POTJ

Physiotherapy and Occupational Therapy Journal

The Physiotherapy and Occupational Therapy Journal's (ISSN 0974 – 5777, Registered with Registrar of Newspapers for India: DELENG/2007/22242) on topics pertaining to physical therapy and rehabilitation. Coverage includes geriatric therapy, pain management techniques, cardiac, orthopaedic and pulmonary rehabilitation, working with stroke patients, occupational therapy techniques and much more. The editorial contents comprise research papers, treatment notes and clinical observations, case histories, professional opinion and memoirs and comments on professional issues. The Editorial Board's mission is to publish significant research which has important implications for physiotherapy and occupational therapy. Our vision is for the journal to be the pre-eminent international publication of the science and practice of physiotherapy and occupational therapy.

Indexed and Abstracted in: NLM catalogue & locator plus, USA, Index Copernicus, Poland. EBSCO Publishing`s Electronic Databases, USA, Academic Search Complete, USA, Academic Search Research & Development, USA, ProQuest, USA, Genamics JournalSeek.

Corresponding address
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I
Delhi - 110 091 (India)
Tel: 91-11-22754205, Fax: 91-11-22754205
E-mail: redflowerppl@vsnl.net
Website: www.rfppl.com

Revised Rates for 2013 (Institutional)

Title	Freequency	Rate (Rs): India	Rate ($):ROW
Indian Journal of Agricultural and Forest Meteorology	3	21000	800
Indian Journal of Agriculture Business	3	11500	600
Indian Journal of Agriculture, Ecosystems and Environment	3	18000	800
Indian Journal of Anatomy	2	3000	260
Indian Journal of Ancient Medicine and Yoga	4	6600	330
Indian Journal of Anesthesia and Analgesia	2	4000	600
Indian Journal of Animal Feed Science and Technology	3	22000	850
Indian Journal of Animal Reproduction Science	3	19000	700
Indian Journal of Cancer Education and Research	2	4500	500
Indian Journal of Dental Education	4	3000	288
Indian Journal of Emergency Pediatrics	4	6000	302
Indian Journal of Food Additives and Contaminants	3	28000	900
Indian Journal of Food and Chemical Toxicology	3	22000	800
Indian Journal of Food Chemistry	3	37000	1100
Indian Journal of Food Engineering	3	25000	800
Indian Journal of Forensic Medicine and Pathology	4	12000	576
Indian Journal of Forensic Odontology	4	3000	288
Indian Journal of Genetics and Molecular Research	2	4800	262
Indian Journal of Library and Information Science	3	7200	600
Indian Journal of Nutrition & Food Sciences	3	38000	900
Indian Journal of Obstetrics and Gynecology	2	1500	200
Indian Journal of Pathology: Research and Practice	3	22000	915
Indian Journal of Pediatric Education	4	3000	150
Indian Journal of Plant and Soil	3	51000	1700
Indian Journal of Preventive Medicine	2	3000	270
Indian Journal of Soil Science	3	34000	1000
Indian Journal of Surgical Nursing	3	1450	70
International Journal of Neurology and Neurosurgery	2	7200	276
Journal of Human Nutrition and Dietetics	2	3000	270
Journal of Psychiatric Nursing	3	1450	70
Journal of Social Welfare and Management	4	6600	276
Meat Science International	3	20000	800
New Indian Journal of Surgery	4	6300	360
Physiotherapy and Occupational Therapy Journal	4	6600	360

1. Advance payment required by Demand Draft payable to Red Flower Publicaion Pvt. Ltd. payable at Delhi.
2. Cancellation not allowed except for duplicate payment.
3. Agents allowed 10% discount.
4. Claim must be made within six months from issue date.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India), Tel: 91-11-22754205, 65270068, Fax: 91-11-22754205. E-mail: redflowerppl@vsnl.net, redflowerppl@gmail.com, Website: www.rfppl.com

Physiotherapy and Occupational Therapy Journal

POTJ

July - September 2013
Volume 6, Number 3

Contents

BOOKS FOR SALE

CHILD INTELLIGENCE

By **Dr. Rajesh Shukla**

ISBN: 81-901846-1-X, Pb, vi+141 Pages

Price: Rs.150/-, US$50/-

Published by **World Informations Syndicate**

This century will be the century of the brain. Intelligence will define success of individuals; it remains the main ingredient of success. Developed and used properly, intelligence of an individual takes him to greater heights. Ask yourself, is your child intelligent! If yes, is he or she utilizing the capacity as well as he can? I believe majority of people, up to 80% may not be using their brain to best potential. Once a substantial part of life has passed, effective use of this human faculty cannot take one very far. So, parents need to know how does their child grow and how he becomes intelligent in due course of time. As the pressure for intelligence increases, the child is asked to perform in different aspects of life equally well. At times, it may be counter-productive. Facts about various facets of intelligence are given here. Other topics like emotional intelligence, delayed development, retardation, vaccines, advice to parents and attitude have also been discussed in a nutshell. The aim of this book is to help the child reach the best intellectual capacity. I think if the book turns even one individual into a user of his best intelligence potential, it is a success.

PEDIATRICS COMPANION

By Dr. Rajesh Shukla

ISBN: 81-901846-0-1, Hb, VIII+392 Pages

Price: Rs.250/-, US$50

Published by **World Informations Syndicate**

This book has been addressed to young doctors who take care of children, such as postgraduate students, junior doctors working in various capacities in Pediatrics and private practitioners. Standard Pediatric practices as well as diseases have been described in a nutshell. List of causes, differential diagnosis and tips for examination have been given to help examination-going students revise it quickly. Parent guidance techniques, vaccination and food have been included for private practitioners and family physicians that see a large child population in our country. Parents can have some understanding of how the doctors will try to manage a particular condition in a child systematically. A list of commonly used pediatric drugs and dosage is also given. Some views on controversies in Pediatrics have also been included. Few important techniques have been described which include procedures like endotracheal intubations, collecting blood samples and ventilation. I hope this book helps young doctors serve children better.

Order from

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I

Delhi - 110 091 (India)

Tel: 91-11-65270068, 22754205, Fax: 91-11-22754205

E-mail: redflowerppl@gmail.com, redflowerppl@vsnl.net

Original Article

Physiotherapy and Occupational Therapy Journal
Volume 6 Number 3, July - September 2013

Rectus Abdominis Muscle Activity on Different Surfaces

Chaya Garg*, Ritu Sharma**

Abstract

Background: Abdominal exercises (AE) are one of the most popular exercises used in fitness and training programs. Exercising on an unstable surface as opposed to exercising directly on a hard flat surface may enhance the body respond to the instability. To remain balanced the muscle recruitment patterns may change and enhanced muscle response may be required. **Methods:** Thirty three normal healthy male and female subjects with age between 18-25 years were included in the study. Subjects were asked to perform abdominal crunches on four different surfaces (plinth, Swiss ball, 2-dimensional wobble board and 3-dimensional wobble board) and electromyographic activity of the upper and lower rectus abdominis was noted. **Results and Conclusion:** Average as well as the peak activity of upper and lower rectus abdominis muscle was found to increase as subject performed on progressively more unstable surface.

Key words: Abdominal exercises; Swiss ball; 2-Dimensional wobble board; 3-Dimensional wobble board.

Introduction

In recent years, health and fitness practitioners have given greater and greater emphasis to core stability for injury prevention, rehabilitation and performance enhancement. The concept of developing strong muscles in the trunk is believed to reduce the risk of both acute and chronic injury.[1]

The "core musculature" can be defined generally as the 29 pairs of muscles that support the lumbo-pelvic-hip complex in order to stabilize the spine, pelvis, and kinetic chain during functional movements.[2] The core is also commonly referred to as the "powerhouse"or the foundation of all limb movement.[3] To ensure stability of the spine in order to produce force and to prevent injury, trunk muscles must have sufficient strength, endurance, and recruitment patterns.[4]

A well developed muscle of the abdominal is an essential ingredient to the type of complete physique for any sports performance. The anatomical and kinesiological studies have revealed that abdominal muscles are the stabilizer of the pelvis, the lumber spine and the thorax and are prime mover for the trunk flexion and rotation.[5]

The most well known and prominent abdominal muscle is rectus abdominis. It is a long flat muscle that extends vertically between the pubis and the fifth, sixth and seventh ribs.[6] It helps to flex the spinal column, narrowing the space between the pelvis and the ribs. It is also active during side bending motions and helps stabilize the trunk during movements involving the extrimities and head.[7]

Core stability exercise can be defined as "any exercise that channels motor patterns to ensure a stable spine through repetition.[8] However, the current trend toward core stability training

Author Affilation: *Head and Associate Professor, Department of Physiotherapy, Galgotias University, Gautam Buddha Nagar, Noida, UP, **Physiotherapist,Bhatt Physiotherapy and Pain Clinic,Kaushambi,Ghaziabad,U.P.

Reprint request: Dr. Chaya Garg, Head and Associate Professor, Dept. of Physiotherapy, Galgotias University, Gautam Buddha Nagar, Noida, UP.

E-mail: chayagarg79@gmail.com

in commercial fitness centers may have originated from physical therapy methodology. When performed in this setting, core stability exercises are different from the a fore mentioned free weight lifts in that the emphasis is on isometric muscle actions (e.g. prone or supine bridging) performed with body mass or relatively light loads . Furthermore, these exercises are often performed while lying, seated, or standing on unstable equipment such as a Swiss ball, wobble board, low density mat, or air-filled disc.

Abdominal exercises (AE) are one of the most popular exercises used in fitness and training programs. The main goal of AE is to strengths the thoraco-lumbar flexor muscles. Research shows that weakness of the rectus abdominis (or any anterior abdominal muscle: pyramidalis, transversus abdominis external or internal oblique abdominal) can cause chronic instability of the pelvis due to abnormal pelvic rotation and movement.[9]

The use of unstable equipment has increased in popularity among healthy athletes. Various forms of unstable equipment have been claimed effective training tools for improving strength and power.[10] Surface instability is a common addition to traditional rehabilitation and strength exercise with the aim of increasing muscle activity and increasing exercise difficulty.[11]

The swiss ball exercises are believed to activate the trunk musculature to a greater extent than more traditional resistance execises. The unstable surface of ball is thought to provide a greater challenge to the core muscles than a solid bench or standing on a stable surface. The swiss ball stability and balance exercises increases the torso balance and electromyographic activity compared to conventional floor exercises.[12]

A primary benefit with an exercise ball as opposed to exercising directly on a hard flat surface is that the body responds to the instability of the ball to remain balanced.[13] Swiss balls are unstable surface which may result in an increased need for force output from trunk muscles to provide adequate spinal stability or balance. They increase the muscle isolation, improved balance, greater dexterity and enhanced strength.[14] Swiss ball exercises are the key to effective improvements in trunk strength, as actions performed on the ball involve greater stimulation of the neuromuscular system.[15]

The correct alignment required to stabilize and accommodate movements of the pelvic girdle depends on adequate strength and endurance of abdominal musculature.[16] Swiss balls have been incorporated into strength training regimes and touted as a means to train musculoskeletal system effectively.[13]

The other most commonly used unstable surface is the wobble board. It is however possible to use the wobble board in a wide variety of exercises, such as balanced push ups and sit-ups or to improve balance on one leg. Balance board training can help to build core strength and stability, increase the range of motion in lower extremities, and improve posture. All these physical benefits can engender greater body awareness and confidence that will positively affect our athletic performance.[17]

The use of electromyography has been an important tool in understanding the muscles activity. Experimental research uses electromyographic (EMG) methods to characterize the activation of muscles.[18]

Methodology

Thirty three normal healthy male and female subjects with age between 18-25 years were included in the study. The group had a mean age of 22.18 yrs and a mean weight of 55 kgs, and a mean height of 162.01 cms. The subjects were excluded if there was any history of low back pain in last 3 months[17], any balance impairment, history of abdominal surgery, spinal surgery and hernia, orthopedic disorder of back, hip or knee, back and lower extremity malignancies, were pregnant, had hypertension, any neurological disorders affecting back and lower extremities, were

under medication (muscle relaxants), had unhealed scar or wound on the trunk, metal implants in back and lower leg.

Potential subjects were apprised of the procedure and its potential risks and benefits and the evaluation was done. Subjects who fulfilled the inclusion and exclusion criteria and gave their informed consent were included in the study. Subjects were asked to perform abdominal crunches on four different surfaces (plinth, swiss ball, 2-dimensional wobble board and 3-dimensional wobble board) and electromyographic activity of the upper and lower rectus abdominis was noted. A rest period of two minutes was allowed in between each task. Two practice trials on each surface were given prior to data collection.

Testing procedure

Self adhesive electromyographic electrodes were placed approx 3 cm lateral and 5 cm superior to the umbilicus for upper rectus abdominis and approx. 3 cm lateral and 5 cm inferior to umbilicus for lower rectus abdominis.[17] The subject was made to lie supine with both feet flat on the plinth and hips and knees flexed. The resting muscle activity of the upper and lower rectus abdominis was noted.

Fig 1: Abdominal crunch on plinth

Fig 2: Abdominal crunch on swiss ball

Fig 3: Abdominal crunch on 2-dimensional wobble board

Fig 4: Abdominal crunch on 3-dimensional wobble board

The subjects then performed the abdominal crunch on 4 different surfaces. Subjects were instructed to lift their upper body till the inferior angle of scapula was off the supporting surface but not to flex the neck. Subjects were then asked to maintain this position for 6 seconds and electromyographic activity of the upper and lower rectus abdominis was noted. On the plinth subject was positioned with both feet flat on the plinth and hips and knees flexed. On gym ball the subjects were positioned with lower lumbar region supported on a gym ball & feet placed flat on the floor. The inflation of the Swiss ball was checked between subjects to ensure that the diameter remained at 60 cms prior to each test. On a 2 and 3-dimensional wobble board the subject were made to lie with board under his lower lumbar region and both hips and knees flexed and feet flat on the ground.

Results

Activity of upper and lower rectus abdominis muscle on different surfaces is shown in table 2 and table 3.

