

Whey Protein versus Chocolate Milk Supplementation: The Physiological and Training Effects When Combined With a Four-Week Resistance Training Program

Cassandra Klatt, Casey Albrecht, Abby Johnson, Emily Kidd, Michael Miland
Faculty Advisor: Gary P. Van Guilder, PhD
Department of Kinesiology, University of Wisconsin-Eau Claire, Eau Claire, WI



ABSTRACT

Purpose: Post-resistance training protein supplementation may produce numerous physiological benefits and training adaptations including improved muscular endurance, body composition, and muscle hypertrophy. However, previous studies demonstrate conflicting results related to post-exercise supplementation with whey protein as well as with chocolate milk. The purpose of this study is to compare the effects of whey protein supplementation to chocolate milk on muscular endurance, body composition, and muscle hypertrophy in young adults when combined with 4-weeks of resistance training. **Methods:** Seventeen young healthy adults (10 women, 7 men) were randomized to complete a 4-week upper- and lower-body resistance training program (3 days per week; 30-45 minutes per session; 8-10 exercises; 3 sets; 12-15 repetitions) while supplementing their normal diet with either a whey protein (24 grams protein) or chocolate milk (16 grams protein). The supplement was ingested orally within 30 minutes following each resistance training session for 4-weeks. Muscle hypertrophy, body composition, and measures of muscle endurance (one-minute push-up test, one-minute sit-up test, and a wall-sit to failure) were measured before and after the resistance training program. **Results:** Generally, subjects improved in all areas of muscle strength and endurance following 4-weeks of resistance training with chocolate milk supplementation. However, the wall-sit to failure test was the only statistical significant improvement in this group (before: 113.1±28.1 sec; after: 164.5±56.8 sec; $P<0.05$). In contrast, the participants in the whey supplementation group demonstrated significant increases in the number of push-ups, shoulder girth and body weight. The wall-sit to failure test also improved by an average of 21 seconds. **Conclusions:** Overall, post-exercise supplementation with either whey protein or chocolate milk during a 4-week resistance training program improves muscle endurance and shoulder girth.

BACKGROUND

➤ The supplement industry is considered one of the most rapidly growing industries in the United States.

➤ Resistance training is a popular method of exercise amongst people of all ages to help increase strength or muscle mass, decrease body fat, or improve general muscle tone.

➤ Whey protein is a high-quality protein and contains more essential amino acids when compared to other common food sources of protein.

➤ Chocolate milk, which contains a high amount of protein, can be used as an alternative to expensive whey protein supplements to enhance muscle building during resistance exercise.

➤ Whey protein has been shown to have ergogenic and anti-catabolic properties, while individual effects of supplementing chocolate milk (casein) after resistance training is not well known.

EXPERIMENTAL AIM AND HYPOTHESIS

To compare the effects of supplementation of whey protein and chocolate milk on muscular endurance, body composition and muscular hypertrophy when combined with a 4-week resistance training program in young adults.

We hypothesized that whey protein supplementation will improve these variables to a greater extent than supplementation with chocolate milk.

METHODS

Subjects

➤ Seventeen young, healthy adults (10 female, 7 male) between the ages of 18-25 years participated in the study.

➤ Volunteers were recruited from the University of Wisconsin- Eau Claire by personal contact and flyers.

➤ All subjects provided written informed consent according to the guidelines of the University of Wisconsin – Eau Claire.

