"Review of Strength Training Principles Utilizing the Total Gym® Jump Trainer™"

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As medical professionals it is our job to be experts in exercise prescription. Just as medical doctors prescribe specific medications for a disease, we as health professionals must be able to give specific orders of exercise variables to maximize our athletes' strength gains. The number of repetitions, sets, intensity, rest time and planes of motion are a few of the variables that must be factored in on each and every exercise we suggest to our athletes.

This article will focus on the fundamental principles of strength training along with the different variables that must be considered to maximize strength improvements on a lower leg program utilizing the new Total Gym Jump Trainer.

These are the variables to analyze when prescribing exercises:

1. Reps or repetitions – refers to the number of times one performs a particular "weight" or movement during an exercise.

2. Sets – the sequential collection of reps.

3. Intensity – is the effort that is performed to complete a set.
   Figure 1 below is an excellent chart that will guide the medical professional to select the appropriate intensity of a specific exercise. This chart (Figure 1) will help determine the muscular physiological result that is desired, the time under tension that is needed to create this response (based on reaching near failure), appropriate rest time in between sets, the percentage of 1 ep max the weight will be, the fuel source that will be activated (this is important for sport specific training purposes) and the average reps range to create the response (based on a 5 second per rep rate of movement).

Figure 1

Objective	Time - Total Time To Near Failure	Rest Interval	% Range	Fuel Score	Ave. Rep Range - ave. movement of 1 rep based on 5 seconds
Maximal Strength / Highest Neural Stimulation	4-10 Sec	1.5 - 5 Min	85-100%	ATP/PC	1-2 Reps
Sarcomere Hypertrophy - Near Maximal Strength Gains	10-20 Sec	60-90 Sec	75-85%	ATP/PC & Some Lactate	3-5 Reps
Sarcoplasmic Hypertrophy / Optimal Compromise of Max Strength & Hypertrophy	20-45 Sec	45-75 Sec	60-75% To Failure	Lactate	6-8 Reps
Short-Term Muscular Endurance / Hypertrophy Gains & Strength Gains	40 Sec - 2 Min	30-60 Sec	<60%	Lactate	9-25 Reps
Medium-Term Muscular Endurance Strength	2-5 Min			Oxygen & Some Lactate	26 - 60 Reps
Long - Term Muscular Endurance Strength	5+ Min			Oxygen	61+ Reps

A few take home points are:

- Select the intensity (time to near failure) that will not compromise the athlete's joints, ligaments and soft tissue. For most rehab situations, staying in the 6-25 reps zones (intensities below 75% of 1 rep max) will provide adequate intensity for strength gains while not causing undo stress.

- Just selecting reps as your determining factor without incorporating both intensity/time to failure into your prescription will not result in the muscle's desired physiological changes. For an extreme example, lifting a pencil for 2 reps will not build maximal strength because the intensity was too low as well as the time to failure was not close to occurring. Reps must be based on intensity and time under tension to reach failure.

- The Total Gym Jump Trainer provides a specific loading chart (Figure 2). This is based on the athlete's body weight and the level/angle of the Total Gym Jump Trainer and allows the medical professional to objectively document the specific intensity.

Figure 2

Slide Distance Regulator (SDR) Instructions

The function of the Slide Distance Regulator (SDR) is to reduce the motion of the glideboard in the downward direction to prevent excessive knee flexion in rehabilitation exercises. To set the SDR to a desired position, disengage safety lock and move the glideboard up about one inch above the lowest position you want the glideboard to go. Hold that position while you unscrew the SDR knob and pull it out. While holding the knob out, slide it toward the glideboard as close as it can go. Release the knob and slide it down the Right Rail until it is engaged in one of 12 positions. Then tighten the SDR knob and begin exercising.

Variable Resistance Band Instructions

For additional resistance you can add variable band resistance using the four bands located beneath the bottom of the glideboard. To attach bands, pull the knobs down and hook them to the rack. Do not do this while on the machine. Detach bands after each use to preserve life.

