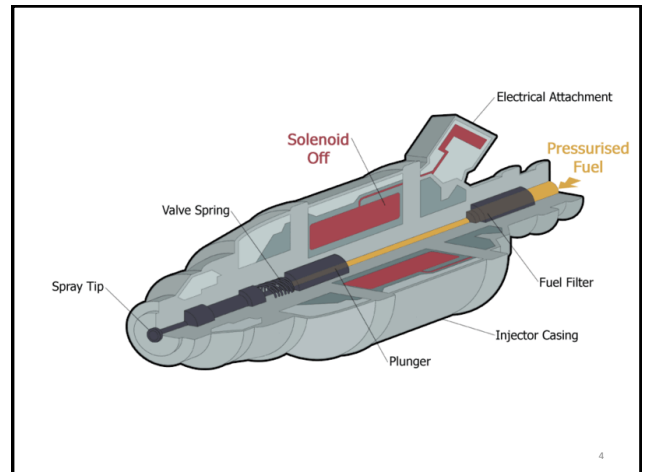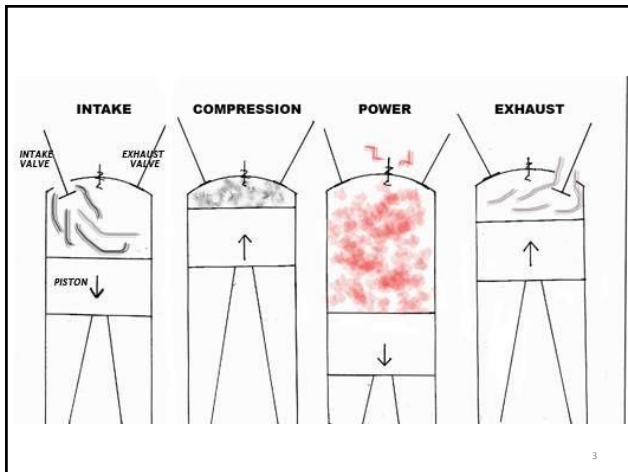Expert Application of the 4x4
Matrix – Focus on Progression

Phil Plisky, PT, DSc, OCS, ATC, CSCS

2013
FUNCTIONAL
MOVEMENT SUMMIT

INTAKE   COMPRESSION   POWER   EXHAUST

INTAKE VALVE   EXHAUST VALVE

PISTON

3

Electrical Attachment

Solenoid Off

Pressurised Fuel

Valve Spring
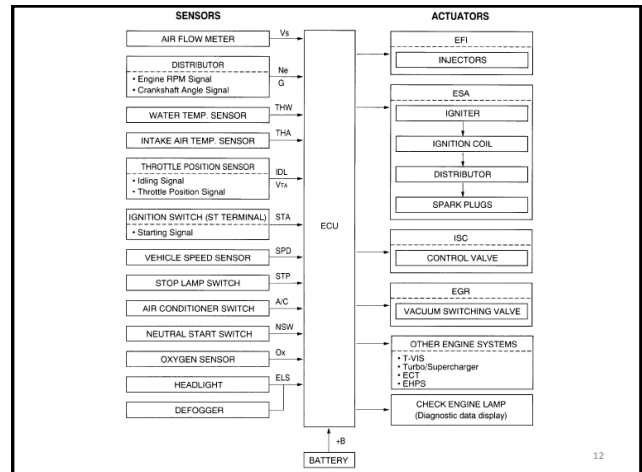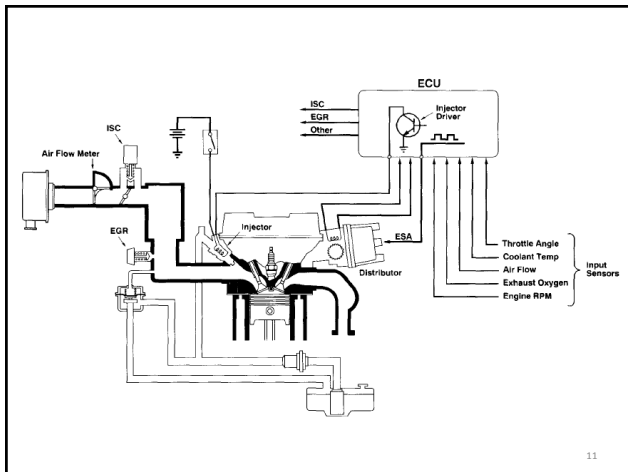
Spray Tip

