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POSSIBLE FACTORS STIMULATING MUSCLE GROWTH

1. MUSCLE DAMAGE: This was once the prevalent theory of muscle growth, and it was intellectually elegant and made logical sense. It just turned out to be incorrect. Experiments with muscle damage in the absence of mechanical stimulus led to no muscle growth (even to muscle loss in some cases) while others found muscle growth even in the absence of muscle damage. While muscle damage does lead to an increase in protein synthesis, it is not used to add new tissue; only to repair the damage. **Muscle damage is thus NOT a good growth promoter.**

2. MECHANICAL TENSION: Much more likely is the tension imposed on muscle fibers. This mechanical stress activates several pathways leading to muscle growth like the mTOR and PI3K/Akt pathways by increasing protein synthesis used to add muscle tissue.

3. METABOLIC FACTORS: Local increase of growth factors (IGF-1, MGF for example) in response to metabolic changes occurring during training (increase in lactate, ions accumulation, oxygen deprivation). These growth factors also activate the PI3/Akt pathway leading to an increase in protein synthesis. However, increasing those growth factors without mechanical tension doesn’t lead to much growth.

* Growth factors and crops growing analogy
MECHANICAL TENSION: THE MAIN DRIVER OF HYPERTROPHY

The key is thus mechanical tension per fiber. The more mechanical tension is imposed on an individual fiber, the more it is stimulated to grow.

To be precise, to be maximally effective, a repetition must recruit as many muscle fibers as possible (especially the high threshold motor units) then impose the highest possible amount of mechanical tension on those recruited fibers. A repetition where both conditions are present are said to be an “effective rep”.

Then it becomes a matter of performing enough of those effective reps to trigger the growth processes.

We must first understand that internal mechanical stress or tension is NOT the same thing as external force or movement force production.

For example, in an explosive lift against a light load (or no added load like with jumps) the movement force production is high (Force = Mass x Acceleration), muscle fiber recruitment is also very high (during explosive movements, the HTMU are recruited) yet there is pretty much no growth stimulation. Why? Because the high velocity makes it impossible to impose a large internal mechanical load on each fiber. You just cannot create as many actin-myosin cross-bridges which leads to a low mechanical tension.
MECHANICAL TENSION: THE MAIN DRIVER OF HYPERTROPHY

To have a high amount of mechanical tension you must essentially have 2 elements present:

1. Having to resist or overcome a stretching/lengthening force (dependent on the external load)
2. Having a slow contraction speed (or no movement like in the case of isometrics)

That ensures that, for the recruited fibers, mechanical stress will be high.

It doesn’t ensure maximal fiber recruitment though, that is a function of how hard the repetition is compared to your capacity. This can be increased either via the magnitude of the load to overcome or by the fatigue that accumulates during the set which makes you weaker.

By the way, when I mention a slow contraction speed, going slow on purpose with an easy weight will not work. The speed has to be slow because the resistance to overcome is challenging compared to your capacity to overcome it.

The reason is that if you go slow on purpose, you reduce force production which decreases muscle fiber recruitment. So, while the recruited fibers (which will only be the slow twitch fibers which cannot really grow) do have a high level of internal tension (because the slow speed allows for a lot of cross-bridges formation) you don’t recruit enough growth prone fibers to stimulate hypertrophy.
The speed will be faster during the first reps because the load is relatively light. This requires low force so you don’t have a lot of muscle fibers brought into play, and none of the fast-twitch fibers. If you try to accelerate as much as you can on those easy reps you will have a higher fast-twitch fibers recruitment but lower tension which still makes those early reps ineffective at stimulating growth.

As fatigue sets in, speed slows down which allows the formation of more bridges and a greater internal tension per muscle fiber. Increasing the effect on hypertrophy.

Therefore, if you reach a point where you cannot do one more repetition in your set, the last 5 reps will be effective for growth.

And this number doesn’t change depending on the number of repetitions (unless you do less than 5). If you reach the same effort level (no reps in reserve) your set will provide you with 5 effective reps, regardless of the total number of reps in your set.
EFFECTIVE REPS

ANOTHER WAY TO LOOK AT EFFECTIVE REPS

1. When the load on the bar represents more than 80% of the amount of weight you can lift at the beginning of that rep that rep will be an effective rep because it will be recruiting the fast-twitch fibers and the speed will be slow enough to provide the proper level of tension on the fibers.

2. Each repetition causes a certain level of fatigue (1 to 4% depending on the weight, but by an average of 3% for reps in the 6-12 range) which makes you weaker from rep to rep.

3. Because the load on the bar doesn’t change, the relative load of the bar (% of your capacity at the beginning of a rep) increases with fatigue.

