Functional Exercise Prescription

Supporting rehabilitation in movement and sport

Eyal Lederman

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FOREWORD BY ROBERT SCHLEIP

Beware dear reader! You are entering dangerous territory! If you are searching for orientation in the complex world of manual and movement therapies, and are hoping to find some easy guidelines that will reassure you in your beliefs then please think twice before reading further.

Let me tell you how I first got to know about the author, Dr Eyal Lederman, and how torn I was then between hating and admiring him. This was about 20 years ago, and long before I changed from being a bodywork practitioner towards becoming a fascia researcher. At that time, I earned my living as a teacher and practitioner of the Rolfing method of Structural Integration, a method of deep tissue manipulation mixed with postural education. I had attracted some respect within the Rolfing faculty and membership with a novel concept explaining how this deep tissue mobilization method might work. Contrary to the prevailing model at that time, which assumed that the manual pressure of the practitioner would be sufficient to induce a long-lasting gel-to-sol transition of the ground substance of fascial tissues, I had started to propose that the main tissue relaxation effect would more likely be due to a stimulation of Golgi tendon receptors. Stimulation of these receptors would elicit a relaxation of specific muscle fibers which then influences the resting stiffness of that same tendinous tissue. As I had some nice plausible arguments as well as anecdotal success stories at hand, I had become quite convinced and attached to that new concept and had started to teach it in my classes and beyond. But then one day, by reading an earlier book by Eyal Lederman[1], I came across a passage in which he presented clear evidence that the Golgi tendon organs do not receive sufficient stretch stimulation if the muscle fibers which are mechanically connected with them are in a relaxed condition. This is because the tendon is arranged in series with those muscle fibers. In such a dual tissue arrangement, the softer component takes over most of the overall stretch elongation while the stiffer element stays more or less the same. Unfortunately for me, Dr Lederman substantiated that analysis not only with plausible arguments but also with evidenced-based scientific references. Based on these few pages by the author, I decided to withdraw my wonderful explanatory concept, and return to the previous and less comfortable "we do not know" attitude as a humble practitioner.

Several years later, Dr Lederman stirred up a lot of heated debates when he publicly critiqued the fashionable core stability concept as "a myth".[2] That concept, which allocated a much higher importance to specific core muscles (in contrast to more superficial muscles in the same region) had become almost like a new religion for many Pilates teachers, yoga instructors and other health professionals. Not surprisingly many of these responded with less than loving feelings towards the severe arguments against their sacred beliefs. Although I had not met Dr Lederman in person at that time, I started to envision him as somebody who took a personal pleasure in being destructive and making other people angry. This impression was strengthened when he subsequently published a much discussed article on *"The fall of the postural–structural–biomechanical model in manual and physical therapies"*.[3] Here too he seemed to take great pleasure in questioning – and deconstructing – many of the prevailing concepts about good posture and proper biomechanics and their importance for overall health. And again, the arguments he presented were well-formulated,

well-referenced, and described in a similar manner to what you will read in this book – that is, with a very convincing and clear style of presentation.

What a surprise it was then, when I eventually met in person this man whom I had envisioned as the ultimate destroyer or as a "living knife"! I met a very charming and humble man, who was able to listen, and who treated other authors and practitioners with great respect. He enjoyed thinking deeply about almost everything, particularly about our most common assumptions. And he was also taking great diligence in developing new treatment concepts, which he had not yet published at that time.

As you read further into this book you should be willing to re-examine some of your sacred therapeutic assumptions. But more than that, you will be rewarded by novel concepts and suggestions on improving musculoskeletal health that demonstrate the opposite of a destructive attitude, by suggesting new and easy to understand concepts on health and pathology, that can be translated into daily practical applications. These include a novel focus on functional movement applications, which are particularly tailored for the individual. In addition, the book introduces a process-oriented approach, that focuses on different aspects of recovery. Rather than a sharp destructive knife, this book feels to me like the careful architectural construction of a novel foundation for future manual and movement therapy developments.

What I like the most are the author's explicit and excellent suggestions for applying the suggested principles to activities of daily living. Whether walking, standing, climbing stairs, and so forth, you will be able to practice the new functional and process-oriented principles with great pleasure in your daily life. Yes, this man is dangerous. But with this impressive book, the author provides one of the most constructive and valuable contributions towards the field of manual and movement therapies that I have known so far.

Robert Schleip

Munich, Germany

November 2021

References

1. Lederman E. *The Science and Practice of Manual Therapy*. Edinburgh: Elsevier Health Sciences; 2005.
2. Lederman E. The myth of core stability. J Bodyw Mov Ther. 2010;14:84–98.
3. Lederman E. The fall of the postural-structural-biomechanical model in manual and physical therapies: exemplified by lower back pain. J Bodyw Mov Ther. 2011;15:131-8.

FOREWORD BY WILBOUR E KELSICK

It is an honour to be asked to write a foreword for Dr Eyal Lederman's book on one of the most challenging and rapidly changing sectors in healthcare in this century—exercise and rehabilitation. The validity of rehabilitative care has been challenged in the past, both in terms of its effectiveness and cost-efficiency. Rehabilitative care has now proven its rightful place but continues to face some scrutiny. I believe this book will help to minimize the criticism of rehabilitation and exercise within the healthcare field, moving it towards acceptance and validation.