Supplementation Information

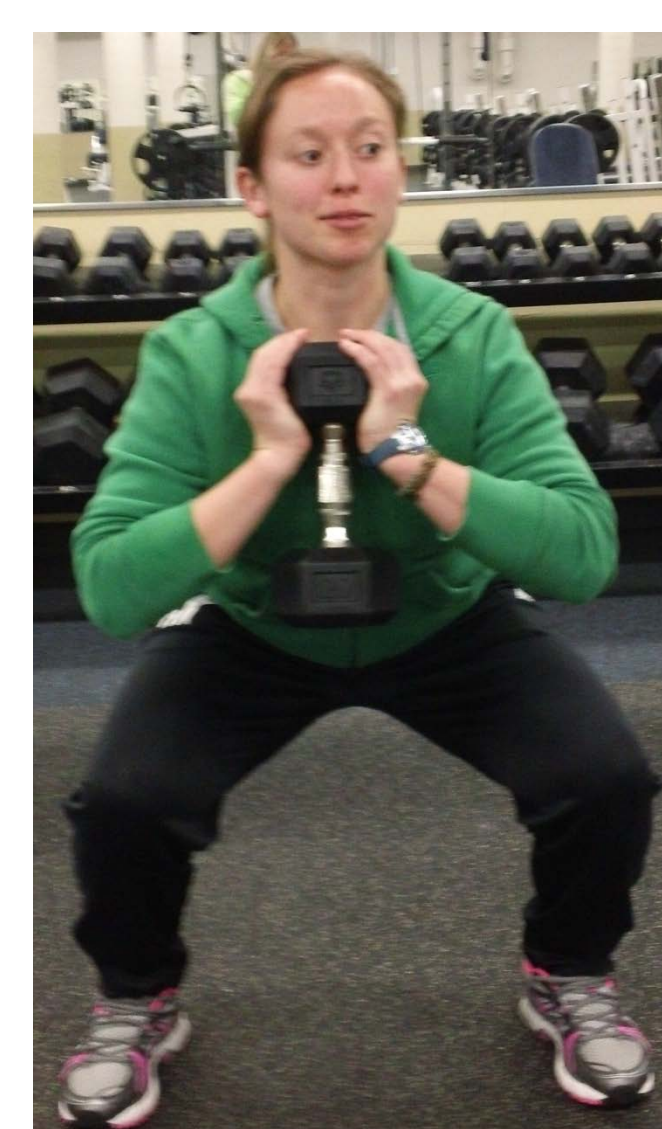
- Subjects were randomized into the whey protein or chocolate milk group
- Whey protein group members' dosage followed manufacturer's instructions for serving size: 1/3 cup mixed with 8 oz. of water (24 g protein)
- Chocolate milk group members were instructed to consume 2 cups of chocolate milk (16 g protein)
- Subjects were required to consume the supplement within 30 minutes of exercise

Screening and Testing Procedures

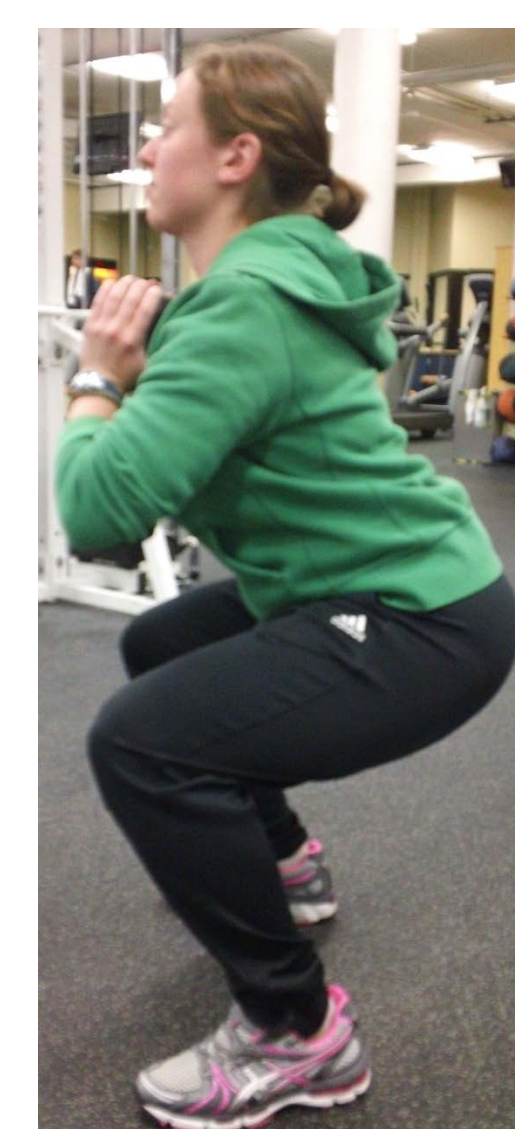
- Health history and physical activity questionnaires were completed
- Baselines assessments included: resting blood pressure and heart rate, height, body weight, waist circumference, body mass index, body fat percent, limb girth, and muscular endurance
- Muscular endurance was assessed using a wall-sit to failure test and one minute push-up and sit-up tests
- Subjects were asked to track their diet for 3 days during the program, excluding their chocolate milk or protein supplement
- Subjects performed resistance training sessions 2 times per week for the first 2 weeks of the program and 3 times per week for the final 2 weeks

