

AUT-SPRINZ & NZSCA Sport Technology Conference: The Load-Carriage Challenge in the New Zealand Army

- Soldiers routinely carry 25–50+ kg of operational equipment.
- Body armour, weapons, ammunition, water, communications and mission-specific systems increase total load.
- Heavy loads reduce mobility, increase fatigue, elevate injury risk and impair decision-making.
- Modern operations demand sustained physical performance under load.

PROBLEM

Load ↑ → Fatigue ↑
Injury Risk ↑
Mobility ↓
Operational Performance ↓

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Solutions: Building Load-Carriage Capacity

- Maximal strength development (lower body, trunk and upper body).
- Progressive load-carriage conditioning and exposure.
- Aerobic fitness to sustain prolonged movement.
- Movement efficiency and resilience training.
- Monitoring workload, recovery and readiness.

SOLUTION

Strength + Conditioning +
Load Exposure +
Recovery =
Enhanced Military Performance



Why Load Carriage Underpins Operational Effectiveness

- Enables tactical mobility across challenging terrain.
- Supports combat effectiveness throughout extended missions.
- Reduces musculoskeletal injury burden.
- Maintains cognitive performance under fatigue.
- Improves survivability and mission success.

OPERATIONAL DEPENDENCE

Move • Fight • Think
While Carrying Mission-Essential Loads



Why This Matters for the **New Zealand Army**

- Load carriage remains a fundamental military task.
- Strength and conditioning directly contribute to readiness.
- Physically prepared soldiers are more resilient and adaptable.
- Human performance optimisation protects capability and people.
- Workshop participants will handle body armour, webbing and representative military loads.

KEY MESSAGE

Stronger Soldiers =
More Resilient Soldiers =
More Effective Soldiers

New Zealand ARMY
NGĀTI TŪMATAUENGA

LOAD CARRIAGE. HUMAN PERFORMANCE. OPERATIONAL ADVANTAGE.

Why Physical Conditioning & Strength Training Are Essential in the Dynamic Human Performance World

AUT SPRINZ

NEW ZEALAND STRENGTH & CONDITIONING ASSOCIATION

20-MINUTE PRACTICAL WORKSHOP | EXPERIENCE THE LOAD. UNDERSTAND THE DEMAND. BUILD THE SOLUTION.

1. THE PROBLEM

Load carriage is non-negotiable in modern military operations.

HEAVY & VARIABLE LOADS
Soldiers routinely carry 25–40+ kg for extended durations across unpredictable terrain and climates.

PHYSIOLOGICAL & INJURY RISK
Load carriage increases energy cost by 20–40%, degrades movement patterns and is a major contributor to overuse injuries (low back, knees, ankles, feet).

PERFORMANCE CONSEQUENCES
Fatigue, reduced mobility, slower decision making and compromised lethality when physical capacity doesn't match the load.



TYPICAL NZ ARMY LOAD EXAMPLES

PATROL LOAD	PATROL + WATER/AMMO	SECTION LOAD
25–30 kg	30–40 kg	40+ kg

LOAD COMPOSITION (EXAMPLE – 35 KG)



2. SOLUTIONS

Train the person. Prepare the system. Build the capacity.

STRENGTH AS A FOUNDATION
Build maximal strength to enhance load tolerance, joint resilience and injury reduction.
Key: Squat | Hinge | Lunge | Push | Pull | Loaded Carry

SPECIFIC LOAD CARRIAGE PREPARATION
Progressive ruck/loaded march training improves efficiency, reduces metabolic cost and builds operational endurance.
Key: Progressive Overload | Terrain | Time on Feet

MOVEMENT QUALITY & RESILIENCE
Strong, mobile and stable athletes move better under fatigue and with load.
Key: Mobility | Core Stability | Ankle & Hip Resilience

RECOVERY & READINESS
Sleep, fuelling, hydration and stress management sustain performance and reduce injury risk.
Key: Recover | Refuel | Rehydrate | Repeat

MONITOR, MEASURE, ADAPT
Use data to individualise training and track progress.
Key: Strength | Endurance | Load Tolerance | Wellness

STRENGTH STANDARDS (INDICATIVE TARGETS)
For Effective Load Carriage

BACK SQUAT
≥ 1.5 x Body Mass

TRAP BAR DEADLIFT
≥ 2.0 x Body Mass

LOADED CARRY
≥ Body Mass for 200 m

RUCK MARCH
20 km in ≤ 3 hrs with 25 kg

VO_2 MAX
≥ 50 $ml \cdot kg^{-1} \cdot min^{-1}$

3. OPERATIONAL DEPENDENCE

Load carriage ability underpins everything we do.

MOBILITY & ENDURANCE
The ability to move further, faster and for longer across complex terrain.

LETHALITY
Stable, strong and controlled with our weapons when it matters most.

SURVIVABILITY
Physical resilience reduces injury risk and keeps soldiers in the fight.

DECISION MAKING & MENTAL TOUGHNESS
Physical capacity protects cognition, confidence and composure under stress.

MISSION SUCCESS
Fit, strong and resilient soldiers and teams create operational advantage.

4. WHY IT MATTERS

People are our most important capability.

DEFEND AOTEAROA
Our people must be ready to respond anytime, anywhere.

FOR OUR PEOPLE
Better prepared soldiers = healthier careers and lives.

PROFESSIONAL ADVANTAGE
Physical superiority translates to tactical and moral advantage.

ADAPT & WIN
In a complex, uncertain world – fitness, adaptability and grit are decisive.

STRONG TODAY. READY TOMORROW.
Invest in performance now, sustain operational effectiveness for the New Zealand Army.

PRACTICAL WORKSHOP EXPERIENCE

Feel the load. Understand the demand.



TRY ON BODY ARMOUR | **WEAR WEBBING & FEEL THE LOAD** | **LIFT & EXPERIENCE OUR WEAPONS** | **ASSEMBLE A PATROL LOAD**

ENGAGE. EXPERIENCE. APPLY.
Take the learning back to your athletes, teams and organisations.



PRESENTER: DR DAVID EDGAR
Physical Performance Specialist – New Zealand Army
PhD Sport & Exercise Science | Accredited S&C Coach | Tactical Athlete Practitioner

KEY TAKE-HOME MESSAGE
Build the capacity.
Carry the load.
Win the mission.

EVIDENCE BASE
Cotter, J. D. et al. (2018). *Int J Sports Physiol Perform*, 13(10), 1284–1290.
Lockie, R. G. et al. (2020). J Sci Med Sport, 23(10), 889–905.
Bullock, S. H. et al. (2012). Mil Med, 177(3), 293–301.
NZ Army Doctrine & Training Publications

The load-carriage challenge with the New Zealand Army: David Edgar

Notes