

Eccentric Quasi-isometric (EQI) Training

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(Heavy) Eccentrics

- Load \gg muscular force
 - Muscle lengthens
- Angus Ross and Jamie Douglas
 - Training with a load that accounts for eccentric strength ($>1RM$)

What Are Relevant Adaptations?

- Heavy eccentrics
 - Addition of sarcomeres in series = longer fascicles
 - Type 2 fibre type shift
 - Hypertrophy = increased CSA (\approx dynamic training)
 - Connective tissue remodelling (increased tendon stiffness and CSA)
 - Changes in t-tubule network handling of calcium
 - Cumulatively, right-shift in F-V curve and possible DOMS protective effects
 - Slow detraining (possibly due to proposed muscle molecular/cellular changes); weeks to several months?

(Not So Heavy) Eccentric Quasi-isometrics

- Load < muscular force, under normal conditions
 - Introduce fatigue (via prolonged isometric)
 - Muscle lengthens
- Training that manipulates eccentric velocity and volume
- Training that prepares for heavy eccentrics
 - And other training options that may take advantage of relevant adaptations e.g. power, plyometric
 - Perhaps best programmed as a preparatory phase preceding eccentrics/plyos; and as accessory/supplementary exercises
- Training that replaces heavy eccentrics in special pops
 - Unaccustomed or contraindicated pops e.g. clinical, youth?

Other Names?

- May also be termed, or comprise:
 - Fatiguing isometrics
 - Yielding isometrics/eccentrics
 - Duration-accentuated eccentrics
 - Velocity-based eccentrics?

What Are Relevant Adaptations?

- Isometrics (e.g. submaximal, fatiguing isometrics)
 - Mild blood flow restriction
 - Hypertrophy
 - Improvements in peak concentric force
 - Adaptations best at long muscle lengths (EQIs use short muscle lengths)
- Moderate-load eccentrics?
 - Theoretical rationale for similar types of adaptations to heavy eccentrics, though likely lesser in magnitude

EQIs Are Practical (Ease of Use)

- Lower loads; longer (slower) eccentric phase, thus low rate of torque increase and stretch velocity, include an isometric component
- BUT may produce some favourable adaptations in conjunction with ongoing dynamic training
 - Increased ROM (\approx loaded stretching)
- Arguably more practical
 - $<1\text{RM}$ loads; can do solo; body-weight or minimal loaded tasks; motor learning and movement control; less DOMS
- Need more research this space (Dustin Oranchuk, AUT; Anushka Bhargava, VU)

Practical Programming with EQIs

- When and where to use them?
 - In preparation for phases where initial adaptations may be advantageous (e.g. prior to slow, heavy eccentrics)
 - In populations where you might not want to use heavy eccentrics (young, clinical, rehab)
 - To add a motor control element to movement tasks
 - To add volume and variety
 - As a finisher in a session
 - As a loaded stretch

Practical Programming with EQIs

- Anecdotally ↓ DOMS vs heavy eccentrics, nil after 2-3 sessions
- May detrain slowly
- Try introducing a block of ~10 sessions (2-3 times per week for 3-4 weeks)
 - into high volume/hypertrophy
 - prior to strength phase
 - or prior to slow heavy eccentrics
 - possibly avoid prescribing during power/velocity
- Cover major &/or tight muscles 1-2 times per week
- Loads typically 40-80% of “1RM”

Split Into Two Groups

- Dustin – commercial gym
- Andre – this room
- Suggest teams split staff to get different exercises
 - 4-5 stations; you'll be doing EQIs so be prepared to work
 - We want you to note loads + times to isofail/eccentric fail (end ROM)
 - Note difference between intent to 'hold' or intent to 'push' and time to fail
 - Note differences between doing EQIs before or after dynamic training i.e. what context (preceding work) have you used them in?
 - Note differences between muscles/movements in time to fail

General EQI Protocol

- Aim for about 40-60 seconds of work
 - ~30 seconds of isometric until failure (noticeable isofail, into gradual eccentric)
 - Remaining ~10-30 seconds as eccentric
- For some tasks, 1 x warmup set: can you hold it isometrically for 30 seconds?
 - Isometric only; just try to refine the load to get ~30 sec isometric
 - If you got there easy, increase your load for first working set
- 2-3 x working sets (of one repetition)
 - Set 1, 30-40 isofail with 10-30 eccentric; refine load if needed
 - Sets 2 and 3, ~30-40 isofail and 10-30 eccentric to end ROM

General EQI Protocol

- Fatigue time will vary depending on preceding work, joint/muscle, start position, perhaps 'hold' vs 'push' approaches, muscle/joint being targeted (particularly the eccentric phase)
- You may see stepwise isometrics through initial ROM (rather than gradual eccentric) up to a point.... then runaway failure to end ROM
- Use of bands to support body mass tends to prolong the eccentric phase
- Single limb work enables LHS/RHS comparisons (how balanced are they)

