
'The Role of Pilates in Facilitating Sports Performance'

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Aims

To explore and discuss the role of the Pilates method in dance and sport. An athlete was originally described in Greek as “a contestant in the Games”. In modern day framework, by the term athlete I mean someone who trains more than the basic recommendations of Chief Medical Officer for health benefits, in order compete in their chosen discipline(s) whether this be as an individual, or in a team.

Introduction

Although Joseph Pilates (1883-1967) developed his principles of Contrology whilst interned on the Isle of Man during the First World War, he was way ahead of his time and certainly his ideas are still very relevant today. In particular I wish to discuss the potential beneficial role of Pilates integrated within sports training. In other words to try and dispel a common misconception held today that Pilates is mainly for middle aged women and often not challenging enough for others.

“Anima sana in corpore sano” is a line from the Latin poet Juvenal, which translates as “a healthy mind in a healthy body”. Why I find this simple phrase intriguing is that it implies a reciprocal, symbiotic relationship. You can’t have one state without the other and equally there is feedback between body and mind. This aphorism is echoed in Joseph Pilates’ chapter on ‘Contrology’ where he explained that this effectively meant the “balance of body and mind”ⁱ. To bring this right up to date the World Health Organisation define health as physical, mental and social well being.

Joseph Pilates suffered with rickets as a child, but was very pro-active in dealing with this by exercising in his shorts outside in the German forests to boost his production of vitamin D. He also came from a sporting background as a circus tumbler, touring in Britain when WW1 broke out and hence was interned. As this meant inactivity, he was inspired to create a series of exercises, which could be done without special equipment. Later during his internment springs on the hospital beds were used, which inspired development of the Pilates apparatus we know today. What strikes me from this sequence of events is that Joseph Pilates took responsibility for his health and physical fitness. Something that I think everyone could take note of. As he says in the article in Sports Illustrated way back in 1962: “so, you want to learn how to do better. It’s all up here, in the head”ⁱⁱ. In other words mind over matter, or better still: mind in dialogue with body harnessing the beginnings of sports psychology.

The other significant factor in favour of Pilates being useful for athletes, is that part of his inspiration came from observing animals, in particular cats who demonstrate such an elegant, co-ordinated agility. As he wryly observed animals do not lift weights. “No bulging biceps, more focus on muscles that will hold you up rather than knock others down”. In other words not over developing few muscles at the expense of others, which would mean less cat-like characteristics of grace and suppleness. In modern day speak, focus on “core”/trunk stability, rather than hypertrophy of superficial muscles. A “six pack” while aesthetically sought, will not necessarily ensure balance in ballet, streamlining in swimming or efficient independent movement of the limbs

without disturbing trunk alignment required in running or cycling. In other words function rather than aesthetic.

In fact Joseph Pilates challenged that even trained athletes may not be able to execute Contrology exercises properly. In my opinion the vital word here is the adverb “properly”. Most people can adopt 4 point kneeling and extend opposite arm and leg in “superman” pose. However, it is surprising that even some athletes show “softness” in lumbar area and displacement of hips (despite an often impressive “six pack”). QED: quod erat demonstrandum!

Main discussion points

I suggest that Pilates could be used more extensively as “cross training” in sports. A form and sequence of body movements and understanding of these, which would be relevant and specific for the discipline of dance, or a particular sport. However, the advantage is that it would not necessarily involve repetition of the steps in dance, nor the exact, full movement required in a particular sport. This approach avoids simply reinforcing any faulty technique and takes out the stress of being in the dance studio, or sports venue. Pilates involves the unique approach of working round the body in 3 dimensional manner from deep to more superficial. Thus, not only could Pilates be a used in rehabilitation and injury prevention, but particularly for the motor skill component of improved athletic performance.

Considering the 6 essential principles of Pilatesⁱⁱⁱ:

Breath

Concentration

Centring

Control

Precision

Flow

These are very similar to the motor skill/neuromuscular fitness component of overall fitness. Namely: balance, co-ordination, speed, agility, power (specifically ability to recruit muscles in a co-ordinated sequence) and reaction time. In addition, Pilates contributes to muscular strength and endurance (MSE) and flexibility. Thus cardiovascular (CV) fitness is the only component of fitness that is best improved by aerobic exercise monitored by heart rate zones, rather than Pilates. For these reasons, it is obvious why dance, as a very skill related activity has embraced Pilates. Conversely, these may also be the reasons why not so many men currently seem to participate in Pilates.

Developing athletes

“First educate the child!” advocates Joseph Pilates. Very logically he argues that good habits and understanding the balance of body and mind should be established in childhood. Certainly many skill-based sports are often started at an early age, such as dance and gymnastics to encourage neuro-muscular facilitation. Such training, together with diet, can have a significant effect on development in terms of anthropometric parameters, endocrine markers, menstrual status and bone mineral density^{iv}. So a holistic approach, as advocated by Pilates, together with a multidisciplinary approach, would certainly contribute to the health and performance of young dancers and

athletes. Indeed dance training with associated amenorrhoea can have an even longer term effect on bone mineral density, even after retirement from dancing, which is highlighted in earlier studies I conducted^v. Some of the findings from my studies are incorporated into the Dance UK publication “Your body your risk” and National Osteoporosis Society publication “Fit but Fragile”. So from this evidence it is essential as Joseph Pilates put it, to first educate the child, not only to improve current athletic performance, but in order to lay the foundations and understanding for continued health and fitness into adulthood.