For example:

LOAD ON THE BAR = 70%

<table>
<thead>
<tr>
<th>Rep</th>
<th>% of your strength potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rep 1</td>
<td>70%</td>
</tr>
<tr>
<td>Rep 2</td>
<td>73%</td>
</tr>
<tr>
<td>Rep 3</td>
<td>76%</td>
</tr>
<tr>
<td>Rep 4</td>
<td>79%</td>
</tr>
<tr>
<td>Rep 5</td>
<td>82%</td>
</tr>
<tr>
<td>Rep 6</td>
<td>85%</td>
</tr>
<tr>
<td>Rep 7</td>
<td>88%</td>
</tr>
<tr>
<td>Rep 8</td>
<td>91%</td>
</tr>
<tr>
<td>Rep 9</td>
<td>94%</td>
</tr>
<tr>
<td>Rep 10</td>
<td>97%</td>
</tr>
<tr>
<td>Rep 11</td>
<td>100%</td>
</tr>
</tbody>
</table>

Reps 5-6 would be moderately effective (FT are recruited but still fairly easy. And reps 7-11 would be maximally effective. Reps 1-4 would essentially be “pre-fatigue” reps.
WHAT CAUSES MUSCLE GROWTH?

We can make the following observations:

1. Regardless of the load (as low as 30% and as high as 85% of 1RM), if you go to the same effort level (1 RIR) your set will provide you with 5 maximally stimulating repetitions.

2. The reps performed prior to the last 5-6 repetitions of a set are essentially “pre-fatigue” repetitions that are used to create the fatigue that will force more muscle fibers to be recruited and speed to slow down. Leading to the optional growth conditions.

3. We can thus say that reps from 5 to 20 (we could argue for 6 rather than 5 as the first rep could be suboptimal due to poorer activation) will have a significant and fairly similar effect on muscle growth.

4. However, having to do a lot of repetitions to get to those 5 money reps leads to a greater central fatigue, which can have a negative impact on the overall quality of your workout: as central fatigue increases it becomes harder and harder to recruit the HTMU, making the sets performed in that set sub-optimal.

5. For that reason, sets of 6-10 repetitions would be the ideal zone to train for hypertrophy. With occasional bouts as high as 12 reps on smaller movements (which are less at risk of causing central fatigue).
A “normal” repetition has three main phases:

THE ECCENTRIC PHASE: where the muscle is lengthening while under tension

THE CONCENTRIC PHASE: where the muscle is shortening while under tension

THE STRETCH OR TRANSITION PHASE: the point where the muscle is at its most lengthened position, just prior to reversing the movement
THE VALUE OF EACH PHASE OF A REPETITION

It is interesting to note that all three phases can contribute to stimulating hypertrophy and do it slightly differently.

1. The fast-twitch fibers are preferentially recruited during the eccentric phase of a movement.

2. LESS total fibers are used during the eccentric phase

3. More muscle damage is caused during the eccentric phase

4. The fiber recruitment and level of tension are not decreased when you try to voluntarily go very slow (different than during the concentric phase)

5. You can thus make the eccentric phase more effective by going slower, but going too slow might force you to use less weight, making the concentric phase less effective.

6. The eccentric phase increases hypertrophy via an increase in sarcomere in series, creating a bit more growth at the distal (close to the tendon) portion of the muscle.

7. The eccentric phase can help develop tendons better than the concentric
THE VALUE OF EACH PHASE OF A REPETITION

It is interesting to note that all three phases can contribute to stimulating hypertrophy and do it slightly differently.

1. Muscle fibers are recruited according to the size principle.
2. The number of fibers recruited increases with an increase in effort level.
3. As concentric speed slows down during a set, tension increases.
4. If you go slower on purpose, you increase tension, but only recruit slow twitch and some intermediate fibers.
5. By going slow on purpose you thus don’t get any hypertrophy benefit because the higher tension is placed only on fibers with low growth potential.
6. Going slow on purpose can be effective at improving movement quality and mind-muscle connection (good strategy for beginners).
THE VALUE OF EACH PHASE OF A REPETITION

It is interesting to note that all three phases can contribute to stimulating hypertrophy and do it slightly differently.

1. “The muscle being stretched the most is the muscle being stimulated the most”
2. Intense stretch (stretching under tension) can stimulate hypertrophy\(^a,b,c\) (stretch-induced hypertrophy)
3. Loaded stretch can develop tendons
4. Holding the loaded stretch position on a rep for 2-3 seconds can negate the stretch reflex, increasing muscle contraction at the beginning of the concentric phase
5. “Bouncing” (using the stretch reflex) can increase fast-twitch fiber recruitment and increase tension at the start of the rep but decrease it overall


DOES THE WAY YOU PERFORM YOUR REPS MATTER?

As we’ve seen, provided that you reach the same effort level in your sets, anything from 6 to around 30 reps can give the same amount of hypertrophy (at least on a set-to-set basis).

