

**BONES FOR LIFE PROGRAM**

**PROPOSAL FOR NASA 2004**

**Bones for Life Strategies for Effective Rehabilitation of Bone Strength within  
Protection of Vulnerable Joint and Connective Tissue**

**Submitted to NASA, Huston, Texas**

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Jerusalem. Israel 2004**

BONES FOR LIFE PROGRAM

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**Biomedical Research and Countermeasures:**  
**Flight Research Opportunities**

Effective countermeasures or operational techniques for problems associated with the preparation or pre-habilitation of humans for space flight, or for their re-adaptation/rehabilitation after return to earth.

Scientific knowledge appropriate countermeasures or operational procedures

Development of risk mitigation

Exercise regimens and fitness levels; rehabilitation and/or stress reduction strategies

**Critical Question 2.18 Risk 11**

What countermeasures can reduce the incidence of soft connective tissue injury and pain during recovery after prolonged microgravity or bed rest?

**Critical Question 2.19 Risk 9**

Is bone loss reversible and if so, within what time frame? Can geometry and architecture return to baseline as well as BMD (bone mineral density)?

**Critical Question 2.20 Risk 9**

What is the most optimal rehabilitation regimen upon return to normal gravity to maximize return to baseline BMD and bone morphology, especially given that muscle strength will recover more quickly than will bone strength?

**Critical Question 2.26 Risk 9, 10**

What treatment regimen will most efficiently restore bone mass, geometry, and strength to their preflight integrity for returning crew members with bone loss?

## PROPOSAL TITLE

### **Bones for Life Strategies for Effective Rehabilitation of Bone Strength within Protection of Vulnerable Joint and Connective Tissue**

## PROPOSAL OUTLINE

### **I. Abstract**

#### **Introduction**

**A. Training in the horizontal plane: The advantage of organizing optimal weight bearing patterns in the load free context of lying down before applying them in verticality**

**B. Bio-mechanical strategy for preventing injury while regaining bone withstanding: A progressive procedure for rehabilitation of hip joint**

Appendix 1. Rehabilitation of the hip joint in horizontal transmission of pressure

Appendix 2. Aligning the hip joints by tightening them to each other

Appendix 3. Hip joint – spine interaction in primal swimming

Appendix 4. Countersymmetry of the human walk

Appendix 5. Recoil of the hip joint as preliminary for launching a step forward

Appendix 6. Total alignment – relating heel to ischium

Appendix 21. Feedback letter

**C. The perspective of integration: Upgrading neuro-motor dysfunction through the coordination of reciprocal interaction of body parts**

**D. Aligning the posture: Conditioning increase of load on organizing skeleton in consistent continuity (domino effect) for safe transmission of force**

Appendix 7. Aligning the neck, orientation by touch of hand

7A. Aligning the neck by resistance

Appendix 8. Aligning the lumbar, bridging pelvis to ribcage

8A. Elongating the posterior by shortening the anterior

8B. Proportional distribution of flexibility, shifting the differentiation to back

8C. The foot – lumbar neuro-motor connection

8D. Maneuvering the surface

8E. Pressure in the heel equals elongating lumbar

- 8F. The neutral point of the lumbar
- 8G. Support by means of a wall
- Appendix 9. Restoring springiness of the knees
- Appendix 10. Aligning the feet

**E. Patterns of pre-cultural locomotion: Training in primal movements to achieve anatomic balance between muscle investment and bone morphology**

- Appendix 11. The wave and axis principle
- Appendix 12. Balancing force and morphology in the function of creeping

**F. Auxiliary means for securing safety of joints in dynamic movement**

**G. The relationship between resistance of bone to a load and the alignment of posture**

**H. The neurological clue for bone strengthening through principles of vigorous walking**

**I. Examples of bio-mechanically-efficient dynamic training**

- Appendix 13. Bouncing on the heels
- Appendix 14. The function of pulling: strengthening by resistance
- Appendix 15. The function of climbing: strengthening through reversing proximal and distal
- Appendix 16. Safe lifting of weights: direct biomechanical motivation for the strengthening of bones
- Appendix 17. Carrying a load on the head: strengthening by relating the polarities to each other
- Appendix 18. Safe jumping: the ultimate teacher for withstanding load

**II. About the Feldenkrais Method of Awareness Through Movement and Functional Integration**

- Appendix 19. The Feldenkrais Method

**III. About Ruthy Alon, Creator of the Bones for Life Program**

- Appendix 20. Measurements of bone density, Tel Aviv, 2004.

## **I. The Abstract**

### **Introduction**

The Bones for Life program (BFL) offers a regimen of dynamic weight bearing exercise which demonstrates efficient and safe stimulation of bone strength. The efficiency of the program is focused on basic bio-mechanic principles of pre-cultural locomotion which were proved functional and bone-withstanding throughout eons of generations.

Regaining the original potent patterns of movement is achieved by improving the quality of coordination between all corresponding parts of the body, and adjusting proportional distribution of labor for safe dynamic functioning, thus minimizing risk to vulnerable joints and connective tissue.

The success of the natural movement to transform increased force, as produced in a dynamic movement, into a stimulus for strengthening bone is conditioned on a safe design of the skeleton in action. The Bones for Life program trains people to organize their posture into a continuous alignment for effective transmission of weight bearing load. Following the consistency of a domino effect, this force is transmitted from foot to head without loss, deviation or compression.

The skill to design the ever-variant skeleton into a streamlined functional alignment is advanced somatic sophistication which cultural man needs to relearn. The Bones for Life program is committed to sharing this somatic learning of bone strengthening with the public and is honored to offer it to astronauts for training pre, during and post flight.

The Bones for Life program is offered as a working protocol for rehabilitation of bone strength and morphology. To date, a few hundred participants, mainly women of mixed ages, in fourteen countries have learned the Bones for Life program. Systematic measurements of two groups were taken in Tel Aviv in 2002 and 2004. The regimen consisted of meeting for four hours once a week over a four month duration. It was also assumed that participants would exercise between meetings. More than 50 percent of the participants showed quantitative improvement in bone density. (See Appendix 20. Measurements of bone density, Tel Aviv, 2004.)

In addition to the measured achievements, most of the participants provided subjective feedback about the improvement of quality in their uprightness of standing, their readiness to move, their enhanced capability to perform daily functions, and their feeling of a biological optimism.

The program offers a new paradigm of strategies for awakening the intelligence of movement management. It involves deprogramming counter-productive disturbances and arriving at optimal functioning.

## **A. Training in the horizontal plane**

A reorganization of function can be more easily regained when training begins in the lying down position. The effect of the weight bearing pattern of organization can be applied in the horizontal plane with the advantage that it provides a greenhouse condition for learning. Supported by the floor, the practice is freer of risk, adjustable to the individual, and allows clearer observation of the desired coordination which can be carried out with less resistance.

The program gives guidelines for how to push a wall with a hand or foot while lying down, with the purpose of aligning the whole skeleton in continuity for the experience of a well-controlled and modified transmission of pressure effect. The provided impact tones the whole body in the characteristic strength, similar to the experience of vertical weight-bearing movement. Mechanically, the solid plane of the floor navigates the transmission of pressure to its optimal efficiency and reduces deviations and shearing stress. Repeating these anatomically correct movements over a period of a few weeks gradually increases the tolerance of bones to withstand load, and builds up their strength.

The Bones for Life strategy for regaining a correct weight-bearing function safely and within a short period of time begins by establishing the functional pattern while lying down. In the second stage, the skeleton loading is done in supported standing by a wall or in a harness, consisting of seven meters of cloth wrapped around the body, and finally, in an independent standing. In this way, the dynamic challenge is increased without compromising the safety of bone morphology.

## **B. Bio-mechanic strategies for preventing injury while regaining bone loss**

As an initial stage in addressing a dysfunctional joint, the Bones for Life program suggests stabilizing the joint while the rest of the body is engaged in a pattern of walking movement. Neutralizing the isolated joint and inhibiting its participation in the general movement is a device to de-program the dysfunctional pattern.

The selective inhibition of the joint is done either by tying it in a harness or by a directed self-touch of the hand. This limits its movement mechanically, and more importantly, alters the operational concept of movement management. Isolating the site of the disturbance, the dysfunctional joint, and performing the full function without it, establishes a more supported distribution of labor and educates both the joint and the rest of the body to improve the quality of the function.