In the present-day field of biological science, both the concept and the interpretation of human anatomical structure are rapidly changing. Standard traditional anatomy studies are being replaced with a more functional approach where the concepts of interrelationships between the myofascial architecture network and other body systems are highlighted or the focus. Human anatomy is no longer viewed as a static structure but rather from an integrative, functional perspective. Clinical scientists now widely accept the fact that movement is the essence of life and without it, life, in its true sense, is less than optimal, creating an environment for dysfunction and disease. Recent discoveries in the science of fascia and biotensegrity are providing more accurate interpretations of human movement and overall whole-body integrated function. Bluntly said, standard topographical anatomy is now less appealing than before, and integrated functional 3D anatomy is the new kid on the block.

This 21st century interpretation of anatomy makes it clear that movement in biological systems is not fragmented into separate compartments but functions as an integrated whole. The author highlights the concept of adaptive wholeness and its profound importance for designing personalized and condition-specific programs. He further emphasizes that adaptive changes are multidimensional in their effects on tissue, at both neurological and psychological levels; supporting integrative wholeness and not a fragmented body system. Viewing anatomy through this 21st century lens thus enables the incorporation of the interrelationship between the body's internal and external myofascial architectures and is the fundamental base on which this fascinating book is built.

In the last three decades, medical rehabilitative science has been under constant pressure to demonstrate its effectiveness within the overall healthcare paradigm. The newest concept in musculoskeletal (MSK) rehabilitation medicine is the emphasis on functional restoration rather than mere symptomatic resolution or relief. Achieving full range of motion or strength is no longer the optimal goal of treatment. However, the term "functional" is elusive in present-day rehabilitation processes if it is not structured around the need to know **why** we rehabilitate, **what** parameters we are rehabilitating, and **how** we go about rehabilitation. Unfortunately, until the why and the what are managed appropriately, the how will always be inefficient and inconsistent at all levels. This is a theme which is strongly emphasized in this book.

The main purpose of functional exercise is to "bridge the gap" between rehabilitation and a return to the same or similar levels of movement and, with the capacity to function and perform the same activities with the same skill and enjoyment as before the onset of injury or dysfunction. Eyal Lederman's classification of principles of management into functional and process approaches targeting recovery is a powerful and effective strategy. With self-healing and self-recovery as the common theme in any form of MSK dysfunction and pain recovery, such well-thought-out methodology

makes logical sense as a fundamental guide for steering the complex MSK rehabilitation process. Eyal identifies three dominant processes of recovery: repair, adaptation, and alleviation of symptoms. His belief that any exercise is better than no exercise, and that the only "bad exercise" is that which fails to serve the goal of rehabilitation, is a brilliant way to encourage both therapists and patients that movement should not be feared when recovering from injury. Eyal drives home the message that even just the intent of movement is the essence of success in the rehabilitation process.

It's a great honor to have known Dr Lederman for many years and to have had the privilege to attend his workshops. His pedagogy is always clear, concise, vibrant and scientifically sound, just as it is throughout this book, in which he provides a practical and realistic approach to functional exercise as the most efficient and effective practice in rehabilitating and healing our integrated body as a whole. There are several features of this textbook that I find particularly impressive, and which brilliantly drive home the author's message:

- Chapters are organized such that the scientific background and evidence are presented first, providing a foundation for the author's thesis.
- The author's discussion of shared management highlights the concept of meaningful integration in our present healthcare system (Chapter 13).
- Chapter 14 provides detailed practical applications of the concepts and theories presented throughout the book.
- A large number of diagrams, graphs and tables that are simple to understand visually support the text.
- Comprehensive summaries at the end of each chapter serve to highlight all the important points in a concise, and easy to digest bullet-point format.

Eyal is bold in his approach but also reveals a willingness to compromise. In Chapter 7 he tackles sensitive and faddish topics about auxiliary exercises and exercise transfer, and what he refers to as its "clinical illusion". However, while Eyal believes exercise transfer has minimal benefits, he allows that any exercise movement can have some benefits, even if it's not optimal to the rehab process. This flexible approach does not alienate readers but encourages them to continue the journey into this compelling text.

Today's healthcare systems are complex, and the need for communication that facilitates an understanding of illness, therapeutic interventions, goals and outcome measures is of utmost importance. Reading this book will not only enhance your knowledge and skill about exercise prescription in rehabilitation but will also allow you to think more about why you prescribe, what you prescribe, and how you encourage your patients to adhere to their exercise programs.

I commend Dr Lederman for his effective efforts to address such a dynamic, complex and challenging topic. This piece of work is captivating and will be an effective resource and guide for accessing knowledge and fine-tuning rehabilitative skills in healthcare practitioners. I highly recommend this book to everyone with an interest in the science of exercise and rehabilitation.

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PREFACE

My aim in writing *Functional Exercise Prescription* was to provide the reader with an understanding of the science underpinning exercise prescription and the knowledge to construct a personalized and condition-specific management for common musculoskeletal and pain conditions. There are two main themes running through the book: a *functional management* that individualizes the rehabilitation, and a *process approach* which makes it condition- and recovery-specific.

In a functional approach, all human movement is considered to be an exercise. The remedial exercises are constructed from the individual's own movement repertoire – the "life gym". Throughout life, the majority of our musculoskeletal and pain conditions recover by our daily physical activities. If these health-promoting activities are so effective, why not focus on amplifying them? It simplifies dramatically the management for the patient and supports them in attaining their own recovery goals. I came to realise early on that recovery in many musculoskeletal and pain conditions depends on three principal, whole person, processes – *repair, adaptation* and *alleviation of symptoms*. It then came to light that each of these processes requires a unique management which should be reflected in the prescribed exercise – that we need to identify the recovery process associated with the person's condition and match the exercise to support it. The outcome is a shorter and more complete recovery. This is the basis of a *process approach*.