And we now understand that for reps to be effective you must reach a point where the speed slows down even when trying to push hard. Not only that, but controlling the eccentric is superior to both a fast eccentric and a super-slow eccentric, at least for hypertrophy.

1. If you perform the “easy” reps of the set with maximum concentric acceleration, these repetitions can have a positive effect on power production (fast and slow reps have a different recruitment pattern). So, the first half of a set of 10 can be effective for power and when reps slow down in the second half, they become effective for hypertrophy.

2. If you perform the “easy” reps more slowly on purpose you can improve movement quality, better target the muscle and get superior motor learning while still getting 5 effective reps the end of your set.

3. If you pause 1-2 seconds when the muscle is in its lengthened position, you can trigger a bit more growth through stretch-induced hypertrophy.

4. If you use the rebound in the lengthened position, you can develop your capacity to use the stretch reflex
**Body type:** Individuals with long limbs/a short torso will not benefit from the same strategy as those with shorter limbs and a longer torso.

**Hypertrophy strategy/mechanism:** Mechanical tension vs. Metabolic factors
BODY TYPE

LONG LIMBS/SHORT TORSO

When it comes to « pressing muscles » people will longer limbs will be more effective at stimulating the pectorals and triceps will be the hardest to develop.

In order:

- **Easiest**: Pectorals
- **Middle**: Deltoids
- **Hardest**: Triceps

As such they don’t require as much direct work for the pectorals or modifications to put the chest in a favorable position.

SHORT LIMBS/LONG TORSO

When you have shorter limbs, the triceps will be in a mechanical advantage when pressing. Depending on shoulder width, the deltoids can also be at an advantage. And the pecs are the hardest to develop.

In order:

- **Easiest**: Triceps (if narrow clavicle) / Deltoids (if wide clavicle)
- **Middle**: Deltoids (if narrow clavicle) / Triceps (if wide clavicle)
- **Hardest**: Pectorals

Compared to the long limbs lifters, they will need more targeted work for the pectorals and to adjust the big basics to focus on the pecs.
TRAINING STRATEGY

MECHANICAL FACTORS

*Lengthening/stretching then contracting the muscle fibers while they are under high tension

*The muscle being stretched the most will be the muscle being stimulated the most.

*We must go with exercises what puts a lot of load on the muscle and in which this muscle is lengthened as much as possible (while it’s still under load)

*Heavier loads (6-10 reps per set)

*Rest/pause

METABOLIC FACTORS

*Keeping the target muscle(s) under constant tension

*Ideally a peak contraction exercise

*Higher reps and longer TUT (10-15 reps/40-60 seconds)

*Combo sets/mechanical drop sets/drop sets

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**PROPORTIONS**

*The quickest tool to select the right exercises*

**LEG/HEIGHT RATIO**

Measure from the foot to anterior sacro-iliac spine (or posterior) and compare to height

- Short legs = 40-43% of height
- Average legs = 44-47% of height
- Long legs = 47-51%+ of height

**TIBIA/FEMUR RATIO**

- Tibia = from the malleolus to the patella
- Femur = from the patella to anterior sacro-iliac spine

- Short Tibia = -75-78% of femur
- Average Tibia = 79-84% of femur
- Long Tibia = 85%+ of femur
## LEG LENGTH/HEIGHT RATIO

### LENGTH OF THE LEGS AND EXERCISE SELECTION

<table>
<thead>
<tr>
<th>SHORT LEGS 40-43%</th>
<th>AVERAGE LEGS 44-47%</th>
<th>LONG LEGS 47-51%+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantage on anterior chain exercises</td>
<td>* Look at tibia/femur ratio</td>
<td>Advantage on posterior chain exercises</td>
</tr>
<tr>
<td>Disadvantage on posterior chain exercises</td>
<td>Short or average tibia = long legs strategies</td>
<td>Disadvantage on anterior chain exercises</td>
</tr>
<tr>
<td>Needs more assistance for the deadlift</td>
<td>Long tibia = short legs strategies</td>
<td>Needs more assistance for the squat</td>
</tr>
<tr>
<td>Needs less assistance for the squat</td>
<td></td>
<td>Needs less assistance for the deadlift</td>
</tr>
<tr>
<td>Order for easiest muscles to develop</td>
<td></td>
<td>Benefits from more unilateral work</td>
</tr>
<tr>
<td>1. Quads</td>
<td></td>
<td>Order for easiest muscles to develop:</td>
</tr>
<tr>
<td>2. Calves</td>
<td></td>
<td>1. Glutes</td>
</tr>
<tr>
<td>3. Hamstrings</td>
<td>2. Hamstrings</td>
<td></td>
</tr>
<tr>
<td>4. Glutes</td>
<td>3. Quads</td>
<td></td>
</tr>
</tbody>
</table>

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**PROPORTIONS**

**ARM SPAN/HEIGHT RATIO**

ARM SPAN = arms extended, from finger tip to finger tip

Short arms = less than height
Average arms = equal to or up to+ 1.5” (4 cm) longer than height
Long arms = over 1.5” (4 cm) longer than height