The neuro-motor revolution in the organization of the body, which takes place as a result of this selective inhibition, is sometimes immediate and remarkable. The effect stays afterward even without the inhibition, thus indicating the potential of the organism to change and update its habitual patterns according to its subjective experience. The program uses experiential checks before and after functioning in order to assess the effectiveness of the process.

**Appendix 1-6. Examples of a progressive procedure for  
(1) rehabilitation of a vulnerable hip joint and  
(2) organizing it for safe weight bearing**

**Appendix 1: Rehabilitation of the hip joint in horizontal transmission of pressure**

“Bicycle” is the process for articulating the spine while inhibiting the hip joint. While lying on his side, with the vulnerable hip on top, the person is guided to push a foot to the wall and produce a transmission of elastic force throughout the body. The upper hand holds the trochanter together with the pelvis and causes the leg and the pelvis to move together as one unit without relative movement between them.

Returning from the wall, the counter pressure streams from the foot to the head through the well-aligned hip joint, without changing it and without risking it in erosion or in painful resistance. This provisional fixation of the hip joint, by the help of the hand, trains both the joint and the body to respond to pressure by organizing a structural alignment that is consistent and safe.

Through several variations in the process, the pelvis, which is welded to the leg that is pushing the wall, is being moved in a pattern symbolic of riding a bicycle. The leg is trained to maintain the safe disposition of the joint while performing a complex movement. Lying on the floor allows the lumbar to refrain from overreacting to the circle made by the pelvis and avoid getting compressed as a compensation for the inhibited hip joint.

The adjustment which is demanded in the movement takes place in the vertebrae of the spine, free of the hip joint or the lumbar. In this way, a more desired anatomical proportion of functioning is achieved all over the body. By a subjective test of the way the body leans on each leg before and after the process, people report a meaningful relief in withstanding of load on the joint that was treated in the process.

**Appendix 2: Aligning the hip joints by tightening them to each other**

In another process called "A Narrow Pelvis," stabilization of both hip joints is achieved simultaneously by tightening them to their origins in the cavities of the pelvic bone. This is accomplished by tying them in the harness or by thrusting the glutei's with two fists toward the center, while performing different variations on the formula of walking. The coordination of drawing the hip joints closer together is learned first in lying down, and is subsequently transferred to the vertical reality.

Inhibiting the loosened joints to avoid a risky deviation under the pressure of weight-bearing movement secures their safety and enhances verticality.

From an anthropological point of view, the distance between the hip joints of the by-pedal vertical human is shorter than that of quadrupeds. But the distance in female skeletons is wider than that of male skeletons, probably due to the need to give birth. It might be that this elicits the more undulating style of walking in women, which increases both the load on the joint and the risk to shake it out of safe alignment.

After experiencing the process of “Narrow Pelvis” people walk more uprightly and more determinedly in forward direction; they produce a greater impact of springy pressure with each pulsating step.

Since any energy works to reestablish the pattern of the context in which it was active, walking while tightening the hip joints reinforces their stability. Being an integral function of nature, walking adjusts each part of the body to the secured joints and increases the chance that their new alignment will be accepted by the whole body.

Tightening the hip joints by self-touch of the hand over a period of time can be an easy and available reminder of the morphological alignment of the bone within dynamic movement.

### **Appendix 3: Hip joint, spine interconnection in primal swimming**

In a more advanced stage, the range of free movement in the joint is attended to. The model of the prototype of primal swimming is used in the pattern of the frog to clarify the optimal relations between the movement of the hip joint and the response of the spine.

While lying on his back, the person is trained to increase the range of movement in the hip joint when the knee bends to the side, with or without the rotation of the rib cage and the pelvis. The person also trains in the whipping of the leg and straightening it in order to propel the actual step forward, while the joint is closing the leg to the front and aligning the leg with the body on its longitudinal axis. This is done for each leg separately and both of them together. Working on each side separately allows for observation of differences and consideration of personal limitations. This sensitivity is essential for restoring the functioning of the joint and adjusting it to the rest of the body with the body's consent.

### **Appendix 4: Counter symmetry of the human walk**

Observations of the exchange of roles between one side and the other in walking is learned in a process called "Bow and Arrow". In this process, a person pulls close to the body one leg while the leg is straight in the knee, in a sense of shortening it; and the other leg, bent in the knee, pulls away from its origin in the pelvis in a sense of elongation. The capacity to cultivate a different design suitable to each side simultaneously brings more fruitful results than a symmetrical operation. Specifically locating the difficulty of the vulnerable hip joint in the function and adjusting the counter joint to that limitation calms it. From this neutral point of acceptance, it is possible to begin to develop the capacity of the vulnerable joint to move with further success.

This strategy is transferred afterward to standing while leaning the back against a wall, and finally, it is applied in free walking. The body is willing to adopt an organization which provides a sensation of comfort and safety, and it corrects itself. There have been cases of people with injured hip joints who improved with meaningful relief from only the process of "Bow and Arrow".

(See Appendix 21. A feedback letter from a woman who had a long history of an injured hip joint and gained improvement through the "Bow and Arrow" process.)

#### **Appendix 5: Recoil of the hip joint as a preparation for launching a step forward**

The withdrawal of the hip joint backward is a phase in walking in which the leg behind is thrust to the floor right before detaching for a step forward. The range of the step is conditioned on the capacity of the hip joint to open its angle backward. The recoil of the hip joint is studied in the program in a sitting position with the back leaning against the wall and the hands pushing on the floor, producing a weight-bearing force that slightly detaches the pelvis from the ground. In this position, when the pelvis is free to maneuver, the Achilles tendon of one leg rides on the bottom of the toes of the other foot, allowing the feet to initiate a backward thrust of the upper leg. Training the hip joint to withdraw backward in this way recapitulates the potential range of its movement and widens the step in walking. After the process, people run with bigger steps and with more emphasized pulsating impact in the confrontation of the foot with the earth, which increases the momentum of vigorous movement.

#### **Appendix 6: The total alignment; relating the heel to the ischium**

This process is about challenging the range of movement in the hip joint in relationship to the response of the spine. While lying on the back with bent knees, the person brings the heel of one foot close to the ischium of the other leg, The knee bends to the side horizontally while being supported on some elevation. In this movement, the spine is confined to twist in a certain way, in order to allow both the opening of the angle in the hip joint and the bending of the knee on the side. Pulling the foot with the opposite hand or with the help of a strip of cloth, and dragging the thigh to a more congruent continuity with the line of the spine, the whole body adjusts itself to support the opening of the joint.

Maneuvering the body in relation to the motionless and open joint reverses the roles between the proximal and distal and releases another range of movement in the joint, which might not be used in habitual walking. In cultural walking the task of adjustability is usually carried out by the hip joint. In free walking there is no confinement to articulate the stiff vertebrae of the back. However, while lying on the floor, with the hip joint open, with the knee dragged to the side, the spine has no choice but to use its flexibility. Experiencing the expended option of movement in the hip joint, which is registered in the functional memory as the primal pattern of creeping, allows it afterward to align itself more accurately toward the front.

At the end of the process, the spontaneous alignment of the legs to the front is very impressive; it results in more upright posture and upgrades the walking to its optimal vitality, the two components of the potential of bone strength.

**Appendix 21. Letter from a woman who got relief from her painful hip joint through the BFL process**

**Appendix 21: Feedback letter.**

*Elspeth Terry 76 Upland Road Kelburn Wellington New Zealand*

To dear Ruthy Alon,

February 5, 2004

It was wonderful that you would come this way again. When I came to your first three day workshop years ago you were an inspiration and I was only too happy to be able to work with you again.

My age is almost the same as yours, I am 72, and seeing your graceful easy movement it gave me a determination to challenge my difficult hips.

There is significant arthritis in my lower back, lumbar vertebrae 3 4 5 and in my right hip – the left hip was replaced in 1997.

The left hip was fine, no pain and easy movement for three years after the operation, until I slipped accidentally and dislocated the prosthesis. Then because of the damage to the supporting capsule it dislocated again easily – four times that year and twice the next. I was told a revision with further surgery was necessary (by three orthopedic specialists) but my senses told me that the rate of dislocations were decreasing and there was a chance that the body was healing itself.

Elke Dunlop helped tremendously teaching me to move in a balanced way again, using Feldenkrais Methods both in private lessons and in regular classes. I also had sessions of deep tissue massage with a highly trained therapist which helped to move the scar tissue and relax tense muscles. Now after two years clear of problems, the orthopedic surgeon has given the all clear to live carefully but normally again.