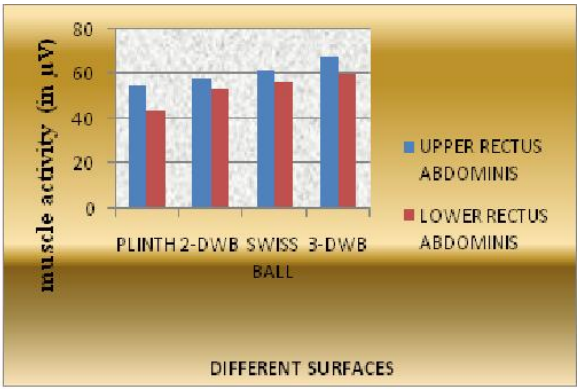
Table 1: Comparison of average activity of upper and lower rectus abdominis muscle on various surfaces

MUSCLE	PLINTH	2-DWB	SWISS BALL	3-DWB
UPPER RECTUS ABDOMINIS Mean (SD)	54.81 (26.41)	57.8 (33.5)	61.65 (35.05)	67.87 (49.74)
LOWER RECTUS ABDOMINIS MEAN (SD)	43.69 (26.41)	53.83 (54.37)	56.86 (52.87:)	60.33 (54.81)

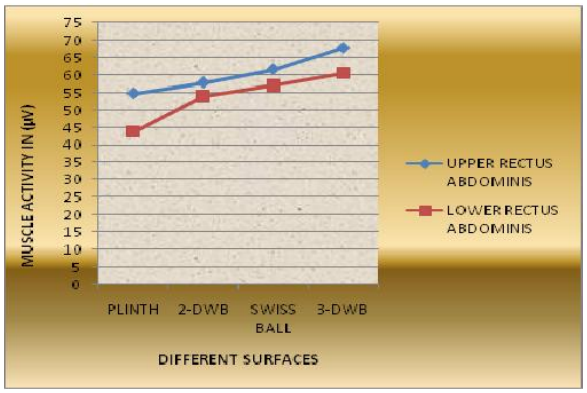
Table 2: Comparison of peak activity of upper and lower rectus abdominis muscle on various surfaces

MUSCLE	PLINTH	2-DWB	SWISS BALL	3-DWB
UPPER RECTUS ABDOMINIS Mean (SD)	123.81 (114.86)	126.59 (92.70)	116.78 (19.14)	139.95 (103.4)
LOWER RECTUS ABDOMINIS Mean (SD)	91.75 (54.25)	110.74 (101.63)	114.83 (111.59)	136 .93) (114.0)

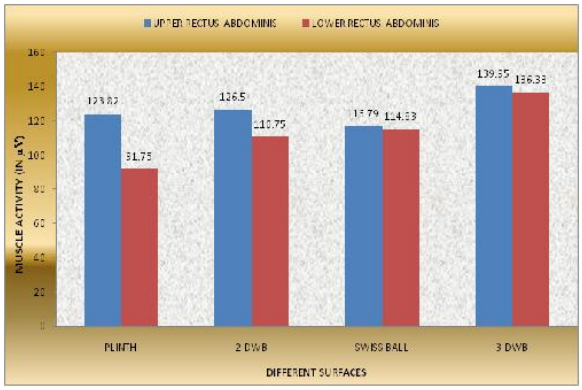
Graph 1: Comparison of average upper and lower rectus abdominis muscle activity on different surfaces.



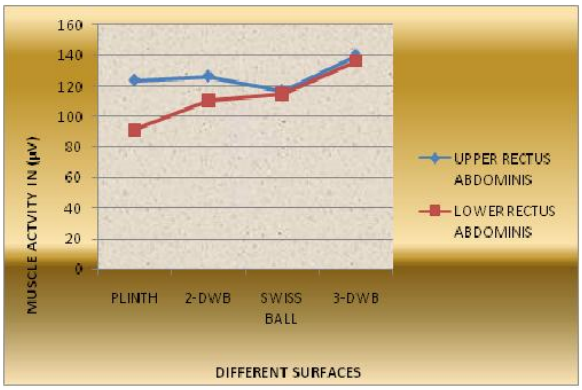
Graph 2: Comparison of average upper and lower rectus abdominis muscle activity on different surfaces



Graph 3: Comparison of peak upper and lower rectus abdominis activity on different surfaces



Graph 4: Comparison of peak upper and lower rectus abdominis muscle activity on different surfaces



Average activity of upper and lower rectus abdominis muscle

Average activity of upper and lower rectus abdominis muscle was found to increase as subject performed on progressively more unstable surface. The amount of rise in lower rectus abdominis muscle was more as compared to upper rectus abdominis muscle, though the level of activity of upper rectus abdominis muscles was greater on all the surfaces.

Peak activity of upper and lower rectus abdominis muscle

Peak activity of upper and lower rectus abdominis were found to increase as subject performed on progressively more unstable surface. But the amount of rise in lower rectus activity was more as compared to upper rectus abdominis on Swiss ball due to extended hip position . The upper rectus abdominis activity is more on other surfaces.

Discussion

The hypothesis proposed in the current study was supported by the positive result of increased rectus abdominis muscle activity as the unstability of the surface is increased. The result indicated that the muscle activity was highest on 3-dimensional wobble board.

The activity of the upper rectus andominis muscle is more than that of the lower rectus abdominis muscle while performing crunch on all the surfaces. Performing crunch exercises on labile surfaces appears to increase abdominal muscle activity. This increase in muscle activity is probably due to increased requirement to enhance spine stability and whole body stability to reduce the threat of falling off the labile surface. The use of labile surfaces appears to increase muscle activity levels and co activation, further challenging endurance capabilities. Axler and McGill noted that generally curl-ups (at least on stable surfaces) were the safest of those chosen from a wide variety of abdominal muscle exercises.

It's also claimed that Swiss ball training improves nervous-system function that results in functional strength gains. The neural component of strength is well established, and maximum strength development requires the development of this component along with that in contractile tissue.[19] A study has proposed taxonomy of tasks based on task function and the environmental context in which the task is carried out. The simplest tasks are closed tasks in which the regulatory stimuli (the pertinent sensory information) are stable and no variability exists between trials to trial. Practicing closed tasks results in fixation, a type of learning that narrows the range of performance. The most complex tasks are open tasks in which the regulatory stimuli are unstable and there is variability between trials to trial. Practicing open tasks results in diversification, the acquisition of a more flexible motor strategy, adaptable to changing environmental conditions.[20] Swiss ball training has been used by physical therapists to challenge their patients toward diversification [13]. If Swiss ball training with weights results in a similar motor strategy diversification in athletes, the strength gains may be more functional to performance.[21]

The result of this study differed from the study done which proposed that the unstable surface does not cause an increase in muscle activity. Different individuals respond differently to unstability.[22] But there are many studies that support the result of the current study which states that[23] there is a significant increase in rectus abdominis muscle activity while performing single leg holds on Swiss ball. Also a study[24] done concluded that the rectus abdominis muscle activity becomes double on a Swiss ball.

Studies have already shown that introduction of an unstable surface increases the muscle activity while performing crunches on an unstable surface. The inflatable disc, perhaps due to a combination of higher instability and a smaller base of support, elicited greater activation of the rectus abdominis than when compared to levels of activation during the stable curl up. A similar

study[25] done concluded that the rectus abdominis muscle activity was maximum on a 3-dimensional wobble board while performing abdominal crunches as compared to crunches performed on Swiss ball and 2-dimensional wobble board.

In this study the hold time for a crunch is of 6 seconds[17] and a rest of 2 minutes is provided in between each task.[17] The 6 seconds time is taken because McGill suggested that there is some seconds needed by all the nuscle fibfres to be recruited. And hence to get the peak activity of the muscle.[17]

Although it appeared that the unstability of the surface increases the rectus abdominis muscle activity while performing the crunches, many questions remain unanswered regarding the muscle contraction that whether the subjects were able to recruit the upper rectus abdominis properly while performing crunch.

The limitations of this study were that only young normal adults were included, number of subjects is less due to limited sample of subjects and time constrains, the abdominal muscle strength is not tested for inclusion as it can vary from person to person. Surface electrodes were used instead of needle electrodes.

Future investigations may include persons with different age groups, spinal conditions, measuring muscle activity of other abdominal muscles along with rectus abdominis.

Conclusion

The result of this study showed that the upper rectus abdominis muscle activity is more as compared to lower rectus abdominis muscle while performing crunch on stable and unstable surfaces. The maximum increase in muscle is on 3-dimensional wobble board and least increase on plinth as compared to Swiss ball and 2- dimensional wobble board. Among Swiss ball and 2-dimensional wobble board the upper rectus abdominis muscle activity is more on Swiss ball.

Hence this study concluded by accepting the suggested hypothesis that the rectus abdominis muscle activity increases on unstable surfaces. Therefore, it is suggested that the 3-dimensional wobble board is most challenging in training the upper rectus abdominis muscle followed by Swiss ball, 2-dimensional wobble board and plinth.

References

1. Hodges PW, Richardson CA. Contraction of the abdominal muscles associated with movement of the lower limb. *Phy Ther.* 1997; 77(2): 132-42.
2. Fredricson M, T Moore. Core stabilization training for middle and long distance runners. *New Stud Atheletics.* 2005; 20: 25-37.
3. Akuthota V. Core strengthening. *Arch Phy Med Rehab.* 2004; 85: S86-S92.
4. Bergmark A. Stability of the lumbar spine in mechanical engineering. *Acta Orthop.* 1989; 230: 20-24.
5. Whiting and Rugg S. Electromyographic comparison of a stability ball crunch with a traditional crunch. 2007; 21.6. Gray's Anatomy. 40th British Addition.
6. Fredricson M, T Moore. Core stabilization training for middle and long distance runners. *New Stud Atheletics.* 2005; 20: 25-37.
7. Elizabeth Quinn. Guide to sports medicine. 2009.
8. McBride JM, P Cormite, R Dean E. Isometric squat force output and muscle activity in stable and unstable conditions. *J Strnghth Cond Res.* 2006; 20(4): 915-918.
9. Bell JT. Building six- pack abs, developing the abdominal muscles. 2006
10. Carter JM, WC Beam, SG Mcmahan, ML Barr, L Brown. The effects of stability ball training on spinal stability in sedentary individuals. *Strength Cond Res.* 2006; 20(92): 429-435.
11. Gregory J Lehman, Hodaw *et al*. Replacing a Swiss ball for an exercise bench causes variable changes in trunk muscle activity during upper limb strength exercises. 2005; 10: 1186/1476-5918-4-6.

12. Casio-Lima LM, Reynolds KL, Winter C, Paolone V. Effects of physioball and conventional floor exercises on early phases adaptations in back and abdominal core stability and balance in women. 2003; 17(4): 721-725.
13. Grenier SG *et al*. An unstable surface is not a sufficient condition for increase in muscle activity during rehabilitation exercise. 2007; 51(3): 139-143.
14. Flett, Maureen *et al*. Swiss Ball: For Strength, Tone and Posture. Sterling Publishing Company; 2003.
15. Goodman P *et al*. NCSA'S Performance. *Training Journal*. 2003; 2(6): 9-25.
16. Michael Duncan. Muscle activity of upper and lower rectus abdominis during exercises performed on and off a Swiss ball. *Journal of Body Work and Movt Therapies*. 2009,13(4): 364-367.
17. Stuart M McGill, Sylvain G Grenier.Abdominal muscle response during curl- upon both stable and labile surfaces. *Phy Ther*.2000; 80(6): 564-569
18. Souza GM, Baker LL, Powers CM. Electromyographic activity of selected trunk muscles during dynamic spine stabilization exercises. *Arch Phys Med Rehab*. 2001; 82(11): 1551-7.
19. Meshram Swati C. A differential electromyographical analysis of rectus abdominis muscle segments during performance of different test movements. *Indian Journal of Physiotherapy and Occupational Therapy*. 3: 0979-6674.
20. Hall SJ, Lee J & Wood TM. Evaluation of selected Sit-Up variations for the individual with low back pain. *Journal of Applied Sport Science Research*. 1990; 4(Suppl. 1): 42-46.
21. Taylor MJ, JS Gunther, A motor control rationale for the therapeutic use of a Swiss ball. In Swiss ball applications for orthopedic and sports medicine. *Ball Dynamics International*. 1995; 5-21.
22. Tirish Gordan, JO Langley. Replacing a Swiss ball for an exercise bench causes variable changes in trunk muscle activity during upper limb strength exercises. *Dynamic Medicine*. 2005; 1476-5918-4-6.
23. Marshall PW, Murphy BA. Core stability exercises on and off a Swiss ball. *Arch Phys Med Rehab*. 2005; 86(2): 242-9.
24. Jerrold S, Batt Jeniffer, Davis. Core muscle activity during exercise on a mini stability ball compared with abdominal crunches on the floor and on a Swiss ball. *Journal of Applied Research*. 2007; 7(3).
25. Robinson, Mark, Lees, Adrian, Barton, Gabor. An electromyographic investigation of abdominal exercises and the effects of fatigue. 2005; 48(11-14): 1604-1612.

Physiotherapy and Occupational Therapy Journal

Library Recommendation Form

If you would like to recommend this journal to your library, simply complete the form below and return it to us. Please type or print the information clearly. We will forward a sample copy to your library, along with this recommendation card.

Please send a sample copy to:

Name of Librarian

Library

Address of Library

Recommended by:

Your Name/ Title

Department

Address

Dear Librarian,

I would like to recommend that your library subscribe to the **Physiotherapy and Occupational Therapy Journal**. I believe the major future uses of the journal for your library would be:

1. As useful information for members of my specialty.
2. As an excellent research aid.
3. As an invaluable student resource.
4. **I have a personal subscription and understand and appreciate the value an institutional subscription would mean to our staff.**
5. Other

Should the journal you're reading right now be a part of your University or institution's library? To have a free sample sent to your librarian, simply fill out and mail this today!

Stock Manager

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I

Delhi - 110 091 (India)

Tel: 91-11-65270068, 22754205, Fax: 91-11-22754205

E-mail: redflowerppl@gmail.com, redflowerppl@vsnl.net

Website: www.rfppl.com

Original Article

Physiotherapy and Occupational Therapy Journal
Volume 6 Number 3, July - September 2013

Comparison of Internal and External Attentional Focussing Strategy on Power Gain with Plyometric on Upper Limb

Shahana*, Shibli Nuhmani, Saurabh Sharma*****

Abstract

Introduction: Attention is a process of selection and selective processing . Attentional focus is either directed internally or externally. The emphasis of verbal instructions can have a significant impact on an individual's attentional focus and the quality of their movements Instructions that influence an individual's attentional focus can have a significant influence on both the accuracy and efficiency of their movements. A sample consisting total of 30 individuals was selected for the study using randomized sampling. It consisted of all the male participants . Chosen subjects were randomly allocated to the three groups, each having 10 subjects where group A (CG) and group B (PIAFG) performed plyometrics with internal attentional focussing strategy and Group C (PEAFG) external attentional focusing strategy . The data was analysed with SPSS software. **Conclusion:** After providing 6 weeks of plyometrics training to the recreational collegiate athletes ,results showed maximum improvement of power in group 2 i.e. the group performing the plyometric training utilizing the internal attentional focus instructions, followed by group 3 i.e. the group performing the plyometric training with external attentional focus instructions and minimum improvement was seen in group 1 i.e. the group performing the plyometric training with no instructions . The internal focusing strategy , may will be beneficial in specific circumstances .it is there by possible that using internally focused instructions to increase muscular activity may aid muscular resistance training and the rehabilitation of injured muscles through increased stimulation.

Keywords: Plyometrics internal attentional focusing(PIAFG); Plyometrics external attentional focusing strategy(PEAFG); Plyometrics.

Introduction

Attention is a process of selection and selective processing, required because the brain has a limited information processing capacity [1] and the attentional focus is defined as the influence of instructions to consciously attend to specific information during the production of action.[2]

Attentional focus is defined as the influence of instructions to consciously attend to specific information during the production of action. [3]

Author Affilation: *Research Scholar, **Assistant Professor, FAHS, Jamia Hamdard, Delhi, ***Assistant Professor, Jamia Millia Islamia, New Delhi-110025.

Reprint request: Saurabh Sharma, Assistant Professor, Jamia Millia Islamia, New Delhi-110025.

