



Mini Review

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Using Electromyography to Examine the Efficacy of Reflexive Performance Reset™ Procedures on the Biceps Femoris Muscle: A Pilot Study

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Abstract

Purpose: This pilot study examined the efficacy of Reflexive Performance Reset (RPR) procedures using electromyography (EMG) techniques.

Design: Thirty participants (16 males and 14 females, aged = 30+10.8 yrs) were connected to EMG equipment at the biceps femoris muscle and asked to fully step up and down on a step without support at a specific cadence. The participants were then introduced to an intervention consisting of diaphragmatic breathing and then undergoing a RPR reset. The participants then repeated the same physical activity that they performed prior to the intervention. The test and retest data were then compared.

Results: Thirteen of the thirty participants expended significantly less energy in their retest performance after the intervention than they did in their initial test. IBM SPSS version 24 indicated $F(1, 28) = 35.34, p = 0.000$.

Recommendation: Continue the examination of RPR with a larger study population, and revise the study design to include an additional recording of data between the diaphragmatic breathing and the RPR reset to determine the contribution of the two-component intervention.

Keywords: Neurolymphatic Process, Lymph System, Trigger Points, Soft Tissue

Introduction

Chapman reflex points refer to nerve ganglion contractions located deep to the skin and subcutaneous tissue, most often within the deep fascia or periosteum of the bone. These neurolymphatic points are found at specific areas of the body that correspond to visceral and soft tissue dysfunctions. They can be felt as small, discrete, and smooth palpable nodules, approximately 2-millimeters in diameter. The Chapman points arise due to lymphatic congestion or blockage from nerve sheaths at free nerve endings [1]. They primarily correspond to the sympathetic fibers of the autonomic nervous system running along dermatomal patterns [2]. Chapman points are typically diagnostic, but they can also be manipulated for therapeutic purposes [3]. Knowledge of the autonomic nervous system, the endocrine system, and the lymphatic system is necessary to determine the pathways from viscous associated

lesions. They should not be confused with myofascial trigger points or Jones tender points [4].

Chapman's reflexes were discovered by Frank Chapman, D.O. in the 1920s who charted their location and therapeutic value. Their value was discounted in the U.S. later in the twentieth century even though they were taught in U.S. schools of osteopathy; however, their value for therapeutic use was recognized by physicians in South Africa and some areas of Europe. In 2012 Douglas Heel, D.O., a South African osteopathic physician modified, a therapeutic procedure using Chapman's reflexes called "Get Activated™" for physicians and introduced it in Chicago. While it was not readily accepted by the medical community a similar therapeutic procedure of Chapman's reflexes called "Reflexive Performance Reset™" (RPR) was designed and introduced for coaches, trainers,

and athletes. It has become a popular therapeutic procedure to improve performance and reduce injuries of athletes in Midwest high schools, colleges, and universities. According to Leon Chaitow, D.O. "Stimulation of cutaneous structures in skilled hands is capable of producing marked sympathetic responses. It can remove pain, improve function, relieve stress, induce relaxation, enhance the body's economy, and greatly aid in healthy restoration without negative side effects [3,4]"

The general consensus by coaches and trainers who utilize RPR procedures maintain that the hyper congested lymphatic centers account for loss of performance and increased injuries; and RPR is a proactive method for maintaining performance levels and reducing injuries. RPR techniques include diaphragmatic breathing and specific therapeutic massage techniques to eliminate the lymphatic congestion in the athletes. According to the RPR practitioners, this procedure accounts for less energy expenditure by the athlete to do the same work.

Up until this point, there has been little peer-reviewed research conducted examining the efficacy and value of RPR. The purpose of this pilot study was to examine the efficacy of RPR procedures using electromyography (EMG) to observe the effects of the biceps femoris muscle in the hamstring group.

Methods

Participants

The participants consisted of 30 participants, 16 males and 14 females, from a convenience study. See Table 1 for a summary of the physical characteristics of the participants. The study was explained to the participants and what procedures were involved. The participants signed a project consent form before any procedure began. The study was approved by the Institutional Review Board (IRB) of the University of New Orleans.

