CONTROL ID: 2392865

CONTACT (NAME ONLY): Bruce Crawford

TITLE: PELVIC FLOOR MUSCLE MOTOR UNIT RECRUITMENT: KEGELS VS SPECIALIZED MOVEMENT

AUTHORS (FIRST NAME INITIAL LAST NAME): B. S. Crawford[1]

INSTITUTIONS (ALL):

1. Center for Pelvic Floor Medicine, Reno, NV, United States.

ABSTRACT BODY:

Objectives :

Pelvic floor exercise is clearly established as appropriate first line treatment for stress urinary incontinence and overactive bladder. The effectiveness of exercise relates to the degree of motor unit recruitment achieved during exercise. To date the Kegel exercise has been the most common recommendation for pelvic floor conditioning and rehabilitation. The purpose of this study is to compare the traditional Kegel exercise to specialized movements that incorporate voluntary pelvic floor contraction at a point in the movement where the pelvic floor is naturally engaged.

Materials and Methods:

Between January 2014 and May 2015 one hundred consecutive patients referred for pelvic floor rehabilitation were instructed as to how to perform 10 different movements know to naturally engage the pelvic floor. Subjects wore small wireless surface EMG sensors recording muscular activity from the pelvic floor, gluteals, lower abdominal muscles, and the lower extremity adductors. Video clips synchronized to 4 channel EMG were recorded for each movement. Each clip began with an isolated pelvic floor contraction before the subject performed one of the ten specialized pelvic floor movements. Mean peak pelvic floor activity during the isolated PF contraction were compared to the peak pelvic floor activity achieved during the movement.

Results : Percent Greater Than Isolated Kegel

1. Lunge: 42% (0-80) p<0.001
2. Squat: 30% (-40 - 75) p<0.001
3. Side Lying Bent Knee Lift: 25% (14 - 72) p<0.001
4. Side Lying Straight Leg Circle: 25% (-33-63) p<0.001
5. Butterfly: 36% (-25-90) p<0.001
6. Bridge: 56% (15-82) p<0.001
7. Corkscrew: 21% (-50-57) p<0.001
8. Hovering: 49% (-12-80) p,0.001
9. All 4s Bent Knee Lift: 30% (-22-71) p<0.001
10. Cat Into Cow: 41% (-5-73) p<0.001

Each of the ten movements produced a mean stastically significant increase in PF activity than traditional (stationary) Kegel exercises.

Conclusion : Specialized movements, when performed in conjunction with voluntary pelvic floor contractions may provide greater motor unit recruitment than traditional Kegel exercises. Individuals vary as to the degree of enhanced engagement with any given movement.

(no table selected)

(No Image Selected)

Presentation Details

PRESENTATION TYPE: Oral - Full or Oral Poster

CURRENT CATEGORY: Pathophysiology of Pelvic Floor Dysfunction

Other Abstract Details

The VESy/Pfilates Method of Pelvic Floor Rehabilitation is Associated with Improvement in Lower Urinary Tract Symptoms and Pelvic Floor Strength

Crawford, Bruce MD., Noia, Carol RMA.

Objective: To assess clinical response to a 4 week program of pelvic floor rehabilitation using the Pfilates Method in combination with Video-EMG Synchronization (VESy) for optimization of each patients home exercise program.

Methods: Retrospective chart review of patients participating in pelvic floor rehabilitation through the Center for Pelvic Floor Medicine between 2012 and 2013.

Results: 60 charts were selected for review. Twenty-five patients completed pre and post pelvic floor manometry. Eighteen patients completed pre and post bladder symptom questioners (UDI-6). Twelve patients provided an estimate of global improvement in lower urinary tract function. The mean improvement in pelvic floor strength, as estimated using vaginal balloon manometry, was 33% (13.2 – 16.9 cm H2O, p=.006). The mean improvement in UDI-6 score was 33% (9.3 – 6.3, p=.001). Among patients with a score greater than 0 on pre UDI-6 the average improvement in overall bladder symptoms was 74% 4 weeks after completion of the program.

Conclusions: Completion of the VESy/Pfilates program of pelvic floor rehabilitation is associated with short term improvement in pelvic floor strength and bladder symptoms.