E-mail: saurabh14332003@yahoo.com

Attentional focus is either directed internally or externally. Recent research has demonstrated that the emphasis of verbal instructions can have a significant impact on an individual's attentional focus and the quality of their movements Instructions that influence an individual's attentional focus can have a significant influence on both the accuracy and efficiency of their movements.[4]

Instructions emphasizing an external focus have been shown to be more beneficial than internally focused instructions in guiding performance and learning a variety of sporting tasks and skills, such as standing balance[5], golf[2,6], basketball, soccer kicks[7,8] and dart throwing.[9] There are two modes of attentional focusing strategies; intrinsic and extrinsic. Operationalised along the dimension of direction an internal focus is induced when a performer's attention is directed towards the actual bodily movements being produced during a movement and an external focus of

attention has been defined as when a performer's attention is directed towards an outcome of, or the effects of, the movement being produced (e.g., a goal, target, intended effect).[10] In the past few years, the effectiveness of instructions in the motor skill learning has been found to depend largely on the focus of attention they induce.[10] A lot of work has been conducted spanning over a year on the beneficial effects of extrinsic focusing strategy in if executing a new unlearnt motor skill and EMG has recently been recognized as an effective tool in the assessment of the focusing strategies and their benefits. It has been seen through the EMG analysis that an external focus of attention is adopted then the motor control system responds by recruiting less number of motor units per movement performed and if an internal focus is adopted then more motor units are recruited per movement performed.[11] l focus on postural and suprapostural task performance.

An increase in force could be accomplished with an increase in motor unit recruitment or firing rate of th e motor units in the agonists and a decrease in the motor unit recruitment or firing rate of the motor units in the antagonists.

Scientist also found an increase in the EMG activity of biceps muscle while performing biceps curls when an intrinsic attentional focusing strategy is utilized.[4,11]

Although an external focus of attention has been shown to have beneficial implications for specific sporting performance. However, applications such as strength training and physical So in the present study, intrinsic and extrinsic attentional focusing strategies have been incorporated into a progressive plyometric training program and would wish to see whether intrinsic or extrinsic strategy proves to be more fruitful in bringing about more power gains in upper limb. Power is an essential component for successful performance in many sports. Power represents the amount of work a muscle can produce per unit of time. An increase in power gives the athlete the possibility of improved performance in sports in which the improvement of the speed-strength relationship is sought . Power is an essential component for successful performance in throwing and overhead activities

Plyometrics consists of exercises commonly used to enhance explosive power via the stretch-shortening cycle (SSC). This is accomplished by optimizing the SSC refers to eccentric muscle action, whereas the shortening refers to the concentric muscle action.[12] The implementation of SSC programme begins initially with the development of an adequate strength and physical condition base. The development of a greater strength base results in greater force generation as a result of both the increased cross-sectional area of the muscle and the resultant elastic component. Plyometric training for the lower body nearly always the form of various jumping movements, such as hopping, bounding and drop jumps, while upper body plyometrics often uses medicine ball throwing movements. Both of these types of movements have been well documented.

Methodology

A sample consisting total of 30 individuals was selected for the study using randomized sampling. It consisted of all the male participants. Subjects were recruited on the basis of voluntary participation through informed consent. Subjects were recruited from Faculty of Allied Health Sciences, Jamia Hamdard University and Students pursuing D Pharmacy, Jamia Hamdard University. In group A with no instruction (CG) 10 physically active male (age=24.30±0.82 yrs, weight = 66.7±5.65 kg, height = 1.74±4.02 m), in Group B, internal attentional focusing (IAFG) 10 physically active male (age = 24.10±0.87 yrs, weight = 67.20±6.17 kg, height = 1.76±3.65 m) and in Group C that is external attentional focusing group (EAFG) 10 physically active male (age = 24.30±1.05 yrs, weight = 68.70±8.38 kg, height = 1.75±5.97 m) were recruited according to inclusion and

Figure 1: Pre –post PGIAF for group 3

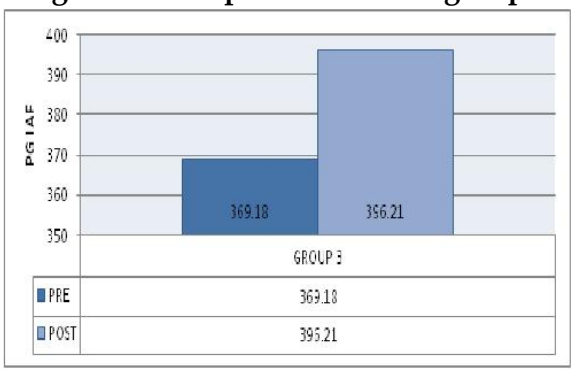
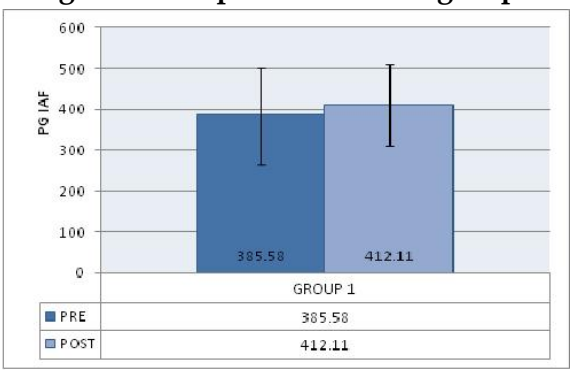


Figure 2: Pre-post PGIAF for group 1



exclusion criteria. A informed consent was obtained from those volunteers.

Inclusion criteria

Healthy young male, age group 18-25,normal BMI value.

Exclusion criteria

Any upper extremity injury in the past 6 months, any cardiac or metabolic condition, Subjects involved in any form of physical

Figure 3: Pre-post PGIAF for group 2

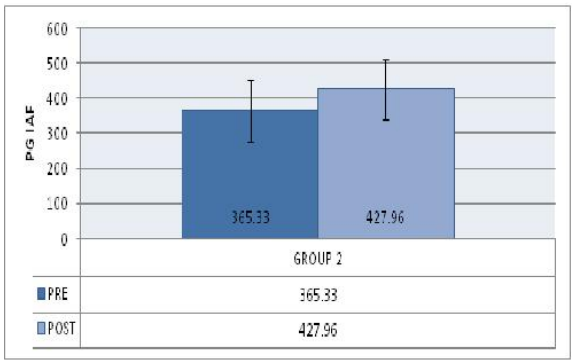


Figure 4: Difference in power between group 1 and 3

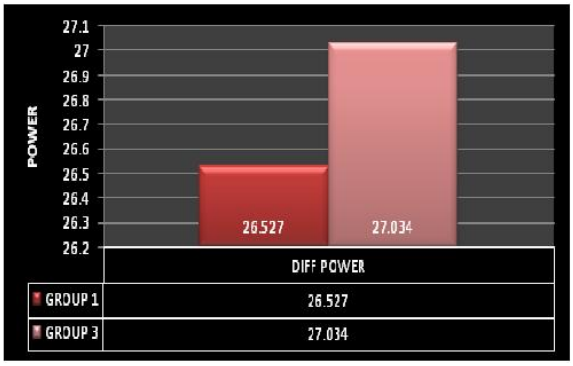
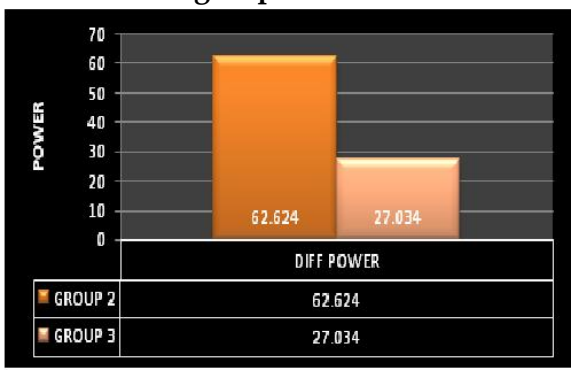


Figure 5: Difference in power between group 2 and 3

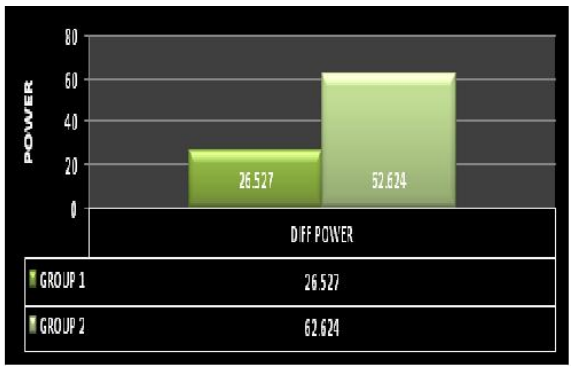


exercises for upper extremity for atleast 3 months and any neurological or cognitive disorder.

Samples were assigned to control group internal attentional focusing and external attentional focusing strategy randomly based on lottery method.

Chosen subjects were randomly allocated to the three groups, each having 10 subjects where group A (CG) and group B (PIAFG)

Figure 6: Difference in power between group 1 and 2



performed plyometrics with internal attentional focussing strategy Group C (PEAFG).

Each subject in group A and group B underwent plyometric training according to their group for 6 weeks for 3 days per week with 2 days rest between the sessions.

Pre test measurement included measuring weight, height, computing BMI values from respective weight height data and all the dependent variables.

BMI = Body Mass (kg) ÷ Stature (m^2)

Measurement of upper limb power

Medicine ball put test

Result

A total of 30 subjects participated in the A total of 30 subjects participated in the study out of which 10 participated in (group 1) i.e no focus group with only plyometrics training(conventional training group), another 10 subjects participated in (group 2) i.e. plyometrics with internal attentional focusing strategy i.e experimental group (IAFG). Then (group 3) involved another 10 subjects with external attentional focusing strategy their demographic data was analysed by comparing means of descriptives. They have their mean age to be 24±0.66 years, 24.30±0.67 years and 24.30±.67 years. They have their mean height 1.75±6.00 m, 1.75±3.88 m and 1.76±2.41 m. There mean weight was 68.10±8.79 kg, 66.40±5.71 kg and 68.10±5.98 kg, 68.70 ± 8.38 kg respectively. The p value for each age, height and weight was found out to be Age(p value=0.523,Height (p value=0.728) Weight p value=0.822. Each of this indicates there is insignificant difference between these Groups. The p value for each age, height and weight was found out to be Age (p value=0.523) within group results.

Table 1: Comparison between group 1 and 3 i.e. difference in power gains

	Group 1 Mean ± SD	Group 3 Mean ± SD	'p' value
Pre-Post difference power-	26.527±7.737	27.0340 ± 31.171	0.999

Significance level ≤ 0.05

Table 2: Comparison between group 1 and 2 i.e. difference in power gains

	Group 1 Mean ± SD	Group 2 Mean ± SD	'p' value
Pre-Post difference power	26.5270±7.7372	62.624± 43.094	0.038

Significance level ≤ 0.05

Table 3: Comparison between group 2 and 3 i.e. difference in power gains

	Group 2 Mean ± SD	Group 3 Mean ± SD	'p' value
Pre-Post difference power gain	62.624 ± 43.094	27.034 ± 31.171	0.042

Significance level ≤ 0.05

The comparison for within group significance was done using Paired sample 't' test for group 1, group 2 and group 3 respectively. Pre- post measurements were compared for each outcome measure of power of subject

In within group analysis, on comparing pre and post power, power was improved significantly in all the three groups with (p value = 0.000,p=0.001 and 0-023 respectively.

When all the three groups were compared using ANOVA, it was found that there was statistically significant difference ('p' value =0.021) in power gain values. The mean improvement was highest in the internal attentional focusing group (427.96±86.48) followed by external focus i.e training group (3). The p value and F value were found to be significant ('p' value =0.021, F value =4.448).

After doing ANOVA, post hoc analysis was done to do comparisons between different groups. When multiple comparisons done for difference in power gains in different groups.

Group 1 is compared to group 2 .group 1 is compared with group 3,and group 2 is compared with group 3.

When (group 1) was compared with (group 3), it was found by post hoc analysis, that there

was statistically insignificant difference ('p' =0.999)

However, mean improvement in group 1 (26.527 ± 7.737) was less than mean improvement of group 3 (027.0340 ± 31.171). Thus plyometric training with external attentional focusing strategy improved upper limb power gain more than the plyometrics training with no focus group. The p value ('p' value = 0.999) was found to be insignificant ('p' value =0 .001).

When (Group 1) was compared with (group 2), there was statistically significant difference ('p' =0.038) in power gain values. The p value was found to be significant.

When (Group 2) was compared with (group 3), it was found by post hoc analysis that there was statistically significant difference.

In the analysis, that there was no statistical significant difference ('p' =0 .489) in agility performance values. However, mean improvement in group 2(0.475 ± 0.362sec) was more than mean improvement of group 1(0.312 ± 0.357sec). The p value was not significant ('p' value =0 .489).

Discussion

After providing 6 weeks of plyometrics training to the recreational collegiate athletes ,results showed maximum improvement of power in group 2 i.e. the group performing the plyometric training utilizing the internal attentional focus instructions, followed by group 3 i.e. the group performing the plyometric training with external attentional focus instructions and minimum improvement was seen in group 1 i.e. the group performing the plyometric training with no instructions.

When the group 1 (no attentional focus) was compared to group 3 (external attentional focus) it was seen that though group 3 performed better than group 1, but the results were not statistically significant here are many possible reasons why there were more strength gains with internal attentional focus when compared with external attentional focus or no attentional focus.

Instructions which increase muscular activity (internal focus) might have practical relevance in rehabilitation and strength training settings. Weight training or rehabilitative excercises often isolate the contribution of a single muscle group, for example to promote muscle growth or strength gains.As such, the increased muscular activity observed in the internal focus conditions, may will be beneficial in such specific circumstances if increased muscular activity is the aim ,it is possible there by using internally focused instructions to increase muscular activity may aid muscular resistance training and the rehabilitation of injured muscles through increased stimulation.

Emanuel *et al* conducted a study in which adults and children were made to perform a dart throwing task they found that though the adults performed better with the internal external focus instructions. They reasoned out that children may use body movement guidance (instructions on internal focus of attention) to improve their motor learning,unlike adults for whom these instructions seem to compromise automatic motor control.[9]

Recently, EMG activity of the target muscles has been utilized as an objective measure to judge the performance under various attentional foci. It has been seen that there is an increased EMG activity when an internal focus of attention is adopted and a deacrease in EMG activity when an external focus of attention is adopted.[13,4,11] This increase in EMG activity seen with the internal focus can lead to attentional strength/power gains in that group because physiologically it has been seen that only those motor units that are recruited in the exercise are subject to adaptations with weight training. Adaptations with resistance training enable greater force generation so if more motor units are recruited per contraction in the internal focus conditions then more motor units will adapt with weight training as compared to other groups and would thus produce greater force with internal attentional focus strategy. Attentional

styles have also been classified into association and dissociation. Association is a cognitive strategy in which the individual attends to the bodies internal related cues such as muscle tension and breathing. This strategy allows individuals to alter their movement pattern according to body awareness racing strategies and muscular tension. The athlete with an aim of performance improvement as the primary goal may be best served by an associative strategy. Dissociation ,on the other hand is a cognitive strategy in which the performer focuses on external cues,day freaming ,admiring the views, and problem/ task solving ther by restricting influence of sensory information from the body.[14]

During conditions of low effort, attention can be easily and voluntarily shiftedfrom internal to external,and from wide to narrow widths.

However, when effort level become high or maximal attention cannot be voluntarily shifted or controlled but is forced to remain internal and narrow. Due to those constraints, dissociative strategies no longer become effective during exercise of high intensity and long duration.[14,15]

Findings of Scott *et al*[16] study confirmed that an associative strategy is allied with superior endurance performance. Their results also suggested that novice athletes can benefit from an associate coping strategy and should be encouragedto adopt associative strategy. They also stated that associative can effectively assist the novice athletes's skill acquisition.