**ULNA/HUMERUS RATIO**

Short ulna = 75-78% of humerus
Average ulna = 79-84% of humerus
Long ulna = 85%+ of humerus
# Arm Span/Height Ratio

## Length of Arms and Exercise Selection

<table>
<thead>
<tr>
<th>Short Arms</th>
<th>Average Arms</th>
<th>Long Arms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than Height to 1” longer than height</td>
<td>Equal to or up to 1.5” longer than height</td>
<td>Over 1.5” longer than height</td>
</tr>
</tbody>
</table>

- **Mechanical advantage in pushing movements**
- **Disadvantage in pulling movements**
- **Needs less DB and unilateral movements**
- **Muscles that pull (in order)**
  1. Biceps
  2. Traps
  3. Rhomboids/posterior deltoids
  4. Lats
- **Muscle that push**
  1. Triceps
  2. Deltoids
  3. Pectorals

*Look at the ulna/humerus ratio*

- **Short or average ulna = strategies for long arms**
- **Long ulna = strategies for short arms**

**Mechanical advantage in pulling movements**
- **Disadvantage for pushing movements**
- **Needs more DB and unilateral movements**
- **Muscles that pull (in order)**
  1. Lats
  2. Rhomboids/posterior deltoids
  3. Biceps
  4. Traps
- **Muscles that push**
  1. Pectorals
  2. Deltoids
  3. Triceps
The muscle being stretched the most is the muscle being stimulated the most.
THE PRINCIPLE OF TRAINING MONEY
**IMPORTANT**: When we are talking strictly about hypertrophy, machines are often superior to their free weight equivalent (e.g. a chest press machine will be better than a bench press). This is because free weights require more stabilization and more active muscles, which is great for strength and athletic training, but for hypertrophy this will divide the neural excitatory drive into all the muscles involves, leaving a smaller excitation signals for the target muscle. This makes it harder to recruit the growth-prone fast-twitch fibers. BUT to keep it simple I used mostly common free weight exercises in the strategy section. You can simply replace it with the machine equivalent, especially if it’s for a muscle you are less gifted for.
WHAT ARE THE BEST STRATEGIES FOR A BIGGER CHEST?
LONG LIMB LIFTERS / BEST CHEST EXERCISES

**Mechanical factors:** Bench press, Dips, Incline DB press

**Metabolic factors:** Cable flies, pec deck, incline DB flies

THE LONG LIMBED LIFTER SHOULD PUT MORE EMPHASIS ON THE FIRST CATEGORY FOR THE PECTORALS, BECAUSE THEY ARE EFFICIENT AT RECRUITING IT. THEY DON’T NEED A LOT OF ISOLATION WORK. BUT THEY WILL BE THE OPPOSITE FOR TRICEPS.
SHORT LIMB/NARROW CLAVICLE LIFTERS

**Mechanical factors:**
Wide grip bench press, Power flies, DB Fly-press

**Metabolic factors:**
Pec deck, Cable flies, Squeeze/hex press

The short limbed lifters should use more isolation exercises and 1-2 less compound movements for the pectorals because they more easily compensate with the triceps or deltoids.
SHORT LIMB/WIDE CLAVICLE LIFTERS

Mechanical factors:
Wide grip decline bench press, Power decline flies, Decline DB Fly-press

Metabolic factors:
Cable cross-over, Decline DB/cable flies, Decline squeeze/hex press

The short limbed lifters should use more isolation exercises and 1-2 less compound movements for the pectorals because they more easily compensate with the triceps or deltoids.
THE BEST ARM-BUILDING STRATEGIES FOR YOUR BODY TYPE
<table>
<thead>
<tr>
<th>Body Type</th>
<th>Long arms</th>
<th>Short arms/narrow clavicle</th>
<th>Short arms/wide clavicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wingspan longer than height.</td>
<td>Wingspan equal or shorter than height. Hands hanging lower than middle of hip bone.</td>
<td>Wingspan equal or shorter than height. Hands hanging at middle of hip bone or higher.</td>
<td></td>
</tr>
<tr>
<td>Require the most isolated work for arms.</td>
<td>Require the least amount of isolated arm work; might not even require any.</td>
<td>Requires a moderate amount of isolated arm work. Depending on goal they might not need much at all.</td>
<td></td>
</tr>
<tr>
<td>They are those who will benefit the most from a dedicated arm day.</td>
<td>The big compound movement will tend to develop the distal/limb muscles the most.</td>
<td>The big compound movements will be very effective by themselves to stimulate biceps and triceps growth.</td>
<td></td>
</tr>
<tr>
<td>The big compound movement will develop mostly the proximal/central muscles.</td>
<td>Big lifts like close-grip bench, dips, supinated pull-ups are often enough to build the arms.</td>
<td>Their strategy will use a combination of “arm-oriented” compound movements and isolated work.</td>
<td></td>
</tr>
<tr>
<td>Benefit the most from unilateral and DB work rather than bar work.</td>
<td>If they do include a good amount of isolated arm work, they are normally those who reach “freak arms” status. But it can overpower their physique (e.g. Lee Priest)</td>
<td>They don’t have an advantage with DBs versus bars.</td>
<td></td>
</tr>
</tbody>
</table>
LONG LIMBS LIFTERS / BEST BICEPS EXERCISES