Then this year you returned to New Zealand with “Bones for Life”, a course that was appropriate for my age and my problems as well as for younger people.

I felt very fortunate.

Coming to the workshop having recently moved house and done extensive renovations my back was tired and a bit twisted, my hip was stiff and I could not walk easily.

It was wonderful to be able to find the relief the movements gave, to be able to move gently, gaining confidence as I did, allowing the muscles to release and allowing the normal movement to re-establish.

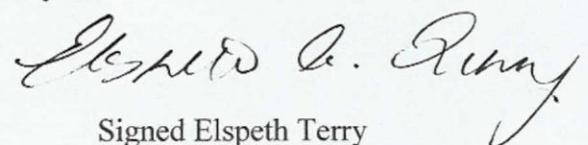
It was easy to feel confident of the expected benefit. Lying on the floor, pushing against the wall, with feet or hands to imitate the pressure of gravity, it became obvious that the movements which were difficult when standing were in fact possible and comfortable! Also the alignment of the spine quietly improved when the movements curved the spine to turn and return naturally.

So on each day in the “Bones for Life” course I moved further from stiff and sore, towards fluid movements, so that gradually it became possible to run!

It was also possible to jump and bounce - in the supporting 7m. winding cloth.

All in three days! Now I have freedom to move easily again and movements to remember.

All I can do is say a very heartfelt thank you.



Signed Elspeth Terry

### **C. The perspective of integration: A key to upgrading function by coordinating the reciprocal connections throughout the whole body**

An essential countermeasure in reducing injury and dysfunction is integration which enhances the cooperation of all body parts in support of one intention. The reciprocal conditioning of each part on the whole is a characteristic principle of every living organism. Healing an injured joint or tissue and bringing it back to efficient activity is carried out more easily when the corresponding neuro-motor responses throughout the network of the whole of the body are readjusted as well. The organism identifies the pattern of harmonious integration and interprets it as capacity. Insisting on producing a local and isolated change will tend to create resistance and frustration, whereas organizing first the entire body to support the change is like setting most of the puzzle in place; and just completing the final piece is not as difficult. In this way it is possible, for instance, to (1) improve vulnerable lumbar by making the knees springier or (2) to align the neck by drawing out the chest and pushing a foot onto the floor.

### **D. Aligning the posture: Conditioning the increase of load on organizing the skeleton in continuity of the domino effect for the transmission of pressure from foot to head with no loss and no compression**

Only when the posture is organized in the consistency of a domino effect is it possible to withstand weight-bearing movements without injury. A well-organized posture is a basic pre-condition for any dynamic activity. The configuration of the posture will determine if the confrontation of the body with gravity will work to strengthen the bone or to erode it.

Changing posture is a transformation of an habitual style of moving which is as persistent as an addiction. A direct interference in an attempt to correct the façade of the posture against the tendency of the body is not valid for a long time and, in any case, feels artificial. The Bones for Life program deals with this issue and offers a number of simple short cut strategies which challenge the habit and inspire a spontaneous re-organization of a more useful alignment.

A large part of the program is devoted to aligning a weight-bearing posture in an economical way of standing, in which every part allows its full weight to lean on the part below, with muscles exempt from investing in verticality and free to produce action. Many processes end up with a quality of well-equilibrated standing, and people are able to stay in it for a long time without becoming preoccupied. Learning to align the body in an anatomically correct way brings to people a feeling that can be described as "reconciliation with the vertical".

Participants say that the main benefit of the program is the relief of the posture that becomes upright by itself, whereas the strengthening of the bone is the bonus.

## **Appendix 7-10. Examples of spontaneous alignment of neck, lumbar, knees and feet**

### **Appendix 7: Aligning the neck; orientation by touch of hand**

A simple and immediate device to align the neck is to put the palm behind the neck, with the little finger at the base of the skull and the index finger on the protruding seventh cervical vertebra. The thumb can rest on the shoulder for stabilization. Opening and closing the spaces between the fingers, while they keep in contact with the skin of the neck, helps to observe changes in the length of the neck and its line. This device enriches the awareness with the orientation of the hand in order to decipher the posterior arrangement that is sometimes obscured from consciousness. Succeeding in opening the fingers to elongate the neck, while maintaining the verticality of the front of the face, brings a transformation which places the head more directly on top of the, so that the projection of the crown of the head is over the tailbone. In this way, the posture is organized to secure a consistent passage for the transmission of pressure that will not be blocked in the neck and will not cause it damage.

This re-alignment of the neck is produced, not from an expectation that the vertebrae of the neck themselves will create the change, but rather by inviting the cooperation of the rest of the body. The neck can straighten with the help of a certain drawing up of the chest, which derives its power from the foot that emphasizes the impact of stepping on the ground in the pulse of stepping. In this way, the alignment of the neck is being achieved, not by forcing a local correction, but rather as an integral function of the whole body which sets itself more efficiently to confront gravity. This is what makes the correction organically valid.

After the neck is aligned, if a rhythmic movement of the whole body is added—such as walking or running in place—the adjustment of the neck is reinforced and deepens. The energy of the walking works to reinforce the context of the pattern in which it was done. The function determines the structure. Throughout the Bones for Life program, rhythmic movement is applied to each achievement of improved structure. This is mostly through a movement that the body understands and is skilled at—the full movement of walking. The integral movement of walking engages every part of the body and organizes it to adjust to the change that was achieved in the specific site, and to support it.

It is possible to repeat this device sometime during daily life, not only at the time of exercising. In time, this simple device can serve for weaning the impulsive tendency of the civilized man to overreact and compress the neck with any other effort of the body. The vertebrae of the neck, being more flexible than the other links in the chain of the spine, volunteer to do more of the work and in this way, create a biased distribution of labor.

When only the neck is being used for mobilization, the back becomes lazy, and the neck becomes eroded. If the work being done is at a high level of dynamic impact, the injury to the neck can be serious and exercising cannot continue. Moreover, people might develop a negative predisposition of being threatened by the exercises.

In a well-organized body, the vertebrae of the back are doing the main work, and the neck has just to complete the directing of the periscope of senses precisely to the target.

### **Appendix 7a: Aligning the neck by resistance**

Another device to align the neck is to insert the bent knuckle of the index finger between the teeth with an intention to stabilize it, while the in-curve of the neck aims to move backward and withdraw against the resistance of the finger in the teeth. The neck straightens and the person gains control over the alignment of the neck. This polarized pull reinforces the straightening of the neck and clarifies its dynamics. The challenge is to re-educate the neck and the corresponding network all over the body to allow the neck to straighten.

At the beginning, people train by using the knuckle of the index finger between the teeth; afterward, without it. It is easy to apply this strategy in daily life, especially when performing functions which challenge the confrontation with gravity like in moving from sitting on a chair to standing, in walking, or in bouncing on the heels.

The strategy of the bent knuckle between the teeth guarantees that the increased load in intense movement will not be held in compression between the vertebrae of the neck, but rather, will stream on and will allow the neck to form a reliable bridge between the body and the head.

The secondary benefit of aligning the neck so that the top of the head is projected on the spine is in designing a body language in which the head is being carried in a stance that radiates assertiveness and leadership.

### **Appendix 8: Aligning the lumbar: bridging pelvis to the ribcage**

The first stage in restoring a vulnerable lower back is to stabilize the lumbar and to limit its articulating in order to enhance a more reliable bridge between the back and the pelvis. The goal is to have a lower back that is not easily over articulating with each physical assignment. It is possible to create an alternative bridge to the lumbar by tightening the back of one hand to the curve of the lower back. Opening the tightened to the area of the lumbar, allows the hand to serve as a supporting scaffold for the back. The hand becomes a reliable support, which helps to keep the lumbar from contracting and releases it from its impulsive over-recruiting. It is possible to add this support to the activities of daily life and especially during exercising.

### **Appendix 8a: Elongating the posterior by shortening the anterior**

A more sophisticated device for releasing tension in the lumbar is to pinch the tissues of the abdomen between the thumb and the fingertips from the pubic bone to above the umbilical, in a way that shortens the anterior of the belly. As an unavoidable result of the shortening of the front, the spaces between the posterior processes of the vertebrae open, and the length of the lumbar is released and straightens. This use of the hand in front can maneuver the blind zone behind. There is an advantage to this indirect approach. Trying to intentionally change the alignment of the lumbar behind, is very difficult to do in the rate and with coordination that will suit the rest of the body. The use of the hand in front leads the body itself to initiate the change, bringing the result not only in an easier way but also in precision and harmony.