The present study incorporated a high resistance training type of task. so according to the ab The above discussion explains why internal focus is performing better than external focus in achieving power gain, but what wud be the reason for external focus group although not statistically significant but still performing slight better than the control group.in some previous study external focus has performed quite well in enhancing performance in context of skill this could bethe reason for external performing better than control although insignificant difference is present.

Wulf su's[17] research stated that external focus improved the performance of novice and skilled players in skillfully hitting the target ,more efficiently and accurately i.e external focus improving movement efficiency more than more muscular output.

Through mounting evidence it can be assumed that during an intense task such as plyometrics training in the present study association would be utilizedto provide better results and association is nothing but focusing all the attention internally (in this study focusing all the attention on the arms movement). Also novices perform better under associative (or internal) conditions because in this they can concentrate on their basic body movement and muscle contractions which may help in greatert force and simultaneously power production.

This may be another explanation which supports the results of the present study i.e.the group with internal attentional focus performing betterthan the othr group.

This could also be the reason for external focus showing more power than control that all participants were utilizing the dissociative strategy(external focus)[14,15] which is less effective in high intensity tasks hence external could not perform better but slightly better than control as control group had no instructions to follow hence attention might have moved from internal to external at times Hence external and controlled showed better results but not better than internal attentional focus.

Results for power gain in within group subjects demonstrated a significant improvement because plyometric training drills are believed to develop explosiveness and ability to use strength as quickly as possible.

The results from enhancing motor unit recruitment and improving muscles ability to store kinetic energy within the elastic components of the muscle this enhances power of the muscle groups involved in plyometrics (physiological considerations of strength and power training drills).

Physiotherapists, sports trainers, coaches,

and others in situations where verbal instructions guide movements for power training should be aware of the impact that differently emphasized instructions can have on power gains clearly based on current evidence, it can be concluded that for healthy subjects and athletes internal focus attentional instructions can help in achieving better power gains for upper limb. As per previously known facts, the improvement in power can perform better in sports like volley ball basketball etc. and reduces the risk of injuries during sports participation. Therefore, the young population can get immense benefit from this attention with plyometrics protocol

Limitations

There were some limitations like the generelization of the result on subjects with any pathology is not possible as it was conducted on normal subjects lack of adequate financial support and non-availability of isokinetic machine to measure power as power was measured using only medicine ball test, sample size was small.

The subjects to this study were all male so gender comparisons was possible to determine if the results were same or different in males and females.

Future scope

Future studies can take the use of proper laboratory set up and instruments like isokinetic machines. Future research can be warranted to determine the effect of plyometrics and attentional focusing on age groups other than the young adults used in the present study, to determine if similar results are obtained for middle aged and elderly adults. Gender specific studies should be designed to evaluate difference in patterns between men and women. Further studies should be done to find the effect of attentional focusing on other activities to make this training beneficial for athletes.

References

1. Wood S, *et al*. Attention design: Eight issues to consider. *Computers in Human Behaviour.* 2006; 22: 588-602.
2. Perkins-Ceccato N *et al*. Effects of focus of attention depends on golfers' skill. *Journal of Sports Sciences.* 2003; 21: 593-600.
3. Van Cutsem M *et al.* Changes in single motor unit behaviour contribute to the increase in contraction speed after dynamic training in humans. *Journal of Physiology*. 1998; 513(1): 295-300.
4. Marchant D *et al*. Attentional Focusing Instructions Influence Force Production and Muscular Activity During Isokinetic Elbow Flexions. *Journal of Strength and Conditioning Research.* 2009; 23(8): 2358-2366.
5. Wulf G. Attentional Focus Effects in Balance Acrobats. *Research Quarterly for Exercise and Sport.* 2008; 79(3): 319-325.
6. Wulf G , Su J. An external focus of Attention Enhances Golf Shot Accuracy in Beginners and Experts. *Research Quarterly for Exercise and Sports.* 2007; 78(4): 384-388.
7. Ford P, *et al*. Attentional-Focus Manipulations in a Soccer Dribbling Task: Implications for the proceduralization of motor skills. *Journal of Motor Behavior.* 2005; 37(5): 386-94.
8. Uehara L *et al*. The effect of focus of attention instructions on novice learning soccer chip. Brazilian *Journal of Biomotricity.* 2008; 2(1): 63-77.
9. Emanuel M, *et al*. Effects of focus of attention and Age on Motor Acquisition, Retention and Transfer: A Randomized Trial. *Physical Therapy*. 2008; 88(2): 251-260.
10. Wulf G , Prinz W. Directing attention to movement effects enhances learning: A review. *Psychonomic Bulletin & Review.* 2001; 8(4): 648-660.
11. Vance, J *et al*. EMG activity as a function of the performer's focus of attention. *Journal of Motor Behaviour.* 2004; 36: 450-459.
12. Battaro M *et al*. Effects of rest duration between sets of resistance training on acute hormonal responses in trained women. *Journal of Science*

and Medicine in Sports. 2009; 12(1): 73-78.

13. Marchant D *et al*. Attentional Focussing Strategies Influence Muscle Activity During Isokinetic Biceps Curls. *Athletic Insight.* 2008,10(2).
14. Baghurst T *et al*. Evidence for a relationship between attentional styles and effective cognitive strategies during performance. *Athletic Insight.* 2004; 6(1): 36-51.
15. Lind E *et al*. Do 'mind over muscle' stratigies work? Examining the Effects of Attentional Association and Disassociation on External, Affective and Physiological Exercise. *Sports Med*. 2009; 39(9): 743-764.
16. Scott LM *et al*. The effect of associative and dissociative strategies on rowing ergometer performance. *The Sports Psychologist*. 1999; 13: 57-68
17. Wulf G. Attentional focus and motor learning: A review of ten years of research. In E.-J. Hossner & N. Wenderoth (Eds.), Gabriele, Wulf on attentional focus and motor learning. *E-Journal Bewegung and Training*. 2007; 1: 4-14.

Original Article

Physiotherapy and Occupational Therapy Journal
Volume 6 Number 3, July - September 2013

A Correlation between Latency Period of Transverse Abdominis and Dynamic Balance: An EMG Study

Arti Kaushik*, Saurabh Sharma**

Abstract

Introduction: Stabilizing the core is a dynamic process of maintaining balance. The Transverse abdominis (TrA) muscle is the first muscle activated during lower extremity movements indicating that it is primary muscle linked to core stability during lower limb movements. The literature in recent years has consistently linked the changes of the activity onset of the TrA as a marker of motor control dysfunction that directly reflects an impairment resulting in less than optimal mechanical stability of the lumbar spine This study evaluated the correlation between core stability and dynamic balance based on three objectives namely the myoelectrical activity of transverse abdominis and direction specific muscles of stance extremity (Vastus medialis ,Vastus lateralis and Biceps femoris) , the latency period of transverse abdominis and direction -specific muscles of stance extremity in respective directions of modified star excursion balance test and the Star Excursion Balance test (SEBT) score. The Research design is Experimental. 30 Healthy collegiate male from university were included in study based on inclusion criteria. The EMG electrodes were placed on Transverse abdominis, Vastus medialis obliques , Vastus lateralis , Biceps femoris muscles . The Ground electrode was placed on iliac crest . The Measurement was done through modified star excursion balance test score. The SEBT testing was done in anterior, posteromedial, posterolateral directions . the *SPSS 19.0* was used for statistical analysis. The level of significance $p<0.05$ was taken for all tests . the results showed Statistically significant, strong negative correlation between measure of core stability (latency period) and components of modified SEBT was found ($p<0.001$).
Conclusion: The study found that latencies between transverse abdominis and direction specific muscle of SEBT to be highly correlated with each other, So it can be used as an objective assessment tool of core stability along with the modified SEBT score analysis.

Key words: SEBT; EMG; Transversus abdominis.

Introduction

Postural control or balance can be defined statically as ability to maintain a base of support with minimal movement and dynamically as the ability to perform a task while maintaining a stable position.[1] Control and maintenance of balance in upright posture is essential requirement for excelling in sports like soccer, basketball and gymnastics, as well as prevention from musculoskeletal injuries.[2] The ability to rapidly modulate the timing and recruitment of muscles in response to unexpected or expected postural perturbation is considered paramount in maintaining balance and posture.[3]

The central nervous system deals with stabilization of spine by contraction of abdominals and multifidus muscle in an anticipation of reactive forces produced by limb movements.[4] Anticipatory postural adjustments, determined by pre-programmed muscle activation, are involuntary and automatic adjustment to posture, occurring prior to focal muscle activity during limb movement. It is well accepted that CNS initiates sequence of muscle activity involving the limb and trunk muscles in advance of limb movements to prepare the body for predictable disturbance to stability from reactive forces caused by movement. This sequence of

Author Affilation: *Research scholar , MPT Jamia Millia Islamia, ** Assistant Professor, Jamia Millia Islamia , New Delhi -110025.

Reprint request: Saurabh Sharma, Assistant Professor, Jamia Millia Islamia, New Delhi-110025.

E-mail: saurabh14332003@yahoo.com

responses is called feed-forward, and occurs in advance of the limb movement.[4]

The control of spine equilibrium and mechanical stability requires appropriate muscle recruitment and timing.[5] One indicator of motor control for the lower back is timing or onset of abdominal muscle activation. The transverses abdominis (Tr.A) is the first muscle activated during lower extremity movements, indicating that it is the primary muscle linked to core stability during lower limb movements.[6]

Core muscle development is believed to be important in many functional and athletic activities, because core muscle recruitment should enhance core stability and help provide proximal stability to facilitate distal mobility. For optimal core stability, both the smaller, deeper core muscles and the larger, superficial core muscles must contract in sequence with appropriate timing and tension.[7]

Hodges and Richardson found the Transverse abdominis (TrA) to have delayed activation time in people with low back pain compared to healthy individuals, who had TrA activation before lower and upper limb movement. The activation of the TrA preceded the movements of the arms by 30 milliseconds, and the legs by 100 milliseconds, within the healthy individuals

While much of the literature has focused on differences in muscle activation level, timing and pattern of recruitment also play an important role in spine stability and movement control. Various relationships have been demonstrated between core stability, balance performance and activation characteristics of the trunk muscles. Most importantly, a significant correlation was found between poor balance performance in a sitting balance task and delayed firing of the trunk muscles during sudden perturbation. The Star Excursion Balance Test (SEBT) has been reported to train and assess dynamic balance and challenge athletes sufficiently.[8] The SEBT offers a simple, low-cost alternative to more sophisticated laboratory assessments for use in clinical settings.

The SEBT is a closed-kinetic chain exercise which mimics the single-leg squat exercise and therefore the stance leg requires strength, proprioception, neuromuscular control and adequate range of motion at the hip, knee and ankle joints.[8,9]

Earl and Hertel indicated that EMG activation of lower extremity muscles during the Star Excursion balance test was direction dependent[10], while others researchers have identified specific kinematic patterns that dictate performance of this task therefore providing clinicians with knowledge as to which directions are best suited for isolating particular muscles recruitment patterns in rehabilitation.

Present study is addressing motor control component of core stability and correlating it to dynamic balance.There has been dearth of literature studies correlating early onset muscle activation of transverse abdominis as a marker of core stability and dynamic balance at motor unit level.

Objective

The objectives of the study involve analyzing the myoelectrical activity of transverse abdominis and direction specific muscles of stance extremity (Vastus medialis,Vastus lateralis and Biceps femoris) and also to find out the latency period of transverse abdominis and direction-specific muscles of stance extremity in respective directions of modified star excursion balance test.The secondary objectives involve objective correlation of latency period and excursion in SEBT.

Methodology

The design of the study is corelational in nature. The sample population will be healthy collegiate male population. The Sample size was calculated based on previous researches,

with level of significance α= 0.05, and 80% power. The sample size came out to be 30.

Inclusion criteria

a) Healthy collegiate male population
b) Age: 18-26 Years
c) BMI: 18.5 - 24.9
d) Normal AROM (unrestricted) of upper/ lower limb joints.
e) Single –leg stance ability >15 seconds

Exclusion criteria

a) Neurological symptoms in upper/lower quadrant
b) History/existence of fracture/dislocation in upper/lower quadrant
c) History/existence of any surgical procedures (ORIF/arthroscopy etc.) on extremity/spinal joints
d) History/presence of pathological condition in the back, shoulder, elbow, wrist etc.
e) History/presence of joint pain
f) History of abdominal surgery since last 2 years
g) Symptomatic low back pain
h) Presence of any vestibular, cerebellar or visual dysfunction that can affect balance.

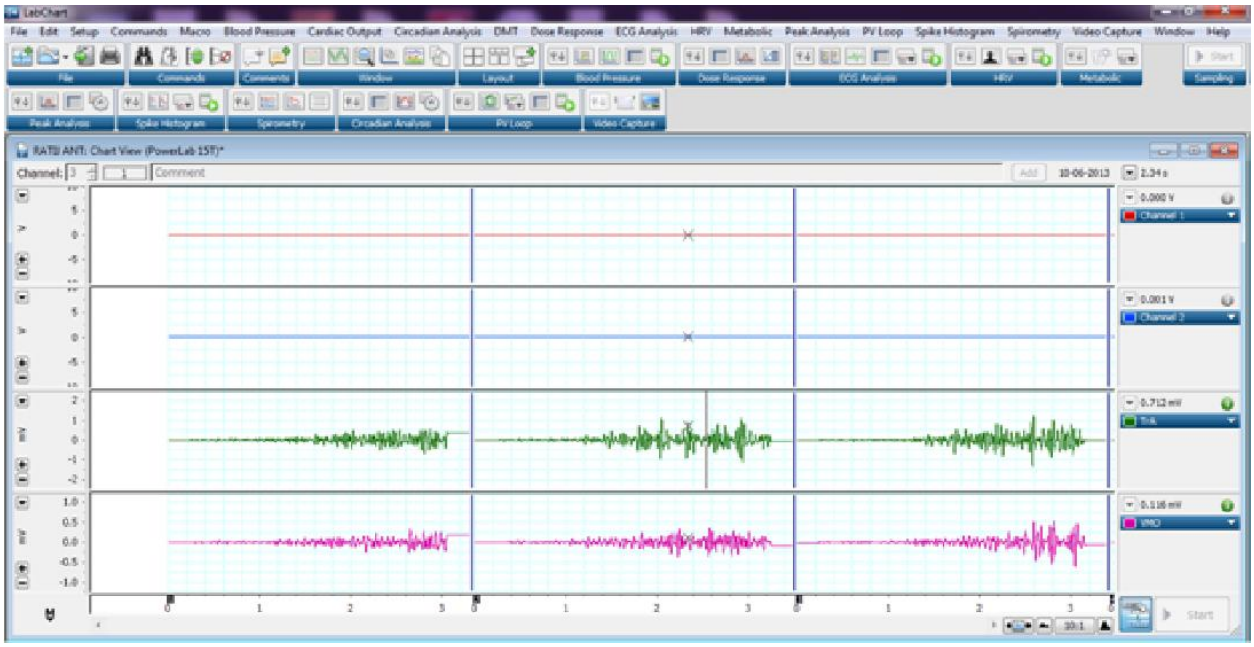
Instrumentation

The instruments include:

