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Efficacy of Multi-Nutrient Supplementation on Improving Physical Endurance and Sports Performance of Physical Education Students, University of Mysore, India

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ABSTRACT

The present study was designed to comprise development of the nutritional supplement (Nutrisport) and its' sensory and acceptability analysis. Then a convenient sample of 12 male students aged between 21-25 years were randomly selected for physical endurance assessment. Both cardio-respiratory and muscular endurance tests were performed on the subjects. Cardio-respiratory endurance test refers to the ability to continue or persist in strenuous tasks involving large muscle groups for extended periods of time.

This type of endurance was assessed by having the subjects run on a treadmill set at a speed of 15KM/hr. Then on exhaustion, time taken to exhaustion, distance covered and the amount of calories burnt by each subject were noted and recorded. Muscular Endurance test was assessed by having the subjects perform press-ups, and counting the number of presses completed to exhaustion. Then the subjects were rated according to the Canadian society for exercise physiology reference by age group and sex.

Keywords: Multi-Nutrient Supplementation, Physical Endurance, Sports Performance, Physical Education Students, University of Mysore

INTRODUCTION

A multi-nutrient supplement was prepared by use of wheat, ragi, rice, green gram dhal, flax-seed, coconut milk powder, palm oil, whey protein and sugar. All the ingredients apart from palm oil and whey protein were first roasted and milled into flour before all the ingredients were then thoroughly mixed together to obtain a homogenous product. Then a convenient sample of 12 male students were randomly selected for the study. They were assessed for physical endurance before supplementation with the Nutrisport and after supplementation.

The results of both pre- and post-intervention assessment were analyzed in order to establish efficacy of the supplementation on improvement of physical endurance of the sports' students. The analysis was done by use of a paired t-test method.

MATERIALS AND METHODS

Supplement development.

The supplement was prepared by use of wheat, ragi, rice, green gram dhal, flax-seed, coconut milk powder, palm oil, whey

protein and 30% sugar. All the ingredients apart from palm oil and whey protein were first roasted and milled into flour before all the ingredients were then thoroughly mixed together to obtain a homogenous product.

Sensory and acceptability analysis

Before supplementation, sensory analysis was done to assess the acceptability of the supplement. This was done by developing a hedonic scale score card which consisted of the following; colour, appearance, texture, consistency, taste, aroma and overall acceptability. The supplement was subjected to sensory analysis by a trained 6 member panel in two forms i.e. in one preparation the powder was reconstituted by stirring it in boiling water for a short period of 10 seconds and the other one with the powder (supplement) reconstituted by stirring it in Luke warm water.

The panel members were then asked to define and characterize each parameter separately. The panel rated the variation made by stirring the powder in boiling water for a short time as the most acceptable.

Proximate Composition analysis

The nutrition supplement was analyzed for; Protein, Moisture, Crude fat, Dietary fibre (insoluble, soluble & total dietary fibre), starch (total starch, available starch & resistant starch), Ash content, Iron, Calcium and Phosphorus to determine its' proximate composition by used of Standard AOAC methods.

SUPPLEMENTATION INTERVENTION

Deworming the subjects and pre-intervention assessment:

Before starting the intervention programme, all the subjects were given deworming tablet each, to reduce chances of poor results due to worm infestation. The subjects running on a treadmill set at a speed of 15KM/hr. Then on exhaustion, time taken to exhaustion, distance covered and the amount of calories burnt by each subject were noted and recorded. Muscular Endurance test was assessed by having the subjects perform press-ups, and counting the number of presses completed to exhaustion.

Administration of the supplement.

After the pre-intervention i.e. cardiorespiratory and muscular assessment, supplementation intervention was started. The intervention period was 8 weeks and each of the 12 subjects was given 50g of the supplement powder per day and was advised to reconstitute it by stirring in 200ml of boiling water (i.e. in the ratio 1:4 respectively) for short period of 10 seconds and then drink it. The subjects were advised to stir the supplement in the boiling water thoroughly until they get a porridge consistency, and then take it 30 minutes before each of the morning exercises. The subjects consumed the supplement along with their daily diet, throughout the intervention period.

Post-intervention assessment

This was a repeat of cardiorespiratory and muscular assessment. After the assessment, the results of pre- and post-supplementation intervention were analyzed to assess efficacy of the supplementation on physical endurance.

Data Analysis

Data was analyzed by use of SPSS. Standard Deviation (SD) and Paired 't' test was used to determine the significance of mean difference between before and after supplementation data, with respect to Muscular and Cardio-respiratory endurance capacity respectively.

RESULTS AND DISCUSSION

PROXIMATE ANALYSIS.

Proximate composition of the developed Nutrition Supplement, (Nutrisport).

Nutrisport was analyzed for proximate composition and it was found to contain 14.5% protein, 8% fat, 64.8% total starch and 11.2% total fiber out of which soluble fiber was 3.85% and insoluble fiber was 7.35%. Out of the total starch, available

starch was 52.38% whereas resistant starch was 12.42%. Ash content of the product was 1.84%. Iron, phosphorus and calcium contents of the product were 5.83mg, 174mg and 128mg per 100g of the sample respectively.

Nutrisport was also analyzed for its' bioavailability of iron and calcium. Iron and calcium bioavailability were 0.7 and 117mg per 100g of the sample respectively.

Sensory and acceptability analysis.

Study subjects were randomly sampled for the supplementation intervention (n=12) and were used in sensory evaluation. They were provided with a sensory evaluation score card each and requested to analyze the product for sensory attributes viz. colour, appearance, texture/mouth feel, taste, aroma, flavor, consistency and overall acceptability, using the rating scale provided.