Fuel Filter
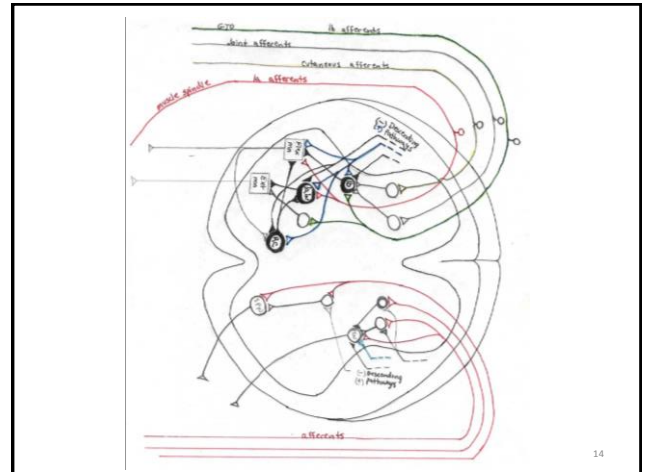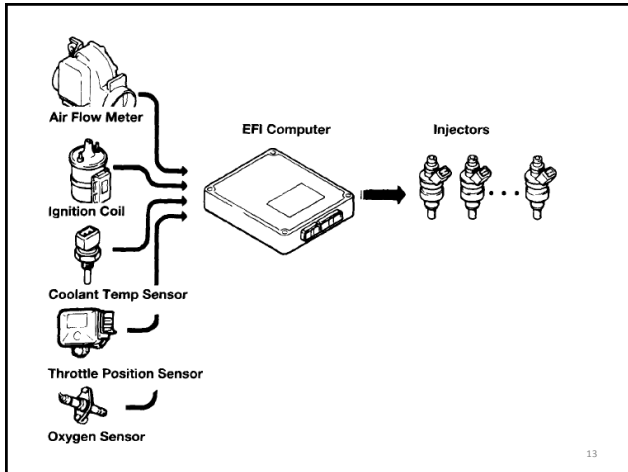
Injector Casing

Plunger

4
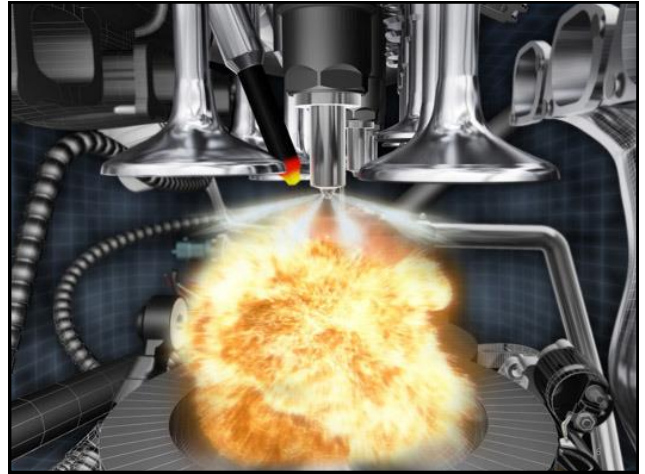
Symptoms of Internal Combustion Engine Dysfunction

- Rough idle
- Hesitation
- Engine Misfire
- Smoke
- Reduced gas mileage
- Hard to start
- Won't start

Is adding more gas the solution?

What could the problems be?

Is adding more EMG activity the solution?

Why do we care which exercise produces the GREATEST EMG activity?

Functional Training

Normalize and Stimulate Sensors & Train the Brain
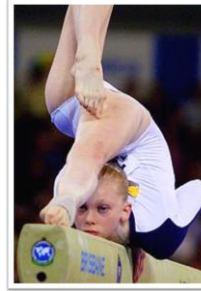
Don't just Train Muscles

Action Point #1

Work on the inputs, not the muscle.

Create a sensory rich environment that elicits the movement pattern you want.

Lab

18

SFMA

- Cervical: FN
- UE: FN
- Flexion: DN - SMCD
- Extension: DN – no forward weight shift -
  – SMCD
- Rotation: FN
- SLS: DN, glut drop, unable to perform eyes closed - SMCD
- Squat: DN – forward lean

19

Segmental Rolling DN - SMCD

**Every time she does anything,
she is in extension**

FMS SCORING SHEET

SCREEN	RAW SCORE R/L	FINAL SCORE
Deep Squat	2	2
Hurdle Step	2 / 2	2
In-Line Lunge	3 / 3	3
Shoulder Mobility	3 / 3	3
Active Straight Leg Raise	3 / 3	3
Trunk Stability Push-Up	1	1
Rotary Stability	2 / 2	2
	TOTAL	16

