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Article

The aerob and anaerob performance beta-alanine supplement and ergogenic aid using to the power output variables in cyclists: A cohort studies random model effect

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Abstract: Supplement the use of ergogenic aids in cyclist's directly have been improved the body metabolism and hemodynamic factors that are micro supplement in chancing reactions on the body muscle mass and limb muscle. Mostly knowing that, muscle power development progressive fast glycolytic and short time oxidative systems reactions. Sport competition intervals, therefore, during periods has been used specific drinks supported to cyclists. But, be obtained during should be long race times. Athletes directly needed some drug and fluid intake to prevented from metabolic breakdown rapidly the dynamic physiologic performance factors. Beta-alanine supplementation can be direct muscle performance development affects the anaerobic metabolism and capacity. It should be determined how the cyclists will use the competitive and training period intervals can increase the cyclists specific sprint and endurance race performance. Science cyclist International Road doses will be created in which, intervals can random effectively the investigate. This study random a cohort studies is examined the effects of beta-alanine supplementation on aerobic and anaerobic power output in specific cyclists. Therefore, we have been databases PubMed, Scopus and Medline initial search 10 August 2020 were created prospective effect the quality of bias work concluded effect size (ES) 95% confidence interval (CI) were used in participant. Participations (N=66) have age range 25 to 38 of the using beta-alanine in training periods to endurance muscle performance, aerobic power, anaerobic power, and sprint time trials. As a result of beta-alanine improved anaerobic and aerobic power output on 4-week time-dependent trial performance condition. Significant values are obtained level factor alpha <0.05 and p-value analysis pre-post interactive standardization.

Keywords: Beta-alanine, supplementation, nutrition, aerob and anaerob performance.

1. Introduction

Application in micro-nutrition a current approach in sports science and competitive-training periodization additional international road cyclists has been obtained micro ingestion form of diet are use increase daily their consumption [1]. Additional macronutrition requirement in standard nutritional content needed are calories taken daily should be substances same time pre-training and competition and post-training and competition of the cyclists help to performance factors and muscle recovery [2]. The cyclists use ergogenic aids to conjunction their performance power output, hgmm, stroke volume therefore, generally not complete diet [3,4]. Increased energy formation of the muscle performance period according to like vitamin and mineral occurs ergogenic aid from same excessive obtaine long period training or competitive that macronutrition ingestion requirement [5]. Recruiment by Canada Academy of Sports and American School of Sports Medicine as suggested is three ergogenic aids class recommendation which, including a have many benefits such as completing reduce metabolism or supercompositing exercise in beta-alanine has been the groups of cyclists [6].

It is possible to see the different time combined to preserve optimal maintain performance when considering cyclists, it is important during long race times occur nutrition intake. Accordingly, groups of cyclists it is diets that will conjunction performance while consuming ergogenic supplement turned have efficiency in superior development of endurance and strength component [7,8] Cycling sports is continued the hard fight with endurance and muscle strength performance and recovery expected to take place in short periods. Condition competitions are observed in different stages and time trials over exceedingly long periods so basically is the sport of endurance [9]. But sprint performance for nature have explosive in short periods [10]. Athletes sometimes some had difficulty feeding depending on time are very hungry therefore, diet control and nutrition programs should be planned closely carefully in appropriate training processes as team and coach [11]. Dynamic performance over long periods peak values occur

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during the rapid recovery and stroke volume when power different metabolism is achieved in blood lactate optimal intervals [12].

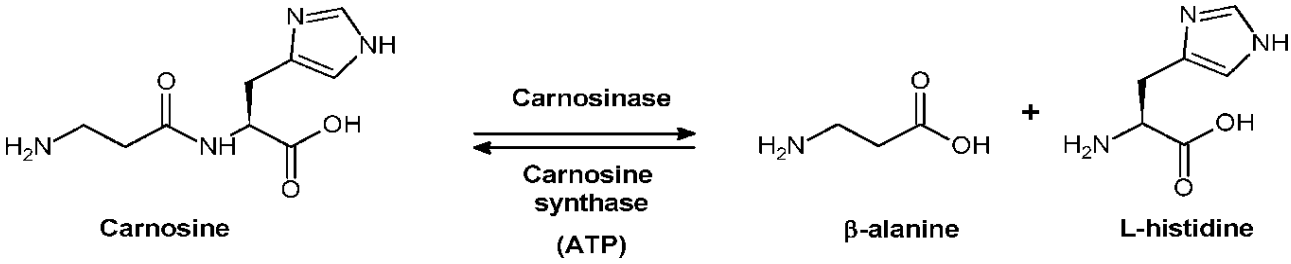

Figure 1. Complex carnosine-L-histidine metabolism of rapid insulin and glycolytic energy formation in muscle perfomance development optimal endurance sequences.