I know there will be some, even Pilates teachers themselves, who will say that Pilates is not suitable for children. However, I agree with Jo Pilates about encouraging youngsters to take responsibility and interest in their health and exercise. The onus is on Pilates teachers to make Pilates interesting and relevant to youngsters, whether they go on to become athletes or not. “The vast majority (of children) mechanically exercise without mental concentration - an utter waste of time and effort,” according to Jo Pilates. Youngsters do indeed have amazing powers of concentration, as demonstrated by for sitting for extended periods of time playing computer games! So it just takes a little imagination to harness this potential. Mat work exercises, including use of basics props such as bands (very similar mechanical properties to springs in Pilates apparatus) would be very suitable for developing bodies. Obviously far safer and more functional just to work with body weight, rather than open kinetic chain exercise with free weights. Re-calibrating proprioception is also very important concept in growing bodies.

Multidiscipline sport

Another group of athletes that could particularly benefit from Pilates input would be those involved in multidiscipline events, such as triathlon. In addition to cardiovascular fitness, a high level of skill is required, not only to master sequential disciplines of swim, bike, run, but to quickly and efficiently transition from one to the other. Although different prime mover muscle groups are required, “core” control is a fundamental requirement. For example, streamlining in swimming and trunk control for efficient cycling and running. Additionally, swimming requires rotator cuff stability in motion and flexible ankles, whilst cycling and running both require good leg alignment. Running requires excellent pelvic stabilisation and foot positioning for efficient propulsion. Thus Pilates would be excellent to improve strength, stability, flexibility and proprioception across these key areas. As triathlon is a relatively “new” sport, triathletes tend to be more receptive to a scientific and a multidiscipline approach, as shown by the wealth of well written magazines (eg. 220 Triathlon) and podcasts available. This is also reflected in the organisation of the Triathlon England body and regional academies, which provide coaching and physiological testing for aspiring triathletes. So these athletes would certainly be receptive to and benefit from Pilates input. Also, the triathlon “age groupers” would certainly benefit, although the male age groupers may be initially less receptive, as they have come from the “old school” attitude that Pilates is for women of a certain age. I also suspect that they may be a little worried that inflexibility and less than optimal

proprioception and co-ordination may be revealed, even if this concern is at a subconscious level.

Both mat and apparatus based exercises would be beneficial. In particular I think that the unique value of Pilates apparatus has not been appreciated. Clearly multigym type machines and Pilates apparatus have a big advantage over free weight, open kinetic chain exercises, from a safety point of view. However, even beyond that, some Pilates apparatus (Reformer, Cadillac and Wunda chair) are unique in using springs. The muscular force required to extend a spring is independent of gravity. According to Hooke's Law the extension of a spring is proportional to the force applied: $F=kx$, up to the elastic limit. Where F =force, k =spring constant and x =extension. In common with springs, bands share the same mechanical properties and hence the same gravity independent advantages when applying muscular force to extend the spring/band. Thus bands are very useful in evolved mat repertoire if Pilates apparatus are not available. From Hooke's law, in order to extend the spring further from rest position, in an incremental fashion, then the force required must be increased in a proportional manner (for a given spring with fixed spring constant). In other words, more force must be applied as concentric muscle contraction continues and conversely in the eccentric phase of muscle contraction most force is required when initiating the phase of allowing the spring to return to its original length.

In contrast to springs/bands used in Pilates, the muscular force required to move a weight (free or multigym) is dependent on gravity. From Newton's second law of motion: $F=ma$. Where F =force, m =mass and a =acceleration. In

the case of moving a weight: $F = \text{muscular force}$ and $a = g$ (acceleration due to gravity). Additionally, in contrast to extending from rest/resisting return to rest of a spring, in order to move a weight against gravity/resist weight returning to original vertical height, the muscular force is constant throughout range of movement. Unless, as with free weights, movement changes the lever length, so the muscular force required may change. In other words, more variables are involved when using multigym and free weights in particular, in contrast to the unique use of springs in Pilates apparatus to provide resistance to movement.