Mechanical factors:
- Barbell curl, incline DB curls

Metabolic factors:
- Single arm preacher curl, cable curl, DB hammer curl, cable reverse curl, machine curl

For long limbed lifters I would recommend one « mechanical stress » exercise trained fairly heavy for 6-10 reps and 2-3 « metabolic factors » exercises performed for longer sets or using « intensification methods ». They benefit the most from a day devoted to training arms, mostly using an A1/A2 approach of combining one biceps movement with one triceps exercise.
LONG LIMBS LIFTERS / BEST TRICEPS EXERCISES

Mechanical factors:
JM press, Nosebreaker

Metabolic factors:
Overhead DB triceps ext., rope pressdown, decline DB triceps ext.

Note that for long-limbed lifters, big movements like dips, bench press, pull-ups are used in the chest/back workout(s)
SHORT LIMBS LIFTERS / BEST BICEPS EXERCISES

Mechanical factors:
Supinated pull-ups, neutral-grip pull-ups, barbell curl

Metabolic factors:
Preacher curl, rope hammer curl, cable curl

For short limbed lifters, using big basic lifts like pull-ups is very effective. In those exercises the EMG data shows a biceps activation that is even higher than with curls. If they can’t do pull-ups, they can use pulldowns. They will likely only need one metabolic factor exercise (if any at all) and 1-2 mechanical stress movements. With them I do not use an « arm day », I add arm work at the end of other workouts.
SHORT LIMBS LIFTERS / BEST TRICEPS EXERCISES

**Mechanical factors:**
- Close-grip bench,
- dips, reverse-grip bench

**Metabolic factors:**
- Nosebreaker, decline DB triceps ext., triceps pressdown
WHAT IS THE BEST EXERCISES STRATEGY FOR A BIGGER BACK?
LONG LIMBED LIFTERS / BEST BACK STRATEGY

2 horizontal and 1 vertical pulls

Mechanical factors:

**Vertical (1):** Close-grip supinated chin-up/lat pulldown

**Horizontal (2):** Bent over row pronated, Seated row neutral, chest-supported DB row, T-bar row

1 trap and 1 mid-back

**Metabolic factors**

**Mid-back (1):** Reverse pec deck, face pull or chest-supported rear delts.

**Traps (1):** Kirk shrugs, DB shrugs, upright row to sternum

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SHORT LIMBED LIFTERS / BEST BACK STRATEGY

1 horizontal and 2 vertical pulls

Mechanical Factors:

Vertical (2):
- Shoulder-width pronated pull-ups/pulldown,
- Seated row torso leaning forward (motorcycle row), wide-grip pronated lat pulldown

Horizontal (1):
- Pendley row, chest-supported row

2 lats

Metabolic factors:

Lats (2):
- Straight-arms pulldown, DB/Bar pullover, pullover machine, kayak row
THE BEST LOWER BODY TRAINING EXERCISE STRATEGY FOR YOUR BODY TYPE
# LOWER BODY VS BODY TYPE

<table>
<thead>
<tr>
<th>PATTERN</th>
<th>LONG LIMBS</th>
<th>SHORT LIMBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squat pattern</td>
<td>Will tend to do hinge dominant squat. Have to use a variation favoring an upright torso</td>
<td>Naturally built for squatting. Any squat variation will be equally effective to target the quads</td>
</tr>
<tr>
<td>Hinge pattern</td>
<td>Well-suited for the hinge, no trouble emphasizing the posterior chain</td>
<td>Will tend to want to squat their deadlift. You need to use variations and technical adjustments to favor the posterior chain</td>
</tr>
<tr>
<td>Hip thrust</td>
<td>Easy focus on glutes</td>
<td>Not a great exercise for them, will pretty much always compensate with the quads</td>
</tr>
<tr>
<td>Single leg</td>
<td>The natural tendency will be to rely on the glutes. Need to make technical adjustments to properly focus on quads. They respond better to unilateral work.</td>
<td>Will naturally rely on quads. If they want to target the glutes they will need technical adjustments. They don’t get much of an advantage from unilateral work.</td>
</tr>
</tbody>
</table>
### LOWER BODY VS BODY TYPE

