, more anxiety symptoms, and more depressive symptoms than their moderately specialized peers

Stockbower et al., Phys Sportsmed, 2022

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Early Youth Sport Specialization

Greg Walker, MD

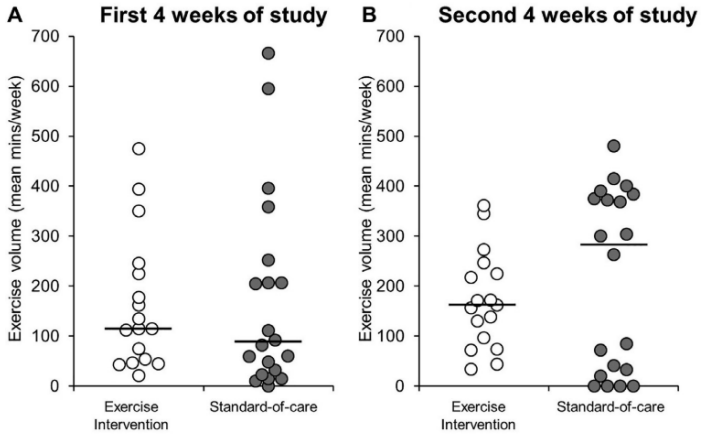
Casey Little

Variable	Exceeds age/volume recommendation	Meets age/volume recommendation	P value
Youth in my sport play too many games before college	Agree/Strongly Agree: 11 (33%)	Agree/Strongly Agree: 21 (16%)	0.03*
Female participants	7 (21%)	9 (7%)	
Male participants	4 (12%)	12 (9%)	
I wish I could spend more time playing other sports	Agree/Strongly Agree: 13 (39%)	Agree/Strongly Agree: 42 (33%)	0.50
Female participants	7 (21%)	21 (17%)	
Male participants	6 (18%)	21 (17%)	

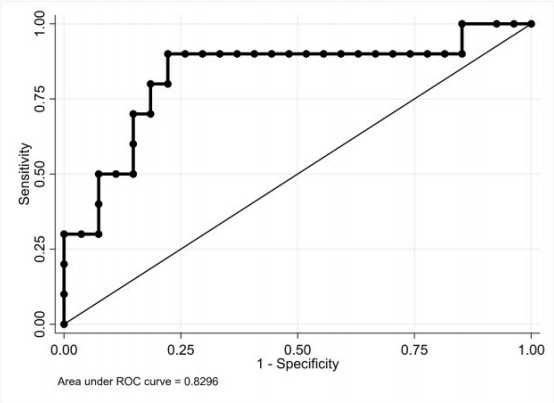
Athletes who spend more hours in sport than their age appear to perceive their competition load during youth sports to be excessive

Little et al., Phys Sportsmed, 2022

Concussion: Early Aerobic Exercise



Patients randomized to an individualized exercise recommendation (100 min/week) exercised at a similar volume as those not provided a recommendation.



Symptom resolution after 4 weeks of study: optimal cut point =

160 min/week aerobic exercise

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Howell et al., Am J Sports Med, 2021

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Early Intervention in High-Risk Patients

Julie Wilson, MD
&
David Howell, PhD

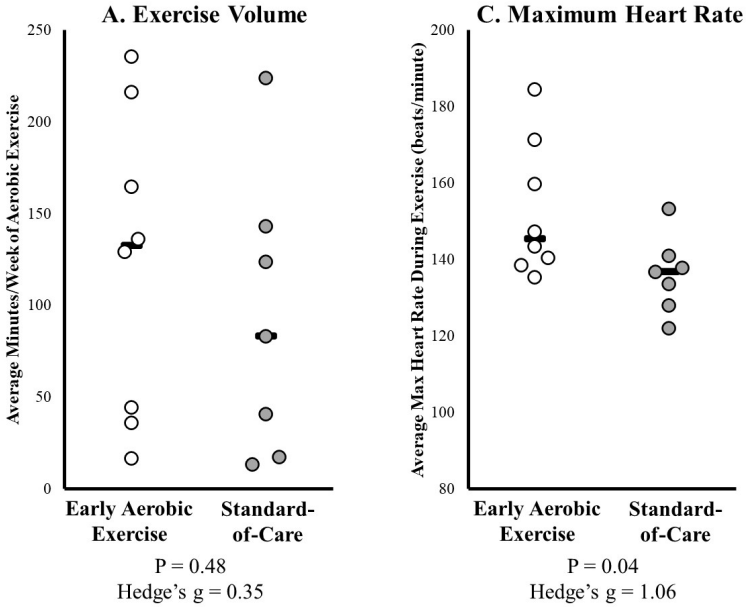
Mathew Wingerson

Pilot Study:

Can early aerobic exercise reduce risk of PPCS for those at highest risk (5P Risk Score ≥6)?

86% (6/7) – SOC developed PPCS

44% (4/9) – early exercise developed PPCS



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Howell et al., PT in Sport, 2022

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Post-Concussion Neuromuscular Training reduces 1-year injury risk

