# Clinical Trial Protocol
# Iranian Registry of Clinical Trials

18 Sep 2026

## Effect of Neuromuscular and Neurofeedback Training on Balance and Plantar Pressure Variables of Table Tennis Players with Chronic Ankle Instability

## Protocol summary

**Study aim**
The aim of this study is to determine the effect of neurofeedback and neuromuscular training on fluctuations in the center of pressure, balance and proprioception sense of the ankle joint in table tennis players with chronic ankle instability.

**Design**
Double Blind Randomized Clinical Trial

**Settings and conduct**
A total of 30 elite male table tennis players with chronic ankle instability were randomly assigned to two groups of neuromuscular training and combination training (neurofeedback + neuromuscular) and do exercises related to their group for eight weeks. Pre-test and post-test (after eight weeks of training) data were recorded and will be analyzed.

**Participants/Inclusion and exclusion criteria**
The inclusion criteria in this study were based on the International Ankle Consortium. Inclusion criteria for CAI subjects' disorders were acute ankle sprain leading to swelling, pain, and loss of functional activity for at least one day, giving way at least twice in the past six months, getting a score of less than 24 on the Cumberland Ankle Instability Tool, and getting a score of more than 5 on the ankle instability instrument. All participants in this study were members of the national team or champions in different age categories of adolescents, youth and adults. Exclusion criteria were lower limb injury, back pain or concussion in the six months prior to the study, neurological and postural disorders, history of fracture or lower limb surgery, and history of taking anti-depressants, anti-anxiety drugs and narcotics. An orthopedic specialist performed examinations to confirm participants' chronic ankle instability for the study.

**Intervention groups**
Neuromascular group Combination (neuromascular with neurofeedback) group

**Main outcome variables**
Neuromascular and Neurofeedback Training

## General information

**Reason for update**

**Acronym**

**IRCT registration information**
IRCT registration number: **IRCT20211018052799N1**
Registration date: **2021-12-01, 1400/09/10**
Registration timing: **retrospective**

Last update: **2021-12-01, 1400/09/10**
Update count: **0**

**Registration date**
2021-12-01, 1400/09/10

**Registrant information**

**Name**
Masoud Azizian
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**Recruitment status**
**Recruitment complete**

**Funding source**

**Expected recruitment start date**
2021-10-23, 1400/08/01

**Expected recruitment end date**
2021-11-22, 1400/09/01

**Actual recruitment start date**
empty

**Actual recruitment end date**
empty
**Trial completion date**
empty

**Scientific title**
Effect of Neuromuscular and Neurofeedback Training on Balance and Plantar Pressure Variables of Table Tennis Players with Chronic Ankle Instability

**Public title**
Effect of Neuromuscular and Neurofeedback Training on Chronic Ankle Instability
**Purpose**
Screening
**Inclusion/Exclusion criteria**
**Inclusion criteria:**
One year before the present intervention, they suffered from lateral ankle sprain injury.Activity of the participants. A score of 24 or higher on the Cumberland Questionnaire (Ankle Instability Assessment Tool)
**Exclusion criteria:**
No surgery, fractures or serious injuries to the ankle and lower limbs. No cardiovascular and respiratory diseases No smoking Lack of pes planus, pes cavus and hallux valgus Absence of deformity in the thoracic, cervical, pelvic, lumbar and lower extremities Lack of diabetes and diseases related to peripheral nerves No history of using any type of shoe or medical shoe, Do not use artificial limbs on the femur, knee and ankles
**Age**
From **18 years** old to **25 years** old
**Gender**
Male

**Phase**
N/A
**Groups that have been masked**

- Participant
- Data analyser

**Sample size**
Target sample size: **30**
**Randomization (investigator's opinion)**
Randomized
**Randomization description**
Participants were randomly divided into two groups of 15 people (neurofeedback and neuromuscular) and neuromuscular group using Random Number Generator software.
**Blinding (investigator's opinion)**
Double blinded
**Blinding description**
In this study, both the examiner and the participants were blind. Because participants in both groups were performing neuromuscular exercises, as well as being unaware of the other group and the application of the protocol in the other group, they assumed that the main protocol was being applied to them. Also, the examiner was not aware of the existence of different interventions and which group each participant was in
**Placebo**
Not used
**Assignment**
Parallel
**Other design features**

