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Designing Conditioning Programs for Tactical Trainees

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DESIGNING CONDITIONING PROGRAMS FOR TACTICAL TRAINEES



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Contents

- Risk Factors to the New Recruit / Trainee
- Risk Factors due to the Program
- A Periodised Plan





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
- Poor nutritional intake
- Poor sleep
- Unhealthy lifestyle (smoking)





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Lower levels of fitness = more risk of injury AND failure to complete training



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Lower levels of fitness = increased fatigue





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

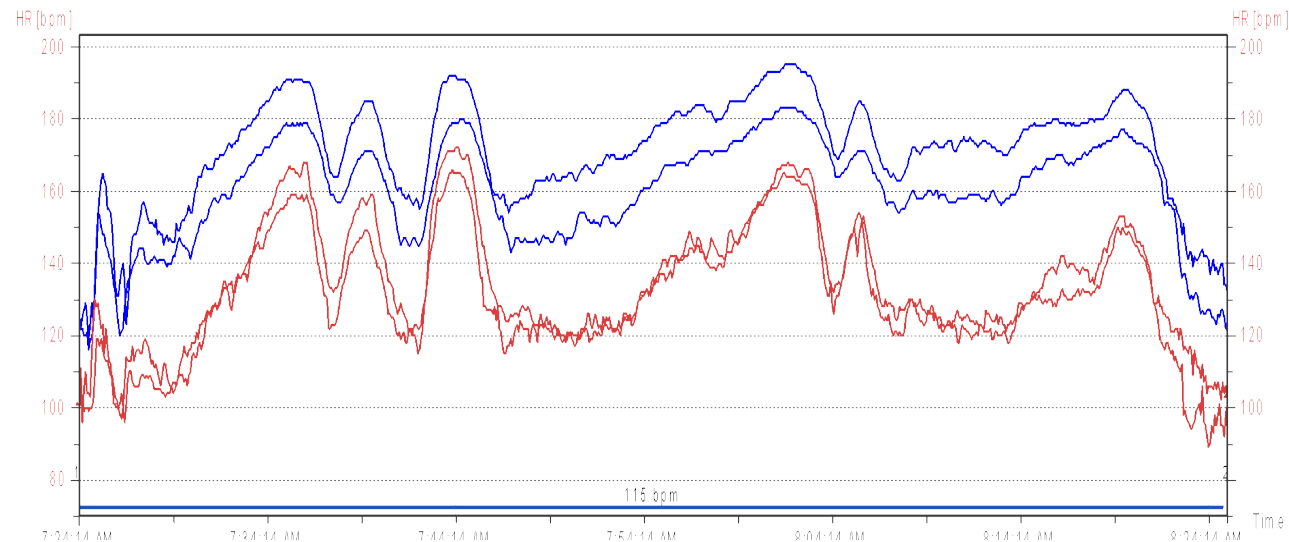
- Low fitness
 - Glycogen depletion
 - Glycogen store recovery, from a state of complete depletion, will take a minimum of 24 hours with nutritional uptake being optimal to replenish. This time period can increase past seven days if the depletion is associated with muscle micro damage.
 - Considering this, Pope (2001p.4) states that:
'...if an unfit military member completely depletes their muscle glycogen stores during the first day of an exercise program or unit exercise, they will be forced to attempt the activities of the next day with only perhaps 20 to 50% of their original stores (replenished overnight), and will become totally fatigued much earlier in the next day's activities.'

http://news.xinhuanet.com/english/china/2013-08/13/c_132626013.htm



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Glycogen depletion
 - Glycogen depletion associated with increased heart rates (working harder for the same task)





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Glycogen depletion = Poor concentration = Increased risk of injury





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Glycogen depletion = Poor concentration = Failing theory / practical assessments





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Those joining are less fit
 - The youth of today are less physically fit and have a higher excess body mass than in previous years (Booth et al., 2003).



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Those joining are less fit

Students fail army fitness standards

English.news.cn 2013-08-13 11:01:24



College students intending to join the army take eyesight tests at a Beijing hospital on Saturday. A Beijing Sport University professor says students' physical condition "has been declining since 1995". (Photo: China Daily)

By Zheng Xin

BEIJING, Aug. 13 (Xinhuanet) -- Beijing's army recruitment efforts have been increasingly hampered in recent years by a decline in the physical fitness of candidates, with many being ruled unsuitable due to common complaints such as being overweight or shortsighted.

According to Beijing's army recruitment office, around 60 percent of college students who apply for military service fail the physical fitness exam, posing a serious problem for the recruitment of college graduates into the army.

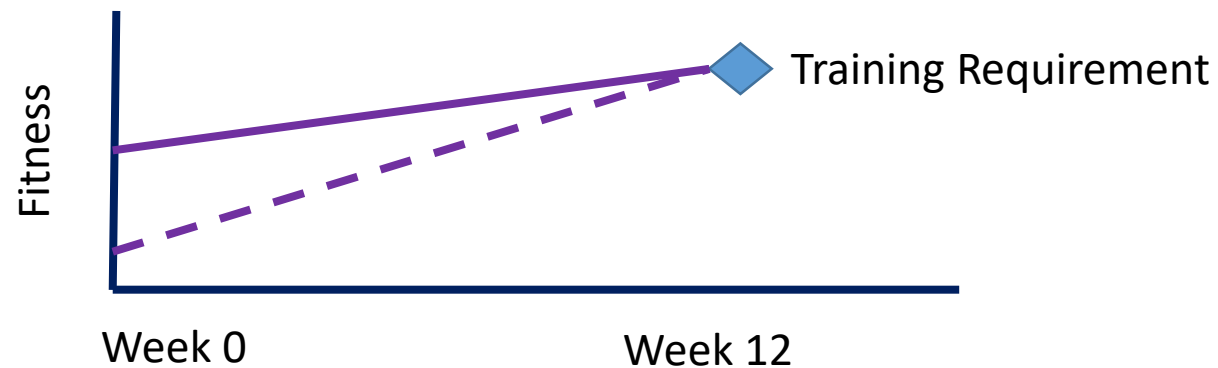
Most graduates are overweight or lack physical strength due to their sedentary lifestyles, with many also suffering from poor eyesight, according to the recruitment office.

http://news.xinhuanet.com/english/china/2013-08/13/c_132626013.htm



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Those joining are less fit
 - Increasing the challenge of making them fit enough for their service during the limited time period for training





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Unsurprising that new trainees are at a high risk of injury due to the sudden increase in physical conditioning requirements, the complexity of new physical tasks, reduced opportunity for recovery and resulting increased risk of overtraining (Booth et al., 2006: Kaufman et al., 2000: Knapik et al., 2011: Orr, 2014)



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Low fitness
 - Make the program longer?
 - Recruit training changed from 80d to 100d
 - More gradual increase load over first four weeks
 - Additional military field training and extended field phase
- Injury prevalence:
 - 80d = 17.8%
 - 100d = 13.9%
- Injury incidence:
 - 80d= 17.8 / 100 soldiers / 100 days
 - 100d: 17.4 / 100 soldiers / 100 days

Dawson, et al., (2015)



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Poor nutritional intake
 - Impacts of communal cooking
 - Cooking food in large quantities quickly as cheaply as possible
 - Food kept in containers for large groups / sharing food
 - Up to 10% found to be suffering from conjunctivitis or gastroenteritis



