EFFECT OF A DERMATOME NEUROPOINT ACTIVATING SOCKS ON OVERALL BALANCE AND STABILITY USING THE SWAY MEDICAL APPLICATION

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INTRODUCTION

Dynamic and static stability and balance along with postural sway have been identified as having an impact on athletic performance, fall risk, general mobility and overall quality of life.

Recently, socks developed using principles of dermatome and neuro-activation have been touted as being able to enhance balance and stability by promoting optimal proprioception and neural connectivity. If wearing such a sock were to improve both balance and stability it could lead to beneficial effects on gait, postural stability, lateral mobility and dynamic and static knee loading in sports and activities where socks use is common. Improvements in dynamic knee loading that reduce risk of ACL injury may be an important consideration. This study tested the hypothesis that wearing a dermatome and neuro-activating socks improves balance and stability.

METHODS

69 subjects (44M, 25F) participated in this study after providing IRB- approved informed consent. A priori sample size estimation indicated a desired population of 36 for an effect size of 0.25.
Inclusion criteria included: (a) no current pain limiting movement, and (b) no foot or knee condition that would limit the ability to wear the socks. Two socks conditions were utilized for the study: DNS- Dermatome Neuropoint Socks (Voxx PFA Socks, Voxx Sports Inc.); RS - Regular Socks (No Name Athletic Socks). The process involved taking a Sway Medical Balance assessment with RS and then the subject replacing the RS socks with the DNS socks and completing the Sway Medical Balance assessment.

Sway Balance is an FDA-cleared mobile balance testing system that measures and scores an individual's balance and stability and can be used to monitor for signs of balance-related dysfunction.

Sway Medical measures stability using the built in motion sensors of any iOS mobile device to quantify postural sway. While the device is pressed against the chest, a proprietary motion analysis algorithm calculates stability and provides an easy to understand value on a 100 point scale with 100 being completely stable and 0 being unstable.

The Overall Score is comprised of the statistical mean of all previous test scores and serves as a baseline or control that can be compared against the latest score to detect change.

A Sway Medical Overall Score of between 80 and 85 is in the 50th percentile. Overall Scores between <80 the 25th percentile and Overall Scores between >85 and 95 are in the 75th percentile.

One-way ANOVA F test was performed to compare and identify change in means in DNS and RS Overall Scores: (ANOVAN, Matlab, MathWorks, Inc.), with post-hoc Tukey's HSD comparisons to identify differences between the 2 socks conditions and between sides (MULTCOMPARE, Matlab, MathWorks, Inc.). An a priori significance level of =0.05 was used for all tests.

RESULTS AND DISCUSSION

Socks condition was a significant main effect. Post-hoc analysis showed that Overall Score was significantly higher for DNS Socks than RS Socks.