N	Male	Female	Age (yrs)	Weight (kg)	Height (m)
30	16	14	30.0+ 10.8 yrs	75.9 + 21.0 kg	1.73 + 8.6 m

Equipment

An IWorxiWire-B3G ECG, an IXTA power supply, and its associated Lab scribe 4 software was used to collect and analyze the study data. A UNO graduate student was trained by a certified RPR and IWorx Human Performance and Health Promotion (HHP) faculty member to use the IWorx equipment and perform the RPR procedures. The UNO graduate student collected all of the data.

Design

The participants were informed to wear loose fitting gym clothes and athletic shoes. The study was conducted in the exercise physiology lab on the campus of the University of New Orleans. Prior to collecting study data the participant was asked to subjectively

rank their current stress level on a scale from 1 to 10 with 1 being completely relaxed and 10 being extremely stressed. This was done to determine the association of the participant's subjective stress level and the results of the current study using IBM SPSS statistical correlation methods.

Essentially, the study compared the energy expenditures of the participants stepping up and down a given height using their entire body weight without assistance for each step at a specific cadence. The performance of the activity and the collection of data was done in the following manner: The participants were instructed to recline on his/her stomach. Two EMG leads were attached to the proximal and distal ends of the participant's biceps femoris muscle and a ground lead was attached above the proximal end of the biceps femoris and connected to the EMG equipment. IWorx iWire-B3G EMG cable leads along with an IWorx IXTA and associated Labscribe 4 software was used to collect and analyze the study data. The participants were asked to warm-up and stretch their hamstring muscles prior to data collection. The participant was asked to stand in front of a 4-inch step and place his/her foot of the wired leg at the top of the step. After telling the participant the study was ready to begin, the EMG was turned on and recording began. Using a metronome operating at a rhythm of 60 "clicks" per minute, the participants were instructed to step up and down the step to activate the biceps femoris muscle by elevating the participant's entire bodyweight unassisted at the metronome's rhythm, The participants were asked to continue this activity at least 6 times to insure proper recording of the activity. This procedure established a specific power load for each participant. The energy expenditure of each participant of this specified work load per unit of time (meter x kilograms x second⁻¹) was recorded using the IWorx equipment system). The EMG recordings of the initial tests of the participants were saved for comparison of the retest data of the associated participants after the intervention.

According to RPR clinical procedure, the participant must be in a parasympathetic state for RPR to be effective. Therefore after the initial test the participant was instructed to recline on his/her back, relax and "belly breathe" 3-5 times. Then begin the "inverted V" RPR protocol on the participant's ribcage and sternum to initiate the parasympathetic state. After completing the "breathing reset" the participant was instructed to roll over on his/her belly and do the RPR hamstring reset by massaging the outer edges of the sacrum, the superior edges of the posterior hip and the two PSIS. This RPR procedure is a modified version of purging the lymph system by palpating the trigger points of Chapman's Reflexes [1,4].

After completing the RPR breathing and hamstring resets, the EMG was turned on and the participants were instructed to repeat the initial procedure of physical activity by activating the biceps femoris muscle using the same specified procedure. The EMG recordings of the retest energy expenditures of the participants were saved for comparison of the associated initial tests. The leads

were removed and the participant was thanked for volunteering for the study.

Analysis

IBM SPSS version 24 was used for statistical analysis of the study. One-way ANOVA and correlation analyses were applied to analyze the test and retest data generated from the IWorks equipment and its associated Labscribe 4 software. As the participants performed the study's specified activity at the prescribed tempo the biceps femoris muscle contracted as the participants stepped up and down on the step. As the muscle contracted the muscle's electrical properties were recorded in millivolts, reflecting the energy expenditure of the study's physical activity. Once the muscle is sufficiently warmed up the energy expenditure for the study's specified workload for each participant should be approximately the same for each contraction. The energy expenditure differed for each participant because of the participant's different body weight and physical conditioning. Continued stepping of the repetitive constant workload should generate equal or greater energy expenditure of the muscle as compared to the initial energy expenditure for each participant. Energy expenditure will increase as a result of muscle fatigue and physical condition of the participant.

