



## Research Article

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# Effect of different training methods on strength of large muscle groups of Altus gymnasium participants in Lege Tafo Lege Dadi, Ethiopia

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## Abstract

**Background:** Athletes performing resistance exercises to gain muscle strength in different modes. The aim of this research was to investigate the consequence of different training methods on strength of a large muscle group of Altus gymnasium participants, Ethiopia. **Methods:** The total population was 32, and they were found in the age of between 18-25 years old on average. Subjects were then divided into two training groups: one repetition maximum (1RM) group (N=16), "Trial and Error" training mode (N=16). The 1RM group performed 80% 1RM load three sets and three days per week for eight weeks and Trial and Error training mode group maximum repetition with the load the person can work out 8-10 maximum repetition with three sets three days per week for eight weeks on large muscle group of the chest, arm, shoulder, leg, and back. At the completion of the eight-week training programs, the subjects were retested. An independent t-test was used to compare the 1RM and "Trial and Error" training mode data. **Results:** A significant difference was found between training programs for changes in the 1RM group for the large muscle groups of the arm, chest, shoulder, leg, and back muscles ( $p < 0.05$ ). And for the Trial and Error training mode group there was a significant change in the chest, back and shoulder large muscle groups, however, strength gained was not different for arm and leg muscles, ( $p > 0.05$ ). There is a considerable variation among the effect of 1RM and "trial and error" training mode on strength of large muscle groups (Arm, Chest, Shoulder, Leg, and Back muscle) of Altus gymnasium participants. **Conclusion:** In conclusion, the 1RM mode of training has more effect than the "Trial and Error" training mode on strength of large muscle groups.

**Keywords:** Arm, Leg, Resistance training and shoulder.

## INTRODUCTION

The resistance types of exercises are very common for military men in different countries such as China, Japan, India, Greece, and Rome. Since the ancient Olympic Games began in 776 BC, competent athletes were incorporating muscle-strengthening exercises into their daily training routines [1].

Strength exercise is one of the most well-known forms of exercise to improve condition and body fitness for a competitive athlete. This strength training or resistance training have all been helps to have bigger muscle size and that used resist an external opposing force. Usually, this exercise is presented by some type of equipment in different gymnasium centers. Resistance training includes different training modality, including the athlete body weight exercises, using elastic bands, plyometrics, and hill running. The resistance exercise training characteristically is using free weights and many standard weight machines [2].

Some strength experts have declared that 1RM can be used to maximize chronic adaptations of muscular strength. Performing variety resistance training exercises and having an experience ranging from novice to trained athletes by incorporating specific percent-ages of the 1RM can produce different strength gains [3]. Accordingly, a predicted 1RM would be necessitated to prescribe effective resistance exercise [4].

Resistance training is that in order to increase strength the resistance load should be 85% or more of 1RM while performing one to six repetitions. When training at heavier load than 85 % of 1RM neural adaptations like increased recruitment and synchronization of motor units occur. These neurological adaptations have shown to be of great importance when it comes to develop maximal strength [5]. The active muscles action can be categorized into three basic types of movements such as static, dynamic concentric and dynamic eccentric [6]. This research focused on muscular strength could be achieved by 1RM or "trial and error" program that would influence muscular strength. Understanding to compares

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between 1RM and trial and error, this study were examined by well-organized training prescription approach on the influence of muscular strength. Due to this reason the study will fill the gap for strength participants to follow the proper and scientific training to improve their muscle strength. As a result, the main objective of this study was to investigate the effect of different training methods strength of large muscle group of Altius gymnasium participants, Ethiopia.

## MATERIAL AND METHODS

### Research Design

In the current study, quasi-experimental intervention was employed to study the effect of two resistance training programs on maximal strength in large muscle group in the age of 18-25. Through this research design, the investigator used quantitative and qualitative methods of data collection that were three times in a week for 8 consecutive weeks which were before and after the exercise.

To investigate the effect of exercises on strength 1RM and "trial and error" training methods were employed. Muscular strength exercise training program was given for 8 weeks 3 days per week for 45 minutes and 5 to 10 minute of warming up and cool down. The selected muscular strength variables were measured before and after muscular strength exercise training program. The parameters which were used Barbell Chest Press, dumbbell chest press, Barbell Shoulder Press, Dumbbell Shoulder Press, Barbell Squat, Dumbbell Lunge, Dumbbell Biceps Curl, Triceps Extension, Back Row and Lat Pull down.

### Study Population

The target population of this study was found around in Lege Taffo Lege Dadi city, Oromia region neighbor to Addis Ababa city with the total number of 32. These subjects were youngsters and found in the

age of 18-25, engaged in strength training program in Altius Gymnasium.