Previous exercise and performance studies for use of beta-alanine into carnosine conjunction is aim in specific type II fibers reported that an amino acid this inductively of hydrogen ions without being induced calcium release simultaneous performed ATP-resentez in the anaerobic glycolysis cycle [13]. But this condition metabolic cycle fast recovery energy in cytoplasm can help to muscle buffering observed intramuscular adaptation pH buffering as regeneration activity on muscle development performance [10,14]. Investigation reported on the horses initial beta-alanine amino acid form for the metabolic carnosine type I oxidative 20% and type IIb fast glycolytic fibers 46% has become evident not type IIa fast glycolytic oxidative [15].

Therefore, developing cycling increase energy formation drug studies firstly have been a multiple antioxidant [16]. Stunning results, using to beta-alanine supplementation highly ingestion in the decade > 4 weeks 3-6 g/day ingestion resulted in intramuscular carnosine levels within type I and type II fibers 30-80% same performance results all during competitive and training doses [17]. Addition, intramuscular recover phase and anaerobic capacity development levels of the muscle mass between male and female 3.5-1.0 ratio in hormonal development residual sex are observed to sytokinease [16]. Same previous studies how exercise performance outputs development of endurance cyclists has not gained obvious as long time- dependent performance [18]. The reason this, in endurance performance is by tolerating rapid glycolytic energy capacities involved in the oxygen cycle over 1-3 min for performance the use of beta-alanine in the few minutes should be used as an auxiliary production [19]. Although, cyclist's group has been reported to contractile mechanics oxidation of percentage reported to cause lactate in anaerobic and aerobic capacity [20]. Increased lactate production has enabled muscle adaptation otherwise total work output capacity increase in bicycle capacity was found to correlate with the carnosine content in muscle within beta-alanine by 50% type I and type II [10]. The muscular efficient of knee and ankle limbs extensor for anaerobic capacity and aerob power output variables is important muscle development in cyclist period and pedalling mechanic [18].

The aim of this studies was to conclude the use of beta-alanine dose in the physiologic effect depend on time-related trials of anaerob and aerob power output performance in cyclists. Dose use in different time periods will be concluded at performance factor (e.g., as performance output glycolytic insulin resistive factor and aerobic residual oxygen capacity).

2. Materials and Methods

This study was followed methodologic quality and bias of include by independent effect size and confidence interval investigate the applied training science Pubmed, Google Scholar and Medline were data publication no limitation. All of times one year the retrospective from August 2021 (2009-2020). The Cochrane Collaboration quality controversies resolved on blind evaluated of the study authors, method, and characteristics sample size, using of the beta-alanine supplement and performance levels of cyclists. Same dose using was formed [21]. All screen evaluation generally eligibility criteria completed the study characteristics; a: participation property characteristics, b: health hydration status, core temperature used to during supplement, c: macro-nutrition standardizes before and after training and

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competitive period of their performance anaerobic and aerobic power output recorded. All statistic paired-T test comparison to between cyclist pre and post values, method Binary R statistics measurement therefore, mean and standart deviation operation systems windows and excel statistically significant was set the effect size and are obtained to use the measurement confidence interval low and high showed Cohen'd effect size 0.20 small, 0.50 medium, 0.80 high this study (SPSS 21, IBM, New York, USA; Salkind, 2010). ($P < 0.05$).

Table 1. Criteria research eligibility

Variable criteria	Included	Excluded
Participation	25 to 38 age and medical health acceptable	38 adult and cyclist age no cyclists e.g., road, mountain, recreational
Method approach	Beta-alanine blind manner and macro-micro specific nutrition intake standardization	Intake caffein, alcohol before periodization and training times and no nutrition program cyclist.
Studies design	Randomize and cohort single- and double-blind studies	No randomize experimental condition nutrition intake
Results	Aerobic and anaerobic power output at least performance parameter	Aerob and anaerob power output no results and conclusion eligibility

3. Results

Participations results obtained PubMed (N= 26), Scopus (N= 74) and Google Scholar (N= 56) total 156 research. Research data variables each statistically significant end of mean and standard error and deviation resulted random effect size estimated in effectively weighted mean difference and 95% confidence interval. Therefore, individual results population sample size as minus standardized [22]. Sub-results analysis into training protocols, strength and endurance, sprint and combined power output was prevented from of the bias in study specific development should be sport science and international cyclists performance could determine and evaluate.