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AUTHORS (FIRST NAME INITIAL LAST NAME): B. S. Crawford[1]

INSTITUTIONS (ALL):

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Other Abstract Details

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2012 Winter Meeting
February 28–March 3, 2012
The Roosevelt Hotel
New Orleans, Louisiana

Poster #BS48

CITRATE SYNTHASE, SACROPLASMIC RETICULAR CALCIUM ATPASE, AND CHOLINE ACETYLTRANSFERASE ACTIVITIES OF SPECIFIC PELVIC FLOOR MUSCLES OF THE RABBIT

Sara Spettel, MD, Elise De, MD, Catherine Schuler and Robert Levin, PhD
Albany, NY
(Presented by: Sara Spettel)

Introduction: An emerging body of research supports a relationship between the pelvic floor muscles and urinary systems manifested as urgency, frequency, incontinence, pelvic pain and bowel complaints.
Improved understanding of the relation between the pelvic floor muscles and urinary tissues is clinically relevant in tailoring the treatment of these patients. This study compares three important cellular enzymes in pelvic floor muscles, bladder muscle (body and base) and bladder mucosa. These enzymes were chosen because of their relationship with intracellular calcium uptake and release, mitochondrial energy production, and muscarinic neurotransmission; which have significant implications regarding contractile function.
Methods: Adult female WNZ rabbits were euthanized and the following muscle were excised: pubococcygeus (PC), ischiocavernosus (IC), bladder body muscle and mucosa, and bladder base muscle. The citrate synthase (CS) (mitochondrial biomarker enzyme), sarcoplasmic reticular calcium ATPase (SERCA) (sarcoplasmic reticular biomarker enzyme), and choline acetyltransferase (ChAT) (biomarker for muscarinic neurotransmission) were quantitated and compared.
Results: The CS and SERCA activities of the bladder body mucosa were significantly higher than that of the bladder body or base muscle. The CS, SERCA, and ChaT activities of the PC pelvic floor muscle were significantly higher than the IC pelvic floor muscle. Thus, specific pelvic floor muscles do not have the same metabolic properties, the PC pelvic floor muscle should have significantly greater capacity to contract than the IC muscle. Interestingly, the bladder body and base muscles have significantly higher ChaT activities than both pelvic floor muscles.
Conclusions: There are significant differences between specific pelvic floor muscles for the three important intracellular enzymes CS, SERCA, and ChAT.

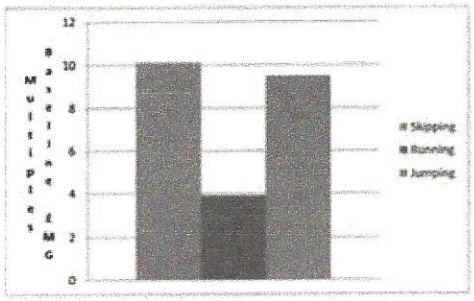
Poster #BS49

SYNCHRONIZED VIDEO AND MULTICHANNEL WIRELESS EMG CAN BE USED TO STUDY PELVIC FLOOR MUSCLE RESPONSE TO MOVEMENT

Cara-Louise Fox, MD[1] and Bruce Crawford, MD[2]
[1]Center For Pelvic Floor Medicine, Reno, Nevada; [2]Center for Pelvic Floor Medicine, University of Nevada School of Medicine, Reno, Nevada
(Presented by: Cara-Louise Fox)

Objective: To demonstrate the usefulness of wireless video synchronized emg in the analysis of pelvic floor muscle response to different movements.
Methods: A 55 year old female subject performed three different jump rope exercises; skipping rope (alternating single foot hop jump), jumping rope (jumping with both feet at the same time), running rope (alternating single foot jump). Pelvic floor, gluteal, lower extremity adductors, and Transversus abdominis muscles were monitored using surface emg electrodes with wireless sensors (Noraxon Inc., Scottsdale AZ). Several seconds of each movement were monitored and average mean amplitude (uV) and average mean area (uV) were measured for each of the three jump rope exercises. Multiples of baseline emg was used to compare average mean amplitude for the three different jump rope exercises.
Results: Baseline amplitude was measured at 9.7 uV.
Skipping rope (MOB = 10.1) and running rope (MOB = 9.5) were found to induce a greater degree of pelvic floor muscular activity than jumping rope (MOB = 3.9) in this subject. In this subject we found skipping rope and running rope to produce 61% and 59% greater average mean amplitude than jumping rope.
Conclusions: Wireless Video Synchronized EMG can be used to interpret the effects of movement on pelvic floor muscular activity. This tool may be useful in the creation of novel programs of pelvic floor muscle exercise as well as the effects of pathological states on pelvic floor muscular response to movement.