General EQI Protocol

- You'll get to experience:
 - Dynamic exercise before EQIs (only 2 EQI sets)
 - Dynamic exercise after EQI (only 2 EQI sets)
 - 'Push' versus 'hold' – is there a difference?
 - LHS vs RHS comparison for isofail/eccentric fail (try using the same load for LHS and RHS)
 - 4-5 tasks per group; try to keep to time so we can rotate around at about the same time

Group 1 (in Commercial Gym)

- Go with Dustin; ~50 min to get through 4 exercises
- Number off 1-6
 - Single leg extension OR Single leg hack squat (2 EQI/side)
 - Hamstring curl/glute ham (4 EQI sets)
 - Barbell high bench pull + EQI OR barbell bentover row + EQI (2 EQI sets)
 - Max pushups + chest dip/high step chest dip (2 EQI sets)
 - Single leg calf raise on leg press machine OR smith machine with step (2 EQI/side)

Single leg extension OR single leg hack squat EQI

- In groups of three:
- Cycle through EQIs with:
 - 1 warmup set (30 sec isometric; refine load/start position)
 - 2 working sets of ~30:10-30 EQI per side
 - Alternate sides LHS, RHS, LHS, RHS... (no rest)
- When on your LHS, cue ‘push into the floor’
 - Actively push to maintain your place
- When on your LHS, cue ‘hold your position’
 - Client tries to hold their overall position, without yielding

Single leg extension OR single leg hack squat EQI

Athlete	Task + Load	Set 1 LHS Time to:		Set 1 RHS Time to:		Set 2 LHS Time to:		Set 2 RHS Time to:	
		Isofail	End ROM	Isofail	End ROM	Isofail	End ROM	Isofail	End ROM
1									
2									
3									
4									
5									
6									

Hamstring curl/glute ham EQI

- In groups of three
- Cycle through EQIs with:
 - 1 warmup set (30 sec isometric; refine load/start position)
 - 3 working sets of ~30:10-30 EQI

Hamstring curl/glute ham EQI

Athlete	Added Load?	Set 1: Time to		Set 1: Time to		Set 1: Time to	
		Isofail	End ROM	Isofail	End ROM	Isofail	End ROM
1							
2							
3							
4							
5							
6							

Barbell high bench pull + EQI OR barbell bentover row + EQI

- One group of three:
 - 2 x 10 high bench pull, 2:1 (2 min rest; 2nd set to failure)
OR 2 x 10 bentover row followed by
 - 2 sets of 30:10-30 EQI (2 min rest)
 - Try to pick a load you can get a 30 sec isometric with
 - Refine the load for the 2nd set if you couldn't get ~30 sec isofail
- Other group of three:
 - 2 sets of 30:10-30 EQI (2 min rest) followed by
 - 2 x 10 high bench pull, 2:1 (2 min rest; 2nd set to failure)
OR 2 x 10 bentover row

Barbell high bench pull + EQI OR barbell bentover row + EQI

Athlete	Pull/row Load	EQI Load		EQI Times (Time to isofail and time to end ROM)			
		Set 1	Set 2	Set 1 Isofail	Set 1 End ROM	Set 1 Isofail	Set 1 End ROM
	Set 2 ONLY ORDER?						
1							
2							
3							
4							
5							
6							

Max pushups + chest dip/high step chest dip EQI

- Do opposite order to pulls
- One group of three:
 - 2 sets of pushups (to failure) followed by
 - 2 sets of chest dips 30:10-30 EQI (2 min rest)
- Other group of three:
 - 2 sets of chest dips 30:10-30 EQI (2 min rest) followed by
 - 2 sets of pushups (to failure)

Max pushups + chest dip/high step chest dip EQI

Athlete	No of pushups	EQI Load		EQI Times (Time to isofail and time to end ROM)			
		Set 1	Set 2	Set 1 Isofail	Set 1 End ROM	Set 1 Isofail	Set 1 End ROM
	Set 2 ONLY ORDER?						
1							
2							
3							
4							
5							
6							

Single leg calf raise on leg press machine OR smith machine with step EQI

- In groups of three
- One person coach the other through EQIs, then cycle
 - 1 warmup set (30 sec isometric)
 - 2 working sets of ~30:10-30 EQI per side
 - Alternate sides LHS, RHS, LHS, RHS... (no rest)
 - Coach notes time to isofail, time to end ROM (ecc fail)
- When on your LHS, cue ‘push into plate/step’
 - Actively push to maintain your place
- When on your RHS, cue ‘hold your position’
 - Client tries to hold their overall position, without yielding

Group 2 (in AH216)

- Stay with André; ~50 min to get through 5 exercises
- Number off 1-6
 - Benchpress + cable chest fly EQI (2 EQI sets)
 - Chinups + lat pull (2 EQI sets)
 - Deficit Bulgarian split squat (4 EQI/side)
 - One leg, 'hold' the position without yielding
 - Other leg, 'push' into the floor
 - Goatbag good morning OR RDL/stiff-legged DL (4 EQI sets)

