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Efficient Method of Delivery for Powdered Supplement or Placebo for an Outdoor Exercise Investigation

Implementation Strategy

RW Salatto, Dustin W. Davis, Bryson Carrier, Brenna Barrios, Jacquelyn Sertic, Peyton Cater, James W Navalta

University of Nevada, Las Vegas, Las Vegas, Nevada, USA, Department of Kinesiology and Nutrition Sciences

Abstract

- Researchers often encounter issues while attempting to deliver complete doses of a desired supplement/placebo when conducting research in outdoor environments. The problem faced by our research team was how to efficiently deliver 6.4 grams of Beta Alanine (BA) powder to subjects while conducting a hiking study on a windy trail in Southern Utah. To minimize the potential impact of the weather, and to maximize the efficiency of delivery, we determined a premixed bolus of BA contained in individual commercially available 8oz water bottles was the most efficient delivery method. The purpose of this article is to detail the development and implementation of this method.

- Point of Application 1: Testing solubility, and efficacy of dissolved BA
- Point of Application 2: Producing a large volume of pre-mixed supplement-bottles and placebo-bottles
- Point of Application 3: On site administration of supplement and placebo
- Keywords: supplementation, ergogenic aids, performance, solubility, green exercise

Introduction

When using powdered supplements dissolved in liquid for research, it is important to blind both participants and researchers as thoroughly as possible (Salatto et al., 2018). To this end, typical methodology includes use of identically flavored, scented and textured liquids. Exact liquid volumes are matched between placebos and treatments. Opaque containers are used to blind participant and researchers from viewing the treatments (Duncan et al., 2013). Generally, powders are carefully measured and mixed, and then administered under controlled conditions inside of a laboratory (Penhollow et al., 2013). For research conducted outdoors, there is much less control. Transporting powders and measuring equipment to outdoor locations may prove logistically difficult, or even impossible. Also, weather conditions (rain, snow, wind, etc.) can make measuring powders outdoors extremely difficult. One solution would be to use premeasured amounts of powder in individual packages (Zuniga et al., 2012), however the transfer of the powder to the vessel could be affected by weather. The purpose of this article is to introduce a method of supplement administration that was developed for a study conducted on a windy trail in Southern Utah. This method, the Salvalta Method, was developed to streamline the on-site administration of the study, to simplify the required materials necessary to transport to the location, and to minimize loss of the supplement due to on-site mixing.

Methods and Results

After obtaining IRB approval from both UNLV and SUU (#1508568, #01-102019a), our study was conducted at Thunderbird Garden Trailhead in Cedar City, Utah. This environment did not afford our research team the advantages of a laboratory; protection from the elements (rain, wind, etc.) or stable platforms to weigh and transfer our NOW brand CarnoSyn® Beta Alanine (BA) (Hill et al., 2007) and placebo (caffeine free, sugar free Crystal light®) (PL) powders into vessels for consumption. Accordingly, our research team had to explore alternatives to standard laboratory procedures for use on-site that delivered accurate doses of BA/PL. After considering many options, it was decided that the best way to deliver our treatment was to employ a pre-mixed dose of BA/PL. Several methods were discussed including mixing large 3-gallon (11.3L) sports-drink style containers of BA and PL and filling opaque containers on-site. Ultimately, to minimize spillage, and to ensure participants received a full serving of BA/PL, our team decided to create single doses of BA and PL using 8oz (237ml) water bottles. These bottles were assembled in the laboratory prior to the start of collection. All bottles were matched for volume, color, flavor, and then labeled (A or B) by a team member whose responsibility was to blind the study (a "blinder"). A random number generator was used to assign participants to either bottle-A or bottle-B for trial one. In counterbalanced fashion, the participants consumed the opposite bottle for trial two. To ensure the sanctity of the blind, the "blinder" would vigorously shake each bottle then hand it to another researcher who would deliver it to the participants. What follows is a description of how our study was conducted using these methods:

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POA1: Testing Solubility, and efficacy of dissolved BA

For this method to be adopted, we first needed to test the solubility of the BA. A dose of 6.4g (Kendrick et al., 2008) of BA was dissolved thoroughly in ~300ml of water inside a clear beaker. The solution was thoroughly mixed by hand until all powder appeared dissolved. The solution was allowed to rest after shaking. Researchers carefully inspected the liquid for any undissolved crystals of BA. Initially, no BA powder remained undissolved. This solution was then allowed to rest undisturbed for a period of 24 hours. After this period, careful inspection was made of the solution and no settling of dissolved BA had occurred. The solution remained entirely clear. The next step toward adoption of this method was to test the efficacy of BA after being dissolved in solution for 24 hours. For this study's purposes, efficacy was determined by the presence of paresthesia after consuming the BA solution. These steps were repeated at 72 hours and at 1 month. A set of participants (n=10) consumed the BA solution from all time periods. Paresthesia (tingling) was experienced by all participants at all times. The final step in adopting this method was to dissolve 6.4g BA in one of the 8oz bottles being used in the field and observe. No settling or recrystallization was observed, and the BA maintained efficacy in the 8oz bottle. It was determined that mixing 6.4g BA in 8oz of water, 24hr before conduction of this study is an effective method of administering BA powder in the field.