It is possible to verify the improved alignment of the lumbar by putting the other hand behind the lower back, and sensing how this area allows its length to be released. As a result, the pelvis too can suspend downward, when the hand in front is shortening the length of the belly.

In order for the lumbar to be able to adjust and to create this transformation from in-curve to straightening, the knees have to be in a springy orientation. This means having the knees open to change—not straight and not bent. It is preferable that in the beginning of the training the feet are located on the floor in a step stance, which implies movement and facilitates change.

Achieving comfortable alignment of the lumbar, which one can do for him- or her-self at any time, can be helpful when there is a feeling that the back is accumulating tension, especially during activities that can risk the lumbar, such as the peak moment of increasing effort against gravity when getting up from a chair, climbing steps, brisk walking, or bouncing on the heels. Even a slight hint of maneuvering the lumbar by shortening the front can prevent its vertebrae from over-reacting in a sharp compression of its curve.

This device can change the style of walking. With the hand shortening the front, the lumbar can complete the missing phase of the full wave and reach the instant of a released out-curve, which can balance the in-curve, with each step. When the trajectory for the transmission of force from the foot is open in the lumbar for a streaming force, every step in daily life acts naturally to stimulate the strengthening of the bones to a greater or lesser degree. After a training of a few weeks, it is possible to bring an actual change in the habitual pattern of organizing the lower back, which is the central vulnerable point in the posture of a person standing on two legs.

The human lumbar is over-ready to be flexible between the upper and lower body while it is sustaining the load of the chest, head, and the arms. This is in a far distinction from being suspended like a horizontal springy hammock in walking on all fours. Over-flexibility in articulating its vertebrae makes the lumbar vulnerable to over-collapse in compression. The lack of correspondence between the lumbar and the shoulder blades in the vertical walk make it liable to more eroding deviation. Furthermore, the upper

vertebrae of the back remain stiff out of lack of any mechanical confinement that will cause them to articulate in the vertical walk.

### **Appendix 8b: Proportional distribution of flexibility: shifting the differentiation to the back**

The intention to arrive at a more proportional distribution of labor all along the chain of the vertebrae can be achieved by making the stiff vertebrae of the upper back more flexible. The shifting of differentiation from the lumbar to the area of the shoulder blades will spare the lumbar the extra flexibility and will bring a true healing of the problem. It is possible to cultivate it in lying on the back with a soft but firm roller placed across the width of the shoulder blade area. Pushing a wall with the hand or the foot to produce a wave of rhythmic oscillations will begin to articulate those vertebrae which are resting on the roller. More details about this are in my book, *Mindful Spontaneity* (North Atlantic Books), Chapter 3, "Family Therapy to the Community of the Vertebrae."

### **Appendix 8c: The foot-lumbar neuro motor connection**

Utilizing the neuro-motor connections between the focus of pressure in the foot and the response of organizing the lumbar can serve as an important clue in the protection of the lumbar from compression while in dynamic activity. Empirical observations show that when the body weight is leaning on the front of the metatarsals, the lumbar tends to deepen its curve. On the other hand, when the leaning wanders more to the heels, the lumbar straightens and the pelvis can suspend with its own weight. This response is an existential need in which the organism protects itself from losing equilibrium in any extreme position, and blocks the risk of falling down.

The program uses this reflexive response by increasing the pressure in the heel in different positions in order to relax the tension in the lumbar and learn how to release its length.

### **Appendix 8d: Maneuvering the surface**

A different insight is revealed in a process named "Heel Lower Than the Surface" by using a platform of about two centimeters high. People stand on it with the metatarsals while the heels remain on the lower floor. This position, which increases the load on the heels, triggers the lumbar to release its length. Performing weight-bearing dynamic movement in this context, where heels are lower than the balls of the feet, like bouncing on the heels or symbolic running in place, stimulates spontaneous elongation of the lumbar. This revolutionary model of the sensation of relief in the lumbar is registered in the functional memory and might be reflected on its own in daily movement, even without elevation for the metatarsals. It is possible to perform dynamic movements within safety for the lumbar just by maneuvering the surface.

### **Appendix 8e: Pressure in the heel equals elongating lumbar**

Counting on the same neuro-motor connection in which pressure in the heel area triggers freedom of compression in the lumbar, the program includes a process that gives the heel and the ankle area an experience of pressure. It is done horizontally, lying down. One heel steps on the other around the inside of the ankle in a very specific way, providing it with the intensity of pressure that might be missing in walking. The configuration of the body in this process deliberately channels the increased pressure on the heel to decompress the lumbar.

The results are amazing. At the beginning of the process, participants check out which of their heels gets less clear response in the lumbar, and the whole process is done on this heel alone. Checking at the end of the process again, about 95 percent of the participants report that the lumbar is now released to its length much more clearly by stepping on the heel on which they were working rather than on the heel that was supposed to have been more functional.

### **Appendix 8f: The neutral point of the lumbar**

To complete the balance between the incurve and outcurve of the lumbar, there is another process in the repertoire of the sixty processes of the program called “The Front of the Heel”. In this process the participants check where the weight of the body is in the foot when the lumbar is neutral: not totally incurved as in standing on the ball of the feet, and not totally out-curved as when standing more on the heels. The question is, where is the point of pressure in the foot when the lumbar is in transition between the extremities?. Where does the body weight lean in the foot in order to give the lumbar neutral freedom? This information on the location of pressure in the foot is essential in securing the safety of the lower back in a dynamic movement. Influencing the lumbar by shifting the focus of pressure in its neurological partner in the foot, is, to a great measure, more successful, easier, and available to change than an attempt to directly interfere in the design of the lower back vertebrae, trying to force them into a preconceived arrangement.

The neurological interconnection, which is a result of the relentless urge to achieve efficiency throughout generations of evolution, is doing it spontaneously, in the right proportion, and in a way that the body is willing to adopt.

### **Appendix 8g: Support by means of a wall**

A direct detachment from the counterproductive programming of the lumbar which exposes it to risk, especially in the standing position, is achieved in the program in standing with the back leaning into a wall, and soft and reliable padding fills in the gap between the lower back and the wall. In this position, it is possible to perform weight-bearing patterns of movement with no preoccupation for the lumbar. Leaning the lumbar vertebrae in full contact with the padding works to limit their tendency to over-articulate and prevents them from deviation or compression. The leaning mainly grants the lumbar a rare experience of being safely supported, in the real time of dynamic activity. This arrangement is applied especially in exercising the function of lifting weights where the increment of the load demands additional protection.

## **Appendix 9: Restoring springiness of knees**

There are several ways to restore springiness in the knees and protect them in the function of absorbing the impact of the shock as well as developing their function of anti gravity levers in dynamic activity:

1. Passivity: Passive bending of the knees in order to avoid triggering the dysfunctional programming;
2. Use of a wall: equalizing proportions of bending in the knee and the spine;
3. Harness: tying the knees and aligning them to the chain of posture;
4. Neuro-motor connections: releasing compression in the knees by activating their corresponding parts of the body.

The knees have no substitute. Injury in the knee is a dominant injury. Years of cultural walking on even, predictable floors wipe out the knees' talent for springiness for absorbing the impact of walking, as well as producing the momentum to the antigravity lever. Functional knees are flexible and springy, not only in their mechanical capacity to bend, but also in their adjustability to cope with challenges of sustaining load. A functional knee responds to increased pressure by sparingly surrendering. Instead of confronting the load by static resistance, a healthy knee is navigating the pressure to the rest of the body.

The readiness of the knees to easily change their attitude to bending, and respond to the need of the action and the surface, while standing under increased load, is an approach of openness, as opposed to the equivocal static response of locking the knees. Weaning the knees from the cultural static principle of operation and transforming it to a flexible approach which is open to change, is the subject of the process called "Springy Knees."

In a process that is simple to perform, people stand in front of a wall, supported with their hands. The legs are crossed in a way that the more functional knee is behind, attached to the depression of the posterior of the less functional knee, which is in front. The more efficient knee is bending actively, and the knee in front, which has the problem, finds itself being passively bent. This passivity enables the problematic knee to bend without activating the programming that is designated for its activity.

