



ALAN NEEDLE, PHD, LAT, ATC, CSCS

PRIMARY INVESTIGATOR

Dr. Alan Needle currently serves as an Associate Professor and director of the Injury Laboratory at Appalachian State University, where he is faculty within the Master of Science in Athletic Training and Master of Science in Exercise Science programs. Dr. Needle is alumnus of Boston University (BS, Athletic Training, 2007) and the University of Delaware (MS, Exercise Science, 2009; Ph.D., Biomechanics & Movement Science, 2013). His research has attempted to identify and treat neuromechanical impairments that follow musculoskeletal injury, with a general focus on ankle sprains and chronic ankle instability. The long-term goal of his research line is to offer screening tools and treatment strategies that identify and correct abnormalities in the nervous system's control of joint motion, such that risk of injury recurrence is minimized.



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"HOW TO TRAIN PATHWAYS: TARGETED REHABILITATION OF ANKLE INSTABILITY THROUGH NEUROLOGICAL PATHWAYS"

PROFESSIONAL GRANT PROGRAM: GENERAL CATEGORY

Funding: \$57,349

STUDY SUMMARY:

In order to combat changes in the central nervous system that potentially predispose individuals to recurrent injuries, such as in the case with ankle sprain & chronic ankle instability (CAI), this randomized controlled study will explore the effects of neuromodulatory interventions on ankle and patient-reported function. Patients will be randomized to 4-week intervention of rehabilitation + transcranial direct current stimulation (tDCS) or rehabilitation + sham-tDCS (rehab only). tDCS runs a low level current through the brain, that when coupled with motor tasks can facilitate plastic changes in the brain and enhance motor learning. Rehabilitation will consist of dynamic balance & agility training while they receive tDCS or sham-tDCS over their motor cortex, pre-frontal cortex. We will measure patient-reported function, balance & hopping performance, and neurophysiologic function (cortical excitability, activation) before and throughout the 4-week intervention, as well as 2-weeks following the intervention. We expect that the use of tDCS in conjunction with rehabilitative exercise will cause improvements in neurophysiologic function that translates towards better performance and patient-reported outcomes beyond the sham current group.

IMPACT ON THE AT PROFESSION

This project offers a direct impact to the profession by investigating new, clinically accessible options in the treatment of chronic ankle instability. Our previous preliminary study found that restoring neural excitability with tDCS translated to improved functional & patient-reported outcomes. This next phase will allow us to better determine what location or pathways within the central nervous system are the optimal target for these neuromodulatory interventions. The funding from the NATA foundation is making this effort possible by providing personnel resources to conduct the study, as well as resources for the recruitment and retention of individuals with CAI through a 4-week intervention and obtaining crucial supplies that will facilitate the study's completion. It is our hope that the success of this research will open the door for subsequent investigations across a myriad of musculoskeletal pathologies, such as ACL injury, glenohumeral instability, and recurrent muscle strains.