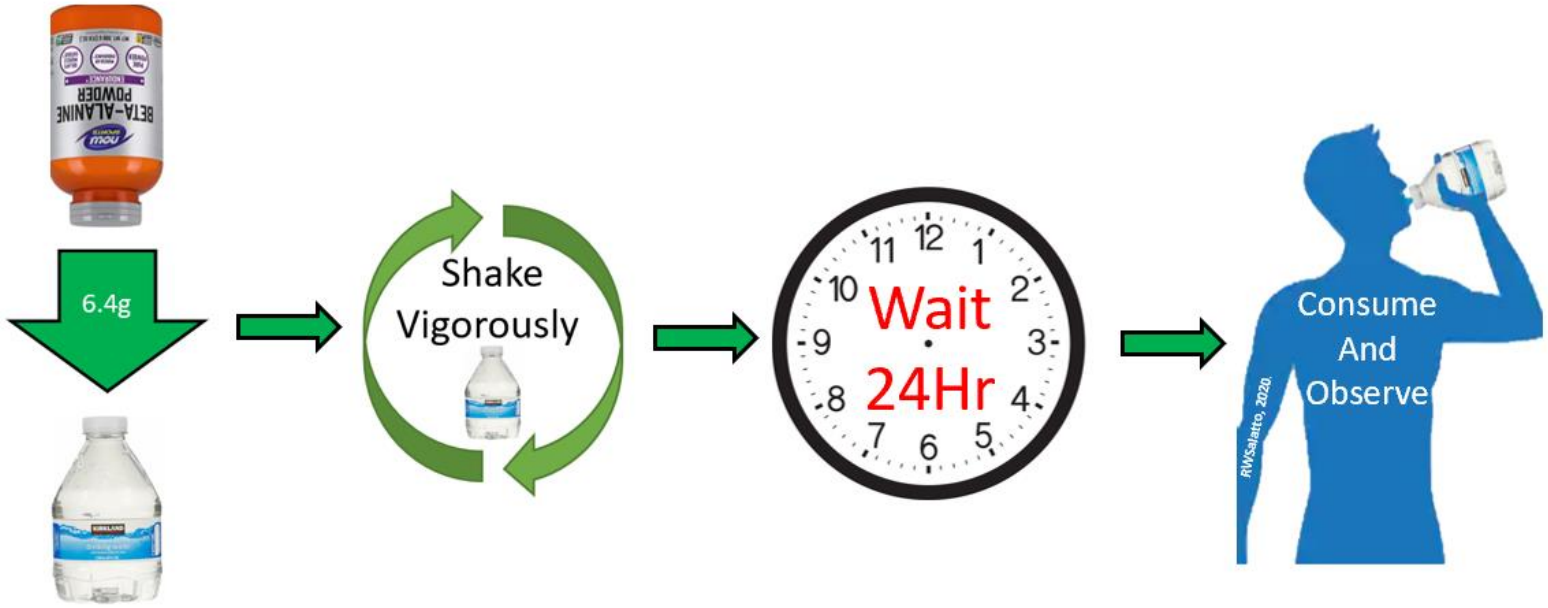

Figure 1. Depicts the process used in determining BA solubility and efficacy.

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POA2: Producing a large volume of pre-mixed supplement-bottles and placebo-bottles

A case (80-count) of generic 8oz water bottles was purchased from a local warehouse store. NOW brand CarnoSyn® Beta Alanine was purchased from an online retailer. Caffeine free, sugar free Crystal light® (CL) was purchased for use as a placebo. Forty bottles of water were allocated for use, 20 for BA and 20 for placebo. An assembly line style production method was utilized to systematically prepare each individual bottle. All stations were run by the same researcher for the duration of production to minimize intra-researcher variance. One station in the assembly line removed a small amount (~20ml) of water from each bottle to allow space for the powder. One station weighed one serving (2g) of Crystal Light® using an A&D HR-60 scale (Tokyo, Japan) and carefully added this to each bottle. One station weighed 6.4g of BA and carefully added this to each bottle. Another researcher moved the assembled bottles to a previously determined, clearly labeled location specifically designated for bottles containing both BA and CL. This assembly line process was repeated with the same researchers facilitating the same steps as before, however there was no BA added to the second 20 bottles. These bottles were moved to a separate, previously determined clearly labeled location specifically designated for bottles containing only CL. The end-result of this production was 40, identical in size, volume, color, and translucency, bottles. The assembly line was overseen by a senior member of the research team to ensure quality control. After production and clean up were completed, the lab was emptied except for one member of the research team whose specific responsibility was to label the bottles and blind the study. Bottles were labeled with an "A" or a "B" written on the cap in permanent marker. Factory labels were left on the bottles to maintain uniformity. Only the Blinder knew which bottles contained both BA/CL or just CL.