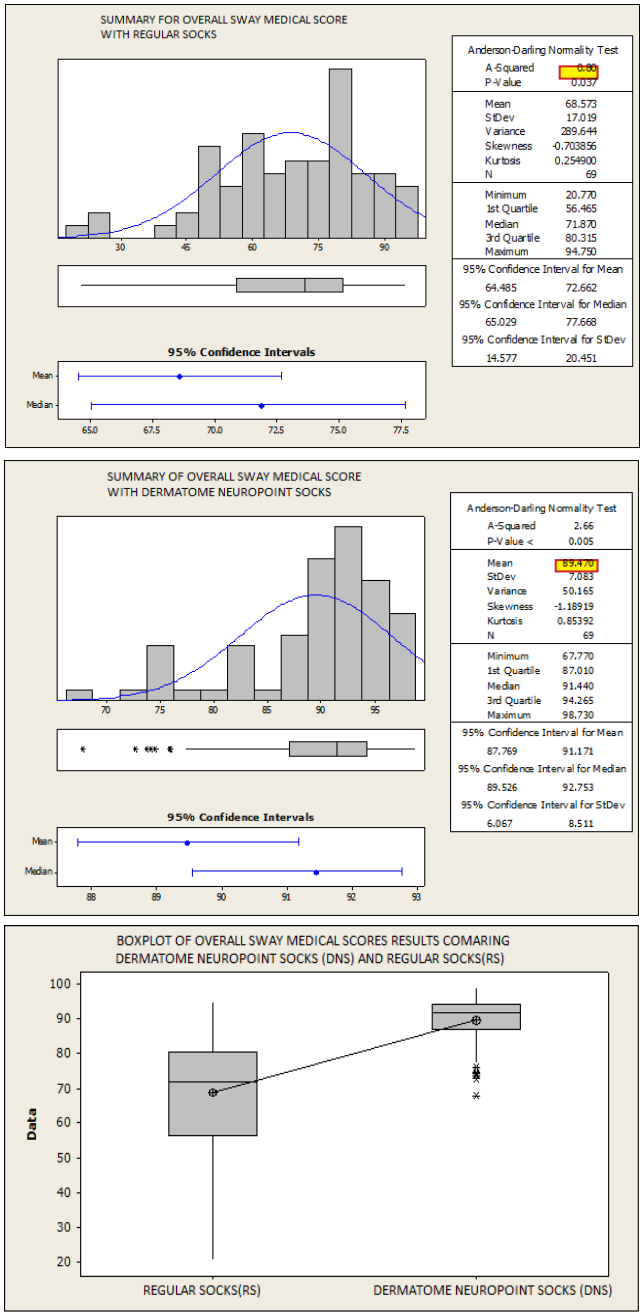

Figure 1, 2, 3 Population marginal means for Overall Score with 95% confidence intervals Dermatome Neuropoint Socks (DNS) and Regular Socks (RS). The DNS Socks appeared to influence neuromuscular balance and stability control during the Sway Medical testing by increasing the Overall Score relative to the Regular Socks (RS). The increase between Socks Conditions was **36.1%**.

DATA HIGHLIGHTS:

- 31% Increase in Mean Sway Score
- 36% Increase in Sway Score with 95% CI

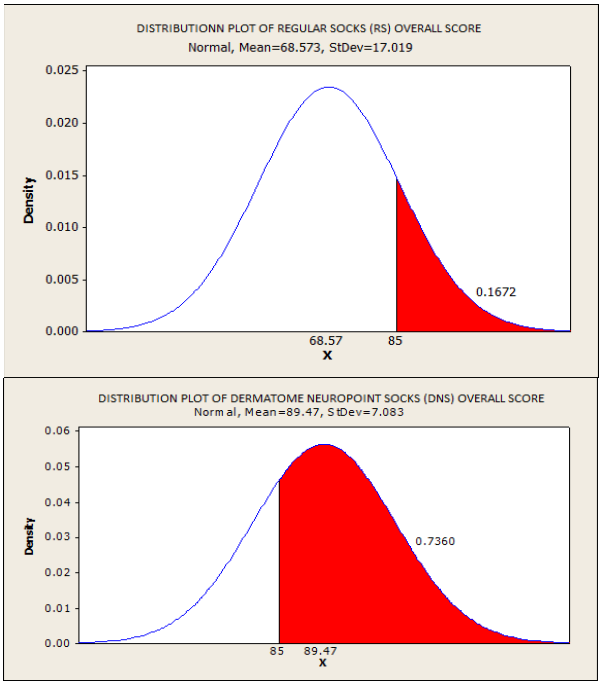

Figure 4, 5 It is also noted that the Socks Condition was a significant effect Overall Score Population Distribution. Whereas the Regular Socks (RS) condition yielded a population of 16.72% with an Overall Score of greater than 85%. The Dermatome Neuropoint Socks (DNS) yielded a population of 73.6% with an Overall score of greater than 85%. Given the potential benefits from Dermatome Neuropoint Socks (DNS), such as a reduction in known biomechanical injury risk factors and improved balance and stability, health, wellness and athletic organizations and authorities may consider general recommendation of the use of DNS socks.

CONCLUSIONS

This study demonstrated an improvement in Overall Balance and Stability Scores in subjects wearing Dermatome Neuropoint Socks (DNS) compared to Regular Socks (RS).

Future prospective studies are needed to test the persistence of this phenomenon, whether the results carry over to socks that provide pain relief, and whether these observed differences in Overall Scores lead to reduced injury rates.