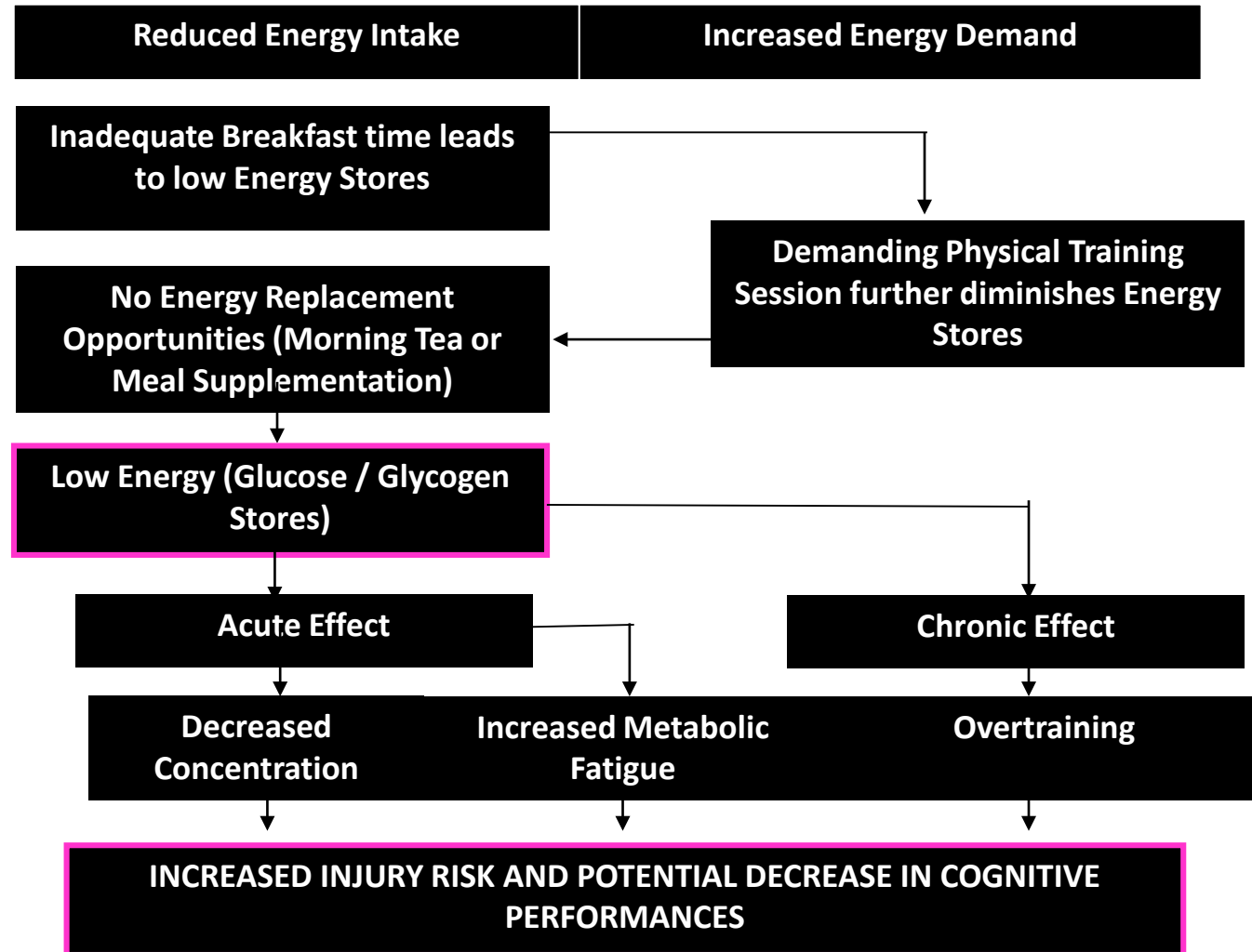
Orr & Moorby, (2006)



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Poor nutritional intake
 - Meal timings
 - 1 hour (1200-1300)
 - After marching to and from eating facility, standing in line for food, completing other tasks, preparing for next lesson (change of clothes, getting equipment, etc) and marching to the next lesson...
 - Recruits were found to have around 10 minutes in the eating facility of which an average of 5 minutes was actually spent eating

Orr & Moorby, (2006)





RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Poor sleep patterns
 - Lights out at 2200 – Reveille at 0600
 - 8 hours?
 - Falling asleep – just because work finishes doesn't mean recruits just fall asleep
 - Snoring, moving in the night – breaks sound sleep

Orr & Moorby, (2006)



RISK FACTORS TO THE NEW RECRUIT / TRAINEE

- Poor health
 - Cigarette smoking a know cause of injury risk in military trainees (Heir & Eide, 1997: Jones, et al., 1993: Kaufman et al., 2000)

Orr & Moorby, (2006)



RISK FACTORS DUE TO THE PROGRAM

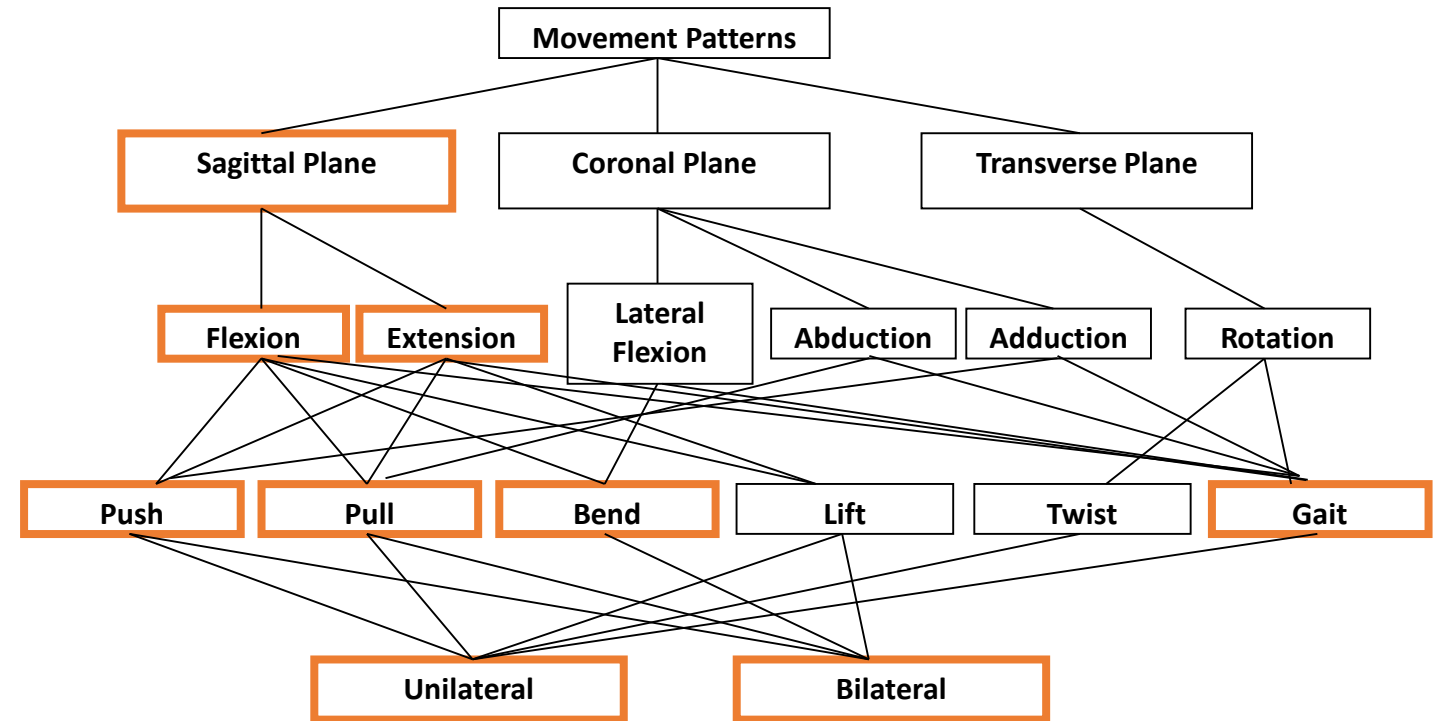
- Pattern Overload
- Excessive run mileage
- Informal loading
- One-size-fits-all approach
- Low synergy requirements