Figure1: Electrodes placement (a) Vastus medialis (b) Vastus lateralis (c) Biceps Femoris (d) Transverse abdominis

Figure 2: Modified Dynamic Balance test (a) Anterior reach (b) Posterolateral (c) Posteromedial reaches

Figure 3: EMG showing latency between transverse abdominis and vastus medialis during anterior reach of modified SEBT



a) Modified SEBT instrument
b) AD instrument
c) Surface electrodes
d) Digital Stop watch
e) Digital Weighing scale
f) Stadiometer
g) Measuring tapes
h) Goniometer
i) Alcohol
j) Sand paper
k) Micro- pore tape

Procedure

Thirty subjects with no history of back and

Figure 4: EMG showing latency between transverse abdominis and biceps femoris during posterolateral reach of modified SEBT

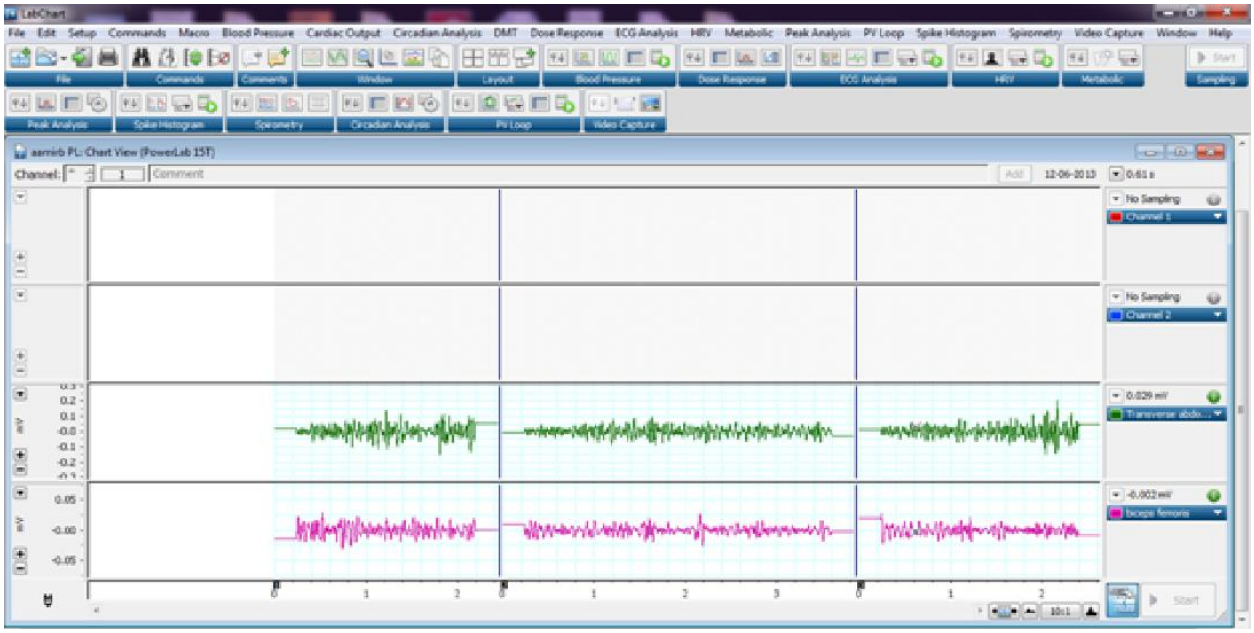
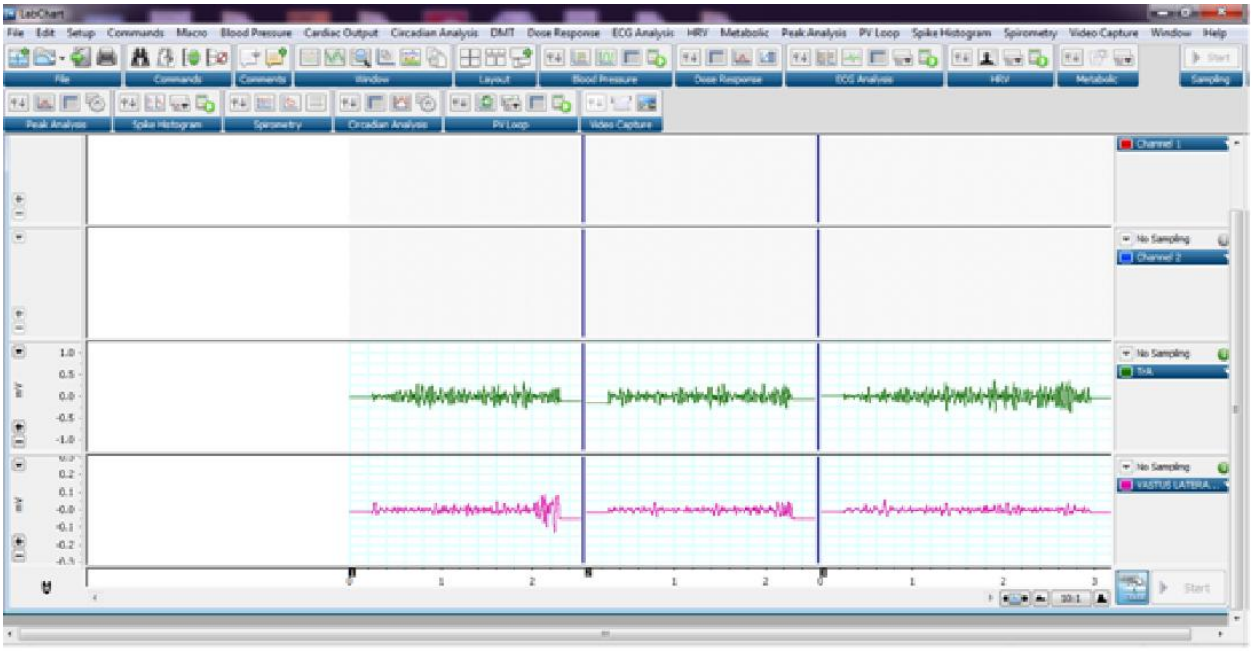


Figure 5: EMG showing latency between transverse abdominis and vastus lateralis during posteromedial reach of modified SEBT



shoulder pathology were included in the study. Each subject signed an informed consent after all the risks and benefits of the study were explained. Ethical approval for this study was obtained from Institutional Human Ethical Committee of Jamia Millia Islamia. A single subject's session would include the measurement of myo-electric activity (Surface EMG) and measurement of reach distance on Modified SEBT.

All EMG onsets were checked visually to ensure that they were valid and not interrupted by artifact from movement or the ECG. Pair of AgCl surface electrodes were used to record activity of transverse abdominis and direction specific muscles of stance 23 extremity i.e. vastus medialis oblique, vastus lateralis, and biceps femoris while performing modified star excursion balance test in anterior, postero-lateral and postero-medial directions respectively.

Electrodes placement

The electrodes were positioned parallel to the muscle fibers with an inter electrode distance of 20 mm following careful skin preparation to reduce the skin impedance. Electrodes placement for muscles will vary. [11]

Transverse abdominis: The electrodes for Transverse abdominis was placed 2 cm infero-medial to the ASIS, during performance of SEBT.

Vastus medialis obliques: Electrode for Vastus medialis oblique was placed on the muscle belly, 55O at an oblique angle, 2 cm medial from superior rim of patella, during performance of anterior excursion of modified SEBT.

Vastus lateralis: The electrodes for Vastus lateralis were placed 3-5 cm above patella at an oblique angle lateral to the midline during performance of posteromedial excursion of modified SEBT.

Biceps femoris: The electrode for biceps femoris was placed 2 cm apart parallel to muscle fibre on lateral aspect of thigh ,tho-third of distance between greater trochanter and back of the knee during performance of posterolateral excursion of modified SEBT.

Ground electrode: The ground electrode was placed on iliac crest.

EMG setting: EMG data were sampled at

Table 1: Descriptive analysis of entire group

	N	Minimum	Maximum	Mean	Std. Deviation
Age (years)	30	18	25	21.46	2.22
Wt (kg)	30	46.3	75.0	59.41	7.09
Ht (metre)	30	1.50	1.80	1.68	0.070
BMI (kg/m²)	30	17.86	25.78	21.16	2.29

Table 2: Correlation between latency period (LP) of transverse abdominis and vastus medialis with normalized anterior reach distance (NRA) of modified SEBT

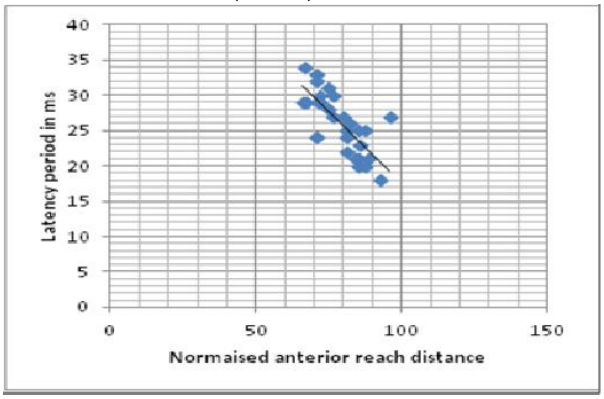
		NRA	LP (ms)
NRA	Pearson Correlation coefficient	1	-.756**
	r value		.000
	N	30	30
LP (ms)	Pearson Correlation coefficient	-.756**	1
	r value	.000	
	N	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

1,000 Hz, band pass filtered between 20 and 1,000 Hz, and stored on computer for analysis (AD Instrument, Australia). Following data processing, the onsets of EMGs were identified visually as the point where the EMG activity exceeded the background level of activity. EMG onsets identified in this manner earlier have been compared with onsets using Matlab software values and found to be accurate.[12]

Measurement of modified star excursion balance test score: Modified star excursion balance test instrument was designed based on Hertel *et al.*[13] recommendations by placing 3 tapes in anterior, posteromedial and posterolateral directions on a nonslip surface. Angle between anterior and posteromedial/posterolateral lines was 135^0, and angle between posteromedial and posterolateral line was 90^o (360^0 full circle).Length of tape in each direction was kept 120 cm which can measure up to least millimeters. The subjects viewed an instructional video which demonstrated the test and testing procedure as explained by Plisky *et al.* which likely to increase efficiency of testing protocol and standardizes instruction.[14] Hertel *et al* found a significant learning effect with the SEBT where the longest reach distances occurred after six trials followed by a plateau.[15] Therefore, the subjects practiced six trials on each leg in each of the three reach directions followed by 5 minutes of rest prior to formal testing. The

Figure 6: Scatter plot between latency period (LP) of transverse abdominis and vastus medialis with normalized anterior reach distance (NRA) of modified SEBT



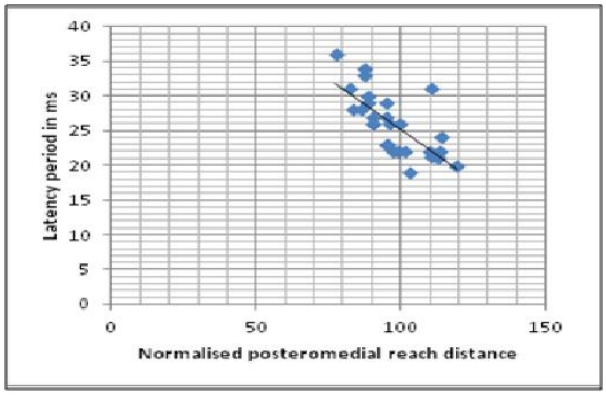
subjects were tested within 20 minutes of practicing. All the subjects were off shoes during the performance of the test as individuals attend testing in a variety of footwear so it is difficult to standardize. The subject stood on one leg on the center grid with the most distal aspect of the toe at the starting line. The trial was discarded and repeated if the participant lifted the heel of the stance leg off the ground, lost balance, came to rest at maximal reach distance, or could not return to the beginning position, reached the maximum balance time of 30 seconds. Distances were marked with chalk on the floor immediately next to the athletic tape that

Table 3: Correlation between latency period (LP) of transverse abdominis and vastus lateralis with normalized posteromedial reach distance (NRPM) of modified SEBT

		NRPM	LP (ms)
NRPM	Pearson Correlation Coefficient	1	-.718**
	r value		.000
	N	30	30
LP (ms)	Pearson Correlation Coefficient	-.718**	1
	r value	.000	
	N	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 7: Plot chart between latency period (LP) of transverse abdominis and vastus lateralis with normalized posteromedial reach distance (NRPM) of modified SEBT



corresponds to the site of touchdown.

The distance from center of grid to the point of touchdown was measured with a measuring tape and recorded to the nearest millimeter and chalk mark was removed after each reach to reduce visual cues. In order to improve the reproducibility of the test and establish a consistent testing protocol, a standard testing order was utilized. The testing order were three trials standing on the right foot reaching in the anterior direction. This procedure was repeated for the posteromedial and the posterolateral reach directions. The specific testing order was right anterior, left anterior, right posteromedial, left posteromedial, right posterolateral, and left posterolateral.

Lower Limb Length - To measure leg length, participant lied on the plinth; a mark was placed with a fine tipped marker on the participant s most inferior aspect of each anterior superior iliac spine and on the most distal portion of medial malleolus. The subject lift hips off the plinth and returned them to starting position. The examiner passively straightened the legs to equalize the pelvis. The subject's limb length was measured in centimeters from the anterior superior iliac spine to the most distal portion of the medial malleolus with a cloth tape measure.

The greatest successful reach for each direction was normalized by dividing reach distance with limb length multiplied by 100 and was used for comparison of latencies between direction specific muscle of SEBT and transverse abdominis of ipsilateral side.

Data analysis

All data were entered into SPSS 19.0 for statistical analysis. Descriptive statistics, including age, height (m.), weight (kg.), BMI were calculated.

A two tailed correlation tests was used in order to determine whether relationships exist between core stability (latency period) of transverse and direction specific muscles of modified SEBT test and reach score in that direction. Mean normalized anterior, posteromedial and posterolateral reach distance of modified SEBT was used for correlation analysis. The level of significance for the statistical tests was set at $p=0.05$.

Discussion

The participating collegiate recreational athlete (n=30) in this study had means height (168 cm ± 7 cm), mean weight (59.41±7.01 kg), mean age (21.46 ± 2.219) and mean BMI (21.16 ± 2.29). Statistically significant, strong negative correlation between measure of core stability (latency period) and components of modified SEBT was found ($p<0.001$). Muscles of core are the structure that provide strong base of support for extremity function and force transfer. Sports are dynamic event which requires optimal dynamic balance and early recruitment of core muscles especially transverse abdominis, as this muscle is mainly linked with core stability. Hence an objective assessment of core stability along with various destabilizing situations is very important. Balance exercises can be considered a type of core stability training in that these exercises activate the core musculature.[16] Sudden perturbations applied to the body during competition can potentially move the center of gravity outside the base of support. To avoid losing balance and falling, postural adjustments are made to move the center of

gravity back inside the base of support. These postural adjustments require activation of the core musculature to stabilize the lumbar spine. Because sports skills are oftentimes performed off balance, greater core stability provides a foundation for greater force production in the upper and lower extremities. Furthermore, the sensitivity of afferent feedback pathways can be improved with balance and motorskill training[17] resulting in quicker onset times of stabilizing muscles.[18]

Core stabilization relies on instantaneous integration among passive, active, and neural control subsystems Neuromuscular control is critical in coordinating this complex system for dynamic stabilization.