Functional Exercise Prescription is an exercise book without "exercise." You will not find here a specific exercise to treat the ankle post-immobilization. However, you will learn how to manage this condition with the numerous activities that make up the individual's movement repertoire, and come to understand how every one of these activities, including sports, can be transformed into a remedial exercise. Yes, it is possible to manage recovery with "remedial shopping" or "remedial vacuuming", as well as "remedial tennis," "remedial soccer," yoga, or any other activity from the individual's unique functional repertoire – all activities can be amplified or attenuated according to the individual's condition.

My aim in writing *Functional Exercise Prescription* has been to shift the emphasis from traditional approaches that use exercises that are outside the individual's experience (extra-functional) towards a functional management: an approach which is more likely to support the individual's recovery needs and goals. The book is intended for use by all clinicians, including physical, manual, and sports therapists; personal trainers and team or sports coaches; and doctors and surgeons. Other health professionals, such as acupuncturists or naturopaths who would like to incorporate exercise prescription into their work, may also find this book useful. Additionally, individuals who are looking for self-care management for various musculoskeletal and pain conditions will also find it to be a useful resource. I hope it will help practitioners and their clients to construct an individualized and condition-specific management that will expedite and optimize return to functionality.

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London, UK
November 2021

Chapter 8

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Exercise prescription: task, component, and movement focus

Exercise prescription: task, component, and movement focus

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Imagine a situation where gait is rehabilitated after a lower limb condition, particularly in the latter phase of repair. The person's condition has shifted from an inflammatory phase and a proliferating phase towards a remodeling phase. Their tissues are rapidly restoring their biomechanical properties, symptoms subside, and the patient is instinctively drawn to resume functional activities. At this juncture, where is the focus and what is the aim of rehabilitation?

There are several management choices here. One approach could be just to practice the whole task, e.g., use walking to rehabilitate walking – referred to as *task-focused rehabilitation*. Another focus could be on particular elements of walking, such as balance, force, endurance, and so on – referred to as *component-focused rehabilitation*. Or management could focus on correcting or modifying the walking movement patterns – termed *movement-focused rehabilitation* (Fig. 8.1A–C).

So, how do we go about deciding which level to focus on?

TASK-FOCUSED REHABILITATION

"Focus on the task and let the body organize the rest."

Task-focused management is about the skillful performance of an activity. In task-focused rehabilitation, the patient is encouraged to practice the affected task as a whole, within the constraints of their condition. A person walking with a limp due to a lower limb condition could be advised to walk, even with a limp. A person suffering from chronic back pain with limited trunk movement could be advised

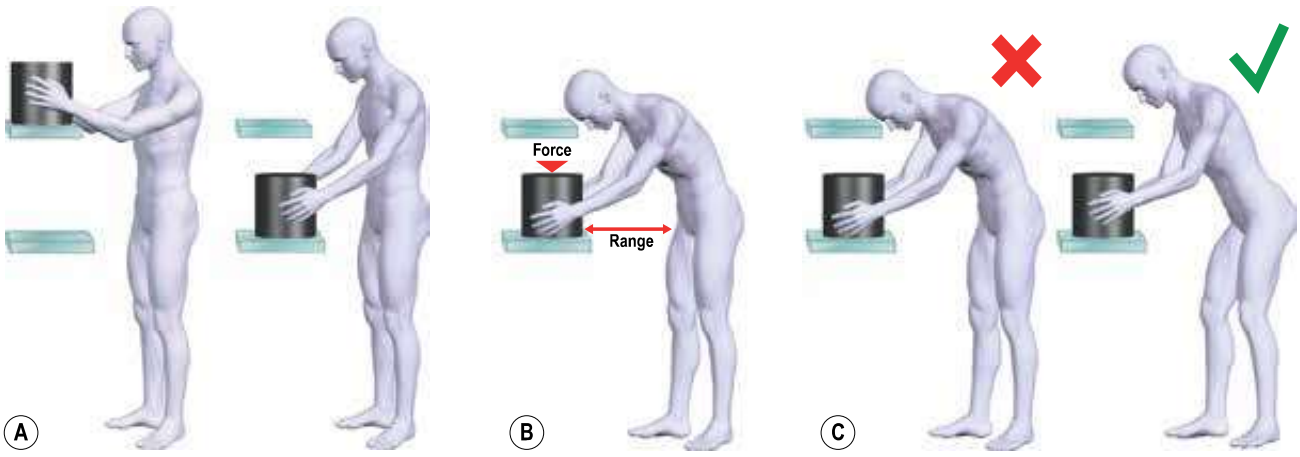

FIGURE 8.1
Focus of rehabilitation. (A) Task-focused rehabilitation: practicing the whole task. (B) Task component focus: same task but modifying the range and force component. (C) Movement-focused rehabilitation: same task but modifying the movement associated with the task ("correctness of movement").

to keep on trying to bend, twist, and lift. Task-focused rehabilitation is also used to enhance and recover skillful performance of activities, in situations such as those that follow long-term disuse or detraining. This approach is also used in central nervous system (CNS) conditions: for example, retraining a stroke patient to reuse their hand in daily activities, such as the skillful use of a fork, lifting a cup, and so on. It is expected that, in time, the activities in focus will "normalize" through repeated daily use. This, by the way, is how most individuals recover from the multitude of injuries they suffer throughout life.