### The study Sample Size and Techniques

The investigator have used purposive sampling method to get information from the available sample, the sample size was 32. Subjects were then randomly divided into two training groups: the first group called one Repetition Maximum (1RM) (N=16) and the second was "Trial and Error" group (N=16).

### Statistical Analysis

Computerized statistical package software (SPSS) version 23 was applied for statistical data analysis. Descriptive analysis was done using mean, minimum and maximum to describe the general information of the trainees. Besides, in this study independent sample t-test was used to compare mean result of 1RM and "Trial and Error" training mode group results. The level of significance was set at 0.05%.

## RESULTS

The data was analyzed through descriptive and the mean difference was explored by an independent sample T-test.

Table 1 revealed that the 1RM and "Trial and Error" groups subjects almost had the same mean age of 21. On the other hand, the average height of both groups of the participants closer this was 1.67 m and 1.68 m respectively. Body mass index of 1RM and "Trial and Error" groups had also similar with average mean value of BMI 22.93 and 22.13 respectively.

**Table 1:** General Information of the trainees of both groups (n=32)

Group		Age of Trainee	Body Height (m)	Body Weight (Kg)	Body Mass Index
1RM Group	N	16	16	16	16
	Mean	20.94	1.6744	63.6875	22.9375
	Minimum	18	1.54	49.00	17.60
	Maximum	25	1.80	80.00	26.30
"Trial and Error" Group	N	16	16	16	16
	Mean	20.50	1.6850	63.0625	22.1313
	Minimum	18	1.55	47.00	17.10
	Maximum	25	1.79	78.00	26.70

**Table 2:** A pretest result of an Independent-samples t-test for strength parameters of 1RM and "Trial and Error" Groups (n=32)

Paramaters	Group	N	Mean	SD	T-test
Barbell Chest Press	1RM	16	70.3750	16.89527	t (30) = .076, p= .940
	"Trial & Error"	16	69.8750	20.24475	
dumbbell chest press	1RM	16	23.5625	5.30369	t (30) = .361, p= .720
	"Trial & Error"	16	22.7500	7.26177	
Barbell Shoulder Press	1RM	16	40.6250	10.80046	t (30) = 0.000, p= 1.000
	"Trial & Error"	16	40.6250	11.49420	

Dumbbell Shoulder Press	1RM	16	18.1250	3.05232	t (30) = .327, p= .746
	"Trial & Error"	16	17.7500	3.41565	
Barbell Squat	1RM	16	92.8750	16.62077	t (30) = .032, p= .974
	"Trial & Error"	16	92.6875	16.17289	
Dumbbell Lunge	1RM	16	25.6250	6.66208	t (30) = .053, p= .958
	"Trial & Error"	16	25.5000	6.59293	
Dumbbell Biceps Curl	1RM	16	14.7500	2.04939	t (30) = .494, p= .625
	"Trial & Error"	16	14.2500	3.49285	
Triceps Extension	1RM	16	55.3125	10.07782	t (30) = .563, p= .577
	"Trial & Error"	16	53.1250	11.81454	
Back Row	1RM	16	66.8750	10.93542	t (30) = .328, p= .745
	"Trial & Error"	16	65.6250	10.62623	
Lat Pull down	1RM	16	56.8750	8.73212	t (30) = .279, p= .782
	"Trial & Error"	16	55.9375	10.20110	

**Table 3:** A Post-test result of an Independent-samples t-test for strength parameters of 1RM and "Trial and Error" Groups (n=32)

Parameters	Group	N	Mean	SD	T-test
Barbell Chest Press	1RM	16	85.9375	14.98207	t (30) = 2.132, p= .041
	"Trial & Error"	16	72.6875	19.83169	
Dumbbell chest press	1RM	16	34.0000	4.95311	t (30) = 4.384, p= .000
	"Trial & Error"	16	24.8750	6.69204	
Barbell Shoulder Press	1RM	16	58.7500	5.49545	t (30) = 4.818, p= .000
	"Trial & Error"	16	43.2500	11.63615	
Dumbbell Shoulder Press	1RM	16	28.7500	4.49444	t (30) = 5.786, p= .000
	"Trial & Error"	16	20.2500	3.78594	
Barbell Squat	1RM	16	107.5000	14.91308	t (30) = 2.052, p= .049
	"Trial & Error"	16	95.6875	17.53746	
Dumbbell Lunge	1RM	16	37.5000	4.87169	t (30) = 4.712, p= .000
	"Trial & Error"	16	27.8125	6.62539	
Dumbbell Biceps Curl	1RM	16	25.1250	3.86221	t (30) = 6.497, p= .000
	"Trial & Error"	16	16.7500	3.41565	
Triceps Extension	1RM	16	68.1250	10.30776	t (30) = 2.406, p= .022
	"Trial & Error"	16	59.0625	10.98768	
Back Row	1RM	16	82.5000	11.10555	t (30) = 2.868, p= .007
	"Trial & Error"	16	71.8750	9.81071	
Lat Pull down	1RM	16	72.5000	10.16530	t (30) = 3.212, p= .003
	"Trial & Error"	16	60.9375	10.20110	