Dynamic balance is a key component of injury prevention and rehabilitation in sports. Training the core muscles has been hypothesized as an intervention for improving balance. However, there is a lack of current scientific evidence to support this claim. Effects of core stability programme on dynamic balance as measured by star excursion balance test were compared. Maximum excursion distances improved for the exercise group, compared with the control group. This result justifies the hypothesis that core strengthening can improve dynamic postural control.[19] There are studies reporting improvement in dynamic balance through neuromuscular training.[20,21] Hodges and Richardson examined the sequence of muscle activation during whole body movements and found that some of the core stabilizers (i.e., transverses abdominis, multifidus, rectus abdominis, and oblique abdominals) were consistently activated before any limb movements.[4] As stated by Kibler *et al* the larger muscles of the core create a rigid cylinder and a greater moment of inertia against body perturbation while allowing a stable base for mobility.[22] When the transverse abdominus contracts, the intra-abdominal pressure increases and tenses the thoracolumbar fascia. These contractions occur before initiation of limb movement allowing the limbs to have a stable base for motion and muscle activation.

Literature in recent year has consistently linked the changes of activity onset of TrA as a marker of motor dysfunction (a component of core stability).It signifies that early the firing of TrA , better the core stability.[23] Core stability comprised of components such as core strength, endurance, power, balance, as well as the coordination of the spine, abdominal, and hip musculatures.[24] Therefore, it is necessary to describe the multifaceted components of core stability.

Researchers suggest that strong and endurable core muscles stabilize the spine favorably by providing greater passive support with effective mechanical integrity and enhanced neurological recruitment patterns; including timely activation of these muscles when exposed to forces and loads.[25] Above mentioned research studies strongly support our finding because core stability is directly linked with early recruitment of core musculature especially transverse abdominis before any limb movement as well as stronger the core stability better the dynamic balance, so it signifies that latency of transverse abdominis with direction specific prime mover of modified SEBT will be correlated.

Conclusion

In our study we found that latencies between transverse abdominis and direction specific muscle of SEBT to be highly correlated with each other, so it can be used as an objective assessment tool of core stability along with the modified SEBT score analysis. Present study has added a new dimension to core motor control and its relation to balancing abilities so; it can be used as a screening tool of various performance components in different variety of sports on the basis of EMG.

It could be inferred through this study that a component of balance is involved while training core muscles through neuromuscular training

Limitations of study

A larger sample size would have been better as it would help in generalizing the results. Our study focused only on transverse abdominis muscle of core stabilizing system, but this muscle does not alone represent the whole core stability .

Future perspectives

Future researchers should attempt to include larger samples, a greater variety of sports (as there may be other activities that require greater core control), elite athletes, and a more demographically diverse sample.

The significance of this research could be enhanced by including low back pain population.

References

1. Winter DA, Patla AE, & Frank JS. Assessment Of Balance Control In Human. *Med Prog Technol*. 1990; 16: 31-51.
2. Gerbino PG, Griffin ED, Zurakowski D. Comparison of standing balance between female collegiate dancers and soccer players. *Gait Posture*. 2007; 26(4): 501–507.
3. Boudreau S, Farina D, Kongstad L, Buus D, & Redder J. The relative timing of trunk muscle activation is retained in response to unanticipated postural-perturbations during acute low back pain. *Exp Brain Res.* 2011; 210(2): 259–267.
4. PW & Richardson CA. Contraction of the abdominal muscles associated with movement of the lower limb. *Physical Therapy*. 1997; 77: 132–144.
5. Ebenbichler GR, Oddsson, J Kollmitzer, Z & Erim. Sensory-motor control of the lower back: implications for rehabilitation. *Medicine and Science in Sports & Exercise*. 2001; 33(11): 1889–1898.
6. Zazulak BT, Hewett TE, Reeves NP, Goldberg B, Cholewicki J. The effects of core proprioception on knee injury: a prospective biomechanical-epidemiological study. *American Journal of Sports Medicine.* 2007; 35: 368-373.
7. Rafael F Escamilla. Core Muscle Activation During Swiss Ball and Traditional Abdominal Exercises. *Journal of Orthopaedic & Sports Physical Therapy.* 2010; 40(5).
8. Munro AG, & Herrington LC. Between-session reliability of the star excursion balance test. *Physical Therapy in Sport*. 2010; 128-132.
9. Olmsted LC, Carcia CR, Hertel J, & Shultz SJ. Efficacy of the star excursion balance tests in detecting reach deficits in subjects with chronic ankle instability. *Journal of Athletic Training*. 2002; 37(4): 501-506.
10. Earl JE, Hertel J. Lower-extremity muscle activation during the Star Excursion Balance Tests. *Journal of Sport Rehabilitation*. 2000; 10: 93-104.
11. Cram JR and GS Kasman. Introduction to Surface Electromyography. Gaithersburg: Aspen Publishers, Inc.; 1998, 408.
12. Hodges PW, Bui BH. A comparison of computer-based methods for the determination of onset of muscle contraction using electromyography. *Electroencephalogr Clin Neurophysiol*. 1996; 101: 511–9.
13. Hertel J, Braham RA, Hale SA, & Olmsted-Kramer, LC. Simplifying the star excursion balance test: analyses of subjects with and without chronic ankle instability. *Journal of Orthopaedic and Sports Physical Therapy*. 2006; 36(3): 131–137.
14. Plisky PJ, Rauh, MJ, Kaminski TW, & Underwood FB. Star excursion balance test as a predictor of lower extremity injury in high school basket ballplayers. *Journal of Orthopedics and Sports Physical Therapy*. 2006; 36(12): 911-919.
15. Hertel, J. Sensorimotor deficits with ankle sprains and chronic ankle instability. *Clinical Sports Medicine*. 2008; 27(3): 353–370.
16. Willardson JM. Core stability training: applications to sports conditioning programs. *Journal of Strength Cond Res*. 2007; 21(3): 979-85.
17. Borghuis J, Hof AL, & Lemmink K. The importance of sensory motor control in providing core stability. *Sports Medicine*. 2008; 38(11): 893-916.
18. Anderson K, Behm DG. The impact of instability resistance training on balance and stability. *Sports Medicine.* 2005.

19. Nicole L, Kahle BS, Phillip, A Gribble. Athletic Training and sports Healthcare centre. 2009; 1(2): 65-73.
20. Filipa A, Brynes R, Paterno MV, Myer GD, Hewett TE. Neuromuscular training improves balance in Star excursion balance test in young female athletes. *Journal of Orthopaedics and Sports Physical Therapy*. 2010; 40(9): 551-558.
21. Valovich, Mc Leod TC, Armstrong T, Miller M, Saures JL. Balance improvement in female high schoolbasketball players after 6 week neuromuscular training programme. *Journal of Sports Rehabilitation*. 2009; 18(4): 465- 468.
22. Kibler W, Press J, Sciascia A. The role of core stability in athletic function. *Sports Med*. 2006; 36(3): 189-198.
23. Allison GT, Morris SL, & Lay B. Differences in feed forward responses of transverses abdominis are directionally specific and act Asymmetrically: Implication for core stability theories. *Ortho Sports Physiotherapy Therapy*. 2008; 38: 228-237.
24. Cowley P, & Swensen T. Development and reliability of two core stability field tests. *Journal of Strength and Conditioning Research.* 2008; 22(2): 619-624.
25. McGill SM, Grenier S, Kavcic N, & Cholewicki J. Coordination of muscle activity to assure stability of the lumbar spine. *Journal of Electromyography and Kinesiology*. 2003; 13: 353-359.

Review Article

Physiotherapy and Occupational Therapy Journal
Volume 6 Number 3, July - September 2013

Comparison of Effect of Fast and Slow Kegels Exercises in Reducing Pain in Primary Dysmenorrhea: Experimental Design

Kaur Amreen*, Saxena Gaurav, Dhakshinamoorty P.*****

Abstract

Objective: To determine the effects of slow kegels and fast kegels in the treatment of primary dysmenorrhea. Design-experimental design,comparative in nature. **Setting:** The study was conducted at mata gujri hostel, SBSPGI, dehradun, uttrakhand. **Population and Sample:** 550 female hostlers of mata gujri girls hostel, Sardar Bhagwan Singh Post Graduate Institute of Biomedical Sciences and Research, Balawala, Dehradun. 24 female subjects (mean age of 21.16 ± 1.2) of SBSPGI, Dehradun, Uttrakhand. **Methods:** Subjects were randomly divided into three groups, Group A - slow kegels (21.1±99),Group B(20.7±1.49)- - fast kegels, Group C(21.5±1.5)-control group. Subjects practiced the pelvic floor muscle exercises every alternate day till a period of 8 weeks. The treatment intervention was measured using two different variables i.e. visual analogue scale and Mentural distress questionnaire. data analysed by 1 way annova and krushkal wallis test. main outcome measure-independent various. **Result:** The mean results of before treatment and after treatment are significant. **Conclusion:** The group b fast kegels was found to be more effective after the treatment protocol of 8 weeks.

Keywords: Ddysmenorrhea; Pelvic floor muscle exercise; Fast and slow kegels.

Introduction

Dysmenorrhea is a painful syndrome that accompanies the menstrual cycles. Dysmenorrhea (or dysmenorrhoea) is a medical condition characterized by severe uterine pain during menstruation.[1]

The prevalence of dysmenorrhoea was lower at 24 years of age than at 19 years of age. At 24 years of age, 67% of the women still experienced dysmenorrhoea; 10% reported dysmenorrhoea which limited daily activity. The severity of dysmenorrhoea (linear analogue scale) was lower at 24 years of age than at 19 years.[2]

Dysmenorrhea can be classified into three groups on the basis of pathophysiology-congestive Dysmenorrhea, spasmodic Dysmenorrhea, and membranous Dysmenorrhea. Spasmodic Dysmenorrhea– the majority of cases of dysmenorrheal fall into this group, and it is probable that nearly 50% of the adult female population suffer at sometime from varying degrees of these symptoms. The patient's history is very characteristic. The pain develops on the first day of the menstrual period, when excruciating lower abdominal pain is experienced which lasts for a relatively short time. This severe pain is intermittent n spasmodic.[3]

Menstruation is the result of marked vascular changes in endometriumin response to both estrogen and progesterone. The fibers those affected are tunica media of endometrial coiled arteries, as a consequence these artery constrict at first intermittently then after 2 days, for the several hours at a time, so that superficial endometrium undergoes ischaemia, that precedes the degeneration of stratum functionalis of endometrium, extravasation of blood into superficial stroma, and eventual sloughing of necrotic, blood soaked stroma

Author Affilation: *Post Graduate Student,KMC, ,Manipal University,Mangalore **Post Graduate Student,Manipal Hospital,, Manipal University,Bangalore ***Associate Professor,Department of Physiotherapy,SBSPGI Dehradun, Uttarakhand.

Reprint request: Dr. Amreen Kaur (MPT Cardio.), Post Graduate Student,KMC, Manipal University Mangalore

E-mail: amreenmalhotra@gmail.com

that constitutes a typical menses.

Symptoms include: Typically, primary dysmenorrhea is characterized by a crampy suprapubic pain that begins somewhere between several hours before and a few hours after the onset of the menstrual bleeding. Symptoms peak with maximum blood flow20 and usually last less than one day, but the pain may persist up to 2 to 3 days. Treatment for dysmenorrhoea aims to relieve pain or symptoms either by affecting the physiological mechanisms behind menstrual pain (such as prostaglandin production) or by relieving symptoms. Treatments such as paracetamol, aspirin, and NSAIDs work by reducing the activity of cyclo-oxgenase pathways, thus inhibiting prostaglandin production. Treatments such as oral contraceptives work by inhibiting ovulation.[4]

Exercise

Physical exercise may reduce dysmenorrhoea. Current studies have too many methodological flaws, however, to be able to confirm results. It is hypothesised that exercise works by improving blood flow at the pelvic level as well as stimulating the release of β endorphins, which act as non-specific analgesics.[1]

Heat therapy has been a traditional home remedy for dysmenorrhoea. One RCT has compared its use with the NSAID ibuprofen. The heat patch (39°C) used for 12 hours a day was found to be as effective as ibuprofen (400 mg three times a day) and more effective than placebo in reducing pain.[1,5,6]

During active exercise the capillaries in the working muscles dilate and their permeability increased. Many capillaries that are closed when the muscle was at rest become open and blood flows through them. in this way the capacity of the muscle to contain blood is markedly increased and the interchange of fuel and waste products between the blood and the tissue fluids is facilitated.[7]

The exercise will decrease duration and severity of dysmenorrhea and also using of sedative tablets in high school girls exercise is known to cause the release of endorphins, substances produced by the brain that raise the pain threshold.[8]

Pelvic floor muscle ex

The pelvic floor muscles are likely to be weak at the end of the day when being sick and just before menturation weak, easily fatigue, saggey muscles do not support pelvic organs and result in supportive dysfunction of pelvic floor muscles. Lenghthened muscle may result in pain and pressure because structures hang on ligamentus supports and stretch the nerves.[9]

In addition, menstrual pain, with its distinctive cramping, tends to tense a woman's muscles, and that in turn can significantly restrict the muscles of the abdomen and pelvic floor.

Methods

Subjects: 24 female subjects after being assessed through inclusion and exclusion criteria and volunteered in the study.the subjects were aged between 19-25 years.

Study design: The design used in this study was a experimental design. The treatment intervention was measured using 2 separate variables. Visual analogue scale and Mentural distress questionnaire measured pain and psychological symptoms along with pain.[10,11] These measurements were taken at the initial physical therapy evaluation (prior to initiation of training), following the measurements were taken at the end of menstruation i.e. 4 week followed by final reading at 8th week.

Instrumentation

Procedure-a detailed explanation was given to each subject regarding the aims of the study, techniques to be used, and the extent of their participation. All the subjects signed an institutionally approved consent form before participating in her study .a physical

therapy assessment were performed on all subjects prior to the initiation of treatment.

Physical therapy assessment

The evaluation included a questionnaire which was designed according to the inclusion and exclusion criteria.

Treatment protocol

The subjects were screened for primary dysmenorrhea so as to fulfill the inclusion criteria. After that the VAS score and menstrual distress questionnaire was measured at 0th week.[1,10,12,13]

Next random sampling of the subjects was done to divide them into 3 groups i.e. group A (n=8) group B (n=8) group C(n=8)with the mean age of respectively. Each subject was then treated according to her respective group. The exercise groups had the position of lying initially by putting a pillow under the buttocks for a month[14] i.e. till the end of 4th week and then progressing to sitting position[15] till 8th week.

In group A, prior to exercise hot pack for 15 minutes was given over lower abdomen then the slow kegels exercise was performed 90 contractions with the hold time of 5-10 sec. in three sets of 30 with 5 minutes break in between. The exercise was done on every alternate day. In group B, prior to exercise hot pack for 10 minutes was given over lower abdomen then the Fast kegels exercise was performed 90 contractions in three sets of 30 with 5 minutes break in between. The exercise was done on every alternate day.[14,15] In group C which is the control group, was given only the hot pack for 10 minutes. After therapeutic treatment was over, again visual analogue score and menstrual distress questionnaire was measured, in each group. The therapeutic treatment was continued till 8 weeks and VAS was measured at the end of 4th and 8th week.