RISK FACTORS DUE TO THE PROGRAM

- Pattern Overload = overuse injuries





RISK FACTORS DUE TO THE PROGRAM

- Pattern Overload
 - Easy exercises to do (Run, sit up, push up)





RISK FACTORS DUE TO THE PROGRAM

- Pattern Overload
 - Train to pass tests (Run, sit up, push up)





RISK FACTORS DUE TO THE PROGRAM

- Excessive run mileage

- Trank (2001)

observed that exercise programs which employ high running mileages (> 25 miles) during basic training led to a higher potential for overuse injury than recruits who completed less overall running mileage (< 25 miles)

the additional mileage did not appear to increase aerobic fitness to a greater degree

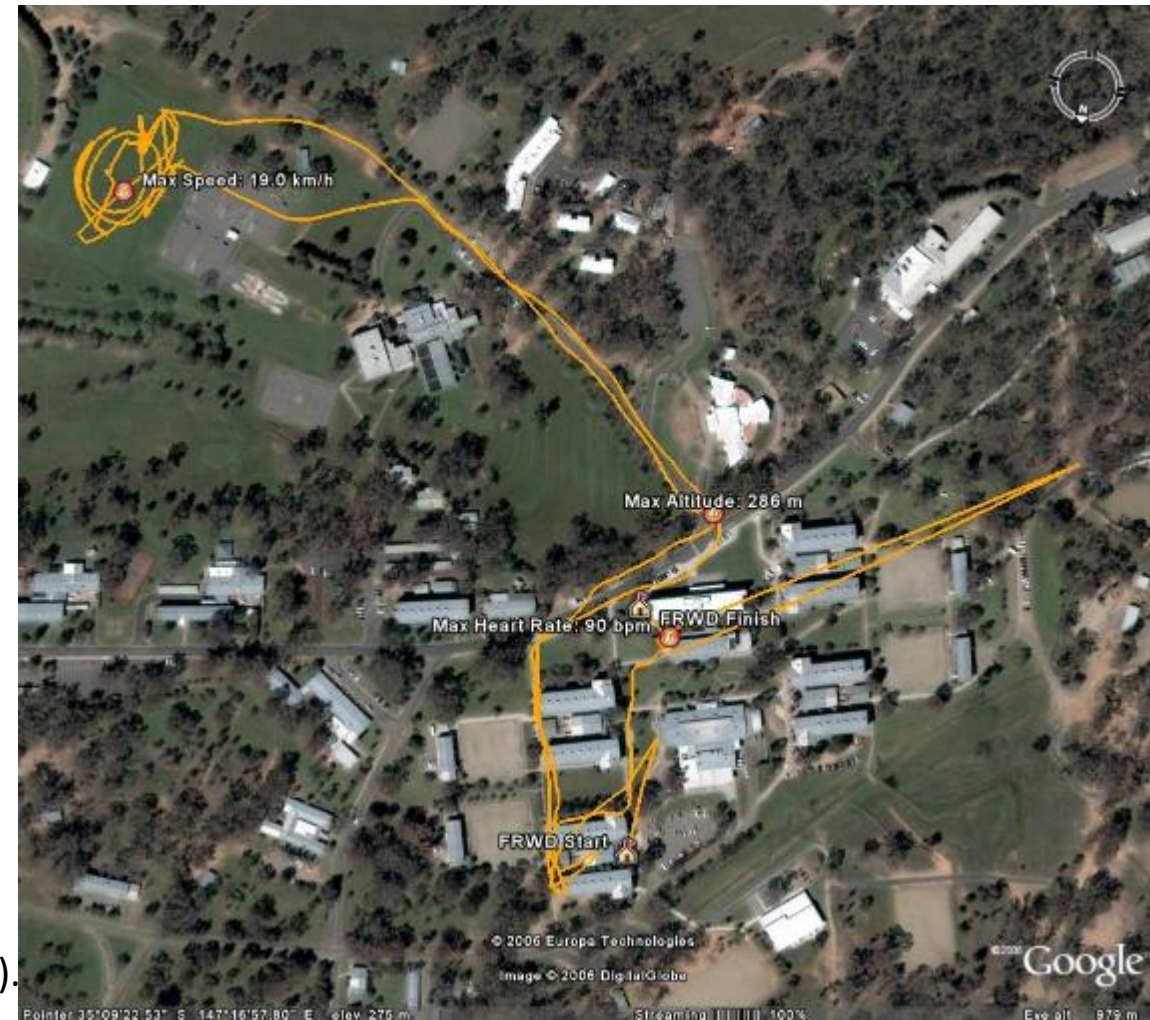
- Results confirmed by other studies (Fields, et al., 2010; Jones & Knapik, 1999; Sherrard, et al., 2002).





RISK FACTORS DUE TO THE PROGRAM

- Informal loading
 - Australian Army Study = Approx. 7.5km/day
 - US Army Study = Approx. 11km/day
 - Many new recruits direct from High School (ltd phys acty as seniors).



Orr & Moorby, (2006).



RISK FACTORS DUE TO THE PROGRAM

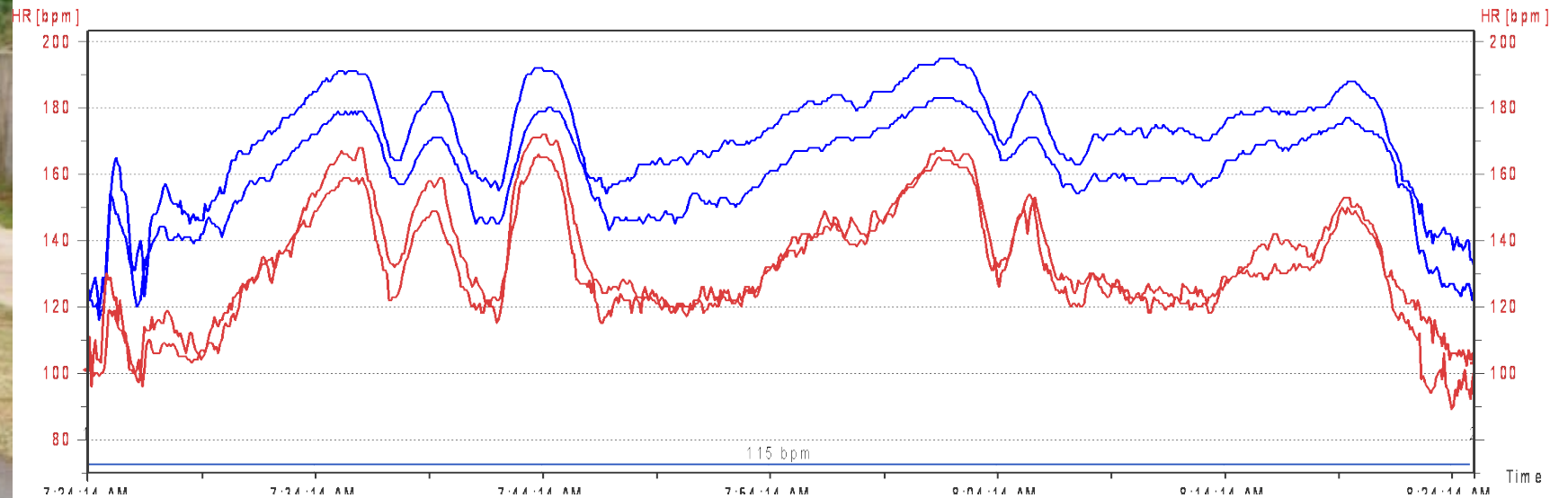
- One-size-fits-all
 - Much of the PT is group based (eg. Group march/run)





RISK FACTORS DUE TO THE PROGRAM

- One-size-fits-all
 - Much of the PT was group based (eg. Group march/run)
 - Work efforts mismatched



Orr, R. (2007)