	Avg Mean Amp	Multip of Baseline	Avg Mean Area
Skiping	98 uV	10.1	1049 uV
Running	38.7 uV	3.9	143 uV
Jumping	92.8 uV	9.5	447 uV



MODERATED POSTERS

Poster #M1

EXTERNAL AND INTERNAL STIMULI RELATED TO URINARY URGENCY AND URGENCY INCONTINENCE

Kathleen A. O'Connell, PhD, RN, Alex Torstrick, MA - Psychology and Elizabeth Victor, MA - Psychology
Teachers College Columbia University
(Presented by: Kathleen A. O'Connell)

Introduction and Objectives: Latchkey incontinence (leakage as one arrives home), a frequent complaint of those with overactive bladder syndrome (OAB), may be an example of responding to a conditioned stimulus. The objective of this study was to investigate whether other external (environmental) or internal (interoceptive) cues may serve as conditioned stimuli in OAB.
Methods: A questionnaire containing 21 external, 5 internal, and 3 unlikely cues was administered to 306 subjects randomly drawn from a panel of respondents maintained by Zoomerang, Inc. such that approximately half (150) had self-reported diagnoses of OAB and half did not. The sample was 66% female, with average age of 53 in the diagnosed group (DX) and 54 in the undiagnosed group (UNDX). DX and UNDX groups were compared on the mean number of cues rated as "often" or "always" associated with leakage and with urgency. Within-

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2011 Winter Meeting
March 1–5, 2011
Arizona Biltmore Hotel
Phoenix, Arizona

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Podium #25

LOWER BODY PLYOMETRIC EXERCISE AND PELVIC FLOOR MUSCULAR ENGAGEMENT

Bruce Crawford, MD
University of Nevada, Reno, NV
(Presented by: Bruce Crawford)

Introduction: Pelvic floor muscle exercises have long been considered the first line therapy for stress urinary incontinence in women. Pelvic floor muscle deconditioning (weakness, poor endurance, poor coordination) has been associated with stress urinary incontinence, overactive bladder, pelvic organ prolapse, anal incontinence, and sexual dysfunction. It is known that patients are poorly compliant with physician recommended programs of isometric exercises. Poor long-term compliance with Kegel exercise programs illustrates this fact. Better compliance has been found for plyometric exercise programs. It may be the case that a plyometric program of pelvic floor exercise would be of better practiced and more effective in restoring and maintaining pelvic floor fitness.
Objective: To determine what plyometric movements induce the greatest degree of pelvic floor muscular engagement in women.
Methods: Between September 2008 and September 2009 real time surface EMG data was collected from the pelvic floor of 6 multiparous women ages (40–47) during performance of 100 different mat Pilates, Yoga, and personal training movements. All movements were simultaneously videotaped and synchronized to EMG recordings so as to identify the point of peak pelvic floor engagement. Movements were rated based on multiples of baseline resting EMG at the point of peak engagement of the pelvic floor.
Results:

Mean multiples of baseline EMG	Point of peak engagement	
1. Side laying straight leg circles	21.6	Forward sweep 45° above horizontal
2. Side laying bent knee lifts	26.1	Top of leg lift
3. Bridging	26.1	Top of bridge Gluteals engaged
4. Corkscrew	17	Hips flexed legs over body
5. Lunges	41.4	Deepest point in the lunge
6. Squats	18	Deepest point in the squat
7. Cat into cow	15.7	Full cat pose
8. Butterfly	24.9	Knees together feet pressed together
9. All 4s side leg lift	21.3	Top of the lift
10. Hovering	28	Top of the movement during pelvic curl

Conclusions: Certain plyometric movements induce effective co-recruitment of the pelvic floor musculature. These 10 movements are considered to the most effective pelvic floor engagers from the large number of movements studied. These movements may provide an effective plyometric pelvic floor conditioning program.

