

Journal of Athletic Training

<http://www.natajournals.org>

Volume 54, Number 3, March 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

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 M. Mazerolle, 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
Lynchburg College

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

Tracey Covassin, PhD, ATC, FNATA
Michigan State 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

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