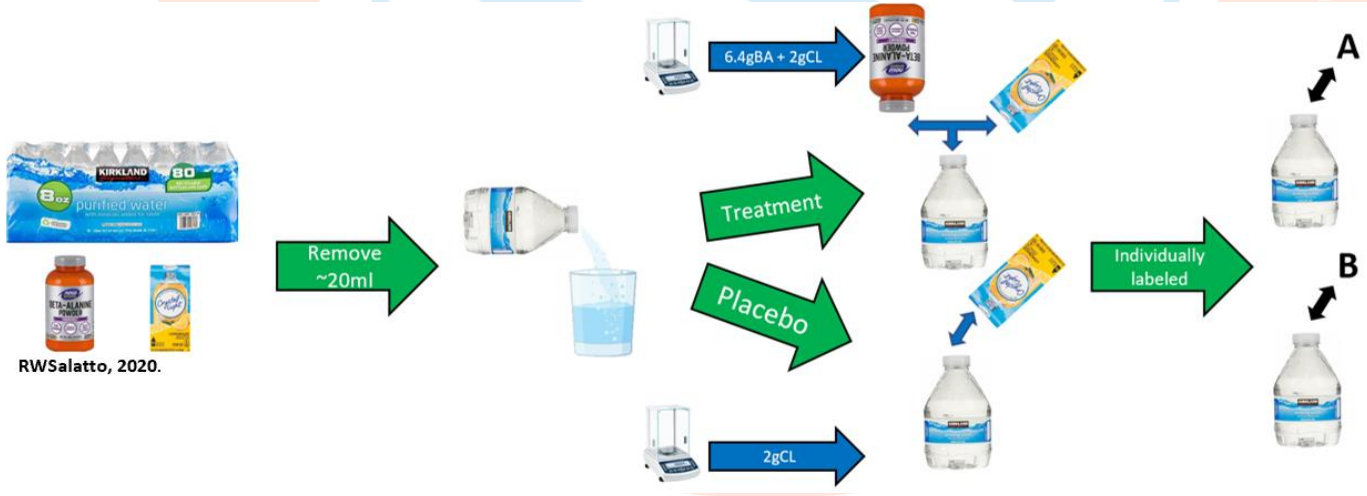

Figure 2. Depiction of the process used to manufacture treatment and placebo bottles

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POA3: On site administration of supplement and placebo

On location, the blinder used a random number generator to randomize the order in which subjects would receive treatment bottle "A" or "B". The blinder would shake the desired bottle vigorously and hand it a subsequent researcher who then delivered it to the participants for consumption. The letter on the consumed bottle was recorded on the participant's data sheet for each day's data collection. In counterbalanced fashion, subjects consumed the opposite bottle the following day. Upon return to the University of Nevada, Las Vegas, all data was input our statistical analysis software without knowledge of participants' treatment order. Once the statistical analysis was completed, the Blinder broke the blind, revealing which bottle (A or B) was the treatment or the placebo. We have come to refer to this methodology (encompassing POAs 1, 2, and 3) as The Salvalta Method. This methodology could be implemented for use with a myriad of supplements and exercise modalities occurring in natural environments.

Figure 3. Depicts the process of randomly assigning participants to either treatment group, as well as the counterbalanced style of our method.

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References

- Duncan, M. J., Stanley, M., Parkhouse, N., Cook, K., & Smith, M. (2013). Acute caffeine ingestion enhances strength performance and reduces perceived exertion and muscle pain perception during resistance exercise. European journal of sport science, 13(4), 392-399.
- Hill, C., Harris, R. C., Kim, H., Harris, B., Sale, C., Boobis, L., . . . Wise, J. A. (2007). Influence of β-alanine supplementation on skeletal muscle carnosine concentrations and high intensity cycling capacity. Amino acids, 32(2), 225-233.
- Kendrick, I. P., Harris, R. C., Kim, H. J., Kim, C. K., Dang, V. H., Lam, T. Q., . . . Wise, J. A. (2008). The effects of 10 weeks of resistance training combined with β-alanine supplementation on whole body strength, force production, muscular endurance and body composition. Amino acids, 34(4), 547-554.
- Penhollow, T., Goldstein, E., Jacobs, P. L., Whitehurst, M., & Antonio, J. (Tina, P., Michael, W., Jacobs Patrick, L., Erica, G., & Jose, A. (2010). Caffeine enhances upper body strength in resistance-trained women. Journal of the International Society of Sports Nutrition, 7(1), 18.). Research article Caffeine enhances upper body strength in resistance-trained women.
- Salatto, R. W., Arevalo, J. A., Brown, L. E., Wiersma, L. D., & Coburn, J. W. (2018). Caffeine's Effects on an Upper-Body Resistance Exercise Workout. The Journal of Strength & Conditioning Research.
- Zuniga, J. M., Housh, T. J., Camic, C. L., Hendrix, C. R., Mielke, M., Johnson, G. O., . . . Schmidt, R. J. (2012). The effects of creatine monohydrate loading on anaerobic performance and one-repetition maximum strength. The Journal of Strength & Conditioning Research, 26(6), 1651-1656.

Equipment Utilized

- NOW brand CarnoSyn® Beta Alanine
- Crystal Light ®
- Kirkland brand 8oz water bottles