According to the responses, 66.6% of the respondents rated colour of the supplement as good, 50% rated appearance as good with 41.6% and 25% rating taste as good and excellent respectively. 41.6% of the respondents rated texture/mouth feel, aroma and flavor as fairly good. 66.6% of the respondents rated overall acceptability as good with 25% of them rating overall acceptability as excellent.

PHYSICAL ENDURANCE TESTS.

Physical endurance tests were also done at both pre-intervention and post-intervention i.e. for both cardio-respiratory and muscular endurance.

Cardio-respiratory endurance assessment.

Cardio-respiratory endurance assessment was done by use of a treadmill. The subjects were instructed to run on the treadmill with the speed set at 15Kmhr^{-1}. The parameters recorded for each run were; time taken to exhaustion, calories burnt and distance covered in Km. The assessments were done three times i.e. pre-intervention, mid-intervention (after 1month) and post-intervention.

The mean time taken to exhaustion for the pre-intervention, mid-intervention and post-intervention assessments was 6.32, 7.12 and 8.09 minutes respectively. Similarly there was a consistent increase in the mean calories burnt and distance covered to exhaustion. Mean calories burnt by the subjects for the three consecutive assessments were 130.53, 132.58 and 162.4 respectively. The mean distance covered for the assessments were 1.52, 1.66 and 1.91 Km respectively.

MEAN TIME, CALORIES BURNT AND DISTANCE COVERED ON TREADMILL

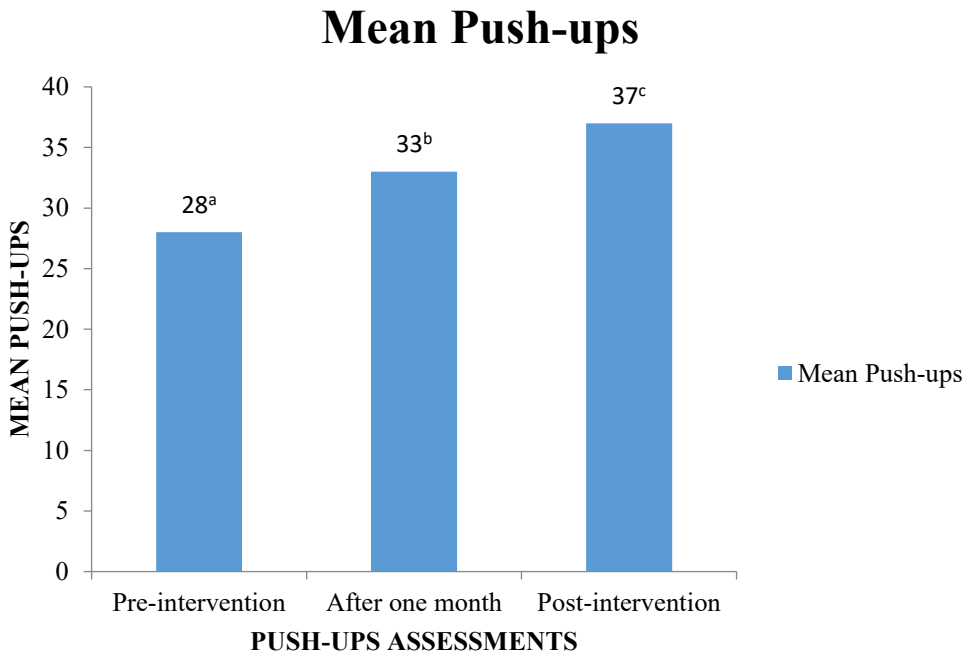
Parameter measured	Pre-intervention	After one month	Post-intervention	SD
Time to Exhaustion (Minutes)	6.32^{a}	7.12^{b}	8.09^{c}	±1.2
Calories Burnt/Expended (Kcal)	130.53^{a}	132.58^{b}	164.4^{c}	±23.9
Distance covered (Km)	1.52^{a}	1.66^{b}	1.91^{c}	±0.27

Muscular endurance assessment.

Muscular endurance of the subjects was assessed by use of complete push-ups to exhaustion. This assessment was also conducted three times i.e. at pre-intervention, after 1 month and post-intervention. The push-ups were done by one subject at a time, in order to observe complete push-ups. Then for each subject, the number of complete push-ups to exhaustion were counted and recorded for each assessment.

In order to improve accuracy of the results, the subjects were asked to perform the push-ups two times for each assessment and the push-ups performance repeated after a day and done at the same time of the day (morning 8.30-9.30). Then the mean of the two push-up exercises were calculated and recorded. According to the results, there was a consistent increase in the mean number of

push-ups done in the three assessments. The mean push-ups from pre-intervention, after one month and post-intervention assessments were 28, 33 and 37 respectively.



CONCLUSION

On the treadmill trial, there was a consistent improvement in mean time taken to exhaustion, mean calories burnt/expended and mean distance covered to exhaustion all of which was a clear indication of a consistent improvement in cardio-respiratory endurance.

According to the push-ups test, there was similarly a consistent increase in mean number of complete push-ups observed during the three consecutive assessments. Muscular endurance showed a significant increase in the mean number of push-ups from 28 to 33 and then to 37 during the pre-intervention, after one month and post-intervention assessments respectively (P=0.001). The results indicated a consistent improvement in muscular endurance of the participants throughout the supplementation intervention period. All these results clearly indicate that the Nutrisport supplementation intervention had a positive effect on improvement of the participants' physical endurance (i.e. both cardio-respiratory and muscular endurance).

Declaration by Authors

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Conflict of Interest: No conflicts of interest declared.

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