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Wii games versus transcutaneous electrical nerve stimulation on pelvic floor tension myalgia

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Abstract
Background: Levator Ani Syndrome has been described as a chronic Charlie-horse up inside the pelvis‖ but it is also known by a few other names; rectal spasm, levator spasm, puborectalis syndrome, chronic proctalgia, proctodynia, coccygodynia, pyriformis syndrome, proctalgia fugax, chronic anal pain syndrome and pelvic tension myalgia. Levator Ani Syndrome consists of pain, pressure, and discomfort in the region of the rectum, sacrum, and coccyx, which appears to be aggravated by sitting. The levator ani is a broad, thin muscle inside the pelvis that tightens and relaxes to aid in number of bodily functions, including bowel movements
Objective: The purpose of the study is to compere between the therapeutic efficacy of Wii games and transcutaneous electrical nerve stimulation on pelvic floor tension myalgia.
Subjects: 30 adult male patients, their age range from 20-35 years, subjects were classified to 2 groups Group A: 15 patients received
Acupuncture TENS treatment: Group B: 15 patients received Wii GAMES treatment.
Methods: pain intensity measured by visual analogue scale and Perineometry (Neen Peritone)
Results: The results of this study showed a significant decrease in pain level and significant decreased in pelvic floor muscle tone after four months of treatment application (post-treatment) of study group when compared with the corresponding value before treatment application (pre-treatment).
Furthermore, the results of the study revealed non-significant difference between both groups pre-treatment or after treatment regarding pain or pelvic floor muscle tone main values.
Therefore the results of current study showed that there was a significant improvement in both groups. This confirms the effectiveness of, TENS and Wii Fit training as therapeutic modality to decrease pain and pelvic floor muscle tone, so that enhancing treatment of pelvic floor tension myalgia.
Conclusion: The results of current study showed that acupuncture like TENS and Wii fit training, for 4 months, is an effective physical therapy modalities in treatment of pelvic floor tension myalgia through decreasing pelvic pain and decreasing pelvic floor muscle spasm, with no statistically significant difference between the two modalities.

Keywords: levator ani syndrome, pelvic floor tension myalgia, wii games, transcutaneous electrical nerve stimulation, perineometry (Neen Peritone), visual analogue scale.

Introduction
Pelvic floor myalgia (muscle soreness) is otherwise known as Levator Ani Syndrome. It is a common cause of sexual pain and is the condition associated with the involuntary tightness of the pelvic floor muscles. It is also known by a few other names; rectal spasm, levator spasm, puborectalis syndrome, chronic proctalgia, proctodynia, coccygodynia, pyriformis syndrome, proctalgia fugax, chronic anal pain syndrome and pelvic tension myalgia. Levator Ani Syndrome consists of pain, pressure, and discomfort in the region of the rectum, sacrum, and coccyx, which appears to be aggravated by sitting (Collinus, 2008) [1].

Patients with Levator Ani Syndrome usually present to a doctor or therapist with chronic or recurrent rectal pain or aching. The pain is often described as a vague, dull ache, or pressure sensation high in the rectum. Attacks often occur suddenly at night, waking patients from sleep. In some cases, attacks may occur when the patient is straining to produce or after a bowel movement. For those with intermittent pain, pain can be set off by sitting, standing, or lying down. Some patients also complain of constipation, post bowel movement pain or low back pain. Pelvic floor muscle spasms can also cause tightness, burning, and a sensation that the rectum is full. Sometimes the pelvic muscle spasm is caused by a trapped nerve or ligament, or some sort of adhesion or restriction in the pelvis. Again, it may be aggravated by sitting, bowel movements, sexual activity and stress (Ng, 2007).

Transcutaneous electrical nerve stimulation (TENS) is a simple, non-invasive analgesic technique that is used

extensively in health-care settings by physiotherapists, nurses and midwifes. It can be administered in the clinic by health-care professionals or at home by patients who have purchased a TENS device directly from manufacturers. TENS is mainly used for the symptomatic management of acute and non-malignant chronic pain. However, TENS is also used in palliative care to manage pain caused by metastatic bone disease and neoplasm It is also claimed that TENS has antiemetic and tissue-healing effects although it is used less often for these actions During TENS, pulsed currents are generated by a portable pulse generator and delivered across the intact surface of the skin via conducting pads called electrodes (Chong and Fung, 2009).