Data analysis

Kruskal Wallis test has been performed to compare mean values of menstrual distress questionnaire scores. AT 0th week,4th week ,8th week in between slow kegels group, fast kegels group and control group.

One way Annova test has been performed for comparing the improvement in Visual analogue scale score at 0th week,4th week ,8th week in between slow kegels group ,fast kegels group, and control group. Post hoc scheffe's test has been performed for comparing mean differences between

1) slow kegels Vs fast kegels,
2) fast kegels Vs control group,
3) slow kegels Vs control group.

Significance level has been selected as 0.05.

Results

A total number of 24 subjects with mean age (21.08±1.282) were taken and divided into three groups with 8 subjects in each, namely group A slow kegels (mean age 21±1.069),group B fast kegels (mean age 20.875±1.246) and group C control group (mean age 21.375±1.597).

Comparison between menstural distress questionnaire scores in slow kegels fast kegels & control group at 0 week

Kruskal-Wallis test was performed to compare mean values of menstrual distress questionnaire scores. scores of slow kegel group at 0 week were 121±34.86, fast kegels group at 0 week were 95.12±14.81, control group at 0 week were 100.62±32.039.the results were non significant at 0 week,(p>.05).

Comparison between visual analogue scale in slow kegels, fast kegels & control at 0 week

One way annova was performed to compare the mean values of visual analogue scale scores of slow kegels group at 0 week were 7.03±0.72, fast kegels group at 0 week were 7.34±1.049, control group at 0 week were 6.86±1.63. The results were non significant at 0

Fig 1: Showing the initial position of relaxation with moist heat pack on lower abdomen

Table 1: comparison between menstrual distress questionnaire scores in slow kegels fast kegels & control group

Group	Menstural Distress Questionnaire(0 week)	
	4TH WEEK	8TH WEEK
slow kegels	104.66±28.319	70.25±16.455
fast kegels	69.125±20.559	60±9.102
Control	86.89±38.105	94.75±27.442
H – Value	4.37	10.3
Significance	N.S.	S.

N.S = Non Significant (p > 0.05);
S = Significant (p < 0.05)

week,(p>0.05).

Comparison between menstural distress questionnaire scores in slow kegels, fast kegels and control group

Kruskal Wallis test was performed to compare mean values of menstrual distress questionnaire sores. The scores of slow kegels group at 4th week were 104.66±28.319, fast kegels group at 4th week were 69.125±20.559, control group at 4th week were 86.89±38.105. The results were non significant at 4th week ,(p>0.05) table 5.4. Kruskal wallis test was performed to compare mean values of menstural distress questionnaire scores. The scores of slow kegels group at 8th week were 70.25±16.455, fast kegels group at 8th week were 60±9.102, control group at 8th week were 94.75±27.442. The results were significant at 8th week,(p<0.05).

Table 2: Comparison between Visual Analogue Scale scores in slow kegels fast kegels & control group

Group	Visual Analogue Scale	
	4TH WEEK	8TH WEEK
slow kegels	5.20±1.33	3.95±2.32
fast kegels	3.975±2.182	2.87±1.532
control	5.33±2.46	6.2±1.62
F-ratio	1.37	6.95
Significance	N.S.	S.

N.S = Non Significant (p > 0.05);
S = Significant (p < 0.05)

Comparison between visual analogue scale in slow kegels, fast kegels and control group

One way Annova was performed to compare the mean values of visual analogue scale scores of slow kegels group at 4th week were 5.20±1.33, fast kegels group at 4th week were 3.975±2.182, control group at 4th week were 5.33±2.46. The results were non significant at 0 week,(p>0.05), table 5.5. One way Annova was performed to compare the mean values of visual analogue scale scores of slow kegels group at 8th week were 3.95±2.32, fast kegels group at 8th week were 2.87±1.532, control group at 8th week were 6.2±1.62. The results were significant at 0 week,(p<0.05).

Comparison between visual analogue scale in slow kegels, fast kegels & control group for post hoc test

Post hoc scheffe's test has been performed for comparing mean differences between 1) slow kegels Vs fast kegels, 2) fast kegels Vs control group, 3) slow kegels Vs control group.

The result shows insignificant difference (p>0.05) between slow kegels and fast kegels, significant difference (p<0.05)between fast kegels and control group, insignificant difference(p>0.05) between slow kegels and control group.

Discussion

This study compares effect of fast and slow kegels exercises in reducing pain in primary dysmenorrhea. The study design comprises of twenty four female subjects who were divided into three groups. group A, slow kegels group performed slow kegels 90 contractions with hold of 5-10 seconds done in 3 sets of 30 with 5 minutes of rest in between preceding moist heat pack of 15 mins. Group B , fast kegels group performed fast kegels 90 contractions clench the muscles quickly and let go and done in 3 sets with 5 mins of rest in between preceding moist heat pack of 15 mins. Each given every alternate day in a 8 week protocol.

As the outcome variable is a questionnaire (MMDQ) and there is no interval in the score amongst different questions so it comes under ordinal level of measurement so test should be non-parametric as the subjects are unmatched and there are three groups ,the Kruskal wallis test were used for data analysis. Data analysis using Kruskal wallis test revealed that there wasn't any significant difference in MDQ scores at 0 and 4th week but the difference was significant at 8th week.

Another outcome variable is VAS and there is a true zero in the scale so it comes under ratio level of measurement so test used should be parametric as the subjects are unmatched and there are three groups the test used for data analysis will be one way Annova and Scheffe's test. Data analysis using one way Annova test revealed that there wasn't any significant difference in VAS scores at 0 and 4th week but the difference in VAS scores at 8th week was significant as compared, data analysis of the final readings was compared by Scheffe's test that revealed that slow kegels Vs fast kegels was insignificant, fast kegels Vs control group was significant ($P>0.05$), slow kegels and control group was insignificant ($P<0.05$).

Primary dysmenorrhea is one of the most frequent of gynaecological complaints.[11] Menstrual pain, with its distinctive cramping, tends to tense a woman's muscles, and that in turn can significantly restrict the muscles of the abdomen and pelvic floor.[16] Carrie m hall (1999) added the pelvic floor muscles are likely to be weak at the end of the day when being sick and just before menstruation. Weak, easily fatigue, saggey muscles do not support pelvic organs and result in supportive dysfunction of pelvic floor muscles. Altered tone of pelvic floor muscles can also occurring response to pain in lower pelvic organs.[9]

Data analysis revealed that the difference between the three groups was significant at second week. When the three groups were compared for extent of effectiveness of data revealed that fast kegels group was better than slow kegels group and hot pack group. Slow kegels are far better than hot kegels.

Certain training principles for large skeletal muscles can be applied to exercise programs for the pelvic muscles.[16] Fast kegels group recruit the fast twitch muscles fibers 30%which are type II fibers this group was more effective as it emphasizes specially on muscle strengthening. Colbey Kisner stated for type II fibers that speed of contraction is fast, rate of fatigue is fast, these muscle fiber provide mobility. These are characterized by fast contractile, response have a low myoglobin content and have a high glycolytic capacity, and are recruited for activities requiring power.[17] Michelle proctor stated Exercises are beneficial (in residing spasm) because they increase morale and Also restore flexibility and strength to musculoskeletal structures.[11] It is hypothesized that exercise works by improving blood flow at the pelvic level as well as stimulating the release of β endorphins, which act as non-specific analgesics.[4] Cornelia A. Griffin (1994) stated strength gain of 20%-40% may occur within the first two weeks of training with no measurable increase in muscle size. These early strength increases are believed to result from improved levels of motor activity, if the training is continued, subsequent additional strength gains are made through muscle hypertrophy. Fast kegels (type II fibers) speed of contraction is fast, recruited for activities requiring power and fiber seems to have

higher potential for muscle hypertrophy. Now exercises are beneficial (in residing pain), restore flexibility and strength to , musculoskeletal structures, more pumping of blood in hypertrophic muscle. Exercise work by improving blood flow at pelvic level, stimulating the release of beta endorphins, which act on non-specific analgesics. Hence, more effective than slow kegels and hot pack.

So, now it can be said that as fast kegels has a better strengthening component than slow kegels the results show fast kegels is more effective. Slow kegels did not concentrated specially on strengthening and moreover had a very less role in it. Slow kegels group recruit the slow twitch muscles fibers 70% which are type I fibers this group had even shown positive results but it is concentrated on as slow kegels is type I fibers. Cornelia A. Griffin (1994) stated that slow twitch fibers are fatigue resistant and better adapted to prolonged activity. These fibers have more mitochondria, more myoglobin, and more dense capillary networks than type II fibers. Carrie m hall (1999) stated that the pelvic floor muscles are likely to be weak at the end of the day when being sick and just before menstruation. Weak, easily fatigue, saggey muscles do not support pelvic organs and result in supportive dysfunction of pelvic floor muscles. She further stated the pelvic floor provides support to the normal pelvic organs. The normal organ pelvic organ support is achieved by ligamentus support from above and PFM from below.[9] The supportive function is primarily performed by the tonic, slow twitch muscle fibers. Hence working on slow twitch muscles will improve the supportive function of the pelvic floor and the weakness is improved.

Accrding to Meyer JM *et al* (2005) Hot packs have least effect as it is temporary relaxing or placebo effect. Hot pack is conjunction with exercises is more effective than hot pack alone.[6] Arthur I. Jacknowitz *et al* (2001) stated that it causes vasodilatation and increases local blood flow, it provides local analgesia.[18]

As the data analysis revealed that the difference between the three groups was significant at 8th week and there was a decrease in vas scores over eight week time as revealed by comparison of individual mean values.

Slow kegels (type I fibers) speed of contraction is slow, recruited for activities demanding endurance.[16,17] These fibers are supplied by small neurons with the threshold of activation and are preferentially in low intensity exercise, these fibers have mitochondria, more myoglobin and more dense capillary networks when worked upon[16], the pelvic floor muscles are likely to be week at the end of the day when being sick and just before menstruation that results in supportive dysfunction of pelvic floor muscles.[12] Supportive function is primarily performed by the tonic, slow twitch muscle fibers hence, weakness improved

Patients given with hot packs also experienced some improvement due to placebo effect or temporary relaxation effect of heat. Heat causes vasodilatation and increases local blood Flow. It may provide local analgesia (possibly through counter irritation and an effect on gate-controlled pain), and hence short term relief of symptoms. Heat packs, placebo effect or heat causes vasodilatation and increases local blood flow which provides local analgesia,short term relief of symptoms.

As after the research it is seen that "There is significant difference in the effect of slow kegels and fast kegels in relieving symptoms in primary dysmenorrhea." The Experimental Hypothesis is accepted.

Conclusion

The result signifies fast kegels group is the effective than slow kegels group and hot pack control group in relieving pain in primary dysmenorrhea.

References

1. Abbaspour Z. The Effect of Exercise on Primary Dysmenorrhea. *J Res Health Sci.* 2006;

6(1): 26-31.

2. Sundell G *et al*. Factors influencing the prevalence and severity of dysemenorrhea in young women. *Br J Obstet Gynaecol*. 1990; 97(7): 588-94.
3. Howkins & Bourne. Disorders of menstruation. Shaw's textbook of gynecology. 12th edition, chapter no. 17. BI Chruch Hill Living Stone Publication; 1999: 214-239
4. Helen Kerr. Menstrual and premenstrual problems, women's health: a textbook for physiotherapists. Chapter 6. Harcourt Brace & Company Asia Publications; 2007: 51-52.
5. Akin, Mark D. MD Continuous Low-Level Topical Heat in the Treatment of Dysmenorrhea. 2001; 97(3): 343-349.
6. French SD *et al.* Superficial heat and cold for low back ache. Oxford: The Cochrane Library; 2006, 1.
7. M Dena Gardiner. Active movement, the principles of exercise therapy. 4th edition, chapter no. 5. CBS Publications; 2005: 41-61.
8. Rebecca J Locke. What is the effect of exercise on primary dysmenorrhea? *british journal of sports medicine*. 1999; 33: 227.
9. Carrie M Hall. The pelvic floor, in therapeutic exercise moving toward function. Chapter 19. Lippincott Williams & Wilkins; 1999: 400-435.
10. Wewers ME & Lowe NK. A critical review of visual analogue scales in the easurement of clinical phenomena. *Journal of Clinical Nursing*. 1990; 10: 697-706.
11. Michelle Proctor *et al*. Diagnosis and management of dysmenorrhea. *British Medical Journal*. 2006; 332(7550): 1134-1138.
12. FC Baker, HS Driver *et al*. High nocturnal body temperatures and disturbed sleep in women with primary dysmenorrhea. *J Appl Physiol Endocrinol Metab*. 1999; 277: 1013-1021.
13. Mary Brown Parlee. Stereotypic A Methodological Note on the Moos Menstrual Distress Questionnaire and Some New Data. *Psychosomatic Medicine*. 1974; 36(3).
14. L Mouritsen. Pelvic floor exercises for female stress incontinence. *International Urogynaecology Journal*. 1994; 5(1): 44-51.
15. Beth Shelly. The pelvic floor, therapeutic exercise moving toward function. Edition 1 Chapter 19. Lippincott Williams and Wilkins; 1999: 400-435.
16. Cornelia A Griffin. Effect of an exercise protocol on pelvic muscle resting pressure in healthy adult women. *Nursing Research (Lippincott,Williams & Wilikins)*. 1994; 43(3).
17. Karen holtgrefe. Principles of aerobic exercise. Chapter 7, 5th edition. 2007; 232-248.
18. Arthur I Jacknowitz *et al*. Therma care therapeutic heat wrapes. American Pharmaceutical Association; 2001: 1-11.

Instructions to Authors

Submission to the journal must comply with the Guidelines for Authors.

Non-compliant submission will be returned to the author for correction.

To access the online submission system and for the most up-to-date version of the Guide for Authors please visit:

http://www.rfppl.com

Technical problems or general questions on publishing with **POTJ** are supported by Red Flower Publication Pvt. Ltd's Author Support team (http://ww.rfppl.com)

Alternatively, please contact the Journal's Editorial Office for further assistance.

A Lal
Publication -in-Charge
Physiotherapy and Occupational Therapy Journal
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091
India
Phone: 91-11-22754205, Fax: 91-11-22754205
E-mail: redflowerppl@gmail.com
Website: www.rfppl.com

Physiotherapy and Occupational Therapy Journal
Volume 6 Number 3, July - September 2013

Motor Neuron Disease Presenting as Low Back Ache: A Case Report

Vivek Sharma*, Harraman Kaur, L.K. Malhotra*****

Abstract

Motor neuron disease (MND) is a progressive neurodegenerative disorder, manifested by upper and lower motor neuron signs and symptoms. It is characterized by progressive weakness, atrophy, spasticity, dysarthria, dysphagia, and respiratory compromise, ultimately resulting in death. The initial presentation of the disease may be diverse, cramps often being the earliest manifestation of the disease especially in the lower motor neuron component. We present a case of 69 year old female, who presented in the physiotherapy department with complains of low back ache, cramp like pain and weakness in both the legs for the last 6 months. Her neurological examination and investigations confirmed the diagnosis of MND.

Key Words: Motor neuron disease; Low back ache; Cramps.