Resistance Training Program

Exercise	Sets x Reps
Goblet squat	3x12
Push-ups	3x15
Dumbbell split squat	3x12
Plank	3x30 seconds
Incline bench press	3x12
Straight Leg Deadlift	3x12
Alternating Biceps Curl	3x12
Overhead Triceps Extension	3x12
Side Plank	3x30 seconds



Goblet Squat



Dumbbell Split Squat

STATISTICAL ANALYSIS

The primary dependent variables were anthropometric and muscle endurance variables before and after the 4-week resistance training program. The independent variables were supplement (whey versus chocolate milk) and exercise. Changes in response to the exercise training program and supplement were determined by repeated measures ANOVA. Data are presented as mean±SD. Statistical significance was set at $P<0.05$. Statistical analyses were performed using SPSS software version 17.0 (SPSS Inc).

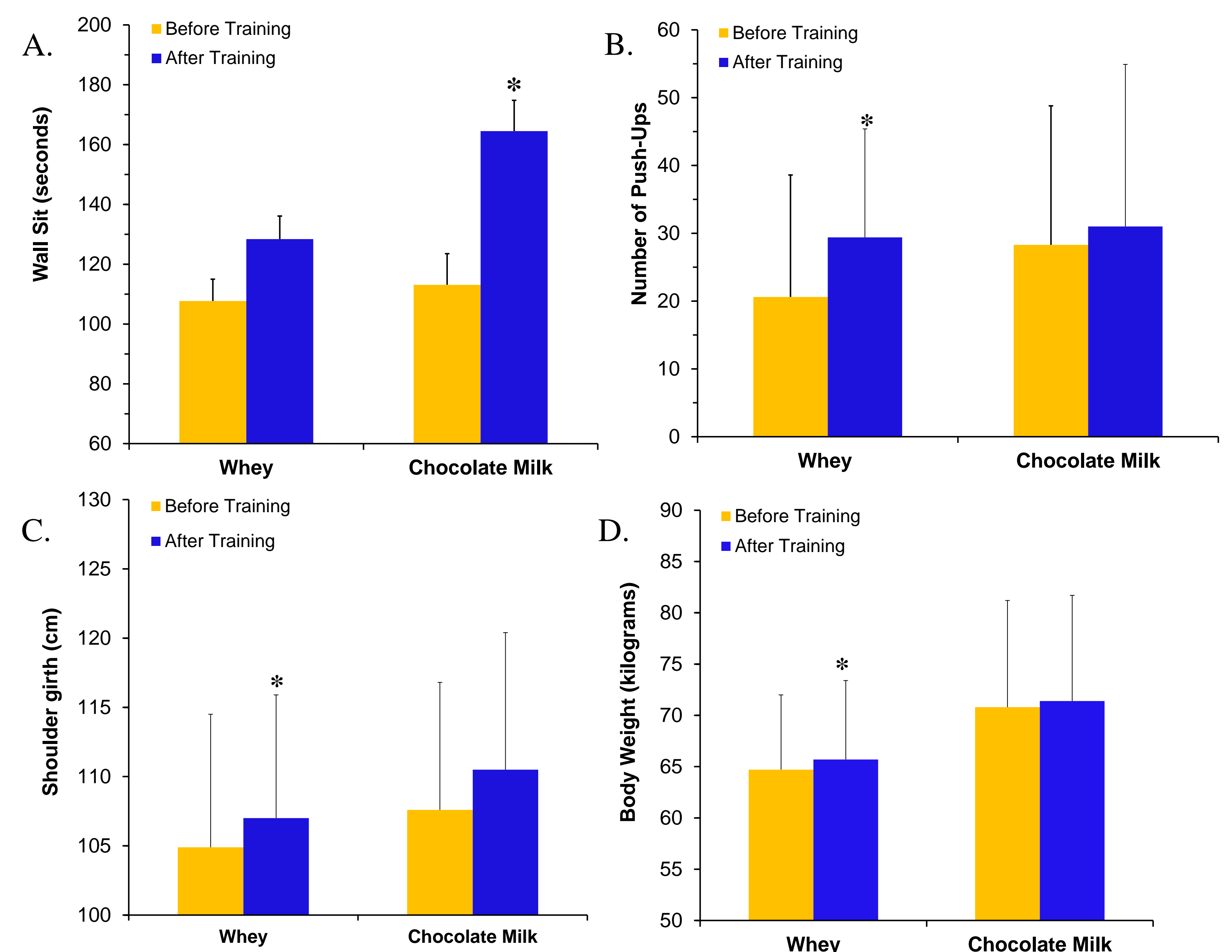
RESULTS

I. Subject data before and after 4-weeks of whey protein or chocolate milk supplementation

Variable	Before Whey	After Whey	Positive Change (Y/N)	Before Chocolate Milk	After Chocolate Milk	Positive Change (Y/N)
Systolic BP, mmHg	113.1±5.8	117.7±9.1	N	113.3±8.4	118.5±3.5	N
Diastolic BP, mmHg	78.9±5.8	73.1±10.1	N	77.0±7.3	65.3±6.5	N
Rest HR, bpm	75.1±10.3	69.1±5.0	N	73.0±14.8	68.3±11.7	N
Weight, kg	64.7±7.3	65.7±7.7*	Y	70.8±10.4	71.4±10.3	N
BMI, kg/m ²	22.6±2.3	23.0±2.1	N	24.0±3.5	24.2±3.5	N
Body fat %	18.3±7.8	19.7±8.4	N	16.1±8.4	17.1±9.7	N
Waist girth, cm	74.3±6.5	74.1±5.0	N	78.9±7.8	78.1±8.3	N
Bicep girth, cm	28.3±2.8	28.6±2.5	N	29.8±4.1	29.9±4.1	N
Mid-thigh girth, cm	46.9±3.1	46.8±3.6	N	50.3±5.0	48.9±3.6	N