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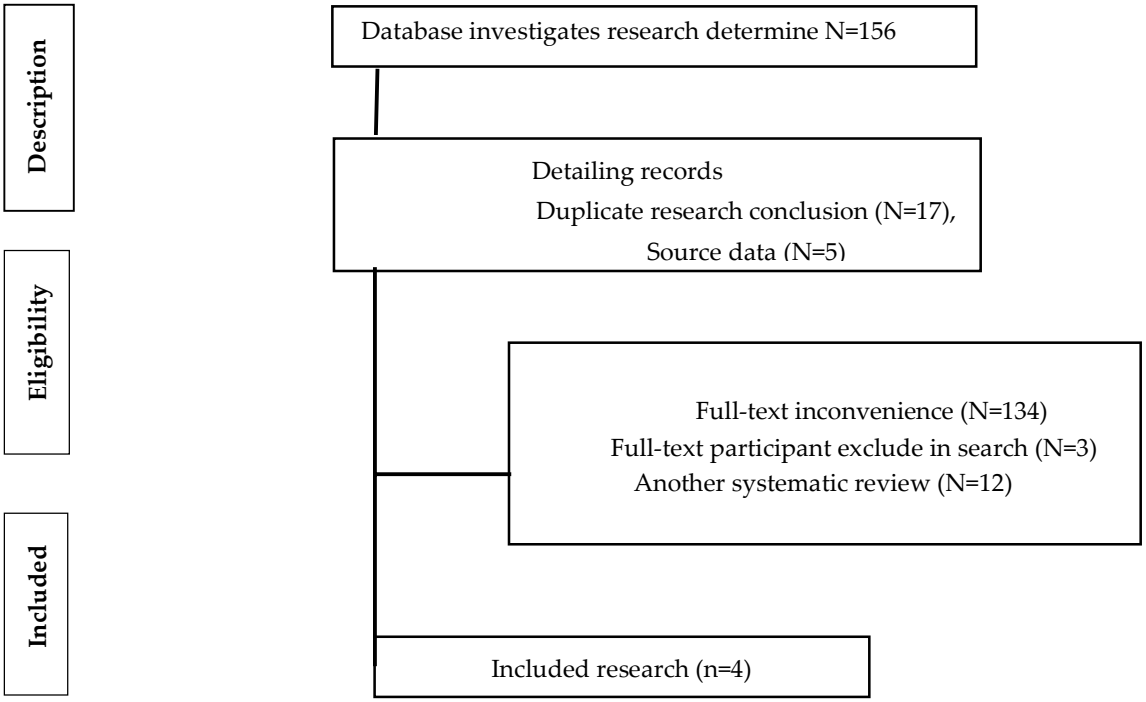

Figure 2. Flow diagram PICO quality checklist

Participation risk of bias in blind author evaluated references listed [22]. This study propered range randomize allocation concealment; blind participation, blinding of outcome evaluate, incomplete outcome data, selective outcome reporting, other sources of bias, overall risk of bias; 2 low, 3 medium, 4 high-risk bias was evaluated as quality cochrane (Table 2).

Table 2. Study risk of bias quality obtained results

Research	Random-ize range	Allocation conceal-ment	Blind par-ticipation	Incomplete outcome data	Selec-tive out-come reporting	Other sources of bias	Over-all risk of bias
Bellinger and Minahan	L	L	L	L	L	L	L
James	L	L	L	L	M	L	L
Howe	L	L	L	L	L	L	L
Van	H	L	L	L	L	L	H

Abbreviation L: Low M: Medium H: High

Note: Evaluated cyclists reported that, results have been shown one study high risk of bias, other studies low risk of bias, same one study medium risk of bias shown this beta-alanine supplement using muscle endurance and anaerobic capacity evaluation of the power output development.

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BA supplement most anaerobic glycolytic systems when performance factors can be effect from glycolytic systems energy output and muscle performance energy. Therefore, anaerobic, and aerobic protocols by different time periods resulted in endurance and recovery of the power performance mechanics and pedalling development [23,24]. However, their acute effect was aimed. Same participation groups regardless of experience characteristics aerobic power has been limited long time periods. Anaerobic power reported that, time as periods to measurement protocols are values parameter obtainement eligibility power output reference [25, 26]. Therefore, races cycling time-period anaerobic less were founded [5]. Reported that the most should focus on power performance changes or not. Systematic values of obtain graph presentation for not significant included in study. Peak training period and peak power development out exercise trial and test condition generally use of BA supplement has been concluded.

