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## **DEEP PENETRATING 3-D TRAINING WITH THE FLEXI-BAR**

### Expert advice concerning the Flexi-Bar<sup>®</sup>'s "performance"

Back pain, unilateral strain, poor posture, lack of mobility, muscle weakness, etc., are all concepts that every one of us becomes familiar with at some point. Meanwhile, these profiles present themselves at progressively younger ages, the symptoms are more varied and the potential remedies increasingly complex. Not uncommonly, the patients have already endured extensive periods of suffering, accompanied by therapies based on relatively passive and monotonous methods, with limited benefits and success, with a commensurate decrease in the patient's motivation to actively cooperate. Training and treatment methods are sought after that can be readily integrated into our daily routines in a simple manner and still have lasting effects – and ideally, are also fun to do.

The Flexi Bar<sup>®</sup> is an ideal multifunctional and 3-dimensional training- and therapeutic device, which can easily be implemented at home, in the fitness studio, at a sports club or even at work for a full body workout which gently activates dormant strength reserves while achieving long-lasting improvements in overall physical condition. Training with machines in a gym and unnatural exertions of strength are not nearly as effective as free, unrestricted movements (Mueller-Wohlfahrt & Schmidlein, 2007), (Tomorrow Focus AF 2008), also known as "functional kinetics", which is to say functional three-dimensional training. All of our normal, everyday movements are 3-dimensional in nature. As per Mueller-Wohlfahrt (Mueller-Wohlfahrt & Schmidlein, 2007) the oscillating vibrations of the bar do not stimulate isolated muscles but rather entire chains of muscles (simultaneous interplay of numerous muscles). Even more important is the functional aspect of the training. Nonfunctional training such as isokinetics or training with nonfunctional fitness equipment (ex.: leg extensions) should be avoided. To quote Van Wingerden (Van Wingerden 1998): "Furthermore, most training with exercise equipment lacks the necessary functionality for the active stabilization of the upper body regions (e.g.: the spine), which also calls into question the use of these often expensive machines" (excerpted from Mueller-Wohlfahrt & Schmidlein 2007).



## Ranges of Use

The ranges of use are considerably varied:

- in physiotherapeutic care, on a case by case basis
- physical rehab (physical therapy, also at-home follow-up care)
- at home
- at the fitness studio or sports club
- in the area of personal training
- specifically for golf training (in a physical therapy practice or on the driving range)

Generally, the training tool can be implemented to excellent result in the fields of physiotherapy, sports therapy, orthopedics, post-surgical rehab, traumatology, neurology, gynecology and rheumatology as well as in preventive or rehabilitative treatments and exercises for individuals or groups. Personally I have successfully applied these oscillating bars in sports-physiotherapy for over 10 years, in particular for the treatment of the following symptoms:

## Indications

- degenerative and chronic spinal disorders, i.e. osteochondrosis, spondyarthrosis, spondylolysis, hemivertebrae, periarticular arthritis
- protruded/prolapsed discs
- spinal canal stenosis
- spondylolisthesis (slipped disc)
- disorders of the cervical, thoracic and lumbar vertebrae
- post-surgical ailments following spinal and vertebral disc operations
- intervertebral disc training
- scoliosis therapy
- rehabilitative care for spinal and pelvic fractures (bone fractures)
- for the stimulation of the connective tissue structures
- instabilities of ligaments and tendons, i.e., knees, ankles, shoulders, elbows, cervical vertebrae, AC joints, etc.
- post-surgical complaints of the shoulders, knees, elbows and hands, i.e. after rotator cup ruptures, shoulder luxations, frozen shoulder, etc.

