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Mini Review

The Foot Centering Biomechanics (FCB) Glossary

Dennis Shavelson*

Medical Director, The Foot Centering Institute, USA

Abstract

Foot Centering Biomechanics (FCB) takes a neoteric approach to Lower Extremity Biomechanics because Biomechanics has been relatively stagnant in recent decades with few important and clinically applicable additions to the literature that discuss innovations and new approaches to solving the same problems that have not been theoretically resolved or proven in peer reviewed study. FCB has introduced new methodology, diagnostic tools, treatment modalities and nomenclature for the biomechanics and bioengineering community. There is a logical progression to FCB as well as anecdotal and clinical and published work in its defense that has stimulated research and clinical professionals to visit and test market Foot Centering in their own institutions, clinics and practices. As Foot Centering terminology regarding anatomy, diagnostic testing, treatment services and tools and biomechanical innovations has become a part of modern lower extremity biomechanics there is a lot to absorb regarding new terms and words that explain what was previously not even considered as important editions to biomechanics. This paper is a collection of terms and words presented alphabetically as a Glossary for those interested in increasing their foundational knowledge regarding Foot Centering Biomechanics.

ISSN: 2637-8078

***Corresponding author:** Dennis Shavelson, Medical Director, The Foot Centering Institute, USA

Submission: November 22, 2023
Published: February 16, 2024

Volume 6 - Issue 5

How to cite this article: Dennis Shavelson. The Foot Centering Biomechanics (FCB) Glossary. Significances Bioeng Biosci. 6(5). SBB. 000647. 2024.
DOI: 10.31031/SBB.2024.06.000647

Introduction

Foot Centering Biomechanics has been patented, published and clinically successful in many areas at a time when biomechanics needs revisiting and acculturation [1-3]. This suggests that FCB is a viable replacement for consideration. This is reinforced by the lack of high level, clinically applicable peer reviewed additions to the lower extremity biomechanics literature for decades in support of the current "gold standards" of biomechanics that are decades old. There are many additions to the literature regarding Foot Centering Biomechanics [4-7]. Foot Centering Biomechanics has added disruptive terminology, diagnostic tests, objectives and treatments, foot type specific, I am publishing a glossary of terms and methodology that need to be foundationally understood by professionals of human movement, therapy and performance who wish to consider, test and certify in Foot Centering Biomechanics. In summary, this Glossary has been assembled to help define and explain some of the terminology and nomenclature that replaces several examples of the antiquated iconic language of Biomechanics in order to better understand their replacement.

The Glosses are presented alphabetically without regard to importance or usefulness.

List of Glossary Words and Terms (Alphabetical)

A. Adaptive BioKickstand Exercise (replaces short foot exercise)

B. Adaptive Joint

C. The BioKickstand of the Foot

D. Compensatory Threshold Training

E. Disengaged Joint

F. Dynamic Foot Braces

G. Flexible Adaptive Foot

H. Foot Centering Biomechanics

I. Foot Centering Closed Chain Kinetics

J. Foot Centering Walking

K. Foot Centering Wedges

L. Functional Foot Typing

M. The Harmonies of Life

N. Magical Thinking in Science

O. Optimal Functional Position

P. PERM (Pronatory End Range of Motion)

Q. Rigid Lever Foot

R. SERM (Supinatory End Range of Motion)

S. The SERM-PERM Interval

T. The Vault of the Foot

Foot Centering Biomechanics Glossary

Adaptive bioKickstand exercise (replaces short foot exercise)

Once diagnosed with a Broken BioKickstand, the most important primary exercise to include in any program of rehabilitation and repair is The Engaged BioKickstand Exercise (called short foot or short and narrow foot until now).

Adaptive joint

A joint with a joint space that is in optimal functional position is said to be adaptive. This means that the involved bones connected by an adaptive joint can function as a Disengaged Joint, a Jammed Joint or and type of joint in between. X-rays and examination confirm that there is a level of joint congruency that will allow any amount of stiffness or movement or be closed-packed without harm or injury. Optimally, other than the joints of the skull that are permanently fused, all joints should be Adaptive.