TENS is the most frequently used electrotherapy for producing pain relief. It is popular because it is non-invasive, easy to administer and has few side-effects or drug interactions. As there is no potential for toxicity or overdose, patients can administer TENS themselves and titrate the dosage of treatment as required. TENS effects are rapid in onset for most patients so benefit can be achieved almost immediately. TENS is cheap when compared with long-term drug therapy and some TENS devices are available for less than £30.00 (Walsh, 2000) [19].

In recent years, a growing number of occupational therapists have integrated video game technologies, such as the Nintendo Wii, into rehabilitation programs. 'Wii rehabilitation', or the use of the Wii in rehabilitation, has been successful in increasing patients' motivation and encouraging full body movement. The non-rehabilitative focus of Wii applications, however, presents a number of problems: games are too difficult for patients, they mainly target upper-body gross motor functions, and they lack support for task customization, grading, and quantitative measurements. To overcome these problems, we have designed a low-cost, virtual-reality based system. Our system, Virtual Wiihab, records performance and behavioral measurements, allows for activity customization, and uses auditory, visual, and haptic elements to provide extrinsic feedback and motivation to patients.

The use of low-cost, commercial gaming systems for rehabilitation has received substantial attention in the last few years. Systems such as the Nintendo Wii encourage players to use natural actions to play games (e.g., swinging the arm to roll a bowling ball, or jogging in place to make a virtual character run). The Wii (and similar systems) has been integrated into rehabilitation programs, and has gained the support of occupational therapists because it is easy to use and has a wide variety of games available. While the Wii does have benefits, the games are not designed specifically for rehabilitation, leading the Wii to have many limitations: it cannot accurately monitor and track patients' progress, games are often too difficult for patients, and there is a lack of appropriate and motivating feedback for patients. By combining the benefits of Virtual Reality and the Nintendo Wii, we have developed a rehabilitation system, Virtual Wiihab, that can be used in the hospital (by a patient with a therapist) or at home (by a patient, monitored over the Internet by a therapist (Dixon, 2008) [3].

Material and Methods

Thirty male patients who had pelvic floor tension myalgia participated in this study. Their ages were ranged from 20 to 35 years old. The participants were selected from hospital of (Bolak Eldacror) and they were randomly distributed into 2 equal groups.

Group A: (Tens group)

This group includes 15 patients who have pelvic floor tension myalgia and who would received acupuncture TENS device (Chen and Nickel, 2003).

Group B: (Wii Games)

This group includes 15 patients who have pelvic floor tension myalgia and who would received wii gams training.

Patients were selected to be enrolled into this study after they had fulfilled the inclusion criteria of the study;

- All patients have no diabetes, blood problems, cancer or stomach ulcer.
- All patients enrolled to the study would have their informed consent.

a) Instrumentations used for evaluation

Patients were assessed just before and just after the treatment program. The assessment procedure was included the following:

Visual Analogue Scale

It was used to measure the intensity of pain pre and post treatment. It was horizontal 10cm line graduated by different levels of pain, starting from 0 (no pain) till 10 (worst pain).

Perineometry

Neen Peritone

The perineometer measurement correlated well with the digital examination. It is a more objective and more precise assessment of pelvic floor activity than Pelvic Floor Muscle Strength Measurement the digital examination. Additionally, in this study, it would based on rectal palpation (rectal sensory). The Peritone is an accurate and sensitive single channel EMG unit that measures muscle activity down to as low as to 0.2 µV (microvolts) and up to 2000 µV. The diverse range enables the unit to measure even very weak muscle activity. It displays the biofeedback by way of bright LED lights on the front of the unit and also gives audio feedback.

b) Evaluation Procedures

Pain analoge Scales

The level of pain was assessed by using the VAS. Each patient was asked to mark and score on the line at the point that representing his or her intensity of pain on 10cm scale before starting the first session and after the end of the treatment (after 4 month).

Perineometry

Peritone is used for objective assessment of the pelvic floor muscles activities.

Manufacturer's Specifications:

- Range 0.2-2000µv.
- Battery 9 volts alkaline.
- Sensitivity 0.1µv RMS.