21

---

3 Corrective Exercises

Adding Sensory Input
AND
What is the **feedback?**

General Guidelines

Reset

Re-Enforce

Reload

23

Reset
Re-Enforce
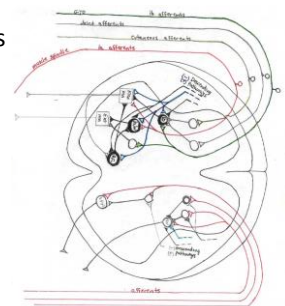Reload

Ways to stimulate the sensors
for fitness professionals
– PNF techniques
– Trigger Point techniques
• Foam Rolling
• Stick Work
– Vibration
– Manual contact
– Massage

24

Slide 25

Reset

Re-Enforce

Reload

- Clinical Manual Therapy Techniques
  - Manipulation
  - Mobilization
  - PNF techniques
  - Trigger Point techniques
  - ASTYM
  - Active Release
  - Dry Needling
  - Laser

25

Slide 26

Reset

Re-Enforce

Reload

Clinical Manual Therapy Techniques
  - Manipulation

26

Slide 27

Reset

Re-Enforce

Reload

Clinical Manual Therapy Techniques
  - PNF techniques

27

Slide 28

Reset

Re-Enforce

Reload

Clinical Manual Therapy Techniques
  - Trigger Point techniques

Clinical Manual Therapy Techniques
— Instrument Assisted Soft Tissue Massage

Clinical Manual
Therapy Techniques
— Active Release

Reset

Re-Enforce

Reload

Discussions and education about hydration, nutrition sleep quality / quantity / positions, ergonomic positions, driving positions, workout modifications.

Slide 33

	Reset
	Re-Enforce
	Reload

Protection……… to reduce stress and exacerbations such as footwear, orthotics, bracing, splinting and weight-bearing status

33

Slide 34

	Reset
	Re-Enforce
	Reload

Stretching and soft tissue work performed by the patient at home

34

Slide 35

	Reset
	Re-Enforce
	Reload

Forms of biofeedback such as leukotape and kinesio tape to provide enhanced perception and input

35

Slide 36

	Reset
	Re-Enforce
	Reload

36

"Don't prescribe strengthening for a motor control problem"

Rotator Cuff Exercise??

Core Exercise????

37

	Reset
	Re-Enforce
	Reload

Do Muscles Have Memory?

38

Is the best way to learn a new movement pattern to perform an exercise that mimics that movement for 8-10 reps?

39

If your client performs a movement flawlessly during a training session – does that mean they will change that same movement in daily life or sport?

40

As long as the client can perform the movement properly, they are training the right thing?

41

When providing feedback to your client it is best to provide it as frequent, immediate, and as informative as possible?

42

Recommended Reading
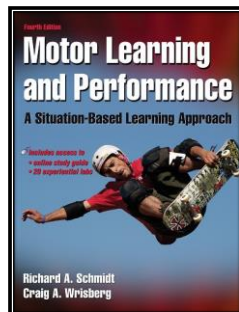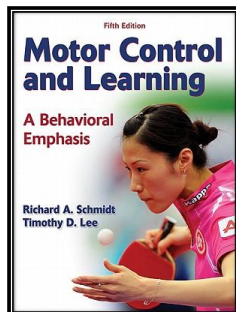
43

Motor Programs are Different than Cognitive Skills

Retention of motor skills is better and more enduring than factual information

H.M.

44

What Research Says About Muscle Memory

Motor Programs are planned in advance and executed without many changes when triggered into action

(Wadman et al.)
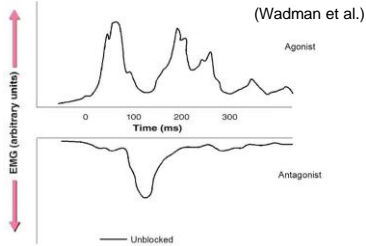
45

What Research Says About Muscle Memory

Motor Programs are planned in advance and executed without many changes when triggered into action

(Wadman et al.)
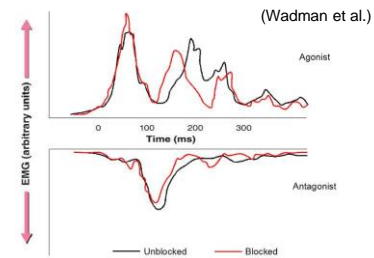
46

So What's the Best Way to Train for the Brain?

