Journal of Athletic Training

http://www.natajournals.org

Volume 54, Number 8, August 2019

Editor-in-Chief

Jay Hertel, PhD, ATC, FNATA University of Virginia

Associate Editors

David C. Berry, PhD, AT, ATC Saginaw Valley State University Paul A. Borsa, PhD, ATC, FACSM

University of Florida

Steven P. Broglio, PhD, ATC, FNATA

University of Michigan

Douglas J. Casa, PhD, ATC, FNATA, FACSM

University of Connecticut

Tracey Covassin, PhD, ATC, FNATA

Michigan State University

Jennifer E. Earl-Boehm, PhD, ATC, FNATA

University of Wisconsin-Milwaukee

Phillip A. Gribble, PhD, ATC, FNATA

The University of Toledo

Joseph M. Hart, PhD, ATC, FNATA, FACSM

University of Virginia

Kristin L. Kucera, PhD, MSPH, LAT, ATC University of North Carolina at Chapel Hill

Stephanie Mazerolle Singe, PhD, ATC, FNATA

University of Connecticut

Patrick O. McKeon, PhD, ATC, CSCS

Ithaca College

Jason P. Mihalik, PhD, CAT(C), ATC University of North Carolina at Chapel Hill

Joseph B. Myers, PhD, ATC

Tampa Bay Rays

James A. Oñate, PhD, ATC, FNATA

The Ohio State University

Brian Pietrosimone, PhD, ATC

University of North Carolina at Chapel Hill

Susan A. Saliba, PhD, PT, ATC, FNATA

University of Virginia

Stacy E. Walker, PhD, LAT, ATC, FNATA

Ball State University

Official publication of the following associations

National Athletic Trainers' Association Taiwan Athletic Trainers' Society Japan Athletic Trainers' Organization Athletic Rehabilitation Therapy Ireland

Clinical Applications Editors

Terry L. Grindstaff, PhD, PT, ATC, CSCS

Creighton University

Marjorie A. King, PhD, ATC, PT, FACSM

Plymouth State University

Senior Associate Editors

J. Ty Hopkins, PhD, ATC, FNATA, FACSM

Brigham Young University

Jennifer M. Hootman, PhD, ATC, FNATA, FACSM

Centers for Disease Control and Prevention

Darin A. Padua, PhD, ATC

University of North Carolina at Chapel Hill

Sandra J. Shultz, PhD, ATC, FNATA, FACSM

University of North Carolina at Greensboro

Tamara C. Valovich McLeod, PhD, ATC, FNATA

Arizona School of Health Sciences

Statistical Consultants

R. Curtis Bay, PhD

A.T. Still University

Heather M. Bush, PhD

University of Kentucky

Monica R. Lininger, PhD, LAT, ATC

Northern Arizona University

Stephen W. Marshall, PhD

University of North Carolina at Chapel Hill

Bryan L. Riemann, PhD, ATC, FNATA

Armstrong State University

Statistical Consultant Emeritus

Bruce M. Gansneder, PhD University of Virginia

Consulting Editors

Craig R. Denegar, PhD, PT, ATC, FNATA

University of Connecticut

Christopher D. Ingersoll, PhD, ATC, FNATA, FACSM

The University of Toledo

Kenneth L. Knight, PhD, ATC, FNATA, FACSM

Brigham Young University

David H. Perrin, PhD, FNATA, FACSM

University of Utah

Digital Applications Editor

Christopher M. Kuenze, PhD, ATC Michigan State University

Managing Editor

Leslie E. Neistadt, ELS

Editor

Kevin P. Clear

Indexes: Currently indexed in MEDLINE, PubMed Central, Physical Education Index, SPORT Discus (SIRC: Sport Information Resource Centre, Canada), CINAHL (Cumulative Index to Nursing & Allied Health Literature), AMED (Allied and Alternative Medicine Database), EMBASE (Elsevier Science), Science Citation Index, Current Contents/Clinical Medicine, Science Citation Index Expanded (SciSearch), Journal Citation Reports/Science Edition, Biological Abstracts, and BIOSIS Previews.

The Journal of Athletic Training (ISSN 1062-6050) is published monthly (\$267 for 1-year institutional subscription; \$303 foreign) by the National Athletic Trainers' Association, Inc, 1620 Valwood Parkway, Ste. 115, Carrollton, TX 75006. Periodicals postage paid at Carrollton, TX, and at additional mailing offices. Claims for copies lost in the mail must be received within 90 days (180 days foreign) of the issue date to ensure replacement at no charge.

POSTMASTER: Send address changes to Journal of Athletic Training, c/o NATA, 1620 Valwood Parkway, Ste. 115, Carrollton, TX 75006. CHANGE OF ADDRESS: Request for address change must be received 30 days prior to date of issue with which it is to take effect. Duplicate copies cannot be sent to replace those undelivered as a result of failure to send advance notice. ADVERTISING: Although advertising is screened, acceptance of the advertisement does not imply NATA endorsement of the product or the views expressed. Rates available upon request. The views and opinions in the Journal of Athletic Training are those of the authors and are not necessarily of the National Athletic Trainers' Association, Inc.

Copyright 2019 by the National Athletic Trainers' Association, Inc. All rights reserved. Printed in the United States. The Journal of Athletic Training is printed on paper that meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).