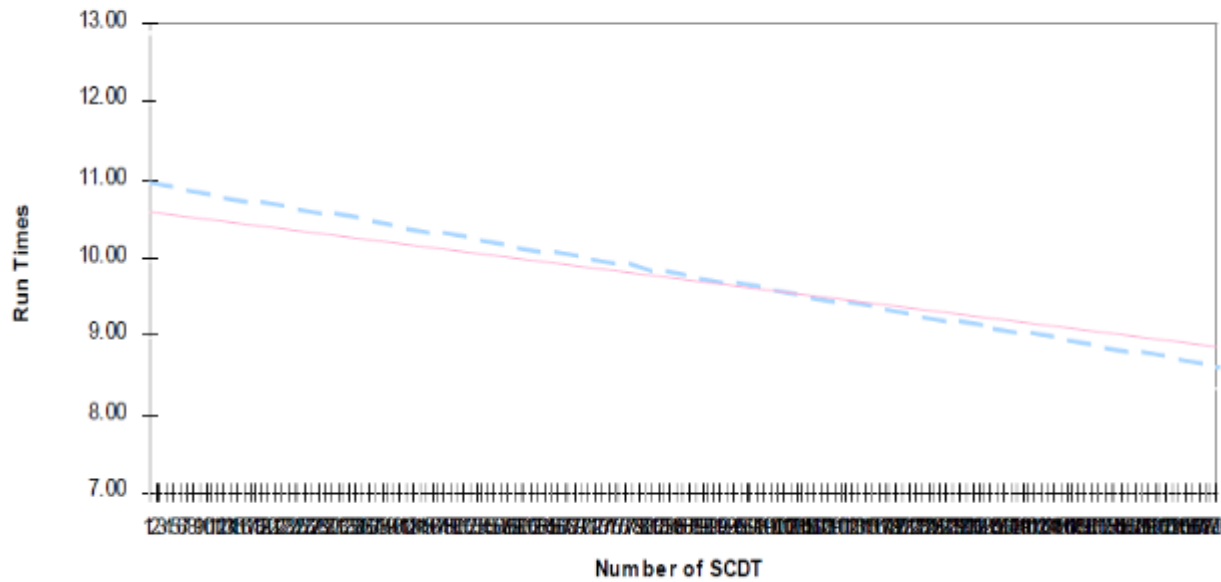


RISK FACTORS DUE TO THE PROGRAM

- One-size-fits-all
 - Much of the PT was group based (eg. Group march/run)
 - Work efforts mismatched
 - Plateauing in fitness

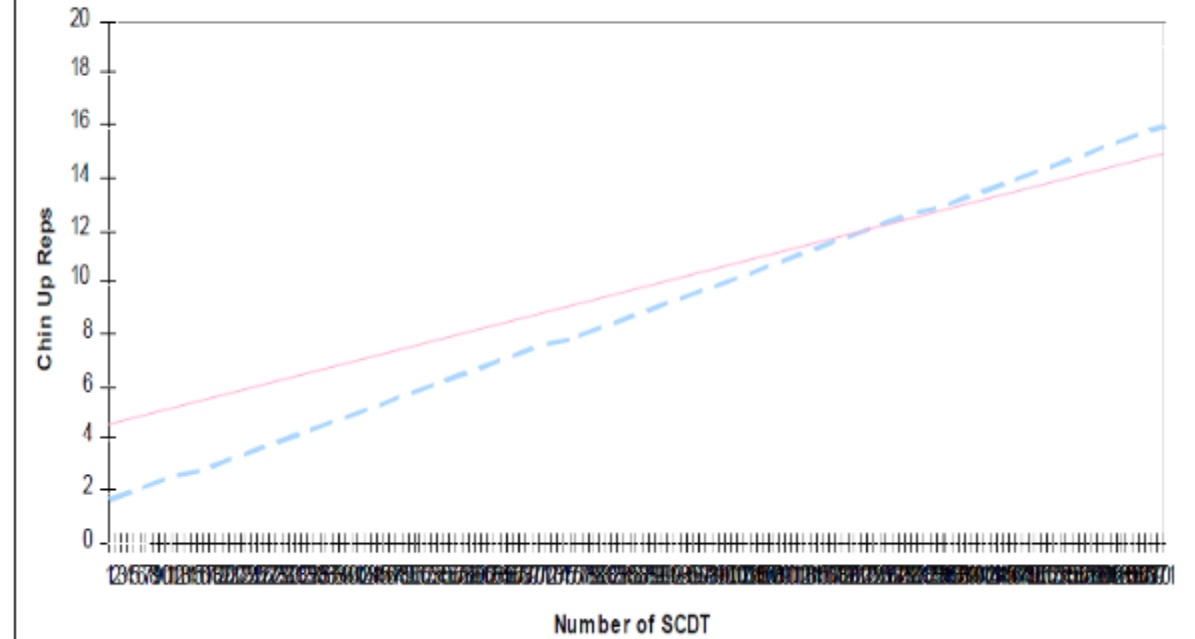


Male 2.4km Run



Orr, R. (2010)

Male Chin Ups

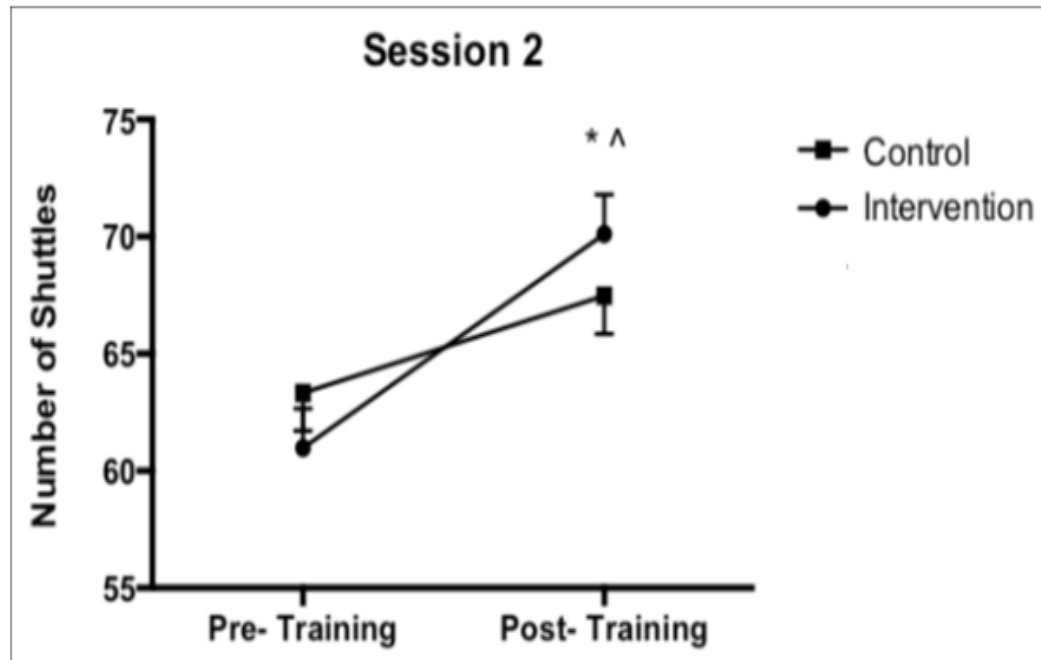




RISK FACTORS DUE TO THE PROGRAM

Ford, et al., (2015)