#### BEST VARIATIONS/ADJUSTMENTS

<table>
<thead>
<tr>
<th>PATTERN</th>
<th>LONG LIMBS</th>
<th>SHORT LIMBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squat pattern</td>
<td>Front squat, heels elevated front squat, high bar, heels elevated parallel back squat (narrow stance)</td>
<td>Anything goes but the back squat is the best choice because it allows for greater loading</td>
</tr>
<tr>
<td>Hinge pattern</td>
<td>Anything goes. The traditional deadlift is their best option. But they don’t actually need to do it often and they will get plenty of posterior chain work even from squatting</td>
<td>RDL with front of the feet elevated</td>
</tr>
<tr>
<td>Hip thrust</td>
<td>The hip thrust will be effective for them, but not required unless you really want to max out the glutes</td>
<td>The back extension or reverse hyper are much better alternatives</td>
</tr>
<tr>
<td>Single leg</td>
<td>Shorter steps. Lunges, not split squats (moving forward, not just down) Bulgarian split squat (short step) Backwards walking “lunges” Backward sled pull</td>
<td>Longer steps. Split squats, not lunges (moving straight down) Single-leg RDL Split squat front foot elevated (long step) Low handles prowler pushing</td>
</tr>
<tr>
<td>Most useful assistance exercise(s)</td>
<td>Hack squat, narrow stance leg press, leg extension</td>
<td>Leg curl, leg press wider feet, glute-ham raise, rope pull-through</td>
</tr>
</tbody>
</table>
• LONG LIMBS TYPICAL SESSION
• Front squat (moderate/low reps, 6 to 8)
• Lunges (moderate reps 8-10 per leg)
• Hack squat machine (moderate reps, 8-10)
• Leg extension (moderate-high reps 12-15)
• Standing calves raise (high reps 15-20+)

• SHORT LIMBS TYPICAL SESSION
Back squat (moderate/low reps, 6 to 8)
RDL front of feet elevated (moderate reps 8-10)
Leg curl (moderate reps, 8-10)
Rope pull-through (moderate-high reps 12-15)
Back extension (high reps 15-20+)
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BODY PROPORTIONS: IMPACT ON STRENGTH AND EXERCISE SELECTION

BY TOM SHEPPARD
BODY PROPORTIONS – WHY ARE THEY IMPORTANT

Body proportions determine:

ROM that specific joints travel through on a given movement

Which muscles are recruited/loaded on a given movement

Mobility demands

“Natural” weak muscle groups/lifts and their sticking points

It determines the training effect an exercise will have
BODY PROPORTIONS DETERMINE TECHNIQUE

How a lifter will perform a movement pattern will depend largely on their proportions.

As such, there is no universal optimal technique.

Joint morphology also plays a role.

This will affect – stance-width, grip-width, deadlift stance, bar placement (squat) and so on.
BODY PROPORTIONS DETERMINE TECHNIQUE
BODY PROPORTIONS DETERMINE TECHNIQUE
BODY PROPORTIONS DETERMINE TECHNIQUE
BODY PROPORTIONS DETERMINE TECHNIQUE
BODY PROPORTIONS: PROGRAMMING CONSIDERATIONS
LONG-LEGGED LIFTERS

Leg length is 47+% of their height or “average legs” with short or average tibia

Posterior chain dominant/Anterior chain weak

Very hinge dominant squats

Strong torso (due to short lever)

Less stability and higher risk of injuries (due to lever length and degree of stretch)
SHORT-LEGGED LIFTERS

Leg length of 43% of height or average leg length with long tibia

Anterior chain dominant/Posterior chain weak

More upright “Oly style” squats

Longer torso = bigger power leak, less stability

More prone to lower back injuries
## LEG LENGTH – PROGRAMMING CONSIDERATIONS

<table>
<thead>
<tr>
<th></th>
<th>LONG LEGS</th>
<th>SHORT LEGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ratio of work</strong></td>
<td>1.5-2:1 ratio of squat/anterior chain work to hinge/posterior chain work</td>
<td>1.5-2:1 ratio of hinge/posterior chain work to squat/anterior chain work</td>
</tr>
<tr>
<td><strong>Dominant groups</strong></td>
<td>Glutes, hamstrings, lower back/core</td>
<td>Quads, Adductors</td>
</tr>
<tr>
<td><strong>Lagging groups</strong></td>
<td>Quads, Adductors</td>
<td>Glutes, hamstrings, lower back/core</td>
</tr>
<tr>
<td><strong>Other considerations</strong></td>
<td>Will need to use front-loaded squat variations to get decent anterior chain stimulation.</td>
<td>Will need to use more “pure” hinge movements to stop quads taking over – RDL, Vert pull etc. (toe elevation), GHR/Nordics</td>
</tr>
<tr>
<td></td>
<td>Loaded stretching for hamstrings and quads to reduce injury risk</td>
<td>Designated work for core and lower back due to longer lever – reverse hyper, loaded carries etc.</td>
</tr>
<tr>
<td></td>
<td>More need for uni-lateral, stability and force absorption work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glute bridge/Hip thrust effective but rarely needed</td>
<td>Less need for uni-lateral and stability work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glute bridge/Hip thrust tends to be quad dominant so not always effective - methods</td>
</tr>
</tbody>
</table>
LONG-ARMED LIFTERS

