

THE EFFECTIVENESS OF PRILEPIN’S CHART FOR POWERLIFTING STRENGTH IMPROVEMENTS IN RESISTANCE TRAINED MALES

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ABSTRACT

Prilepin’s chart (or Prilepin’s table) was developed, based upon observations of elite weightlifters training methods, to act as a guide in the selection of optimal set, rep and intensity schemes when training to improve performance in weightlifting. It has also been used, anecdotally, to successfully guide resistance training in powerlifting and other sports. However, there is currently no research investigating the effectiveness of its guidelines for strength improvements specific to the three powerlifts. **PURPOSE:** To determine the effectiveness of using Prilepin’s chart to guide strength training for improving powerlifting performance over a four week period in resistance trained males. **METHODS:** Nine resistance trained males (mean \pm SD; age = 24.7 ± 4.9 years, bodyweight 82.7 ± 8.8 kg) participated in this investigation. The participants were tested for one repetition maximum (1RM) in the powerlifts, as well as for their 2-10RM to estimate 1RM’s on accessory movements (or variations on the powerlifts), before and after the four weeks of training. Pre-testing took place a minimum of three and no more than seven days prior to the commencement of the training period, and post testing occurred a minimum of four and no more than seven days following the final training session. The training program was based on Prilepin’s chart (Table 1). Statistical analysis involved using two tailed, paired, T-tests with a significance level set at $P < 0.05$. Effect size (ES) was calculated by dividing the change in 1RM by the initial SD. **RESULTS:** Significant absolute strength improvements occurred for all powerlifts; squat from 122.2 ± 26.6 kg to 134.2 ± 25.5 kg ($P < 0.001$, ES 0.45), bench press from 94.7 ± 22.3 kg to 100.6 ± 22.7 kg ($P = 0.006$, ES 0.26), and deadlift from 158.9 ± 34.1 kg to 172.2 ± 36.4 kg ($P < 0.001$, ES 0.39). Significant strength improvements also occurred for all powerlifts relative to bodyweight; squat from 1.47 ± 0.22 x BW to 1.60 ± 0.21 x BW ($P < 0.001$, ES 0.61); bench press from 1.14 ± 0.19 x BW to 1.20 ± 0.19 x BW ($P = 0.028$, ES 0.33), and deadlift from 1.91 ± 0.28 x BW to 2.05 ± 0.30 x BW ($P = 0.002$, ES 0.50). **CONCLUSIONS:** With only four weeks of powerlifting specific strength training, based on the guidelines provided by Prilepin’s chart, strength gains can be made in the three powerlifts in resistance trained males. Improvements tended to be greater for the lower body dominant powerlifts of the squat and deadlift. **PRACTICAL APPLICATIONS:** Prilepin’s chart can be used as a strength training tool in sports where increasing strength in the muscle groups and movements associated with the powerlifts is important. This research confirms the anecdotally reported success of this training methodology in improving strength in the three powerlifts.

INTRODUCTION

Prilepin’s chart has been used by strength athletes and coaches for some time in order to improve their strength and power. There are anecdotal reports of its efficacy in barbell training [1, 2] as well as some literature published in English in which it has been discussed [3, 4, 5]. It is a tool which can be used by strength athletes and coaches to select intensity, rep and training volume ranges in order to achieve improvements in strength. However, it appears there is a lack of literature published in English supporting its efficacy.

Alexander Prilepin was associated with Soviet weightlifting for a decade. He was a researcher as well as a coach who coached both junior and senior weightlifters to medals on the World and Olympic stage [6]. Information regarding Prilepin’s chart appears first in English texts in Laputin & Oleshko’s 1982 text, *Managing the Training of Weightlifters* [5]. They discussed the research of Prilepin who had established guidelines for number of lifts that should be performed for an exercise within a session for optimal training effect. It was stated that performing significantly more or less repetitions than recommended would decrease the training effect. The research which determined this is said to have looked at training logs, bar speed, lifting technique and performance at a lifters next competition in determining the most effective rep ranges [1, 3].

Prilepin's Table			
%	Reps/Set	Range	Optimal
<70	3-6	18-30	24
70-79	3-6	12-24	18
80-89	2-4	10-20	15
90+	1-2	4-10	7

Table 1. Prilepin’s Chart

The chart has four columns (see Table 1) which can be used to guide an athletes training:

- The first indicates a percentage (of one rep max, 1RM) an athlete intends to train at;
- The second tells the athlete how many repetitions should be performed within one set at that intensity;
- The third tells the range of total repetitions that should be performed on that exercise in a single session; and,
- The final column indicates an optimal target for total repetitions on that exercise.

For example, an athlete could perform three sets of six repetitions at 75% of their 1RM for optimal training effect.