Introduction

Motor neuron disease (MND), is a chronic neurodegenerative disorder of the motor system. It is characterized by the loss of motor neurons in the cortex, brainstem and spinal cord, manifested by upper and lower motor neuron signs and symptoms affecting limb, bulbar and respiratory muscles. It is a devastating illness which leads to progressive paralysis and eventual death. Death usually results from respiratory failure and follows on average 2 to 4 years after onset, but some may survive for a decade or more. The exact cause of the neuronal loss in MND is not understood. Motor neuron disease is however relatively uncommon with an annual incidence of 2 in 100,000 and prevalence of 5-7 per 100,000 worldwide.[1,2] There are four variants of motor neuron disease. Amyotropic lateral sclerosis is the most common form, with both upper motor neuron (such as spasticity, hyperreflexia, and Babinski responses) and lower motor neuron involvement (muscular atrophy and fasciculation). In progressive bulbar palsy, disease begins in the lower brainstem, causing dysphagia, dysarthria, and dysphonia. Progressive muscular atrophy is again a rare subtype of motor neuron disease (MND) which affects only the lower motor neurons.[1,2] Lastly, Primary lateral sclerosis which only affects upper motor neurons.We report a case of MND presenting as low back ache in the physiotherapy department of our hospital.

Case report

A 69 year old housewife came to the physiotherapy department of our hospital with low back ache since last 6 months. She also complained of cramp like pain and weakness in both the legs. There was history of frequent falls (3-4 times/month). Her symptoms were progressive in nature. The aggravating factors for her low back pain were prolonged standing and walking and the most relieving position for her was supine lying. On examination, her lumbo-saccral movements were restricted in the end range and there was diffuse tenderness in the lumbo-saccral area.The SLR on both the sides was 70^0, because of hamstrings tightness. The FABER's

Author Affilation: *Consultant Physiotherapist, **Sr. Consultant Physiotherapist, Department of Neurorehabilitation, ***Sr. Consultant Neurologist, Department of Neurosciences, VIMHANS, Delhi, India.

Reprint request: Vivek Sharma, M.P.Th, Consultant Physiotherapist, Department of Neurorehabilitation, VIMHANS, Delhi, India.

E-mail: viveksharma607@gmail.com

test was negative on both the sides. There was distal lower limb wasting seen bilaterally. On manual muscle testing, her lower limb strength was 4/5 proximally (hip & knee) and 3/5 distally (ankle) bilaterally. She had difficulty in heel standing and toe standing. The upper limbs examination revealed bilateral thenar wasting. The pinprick, touch, proprioception and vibration sensations were intact in the upper and lower limbs. The knee and ankle jerks were diminished in both the lower limbs, whereas biceps and triceps jerks were normally elicitable. There was no evidence of aphasia, dysartria, dysphagia, limitation of extraocular movements and visual field deficits. She was continent in bladder and bowel. In view of these findings, the patient was referred to a Neurologist and was subsequently advised MRI L-S spine and EMG/NCV of all 4 limbs. The MRI findings did not reveal any evidence of root compression, except degenerative disc disease at L4-L5 and L5-S1 levels. The nerve conduction was normal in tibial, ulnar and peroneal nerves. NCV could not be done for median nerve because of the atrophy of bilateral abductor pollicis brevis. Sensory potential were normal in sural, ulnar and median nerves. Facial muscles, dorsal paraspinal, C8/T1, T5-6-7, L3-S1 myotomes showed fibrillations and large motor units with reduced interference pattern. The electro-physiological findings were suggestive of motor neuron disease.

Discussion

Low back pain is one of the commonest conditions that we encounter in our everyday physiotherapy practice. Our assessment should focus on neuro-muscular-skeletal assessment in every patient and any unusual finding should not be overlooked. The management of patients should ensure a multidisciplinary approach if there is any doubt regarding the diagnosis. As in this case, the presence of atrophy was unrelated to the complain of low back ache. Therefore it required neurology consultation. The symptoms in MND are diverse and challenging including weakness, spasticity, limitation in mobility and activities of daily living, communication deficits and dysphagia, pain and psychosocial distress, fatigue and sleep disorders.[3] Cramps can often be the earliest manifestation of lower motor neuron component of MND.[2,4,5] Pain may be part of the sensory phenomena noted in few patients or it may arise from abnormal stresses on the musculoskeletal system imposed by weak musculature.[4]

Currently, there is no definite cure for motor neuron disease. Riluzole is the only drug identified to have a beneficial effect on survival. The effect is modest, with a prolongation of life for approximately 3-4 months on average. In MND the focus of management is on symptomatic rehabilitative and palliative therapy, delivered by a multidisciplinary team. Multidisciplinary approach improves care, reduces the frequency and length of inpatient stay, and improves survival.[1,2,3]

The role of physiotherapy in MND is to reduce secondary problems. A marked reduction in activity level secondary to MND can lead to cardiovascular deconditioning and disuse weakness, superimposed on the weakness caused by the disease itself. Reduced physical activity, particularly if prolonged, produces muscle atrophy, reduced strength of tendons and ligaments, osteoporosis, pain and contractures. Exercise programs might have positive physiological and psychological effect on people with MND, especially when implemented before significant muscular atrophy occurs.[4] Breathing exercises and incentive spirometry may improve the respiratory status of the patient. The greatest advancement in respiratory therapy has been the discovery of the beneficial effects of non-invasive ventilation, in which the patient uses a mask ventilator system overnight during sleep. Most patients will eventually have difficulty swallowing. Upright position while eating (upright, no distractions, chin tuck), and dietary modifications in the form of thickened fluids can be helpful. Current practice is to offer the option of enteral feeding to patients

either through percutaneous endoscopic gastrostomy or nasogastric tube when more than 10% of the promorbid weight has been lost.[1,2] Hence, supportive treatment in the form of physiotherapy, respiratory care, nutritional support etc remains the mainstay in the management of patients with motor neuron disease.

References

1. McDermott CJ, Shaw PJ. Diagnosis and management of motor neurone disease. *BMJ.* 2008; 336: 658-62.
2. Adams and Victor. Principles of Neurology, 8th edition. USA: The McGraw-Hill; 2005.
3. Khan NL, Ng L. Multidisciplinary care for adults with amyotrophic lateral sclerosis or motor neuron disease (Review). *Cochrane Database of Systematic Reviews.* 2009; 4.
4. Newrick PG, Hewer RL. Pain in motor neuron disease. Journal of Neurology. *Neurosugery, and Psychiatry.* 1985; 48: 838-840.
5. Baldinger R, katzberg HD, Weber M. Treatment for cramps in amyotrophic lateral sclerosis/ motor neuron disease (Review). *Cochrane Database of Systematic Reviews.* 2012; 4.
6. Dal Bello-Haas V, Florence JM, Krivickas LS. Therapeutic exercise for people with amyotrophic lateral sclerosis (review). *Cochrane Database of Systematic Reviews.* 2008; 4.

Guidelines for Authors

Manuscripts must be prepared in accordance with "Uniform requirements for Manuscripts submitted to Biomedical Journal" developed by international committee of medical Journal Editors.

Types of Manuscripts and Limits

Original articles: Up to 3000 words excluding references and abstract and up to 10 references.

Original articles: Up to 2500 words excluding references and abstract and up to 10 references.

Case reports: Up to 1000 words excluding references and abstract and up to 10 references.

Online Submission of the Manuscripts

Articles can also be submitted online from http://www.rfppl.com (currently send your articles through e-mail attachments)

I) First Page File: Prepare the title page, covering letter, acknowledgement, etc. using a word processor program. All information which can reveal your identity should be here. use text/rtf/doc/PDF files. Do not zip the files.

2) Article file: The main text of the article, beginning from Abstract till References (including tables) should be in this file. Do not include any information (such as acknowledgement, your name in page headers, etc.) in this file. Use text/rtf/doc/PDF files. Do not zip the files. Limit the file size to 400 kb. Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.

3) Images: Submit good quality color images. Each image should be less than 100 kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). All image formats (jpeg, tiff, gif, bmp, png, eps etc.) are acceptable; jpeg is most suitable.

Legends: Legends for the figures/images should be included at the end of the article file.

If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks from submission. Hard copies of the images (3 sets), for articles submitted online, should be sent to the journal office at the time of submission of a revised manuscript. Editorial office: **Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091, India, Phone: 91-11-22754205, Fax: 91-11-22754205, E-mail: redflowerppl@vsnl.net.**

Preparation of the Manuscript

The text of observational and experimental articles should be divided into sections with the headings: Introduction, Methods, Results, Discussion, References, Tables, Figures, Figure legends, and Acknowledgment. Do not make subheadings in these sections.

Title Page

The title page should carry

1) Type of manuscript (e.g. Original article, Review article, Case Report)
2) The title of the article, which should be concise, but informative;
3) Running title or short title not more than 50 characters;
4) The name by which each contributor is known (Last name, First name and initials of middle name), with his or her highest academic degree(s) and institutional affiliation;
5) The name of the department(s) and institution(s) to which the work should be attributed;
6) The name, address, phone numbers, facsimile numbers and e-mail address of the contributor responsible for correspondence about the manuscript;
7) The total number of pages, total number of photographs and word counts separately for abstract and for the text (excluding the references and abstract);
8) Source(s) of support in the form of grants, equipment, drugs, or all of these;
9) Acknowledgement, if any; and
l0) If the manuscript was presented as part at a meeting, the organization, place, and exact date on which it was read.

Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Material, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of thestudy and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (http://www. consort-statement. org). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/l 7-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, what this study adds to the available evidence, effects on patient care and health policy, possible mechanisms); Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006;35:540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003;61:347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997;195 Suppl 2:3-9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000;71:1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O, Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

More information about other reference types is available at www.nlm.nih.gov/bsd/uniform_requirements.html, but observes some minor deviations (no full stop after journal title, no issue or date after volume, etc).

Tables

Tables should be self-explanatory and should not duplicate textual material.

Tables with more than 10 columns and 25 rows are not acceptable.

Number tables, in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.

Explain in footnotes all non-standard abbreviations that are used in each table.

For footnotes use the following symbols, in this sequence: *, ¶, †, ‡‡,

Illustrations (Figures)

Graphics files are welcome if supplied as Tiff, EPS, or PowerPoint files of minimum 1200x1600 pixel size. The minimum line weight for line art is 0.5 point for optimal printing.

When possible, please place symbol legends below the figure instead of to the side.

Original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay

Type or print out legends (maximum 40 words, excluding the credit line) for illustrations using double spacing, with Arabic numerals corresponding to the illustrations.

Sending a revised manuscript

While submitting a revised manuscript, contributors are requested to include, along with single copy of the final revised manuscript, a photocopy of the revised manuscript with the changes underlined in red and copy of the comments with the point to point clarification to each comment. The manuscript number should be written on each of these documents. If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks of submission. Hard copies of images should be sent to the office of the journal. There is no need to send printed manuscript for articles submitted online.

Reprints

Journal provides no free printed reprints, however a author copy is sent to the main author and additional copies are available on payment (ask to the journal office).

Copyrights

The whole of the literary matter in the journal is copyright and cannot be reproduced without the written permission.

Declaration

A declaration should be submitted stating that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under the present authorship has been published or is being considered for publication elsewhere and the authorship of this article will not be contested by any one whose name (s) is/are not listed here, and that the order of authorship as placed in the manuscript is final and accepted by the co-authors. Declarations should be signed by all the authors in the order in which they are mentioned in the original manuscript. Matters appearing in the Journal are covered by copyright but no objection will be made to their reproduction provided permission is obtained from the Editor prior to publication and due acknowledgment of the source is made.

Abbreviations

Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

Checklist

- Manuscript Title
- Covering letter: Signed by all contributors
- Previous publication/ presentations mentioned Source of funding mentioned
- Conflicts of interest disclosed

Authors

- Middle name initials provided.
- Author for correspondence, with e-mail address provided.
- Number of contributors restricted as per the instructions
- Identity not revealed in paper except title page (e.g. name of the institute in Methods, citing previous study as 'our study')

Presentation and Format

- Double spacing
- Margins 2.5 cm from all four sides
- Title page contains all the desired information. Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Abstract provided: Structured abstract provided for an original article.
- Key words provided (three or more)
- Introduction of 75-100 words

- Headings in title case (not ALL CAPITALS). References cited in square brackets
- References according to the journal's instructions

Language and grammar

- Uniformly American English
- Abbreviations spelt out in full for the first time. Numerals from 1 to l0 spelt out
- Numerals at the beginning of the sentence spelt out

Tables and figures

- No repetition of data in tables and graphs and in text.
- Actual numbers from which graphs drawn, provided.
- Figures necessary and of good quality (color)
- Table and figure numbers in Arabic letters (not Roman).
- Labels pasted on back of the photographs (no names written)
- Figure legends provided (not more than 40 words)
- Patients' privacy maintained, (if not permission taken)
- Credit note for borrowed figures/tables provided
- Manuscript provided on a CDROM (with double spacing)

Submitting the Manuscript

- Is the journal editor's contact information current?
- Is a cover letter included with the manuscript? Does the letter

1. Include the author's postal address, e-mail address, telephone number, and fax number for future correspondence?
2. State that the manuscript is original, not previously published, and not under concurrent consideration elsewhere?
3. Inform the journal editor of the existence of any similar published manuscripts written by the author?
4. Mention any supplemental material you are submitting for the online version of your article?

Contributors' Form (to be modified as applicable and one signed copy attached with the manuscript)

Subscription Form

I want to renew/subscribe to international class journal **"Physiotherapy and Occupational Therapy Journal"** of Red Flower Publication Pvt. Ltd.

Subscription Rates:
• India: Institutional: Rs.6600, Individual: Rs.1000, Life membership (10 years only for individulas) Rs.5000.
• All other countries: $360

Name and complete address (in capitals):

Payment detail:
Demand Draft No.
Date of DD
Amount paid Rs./USD

1. Advance payment required by Demand Draft payable to Red Flower Publicaion Pvt. Ltd. payable at Delhi.
2. Cancellation not allowed except for duplicate payment.
3. Agents allowed 10% discount.
4. Claim must be made within six months from issue date.

Mail all orders to
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Tel: 91-11-22754205, Fax: 91-11-22754205
E-mail: redflowerppl@vsnl.net, redflowerppl@gmail.com
Website: www.rfppl.com

Call for Reviewers

Indian Journal of Cancer Educational and Research *(IJCER)* is seeking scholars interested in serving on our volunteer Editorial Review Board. If you are interested, please submit the following information to redflowerppl@vsnl.net / redflowerppl@gmail.com. We will respond to your inquiry shortly. If you have a colleague who may enjoy serving on our volunteer Editorial Review Board, please feel free to forward our Website address to him or her.

Peer reviewers are charged with providing feedback to ***IJCER*** editors about the merits of submissions in terms of quality and contribution to the field. Reviewers are expected to write reviews in a timely, collegial, and constructive manner. Maintaining ***IJCER*** as a medical journal of the highest quality depends on reviewers with a high level of expertise and an ability to be objective, fair, and insightful in their evaluation of manuscripts.

One must have at least five years of experience in the field after completion of the education in that field and at least five original research papers in journal(s).

Please note that the acceptance of your application will be at the sole discretion of the editors.

Please provide your complete information and affiliation in brief through e-mail or you can register your self on our website www.rfppl.com.

For more information, please contact:

Publication–in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091
India
Phone: 91-11-22754205, Fax: 91-11-22754205
E-mail: redflowerppl@vsnl.net, redflowerppl@gmail.com
Website: www.rfppl.com