Table 3. BA supplement participation property aerob endurance and anaerobic capacity effect in training trial testing condition

Parameter	Sample size	Age	Variable	Gender	Design	Research Code
W and L	P= 7 B= 7	25.4 y	4.50 L/VO2	M	28 d; 6.4 g Parallel	Bellinger and Minahan, 2016a
Le	B= 10	24.5 y	4.47 L	M	28 d; 6.4 g Parallel	Bellinger, 2016b
Le	P= 7 B= 7	24.8 y	65.4 mL	M	4-w; 6.4 g Parallel	Bellinger, 2016c
J	P= 11 B= 11	54 y	3.459 J 3.451 J	F	28 d; 800 mg Parallel	Gleen et al., 2016
W and Le	B= 12	26. 6 y	610 W	F	1 d; 1.6 g Parallel	Glenn et al., 2015a
J	P= 11 B= 11	53.3 y	39 mL	F	28 d; 800 mg Parallel	Gleen et al., 2015b
W	P=13 B=14	31.6 y 30.3 y	61 mL 60.4 mL	M	6-w; 800 mg Cohort	Chung et al., 2014
W	P=10 B=9	33 y 32 y	50.773 J 52.538 J	M	4-w; 800 mg Parallel	De Salles et al., 2014
W	P=9 B=10	32.6 y 37.8 y	1993 W 1975 W	M	4-w; 800 mg Parallel	James et al., 2014
J and W	P=8 B=8	22.5 y 26.8 y	67.3 mL 67.5 mL	M	4-w; 127.4 g Parallel	Howe et al., 2013
W and Le	P=8 B=9	24.9 y	60.3 mL/kg	M	8-w; 500 g paralell	Van et al., 2009

J: Joul; W: Watt; N: Newton; Le: Lactate elimination, P: Placebo, B: Beta-alanine, M: Male, F: Female, P: Parallel, C: Cohort.

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NOTE: Lactate elimination and power output concluded in cyclists.

Bellinger and Minahan (2016a) in cyclists for sprint performance depending on race starting 41 km repetations to interval training session and 4 km and 10 km performed three times in supramaximal exercise section [5]. Normalize power founded that, research to km 144.84/Watt conjunction with 1.90 mmol lactate accumulation. The resulted values showed that, 3-4. km has obtained 424/Watt to increased anaerobic improvement concluded (ES= 0.29 moderate, WMD= 23/Watt; p=0.05) as statistical high effective shown. Lactate mmol levels same mean 16.1 mmol totally significant has shown highly effective lactate power energy increase. Power increase daily progressive contraction of muscle mass as 6.4 g are beta-alanine groups cyclists lactate elimination resulted. Howe et al (2013) supramaximal effort 90% reach contraction concentric after HIT-30 s at 4-min mean reported that, results showed total working aerobic power optimal stroke volume/saturation and lactate elimination increase, proved recorded blood resistance, muscle heat and core temperature optimal endurance development of muscle contraction sizes effected performance development (ES= 0.27 moderate; WMD= 11/Watt; p= 0.01) of the showing muscle strain increase resulted to the vastus lateralis and medialis and rectus femoris and gastrocnemious sec has been shown statistical significant with 30 s isokinetic test conclusion time-depend specific protocol increased aimed lactate [10]. However, power output after 4-weeks beta-alanine using was increased. Other studies for peak performance development 90% MSLL 110-min after 10-min time trial functional threshold power sessions and 50% MSSL 30-s sprint time performance determined BA groups cyclists at 10-min time trial and sequence should be aerobic power differ was effect decrease has been showed (ES= 0.50 moderate; WMD: 52/Watt; ES= 0.54 moderate; WMD: 21/Watt; p= 0.03). Therefore, consequently, lactate evaluated finish the power output, overall effect size was taken for level alpha p> 0.05. Additional within research different testing condition peak power values size has been shown alpha level p< 0.05.