Wingspan 4cm+ longer than height OR “average arm” with average or short ulna

“Pulling dominant”/Pressing weak

Longer levers = higher stability demands

Poor at recruiting muscles of the arm

Prone to pec injuries due to high degree of stretch
SHORT-ARMED LIFTERS

Wingspan shorter than height OR “average arm” with long ulna

“Pressing dominant”/Pulling weak

Shorter levers = lower stability demands

Tend to “over-use” muscles of the arm

More prone to kyphotic posture – struggle with OH posture
## ARM LENGTH – PROGRAMMING CONSIDERATIONS

<table>
<thead>
<tr>
<th>BODY TYPE AND EXERCISES</th>
<th>LONG ARMS</th>
<th>SHORT ARMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ratio of work</strong></td>
<td>25-50% more work for pressing work than pulling work</td>
<td>50-100% more pulling than pressing work</td>
</tr>
<tr>
<td></td>
<td>For pulling work – 2-3:1 horizontal to vertical</td>
<td>For pulling work – 2-3:1 vertical to horizontal</td>
</tr>
<tr>
<td><strong>Dominant groups</strong></td>
<td>Lats, Pecs, Deltoids</td>
<td>Traps, Biceps, Triceps</td>
</tr>
<tr>
<td><strong>Lagging groups</strong></td>
<td>Biceps, Triceps, Traps</td>
<td>Lats, Pecs, Deltoids</td>
</tr>
<tr>
<td><strong>Other considerations</strong></td>
<td>Needs direct arm work to develop them</td>
<td>Tends to over-use biceps during pulling work – pronated grip</td>
</tr>
<tr>
<td></td>
<td>Loaded stretching for pecs to reduce injury risk</td>
<td>Vertical pressing challenging from a mobility standpoint – lats/front delt/pec minor (mobility)</td>
</tr>
<tr>
<td></td>
<td>Vertical pressing will be challenging from a stability standpoint (Incline presses etc.)</td>
<td>Often no need for direct arm</td>
</tr>
<tr>
<td></td>
<td>More uni-lateral and dumbbell/stability work</td>
<td>Less need for uni-lateral work</td>
</tr>
<tr>
<td><em>IMPLICATIONS FOR DEADLIFT</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Vertical pressing will be challenging from a stability standpoint (Incline presses etc.)
- More uni-lateral and dumbbell/stability work
- Less need for uni-lateral work
BODY PROPORTIONS: EXERCISE SELECTION
# Best Squat Variations Based on Proportions

<table>
<thead>
<tr>
<th>Long-Legs (Weak Points – Quads, Stability)</th>
<th>Short-Legs (Weak Points – Posterior Chain, Core)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Lift(s)</strong></td>
<td><strong>Front Squat, Squat w/ Narrow-stance/Heels elevated/Forward Bands, SSB Squat, Heels elevated Trap-bar Deadlift</strong></td>
</tr>
<tr>
<td><strong>Assistance Lifts</strong></td>
<td><strong>Back Squat (all varieties)</strong></td>
</tr>
<tr>
<td><strong>Auxillary Work</strong></td>
<td><strong>Wide-stance Squats, Zercher Squat, Zercher Carry, Box Squats, SSB Squat, Paused Squats (bottom position), Beltless work, Cambered Bar Squat</strong></td>
</tr>
</tbody>
</table>

- **Main Lift(s)**: Front Squat, Squat w/ Narrow-stance/Heels elevated/Forward Bands, SSB Squat, Heels elevated Trap-bar Deadlift
- **Assistance Lifts**: Frankenstein Squat, Zercher Squat, Kickstand Squats, Slow Eccentrics/HBT, Hatfield Squats/Belt Squats
- **Auxillary Work**: Split Squats (Front foot elevated, front-loaded), Landmine Squat (heels elevated, feet together), Backwards Sled Drag (Squat position), Sissy Squat Loaded Stretch, general anterior chain work

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# Best Bench Variations Based on Proportions

<table>
<thead>
<tr>
<th>Long-Arms (Weak Points – Triceps, Stability)</th>
<th>Short-Arms (Weak Points – Upper Back, Pecs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Lift(s)</strong></td>
<td>Bench Press, Floor Press, Reverse-grip Bench</td>
</tr>
<tr>
<td><strong>Auxillary Work</strong></td>
<td>1-arm Dumbbell Presses, Savickas Press (BB or DB, 1-arm), JM Press, direct tricep work, focus back work on upper back – Kirk/Kelso Shrug, SGHP</td>
</tr>
</tbody>
</table>
## BEST DEADLIFT VARIATIONS BASED ON PROPORTIONS