- **Block Training**
  - **Do one exercise for a certain number of repetitions per set**
  - **Each rep has the same movement**
  - **No stopping between reps**
  - **Focus on form**

- **Random Training**
  - **Do multiple exercises per set and one rep of each**
  - **Each rep has some different movement**
  - **Take time with each rep**
  - **Focus on feel**

47

Blocked vs. Random Practice

Shea & Morgan, 1979
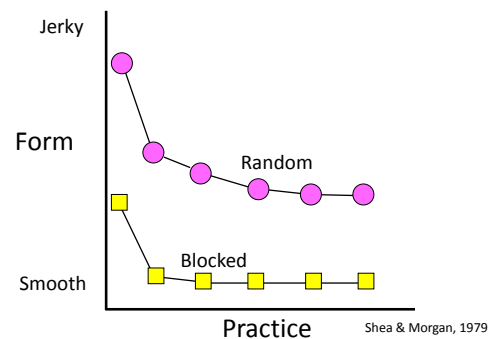
48

Blocked vs. Random Practice
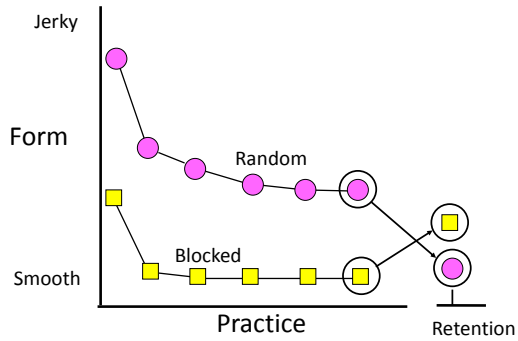
Blocked vs. Random Practice
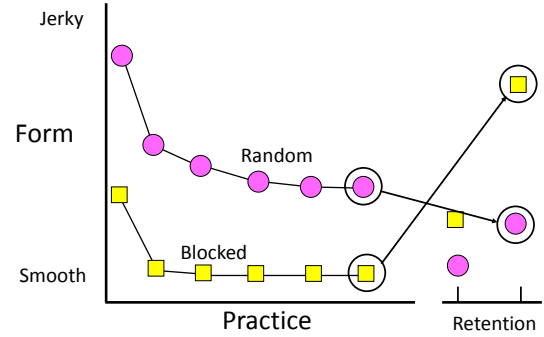
Illusions of Learning

Simon & Bjork, 2001

Illusions of Learning

Illusions of Learning

Form

Jerky

Actual

Random

Predicted

Smooth

Blocked

Practice   Retention
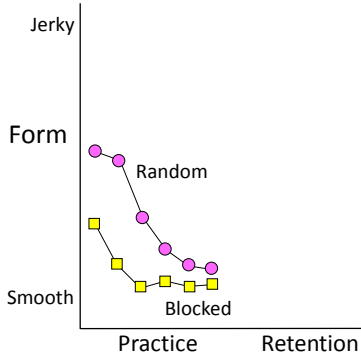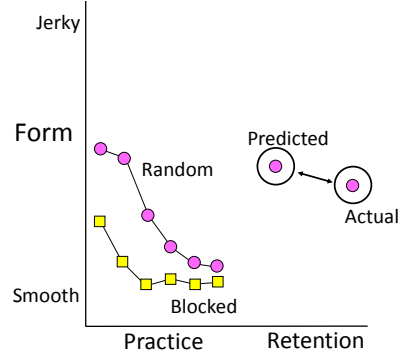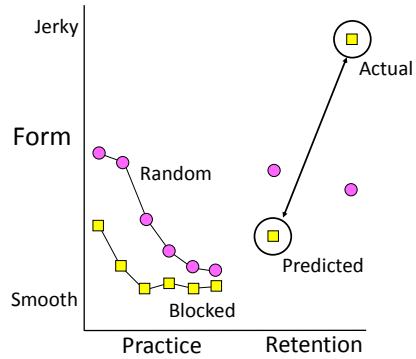
53

Functional Movement Training

Train the Brain   **Not the Muscles**

54

Functional Training

Train Randomly   **Reduce Block Training**

55

Action Point #2

Train randomly for optimal adaptation of movement skill.

SFMA's 4 x 4 Matrix

Functional Exercise Progressions

57

Remember the Neuro-Developmental Perspective

58

Movement was Learned in Stages

- Breathing
- Gripping
- Head-Eye Tracking (Cervical)
- Limb Movements
- Rolling
- Crawling
- Transitional Movements
- Upright Movements

59

Reset
Re-Enforce
Reload

Functional Exercise Positions

- Non-Weight Bearing
  - Supine
  - Prone

60

Slide 61

Reset
Re-Enforce
Reload

Functional Exercise Positions

- Quadruped

61

Slide 62

Reset
Re-Enforce
Reload

Functional Exercise Positions

- Kneeling

62

Slide 63

Reset
Re-Enforce
Reload

Functional Exercise Positions

- Standing

63

Slide 64

Functional Exercise Progressions
The 4X4 Matrix

1 - Non-Weight Bearing	1 - No-Resistance - PA *PA = Pattern Assistance*
2 - Quadruped	2 - No Resistance
3 - Kneeling	3 - Resistance - PA *PA = Pattern Assistance*
4 - Standing	4 - Resistance