The biokickstand of the foot

The most complex bio machine of Biomechanics. It is located at the 1st MTPJ of the forefoot. It engages and disengages when working. When it can no longer engage it is said to be broken. The foot loses its ability to become a rigid lever in closed chain when the BioKickstand is broken. It must be fixed or replaced when broken.

Compensatory threshold training

In an integrative sense, when any segment or part of the posture has one or more muscle engines that are not well leveraged, too weak, de-activated or exhausted (overused) and incapable of performing its primary biomechanical role in human movement, there are adaptations in the musculoskeletal system that allow for movement and tasking in the short term. These modifications are compensatory and often lead to pain, performance issues and foot and postural sequellae. Compensatory Threshold Training prohibits, like yoga, compensatory muscle activation and habitualizations. It strengthens and trains the primary muscle engines to perform more efficiently and injury free.

Disengaged joint

The flexible, more adaptable phase of a working joint where the Joint surfaces are the less congruous allowing pain free and injury free motion to occur between the bones. At some point of standing, moving or tasking a disengaged joint is unable to re-engage, that joint is "broken" and in need of repair or replacement.

Dynamic Foot Braces (DFB's)

Custom Foot Inserts proven restorative and corrective for controlling the stability, support, strength, symmetry and balance of the foot and posture. DFB's incorporate Foot Centering Biomechanics and are cast, dispensed, monitored and maintained Functional Foot Type specific by Certified Professionals.

Flexible adaptive foot

The phase of foot function where the joints of the foot are disengaged allowing for reduced joint surface congruency and motion. This allows for flexibility, movement and less stiffness between the bones it connects.

Foot centering biomechanics

Foot Centering Biomechanics begins with the assertion that Newtonian Mechanics may not perfectly apply to living, thinking, reactive organisms such as man that have the ability to internally react to, foster or deny its primary laws and principles. FC Biomechanics is an integrative system that exists from the ground up beginning with the feet. Its subgroups all feet into one of five Functional Foot Type cohorts that can then be treated aggressively and safely independent from the other functional foot types for better outcomes. It focuses on the joints and their ability to close pack bone segments or allow them to be more flexible and moveable allowing us to stand and task efficiently and injury free for a lifetime. Utilizing SERM-PERM Testing and Optimal Functional Positioning to control and maneuver the Five Harmonies of Life (Stability, Support, Strength, Symmetry and Balance) Foot Centering Biomechanics includes diagnostic and treatment tools and protocols that are utilized functional foot type specific including wedges, kinesiology tape, foot inserts and exercise and movement programs based on science and existing evidence and artistic, professional and clinical success.

Foot centering closed chain kinetics (kinetic counterforces)

Closed Chain Kinetics is the science that occurs when a body is in contact with an opposing force that is exerting a closed packing force to that body which alters the kinetics of an action that is performed. The largest closed chain forces on Earth are its gravitational force pulling all objects down into the Earth and the Ground Reaction Force (GRF) that exists at the surface of the Earth (The Ground), pushing up into the body. These Kinetic Counterforces, great and small, have a close-packing force upon the joints which produce a stiffening and supportive effect upon the joints that exist in the chain. This includes a wall, a floor, a bat or baseball or any object that is touching the body with counterforce. Using Earth's Gravity as an example, Gravity sucks all object down

towards the core of the Earth. That downward force stiffens human beings to the point where they can push off of the ground, walk, jump, stand and support (compare that to the moons lack of gravity where we float and cannot touch the surface to stand or task). In closed chain, counterforce moments change the origin, insertion and function of muscle engines and cause antagonist muscle engine to become symbiotic partners (compare a bicep curl to a pushup when the ground counterforce is added). We all know a bit about closed chain function but not much of its complex functions.