While the person repeatedly bends the knees in this distinction, the plane of the wall confines each part of the body to adjust itself to the passively bent knee. This is a way to accumulate the consensus of more parts of the body to support the more functional bending of the knee and to accept it. By treating the knee not as a local issue alone but by involving the whole network of its partners for coordination, remarkable results are achieved. The result is measured by self-comparison of the depth of the bending before and after the process. Even more than the quantitative depths of the bending, people wonder at the spontaneity in which the knees are able to give up their impulsive locking and to organize in the springiness that can carry their body safely. When the knees are not locked, the whole body feels secure and supported in its stability. Eliminating the

chronic unnecessary locking of the knee is the beginning of its healing. Additional details can be provided as required.

### **Appendix 10: Aligning the feet**

Focusing the leaning in the foot which lends itself to be intentionally maneuvered in relative ease, can be an efficient agent in designing a well-organized posture and in achieving major equilibrium in weight-bearing activity. Is there one anatomically correct way, or is it individually determined? People can find the answer through their own experience if they will explore unused options.

In a process called "Thongs" people explore several options of focusing the pressure in different areas of the metatarsal by standing on one foot while being helped by a wall. They can assess the functionality of each leaning area by performing a movement in it, like raising the head to the ceiling. By the quality of the equilibrium they experience in the challenge of lifting the head, they are able to judge the structural context. Each person can find out from his or her own personal sensation which point in the ball of the foot supports the function the most. People are surprised to discover that the unused option of leaning between the big toe and the second one provides the optimal balance and performance. The area in the ball of the foot between the big toe and the second one is at the middle width of the foot, if the dimension of the thickness is taken into consideration.

Intentional application of leaning in the metatarsal on the optimal focus is recommended especially while walking, running and jumping. It has potential to immediately improve balance, efficiency and determination of the walking direction. During evolutionary development, stepping on the metatarsal was the original use of the foot before man put his heel on the ground in order to gain more equilibrium for his precarious standing.

Reviewing this primal model gives an opportunity to use the anatomy that is designed for the maximum efficiency and to upgrade both stability and movement.

### **E. Balancing muscle investment and bone morphology by patterns of pre-cultural locomotion**

A correct, balanced proportion between strengthening muscles and maintaining safe morphology of the bones can be found by training in the pre-human patterns of locomotion which proved their efficiency throughout millions of years of survival. Taking the clues for efficiency from the principles of the primal models of movement in nature secures optimal coordination of all body interactions. The natural code works both on the mechanics of navigating accurate transmission of pressure throughout the whole skeleton without shearing stress, as well as on the neuro-motor readiness of the body to accept the effective patterns that are registered in the body's functional memory.

**Appendix 11. The wave and the axis**

**Appendix 12. Balancing force and morphology in the function of creeping**

**Appendix 11: The Wave and the Axis Principles**

A basic principle of operation in natural moving is the response of the body to the power that goes through the skeleton. The walking is creating pulsations of a wave in which the lumbar and the neck are alternately undulating from in-curve to out-curve, one opposite the other. In the program, people are trained to perfect the proportions of the wave and to practice the less familiar style of the axis.

While lying on the back, the person pushes the wall with one hand after the other, simulating a walking pattern, which creates a chain reaction of a wave that pulsates back and forth through the whole skeleton, similar to what happens in the dynamics of walking. Producing the pulsations of a proportional wave educates each vertebra and joint to participate in the alternating movement of articulating and tightening within the total movement of the body in the environment. This integration achieves a well-coordinated and synchronized quality of movement.

Diminishing the range of the undulations of the wave and centralizing the rhythmical pulsation on the unified line of the spine allows people to discover the power of the axis. Organizing the longitudinal axis of the skeleton into one unit trains it to safely sustain higher levels of pressure, and to accurately meet antigravity bone building challenges like jumping.

Learning the principles of the wave and the axis is cultivated throughout the whole program and is applied in a variety of situations and functions.

**Appendix 12: Balancing force and morphology in propelling a step forward in the creeping function**

Creating the balance between the muscle force and the morphology in propelling a step forward is learned while lying facedown with the toes of one foot pushing the wall behind and with the knee bent and turned outside as in crawling. In this position, the confining plane of the floor dictates a successful trajectory for the transmission of force returning from the foot to the head. A pillow supports the bottom of the stomach in order to secure the safety of the vulnerable joints in the lumbar provides a stabilizing contact to its vertebrae and to the hip joints. It is also possible to place the back of the opposite hand, fingers separated, behind the waistline to serve as a stabilizing scaffold while activating the transmission of power from the foot to the head. In this disposition, there is a chance that the transmission of pressure will go through the lumbar without changing it, without recruiting it in an exaggerated contraction, and without articulating its vertebra unnecessarily.

The actual dynamic of propelling the step forward takes place when the angle of the knee is widening and changing from bending to straightening while the toes of that foot are anchored in their location with an intention of pushing into the solid ground of the wall behind. The outlet of the counter-pressure that streams to the head threads all the joints of the body while they are changing and aligns them on a line that actualizes the intention of stepping forward.

This complex trajectory has to go through bent toes and ankles, through a knee that is straightening, through spinal vertebrae that twist serpentlike to the pelvis, which frees a space for the other knee to bend outside for the next step, through the shoulders and shoulder blades that are being twisted around the steering according to the movement of the pelvis, all the way to the neck which interprets the serpentine streaming pressure that reaches it, as a turning of the head to the opposite direction.

Adding the use of the hand to propel the locomotion in the creeping function contributes to the organization of the body. This is an additional factor that does not exist when walking on two legs with the arms free of interacting with solid ground. Activating pressure from the hand to the ground when the wrist is flexed and the elbow is standing vertical, as dictated by the creeping, completes the navigation of the transmission of pressure that comes from the foot, and shifts it onto the upper part of the body. The returning pressure from the hand activates the shoulder, thrusts the shoulder blade into the spine and articulates the stiff vertebrae in the roundness of the upper back, thereby aligning the neck in a continuity that is more congruent with the turning of the spine while moving. Initiating the mobilizing force from the hand unravels the roundness of the upper back and the depth of the hollow of the neck, which are the vulnerable characteristic points in collapsing the human posture.

Cultivating the details of the formula of the creeping function over a few weeks can give an appropriate anatomical answer of how to restore the posture to its best. A visualization of a vertical plumb line, suspended from the top of the head in standing, subjectively provides an immediate check of the rate of improvement. This visualization allows the person to superimpose his spine on the imagined line and to compare each segment of the skeleton to the objective vertical, before and after the exercise. The difference sometimes is remarkable, and people perceive it directly through their own sensation.

The more a person trains to align the joints of the chain of posture according to the evolutionary configurations and to free a continuous trajectory for the transmission of pressure in a consistent line and rhythm, the more possible it is to restore the original integrity of the bone morphology. The evolutionary movements serve to construct a standing, with higher resistance to increased pressure, while setting the bones in their right neuro-motor structure.

## **F. Auxiliary means for safety in dynamic movement**

The somatic learning of the BFL program provides means of safety and facilitation while exposing people to nonhabitual challenges. The following means guarantee the intended quality and accuracy of the exercises.

**The wall:** used not only for equilibrium and support for standing, but also as an indication for optimal vertical alignment and for resistance training. .

**The harness:** a strip of cloth (seven meters long, wrapped around the body in a specific way) that holds the whole body around its longitudinal axis while protecting the joints from deviation in dynamic movement. The harness is like a loan of integration with which even unorganized people are able to carry out intense anti-gravity movements in safety without disrupting the line of standing and without risk of injury.

**Practice in pairs:** provides an opportunity to serve each other in training of controlled resistance while performing movement and adjusting to a non-predictable partner.

**The touch of one's own hand:** a simple device to lend the blind sites in the body the clearer orientation of the hands. The increased awareness is the key to the accurate organization of movement. The touch of the hand also serves as a mechanical interference that creates a desirable arrangement which people might not know how to achieve without the feedback of the hand.

**Padding or props:** used for closing the gaps created when leaning on a surface. For instance, supporting the gap of the curved neck or lumbar when lying on the back allows those segments of the spine to flatten and relax their futile investment of tension in resisting gravity. This economical response is essential for efficient coordination. On the other hand, padding or knots in the harness can serve as provocation to change the structure without resistance while standing upright and leaning against a wall.