64

Pattern Assistance

- Timing vs. Firing
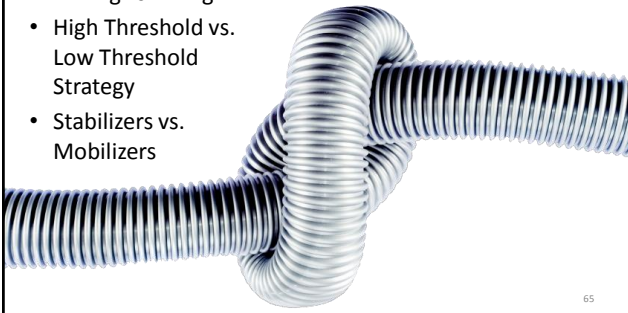- High Threshold vs. Low Threshold Strategy
- Stabilizers vs. Mobilizers

65

Functional Exercise Progressions
The 4X4 Matrix

1 - Non-Weight Bearing	1 - No-Resistance - PA *PA = Pattern Assistance*
2 - Quadruped	2 - No Resistance
3 - Kneeling	3 - Resistance - PA *PA = Pattern Assistance*
4 - Standing	4 - Resistance
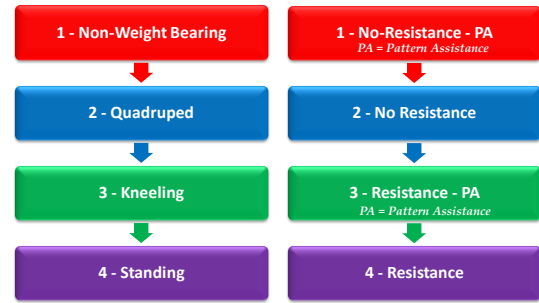
66

Functional Exercise Resistance

- No Resistance
  - With Pattern Assistance (PA)

Active Straight Leg Raise with Pattern Assistance

67

Functional Exercise Resistance

- No Resistance
  - With Pattern Assistance (PA)

Active Straight Leg Raise with Pattern Assistance:

Functional Exercise Resistance

	Reset
	Re-Enforce
	Reload

- No Resistance
  - Except:
    - Gravity
    - Body Weight

Active Straight Leg Raise:

69

Functional Exercise Resistance

	Reset
	Re-Enforce
	Reload

- Resistance
  - With Pattern Assistance (PA)

Resisted Active Straight Leg Raise with Pattern Assistance:

70

Functional Exercise Resistance

	Reset
	Re-Enforce
	Reload

- Resistance

Resisted Active Straight Leg Raise:

Example: Kettlebell Swings
4 x 4 – Patterns (Flx, Ext, Sqt)

	Reset
	Re-Enforce
	Reload

- Standing
- Resistance

72

Turkish Get Up

	Reset
	Re-Enforce
	Reload

- Supine – Quadruped – Kneeling - Standing
- Resistance

1X4   2X4   3X4   4X4

73

Functional Exercise Progressions
The 4X4 Matrix

| 1 - Non-Weight Bearing | 1 - No-Resistance - PA
PA = Pattern Assistance |
| 2 - Quadruped | 2 - No Resistance |
| 3 - Kneeling | 3 - Resistance - PA
PA = Pattern Assistance |
| 4 - Standing | 4 - Resistance |

74

Action Point #3

Place person in posture and position where it can only be done correctly

Higher level postures (standing) can hide dysfunction

Don't rely on verbal coaching

Practical Implementation

- Work on the inputs, not the muscle
  - Create a sensory rich environment the elicits the movement pattern you want

- Train randomly for optimal adaptation of movement skill

76

Practical Implementation

- Higher level postures (standing) can hide dysfunction
  - Work in the lowest level posture that is challenging

- Place person in posture & position where it can only be done correctly
  - Don't rely on verbal coaching

77

philplisky@gmail.com

78

For the latest movement assessment and injury prevention research
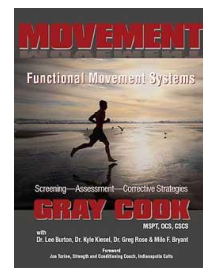
Follow move2perform

Like move2perform

79

Functional Movement Systems

Phil Plisky, PT, DSc, OCS, ATC, CSCS

80