- One-size-fits-all – Ability Based Training

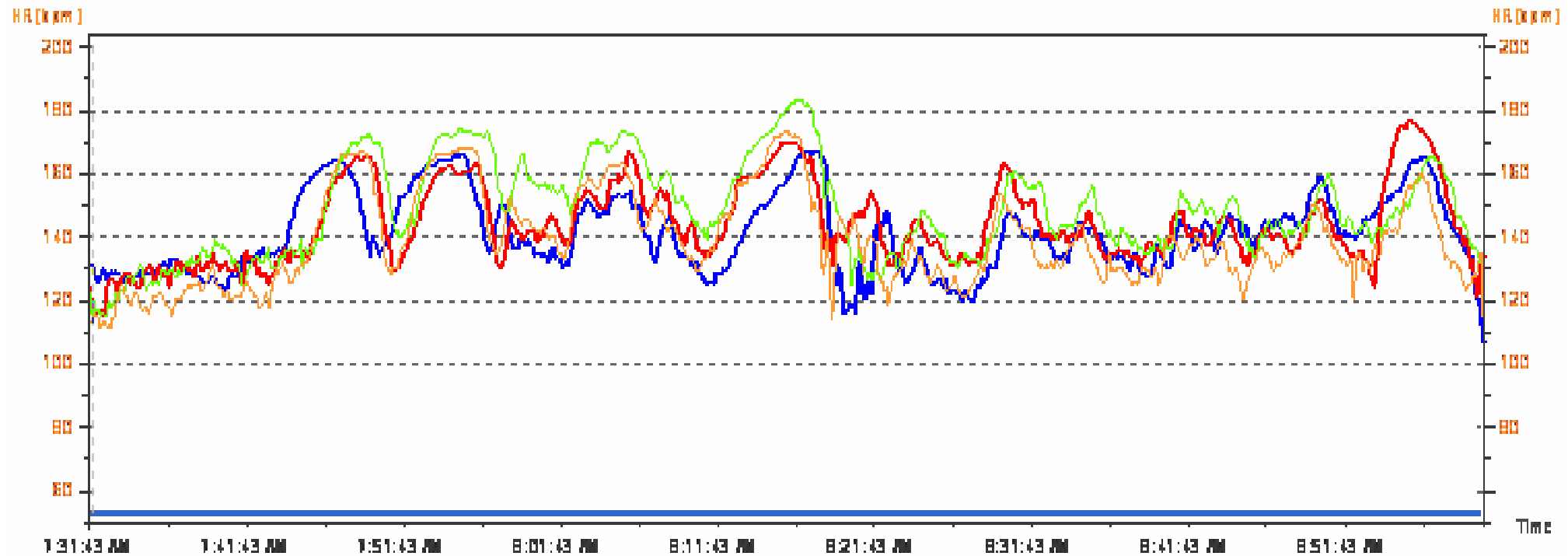


	Session 1		Session 2	
	Control	INT	Control	INT
Size n	29	25	118	115
Injuries n (%)	4 (14%)	1 (4%)	12 (10%)	7 (6%)
Injury site	Foot x1	Foot x 1	Foot x1	
	Knee x 2		Knee x 3	
	Back x 1			Back x 2
			Ankle x 2	Ankle x 1
			Calf x 1	Calf x 1
			Lower leg x 3	Lower leg x 2
			Wrist x 2	Finger x 1



RISK FACTORS DUE TO THE PROGRAM

- One-size-fits-all – Ability Based Training





RISK FACTORS DUE TO THE PROGRAM

- Program Induced Cumulative Overload (PICO)

INJURY PREVENTION

An Ongoing Series

Avoiding Program-Induced Cumulative Overload (PICO)

Robin Orr, PhD; Joseph J. Knapik, ScD; Rodney Pope, PhD

ABSTRACT

This article defines the concept of program-induced cumulative overload (PICO), provides examples, and advises ways to mitigate the adverse effects. PICO is the excessive cumulative physical workload that can be imparted to military personnel by a military training program with an embedded physical training component. PICO can be acute (accumulating within a single

and other accumulating factors may lead to overtraining and eventual injury.^{2,5-8} The purpose of this article is to define the concept of PICO, provide examples of its occurrence, consider key literature that usefully contributes to our understanding of this military training phenomenon, and suggest general principles to reduce the likelihood of PICO.



RISK FACTORS DUE TO THE PROGRAM

- Program Induced Cumulative Overload (PICO)
 - This is an unseen overload caused by the nature of the overarching training program
 - Includes additional kms/mi's covered marching around the area
 - Other physical activities (drill, weapons training, MUC)





RISK FACTORS DUE TO THE PROGRAM

- Program Induced Cumulative Overload (PICO)

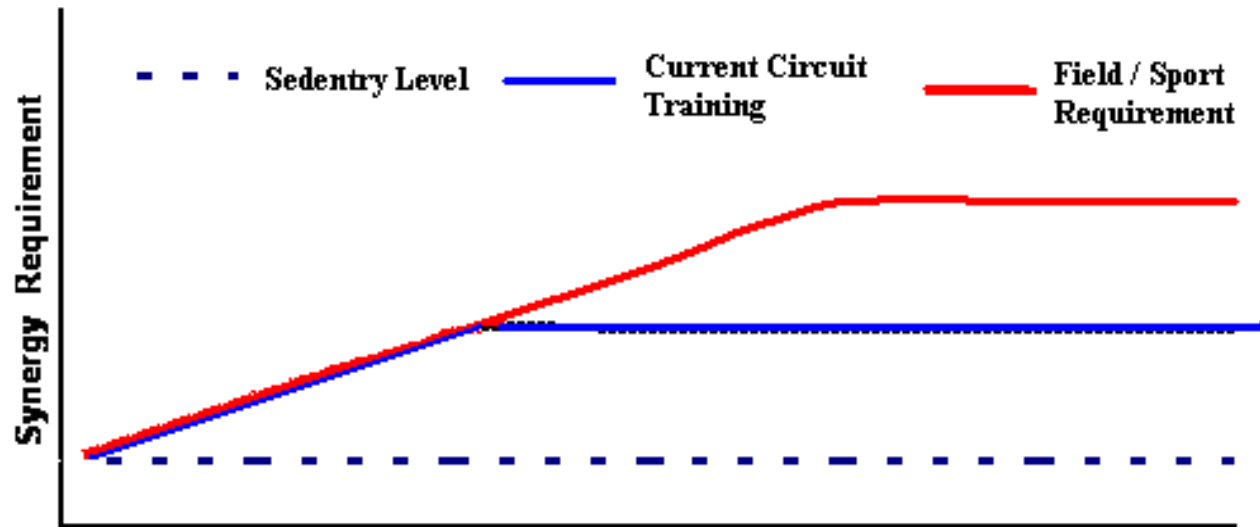
Day	Time	Activity	PT Lesson
y1	AM	Final Fitness Assessment (2p)	PT s1
	AM-PM	Navigation Day and Night Assessment (10p)	
y2	PM	In Lines Training	-
y3	AM	Rope Climbing (1p)	PT s2
	AM-PM	Navigation Day and Night Assessment (10p)	
y4	AM	Obstacle Course (2p)	PT s3
	PM	Individual Drill Assessment (2p)	
	PM	In Lines Training	
y5	AM	15 Km Endurance March (4p)	PT s4
	PM	Perform as a member in a section attack (3p)	
	PM	Swim 6 (1p)	



RISK FACTORS DUE TO THE PROGRAM

- Low synergy requirements

Level of Synergy Required for Different Activities



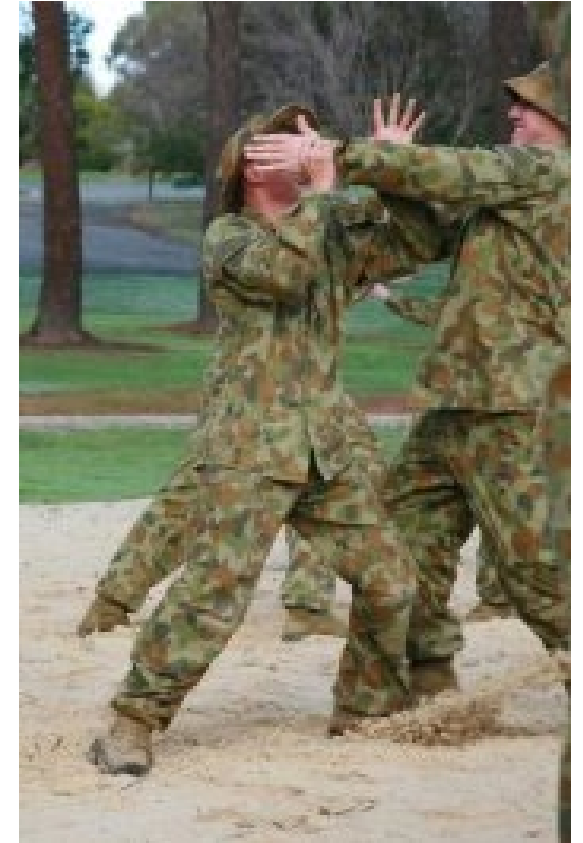
Orr, R. (2010).