Foot centering walking

The biomechanically sound methodology for walking for collapsing (flattening or flat) feet in order to maintain an adaptive BioKIckstand of the Foot Start each step with (Figure 1):

Figure 1:

a) Land on the outside of the heel (not center of heel) and try to stay there.

b) Walk along the outside of the foot to the 5th metatarsal (the outside of the ball of the foot)

c) Roll across the foot from the outside to the inside to the 1st metatarsal (the inside of the ball of the foot, the bunion joint).

d) Shift your weight forward to the tip of the great toe and push off the ground with big toe.

Foot centering wedges

Foot Centering Wedges are U.S. Patented solid pieces of adhesive felt and foam. There is a heel pad shape (felt), a half heel pad shape (felt), a vault shape (foam) and a forefoot shape (felt), These wedges are applied to any foot on an existing foot orthotic, shoe insert or directly to the inside of a shoe, Functional Foot Type Specific, to affect the weightbearing structure and function of the foot.

Functional foot typing

Functional Foot Typing is a U.S. Patented methodology (like Blood Typing) that classifies all feet into five subgroups depending on their rearfoot and forefoot characteristics for the purpose of developing and utilizing classifications for diagnosis and treatment. Functional Foot Typing develops Consensus among its users and patients, better predictable clinical outcomes and better research opportunities.

The harmonies of life

In Foot Centering Biomechanics there are five words that are commonly used to describe underpinning or root causal agents that need to be diagnosed, treated and monitored when it comes to health, fitness and function. These words are Stability, Support, Strength, Symmetry and Balance (Acronym S-S-S-S-B Harmonies) and these are termed “the Harmonies of Life”. They exist simultaneously and each can vary in intensity (low to high) at different times. They are interdependent and collaborative as a unit as each can act as a catalyst or inhibitor of motion, movement, function or performance of human stance and function at different times.

Jammed joint

A Jammed joint is one that connects two bones constantly in closed-packed position. X-rays and examination confirm that there is maximal joint surface congruency in a Jammed Joint (Hallux Rigidus-Bone on Bone). The effect of closed packing of a joint is to stabilize the bones that the joints connect to function as movement is restricted as is flexibility and adaptability. A Jammed Joint must be conservatively or surgically made to disengage in or to allow movement and flexibility (reduced stiffness).

Magical thinking in science

In Foot Centering Biomechanics, as in most scientific schools of thought, there are certain concepts or ideas that are hard to define or classify and there are unsolved problems that can only be solved by a temporary word or concept that eventually needs to be re-explained over time. The conspicuous example in Biomechanics is the concept of subtalar joint neutral and hyper pronation. These concepts solved some existing problems in biomechanics 40 years ago but have clearly been shown to have flaws and defects and are in need of upgrading or replacement.

Optimal functional position

Optimal Functional Position is a limited range of positions of any foot in stance or function that maintains the efficiency, performance and longevity of any foot structurally. Gravity, grf and shoes while serving important useful purposes also contribute unfavorable forces that must be dampened or overcome in order to reduce degeneration, deformity, injury and performance issues. The goal of any biomechanical treatment is to attempt to keep any foot within the range of Optimal Functional Positions.

PERM (Pronatory End Range of Motion)

The Pronatory End Range of Motion of a joint in both open and closed chain useful to measure the total range of motion of that joint as one half of SERM and PERM. A qualitative statistic reported as a direction on the dominant plane of motion of the joint (inverted-everted, dorsiflexed-plantarflexed, abducted-adducted).

Rigid lever foot

The phase of foot function where the Joints of the foot are engaged (closed packed) producing increased joint surface congruency. The result is less flexibility and movement and more stiffness and stability between the Bones it connects.