- after hip-joint and knee-joint surgeries, i.e. prosthetics, ruptured cruciate ligament
- arthritis and osteoporosis (bone metabolism)
- muscular imbalances and damaged/weak posture
- back training, postural training
- joint flexibility and mobility training
- stretching/flexing exercises with vibrations transferred to the musculature
- neural mobility (ULTT, Slump, SLR)
- neurological diseases such as Parkinson's Disease
- diaphragm mobility training (osteopathy)
- as full body training of foot muscles, leg and hip training, rehabilitative gymnastics
- back, shoulder or neck strain
- headaches, back aches
- for paraplegics for the strengthening of torso, shoulder and arm muscles as well as cardiovascular training whether in a seated or supine position (PNF Overflow)
- improvement of sensorimotor skills
- prevention of falls in older adults
- preventive and compensatory exercises
- coordination training (physical and mental, for the activation of the interplay of both sides of the brain)
- warm-up, metabolic and strength-speed training
- obesity and weight management
- golf swing and golf technique training
- torso rotation training and training of rotation-stabilizing muscles (joint stabilization training of the muscoli multifidi), dynamic stabilization training (Mueller-Wohlfahrt & Schmitdlein 2007)
- after chiropractic as well as Dorn therapy and jaw- joint therapy to improve stability
- the following illnesses lead to stability problems, for which stabilization training is also indicated when feasible: diverse rheumatoid disorders, paresis, Marfan syndrome (weakness of the connective tissue), muscular dystrophy, neuropathies
- for prevention of specific injuries (Mueller-Wohlfahrt & Schmitdlein 2007)

The fiberglass bar is very popular with my patients of all ages, primarily because this single training tool yields favorable medical results within a short period of time and with easily executed exercise modules. As its unique feature one should emphasize its ability to stimulate deep-lying muscles. The fact that training methods based on vibrations have a positive and promising effect on the musculature and its performance

potential has been established by studies of rhythmic neuromuscular stimulation (RNS) (Rieger et al, 2003). The oscillating bar, by virtue of its vibrations, enacts an exceptionally deep-penetrating reaction of the body -- a reflexive exertion of the torso, which is otherwise difficult to achieve, since a generalized approach is ineffective to this area. With this type of exercise, all deeper-lying muscle groups of the back, the abdomen and those surrounding the pelvic floor actively work against the vibrations the body is subjected to. Even underdeveloped multifidus muscles can be specifically addressed, which was not previously possible with conventional strength training methods (Mueller-Wohlfahrt & Schmidlein, 2007).

Even in pain management therapy (see Pain/Gate Control) the Flexi-Bar<sup>®</sup> can be used effectively. Because pain relief measures are mostly nonfunctional, they in fact contribute to degeneration and atrophy. Those therapies which do not address the functionality of the structures by therapy or training will only have a short-term effect, if any at all. In terms of functional training, load capacity can only be improved by increasing the load – not decreasing the load but (sensibly) increasing it (Van Wingerden, 1998).

### **Contraindications**

I consider the following conditions contraindications for the use of the Flexi-Bar<sup>®</sup> and recommend a professional consultation with a medical doctor prior to training:

- extreme hypertension (from KW II on)
- acute inflammations of any body parts to be involved in the exercise
- 1-2 weeks after intervertebral disc surgery
- advanced disorders of intervertebral discs, with neurological symptoms
- coronary heart disease in acute stages
- the first few months following a heart attack
- heart failure or inflammatory heart disease
- arteriosclerosis (peripheral arterial vascular disease stages III or IV)
- brain aneurysm
- abdominal aortic aneurysm
- third trimester of pregnancy
- malignant tumors and metastasis

Patients with pain even when at rest must first be free or almost free of pain before starting therapy to stabilize these indications, since pain can lead to inhibiting the primary musculature targeted for stabilization.

## Its design and how it works

A number of different models of oscillating training bars by different manufacturers exist on the market today. To date, the Flexi-Bar<sup>®</sup>, manufactured by FLEXI-SPORTS GmbH is the only back-training tool in Germany which has earned the distinction of carrying the “AGR Seal of Approval”. It was tested and recommended by the National Association of German Back Schools (BV Rueckenschulen e.V.) and by the “Better Living through a Healthy Back” forum (Gesunder Ruecken – Besser Leben). The AGR’s Seal of Approval was awarded the overall grade of “Very Good” by ÖKO-Test, and it enjoys a high acceptance rate in the medical community. “Guter Rat No. 3/2008” (a widely accepted German reference guide) also judged the training bar as follows: “The best remedy for persistent neck-aches is not massage, but deep muscle toning via training with the Flexi-Bar<sup>®</sup>”.