So, what is the reasoning for choosing task-focused management and what happens if we stray from this approach? In order to answer these questions, we need to explore the role of motor control in functional rehabilitation and, in particular, how movement is organized as goal and whole.

Goal-oriented movement

We all have had the experience of practicing a new activity; after a while, we do not have to think about how to carry it out and it seems to occur just by "willing" it. This is a motor learning phenomenon associated with a transition in skill acquisition from a *cognitive* to a subconscious *autonomous* phase: a sort of "beginner" to "expert" state (Fig. 8.2).[1]

The early cognitive stages of learning are characterized by a high level of conscious activity focused on the task's particulars and its related movement. As the individual becomes more proficient in performing a skill, it becomes more autonomous and less under conscious control. At this stage, the task and the related movement are integrated centrally and executed as a whole.[2–4] This integration is so smooth that, throughout the day, we carry out numerous activities while being completely oblivious to the movement that supports them. If you were instructed to touch your phone (if you do not mind just doing that), you will realize that it just happens. You did not have to consider the position of your arm, the elbow angle, the force generated by the biceps, and so on. Our movements are organized around goals or a purpose – we reach for a cup, hit a ball, walk to a location – but we do not set out to move our limbs, move a joint, or contract a muscle.[5,6] At the autonomous phase, the movement and the task/goal are seamlessly and robustly integrated, and consequently, it is difficult to remodel the movement patterns of long-standing, well-rehearsed habits: for example, an experienced sports person learning a new tennis serve or swimming stroke.

Another feature of the transition from the cognitive to the autonomous phase is in the focus of attention.[7] When we focus on the workings of our body and the task-related movement, it is referred to as an *internal focus of attention*. This form of attention is associated with the early cognitive learning phase. Once a person becomes skilled, their attention is directed toward the goal of the activity (grab the phone) – termed the *external focus of attention* (Fig. 8.2). Both internal and external focuses of attention have their place in motor learning. When learning an activity from scratch – e.g., a tennis serve – it initially requires an internal focus of attention.[8] At this stage, the person is learning the basic principles of the task, how to hold the racket, how to serve, how to stand, and a host of other aspects of the movement. Once they acquire the basic principles of the movement, they tend to shift towards an external focus of attention, such as landing the