Benchpress + cable chest fly EQI

- One group of three:
 - 2 x 10 benchpress, 2:1 (2 min rest; 2nd set to failure) OR
2 sets of pushups (to failure) followed by
 - 2 sets of 30:10-30 EQI (2 min rest)
 - Try to load at around one-sixth to one-quarter of BP load
 - Will depend on cable stack weights and arrangement
- Other group of three:
 - 2 sets of 30:10-30 EQI (2 min rest) followed by
 - 2 x 10 benchpress, 2:1 (2 min rest; 2nd set to failure) OR
2 sets of pushups (to failure)

Benchpress + cable chest EQI

Athlete	Bpress Load (or total pushups)	EQI Load		EQI Times (Time to isofail and time to end ROM)			
		Set 1	Set 2	Set 1 Isofail	Set 1 End ROM	Set 1 Isofail	Set 1 End ROM
	Set 2 ONLY ORDER?						
1							
2							
3							
4							
5							
6							

Benchpress + cable chest EQI

Athlete	Bpress Load (or total pushups)	EQI Load		EQI Times (Time to isofail and time to end ROM)			
		Set 1	Set 2	Set 1 Isofail	Set 1 End ROM	Set 1 Isofail	Set 1 End ROM
	Set 2 ONLY ORDER?						
1	60 kg 1st	20	20	35	15	30	10
2	80 kg 2nd	25	25	33	18	30	12
3							
4							
5							
6							

Chinups (banded if needed) + lat pull EQI

- Do in the opposite order to benchpress/chest EQI
- One group of three:
 - 2 x chinups to failure (2 min rest)
 - Followed by 2 sets of 30:10-30 EQI (2 min rest)
- Other group of three:
 - 2 sets of 30:10-30 EQI (2 min rest)
 - Followed 2 x chinups to failure (2 min rest)

Chinups (banded if needed) + lat pull EQI

Athlete	Chin Load (body mass) + reps	EQI Load		EQI Times (Time to isofail and time to end ROM)			
		Set 1	Set 2	Set 1 Isofail	Set 1 End ROM	Set 1 Isofail	Set 1 End ROM
	Set 2 ONLY BAND? ORDER?						
1							
2							
3							
4							
5							
6							

Chinups (banded if needed) + lat pull EQI

Athlete	Chin Load (body mass) + reps	EQI Load		EQI Times (Time to isofail and time to end ROM)			
		Set 1	Set 2	Set 1 Isofail	Set 1 End ROM	Set 1 Isofail	Set 1 End ROM
	Set 2 ONLY BAND? ORDER?						
1	55kg 10 reps Red band 1st	50	40	25	10	30	14
2	80kg 12 reps No band 2nd	70	80	45	20	35	15
3							
4							
5							
6							

Deficit Bulgarian split squat EQI

- Pair off in your group of 6
- One person coach the other through EQIs, then swap
 - 1 warmup set (30 sec isometric)
 - 2 working sets of ~30:10-30 EQI per side
 - Alternate sides LHS, RHS, LHS, RHS... (no rest)
 - Coach notes time to isofail, time to end ROM (ecc fail)
- When on your LHS, cue ‘push into the floor’
 - Actively push to maintain your place
- When on your RHS, cue ‘hold your position’
 - Client tries to hold their overall position, without yielding

Deficit Bulgarian split squat EQI

Athlete	Added Load?	Set 1 LHS Time to:		Set 1 RHS Time to:		Set 2 LHS Time to:		Set 2 RHS Time to:	
		Isofail	End ROM	Isofail	End ROM	Isofail	End ROM	Isofail	End ROM
1									
2									
3									
4									
5									
6									

Deficit Bulgarian split squat EQI

Athlete	Added Load?	Set 1 LHS Time to:		Set 1 RHS Time to:		Set 2 LHS Time to:		Set 2 RHS Time to:	
		Isofail	End ROM	Isofail	End ROM	Isofail	End ROM	Isofail	End ROM
1	BW+20	35	15	25	10	30	14	25	12
2	BW; BW+20	40	20	45	25	35	15	30	16
3									
4									
5									
6									

Goatbag/Barbell good morning OR RDL/stiff-legged DL EQI

- In groups of three, versus each other
 - One group of three goes, then swap
- 1 warmup set (30 sec isometric)
 - 3 working sets of ~30:10-30 EQI
 - Coach notes time to isofail, time to end ROM (ecc fail)

Goatbag/Barbell good morning OR RDL/stiff-legged DL EQI

Athlete	Added Load?	Set 1: Time to		Set 1: Time to		Set 1: Time to	
		Isofail	End ROM	Isofail	End ROM	Isofail	End ROM
1							
2							
3							
4							
5							
6							

Take Home Message - EQIs

- An isometric contraction until fatigue, then actively attempting to hold isometry during the gradual eccentric that follows
- EQIs appeal as a practical method to introduce eccentrics with lower absolute loads, and loaded stretching, into training programs
- They do not replace heavy eccentrics (“training with/for eccentric strength”)
 - They may use half or less of the absolute load of heavy eccentrics
 - Tend to involve movements that can be held (isometrically and eccentrically) for prolonged time (~30 and 10-30 seconds, respectively)
 - May be most practical as preparatory training for phases to come i.e. heavy eccentrics, and for populations where you may not program heavy eccentrics

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