Illus. 1 and 2: tested and recommended by the “Better living through a healthy back” forum (Gesunder Ruecken – besser leben) and the national association of German Back Schools (BV Rueckenschulen e.V.). Additional information at: AGR e.V., Pf. 103, 27443 Selsingen, Tel. +49 (0) 04284/92 69 990, [www.agr-ev.de](http://www.agr-ev.de). Source: <http://www.flexi-sports.com/download/flexi-bar/text.php> March 2008

The bar consists of synthetic material reinforced with fiberglass. The adult version is and 1.5 m long. At both of its ends there is a cylindrical weight made of natural rubber. What make the Flexi-Bar<sup>®</sup> unique is the exactly defined relationship between the bar’s flexibility and strength and the oscillations caused by the weights at the bar’s ends. According to the manufacturer, the planes of movements can be more exactly executed with cylindrical weights at the ends than with spherical weights or weights of any other shape. In therapy we use this feature to our advantage, by varying angles, axes and

planes in physiotherapeutic treatments, thus achieving a more focused and effective training result.

Empirical studies by the manufacturer of more than 300,000 test participants indicate that the best results of functional proprioceptive training is achieved at a frequency of 4.6 hertz (Flexi-Sports GmbH 2008). These results (University of Munich, Technical Research Laboratory) have been applied to the actual production models. At this point it should be mentioned that in the meantime numerous cheap and inferior imitations have also infiltrated the market.

The effectiveness of proper training also hinges upon the quality of the execution of the exercises. Unlike group training, in physio- and sports-therapeutic programs, the exercises can be targeted towards specific complaints or ailments. Proper schooling of the therapist is definitely recommended, so that he will be able to conduct the exercise in the most efficient manner and that he gets to know the broad range of practical applications. As simple as this device may appear at first glance, it nevertheless offers an enormous amount of possibilities that can simply not be conveyed fully through a book or DVD. For example, oscillatory planes, oscillatory directions, grip variations, angle positioning, complementary rotations all play a significant role, not to mention its uses in combination with other tools.

Physiotherapists are able to target their therapeutic programs with the training bar even more specifically towards their patients by making use of different available models of the Flexi-Bar<sup>®</sup>.

### **Variations of the bar and oscillatory force**

#### **1. Flexi-Bar<sup>®</sup> -- *Standard (red)***

Standard version, ranges of use cover all indications.

#### **2. Flexi-Bar<sup>®</sup> -- *Intensive (blue)***

In contrast with the standard Flexi-Bar<sup>®</sup>, the Intensive Flexi-Bar<sup>®</sup> was specifically developed for the management of obesity and weight issues and requires a more forceful swing, which burns fat faster and more effectively.

#### **3. Flexi-Bar<sup>®</sup> -- *Athletic (black)***

This Flexi-Bar<sup>®</sup> was specifically designed for advanced and experienced athletes who already have existing successful training routines with the bar and who desire a more demanding load.

#### 4. Flexi-Bar® -- Kids (green)

for children ages 7 - 14

Due to the frequent occurrence of postural disorders in children and young teens, a Flexi-Bar specifically for children ages 7-14 was developed. Its measurements and weight have been customized to this model's design in accordance with the most current findings on the subject.

#### **Practical Uses and Training Variables**

The intensity of the training is determined by different variables and combinations thereof.

- amplitude motion size
- speed of movements
- regularity of rhythm (rhythmic or irregular)
- frequency of movements
- direction of movements
- length of training session
- number of participating joints
- angles or planes of swing
- direction of swing
- elbow position
- variations of grips (supination, pronation, inward- or outward rotation) The differing grip variations depend on the muscle groups being addressed by the exercise and the respective clinical pictures. Varied hand positions are possible and recommended for certain exercises, i.e. 3-finger grip.
- integration of rotation (i.e. in the glenohumeral articulations of extension, adduction, inward rotations after flexion abduction outward rotations)
- distance of the bar from the body while swinging it, e.g. sagittal elbow extension-flexion, upper body right-left rotation, shoulder adduction and abductions)
- dual-task exercise (plus breathing, plus squat, plus crunch, plus leg lift, plus knee lift)
- in combination with Pilates, Yoga, Thera-Band®, Balance-Pad, gyroscopic exercise, trampoline, exercise ball, Pezzi Ball, rolled-up Airex mats, Pilates ball roll, etc.