- Work rest periods 2-99 sec.
- Unit dimensions 128.5 x 64 x 28.3mm.
- Weight 0.15kg.
- Anuform Anal sensor Probe
- EMG reference and EMG lead wires

Measurement procedure

- Insert a 9 volt PP3 Alkaline battery into the battery compartment. Can also use a rechargeable Nickel Hydride battery which has a longer life than the Ni-Cad rechargeable batteries.
- Insert the EMG reference and EMG lead wires into the labelled sockets at the top of the unit.
- Prepare Anuform Anal sensor probe.
- Lubricant: Apply light coating of KY Jelly or similar lubricating gel to tip and metal surfaces of probe to aid insertion and provide good electrode conductivity.
- Position of patient: patient in comfortable supine hook-lyine position with abducted hips.
- Insert the probe into anus while 'bearing down' as if passing stool. 'Ring' part of ANUFORM® should remain external to the anus at all times.
- Ensure equipment is turned off before connecting to probe cables.
- Turn the unit on by pressing ON/OFF button once.
- Ask the patient to squeeze around the sensor and hold this contraction for 3 seconds and taking a reading of the peak value.
- Withdraw the sensor by ask the patient to relax as he can to release the probe.
- Wash ANUFORM in warm soapy water.
- Rinse in clean water and dry.
- Repeat after each use and dry thoroughly before storing in its plastic bag.
- DO NOT use boiling water.

c) Instrumentation used for treatments

TENS device: Acupuncture like TENS: An alternative approach is to stimulate the A delta (Aδ) fibres which respond preferentially to a much lower rate of stimulation (in the order of 2 - 5 Hz), which will activate the opioid mechanisms, and provide pain relief by causing the release of an endogenous opiate (encephalin) in the spinal cord which will reduce the activation of the noxious sensory pathways. In a similar way to the pain gate physiology, it is unlikely that there is a single (magic) frequency in this range that works best for everybody - patients should be encouraged to explore the options where possible.

WII games (Wii Fit PlusTM)

This protocol was designed so that the participant would play a video game, seated on a pressure base platform, while commanding, it through her pelvic movements. Using a virtual reality game, five activities were performed during 30 min, twice a week, with a total of 10 sessions (Elliott *et al*, 2014) [4].

d) Treatment Procedures

Group A: Tens device

- The determination by the physician of the medical necessity of TENS device must include:
  - The patient's diagnosis and prognosis.
  - Symptoms and objective findings, including measurements which establish the severity of the condition.
  - The reason the device is required, including the treatments which have been tried and failed.
- Each patient in the group would receive treatment with TENS device 3times/week for 4 months.
- Preparation of the patient:
  - The patient to be treated would be lightly clothed.
  - The postion of the patient would be supine position.
  - The patient would be informed about the device and its action.
  - The device would be switched on.
  - The timer would be adjusted at 10 mints.

TENS device preparation

- Clean up the T.E.N.S electrodes placements.
- Adhesive electrodes were used or proper gelling of the electrode was done.

TENS electrodes placements

- Over the perinea l area between anus and scrotum on the Centrum tendineum.
- Patient in comfortable supine hook-lyine position with abducted hips.

Group B: Wii games (Wii Fit plus TM)

- Prepare patient to seat on ball on a pressure base platform.
- Command it through his pelvic movements
- The participants were guided to maintain a mild contraction of the transverse abdominal muscle, while performing pelvic ante version, retroversion, lateral tilting, and circumduction movements.
- Patient would guide to maintain contraction of pelvic floor muscles then follow with maximum relaxation.
- Five activities were performed over 30 min, twice a week, with a total of 10 sessions.

Results

This results were indented to present the collected data of pain and pelvic floor muscle tone that were assessed before application of treatment (pretreatment) and after 4 months of treatment (post treatment) for each patient in both groups of the study (TENS and WII groups). We evaluated the effect of Wii games and transcutaneous electrical nerve stimulation on pelvic floor tension myalgia and they have been evaluated by tow parameters:

Pain by VAS and pelvic floor muscle tone

Statistical analysis was conducted using SPSS for windows, version 25 (SPSS, Inc., Chicago, IL). Prior to final analysis, data were screened for normality assumption and presence of extreme scores. This exploration was done as a pre-requisite for parametric calculations of the analysis of difference. Descriptive analysis using histograms with the normal distribution curve and Normality test of data using Shapiro-Wilk test showed that the data of age, height, weight, BMI, pain and muscle tone in both groups were normally distributed

and not violates the parametric assumption. Independent sample t-test was used for comparison between normally distributed variable between both groups while Paired sample t-test was used for within group comparison (per and post treatment). Alpha level was 0.05.