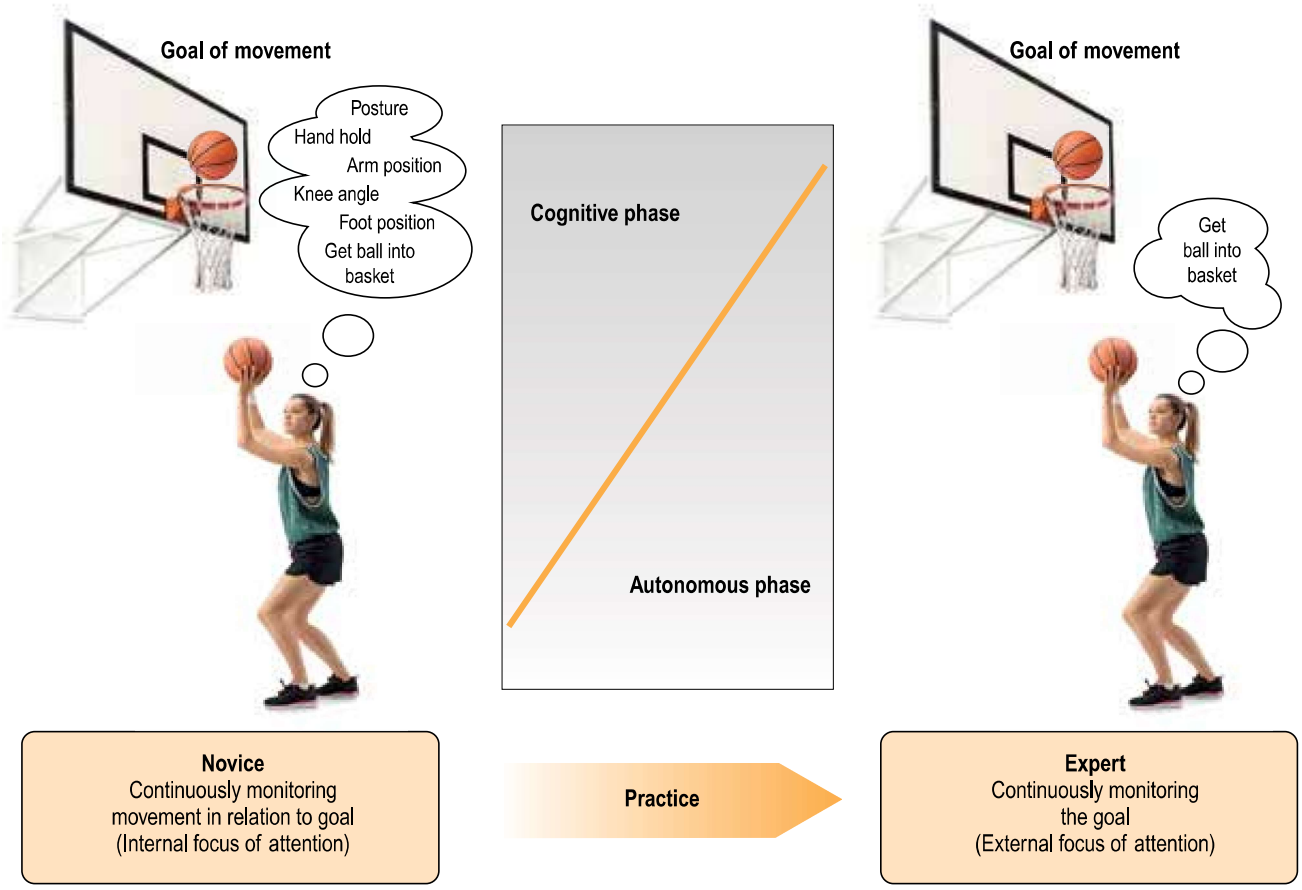

FIGURE 8.2
During motor learning, there is a transition from the cognitive–novice to an autonomous–expert phase. In the early phase, the individual is internally focused on their body, its position, and the principles of the task in relation to the goal. In the autonomous phase, the body "vanishes" as the individual becomes externally focused on the goal.

ball on a specific part of their opponent's court.[9] At that point, the individual becomes "oblivious" to the workings of their body.

The shift from internal to external focus is universal to all skill-learning processes. However – importantly – it does not work in reverse. When an expert is instructed to focus internally and re-examine their movement, their performance tends to degrade in terms of learning, accuracy, and movement economy. In a study of basketball free throws, participants were given internal focus (wrist motion) and external focus (basket) instructions.[10] During the throws, electromyography (EMG) activity was recorded in the participants' shooting arm. Throws performed with an external focus resulted in greater accuracy and lower

EMG activity, indicating an enhanced economy of movement. This advantage in movement economy was demonstrated even in the simple task of lifting a dumbbell. Subjects were given the instruction to focus either externally on the goal height or internally on the elbow angle or biceps activity.[11,12] Again, lower EMG activity was seen in the external focus condition. The performance advantages of external over internal focus have been shown in sports such as golf (focus on the goal versus focus on the wrist),[13] serves in volleyball, and soccer kicks.[14,15] Similarly, balance performance is enhanced with an external rather than an internal focus (e.g., focus on a spot in the distance versus focus on your feet).[16] Even conscious tensing of the trunk muscles (internal focus) has been shown to degrade postural control.[17] So, advising people to focus internally and "engage their core" during sporting activities is totally unnecessary and probably counterproductive to skilled performance.[18]

Individuals who have been injured, are in pain, or have movement deficits due to CNS damage, tend naturally to focus on their body, which may further degrade their movement performance.[19] This effect was demonstrated in baseball position players who recovered from knee surgery and pitchers who recovered from elbow surgery, up to 18 months post-surgery.[19] The position players had an internal focus of attention localized to the knee, whereas the injured pitchers had a diffuse, internal focus. In both groups, the internal focus was associated with inferior performance relative to non-injured athletes. It implies that, following injury, movement recovery can be enhanced by trainings which emphasize an external focus of attention. For example, a person recovering from elbow surgery can be given graded arm-reaching activities with external focus instructions such as "reach for the water bottle," rather than focusing internally on strengthening specific arm muscles or the position of the limb. The beneficial effects of external focus have been demonstrated in balancing and walking performance in conditions such as postural steadiness deficits due to ankle sprains, and CNS conditions such as stroke and Parkinson's disease.[20–23]

Message to the patient: "keep your eyes on the goal, not on your body." Try to steer the person away from training trends which overfocus on the body.

Whole versus fragmentation

"Integrate in order to coordinate."

Traditionally, movement rehabilitation uses exercises that target specific muscle group(s) or chain(s), such as focusing on strengthening the quads in knee conditions, working with the core muscles for back pain sufferers, or concentrating on scapular glide to resolve shoulder conditions. These practices follow the traditional training maxim "*fragment in order to integrate.*" Although movement fragmentation is widely used in all forms of exercise therapy and training, is it beneficial?

Movement fragmentation can be explored by looking at the extent of muscle recruitment during movement. When we perform any activity, our whole body is organized for it, head to toe. One way to visualize the motor output is to imagine a person wearing a full body-suit covered with LED lights that represent the activity intensity of the underlying muscles. If this was possible, we would probably see a psychedelic whole-body light show, continuously changing

as the person moves or even while they are being still.[24] Some areas will show low or even silent phases of inactivity (called surround inhibition) in both static and dynamic activities.[25,26] These relaxed muscle groups are also part of the movement plan. Without their silence, that task cannot be accomplished, e.g., relaxation of the back muscles during forward bending.[27] From a motor control perspective, movement is organized as a whole – there is no single, group-specific, or subsystem muscle recruitment (Fig. 8.3A&B).