#### **Basic and starting position with simple variation**

- foot position: at hip width and parallel (heightened stability of pelvic area)
- foot arch in 3-point position (even distribution of pressure on the heel bone, 1<sup>st</sup> and last toes)
- knees: slightly outward

- pelvis: pelvic neutral
- buttocks: contracted
- stomach: pulled in (indirect activation of transverse abdominals and pelvic floor)
- chest: lifted up
- pull shoulder blades together during all exercises (shoulder adduction and scapular depression)
- shoulders and pelvis should make as few compensatory movements as possible
- if the bar stops swinging, start over
- wrists: neutral (0) position
- thumbs: neutral (0) position (adduction)
- thumbs: 90° position (abduction)
- head in neutral position (gently nod the chin towards the chest)
- long, deep breaths to expand the rib cage to its fullest

### **Determining proper intensity**

The desired level of intensity is dependent on the respective exercise being done, the level or amplitude of one's arm, the intensity of the oscillations and for how long the oscillations are maintained.

degree of swing (based on an axis):	Easy: Level 1 – 5 to 10 degrees
	Intermediate: Level 2 – 10 to 20 degrees
	Hard: Level 3 – 20 to 50 degrees max

duration:	The duration of the oscillations can be anywhere from a few seconds to over a minute per exercise.
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These recommendations are approximations and should be based primarily on the subjective responses of the patients, as well as their medical profile, age, gender, constitution and physical condition.

### **Training frequency**

- Don't overdo it when starting your training. If necessary, implement short breaks into your routine and alternate it with other exercises which do not involve oscillating the bar.
- frequency of training: ideally 2-3 times per week, minimally 10-15 minutes each time.
- it is preferable to start at lower amplitudes and slowly work your way up. The higher the amplitude, the more intensive the training. The duration of the

oscillations is based on the patient's strength, endurance and coordination skills. Initial difficulties are perfectly normal and should not be seen as a reason for giving up.

As long as the bar is oscillating, the back is protected by the activated muscles. For this reason it is optimal to switch upper-body positions such as flexion, lateral inclination, rotation, etc. while the bar is still swinging.

### **Examples of the Flexi-Bar<sup>®</sup>'s uses in therapy**

#### **Arthritis**

The bar's oscillations trigger increased provisions to the hyaline cartilage. This generates beneficial effects for the shoulder's rotator cuffs. Assorted joint structures (bones, cartilage, capsules, sinews, ligaments, nerves) are optimally stimulated. To quote Van Wingerden (1998): "Proprioceptive training. This form of training deserves to be given increased attention, as optimal proprioception is necessary for the production of a functional result".

#### **Osteoporosis**

The specific stimulus of the oscillations has a positive effect on osteoblasts and osteoclasts; in particular, when the gentle push-pull loads are enacted axially from above on the spine. The push-pull loads result in greater bone density. Studies have shown that the higher the physiological loads placed on bones, the better their mineralization, density and stability (Van den Berg, 2003/1).

#### **Degenerative disorders of the spine**

Stimulation of deep-lying muscles is particularly effective in combating degenerative spinal disorders and preventing or reducing the speed of further degeneration. By conditioning the M. erector spinae, existing loads on compromised spinal discs can be alleviated. Lack of movement, immobility and a lack of beneficial physiological stimuli can lead to increased degeneration.

#### **Cartilage disease**

When sufficient physiological loads and unloading are enacted on the affected joints, it is possible to effect a regeneration of the joints and their attendant cartilage. This beneficial stimulation of the cartilage can be accomplished by the push-pull loads of the bar's oscillations (Gunsch 2006).