## Secondary Ids

empty

## Ethics committees

### 1

**Ethics committee**
**Name of ethics committee**
Research Ethics Committees of Bu Ali Sina University-Hamedan
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Bu-Ali Sina University, Shahid Mostafa Ahmadi Roshan Street, Hamedan
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**Approval date**
2021-10-13, 1400/07/21
**Ethics committee reference number**
IR.BASU.REC.1400.037

## Health conditions studied

### 1

**Description of health condition studied**
Chronic ankle instability
**ICD-10 code**
M25.37
**ICD-10 code description**
Other instability, ankle and foot

## Primary outcomes

### 1

**Description**
Variables derived from floor pressure system data (pressure foot) - static balance - dynamic balance - Properioception
**Timepoint**
Pre test_ Post test
**Method of measurement**
Plantar pressure system data (pressure foot)_ Biodex balance system_ Electrogoniometer

## Secondary outcomes

### 1

**Description**
Quality of Life Questionnaire

**Timepoint**
Anxiety and Depression Questionnaire
**Method of measurement**
Questionnaire

## Intervention groups

### 1

**Description**
Intervention group: Intervention group: Neuromuscular rehabilitation protocol was performed for 8 weeks 3 sessions per week for 30 minutes in each session. This training program, this exercises include One -legged knee flexion on three surfaces: flat, uneven surface and on balance boardToe stand with the help of the hand and without the help of the handOne-legged stand on three flat surfaces, uneven surface with eyes closed and on balance boardRunner's pose on three flat surfaces, uneven surface with eyes closed and on balance boardCross-legged sway with the help of the hand, without the help of the hand, without the help of the hand with the eyes closed and on balance board and Toe walk
**Category**
Rehabilitation

### 2

**Description**
Intervention group: The neurofeedback training was performed using an 8-channel ProComp Infiniti device (ProComp Infiniti Procomp2 thought technology co ltd. Canada) and the Biograpth infiniti version 5.0 software. Prior to training protocol, the neurofeedback specialist gave the patients a complete explanation of the components of the neurofeedback device and all the components that make this treatment method more effective. Prior to each training session, noise-causing devices or artifacts such as rings, belts, cell phones and bank cards were placed away from the training area. The treatment protocol of the present study was performed for 8 weeks, 3 sessions per week and each session for 30 minutes . The patient would sit comfortably on a chair to perform the training protocol. Neurofeedback specialist identified 10-20 O1 and O2 points based on the international system, then the area and earlobe were cleansed with medical alcohol and Nuprep exfoliating gel (Nuprep, Weaver, USA). Then, the active electrode on the O1 region and the reference electrode on the O2 region were glued by Ten20 conductive paste (Weaver, USA) and the ground electrode was placed on the right ear .
**Category**
Rehabilitation

## Recruitment centers

### 1

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**Grant name**
**Grant code / Reference number**
**Is the source of funding the same sponsor organization/entity?**
Yes
**Title of funding source**
Bu Ali Sina university ethics committee in research
**Proportion provided by this source**
100
**Public or private sector**
Public
**Domestic or foreign origin**
Domestic
**Category of foreign source of funding**
*empty*
**Country of origin**

**Type of organization providing the funding**
Academic

## Person responsible for general inquiries

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## Sharing plan

**Deidentified Individual Participant Data Set (IPD)**
Yes - There is a plan to make this available
**Study Protocol**
Yes - There is a plan to make this available
**Statistical Analysis Plan**
Not applicable
**Informed Consent Form**
Yes - There is a plan to make this available
**Clinical Study Report**
Yes - There is a plan to make this available
**Analytic Code**
Yes - There is a plan to make this available
**Data Dictionary**
Not applicable
**Title and more details about the data/document**
Data files measured by testers will be shared after the study if needed.
**When the data will become available and for how long**
Start the course one year after the publication of results and articles
**To whom data/document is available**
Researchers and researchers whose field of work is similar to the present research and are employed in universities
**Under which criteria data/document could be used**
The data of the present study will be provided to other researchers only for comparison with future studies and the use of data and their analysis is not allowed.

**From where data/document is obtainable**

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**What processes are involved for a request to access data/document**

A full description of the research should be provided and the details of the use of the data should be fully described.

**Comments**