The motor system does not have a recruitment hierarchy: no muscle is more important than another, and they are all organized to support the task optimally. Importantly, it is the task which determines the muscles' recruitment

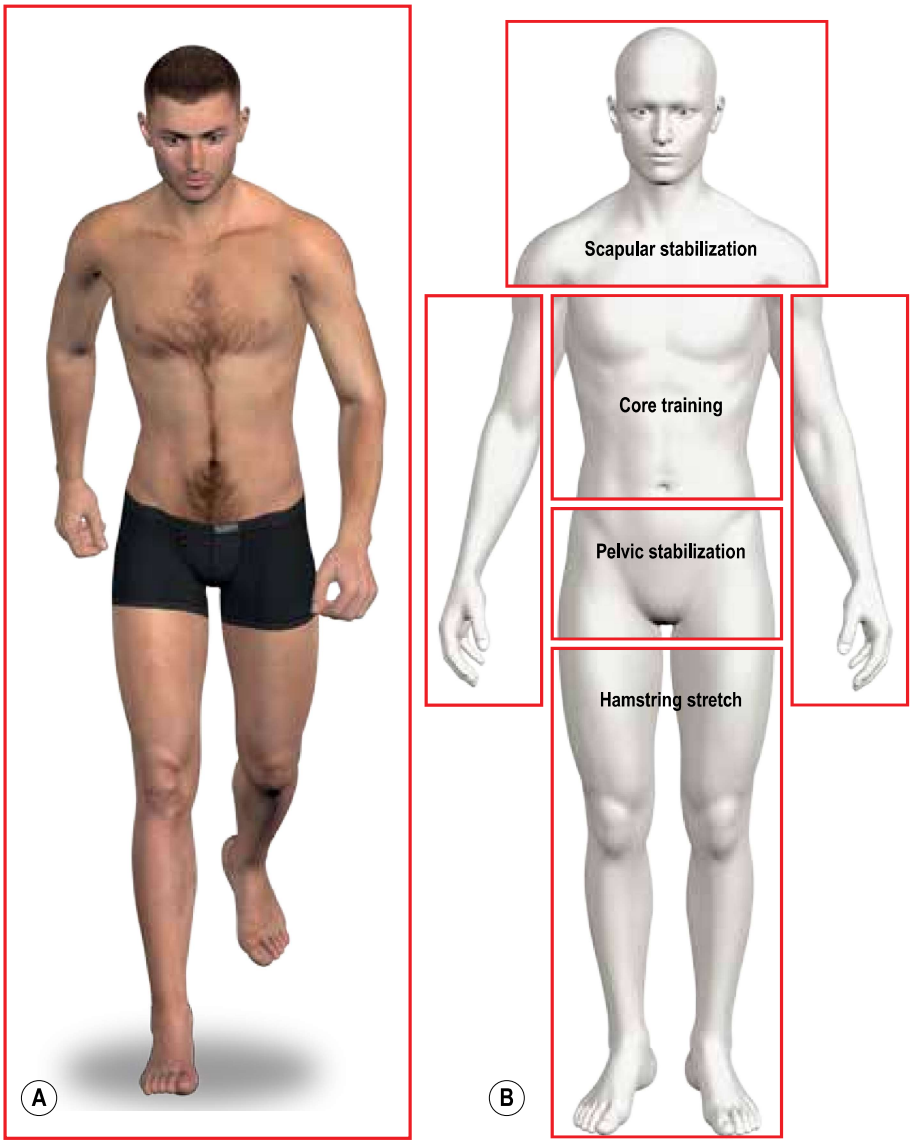

FIGURE 8.3
(A) The body is organized as a whole for movement. (B) There are no closed or isolated muscle systems in the body.

pattern (Fig. 8.4).[28–30] So, the same muscle will have different recruitment patterns, depending on the task (Fig. 8.5). All the hand muscles participate in writing, knitting, or rolling dough, but none of these muscles is specific to any of these particular activities. Equally, there are no specific stabilizers, prime movers, or postural muscles.[31,32] From a motor system perspective, the task determines the muscle recruitment.

Task-determined recruitment and whole-person movement organization have important implications for exercise prescription. Often, muscle- or joint-specific exercises are given with the aim of improving the whole task. However, this kind of fragmentation is a training misconception. To begin with, no matter how far the movement is broken down, it will always involve whole-body recruitment. It is near impossible to single out a particular muscle or muscle group. So, for example, what happens when we prescribe strengthening exercise such as biceps curls to improve a tennis serve? Ask the brain. As far as the brain is concerned, its master, the person, is ordering it to learn a new activity called biceps curls – a new task, with a new title and completely new whole-body muscle recruitment. However, these recruitment patterns will be great for biceps curls but not very helpful for an explosive tennis serve or use of a fork. This relates to the specificity of training, where performance gains are not transferable between dissimilar activities (see Chapter 7). In a fragmented form of rehabilitation, we would end up with a succession of new tasks, formed around these particular movement fragments, but ones which do not carry over any substantial benefits to the goal task.

Generally, training that employs movement fragmentation has not been shown to benefit the performance of the goal activity. For example, training that improves the local power at the ankle, or ankle and knee, fails to transfer to gains in vertical jumping, although this task depends on these neuromuscular components.[33] Exercises that isolate parts of the kicking action do not appear to transfer well to kicking

FIGURE 8.4
Task-specific recruitment. The same muscle is used in all activities but recruitment patterns are unique to the task. Think control, not anatomy.

performance; training needs to involve the whole kicking action.[34] Training in isolated tasks, such as hip flexibility or trunk-strengthening activities, does not improve the economy of walking or running.[35] Core-specific exercises fail to improve the control of walking or sports performance.[36,37] In the elderly, resistance exercises have minimal influence on performance of daily activities, and in stroke patients functional improvements are more evident in whole-task practice.[38,39] (See Chapter 7 for more on training specificity).