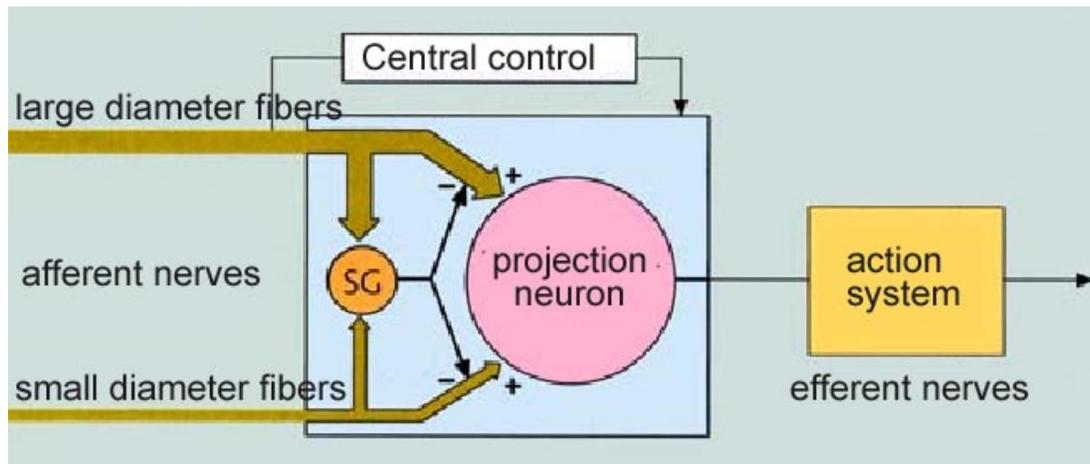
#### **Degenerative disorders of the intervertebral discs**

In spite of many opinions to the contrary, the spinal discs are capable of healing after they have been damaged. Stable connective tissue structures and physiological load stimuli are necessary to promote optimal healing (Van den Berg, 2003/1). The rhythmic alternation of the pull-push loads created by the bar meet the criteria for an adequate muscle load and effect an optimal provisioning of the spinal discs with essential nutrients. Overly forceful or weak, jerky or unilateral loads can lead to improper muscle loading and premature degeneration of the spinal discs (Van den Berg et al, 2001). "The timeframe required by most connective tissues to rehabilitate their original load capacities and normal properties is, under normal physiological conditions, between 300-500 days. This means that, for example, the regeneration of a spinal disc problem (not freedom from pain) will require approximately one year. Training and/or daily exercises are considered necessary for the achievement of functional adaptation and thereby for the prevention of injury recidivism" (Van Wingerden, 1998). The only possibility for regeneration of lumbar spinal disorders is by primarily functional exercises and training, which seek to achieve an improvement in the load capacity of the respective tissues and which directly address the problem (pain) in the movements involved (Van Wingerden, 1998). The patient must self-determinedly take a proactive role in his own recovery, set optimal goals for the regeneration of the afflicted areas, and draw upon his own body's healing powers. According to Van Wingerden, this should not be done to the exclusion of exercises and movements which can cause pain to the affected areas. With load-dependent pain, the joint homeostasis must be altered into a direction where the load no longer causes pain. With the oscillating bar, the above training conditions are met: tissues are specifically targeted with proper loads, a functional stimulus is achieved, and the "active" training in this capacity will be accompanied by reduction of and eventually freedom from pain. This is also the key difference from passive vibration training. Activity overrides passivity.

### **Pain Gate Control**

Through oscillating movements such as training with vibrating bars, mechanoreceptors can be stimulated, which in turn can inhibit the transmission of nociceptive impulses to the spinal cord and brainstem (Kisner & Colby, 2000). Stimulation of large diameter fibers inhibits nociception (mechanism of "large inhibits small"). The Pain Gate Control theory, developed in 1965 by Melzack and Wall, states that the incoming nociceptive signals (A $\delta$  and C-fibers) are inhibited by the stimulation of larger, afferent nonnociceptive fibers (Type II and IIa fibers or also A $\beta$  fibers) so that the "gate" is closed to the transference of afferent nociceptive fibers (Frisch, 2003). This theory implies that nociception via the inhibiting interneurons of the dorsal horn of the spinal cord (substantia gelatinosa) can be blocked by stimulation of large diameter fibers (Zalpour, 2002). Stimulation of this nature, as achieved by activities or therapeutic measures such as pressure, vibration, electrotherapy, massage, manual therapy and