The units of this chapter are presented under the following heads

- Results of the statistical analysis of general characteristics of patients in both groups of the study (A and B).
- Results of the statistical analysis of Pain in both groups of the study (A and B)
- Results of the statistical analysis of pressure algometer in muscle tone in both groups of the study (A and B).

(A) Result of statistical analysis of general characteristics of patients in both groups of the study (A and B).

Group (A)

As shown in table (1) Group (A) consisted of 15 Male Patients, there mean age value was (30±4.884) years, Height mean value was (1.681±0.07) m, Weight mean value was (74.013±7.863) kg and BMI mean value was (26.157±13.303).

Group (B)

Also, table (1) shows that Group (B) consisted of 15 Male Patient, there mean age value was (29.467±4.688) years, Height mean value was (1.717±0.063) m, Weight mean value was (78.6±13.303) kg and BMI mean value was (26.573±3.67).

Comparison between groups

As shown in table (1) statistically there was Non significant difference between both groups regarding age, (P-value = 0.763), height (P-value = 0.26), weight (P-value = 0.149) or BMI (P-value = 0.702).

Table 1: General characteristics of patients

	Age (years)		Height (m)		Weight (k.g)		BMI	
Group	**Group (A)**	**Group (B)**	**Group (A)**	**Group (B)**	**Group (A)**	**Group (B)**	**Group (A)**	**Group (B)**
Mean	30.000	29.467	1.681	1.717	74.013	78.600	26.157	26.573
±S. D.	4.884	4.688	0.070	0.063	7.863	13.303	1.976	3.670
Mean difference	0.533		-4.587		-0.036		-0.417	
T-value	0.305		-1.150		-1.485		-0.387	
p- value	0.763		0.260		0.149		0.702	
Level of significance	Non significant		Non significant		Non significant		Non significant	

Comparison between groups

Table (2) and figure: show that there was Non-significant difference in mean values of pain before treatment between both groups (Group (A) and Group (B)) with (P-value = 0.896) also, there was Non-significant difference between both groups (Group (A) and Group (B)) after treatment (P-value = 0.885).

Table 2: Comparison between pain results before and after treatment in Group (A) and Group (B)

Statistical tools	Group (A)		Group (B)	
	Before treatment	**After treatment**	**Before treatment**	**After treatment**
Mean	5.533	2.200	5.467	2.133
+ S.D	1.457	1.424	1.302	1.060
Mean difference	3.333		3.333	
% of improvement	60.2%		61%	
T-value	20.917		13.229	
P-value	0.000		0.000	
Level of significance	Significant Decrease		Significant Decrease	

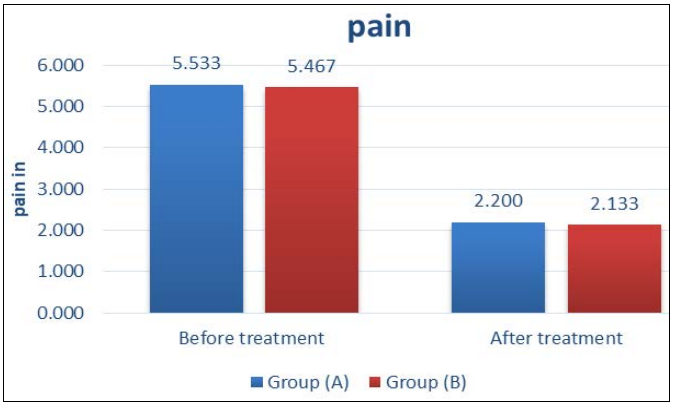

Fig 1: Comparison between pain results before and after treatment in Group (A) and Group (B)

Results of statistical analysis of pressure Algometer in muscle tone in both groups of the study (A and B).

Comparison between groups

Table (5) and Figure (11): shows that there was Non-significant difference in mean values of muscle tone before

treatment between both groups (Group (A) and Group (B)) with (P-value = 0.584) while there was Non-significant difference between both groups (Group (A) and Group (B)) after treatment (P-value = 0.704).