During the retest segment of the study the energy expenditure of each participant for the study's given workload at a specified time rate should not be less than the initial test energy expenditure. If it is less than the initial energy expenditure the retest data would indicate a reduction of electrical resistance of the muscle, reflecting a more efficient contraction of the muscle [1,5,6]. Therefore, retest data of energy expenditures less than the initial data of energy expenditures indicate that the RPR intervention had a positive effect on the muscle. Retest data equal to or greater than the initial test data would indicate no effect on the muscle as a result of the RPR intervention.

The resultant electromyography (EMG) for the initial test and retest were reviewed for each participant. The maximum-minimum electrical range in milli-volts for the muscle contractions of the muscle fibers for each energy burst (approximately every 3 seconds) were noted. The greater the energy expenditure, the greater the electrical range for each energy burst. The levels were recorded and saved for IBM SPSS statistical analysis.

Results

Thirteen (43.3%) of the thirty participants displayed less energy expenditure in their respective retest after the RPR procedure as compared to their initial energy expenditure. The energy expenditure difference (Retest energy expenditure - test energy expenditure) from this group of thirteen indicated significantly lower statistical differences as compared to the group of seventeen that scored equal or higher energy expenditures after the RPR neurolymphatic procedure. One-way ANOVA analysis

between the two groups' energy expenditure differences scored $F(1,28) = 35.338$, $p = 0.000$ with a level of significance set at $p = 0.05$. See Table 2. The assumption of homogeneity was met (Levene (1, 28) = 3.02, $p = 0.097$). Of the thirteen in that group five were female and eight were male.

Table 2: Mean Energy Expenditure Difference (Initial Expenditure - Retest Expenditure)

Group	N	Mean (mV)	Std Dev (mV)
Hypercongested	13	-2.81	+2.3
Non-Hypercongested	17	1.75	+1.3
Total	30	-0.24	+2.9

Correlational analysis of estimated stress levels compared to the test-retest energy expenditure differences were low ($r = .192$); and one-way ANOVA analysis between the same variables was insignificant $F(1, 28) = 3.96$, $p = .056$ with a level of significance set at 0.05. The homogeneity assumption was met (Levene (1, 28) = .161, $p = .852$).

Discussion

The RPR procedure demonstrated significant statistical differences of reduced energy expenditure in 43.3 % of the study's participants. Because their retest energy expenditure was lower than their initial energy expenditure before the RPR procedure the literature suggests that the participants in this group had hypercongested lymphatic systems brought about by physical, emotional, and/or psychological overstimulation in the autonomic nervous system prior to the study's intervention.(1,3,4,5,6) According to RPR proponents the hyper congested lymphatic systems of these participants could result in sub-optimal physical performance and function.

Because the intervention of the current study consisted of a two-part intervention consisting of both diaphragmatic breathing along with RPR soft tissue manipulation, a question that must be asked regarding the study was if the statistically significant effects were caused exclusively by only diaphragmatic breathing or by only RPR manipulation instead of a combination of both. The answer to this question can be resolved by revising the study design by adding an additional recording of data of the participants' physical response during the intervention between the diaphragmatic breathing and the actual RPR neuro-lymphatic reset procedure. The additional set of data would answer the question regarding the study.

It would appear from the current study that the reduction of energy expenditure in the retest results reflects the extent of lymphatic congestion and the corresponding improvement in efficiency in that anatomical area as stated in the literature⁴. The lymphatic congestion is generally the result of excessive hyperactivity of the sympathetic state in the parasympathetic nervous system. However, the condition is not easily detectable,

and not necessarily indicative by subjective stress levels. The participants in the current study were unable to predict their lymphatic congestive status by subjectively estimating their stress level. There was little to no association between the estimated stress levels and their respective test-retest energy expenditure differences. Co-relational analysis indicated a low relationship ($r = .192$).

The results of the pilot test were sufficiently successful to warrant additional research regarding the efficacy of RPR. Proposed studies can determine if one or both of the intervention components are responsible for significant changes by collecting additional data between the two-part intervention of diaphragmatic breathing and the soft tissue RPR reset manipulation. The revised study design along with a larger study population will hopefully yield a more in-depth understanding and efficacy of the neuro-lymphatic procedure referred to as Reflexive Performance Reset (RPR).

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