Working muscles in a fashion independent of gravity is the big advantage of Pilates apparatus, such as use of the jump board on the reformer. As the body lies horizontally and gravity acts vertically, then jumping (as in running, push off from wall in swimming drives/turns, or allegro in ballet) can be practised without the extra impact force experienced when doing so vertically. Thus leg alignment and landing through the feet can be checked, with reduced injury risk. For runners “gravity free” treadmills would be the equivalent, but there are not many of these available, very expensive and high tech to operate. For swimmers lying is a functional position to train in and the principle of exhaling on exertion in Pilates shares the same breath pattern during the pull phase of all 4 strokes. Particularly the pull phase of those 3 strokes performed on front when exhalation in the water occurs as head is submerged. Although “swim benches” are available for swimmers for land training, these are limited in availability and expensive. These are very demanding on shoulder strength and therefore only suitable for the older,

experienced competitive swimmer. In summary Pilates could provide safe, unique and very beneficial training benefits for athletes.

Natal athletes

Another important area for a Pilates input is in the pre and post natal athlete.

Female athletes are a slightly different of subgroup of pregnant women in that their bodies are adapted to high levels of exercise and although some modifications in their usual training regime will be advisable, the advice will be different to that for a sedentary pregnant women. In the case of dancers, some advice is given in publication prepared by Dance UK, for which I made some contributions. For example, relaxin, a protein hormone released during pregnancy and the post natal period, can produce increased flexibility which dancers may welcome, but should be aware that they should not over stretch as the joints will be in a slightly vulnerable state. This is useful in allowing stretch of the pelvic ligaments during childbirth to deliver the baby, but not all dancers are aware that this effect remains for some time in the post natal period. Equally not all athletes realise that they are actually at a physiological advantage in the post natal period with increased circulating volume. In other words, Pilates could definitely help athletes to continue exercising in a safe manner in the pre and especially in the post natal period.

Doping in sport

The down side of improved medical understanding in sport is the abuse of performance enhancing substances in athletes.^{vi}. Unfortunately, as reported in a recent edition of triathlon magazine, even some amateur age group athletes are looking to improve athletic rformance with doping. Luckily there

are safer and legal options, including Pilates, which will have long term beneficial effects.

Conclusions

Joseph Pilates (1883-1967) developed his method of Contrology, a balance of body and mind. This is what we now know today as Pilates and incorporates both mat and apparatus exercises. Although some of the language he originally used is slightly dated, nevertheless the fundamental principles of understanding and taking responsibility for your own health and fitness are of paramount importance. In fact, probably even more so in current times where quick, easy solutions and sedentary lifestyles are favoured.

Although Pilates has come to be considered as an activity for women, actually reading what Joseph Pilates originally wrote is very enlightening. In particular his comments about “educate the child” and challenging trained athletes to perform his exercises properly. There are certainly more benefits of the Pilates method that can be explored to enhance athletic performance, injury prevention and rehabilitation in athletes of all ages, both genders and across a range of sports.

References

- i PILATES, J.H. and MILLER, W.J. (2000) *A Pilates' Primer: The Millennium Edition. Pilates' Return to Life through Contrology (1945) and Your Health (1934)*. Ashland: Presentation Dynamics.
- ii WERNICK, R. (1962) Learning to be an animal. *Sports Illustrated*. 12th February
- iii CLIPPENGER, K. and ISACOWITZ, R. (2011) *Pilates Anatomy*. Champaign: Human Kinetics.
- iv KEAY, N. (2000) The Effects of Exercise Training on Bone Mineral Accumulation in Adolescent Girls. *Journal of Bone and Mineral Research*. 15 (1) p.S289.
- KEAY, N. (1998) Dancing through Adolescence. *British Journal of Sports Medicine*. 32 (3) p.196-7.
- KEAY, N. (1997) Effects of Dance Training on Development, Endocrine Status and Bone Mineral Density in Young Girls. *Journal of Endocrinology*. 155 (1), p.OC15.
- v KEAY, N. FOGLEMAN, I. and BLAKE, G. (1997) Bone Mineral Density in Professional Female Dancers. *British Journal of Sports Medicine*. 31 (2) p.143-7.
- KEAY, N. (1995) Dancers, Periods and Osteoporosis. *Dancing Times* p.1189.
- vi KEAY, N. et. al (2000) Growth Hormone (GH) Effects on Bone and Collagen Turnover in Healthy Adults and its Potential as a Marker of GH Abuse in Sport: A Double Blind, Placebo Controlled Study. *Journal of Endocrinology and Metabolism*. 85 (4) p.1505-1512.
- KEAY, N. (1999) The Effects of Growth Hormone Misuse/Abuse. Use and Abuse of Hormonal Agents. *Sport*. 7 (3) p.11-12.

Bibliography

CYQ Level 2 and 3 online lectures. Accessed December 2014.

Dance UK (2001) Your body your risk.

J.G. Hass (2010) Dance Anatomy. Human Kinetics.

M. Kilon, T. Jackson (2012) Triathlon Anatomy. Human Kinetics.

I. Mcleod (2010) Swimming Anatomy. Human Kinetics.

National Osteoporosis Society (2002) Fit but Fragile.

B. Siler (2000) The Pilates Body. Michael Joseph.

S. Sovndal (2009) Cycling Anatomy. Human Kinetics.

220 Triathlon magazine (monthly).

National Osteoporosis Society (2002) Fit but Fragile.