ACKNOWLEDGEMENTS

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TESTING CASE: DETERMINING EFFICACY OF VOXX PERFORMANCE SOCKS USING RATE of FORCE DEVELOPMENT TESTING METHODOLOGY

TESTING FACILITY: The CALIFORNIA SPORT INSTITUTE FOOTBALL (16)

SPORT: BASKETBALL (14)

ABSTRACT:

Voxx Performance Socks are theorized to positively affect sports performance by their proprietary technology that they embed in their products. The technology is purported to activate dermatomes that have a direct connect to the mid-brain and therefore 'green-light', or turn on portions of the mid-brain that would increase nervous system sensitivity thus affecting, strength, balance, and via a different pathway, respiratory efficiency.

Methodology:

Subjects included thirty (30) experienced athletes, sixteen (16) American Football professional and collegiate players; and fourteen (14) professional and collegiate basketball players. All subjects were each asked to perform Counter Movement Jumps (CMJ) and Squat Jumps (SJ) and were tested using a force-plate calibrated Myotest unit.

Group A: 20 athletes, were each given the same brand and cut of athletic sock (Nike brand, short sock) and each given a pair of Voxx Performance Socks. Each athlete performed 5 CMJs with the Nike sock, removed the Nike socks, rested 10 minutes and then performed the same 5 CMJs wearing the Voxx Performance Socks. This was methodology was repeated executing the SJs.

Group B (Control): 10 athletes, were each given the same brand and cut of athletic sock (Nike brand, short sock) and each given the New Balance version of the short sock also devoid of any performance affecting technology. Each athlete performed 5 CMJs with the Nike sock, removed the Nike socks, rested 10 minutes and then performed the same 5 CMJs wearing the New Balance socks. This was methodology was repeated executing the SJs.

Each group repeated the above tests an additional two more times with three days between tests. The results appearing below were tabulated inclusively over the three testing days as testing between days was statistically insignificant.

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TEST: COUNTER MOVEMENT JUMP

Method: Upon Myotest unit cue, the subject squats down quickly and immediately explosively jumps as high as possible. The subject then lands and re-sets and awaits the next cue to repeat the process. The subject executed 5 jumps.

GROUP A Results:

Jump using neutral sock	Jump using Voxx sock	% Difference
Average Power (W): 3,536	Average Power (W): 4,172	+18
Average Concentric Force (N): 1,955	Average Concentric Force (N): 2,295	+17
Average Eccentric Force (N): 1,360	Average Eccentric Force (N): 1,585	+17
Average Velocity (cm/s): 224.2	Average Velocity (cm/s): 262.32	+17
Average Time to Execute (ms): 730	Average Time to Execute (ms): 672	+08 (Improvement in Performance)

GROUP B (Control) Results:

Jump using neutral sock (Nike)	Jump using Neutral sock (NB)	% Difference
Average Power (W): 3,312	Average Power (W): 3,113	-06
Average Concentric Force (N): 1,631	Average Concentric Force (N): 1,517	-07
Average Eccentric Force (N): 1,317	Average Eccentric Force (N): 1,186	-10
Average Velocity (cm/s): 238.8	Average Velocity (cm/s): 212.3	-11
Average Time to Execute (ms): 830	Average Time to Execute (ms): 896	-08 (Decrease in Performance)

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TEST: SQUAT JUMP

Method: Upon Myotest unit cue, the subject squats down to a position of 90-degrees (as measured on the back of the knee joint) and holds that position statically until cued again by the unit to immediately explosively jumps as high as possible. The subject then lands and re-sets and awaits the next cue to repeat the process. The subject executed 5 jumps.