## **G. The interdependency of withstanding of the bone to pressure and the organization of the skeleton to weight-bearing posture**

The BFL program strengthens the bone by the systematic exercising of biomechanical movements which challenge bone strength. It seems that the function of bone structure is to outsmart gravity, holding the body in the vertical, and thus enabling it to use its own weight for generating movement in space. The contribution of the bone to self-mobilization comes out of the strength of its solid texture which serves as an agent for transmission of pressure. The pliable joints will determine the success or failure of this transmission. The more dynamic the movement, the more critical it is that the disposition of the chain of the articulations along the skeleton be in a consistent continuity. Only a domino effect like alignment will enable the pressure, produced by the confrontation of the foot with the earth, to stream from one bone to the other all the way to the head without delay, loss, compression or deviation. An intense style of moving which stimulates the blood circulation and enables it to penetrate into the bone for its

nourishment, demands a sophisticated skill of designing the posture in a streamlined configuration while being in ever-changing movement.

The Bones for Life program works on both perfecting the posture and exposing it to challenges of withstanding a springy transmission of pressure done in different patterns of walking.

## **H. The neurological clue for bone strengthening through principles of vigorous walking**

The procedures of self-activation that the Bones for Life program offers are bio-mechanically designed to stimulate the strengthening of the bone. The key to these operational procedures is in cultivating the quality of the coordination in natural patterns of vigorous styles of walking. This means that the pressure in the training of weight bearing movement has to be equal in its force and character to the pressure as found in vigorous walking. It is a springy and rhythmical pressure, alternately shifting from one side of the body to the other. The trajectory of transmission of this pressure has to go through the whole skeleton in a consistent continuity of a domino effect. It not only secures the safety of the joints and reaches the level of impact which stimulates blood circulation that carries nutrients into the bone tissue, but it also triggers the neuro-motor signal that identifies the specific quality of this pressure with the function of strengthening the bone.

## **I. Summary of the strategies used to enhance bone tolerance to increased pressure while securing the safety of the joints and restoring the architecture of the bones to its original integrity**

1. Gradual development of redesigning a posture that withstands pressure and can be individually adjusted; developing kinesthetic observation and awareness of the interplay between the reciprocal connections throughout the body which determine the organization of the skeleton;
2. Guidance to experience unused options of movement configurations which enable detachment from counter-productive habitual programming, exchanging it with more functional alternatives; sharpening the listening to inner feedback that helps navigate the movement toward more efficient quality;
3. A basic principle in somatic learning which creates change and minimizes frustration is by creating a defined condition, which presents an organizational problem, thereby awakening in the organism a biological need to solve it. The process is constructed to channel the learner to discover the efficient solution by him. An improvement that comes by autonomic discovery, counting on personal sensation as distinct from imitating a pre-conceived standard which is given by outside authority, gives that improvement a chance to be used in life

as well as encourages the vital resourcefulness which makes the practice enthusiastic.

4. Challenging the neuro-motor relationships between the different parts of the body in activating the basic patterns of intense walking offers tools to reverse compromises of limitations and disturbances and awakens the organism to exchange them into a more efficient performance. For example, challenging by reversing the roles between the initiative and passivity, between the proximal and the distal, or between the stable part and the mobile one, works to refresh the considerations of movement management and release a remarkable functional freedom, developing a creative approach for improving movement skill.

5. Coping with the mechanical and neuro-motor challenges is assisted with a set of auxiliary means such as a wall, which provides a support and controlled resistance, or a harness, which unifies the axis of the body to act as one unit, as needed in the counter-gravity and bone building intense movements. Using these devices has the effect that the organism draws the correction autonomously from its own experience. This has actual value for the improvement of movement quality and can wean people from the obsessions of counterproductive habits of activity. This approach to self correction is based on the Feldenkrais method and is the source of the success of the Bones for Life program. Feeling spontaneous improvement in body organization, in vitality, in freedom from pain, and in expansion of possibilities is a very powerful lever for motivating people to exercise the strengthening of their bones, out of will and satisfaction. I call this feeling biological optimism.

In summary, all these strategies lead to the actual experience of a new organization which presents the body with corrective, more ideal coordination. It creates an opportunity to detach from the anti-productive impulse that might exist in habitual life, and inspires the person to adapt a more anatomically correct style of moving.

This approach communicates with the faculty of movement management in the brain, and awakens it to its original urge to search for solutions and to update its conclusions. If the vital qualities of resourcefulness, which are meant to strive relentlessly to maximize well being, have become dormant in compromised habits or out of ignorance, they wake up from the corrective experience. The discovery of the unused options generates a revolution of creative approach in body intelligence and gives meaning and enthusiasm to exercising.

**Appendix 13. Bouncing on the heels: rhythmic vibrations plus alignment build the bone.**

**Appendix 14 The function of pulling: strengthening by resistance**

**Appendix 15 The function of climbing: strengthening by reversing roles between proximal and distal**

**Appendix 16 Safely lifting weights: the direct biomechanical motivation for strengthening the bone**

**Appendix 17 Carrying weight on the head: strengthening by coordinating the polarities**

**Appendix 18 Safe jumping: the ultimate teacher for weight bearing**

**unit Appendix 13: The function of bouncing on the heels: rhythmic pulsations within weight bearing alignment build the bone**

The primary and constant practice of the Bones for Life program in strengthening the bone is the double tapping of the heels on the floor in the rhythmic pulse of the heartbeat. The vibration from the bouncing stimulates the blood which returns to the heart in the veins, defying gravity. Originally, this exercise was the recommendation of the Russian space engineer Mikulyn who, suffering from a heart complication, invented a means to stimulate his blood circulation by bouncing on his heels.

The vibrations of rhythmical bouncing serve the bone by producing the springy impact of the vertical load, which is the natural neurological signal found in intense walking. This not only provides the bone with the motivation to strengthen, but also stimulates the blood to penetrate and nurture the tiny capillaries of the connective tissue surrounding the bone.

The act of bouncing, readily available, is easy to produce. Several acts of double bouncing immediately change the tone of the body and its organization. The Bones for Life program places special emphasis on acquiring strategies that secure the alignment of the posture so as to avoid local compression while bouncing. It is also possible to adjust the bouncing gradually to the individual's condition and to start, in certain cases, in standing that is supported by a wall or counter.

The bouncing on the heels can be done in a variety of ways, each time changing another factor in the coordination of the body. The program helps people expand their repertoire and perfect additional aspects in the organization of weight-bearing posture. In the beginning, exercising each pattern demands time, readiness and awareness, but later it is possible to exercise the function immediately as part of a personal repertoire.

Variations of bouncing on the heels include the following:

1. Aligning the neck: orientation by self-touch of hand;
2. Aligning the lumbar: releasing the posterior by maneuvering the anterior;
3. Crossed arms: bridging the curves of the neck and lumbar to the spine;
4. Twisted arms: articulating the stiff vertebrae of the spine;
5. Feet inner/outer edge: adjustability by lateral flexion;
6. Feet narrow/wide: distance between the heels determined stability;
7. Focusing pressure in the metatarsal: the point of efficiency and equilibrium;
8. Leaning on the front of the heel: the neutral point;
9. Bouncing on one foot: improvement by neurological diplomacy;
10. Heel lower than the surface: triggering the response of the lower back;
11. Ribs around the steering: freeing the rib cage;

12. Hip joints tightened with fists: aligning the wheels;
13. Bouncing with unlocked knees: accepting springiness.

#### **Appendix 14: The function of pulling: strengthening by resistance**

The BFL program strengthens the muscles while securing the morphological structure of the bone through the function of pulling. The exercise in resistance is between two partners, each holding the other's crossed forearms. The movement consists of alternately bending and extending the arms, drawing one elbow to the body in an outward rotation, and turning the inside of the palm to the ceiling. Simultaneously, each person straightens his other arm in an inward rotation, turning the inside of the palm to the floor. The rotation of the arms engages the vertebrae of the spine and involves the back in producing the resistance.

In this reciprocal motion, each partner resists having his arm straightened, and the rate of investment of power to pull the other partner against his own resistance gradually increases. The commitment of both partners is to maintain the consistency of the pace of the movement, as well as to keep their postures intact. The meaningful increase of the static load, which is accumulated in the reciprocal pulling against resistance, brings about a centralization of the whole body around the longitudinal axis, which increases its ability to withstand higher levels of load.

Aligning stable posture that remains intact under increased pressure, without risking a deviation or shearing stress, is specially enhanced when each partner in turn exercises while standing with his back leaning onto the wall. This limits any unproductive deviation and secures additional protection for the morphology of the strengthening bones.