Table 3: Comparison between muscle tone results before and after treatment in Group (A) and Group (B)

Statistical tools	Group (A)		Group (B)	
	Before treatment	After treatment	Before treatment	After treatment
Mean	60.667	35.200	58.333	33.467
+ S.D	12.275	12.852	10.722	11.843
Mean difference	25.467		24.867	
% of improvement	42%		42.6%	
T-value	14.660		13.395	
P-value	0.000		0.000	
Level of significance	Significant Decrease		Significant Decrease	

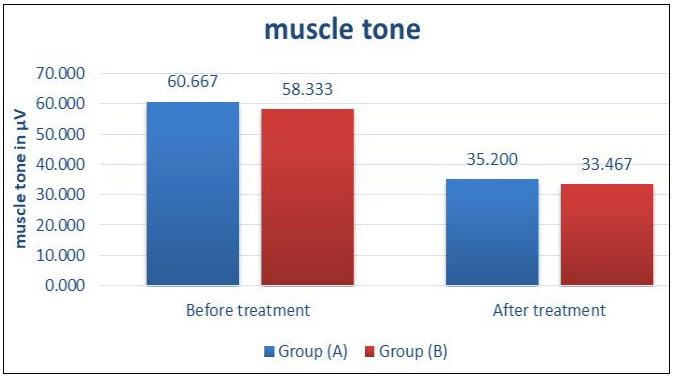

Fig 2: Comparison between muscle tone results before and after treatment in Group (A) and Group (B)

Discussion

The levator ani syndrome is also called levator spasm, puborectalis syndrome, chronic proctalgia, pyriformis syndrome, and pelvic tension myalgia. The levator ani syndrome is characterized by relatively constant and/or frequent dull anorectal pain, often associated with tenderness to palpation of the levator ani but not urinary symptoms or an organic disease which can explain pain. The diagnosis is based on characteristic symptoms in the absence of anorectal and pelvic pathophysiology. The diagnostic criteria are as follows: Twelve weeks, which may not be consecutive, of: Chronic or recurrent rectal pain or aching; and Episodes last 20 minutes or longer; and Other causes of rectal pain such as ischemia, inflammatory bowel disease, cryptitis, intramuscular abscess, fissure, hemorrhoids, prostatitis, and solitary rectal ulcer have been excluded (Bharucha and Trabuco, 2008).

The discomfort may be relieved by walking or pelvic tightening exercises similar to Kegel exercises. Other treatments include massage of the muscle, warm baths, muscle relaxant medications, and biofeedback. Electrical stimulation of the levator ani muscle has been used to try to break the spastic cycle. Injection of botulinum toxin A has also been used. Variants of levator ani syndrome include proctalgia fugax (fleeting pain in the rectum) and coccydynia (pain in the coccygeal region). Proctalgia fugax and levator ani syndrome have not been found to be of psychosomatic origin, although stressful events may trigger attacks (Chiarioni *et al*, 2011).

Treatments that can help are medications to decrease muscle spasm and pain as relax capsule (muscle relaxant), biofeedback to learn how to relax and contract the pelvic floor muscles properly, and electrical stimulation to the pelvic floor muscles to relax them and to increase circulation and promote healing. TENS electrical stimulation to the pelvic floor nerves in the lower spine may help to "cover up" the pain and helps to relax the muscles, sometimes the pain is worse because of spasm in the buttock muscles or problems in the sacroiliac joint. Physical therapy can treat these areas; heat and ultrasound are used by physical therapists to relax the pelvic floor muscles. A special form of rectal and buttock massage can be performed by the physician or the physical therapist to decrease pain and spasm (Rosenbaum and Owens, 2008) [15].

The most common TENS mode is one that uses a high rate, narrow pulse width and low or moderate intensity; this is the conventional or the high frequency low intensity mode designed to selectively activate the large myelinated afferent fibres. Muscle contraction or fasciculation must not be apparent with conventional TENS. This TENS mode (If effective) results in a fast onset of pain relief, but has a relatively short aftereffect (Duration of relief), generally not exceeding the length of the stimulation. There are, however, reports attesting to a prolonged aftereffect of hours & occasionally a day or more with conventional TENS. Conventional TENS produces mild or moderate comfortable paraesthesia that is most effective when perceived throughout the painful area (Johnson, 2007) [6].