Julie Wilson, MD
&
David Howell, PhD

Cory Seehusen

For one year after concussion RTP

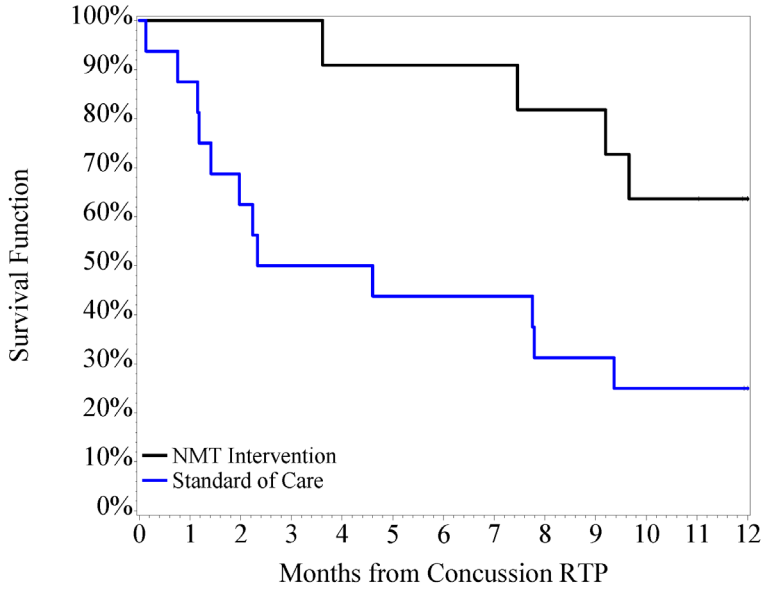
Intervention: **36%** (n=4/11)
sustained a sport-related MSK injury

Standard of Care: **75%** (n=12/16)
sustained a sport-related MSK injury

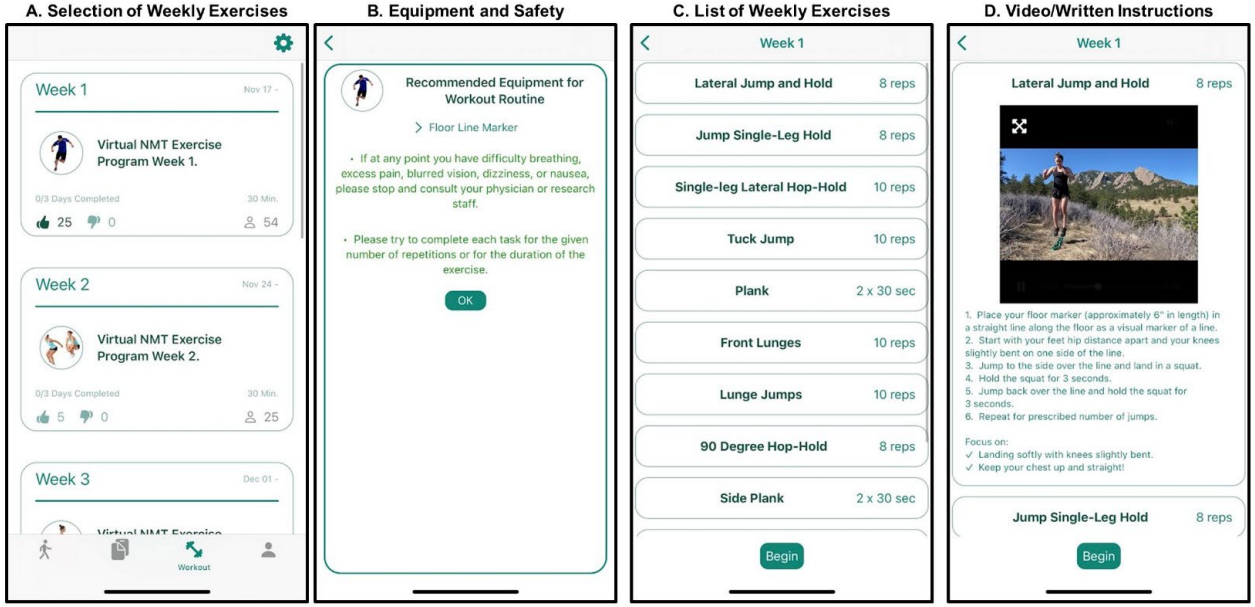
Hazard ratio = 3.56

(95% CI: 1.11 – 11.49; p = 0.03)

Adjusted for strata (sex and age)

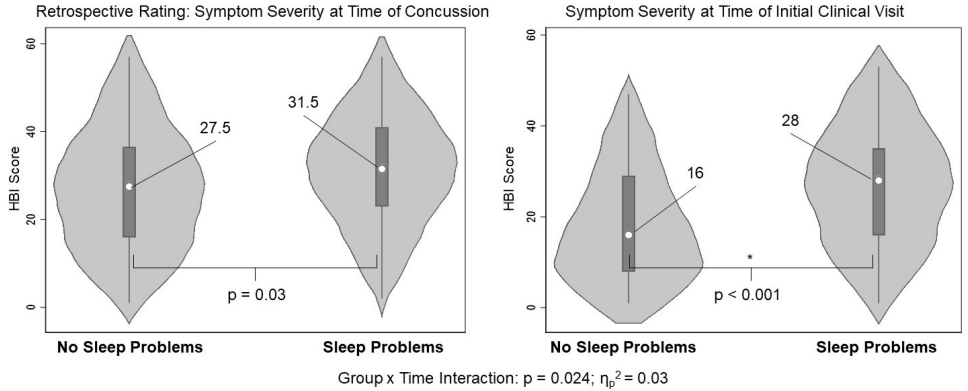


Translation to Virtual Environment



Screenshots of the Self-Guided virtual rehab program. Participants progress through each week using their smartphone, completing three sessions/week. Weekly check-ins with the research team ensure compliance and timely troubleshooting

Sleep as a Prognostic Indicator



Julie Wilson, MD
&
David Howell, PhD

Samantha Magliato

53% of those **with** sleep problems developed PPCS
31% of those **without** sleep problems developed PPCS
P = 0.004

After adjusting for *time of visit and pre-injury sleep problems*:
aOR = 2.02, [1.01, 4.06], p = 0.049

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Magliato et al., In Review

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Know a Potential Participant?

We are enrolling active/healthy adolescents in ongoing studies. Use the QR codes below to get in touch!

Understanding How Sleep Health Affects Recovery from Adolescent Concussion

Energy Availability and Quality of Life in Adolescent Athletes