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Original Research

The Feasibility and Effects of Acupuncture in an Adolescent Nordic Ski Population

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Abstract

Background: Studies investigating the use and effectiveness of acupuncture in adults after exercise have been well documented. Fewer studies involving acupuncture have been completed in the adolescent athlete population. To our knowledge, there are no published studies that investigate the use of acupuncture in adolescent athletes within their field of play.
Objective: To primarily assess the feasibility of performing acupuncture in adolescent Nordic skiers within their athletic environment, and secondarily to measure the effect of acupuncture on muscle soreness and sense of well-being.
Design: Prospective feasibility study.
Setting: Local outdoor cross country ski trails and indoor lodge.
Participants: Fifteen healthy participants (80% female, 20% male; age 14-17 years) were involved on at least 1 of 5 treatment days.
Intervention: Fifteen-minute treatments were administered using traditional needle acupuncture following the first 5 consecutive Nordic Ski Team practices of the season in an attempt to capture the effect of acupuncture on delayed-onset muscle soreness (DOMS). Acupuncture points specific to muscle groups in the lower limbs that are commonly reported as painful during Nordic skiing were chosen. Pre- and posttreatment surveys included visual analogue scales (VAS) to track participant responses.
Outcome Measures: Time, cost, side effects, and participant to provider ratio was observed to determine feasibility. Effect on muscle soreness and sense of well-being was measured via pre- and posttreatment VAS (0-10) rating analyses.
Results: Total time required by research staff on treatment days was 90 minutes; total cost, $1500; temperature range, −13.9°C to −2.8°C, and largest participant to acupuncturist ratio, 7:1. No major side effects occurred. The majority (73%) of participants reported minimal side effects; most common was treatment site pain. The overall pre- to posttreatment effect on muscle soreness (average over 5 days) demonstrated significantly improved posttreatment scores ($P = .04$). The effect of the day (average over pre- and posttreatment values) demonstrated significantly higher muscle soreness scores on day 3 versus day 1 ($P = .03$). At study completion, all participants indicated that they would consider acupuncture in the future and would recommend treatments to friends or teammates.
Conclusion: Providing acupuncture to adolescent Nordic ski athletes in the practice field under extreme temperatures is feasible with the appropriate resources. Despite mild side effects, acupuncture was well received by the athletes. Lessons learned from this trial can provide a framework for delivering acupuncture to other athletes in their training environment.
Level of Evidence: To be determined.

Introduction

Acupuncture is one of the world's oldest recognized medical therapies. Originating more than 2500 years ago in China [1], acupuncture continues to be used as a means to maintain health, to relieve pain, and to treat a wide range of illnesses. Acupuncture treatment involves stimulation of specific points in the body by the insertion of fine, pre-sterilized, stainless steel needles. This stimulation generates many responses within the nervous and endocrine system and can affect muscles and the circulatory system as well as antibody production and hormone output [2,3]. Current research demonstrates that acupuncture may increase the body's

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release of natural painkillers, such as endorphins and serotonin, modifying pain pathways in the brain and spinal cord [4-6].

The effects of acupuncture on performance and postexercise recovery in athletes and healthy adults have been studied over the years [7]. Studies have shown that acupuncture reduces perceived pain arising from exercise induced muscle soreness, reduces muscle spasm and provides positive effects on mood state [8]. Acupuncture has also been shown to serve as an adjunct to improve muscle strength training and to accelerate recovery from workouts and injury, all of which are important applications in the athlete population [9,10]. DeWeber et al used auricular acupuncture (AA) during Paralympic sports in the 2010 Warrior Games [11]. This case series demonstrated that AA could reduce pain during events and allowed participants to resume competition. Two systematic reviews found mixed results when studying the use of acupuncture as an ergogenic aid. Findings in these studies suggested that acupuncture could potentially increase strength, power, and aerobic activity in varying degrees of effectiveness. Many studies reviewed involve nonathlete populations, and study findings may not correlate with actual athletes [2]. One small study by Abe et al demonstrated a reduction in pain in paraplegic athletes following acupuncture treatment, after the athletes failed to have pain improvement with pharmacologics [12]. Acupuncture applied to college basketball players resulted in reduced heart rate, VO_2 max, and blood lactic acid levels 30 minutes after exercise and reduced blood lactic acid levels at 60 minutes after exercise [12]. These athletes were studied following exertion on stationary bikes and not during actual basketball competition. Another study involving young soccer players aged 15-16 years demonstrated increased power with cycling after acupuncture treatments; however, this study was also performed in a controlled laboratory setting and did not involve their specific sport [13].

The majority of previous studies regarding acupuncture use in athletes have focused on the adult population, in which acupuncture treatments were conducted in a laboratory setting after exercise and the induction of muscle fatigue. There are few studies that have performed acupuncture in the training field under true sports performance conditions. Acupuncture has been widely performed and studied in the pediatric population and has been shown to be safe when performed by appropriately trained acupuncturists [14,15]. However, there have been very few studies investigating the effects of acupuncture in the adolescent athlete population. The goal of the current study was to explore the feasibility of using acupuncture in an adolescent athlete population in their true training environment. As a secondary objective, we also measured the effects of acupuncture treatment on muscle soreness and overall sense of well-being by administering pre- and post-treatment surveys to our participants.

Methods

Study Design

This was a prospective study to determine the feasibility of acupuncture interventions within a specific population. The study also used an observational design to measure effects of the intervention over a 5-day treatment period. There was no long-term follow-up, randomization, or blinding. Institutional review board approval was obtained prior to the recruitment of subjects for this study.

Participants

The adolescent athletes intended for this study were recruited at the local Nordic Ski Team preseason information sign-up meeting. This meeting was attended by all local adolescent athletes between grades 7 and 12 who planned to participate in the Nordic ski recreational or competitive ski groups. With ski coach cooperation, the Primary Investigator (PI), Co-Primary Investigator (Co-PI), and Licensed Acupuncturist presented the proposed research study to the athletes and their parents, followed by a live demonstration of the actual treatment by the Licensed Acupuncturist performed on the PI. Each athlete interested in participating was given a consent form that both the adolescent and parent could read, discuss, and sign at home over the following 3 weeks. Extra consent forms were available on each treatment day for those who chose to opt into the study. Informed consent was given by all participants and their parents. The coaches' permission and cooperation to conduct and execute this study was required; however, they had no influence on athlete involvement.

Participants were included in this study if they were between the ages of 13 and 18 years, were male or female members of the local Nordic Ski Team, reported no current musculoskeletal injuries, and were generally healthy individuals who planned to complete the season barring injury or other unexpected events. Participants were excluded from this study if they had received acupuncture treatment within the past year or had a known active musculoskeletal injury or condition, immunocompromised state, prosthetic heart valve, pregnancy, or bleeding disorder.

Intervention

There were a total of 5 treatment days that corresponded to the number of practices in the first 2 weeks of the Nordic Ski team season (Monday through