Resistance Charts

JUMP RESISTANCE CHART – FITNESS SETTING

Nominal % of Bodyweight	Level	Squat Resistance % of Your Body Weight						
		100	130	150	180	200	300	400
80	7	87	81	78	75	73	69	66
75	6	82	76	73	70	69	64	62
70	5	76	71	68	65	64	60	58
65	4	71	65	63	60	59	55	53
60	3	65	60	58	55	54	51	49
55	2	59	54	52	50	49	46	44
50	1	52	48	47	45	44	41	40

Bungees add resistance in 10 lb increments from 10 to 70 lbs

JUMP RESISTANCE CHART – PHYSICAL THERAPY SETTING

Nominal % of Bodyweight	Level	Squat Resistance % of Your Body Weight						
		100	130	150	180	200	300	400
65	7	74	68	66	63	62	58	56
60	6	67	62	60	58	56	53	51
55	5	60	56	54	52	50	47	46
50	4	53	49	47	45	44	42	40
45	3	46	42	41	39	38	36	35
35	2	38	35	34	33	32	30	29
30	1	31	28	27	26	26	24	23

Bungees add resistance in 10 lb increments from 10 to 70 lbs

4. Volume – refers to the total worked performed (reps x sets x weight) in a specific workout session. The latest research consensus state that the ideal volume is 30-60 reps per "big muscle" group per workout and 15-30 reps per workout for the "smaller muscle" group. (The smaller muscles are often activated/used during the "bigger muscle" targeted exercises.)

Take home point:

- Looking at volume alone without examining the intensity along with the time under tension to near failure is misleading.
  For example: 3 sets of 8 reps = 24 reps at a moderate intensity - creates a combination of muscle strength and hypertrophy. While 8 sets of 3 reps = 24 reps at a high intensity - creates mostly strength gains. Both have the same amount of volume but different physiological outcomes.

5. Frequency – how often one is training a specific muscle group per week. As a general rule of thumb, heavy intensity training (training that involves greater than 60% of 1 rep max - high intensity, low reps) usually requires 48 hours rest whereas endurance training (generally less than 60% of 1 rep max - low intensity, high reps) requires 24 hours for optimal recovery time.

6. Types of contractions
   - Isotonic contractions – are contractions of the muscle that create force by shortening the muscle (concentric – creates force and power) and then elongating (eccentric – necessary for decelerating and controlling movement) the muscle in response to an opposing force. Remember that eccentric contractions can create 20% more force as compared to a concentric contraction.

   - Isometric contractions – are contractions without changing the length of the muscle. This type of contraction is used for gaining stability and control in the body.

   - Plyometrics – is a specific type of contraction that involves a very fast loading phase (eccentric) to the muscles which then causes a stretch reflex to involve a powerful (concentric) contraction. These plyometric contractions can be safely used on the Total Gym Jump Trainer by adjusting the height/intensity of the Total Gym Jump Trainer. Remember the forces created by a plyometric contraction are greater than the forces that could be developed by the same athlete's voluntary contractions. Therefore a proper assessment and understanding of the athlete's condition (current muscle strength, if in rehab guidelines by medical doctor, athlete's current balance and proprioceptive levels) must be in place before attempting even a low level intensity plyometric.

7. Speed of contractions – the tempo of the repetition determines the effect of the muscles. This refers back to Figure 1.
   For example – if you perform a very slow rep, a rep that takes 45 seconds to reach failure, the training effect onto the muscle is hypertrophy/muscle endurance strength that will use the lactate energy system whereas 1 rep that takes 5 seconds to failure will create a maximal strength/neural stimulus response and use the ATP/PC energy system.

8. Planes of motion – the body functions in all three planes of motion and effective strength training must include training in all three of these planes.
   - Sagittal plane – this plane separates the body into left and right. Movements/forces in this plane are forward and backward such as flexion and extension. (Video 1)

- Frontal plane – this plane separates the body into front and back. Body movements/forces are either moving toward or away from the midline of the body. (Video 2)

- Transverse plane – this plane separates the body into top and bottom. This plane is a rotational plane of movement/forces. (Video 3)

Also note that the Total Gym Jump Trainer includes a Slide Distance Regulator (SDR) which can limit the range of motion of the movement for training or rehab purposes. (Figure 2)

In summary, the understanding of training variables is a must in order to elicit the appropriate muscle gains that we are looking for in our sports performance and rehab clients. The Total Gym Jump Trainer allows a medical professional to take athletes all the way from a post-operative state to sports performance exercises with one exercise apparatus!

References

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3. Total Gym, “Total Gym Jump Trainer Owner’s Manual”, 2016, San Diego, CA