SERM (Supinatory End Range of Motion)

The Supinatory End Range of Motion of a Joint in both Open and closed chain useful to measure the total range of motion of that joint as one half of SERM and PERM. A qualitative statistic reported as a direction on the dominant plane of motion of the joint (inverted-everted, dorsiflexed-plantarflexed, abducted-adducted).

The SERM-PERM interval (see SERM and PERM)

The interval of motion between the SERM and PERM of a Joint. A qualitative statistic reported as low, medium or high. Motion within the SERM-PERM Interval is efficient and injury free (Figure 2).

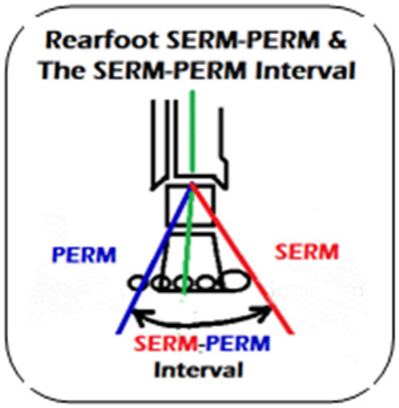

Figure 2:

The vault of the foot

The vault of the Foot is a three-dimensional area that is defined by the bones bordering the two longitudinal arches and the roof that connects them and the skin and connective tissue floor below. The Vault contains connective tissues, muscles, nerves, ligaments, vascular elements body fluids. The Vault of the Foot changes in shape (open or closed chain), density and function depending on the state of the foot and the actions and tasks it is performing (rigid lever, flexible adapter).

Discussion

Lower Extremity Biomechanics and Closed Chain standing, moving and tasking have long been stagnated by decades old "gold standard" terminology and methodology for diagnosis and treatment that has resulted in a dearth of valid and applicable high level, peer reviewed evidence. This torpor began in the 70's and continues today from the ground up with terms like pronation, subtalar joint neutral and forefoot varus and valgus [8]. This torbidity has led to a reduction of consensus within the biomechanics community in general that wishes to be evidence based. There are so many schools of thought and hypotheses that divide biomechanical and close chain thought at its source reduced high level literature from surfacing. Divisive questions arise too often that can only be answered by different scholarly and self-acclaimed authorities as to; How to precede when evidence-based practice is required but very little evidence is available [9]? Foot Centering Biomechanics began in the mid 2000's as Neoteric (New and Fresh) Biomechanics [7]. It has matured over the years, consolidated and has attempted to explain many of the magical thoughts into language that contains newer terminology, methodology and science that hopefully has the substance and durability to increase the Consensus of Biomechanics back to its glory days of importance and applicability as a science. In 2018, the science was published a Foot Centering Biomechanics [10], an integrative human science that exists in closed chain holistically, from the ground up, like a human that can stand, move, bend, task and adapt in the air and gravity of Earth [11-14].

Conclusion

During the past 40 years, technology, medical diagnostics, medical instrumentation and educational and scientific marketplace have grown exponentially taking the arena to new and greater heights. In opposition, the science of human biomechanics has stagnated and even worse, many of its core tenets and mandates have been proven to be flawed [1-4]. For a long time, the medical, physical and scientific communities have noted the shortcomings and flaws of the current "gold standard" of version closed chain biomechanics but the decision makers and those in powerful economic seats of authority have kept innovators and revisionists from upgrading and pre-fermenting biomechanics in order to take its education, practice, research and clinical outcomes to new heights and standards. Foot Centering Biomechanics is one of these theoretical turned practical paradigms that may be with visitation from open minded skeptics and watchdogs looking for a replacement for vestigial "Gold Standard" Biomechanics. The current literature and mainstream practices have investigated Foot Centering Biomechanics sense that there are at least some places where improvement and restoration exist over existing education and practices. One area of concern that is often raised if that Foot Centering Biomechanics and its education and literature contain terminology and nomenclature that is difficult to understand research and utilize in real time. This has led to a referenced Glossary of Foot Centering terminology Terms to serve as a bridge to gaps that may exist.

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