PERIODISED TRAINING

- Because basic training programs are well defined
 - Length of training (e.g. 12 weeks)
 - Entry standards
 - Outcomes needed to complete training (end-state)
- ... Training programs for new recruits are easier to periodise





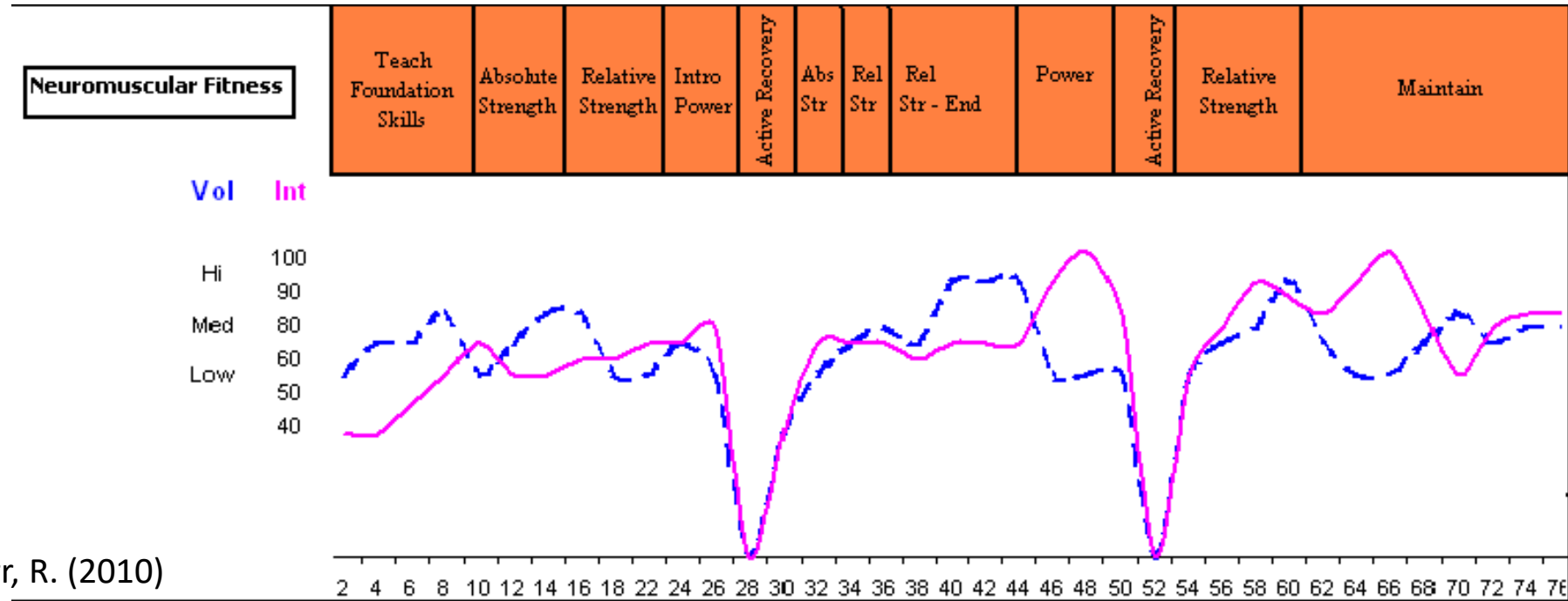
		Training Plan (18 Months)												
Phase of Training	Physical Development Phase (III CLASS)			Transition	Physical Hardening Phase (II CLASS)			Transition	Self Management and Corp Specific Phase (I CLASS)					
	Anatomical Adaptation	Complex Skills Development			Recond	Physical Hardening			Recond	Maintain	Corp Specific			
Sub Phase of Training														
Macrocycle	[Orange shaded area representing macrocycle blocks]													
Microcycle	[Cyan vertical stripes representing microcycle blocks]													
Individual Fitness and Healthy Lifestyle	Metabolic Fitness													
	Neuromuscular Skills and Fitness													
	Injury Prevention													
	Healthy Lifestyle Education													
	Personal Training and Fitness													
Military Specific Fitness	Load Carriage													
	Complex Warfighting Skills and Fitness													
Sports Specific Fitness	[Yellow shaded area]													
Remedial Training and Rehabilitation	[Magenta shaded area]													

Orr, R. (2010).



PERIODISED TRAINING

- Neuromuscular example

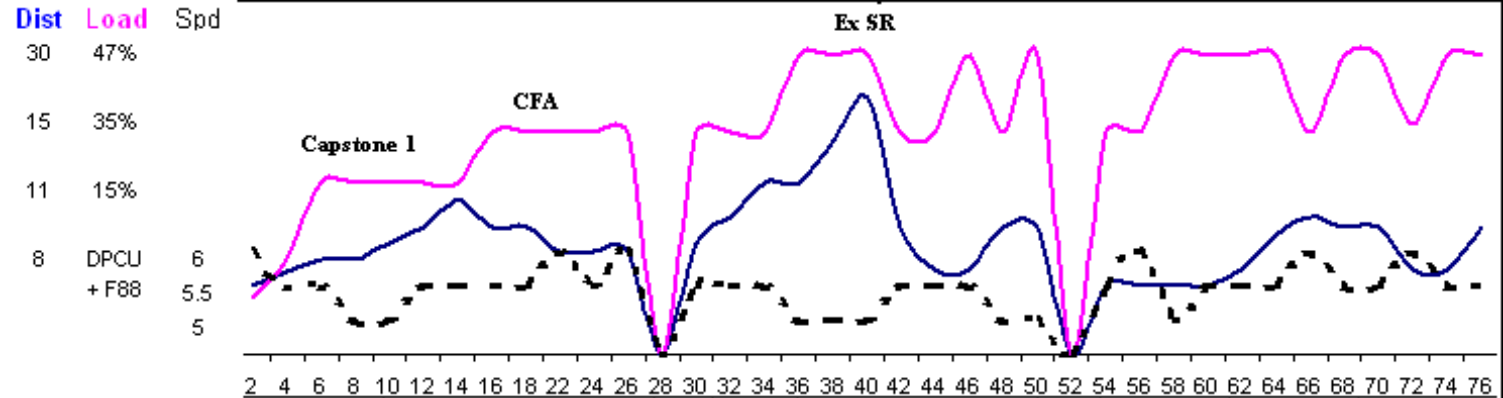




PERIODISED TRAINING

- Load Carriage example

		Training Plan (18 Months)										
Phase of Training	Physical Development Phase (III CLASS)			Transition Regen	Physical Hardening Phase (II CLASS)			Transition Regen	Self Management and Corp Specific Phase (I CLASS)			
	Anatomical Adaptation	Complex Skills Development			Recond	Physical Hardening			Recond	Maintain	Corp Specific	
Sub Phase of Training	Volume & Intensity	Volume	Intensity	Active Recovery	Vol & Int	Maint		Active Recovery	Int	Vol & Int		
Load Carriage Continuum												



Orr, R. (2010)