Editorial Board

William M. Adams, PhD, ATC University of North Carolina at Greensboro

Jatin P. Ambegaonkar, PhD, ATC, OT, CSCS

George Mason University

Christopher M. Bailey, PhD Case Medical Center

David R. Bell, PhD, ATC University of Wisconsin-Madison

Michael F. Bergeron, PhD SIVOTEC Analytics

J. Troy Blackburn, PhD, ATC University of North Carolina at Chapel Hill

Michelle C. Boling, PhD, LAT, ATC University of North Florida

Thomas G. Bowman, PhD, ATC University of Lynchburg

Christopher R. Carcia, PhD, PT Duquesne University

Shane V. Caswell, PhD, ATC George Mason University

Damien Clement, PhD, ATC, CMPC, NCC West Virginia University

Michael W. Collins, PhD University of Pittsburgh

R. Dawn Comstock, PhD Colorado School of Public Health

Nicole Cosby, PhD, ATC Point Loma Nazarene University

Kevin M. Cross, PhD, PT, ATC University of Virginia

Gianluca Del Rossi, PhD, ATC, FNATA University of South Florida

Eamonn Delahunt, PhD, BSc (Physiotherapy) University College Dublin

Lindsay J. DiStefano, PhD, ATC University of Connecticut

Carrie L. Docherty, PhD, ATC, FNATA Indiana University

Thomas P. Dompier, PhD, LAT, ATC Datalys Center for Sports Injury Research and Prevention, Inc

Jeffrey B. Driban, PhD, ATC, CSCS Tufts Medical Center

Kyle T. Ebersole, PhD, ATC University of Wisconsin-Milwaukee

Ruben Echemendia, PhD PANBA, Inc

Todd A. Evans, PhD, ATC University of Northern Iowa

Reed Ferber, PhD, ATC, CAT(C) University of Calgary, Canada Sandra Fowkes Godek, PhD, ATC West Chester University

Matthew S. Ganio, PhD University of Arkansas

Kevin M. Guskiewicz, PhD, ATC, FNATA, FACSM University of North Carolina at Chapel Hill

Jolene M. Henning, EdD, ATC High Point University

Lee Herrington, PhD, MSc, MCSP University of Salford, United Kingdom

Mark Hoffman, PhD, ATC, FNATA Oregon State University

Yuri Hosokawa, PhD, ATC Ritsumeikan University

Tricia J. Hubbard-Turner, PhD, LAT, ATC, FNATA University of North Carolina at Charlotte

oniversity of North Carolina at On

Daniel A. Judelson, PhD Nike Sport Research Lab

Thomas W. Kaminski, PhD, ATC, FNATA, FACSM University of Delaware

Zachary Y. Kerr, PhD, MPH University of North Carolina at Chapel Hill

Sarah B. Knowles, PhD, MPH
Palo Alto Medical Foundation Research
Institute

Michael C. Koester, MD, AT Ret Slocum Center for Orthopedics and Sports Medicine

Roger O. Kollock, PhD, ATC, CSCS The University of Tulsa

Kenneth C. Lam, ScD, ATC A.T. Still University

Kevin G. Laudner, PhD, ATC, FACSM Illinois State University

Carl G. Mattacola, PhD, ATC, FNATA University of Kentucky

Timothy A. McGuine, PhD, ATC University of Wisconsin, Madison

Jennifer M. Medina McKeon, PhD, ATC, CSCS Ithaca College

Kevin C. Miller, PhD, ATC Central Michigan University

Anh-Dung Nguyen, PhD, ATC High Point University

Sakiko Oyama, PhD, ATC The University of Texas at San Antonio

Riann M. Palmieri-Smith, PhD, ATC, FNATA University of Michigan

Scott G. Piland, PhD, ATC The University of Southern Mississippi

William A. Pitney, EdD, ATC, FNATA Northern Illinois University

Johna K. Register-Mihalik, PhD, LAT, ATC Matthew Gfeller Sport-Related TBI Research Center

Scott E. Ross, PhD, ATC, FNATA University of North Carolina at Greensboro

Eric L. Sauers, PhD, ATC, FNATA Arizona School of Health Sciences

Randy J. Schmitz, PhD, ATC, FNATA University of North Carolina at Greensboro

JoEllen Sefton, PhD, ATC, CMT Auburn University

Susan M. Sigward, PhD, PT, ATC University of Southern California

Michael R. Sitler, EdD, ATC, FNATA Temple University

Chad Starkey, PhD, ATC, FNATA Ohio University

Erik E. Swartz, PhD, ATC, FNATA University of New Hampshire

David I. Swedler, PhD, MPH University of Illinois at Chicago School of Public Health

Abbey C. Thomas, PhD, ATC University of North Carolina at Charlotte

Toni M. Torres-McGehee, PhD, SCAT, ATC

University of South Carolina

Bonnie L. Van Lunen, PhD, ATC Old Dominion University

Luzita I. Vela, PhD, LAT, ATC University of Virginia

Evert Verhagen, PhD EMGO Institute for Health and Care Research

Cailee E. Welch, PhD, ATC A.T. Still University

Erik A. Wikstrom, PhD, ATC, FACSM University of North Carolina at Chapel Hill

Gary B. Wilkerson, EdD, ATC, FNATA University of Tennessee, Chattanooga

Jonathan E. Wingo, PhD University of Alabama

Susan W. Yeargin, PhD, ATC University of South Carolina