When addressing the muscles of the pelvic floor, simple contractile strengthening exercises, popularly referred to as “Kegels,” are insufficient and may actually worsen the symptoms. To be effective, pelvic floor muscle exercises require proper coordination, timing and synergistic recruitment of other core postural muscles, and the ability to relax. Sexual activity, which requires physical stamina, muscle strength, and mobility, may be hampered by musculoskeletal pain as well as incoordination and instability of the pelvic floor muscles. Patients are instructed in exercises which directly address deficits in motor control, and teach new, functional ways to control and recruit muscles (Rosenbaum and Owens, 2008) [15].

This study was conducted to compere between the therapeutic efficacy of wii games and transcutaneous electrical nerve stimulation on pelvic floor tension myalgia.

The pre- treatment results of the present study revealed no significant difference between the mean values of pain and muscle tone of two groups. The post - treatment results of this study showed reduction in pain and muscle tone after the treatment for Group (A) and (B) with a percentage of 60.2% and 61% respectively for pain and 42%, 45.6% respectively for muscle tone. Post - treatment results of the present study revealed non significant difference of the mean values of pain and muscle tone between the two groups (p-value > 0.05).

Therefore, the results of current study showed that there was a significant improvement in group A (TENS) and group B (Wii Fit). This confirms the effectiveness of TENS and Wii Fit as therapeutic modality to decrease pain and muscle tone so that enhancing treatment of pelvic floor tension myalgia.

Regarding the results of TENS group, our study consistent or supported by the works reported by Sharma *et al*. (2017) [17];

Schneider *et al*. (2013) [18]; and Lamina *et al*. (2008) [7].

Sharma *et al*. (2017) [17] who assess the effectiveness and safety of TENS in idiopathic chronic pelvic pain in a prospective, experimental study on patients with idiopathic chronic pelvic pain for ten treatment sessions (5 sessions/week) of 30 min were conducted. Results showed that, there was a significant improvement in pain scores in TENS group as compared with control group, and two patients were completely pain free following TENS therapy. The study concluded that women patients with idiopathic chronic pelvic pain, TENS can be a useful intervention. TENS units are safe, economical, and easily commercially available.

Schneider *et al*. (2013) [18] who evaluate the effect of transcutaneous electrical nerve stimulation (TENS) for treating men with refractory chronic pelvic pain syndrome (CPPS) on 60 men with refractory CPPS. The effects of treatment were evaluated by a pain diary and by the quality of life item of the National Institutes of Health Chronic Prostatitis Symptom Index at baseline, after 12 weeks of TENS treatment, and at last known follow-up. Adverse events related to TENS were also assessed. Results revealed that TENS was successful after 12 weeks of treatment in 29 (48%) patients and a positive effect was sustained during a mean follow-up of 43.6 months in 21 patients. After 12 weeks of TENS treatment, mean pain visual analogue scale decreased significantly from 6.6 to 3.9. Patients' quality of life changed significantly after TENS treatment. No adverse events related to TENS were noted.

Lamina *et al*. (2008) [7] who investigate the therapeutic efficacy of transcutaneous electrical nerve stimulation (TENS) in the symptomatic management of chronic prostatitis pain/chronic pelvic pain syndrome on twenty-four patients diagnosed with chronic prostatitis- category IIIA and IIIB of the National Institute of Health Chronic Pain (NIH-CP) were referred for physiotherapy from the Urology department. The TENS group received TENS treatment, 5 times per week for a period of 4 weeks (mean treatment frequency, intensity, pulse width and duration of 60 Hz, 100 microS, 25 mA and 20 minutes respectively). The Analgesic group received no TENS treatment but continued analgesics; the Control group received no TENS and Analgesic but placebo. All subjects were placed on antibiotics throughout the treatment period. Results found that, TENS is an effective means of non-invasive symptomatic management of chronic prostatitis pain.

From the previous discussion of these results and according to reports of other investigators in similar studies, the main mechanisms by which TENS decreases pain can be explained as following:

Low-intensity, non-noxious TENS paraesthesiae (conventional TENS) relieves pain by a segmental mechanism. Higher intensity TENS increases the likelihood of activating extrasegmental descending pain inhibitory pathways and diffuse noxious inhibitory controls via counter-irritant effects. TENS will also cause peripheral blockade of afferent impulses that have arisen from a peripheral structure (i.e. 'busy line-effect') (Johnson, 2007) [6].