#### **Appendix 15: The function of climbing: strengthening through reversing the proximal and distal**

Climbing, which is actually an anti-gravity vertical crawling, demands a very precise organization in order to succeed in it. The higher challenge of climbing organization can serve as a context for cultivating strength while coordinating optimal configuration of the bones in movement. Practicing climbing is carried out when one of the partners stands in a step position with his back leaning against the wall and his lumbar padded with not-too-soft or too firm texture. An edge of the strip of the harness is tied around his loins. The climbing partner holds the other end of the strip at a distance and advances along it one step after the other, in a coordinated pattern of cross-crawl climbing. Although the line is horizontal, and not vertical, as in real climbing, the climber inclines his full weight backward and loads his spine while he is held by the resistance of his partner, who is leaning against the wall. In this way, the climber generates the power that enables him to drag his total weight and to approach his body to his extended hand for the next step.

In the function of climbing, a non-habitual dynamic is taking place. The extended hand is anchoring farther away from the body, and the body has to come closer to the hand. This reversibility of the habitual roles of the proximal and distal awakens the resourcefulness of the brain to invent a new organization, one that is more relevant to the act, freed from the habitual programming. Thus the climber cultivates both his force and upgrades the quality of his performance. Perfected by nature, the primal function of the climbing, when efficiently organized, ensures that the direction of the bones and their disposition in space will be optimal and without injury.

Also, the partner who stands with his back to the wall has to organize himself to adjust his power of resistance to the load of the climber and his movement. Without a movement outlet, he too, is developing the power of his muscles and strengthening his bones. He receives his safety from the wall, which prevents him from deviating or collapsing under the load. He is assisted by tying the harness around his hip joints, where he initiates his resistance. Producing the power from the pelvis and not from the arms alone prevents risk to the lower back in the critical moment of increasing the effort. This way of training in the pattern of climbing, with reciprocal cooperation between two partners, produces for each a controlled strengthening of the muscles, whether static or dynamic, that is proportional to the increase of load in the bones, which are correctly structured in the natural geometry of climbing.

#### **Appendix 16: Safe lifting of weights: direct biomechanical motivation for strengthening of the bones**

The Bones for Life program uses the direct motivation of the body to strengthen itself by increasing the challenge of the load in a series of weight lifting exercises.. Avoiding the risk of compensation and exaggeration of the problematic curves of the spine while lifting the weight, is attained by standing with the back against a wall. The initial stance is a step position with one foot forward. This diagonal step position, distinct from frontal standing, is congruent to the principle of mobilization of the vertical human. It implies walking and facilitates the concept of moving. The person lifts the weights while leaning his back against a wall. His lumbar is well padded with a texture that is both surrendering and firm. This ensures that the vertebra of the lumbar can sustain the increased pressure of lifting the weight while they are fully supported and their mobility limited, by the solid ground of the padding.

The confinement of the wall ensures that the alignment of the standing will aim at the vertical without collapsing. The actual lifting of the weight coincides with deepening the bending of the knees, not with straightening them. This guarantees that the increase of the challenge of lifting the weight will coincide with the opportunity to release the lumbar and align it to a continuous passage for the additional pressure that will go through it without risk of compression. The more bent the knees are bent, the more the back will respond with readiness to give up its inefficient stiffness, and change accordingly.

In the beginning, lifting the weights is done with each hand separately, training in the spiral trajectory. This facilitates the movement of the shoulder and reaches, gradually,

one by one, to the vertebrae of the back and articulates them proportionally. In this way, the increment of the load strengthens the bone and improves the organization of the body.

The weights are applied to the feet in different movements while training in recovering equilibrium. Stability is cultivated by a moderated training of learning how to give it up. The weights on the ankles are also used in walking, running in place and in space.

The rate of bone strengthening can be known only by measuring with instruments, but the subjective direct feeling of power that is experienced in this training is very meaningful and serves as an incentive to continue and train regularly. After removing the weights, people stand like a well-planted tree, and they don't have any wish to move. This reconciliation with human standing is a model for strength that will not be soon forgotten.

### **Appendix 17: Carrying a load on the head: strengthening by relating polarities to each other**

Much has been written about the intriguing achievement of women in pre-technological cultures who carry load on their heads while walking gracefully. With any organization that was less than perfect, those women would be injured and would not survive. Interestingly, the percentage of hip joint fracture for women carrying weight on their heads is one hundredth of that of women in the west. This is in spite of the fact that their bone density is lower than that of women in the west. This information indicates that there might be another factor involved in enhancing withstanding of the bone that relates to the skill of organizing body coordination and the regular practice of carrying a load on the head. The Bones for Life program attempts to decipher and put into practice the biomechanics of the efficiency factor of carrying weight on the head.

The most outstanding change is in the neck. In a free walk, the head controls the balance, and with its mass it compensates for every deviation in the rest of the body by adjusting the neck. When the load is heavy on the head, a biological need is created to protect the neck and to organize it as an unbendable stick that can transmit the pressure from the feet to the upper polarity at the top of the head. This connects the head to the torso in consistency. The adjustments that are demanded from the constant maneuvers of propelling the walking movement are assigned to the center of the body, which awakens to the potential of its vitality. The rib cage participates in initiating the rhythmic pulsations of the wave of walking and is drawn higher with each step. The capacity to raise the chest without recruiting the lumbar to compensate for it by a sharp deepening of the curve, but rather by allowing the streaming pressure to go through it in continuity, is a revolutionary skill which answers the critical issue of vulnerability of the lumbar in dynamic walking.

At the same time, with each drawing out of the chest in walking, the heel of the leg behind is raised and the leaning of the weight wanders forward to the metatarsal of the front leg. When the leg behind leaves the ground and passes through the air, an instant in which, standing on one foot, the body needs more support, the leaning withdraws backward from the metatarsal to the front of the heel, which is a more relevant location

for withstanding the vertical load of the body. In this way, a vibration of horizontal ping pong is created in walking, that which *Nature* magazine calls "Walking in Pendulum."

The detachment of the foot from the ground for a step forward also has to be carried out in a specific way, such that it will not shake the balance of the load on the head. The need to stabilize the load on the top directs the bottom polarity on the ground to detach the foot, in a way that the heel leaves the ground when it is precisely aligned with the plane of the lower leg, the thigh, the ischium, and the spine. This could be a superb training in maintaining the optimal morphology of the total skeleton while under a load.

### **Appendix 18: Safe jumping: the ultimate teacher for withstanding load**

The jumping exercise is the main success of the Bones for Life program. The advantage gained is proportional to the risk. Jumping produces five times more stimulating load for building bone than a regular walk. Jumping is done in a safety device by means of a strip of cloth seven meters long that is wrapped around the body, fastening all its parts into one. The harness secures constant relations between the joints of the spine, the pelvis and the limbs, and inhibits them from articulating in deviation. The harness centralizes the whole body on its longitudinal axis as needed for jumping. In this way jumping becomes feasible with less effort and more alignment of posture. In addition, even people who are not well-organized, who may have neglected their fitness or have unresolved injuries, are also able to experience the bone-building impact of jumping with supportive safety. (Feedback from a woman with a history of injury in the hip joint is in Appendix 21.)

Well-structured jumping is the most efficient teacher for achieving optimal posture. The harness is like a loan of integration that provides the organization that is required for jumping. The harness activates the torso as one unbending unit, and just the joints of the legs flex and absorb the shock as they provide the springy antigravity lever for the jumping.

Wrapping the harness around the thighs, too, works to align the legs and condition them fully on the chain of the posture, thus contributing to the efficiency and safety of the jumping. In cases of vulnerability or hesitation, it is recommended that a somewhat firm piece of padding be placed in the strips of the harness between the head and the back. This serves as an alternative bridge to the neck, protecting it from collapsing in the powerful jump. It is also possible to stack a similar padding between the back and the pelvis. This supports the release of the lumbar so that it will not compromise and distort under the impact of the jumping.

This tying of the harness, reinforced by padding, can serve as a safe context for performing weight bearing activities. The more challenging the activity of the body, the more established will its organization of posture be. Having been accepted by the organism, the weight bearing posture has a chance to be adopted in daily use. When the

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<sup>1</sup>*Nature*, 52, 1995.

efficient posture becomes a habit, every movement in daily life will work to strengthen the bones.

In order that shortness of breath does not limit the amount of jumping, the program offers a formula of rhythmic breathing, as follows: In the pace of one jump, the person breathes out an intense breath; in the next three jumps, the person allows the body to passively take in air. This formula maximizes the quantity of oxygen intake, thus increasing the capacity to jump for a longer period of time while experiencing the meaningful impact of the load. People are astonished by how long they are able to jump like this without getting tired.