Shoulder girth, cm	104.9±9.6	107.0±8.9*	Y	107.6±9.2	110.5±10.0	Y
Chest girth, cm	88.9±4.7	88.3±4.0	N	92.4±8.9	90.6±8.0	Y
Push-ups, #	20.6±18.0	29.4±16.0*	Y	28.3±20.5	31.0±23.9	N
Wall sit, sec	107.7±41.1	128.4±56.3	N	113.1±28.1	164.5±56.8*	Y
Sit-ups, #	33.9±5.4	34.4±6.1	N	33.4±11.9	35.3±12.4	N

* $P<0.05$ versus before

II. Muscle endurance (A and B) and select anthropometric improvements (C and D) between whey and chocolate milk. * $P<0.05$ versus before training.



SUMMARY AND CONCLUSIONS

➤ Generally, subjects improved in all areas of muscle strength and endurance following 4-weeks of resistance training with chocolate milk supplementation. However, the wall-sit to failure test was the only statistical significant improvement in this group.

➤ In contrast, the participants in the whey supplementation group demonstrated significant increases in the number of push-ups, shoulder girth and body weight. The wall-sit to failure test also improved by an average of 21 seconds.

➤ Overall, post-exercise supplementation with a resistance training program shows increases in muscle endurance and anthropometric improvements for physiological and training effects.

➤ One should take into account that the whey protein group was ingesting 8 grams more protein compared to the chocolate milk group.

ACKNOWLEDGMENTS

We would like to thank all of the participants for volunteering in our study. We would also like to recognize the Department of Kinesiology at the University of Wisconsin-Eau Claire for the use of equipment and supplies necessary to complete this study.