1. Segmental mechanisms

Evidence from animal studies shows that TENS reduces ongoing nociceptor cell activity and sensitization in the central nervous system when applied to somatic receptive fields and after spinal cord transection. TENS-induced A-delta activity causes long-term depression of central nociceptor cell activity for up to 2 hours.

2. Extrasegmental mechanisms

TENS-induced activity in small diameter afferents (A-delta) leads to activation of the midbrain periaqueductal grey and rostral ventromedial medulla (i.e. descending pain inhibitory pathways) and inhibition of descending pain facilitatory pathways. Larger effects have been observed when muscle rather than skin afferents were activated (Johnson, 2007) [6].

3. Peripheral mechanisms

Antidromic activation of peripheral nerves by TENS generates nerve impulses that have been shown to collide and extinguish afferent impulses arising from peripheral structures. Peripheral blockade of nociceptive impulses is more likely when TENS activates A-delta fibres (i.e. intense TENS). TENS-induced activity in large diameter afferents (i.e. conventional TENS) will block afferent activity in large diameter fibres that may be contributing to pain (Johnson, 2007) [6].

4. Neurochemicals

TENS effects are mediated by many neurochemicals including opioids, serotonin, acetylcholine, noradrenaline and gamma-aminobutyric acid (GABA). Low but not high-frequency TENS has been shown to involve mu opioid and 5-HT2 and 5-HT3 receptors. High but not low-frequency TENS has been shown to involve delta opioid receptors and reduce aspartate and glutamate levels in the spinal cord (Johnson, 2007) [6].

5. TENS and muscle spasm

It can be explained that TENS decrease muscle spasm by nonaddictive method of managing pain, muscle guarding and dysfunction of the pain cycle as well as the internal changes that accompanied the pain cycle can be managed or at least reduced by TENS application. As pain produces a state of muscle tension that results in a diminished blood supply within the painful area (or a state of ischaemia), increased metabolites, decreased oxygen supply, decreased lymphatic clearing, decreased nutrient supply, increased muscle fatigue, inflammation and oedema. All these internal changes can lead to the progressive amplification of the pain cycle which can be prevented or reduced by TENS (Mowafy *et al*, 2016) [11].

Regarding the results of Wii Fit group, our study consistent or supported by the works reported by Martinho *et al*. (2016) [9]; Polackwich *et al*. (2015) [13]; Giubilei *et al*. (2007) [5]; and Cornel *et al*. (2005) [2].

Martinho *et al*. (2016) [9] who evaluate the effectiveness of abdominopelvic training by virtual reality compared to pelvic floor muscle training (PFMT) using a gym ball (a previously tested and efficient protocol) on postmenopausal women's pelvic floor muscle (PFM) strength. A randomized controlled trial was conducted with 60 postmenopausal women, randomly allocated into two groups: Abdominopelvic training by virtual reality. Both types of training were supervised by the same physical therapist, during 10 sessions each, for 30 minutes. The participants' PFM strength was evaluated by

digital palpation and vaginal dynamometry, considering three different parameters: maximum strength, average strength and endurance. An intention-to-treat approach was used to analyze the participants according to original groups. Both protocols have improved the overall PFM strength, suggesting that both are equally beneficial and can be used in clinical practice. Muscle endurance was higher in patients who trained using virtual reality which may confirm that virtual reality is more interesting that conventional exercises so, virtual reality can encourage the performance of abdominopelvic movements through virtual games that did not necessarily require active PFM contractions, this time without any verbal commands.

Polackwich *et al*.(2015) [13] who compared outcomes of pelvic floor physical therapy as part of multimodal therapy in patients with chronic pelvic pain syndrome and they concluded that Pelvic floor physical therapy can be effective for chronic pelvic pain syndrome in patients with pelvic floor spasm. However, the outcome depends on specialty training and experience of therapists.

Giubilei *et al*. (2007) [5] who performed a preliminary investigation of the role of physical activity and its effects on select patients with chronic prostatitis/chronic pelvic pain syndrome. The study was conducted of volunteer sample of 231 eligible males 20 to 50 years old with chronic prostatitis/chronic pelvic pain syndrome who were unresponsive to conventional treatments and free of any contraindication for moderate intensity physical exercise. Patients were randomized into 2 groups. Participants were randomly assigned to the aerobic exercise group (52) and the placebo/stretching and motion exercises group (51). Main outcome measures were the Italian version of the National Institutes of Health Chronic Prostatitis Symptom Index, Beck Depression Inventory, State Anxiety Inventory-Y and a pain intensity visual analog scale administered at baseline, and 6 and 18 weeks. The study results showed significant improvements in the aerobic exercise group in comparison to the placebo/stretching and motion exercises group.