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士兵负重能力提升训练研究综述

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战术体能研究小组, 澳大利亚 昆士兰 4226)

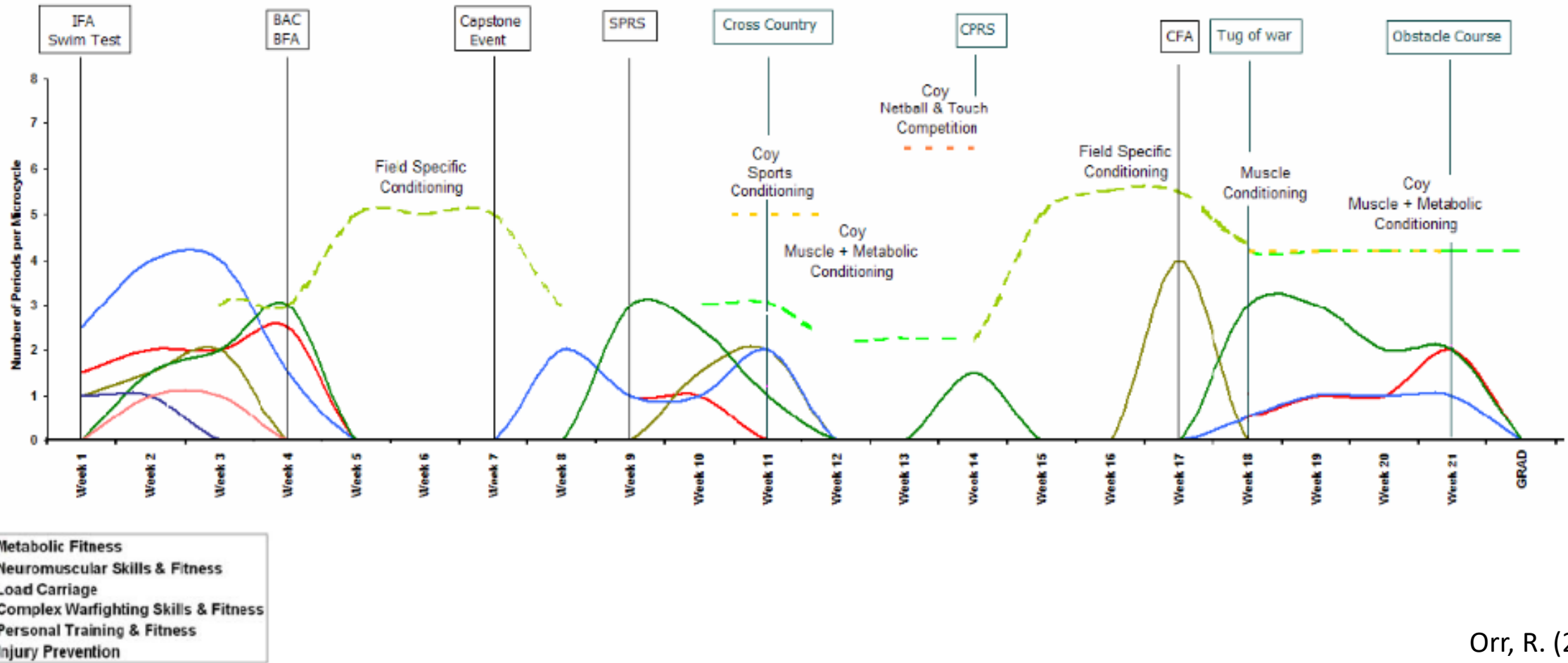
摘 要: 较大的负重不仅影响士兵的平衡性、移动速度及灵敏性, 降低任务执行效率和表现, 还可增加士兵受伤风险。士兵负重能力提升训练是降低负重负面影响, 减少负重相关损伤的重要途径之一。采用文献资料法, 对外军资料中介绍的士兵负重能力提升训练的指导原则, 方式、方法, 训练频率, 训练强度及训练持续时间进行了综述, 目的旨在为我军进行更好的负重能力提升训练, 增强战斗力, 减少训练损伤提供借鉴。

关键词: 有氧训练; 阻抗训练; 军队; 负重; 任务执行表现

中图分类号: G807.01

文献标识码: A

文章编号: 1671-1300 (2018) 01-0033-05



Orr, R. (2010)



		Physical Development Phase																				TOTAL				
		Anatomical Adaptation					Complex Skill Development																			
		Intro MI PT and Teaching Functional movement patterns Establish metabolic and neuromuscular base fitness					Progress from base into more military task orientated fitness (Load Carriage and Complex Warfighting skills and Fitness) Increase complexity of Neuromuscular skills										Obstacle negotiation under demanding situations MSD resilience preparation									
		Macrocycle 1		Macrocycle 2			Macrocycle 3			Macrocycle 4					Macrocycle 5					TOTAL						
Predicted Lesson Allocation %																				% of Trg						
Individual Fitness and Healthy Lifestyle	Metabolic Fitness	20		30			20			0										20		19				
	Neuromuscular Skills & Fitness	35		20			30			0										15		20				
	Injury Prevention	5		0			0			0										0		1				
	Healthy Lifestyle Education	10		15			5			0										15		9				
	Personal Training & Fitness	0		0			0			0										0		0				
Military Specific Fitness	Load Carriage	15		0			15			50									0		16					
	Complex Warfighting Skills & Fitness	10		35			30			50									50		35					
Sports Specific Fitness		5		0			0			0									0		1					
TOTAL (% of cycle)		100		100			100			100									100		100.0					
Lesson Allocations		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	GRAB	MSD	TOTAL	
Individual Fitness and Healthy Lifestyle	Metabolic Fitness	1.5	2	2	2.5				2	1	1	0			0				0.5	1	1	2	0		16.5	18.8
	Neuromuscular Skills & Fitness	2.5	4	4	1.5				2	1	1	2			0				0.5	1	1	1	0		21.5	24.4
	Injury Prevention	1	1	0	0				0	0	0	0			0				0	0	0	0	0		2	2.3
	Healthy Lifestyle Education	1	1	1	1				0	0	0	1			0				1	0	0	1	1		8	9.1
	Personal Training & Fitness	0	0	0	0				0	0	0	0			0				0	0	0	0	0		0	0.0
Military Specific Fitness	Load Carriage	1	1.5	2	0				0	0	1.5	2			1.5				0	0	0	0	0		13.5	15.3
	Complex Warfighting Skills & Fitness	0	1.5	2	3				0	3	2.5	1			1.5				3	3	2	2	0		24.5	27.8
Sports Specific Fitness		0	1	1	0				0	0	0	0			0				0	0	0	0	0		2	2.3
TOTAL (Number of lessons per microcycle)		7	12	12	8	0	0	0	4	5	6	6	0	0	3	0	0	4	5	5	4	6	1	0	88	100.0
		39 Periods							49 Periods																	

- Events:**
- Week 1: IFA, Swim Test
 - Week 3: Navex
 - Week 4: BAC, BFA
 - Week 7: Capstone Event
 - Week 9: SPRS
 - Week 11: Inter Coy Cross Country Competition
 - Week 14: CPRS Testing
 - Week 17: CFA (BB3B with ADFA SST)
 - Week 18: Inter Coy Tug of War Competition
 - Week 21: Inter Coy Obstacle Course Competition



		Anatomical Adaptation						
		Intro Mil PT and Teaching Functional movement patterns						
		Establish metabolic and neuromuscular base fitness						
		Macrocycle 1			Macrocycle 2			
	Predicted Lesson Allocation %							
Individual Fitness and Healthy Lifestyle	Metabolic Fitness	20			30			
	Neuromuscular Skills & Fitness	35			20			
	Injury Prevention	5			0			
	Healthy Lifestyle Education	10			15			
	Personal Training & Fitness	0			0			
Military Specific Fitness	Load Carriage	15			0			
	Complex Warfighting Skills & Fitness	10			35			
Sports Specific Fitness		5			0			
TOTAL (% of cycle)		100			100			
	Lesson Allocations							
Individual Fitness and Healthy Lifestyle	Metabolic Fitness	1.5	2	2	2.5			
	Neuromuscular Skills & Fitness	2.5	4	4	1.5			
	Injury Prevention	1	1	0	0			
	Healthy Lifestyle Education	1	1	1	1			
	Personal Training & Fitness	0	0	0	0			
Military Specific Fitness	Load Carriage	1	1.5	2	0			
	Complex Warfighting Skills & Fitness	0	1.5	2	3			
Sports Specific Fitness		0	1	1	0			
TOTAL (Number of lessons per microcycle)		7	12	12	8	0	0	0
		39 Periods						

Orr, R. (2010)



Year/Week	Activity/Event	Category	Phase	Level	Notes
2018/19
...
2019/20
...
2020/21
...
2021/22
...
2022/23
...
2023/24
...