As indicated in the above Table 2, in the first column of the table, there was no significant difference between the 1RM group (M=70.38, SD=16.99) and "Trial and Error" group (M= 69.88, SD = 20.24); t (30) = 0.076, p=0.940 pretest result of barbell chest press. The second column of the table also showed that there was no significant difference between the 1RM group (M=23.56, SD=5.3) and "Trial and Error" group (M= 22.75, SD = 7.26); t (30) = 0.361, p= 0.720 pretest result of dumbbell chest press. The third column indicated that there was no significant difference between the 1RM group (M=40.62, SD=10.80) and "Trial and Error" group (M= 40.63, SD = 11.49); t (30) = 0.001, p=1.000 pretest result of barbell shoulder press. The fourth column specified that there was no significant difference between the 1RM group (M= 18.125, SD=3.052) and "Trial and Error" group (M= 17.75, SD = 3.42); t (30) = 0.327, p= 0.746 pretest result of dumbbell shoulder Press. The fifth column as well illustrated that was no significant

difference between the 1RM group (M= 92.88, SD=16.62) and "Trial and Error" group (M= 92.69, SD = 16.17); t (30) = 0.032, p= 0.974 the pretest result of barbell Squat. The sixth column showed that was no significant difference between the 1RM group (M= 25.63, SD=6.66) and "Trial and Error" group (M=25.50, SD = 6.59); t (30) = 0.053, p= 0.958 the pretest result of dumbbell lunge. The seventh column demonstrated that was no significant difference between the 1RM group (M=14.75, SD=2.05) and "Trial and Error" group (M= 14.25, SD = 3.49); t (24.23) =0.494, p=0.001 the pretest result of dumbbell biceps curl. Column eighth showed there was no significant difference between 1RM group (M=55.31, SD=10.08) and "Trial and Error" group (M=53.125, SD = 11.81); t (30) = 0.563, p= 0.577 the pretest result of Triceps Extension. The ninth column confirmed that there was no significant difference between 1RM group (M= 66.88, SD=10.94) and "Trial and Error" group (M=65.63, SD = 10.62); t (30) =0.328, p= 0.745

pretest result of back row. The last and tenth column of the table indicated that there was no significant difference between 1RM group (M=56.875, SD=8.73) and "Trial and Error" group (M= 55.937, SD = 10.20);  $t(30) = 0.279$ ,  $p = 0.782$  the pretest result of Lat Pull down.

Therefore, as the pretest result of the current study there was no significant difference in 1RM and "Trial and Error" groups in their barbell chest press, dumbbell chest press, barbell shoulder press, dumbbell shoulder press, barbell squat, dumbbell lunge, dumbbell biceps curl, triceps extension, back row and lat pull down results. The result clearly indicated that before the intervention of 8 weeks resistances training both groups are not different each other in their maximum strength of their large muscles such as chest, shoulder, leg, biceps, triceps, and back muscles.