Cornel *et al*. (2005) [2] evaluate the effect of biofeedback physical therapy on the symptoms of men with Chronic Pelvic Pain Syndrome (CPPS) on 33 men with CP/CPPS based on history including the NIH-CPSI questionnaire and physical examination including pelvic floor muscle tonus, urinalysis, uroflowmetry with residual urine measurement and transrectal ultrasonography of the prostate. All patients participated in a pelvic floor biofeedback re-educating program. Our study clearly demonstrates a significant effect of exercises using biofeedback physical therapy and pelvic floor re-education for CP/CPPS patients, leading to a significant improvement of the symptom score. The correlation between the pelvic muscle tonus results with NIH-CPSI score is highly suggestive that the pelvic floor plays an important role in the pathophysiology of CP/CPPS.

From the previous discussion of these results and according to reports of other investigators in similar studies, the main mechanisms by which Wii Fit exercises decreases pain and muscles spasm can be explained as following:

Pelvic floor muscle dysfunction affects muscle fibre length and contractile force. Patients whose muscular contraction occurs below the resting muscular length, as with overactive pelvic floor muscle (OPFM), experience muscular weakness and early time-to-fatigue (Marques *et al*, 2010) [8], so achieve effective function, patients should ensure that their pelvic muscles have strength (maximal force production), endurance and coordination. In the context of PFM training, overload training enhances the number and size of mitochondria, and increases the activity of some aerobic and anaerobic enzymes, intramuscular glycogen content, and the number of capillaries and their surface area. The muscle will also become hypertrophic and exhibit hyperplasia, even in muscles in the pelvic floor (Russel and Brubaker, 2008) [16].

Entertainment exercises, using devices such as Virtual realty devices and Wii Fit, are more attractive, facilitate adherence, and motivate the continuation of training, which could help maintain the gains achieved during treatment. Thus, stimulating, and interactive, pelvic floor exercises protocols should be used, since the success rate after the intervention protocols depends on the adherence as well as maintenance of the proposed exercises (Bø and Hilde 2013; Bø *et al*., 2005).

Wii Fit may improve the adherence to exercise which is a problem reported by Quartly *et al*. (2010) [14] that there is a loss of adherence in the long-term in conventional PFMT programs, such as the Kegel exercises.

On the other hand, our results regarding the positive relaxing effect of pelvic floor exercises using Wii Fit came in contradiction with the works reported by Masterson *et al*. (2017) [10]

Masterson *et al*. (2017) [10] who evaluated the effect of comprehensive pelvic floor physical therapy (PFPT) program men with chronic pelvic pain syndrome (CPPS) on 14 men who underwent physical therapy for idiopathic CPPS. Treatment included: (I) manual therapy (internal and external) of pelvic floor and abdominal musculature to facilitate relaxation of muscles; (II) therapeutic exercises to promote range of motion, improve mobility/flexibility and strengthen weak muscles; (III) biofeedback to facilitate strengthening and relaxation of pelvic floor musculature; (IV) neuromodulation for pelvic floor muscle relaxation and pain relief. Male CPPS is difficult to treat and often requires a multimodal approach. Based on the results of (Masterson *et al*, 2017) [10] study, pelvic floor rehabilitation may be an effective treatment option for select patients as any patients have overactive or hypertonic musculature that requires relaxation as opposed to strengthening and Kegels can worsen symptoms in some men with CPPS. Also, pelvic floor therapy requires special training to be effective.

Finally by the result of this study it can be claimed that, there was greater improvement after application of TENS and pelvic floor exercises using Wii Fit and so enhancing the treatment of pelvic floor tension myalgia by decreasing pelvic pain and pelvic floor muscle tone. Also TENS is effective as pelvic floor exercises using Wii Fit, both are cost effective, and finally patient can regain to normal life style quickly.

Conclusion

The results of current study showed that acupuncture like TENS and Wii fit training, for 4 months, is an effective physical therapy modalities in treatment of pelvic floor tension myalgia through decreasing pelvic pain and decreasing pelvic floor muscle spasm, with no statistically significant

difference between the two modalities.

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