Podium #26

FUNCTIONAL OUTCOMES AFTER REPAIR OF MESH EROSION INTO THE LOWER URINARY TRACT

Laura Chang Kit, MD and Roger Dmochowski, MD
Vanderbilt University, Nashville, TN
(Presented by: Laura Chang Kit)

Introduction: Mesh erosion into the lower urinary tract after pelvic surgery is a well-known complication.
Objective: To assess the functional outcomes after repair of mesh erosion in the lower urinary tract and how these were managed.
Methods: Retrospective review of medical records from January 2000 to August 2010. CPT codes for endoscopic or vaginal foreign body removal, urethrolysis, sling revision or removal, female urethroplasty, cystorraphy and cystectomy (partial/simple) were used to identify patients with erosions of any graft material into the urinary tract following pelvic surgery. We recorded age at repair, type of eroded graft material, inciting procedure, duration of follow-up, location of erosion, number of previous attempts at repair, initial management, functional outcome, subsequent procedures and overall outcome. No funding was provided.
Results: Thirty-six females identified. Mean age at repair was 52.3 years (25–89). Mean follow-up was 1.6 ± 1.9 years. Twenty-nine patients had undergone mid-urethral slings (81%) [28 polypropylene, 1 Stratisis]. Most frequent sites of erosion were urethra (42%) and bladder walls/dome (36%). Ten patients (28%) had 12 previous attempts at repair. Our initial repair involved urethroplasty (44%), partial cystectomy (28%), cystorrhaphy (17%), endoscopic techniques (8%) and abdominal vesico-vaginal fistula repair (3%). Postoperatively, 1 patient (3%) developed de novo urgency, treated with anticholinergics. Twenty-one patients (64%) had incontinence [6 urge (17%), 4 stress (11%), 11 mixed (31%), 2 total (5%)]. One patient developed new pelvic pain requiring referral to pain specialists, and 3 had ongoing pelvic pain. Fourteen patients (39%) required secondary procedures including botox injection (2), neuromodulation (1) and bladder augmentation (1). Six patients (17%) underwent a third procedure and 2 patients required a fourth. At last follow-up, 36% were cured of their preoperative symptoms, 36% had good control over their postoperative symptoms and 28% had significant ongoing symptoms.
Conclusion: Mesh erosion into the genitourinary tract usually requires a complex surgical approach. Polypropylene mid-urethral sling erosions of the urethra are most commonly seen. After initial repair, 2/3 will have incontinence (mostly mixed or urge) and de novo urgency is rare. Approximately 40% will require a secondary procedure. About 70% of patients will achieve either good control or resolution of their symptoms.

Podium #27

NOCTURIA TREATED WITH SACRAL NEUROMODULATION

Charles R. Powell, MD[1], Joseph Zabell, MD[2], Elizabeth B. Takacs, MD[2] and Karl J. Kreder, MD[2]
[1]Indiana University School of Medicine; [2]University of Iowa, Iowa City, IA
(Presented by: Charles R. Powell)

Purpose: We examined the role of sacral neuromodulation for the treatment of nocturia in patients with lower urinary tract symptoms.
Methods: Between January 2000 and October 2009, 82 patients (72 women, 10 men) underwent successful sacral nerve test stimulation followed by permanent generator implantation if the patient had $>50\%$ improvement in the presenting symptom. Primary outcome was the difference in nocturia between pre- and postoperative periods stratified by age, and by presence or absence of painful bladder syndrome. Severity of preoperative nocturia was also evaluated as a possible predictor for long-term success with neuromodulation.
Results: When stratified by age (<50, 50–69, ≥ 70), all groups experienced a significant decrease in nocturia episodes per night (1.82, 2.39, 1.63, respectively, $P < 0.01$). Age ≥ 70

Pelvic floor Pilates

The low down on your **pelvic floor post baby..** what your Pelvic Floor is, signs of weakness & how to **strengthen it**

By Bruce S. Crawford MD. *(Creator of the Pfilates Method of Pelvic Floor Training)*

"Hey moms!

Not familiar with the term 'Pelvic Floor'? You are not alone! It is increasable, but even many health care providers would have a difficult time describing this mysterious, and yet so essential, element of the female (and male) body. That's a problem! It is a problem because our pelvic floor is responsible for so many essential functions our body must perform. Bladder control, sexual response, support of the pelvic organs, and even bowel control all depend on the health and fitness of the group of small muscles called the pelvic floor.