Anatomical Adaptation
Complex Skills Development
Physical Hardening
Reconditioning
Maintenance
Corps Specific
Reconditioning

Leave Period | Semester Break Conditioning Program | Transition | Leave Period | Semester Break Conditioning Program | Transition

Misc. 1st Cond. Screen PRS Prep | Sports Specific Conditioning (SSC) AFL Focus
 Net Cond. XCT Prep | AFL Round Robin Comp
 Misc. Card XCT | SSC Tactical Task
 Net Cond. CRIS Prep | Medal & Touch Round Robin Comp
 1st Cond. T&W Prep | Live Shield Events

Orr, R. (2010)



W	DATE	DAY	MLO	TYPE	CLO	PERIODS	LESSON	Period
	26-Jan-08	Sat						
	27-Jan-08	Sun						
	28-Jan-08	Mon				AUSTRALIA DAY PWH		
	29-Jan-08	Tue						
	30-Jan-08	Wed						
	31-Jan-08	Thu						
1	01-Feb-08	Fri	ICT	Assessment	2.2.2.5a	III PT 1 (IFA)	PT INTRO HLM 1/IFA	3
	02-Feb-08	Sat		Assessment	2.2.2.5b	III PT 2 (swim test)	SWIM TEST/FORMATIONS	2
	03-Feb-08	Sun	2.2.2.6	AA	2.2.2.6a	III PT 3	HLM 2 (NU MNGWR COND 1)	2
	04-Feb-08	Mon		AA		III PT 4	FUNCT OCT 1	2
	05-Feb-08	Tue		AA		III PT 5	FAMIL RUN IFA RETEST	2
	06-Feb-08	Wed						
2	07-Feb-08	Thu		AA		III PT 6	END MAR1/CM 1 (INLINES)	2
	08-Feb-08	Fri		AA		III PT 7	AER COND 2/FUNCT 2	2
	09-Feb-08	Sat		AA		III PT 8	END MCH 2 / INLINES OCT	2
	10-Feb-08	Sun		AA		III PT 9	AER COND&PUSH-CORE	2
	11-Feb-08	Mon						
	12-Feb-08	Tue		AA		III PT 10	END MCH 3/PULL-LEGS	2
	13-Feb-08	Wed		AA		III PT 11	PUSH-CORE / HLM 3	2
	14-Feb-08	Thu		AA		III PT 12	END MCH 4/PULL-LEGS	2
	15-Feb-08	Fri		AA		III PT 13	FUNCT OCT 3	2
	16-Feb-08	Sat		AA		III PT 14	END MCH 5	2
	17-Feb-08	Sun		AA		III PT 15	FUNCT OCT 4	2
	18-Feb-08	Mon						
	19-Feb-08	Tue		AA		III PT 16	AER COND 4/RIFLE EX	2
	20-Feb-08	Wed				III PT 17	HLM 4	1
4	21-Feb-08	Thu		Assessment	2.2.2.5c	III PT 17 (BFA)	BFA	3
	22-Feb-08	Fri		AA		III PT 18 (Bay Cse)	BAYONET CSE- DEMO	2
	23-Feb-08	Sat						
	24-Feb-08	Sun						
	25-Feb-08	Mon				RANGE WEEK		
	26-Feb-08	Tue						
	27-Feb-08	Wed						
6	28-Feb-08	Thu						
	29-Feb-08	Fri						
	01-Mar-08	Sat						
	02-Mar-08	Sun						
	03-Mar-08	Mon						
	04-Mar-08	Tue						
6	05-Mar-08	Wed						
	06-Mar-08	Thu				FIELD CRAFT / EX FC / BB3A		
	07-Mar-08	Fri						
	08-Mar-08	Sat						
	09-Mar-08	Sun						
	10-Mar-08	Mon						
	11-Mar-08	Tue						
	12-Mar-08	Wed						
7	13-Mar-08	Thu						
	14-Mar-08	Fri				Ex Sattelburg (walk to RMC)		
	15-Mar-08	Sat						
	16-Mar-08	Sun						

Anatomical Adaptation

Orr, R. (2010)

BODY MVT PATTERN	PARRALLEL LIFT	UNILATERAL LIFT	PULL	PUSH	BEND 1	ROTATION	SHOULDER MOBILITY	BEND & LIFT
	SQUATTING	LUNGING	PULLING	PUSHING	UPPER CORE FLEXION	SPINAL ROTATION	ARMS ROM	BENDING
LEVEL - 4	Assisted Squat	Step Up	Cable Pull	1 Arm Cable Push	Ball Sit	SB Lower Partial	Wall Mil Press	SB Prone Hip Extn
LEVEL - 3	Sit/Stand Squat	Partials	Standing Pull Up	Wall Push Up	Pendulum	SB Circling	Rotators	SB Knee Bend
LEVEL - 2	Partial Squat	Iso Partial	Incl Pull Up	Incline Push Up	Breathing Sit Up	Upper/ Lower Twist	Arm Circling	SB Leg Curl
LEVEL - 1	SB Wall Squat	Static Lunge	Bent Leg Pull Up	Knee Push Up	1/4 BFA Sit Up	Grav res Upper/ Lower Twist	Window Washer	Kneeling Bend
LEVEL 0	Body Squat	Step Lunge	Lying Pull Up / 1 Arm Row	Push Up	BFA Sit Up	Russian Twist	Curl / Press / Extend	Body Dead Lift
LEVEL 1	Overhead Squat	Walk Lunge	Jump Hve	Push Up Arm Extn	Full Sit Up	Seated Wood Chop	MD Power-Up and throw	Loaded Deadlift
LEVEL 2	Weighted Squat	Directional Lunge	Hve Under/G	Decline Push Up	Halo Sit Up	MB twist and pass	High Pull/Push Press	Unilateral Loaded deadlift
LEVEL 3	MB Squat Pass	Lunge Arms Extended	Loaded Hve	MB Push Up	Weighted Full Sit up	Dynamic twist and pass	MB O/H Pass	Double Extension
LEVEL 4	1 Arm O/H Squat	Lunge Rotate	Mobile Hve	Clap Push Up	Bosu Full Sit up	Diagonal Mobile Wood Chop	Upright Row Press	Triple Extension



Take Home Messages

- Lower fitness levels, from less fit population, and excessive running cause recruit injuries
- Other factors like Program induced Cumulative Overload (PICO) and accommodation of seasonal variations must be controlled through consultation
- Once developed program becomes stable (No Ad Hoc Training / Programs and no JIT)
- Monitor recovery (Nutritional / Sleep)
- In training environments a well periodized training program can be used to meet targeted physical capability end-states
- The majority of injuries are musculoskeletal to the lower limbs and back (Shoulders?)
- Effective rehabilitation in the unit increasing fitness to greater than that at time of injury is important



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DESIGNING CONDITIONING PROGRAMS FOR TACTICAL TRAINEES



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