compressions, can specifically target the alleviation of. However, the longer a condition has persisted (chronic pain), the greater the chances that the damage is irreversible, which is to say that attendant to the chronic condition, pain inhibition drops out. If the inhibition drops out, even the large diameter fibers turn into pain-conducting nerve fibers.



Illus. 4: Representation of the Gate Control model

Source: Van den Berg, F. (Ed.) 2003. Applied Physiology, illus. 4, nociceptive structures and pain management, Stuttgart: published by Thieme, p. 293.

Zusman (Zusman & Moog-Egan, 2003) describes how an intensive stimulation or stimulation by a harmful stimulus ( $A\delta$  fibers) can physiologically activate the production of opioids, which in turn inhibits pain (annotation c). In this case it also comes down to central inhibition of pain, in this case however induced by the stimulation of small diameter fibers (counterirritation). An example of this is intensive passive movements at the limit of the range of motion (levels IV and V). The stimulation (therapeutic stimuli) can be applied to a pathologically altered site or its vicinity. Intensive stimulation is a mechanism which can be used to treat not only acute, but also chronic pain (Zusman & Moog-Egan, 2003).

Berg (Van der Berg, 2003) however brings up the fact that the process of intensive pain-inhibitive stimulation (counterirritation), which by the setting of painful stimuli is supposed to mitigate pain, can have adverse consequences. An overly high application of such stimuli can actually cause pain and worsen existing pain. On the other hand, he also brings up the point that these stimuli, which lead to the release of endorphins and thereby are supposed to reduce the transmission of pain, must be of a high intensity and primarily should take place via the  $A\delta$  fibers.

### **Syndromes of the spine, shoulders and knees**

Independent of whether their handlings are to be managed conservatively or surgically, results will always be better if the joint stabilizing muscles and ligaments are properly conditioned, which is to say they have sufficient strength, endurance and coordination. Many disorders of these systems can be compensated for in this manner alone. These joint stabilizers can be trained in a particularly gentle and effective manner with the bar. To quote Van Wingerden (1998): "Proprioceptive training remains one of the most important forms of training for the improvement of the quality and precision of motor-related performance or sustainability". "Structures such as cartilage, discs, menisci, but also spinal discs obtain their physiological loads through compression. Compression develops through not only through the load of the body's weight, but also by forces emanating from muscular contractions" (Van den Berg, 2003/1). Physiological stimuli of the musculoskeletal system are determined by movement and muscle contractions and thereby counteract degeneration.

In these times of so-called medical advances and with regard to the soaring costs of health care, it is necessary to identify and utilize efficient, effective and lasting methods of treatment. Physical therapy clinics which offer medical fitness and equipment-assisted rehabilitative exercise as an extension of their practices vary widely in their respective areas of specialization. Specialization invites branding (Kling, 2003). It has been shown that practices which are outfitted with functional equipment experience better results in therapy (Buchbauer, 2004). The large number of success stories from my own patients show that through the implementation of functional training tools (for example, cable machines, MFT disc, Flexi-Bar<sup>®</sup>, Balance Pad, ball cushion), a strategic market advantage can be gained, as it sets it apart from other clinics.

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Notes/Annotations:

a

All indications for the Flexi-Bar<sup>®</sup> were compiled in collaboration with Dr. R. Schneiderhan M.D., a Munich back specialist at the Medizinisches Versorgungszentrum (Medical Care Center) in Taufkirchen.

b

Reference for some indications

<http://www.wdr.de/tc/daheimundunterwegs/service/gesundheit/20050201.phtml> March 2008

c

Possibly a comparison can be drawn here to the typically cutting sensation and attendant effectiveness of a connective tissue massage.