<table>
<thead>
<tr>
<th><strong>Main Lift(s)</strong></th>
<th><em><em>LONG-LEGS (WEAK POINTS – QUADS, HAMSTRINGS</em>, UPPER BACK) +<em>in lengthened position</em></em></th>
<th><strong>SHORT-LEGS (HAMSTRINGS/GLUTES, CORE, LATS)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deadlift (all variations), Good-morning from pins</td>
<td>Block Pull (mid-shin/below knee), Trap-bar Deadlift</td>
</tr>
<tr>
<td><strong>Assistance Lifts</strong></td>
<td>Block Pull (below knee), GHR/Nordic Curls, Snatch-grip Deadlift, Floating Deadlift, Floor-to-knee Deadlift, Cheat Pendlay Row</td>
<td>Zercher Goodmorning, Sweeping Deadlift, Vert Pull, Stiff-legged Deadlift (Sweeping), Loaded Carries, Axle-bar Deadlift</td>
</tr>
<tr>
<td><strong>Auxillary Work</strong></td>
<td>Kickstand Romanian Deadlift, Strict Pendlay Row/Seal Row, Leg Press/Hack Squat,</td>
<td>Straight-arm Pulldowns (hip flexed position), Pullthrougths, Leg curl variations, Traditional core work, Glute bridge variations (MMC)</td>
</tr>
</tbody>
</table>
BODY PROPORTIONS: STRENGTH RATIOS
STRENGTH RATIOS

A “well balanced” lifter will have 1RM for various lifts that fall within a certain range of each other.

If a lifter’s 1RM on an exercise is outside of the expected range then it can illustrate that there is a weakness or imbalance we need to fix.

This can be used to assign assistance work and variations for the main lifts.
STRENGTH RATIOS

Considerations when using strength ratios:

The ranges are a guide based on a lifter having “normal” proportions - you need to take the individual’s levers/proportions into account.

The ranges assume equal, or near equal, skill-level across all lifts.

Remember the context of the athlete when looking at “weaknesses” – it’s probably not a big deal that your competitive strongman’s power snatch is lower than expected based on their deadlift.
<table>
<thead>
<tr>
<th>EXERCISE</th>
<th>MINIMUM EXPECTED (%)</th>
<th>MAXIMUM EXPECTED (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bench Press</td>
<td>72.5</td>
<td>77.5</td>
</tr>
<tr>
<td>Deadlift</td>
<td>110</td>
<td>120</td>
</tr>
<tr>
<td>Military Press</td>
<td>42.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Front Squat</td>
<td>82.5</td>
<td>87.5</td>
</tr>
<tr>
<td>Snatch-grip Deadlift</td>
<td>82.5</td>
<td>87.5</td>
</tr>
<tr>
<td>Close-grip Bench Press</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Push Press</td>
<td>62.5</td>
<td>65</td>
</tr>
<tr>
<td>Weighted Dip</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>Chin-up</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Power Clean</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Power Snatch</td>
<td>52.5</td>
<td>57.5</td>
</tr>
</tbody>
</table>

*Women will need to lower % on upper body lifts by around 25% in THIS TABLE ONLY*
<table>
<thead>
<tr>
<th>EXERCISE</th>
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<td>Snatch-grip Deadlift</td>
<td>82.5</td>
<td>87.5</td>
</tr>
<tr>
<td>Deadlift</td>
<td>110</td>
<td>120</td>
</tr>
<tr>
<td>Low-bar Squat</td>
<td>105</td>
<td>110</td>
</tr>
<tr>
<td>Paused Squat (2-3s @ bottom)</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>Cambered/SSB Squat</td>
<td>87.5</td>
<td>92.5</td>
</tr>
<tr>
<td>Deficit Deadlift (1-2”)</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>Zercher Squat</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>Block Pull (below knee)</td>
<td>125</td>
<td>135</td>
</tr>
</tbody>
</table>
# Upper Body Strength Standards vs. Bench

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Minimum Expected (%)</th>
<th>Maximum Expected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close Grip Bench Press</td>
<td>87.5</td>
<td>92.5</td>
</tr>
<tr>
<td>Push Press</td>
<td>82.5</td>
<td>87.5</td>
</tr>
<tr>
<td>Incline Bench Press</td>
<td>77.5</td>
<td>82.5</td>
</tr>
<tr>
<td>Military Press</td>
<td>57.5</td>
<td>62.5</td>
</tr>
<tr>
<td>Weighted Dips</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>Chin-up</td>
<td>72.5</td>
<td>77.5</td>
</tr>
<tr>
<td>Pendley Row (Strict)</td>
<td>72.5</td>
<td>77.5</td>
</tr>
</tbody>
</table>
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