There are two exceptions for using extra-functional localized exercise: in supporting repair and modulation of symptoms. In acute injuries, the affected joints/tissues can be singled out and exercised specifically to support the local repair process, e.g., sitting pendulum swings of the lower leg for an acute knee injury or post-surgery (see Chapter 14). However, this should be restricted to the initial inflammatory and proliferation phases. As the repair shifts toward the remodeling phase, movement should strive to resemble functional activities. As for modulation of symptoms, different forms of exercise can have an effect on symptoms, including area-specific exercises, such as limb-specific strengthening exercise for managing a symptomatic arthritic knee.[40] However, in terms of compliance and adherence, there may

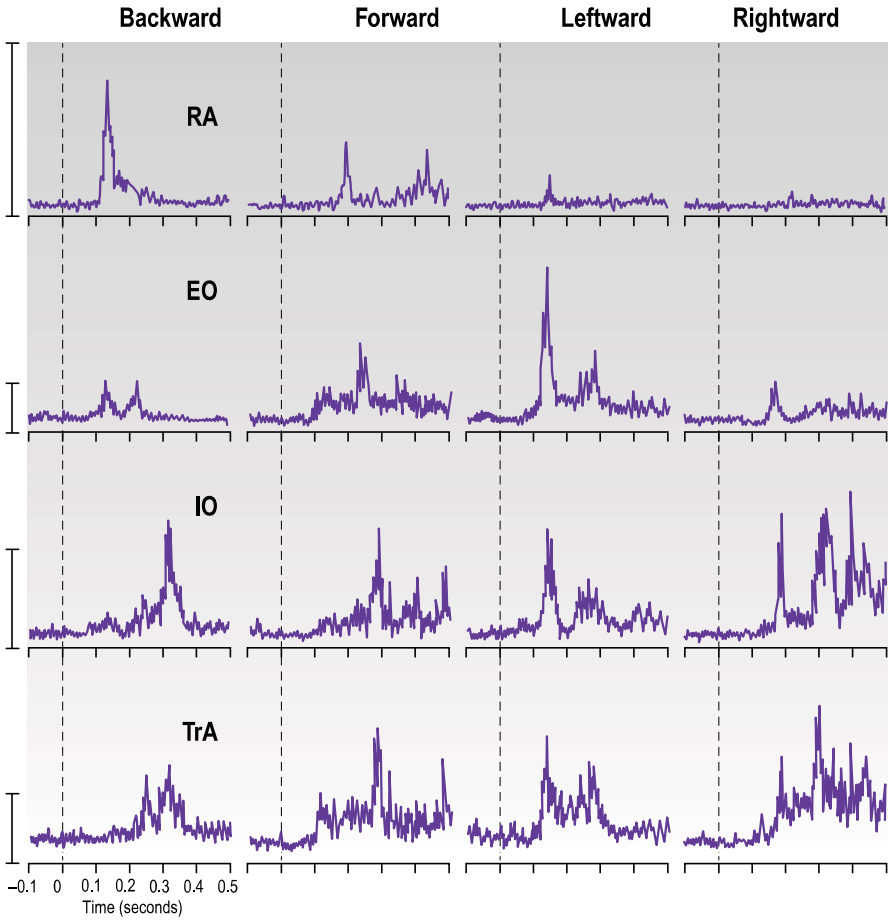

FIGURE 8.5
Recruitment specificity (electromyelogram) of anterior trunk muscles during bending. RA, rectus abdominis; EO, external oblique; IO, internal oblique; TrA, transversus abdominis. (After Carpenter MG, Tokuno CD, Thorstensson A, Cresswell AG. Differential control of abdominal muscles during multi-directional support-surface translations in man. Exper Brain Res. 2008;188:445.)

be greater benefit in management which is whole and functional (see Chapter 13).

In summary, practicing the task as a whole with a goal is faithful to the motor control processes underlying learning, recovery of movement control, and enhancement of skill performance. Using whole and goal movement means that the "injured expert" can train within their skill set. They can bypass practices that depend on dissociation and fragmentation of movement, practices which are likely to impede recovery rather than aid it. All forms of movement fragmentation are likely to be outside the person's experience and are therefore extra-functional in nature. Ultimately, these training approaches will fail to carry over meaningful benefits to the target activity (see specificity, Chapter 7). From a functional point of view, the most effective, efficient, and uncomplicated rehabilitation for the patient (and therapist) is to practice the affected tasks as a whole. The message at task-level rehabilitation is "*focus on the task and let the body organize the rest.*"

Beware of Frankensteinian rehabilitation: in essence, the whole task cannot be recovered by "reverse engineering," using muscle-by-muscle, joint-by-joint rehabilitation, e.g., "strengthen this muscle, stretch the other". Such traditional training approaches can be likened to the creation of Frankenstein's monster: the attempt to reanimate a whole person by assembling a collection of different body parts. If Aristotle were present, he would surely remark that, "The task is greater than the sum of its muscles."

A new training maxim: *"Integrate in order to coordinate" (not "fragment in order to integrate").*

In a functional approach, we rehabilitate the task and not "the muscle" – "practice the task and the body (muscle) will follow."