GROUP A Results:

Jump using neutral sock	Jump using Voxx sock	% Difference
Average Power (W): 3,110	Average Power (W): 3,545	+14
Average Concentric Force (N): 1,790	Average Concentric Force (N): 1,986	+11
Average Eccentric Force (N): 0	Average Eccentric Force (N): 0	-
Average Velocity (cm/s): 202.3	Average Velocity (cm/s): 218.16	+08
Average Time to Execute (ms): 735	Average Time to Execute (ms): 669	-09 (Improvement in Performance)

GROUP B (Control) Results:

Jump using neutral sock (Nike)	Jump using Neutral sock (NB)	% Difference
Average Power (W): 2,912	Average Power (W): 2,796	-04
Average Concentric Force (N): 1,570	Average Concentric Force (N): 1,491	-05
Average Eccentric Force (N): 0	Average Eccentric Force (N): 0	-
Average Velocity (cm/s): 231.9	Average Velocity (cm/s): 223.4	+04
Average Time to Execute (ms): 478.8	Average Time to Execute (ms): 486.1	+02 (Decrease in Performance)

RFD Analysis:

Average Power:

Group A: There was an average 18% increase in average wattage output in executing the CMJ and a 14% increase in average wattage in executing the SJ when performing the jumps wearing the VOXX socks as opposed to not wearing the Voxx socks.

Group B (Control): There was an average 6% decrease in average wattage output in executing the CMJ and a 4% decrease in average wattage in executing the SJ when performing the jumps wearing the Nike control socks as opposed to wearing the New Balance socks.

Average Concentric Force:

Group A: There was an average 17% increase in average force production in executing the CMJ and a 11% increase in average force production in executing the SJ when performing the jumps wearing the VOXX socks as opposed to not wearing the Voxx socks.

Group B (Control): There was an average 7% decrease in average force production in executing the CMJ and a 5% decrease in average force production in executing the SJ when performing the jumps wearing the Nike control socks as opposed to wearing the New Balance socks.

Average Eccentric Force:

Group A: There was an average 17% increase in average force production in executing the CMJ performing the jumps wearing the VOXX socks as opposed to not wearing the Voxx socks.

Group B (Control): There was an average 10% decrease in average force production in executing the CMJ when performing the jumps wearing the Nike control socks as opposed to wearing the New Balance socks.

Average Velocity:

Group A: There was an average of 17% increase in the velocity produced in executing the CMJ and an 8% increase performing the SJ wearing the VOXX socks as opposed to not wearing the Voxx socks.

Group B (Control): There was an average of 11% decrease in the velocity produced in executing the CMJ and a 4% decrease performing the SJ wearing the Nike control socks as opposed to wearing the New Balance socks.

Average Time to Execute:

Group A: There was an average 8% decrease in the length it took to generate force in executing the CMJ and a 9% decrease in performing the SJ wearing the VOXX socks as opposed to not wearing the Voxx socks.

Group B (Control): There was an average 8% increase in the length it took to generate force in executing the CMJ and a 2% increase in performing the SJ wearing the Nike control socks as opposed to wearing the New Balance socks.

Discussion:

That *velocity, average power and force - both eccentric and concentric* - productions all notably increased when all tested subjects donned the Voxx Performance Socks as compared to when wearing the neutral socks is very interesting. Notably as well, is the decrease in time it took to generate force while wearing the Voxx socks as opposed to not wearing that product.

The on-going off-season training of each athlete had been completely designed and monitored and in all previous Rate of Force Production jump training tests there had never been one single recorded jump test that showed an increase in any performance parameter within a single workout session. (As evidenced by the normal degradation in performance of the control group between jumps, a 10 minute rest period between bouts of activity - as tested by a plethora of researchers in multiple studies - is not enough time to regenerate the CNS and muskoloskeletal processes to engender on average a statistically significant increase in power-based performances. As expected our control group had predictable decreases in performance).

It was entirely unexpected therefore, that the athletes who wore the Voxx socks product improved dramatically their performance across the board. The mechanisms of this remarkable transformative result is not completely understood by this researcher but that the change in performance was so profound there indeed does seem to be some process going on that is instigated by the proprietary technology imbedded into the Voxx socks.

The concept of a direct linkage between large (in concentration) dermatome sites and the mid-brain is not novel but that mechanism has never been fully studied and deconstructed to this researcher's knowledge. Having said that; that the Voxx socks does produce clinically measurable positive increases in standard performance parameters does indicate that the logic is sound behind the theory and further testing will likely ultimately lead to the complete understanding of the bio/neuro process involved. To our knowledge, we are not aware of the existence of a non-ergogenic (PED) aid that engenders so compelling a boost to performance as does the Voxx socks in a perfectly legal and ethical fashion