Although the chart is based on Prilepin’s work with weightlifters, it has been used by Powerlifters and other strength athletes. USA Powerlifting Coach Matt Gary has discussed his use of the table for guiding the training in most major barbell movements, stating a major reason he uses the table is to ensure a lifter maintains good form, as well as having the flexibility to adjust total reps performed in a given training session based on how a lifter feels [7]. Kontos [1] discussed its use, with minor modifications due to the use of supportive Powerlifting equipment, by Powerlifters at Westside Barbell. In peer reviewed literature its effectiveness has not been investigated. Hammer [4] mentioned their use of the table in training Baseball players. However, no data was reported regarding strength improvements through it’s use. Godawa [3] used Prilepin’s chart to guide training volume and saw significant improvements in strength in the powerlifts, however it is unclear whether the repetitions per set guidelines were also followed.

Given the lack of literature specifically investigating the efficacy of Prilepin’s chart, the aim of this study was to determine the effectiveness of using Prilepin’s chart to guide strength training for improving powerlifting performance in resistance trained males.

METHODS

Nine males with at least two years of resistance training experience volunteered to participate in the study. Participants provided written informed consent before any testing began and the study was approved by the Institutional Ethics Committee before commencing research. Participants had a mean (\pm SD) age of 24.7 ± 4.9 years and initial bodyweight of 82.7 ± 8.8 kg.

Participants were tested for their 1RM in the powerlifts (squat, bench press and deadlift), as well as for their 2-10RM to estimate 1RM’s on accessory movements (or variations on the powerlifts – see Table 2), before and after the four weeks of training. Pre-testing took place a minimum of three and no more than seven

days prior to the commencement of the training period, and post testing occurred a minimum of four and no more than seven days following the final training session. The training program was based on Prilepin’s chart for all major lifts - exercises one through three each day - with the fourth exercise aimed more at hypertrophy. The training was arranged beginning each day with a competition style powerlifting movement, followed with a second and third exercise that was usually a modification of a competition powerlifting movement, and finished with a hypertrophy focused accessory exercise

Day	Exercise	Week One			Week Two			Week Three			Week Four		
		Sets	Reps	% 1RM	Sets	Reps	% 1RM	Sets	Reps	% 1RM	Sets	Reps	% 1RM
1	Bench Press	3	4	80	3	4	82.5	4	3	85	4	3	87.5
1	Back Squat	4	6	75	4	6	77.5	4	4	80	4	4	82.5
1	Military Press	4	6	75	4	6	77.5	4	4	80	4	4	82.5
1	Barbell Row	3	10	70	3	10	72.5	4	8	75	4	8	77.5
2	Deadlift	3	4	80	3	4	82.5	4	3	85	4	3	87.5
2	Close Grip Bench Press	4	6	75	4	6	77.5	4	4	80	4	4	82.5
2	Deficit Deadlift (2")	4	6	75	4	6	77.5	4	4	80	4	4	82.5
2	Good Morning	3	10	70	3	10	72.5	4	8	75	4	8	77.5
3	Back Squat	3	4	80	3	4	82.5	4	3	85	4	3	87.5
3	Paused Bench Press	4	6	75	4	6	77.5	4	4	80	4	4	82.5
3	Front Squat	4	6	75	4	6	77.5	4	4	80	4	4	82.5
3	Barbell Row	3	10	70	3	10	72.5	4	8	75	4	8	77.5

Table 2. Four Week Training Program

Estimated 1RM’s were calculated using the formula: $1RM = \text{Weight} / (1.0278 - (\text{Reps Performed} \times 0.0278))$ [8]. Statistical analysis involved using two tailed, paired, T-tests with a significance level set at $P < 0.05$. Effect size (ES) was calculated by dividing the change in 1RM by the initial SD. ES of performance measures were calculated and interpreted as: trivial 0-0.2, small 0.2-0.6, moderate 0.6-1.2, large 1.2-2.0 and very large >2.0 [9].