COMPONENT-FOCUSED REHABILITATION

So far, it has been proposed that, for recovering functionality, the focus should be on practicing the whole task. Now imagine a situation where a patient has walking difficulties following hip surgery. They are unable to sustain walking for more than a few minutes and, additionally, present with restricted stride length due to loss of hip flexibility. We can observe two distinct components of the task which have been affected: one is endurance, which is associated with duration of walking, and the second is range, associated with limitation in hip range of movement (ROM). In a task-level approach, we could simply instruct the patient to walk, in the hope that, under the principle of "practice the task and the body will follow," these two components will eventually recover. But what happens if only one does – if the walking distance recovers but the stride length remains restricted? To overcome this limitation, we could advise the patient to take wider steps while walking. Now, our intervention is focused on the range component of the task. This, in essence, is component-focused management, where the affected task components are identified and become the focus of the exercise intervention.[36] *Importantly, these components are always rehabilitated within the context of the affected task* (walking in this example). This is largely because all components are present in all tasks; however, each task has its unique

component profile (Fig. 8.6A&B). For instance, the force profile of a tennis serve is very different to the force profile of lifting a cup of tea or lifting a dumbbell. It means that these profiles are unique to the task and non-transferable between dissimilar activities (see specificity, Chapter 7).

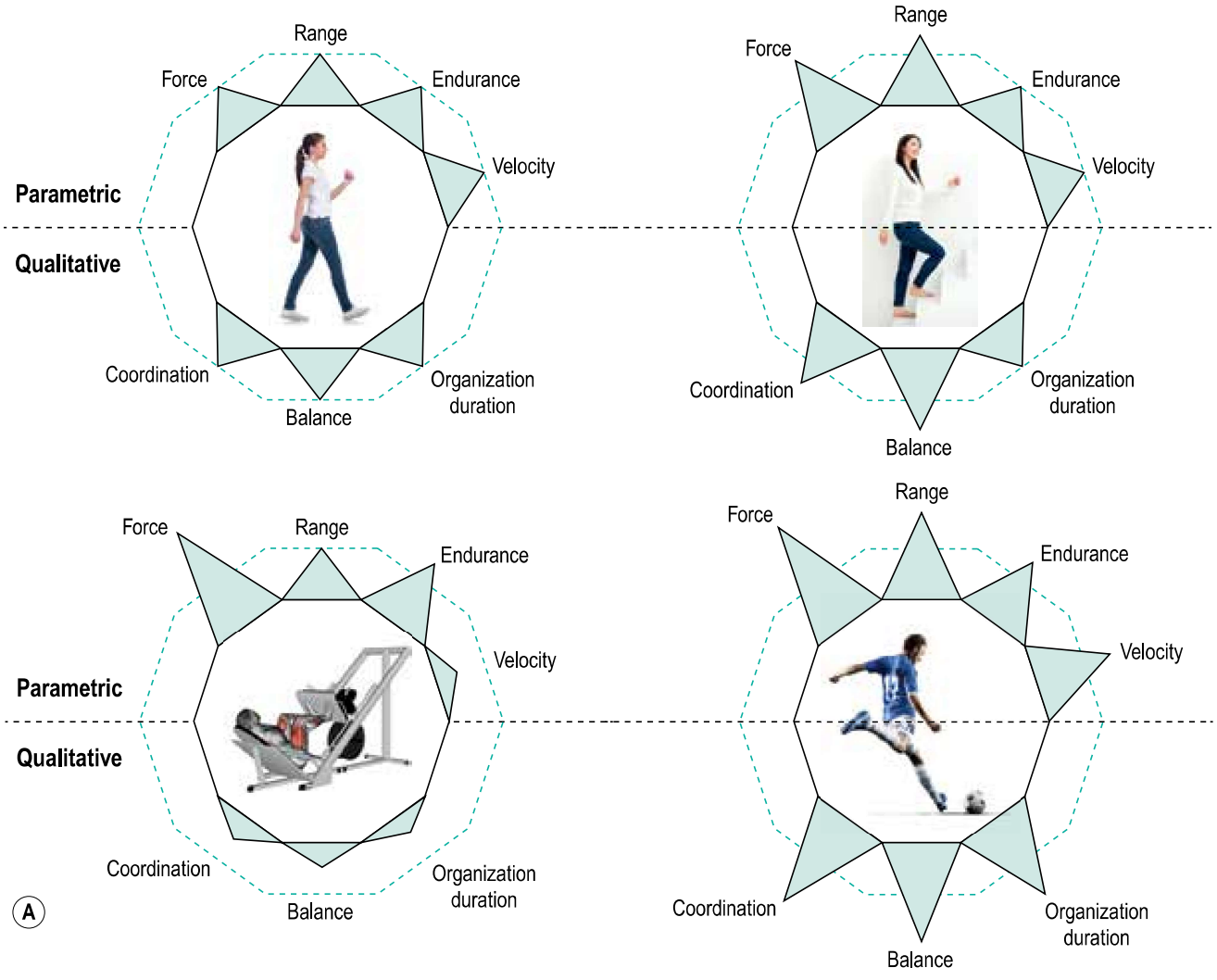

FIGURE 8.6
(A) An attempt to depict the task component profile in the legs during different activities in comparison to walking (dashed outline).

Continued

Chapter 14

FIGURE 14.6

Description

Carrying
Pendulum swings into flexion–extension (A)
Hold in abduction (B)
Hold in full external rotation by turning the palm forwards (C)
Extension (D–E)
Internal rotation and abduction (F)

Components

Range:
- Abduction ++
- With external rotation added (palm of the hand facing forwards) ++ to +++++!
- Internal rotation and abduction ++
- Extension + to +++
- Flexion + to ++
- Force + to +++++ depending on weight and position
- Endurance + to +++++ depending on duration of maintaining the position

Notes

All these positions can be static when standing or swung while walking