Like any other muscular system, if the pelvic floor is not fit, it cannot perform. If the muscles of the lower back don't perform well, we are at risk for functional problems like low back pain. If the muscles of the top of the thigh don't perform well, we are at risk for falls and knee problems. If the muscles of the pelvic floor don't perform well, the consequences may include a leaky bladder, loss of sexual satisfaction, and not being able to control when you pass gas (or worse!). Have I got your attention? Here is the kernel of information that has been missing from the consciousness of the general public: Bladder control and other pelvic floor problems are

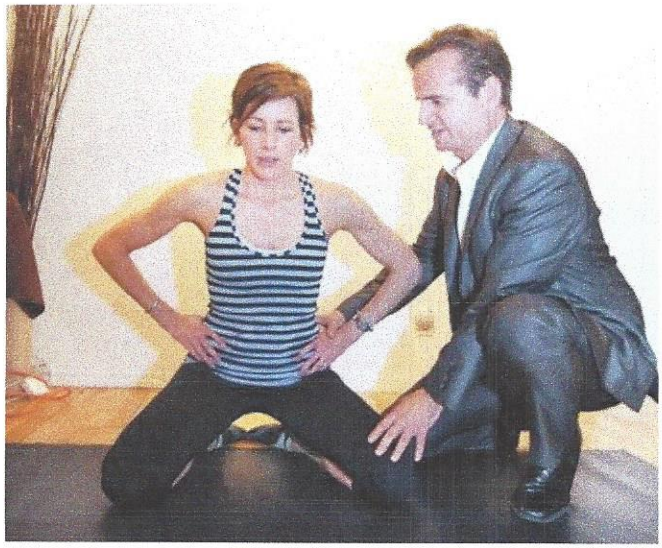
Bladder control, sexual response, support of the pelvic organs, and even bowel control all depend on the health and fitness of...the pelvic floor

fitness issues, and this is pretty good news! You can do something about a fitness issue! What we know about the pelvic floor is this: The pelvic floor responds to conditioning like any other neuro-muscular system. The same basic principles of conditioning apply. The mainstay of pelvic floor fitness training has been, since the 1950s, the Kegel exercise. While useful, we can do better. There is no Fitness Trainer, or Physical Therapist who would recommend you condition your quadriceps (muscles on top of the thigh) by sitting in a chair and contracting your quadriceps over and over. Rather, they would recommend a program of functional movement that challenges the natural

purpose of the quadriceps, with progressive intensity, to achieve improved performance. The pelvic floor muscles, like the quadriceps, are muscles that naturally respond to movement; they are core stabilizing muscles used to maintain balance and posture. By applying a program of functional movement, rather than simply performing Kegels, we can more completely engage these muscles and better achieve a conditioning effect.

HOW WE BEGAN

In 2009 we created a program of functional movement for pelvic floor training called Pfilates. Many of the movements we use were inspired by the movements of Pilates and Yoga.



The movements were selected based on extensive EMG research on over 120 different movements considered to be likely to engage the pelvic floor. Ultimately 10 movements were selected and assembled into a routine called Pfilates (www.pfilates.com). It is not essential that one perform all 10 movements. Rather, we suggest that 3 or 4 movements be identified that can be incorporated into one's regular fitness routine for 5 minutes per day. Choosing the right movements may be done by paying attention to which of the 10 movements provide that "feeling of central tightening" associated with a pelvic floor contraction.

Alternatively, some choose to work with one of the Certified Pfilates instructors of which there are over 500 in North America alone. The most precise way to identify your "best movements" is to participate in a VESy session (www.vesylab.com) whereby clients have the pelvic floor and related muscles monitored with EMG as all 10 movements are performed and analyzed.

"I look forward to expanding on these techniques in future issues of Your Toddler! In the meantime feel free to ask questions! You can contact our team at info@pfilates.com."

Dr Bruce Crawford MD is a board certified Obstetrician Gynecologist and Pelvic Floor Specialist in private practice in Northern Nevada. Dr. Crawford attended medical School at New York University before completing a residency at the University of Arizona, Tucson. Dr. Crawford is a member of the International Organization for Women and Development and has made several surgical trips to Niger, West Africa and Kigali Rwanda to repair obstetrical fistula.

pfilAtes™
pelvic floor pilates

Dr. Crawford is the creator of **Pfilates** and the **VESy Lab**, two cutting edge methods of pelvic floor conditioning. Dr. Crawford has published numerous articles in the areas of obstetric fistula and pelvic floor neuromuscular function. Dr. Crawford is a member of The Society of Gynecologic Surgeons, Society for Urodynamics and Female Urology, the International Continence Society, and the American College of Obstetricians and Gynecologists.