RESULTS

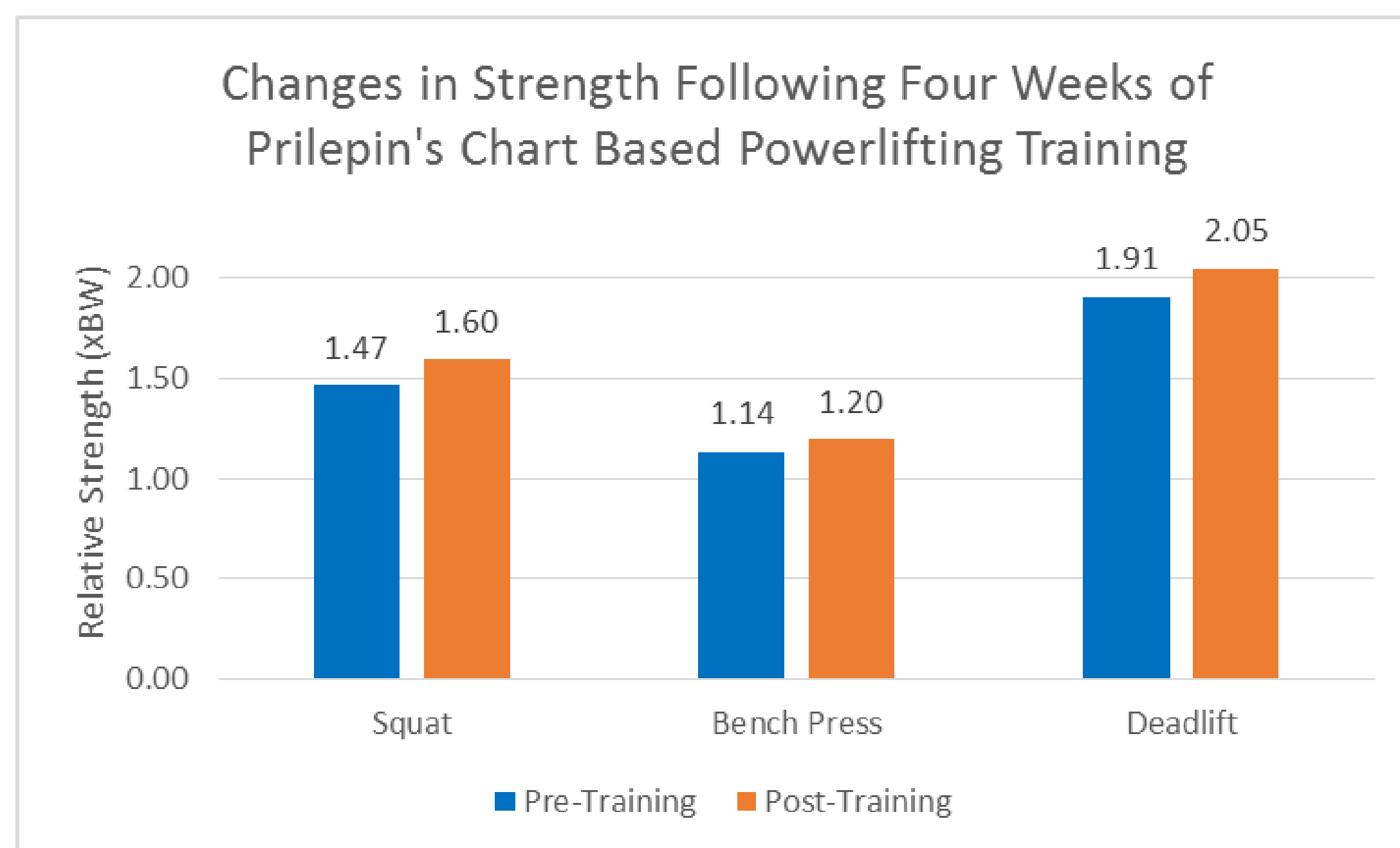


Figure 1. Changes in Strength Following Four Weeks of Prilepin’s Chart Based Powerlifting Training

Figure 1 shows the relative strength of the three powerlifts before and after training. All three powerlifts showed significant improvements in relative strength (squat $P < 0.001$, bench press $P = 0.028$ and deadlift $P = 0.002$). The squat improvements were of a moderate ES (0.61), while bench press and deadlift were both small (ES = 0.33 and 0.50, respectively).

Absolute strength improvements occurred for all three powerlifts; the squat from 122.2 ± 26.6 kg to 134.2 ± 25.5 kg ($P < 0.001$, ES 0.45), bench press from 94.7 ± 22.3 kg to 100.6 ± 22.7 kg ($P = 0.006$, ES 0.26), and deadlift from 158.9 ± 34.1 kg to 172.2 ± 36.4 kg ($P < 0.001$, ES 0.39). Each of these changes was significant and of a small ES.

Bodyweight increased from 82.7 ± 8.8 kg to 83.5 ± 8.3 kg, though this change was insignificant.



Figure 2. A Powerlifter Squats 270kg at the 2014 Asia/Oceania Powerlifting Championships

CONCLUSIONS

Four weeks of powerlifting specific training based around Prilepin’s chart was able to elicit significant improvements in maximal strength in each of the three powerlifting movements in resistance trained males, both absolutely and relative to bodyweight. The two lower body dominant movements (squat – shown above in figure 2 – and deadlift) appeared to have a tendency to improve by a larger amount compared to the one upper body dominant movement (bench press). Further research is required to determine the effectiveness of Prilepin’s chart in training well-trained strength athletes.

PRACTICAL APPLICATIONS

- Strength and conditioning practitioners should feel confident in using Prilepin’s chart to prescribe resistance training sessions, focused on the powerlifts, for enhancing maximal strength.
- This research confirms the anecdotally reported success of, and encourages the continued use of, this training methodology in improving strength in the three powerlifts.

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