## **II. About the Feldenkrais Method® of Awareness through Movement® and Functional Integration®**

The Bones for Life program derives its effectiveness from the Feldenkrais Method for improving movement coordination and efficiency of functioning.

Dr. Moshe Feldenkrais (1904-1984) was an inventor, physicist, engineer, and held a black belt in judo. He worked in the laboratory of Joliot-Curie in Paris, in the British Navy and in Israeli industry. As a result of a serious injury to his knee, he developed a revolutionary approach to restore function and since that time, devoted himself to teaching his method in Israel, Europe and the United States.

The uniqueness of the Feldenkrais Method is in the strategy through which quantitative and qualitative improvement of functioning is achieved. This somatic relearning consists of guiding people to experience unused options while being aware of the coordination of the reciprocal cooperation between all body parts.

The key to this improvement is focused on the harmonious integration which is a basic characteristic of any organism. The process of reorganization is designed according to the model of the primal learning as seen in the developing baby. The principle of acquiring the mother tongue of autonomous control of functioning is the exploration of a variety of possibilities and sorting out the efficient. Simultaneously, the sharpening of the self judgment mechanism acts as a reliable compass to navigate performance thereafter. Through similar methodology, the Feldenkrais relearning guides mature people to explore a variety of options regarding a given movement theme, accompanied by awareness and consideration of inner feedback. Assisted by neuro-motor strategies which shake the brain from the fixation of habit, people upgrade the quality of their performance and regain what they have lost in their poorly challenging cultural life.

Striving to perfect the quality of self conduct, awakens in the brain its resourcefulness to invent solutions, to solve functional problems, to rely on its own direct sensation, and to

organize itself in a more optimal way that can support the person to actualize his or her intentions. The configurations in the movement processes in this personal laboratory of self-improvement are derived from pre-homo sapiens' patterns of natural movement, rich in efficient coordination and proven functionality through millions of years of survival tests. The somatic learning strategies of Dr. Feldenkrais are derived from the scientific observation of a mechanical engineer and the art of a judo master, and they are confirmed by subjective feedback in the experiential field of sensation.

Unfortunately, there is not yet research to confirm the quantitative and qualitative perceptions of functional integration as a clue for improving performance. There are several reasons for this: (1) The complexity of the interactions that are involved in the choice of coordination in organic movement does not lend itself to simplistic measurement. (2) There is also a difficulty in repeating an experiment and confirming its result, because the previous experiment already created an insight of learning and changed the starting point. (3) Lastly, there is difficulty in being motivated to invest resources in educational research compared to the economical opportunity to heal by drugs.

There is however, forty years of successful experience in the Feldenkrais Method that is subjectively confirmed by people who testify to their rehabilitation from difficult physical problems, or the improvement of their well being. They report about refining sophisticated skills, increased fitness and readiness for movement, as well as newly creative ways of thinking. Scientific research of this new approach for enhancing bodily intelligence will contribute to the personal ecology, not only of the few fortunate people who learn it, but also of a wider population that is looking for a way to fight the culturally-related loss of bodily vitality.

### **Appendix 19. A demonstration of improvement of function in the Feldenkrais Method®**

#### **Appendix 19: A demonstration of improving a function in the Feldenkrais Method**

If you would like to improve a typical personal limitation, for example, to achieve a freer rotation of your neck, you can first test which side has more difficulty in turning. Turn your head gently to one side several times to get the impression of the character of the barrier and the range of the movement. Turn your head to the other side and come to a decision which side you would like to improve.

Extend your arms forward, crossing on top the arm of the side you would like to improve. Turn the palms one toward the other and interlace the fingers. Begin to twist the crossed arms and wring them around themselves in the direction of the bottom arm several times. Each time raise the shoulder of the side you would like to improve. After a few times fixate the contact of the shoulder with your cheek. If this is difficult, you may use a connecting agent in the form of a folded towel. While holding the shoulder and the face together, lead your extended, crossed and twisted arms in a big circle, first clockwise and

then counter clockwise. Finally, uncross your arms and rest. To verify the result, turn your head to the side you wanted to improve and notice the change.

The quantitative achievement of widening the range of the movement, and the qualitative achievement of the ease and readiness with which the head moves after the process, lends it to an organizational explanation: Attaching the shoulder to the face inhibits the vertebrae of the neck from articulating in the pattern that probably predisposed them to be eroded in resistance. At the same time, the differentiation, which comes from the movement of the circle of the crossed arms, engages the vertebrae of the upper back, which are usually stiff, and not participating in the movement of the head, and reminds them to move.

The new freedom that is opened in the back by this organizational interference establishes a more proportional distribution of labor and relieves the load from the neck. This change did not come about as a result of forcing the neck into a preconceived arrangement, but rather, emerged as a spontaneous conclusion of the system following its own experience. This is an example in a capsule. Usually a movement process takes at least one hour, and its value is in the revolutionary organization of functional knowledge. The quality of improvement does not depend so much on repetition as on the awareness of the dynamics which support the movement.

### **III. About Ruthy Alon, Creator of the Bones For Life Program**

Ruthy Alon, of Israel, is a senior trainer in the Feldenkrais Method of Awareness through Movement and Functional Integration. She learned and worked directly with Dr. Feldenkrais for 35 years, and has directed professional trainings for Feldenkrais practitioners in Europe, the United States, Australia and Israel. She is the author of the book *Mindful Spontaneity* (1990, North Atlantic Books) which has been translated into five languages, and the video *Movement Nature Meant*. Ruthy Alon applies the somatic learning strategies of the lying-down, free of gravity laboratory of coordination from the Feldenkrais Method, and adapts them to the dynamic context of vertical weight-bearing movement, which is essential for stimulating bone strength. The special talent of Ms Alon is her capacity to decipher complex patterns of movement and to teach their dynamics in simply-perceived clarity.

The Bones for Life program has been successfully launched in 14 countries, and has produced several hundred certified teachers. More information is on the website [www.bonesforlife.com](http://www.bonesforlife.com)

**Appendix 20: Measurements of bone density, Tel Aviv, 2004.****NEW PROGRAM MAY HELP COMBAT OSTEOPOROSIS**

Kansas City, Mo. -- May 9, 2005 - Bone density improved in women within a few months of doing Bones for Life® lessons, the program's originator Ruthy Alon reported today at the Aerospace Medical Association's annual meeting. The women learned to do weight-bearing movements with an efficiently aligned spine.

"Bones for Life® improves posture, restores equilibrium, and enhances the pleasure of moving," said Alon. "Your bones reliably sustain your weight, and movement becomes pleasurable, inspiring self confidence and biological optimism."

Bone Mineral Density (BMD) improved in a statistically significant way in the 31 female participants, aged 28 - 69 years old, who worked with Ruthy Alon for four months, meeting three hours per week. BMD is a measurement to diagnose osteoporosis, which is a bone disease that can lead to bone fractures, disability and even death.

Alon reported that Bone Mineral Density (BMD) improved in the forearm (the distal radius). The diagnostic device used in study was a Speed of Sound Sonometer. Before doing the Bones for Life Program, testing showed BMD scores ranged from minus 3.70 to plus 1.40. After four months in Alon's program, BMD scores ranged from minus 3.50 to plus 2.70, a statistically significant improvement.

Alon is a Senior Trainer in the Feldenkrais Method®. She was one of Moshe Feldenkrais's original students. She continues to teach internationally and is now training others to teach Bones for Life in the U.S. and other countries. To learn about Bones for Life and where it is taught, see [www.bonesforlife.com](http://www.bonesforlife.com).

**Descriptives****Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
age of woman	31	28.00	69.00	53.0323	10.06474
BMD T score PRE	31	-3.70	1.40	-.9871	1.24197
BMD T score POST	31	-3.50	2.70	-.7290	1.34665
Valid N (listwise)	31				

**T-Test**

**Paired Samples Statistics**

		Mean	N	Std. Deviation	Std. Error Mean
Pair	BMD T score PRE	-.9871	31	1.24197	.22306
1	BMD T score POST	-.7290	31	1.34665	.24187

**Paired Samples Test**

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair	BMD T score PRE - BMD T score POST	-.25806	.63339	.11376	-2.268	30	.031

**Test Statistics<sup>b</sup>**

	BMD T score POST - BMD T score PRE
Z	-2.064 <sup>a</sup>
Asymp. Sig. (2-tailed)	.039

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test