In Table 3 the post test results of participants are presented in ten different columns of the table. The first column indicated that barbell chest press result was significantly different in the scores of 1RM group (M= 85.94, SD= 14.98) and "Trial and Error" group (M=72.69, SD=19.83);  $t(30) = 2.132$ ,  $p = 0.041$ . The second column also point out the post test of dumbbell chest press was highly and significantly different for 1RM group (M= 34.00, SD= 4.95) and "Trial and Error" group (M=24.87, SD=6.69);  $t(30) = 4.384$ ,  $p = 0.001$ . Consistent with this the third column shows post test of bench press, there was significance difference between 1RM group (M= 58.75, SD= 5.49) and "Trial and Error" group (M=43.25, SD=11.64);  $t(30) = 4.818$ ,  $p = 0.001$ . The fourth column illustrated that post test of dumbbell shoulder press was highly as well as significantly different for 1RM group (M= 28.75, SD= 4.49) and "Trial and Error" group (M=20.25, SD=3.78);  $t(30) = 5.786$ ,  $p = 0.001$ . The fifth column demonstrated that the mean value post test of Barbell Squat was statistically different for 1RM group (M= 107.50, SD= 14.91) and "Trial and Error" group (M=95.687, SD=17.537);  $t(30) = 2.052$ ,  $p = 0.049$ . The sixth column explored that mean value of post test of dumbbell Lunge was significantly different for 1RM group (M= 37.50, SD= 4.87) and "Trial and Error" group (M=27.81, SD=6.63);  $t(30) = 4.712$ ,  $p = 0.001$ . In the same table of column seventh, post test of dumbbell biceps curl, there was significance difference in the scores of muscle gain in 1RM group (M= 25.125, SD= 3.86) and "Trial and Error" group (M=3.42, SD=16.75);  $t(30) = 6.497$ ,  $p = 0.001$ . The eighth column showed that post test of triceps extension, there was significance difference in the scores of muscle gain in 1RM group (M= 68.13, SD= 10.31) and "Trial and Error" group (M=59.06, SD=10.98);  $t(30) = 2.406$ ,  $p = 0.022$ . The ninth column also indicated that post test of back row, the mean value was significantly different for 1RM group (M= 82.50, SD=11.11) and "Trial and Error" group (M=71.875, SD=9.81);  $t(30) = 2.868$ ,  $p = 0.007$ . Besides, the final tenth column proved that post test of Lat Pull down was highly and significantly different for 1RM group (M= 72.50, SD= 10.17) and "Trial and Error" group (M=60.94, SD=10.20);  $t(30) = 3.212$ ,  $p = 0.003$ .

These result indicated that in the post test even though both the "Trial and Error" and 1RM training mode group showed improvement of barbell chest press, dumbbell chest press, barbell shoulder press, dumbbell shoulder press, barbell squat, dumbbell lunge, dumbbell biceps curl, triceps extension, back row and lat pull down results, there was significant difference between 1RM strength training group and "Trial and Error" strength training group which showed that 1RM training mode had more effect on the chest, shoulder, leg, biceps, triceps, and back muscles strength of the trainees.

## DISCUSSION

As the result of this finding both the "Trial and Error" and 1RM training mode group showed improvement. However, there was more significant effect of 1RM training mode on strength of large muscle groups (Arms, Chest, Shoulder, Leg and Back muscles) of Altius gymnasium participants. Similar study [7] showed that, 1RM resistance bench press training for men had a significant important to gain muscle

strength. Moreover, other studies also showed strength exercises can contribute for the improvement of resistance-trained men participants to get a greater strength [8, 9]. Furthermore, Young untrained men have got strength from 1RM resistance training [10].

There is significant effect of "Trial and Error" training mode on strength of large muscle groups (Arm, Chest, Shoulder, Leg and Back muscle) of Altius gymnasium participants. But this significant change is not scientific. Yong's men are practicing resistance exercises without updated and scientific knowledge. Many findings are agreed on the scientific training mode of 1RM to gain maximal strength. Young untrained men trained 1RM squat and other strength exercise for more than 8 weeks can bring greater strength [11, 12]. Moreover, resistance exercises for 8 weeks in three times per week, practicing 1RM squat provides strength [13]. Nevertheless, "Trial and Error" training mode provides strength but it will be very difficult to gain required strength for large muscles.

Strength is an essential health related component for all human beings. Hypertrophy and rising of muscular strength are very essential to a variety of populations [14]. Force output is directly correlated to muscle cross-sectional area (CSA); increasing muscle hypertrophy may convey to enhance performance in power and strength athletes. Strength exercise has been well recognized as the main mode of exercise to enhance muscular strength and hypertrophy. Changes in maximal strength following an intervention of resistance training group on Biceps curl showed significant change [15]. Besides, training on maximal strength resistance training of a group of experimental and control group on lat pull-down showed significant change on strength [15].

## CONCLUSION

The current study result showed that Even though both the 1RM and "Trial and Error" exercises mode showed improvement in the post test of barbell chest press, dumbbell chest press, barbell shoulder press, dumbbell shoulder press, barbell squat, dumbbell lunge, dumbbell biceps curl, triceps extension, back row and lat pull down results, there was significant difference between 1RM strength training group and "Trial and Error" strength training group which indicated that 1RM training mode had more effect on the back muscle strength of the trainees. In conclusion, 1RM mode of training has more effect than "trial and error" training mode on strength of large muscle groups (chest, shoulder, leg, biceps, triceps, and back muscles).

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## Author's Contributions

Author's (Cheru and Tilahun) contributed in the research design, data collection and statistical data analysis; and the interpretation of results. All authors involved to the manuscript writing. Both authors have approved and read the final version of the manuscript, and agree with the order of presentation of the author.

## Conflicts of interest

None declared.

## Financial Support

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