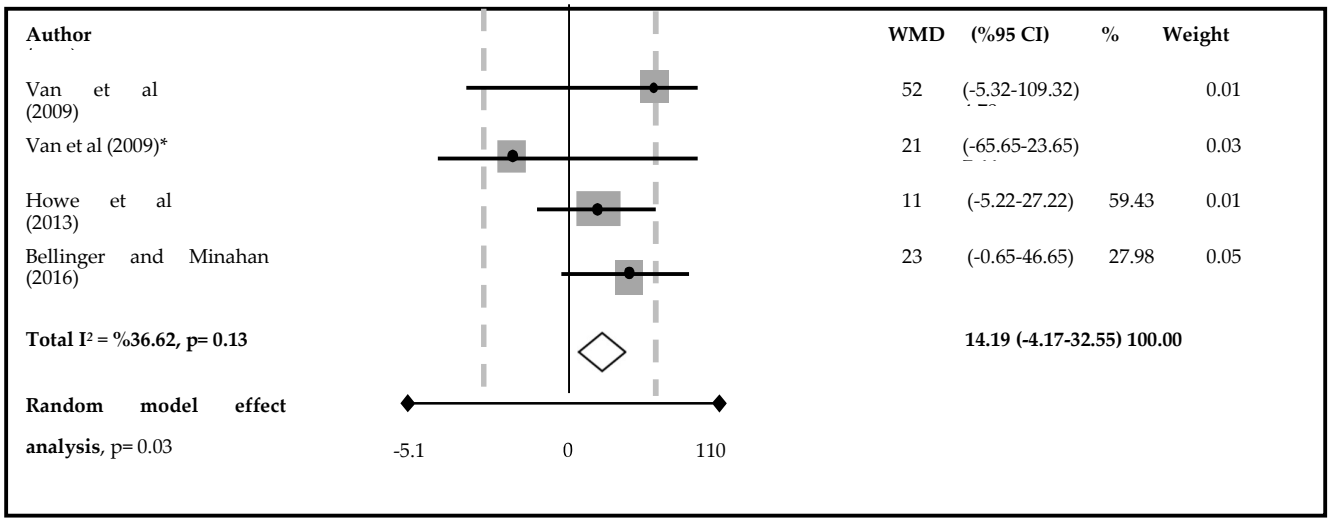

Table 4. Forest plot of BA supplement using aerobic power and anaerobic capacity of normalize power developing on power output results shown that, random effect analysis determination

Mean data concluded random anaerobic capacity peak power development showed 4 research highly effective significant and confidence intervals increase. One research experimental other three research both experimental and clinic should be [10]. Conclusion, carnosine similarly insulin levels is normal course. Single research for washout period 5 to 6 week before BA use 15-week normally stressed that, it should be in this time over 47 age is low carnosine level with relationship health insulin hormone decreased energy formation [10]. Performance of BA supplements long time race not studied in cyclist only has found sprint into muscular endurance peak systematic hormonal and insulin take from normalize power. Generally known that hours, weeks, and mount training effectively muscle hypertrophy aimed to sprint developing on muscle size effectively [5]. Therefore, sprint performance always buffering of muscle capacity be explosive in short time trial training periodization so-called micro cycle. Total capacity studies showing that, WMD: 14.19/Watt relationships between oxygen cycle, contraction mitochondria enzyme same effective

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pH changes with hgmm and heartbeat. However, studies are heterogeneous Q value is 4.73 and different have shown investigated alpha value work every significant random effect. Therefore, we showed to obtained heterogeneous I^2= 25-50% small [22] Van et al (2009) were obtained (CI: -5.32 – 109.32) changes pre-post differed about 4 repetitions same 1 km references concluded in beta-alanine will show that, highest power increases ($p < 0.10$). Bellinger and Minahan (2016a) that founded (CI: -0.65 – 46.55) was as other same trial methods. Minimum effect has been found anaerobic-aerobic complex periodization application in total should 4-week beta-alanine with 800 mg short muscle energy capacity and recovery [5,10].

4. Discussion

Over long time periods, it is believed that it can increase the effect of international road cyclist training of anaerobic and aerobic high effect time 1-day micro cycle anaerobic threshold but long-term efficiency as 4-to-8-week same periodization because estimated to power and lactate mmol increase [5, 20, 24, 25, 26, 27, 28, 29]. Male cyclist at least per week 7 hours training about 20 km trial load is occur 7/Watt power increase sequence of intervals but increasing mechanism in the muscle would not proper training into beta-alanine use because 48 hours or 24 hours eliminated lactate as well as recovery most speed. Beta-alanine individual dose prevent from lactate decreased must be macro carbonhidrate if use decreased, short concentric activation did not formation. Limitation must be their insulin pooled mmol ATP glycogen. Chung et al (2014) other studies as 1-hour working of muscle using beta-alanine time interval total 101 km road with gastronomes and soleus when carnosine with macronutrition level investigated the mean development obtained 20/Watt, similarly total load means caused 1.987 J power [29]. However, BA group were not randomized because there was only indicating training effectiveness [26]. High total work in this study 6-week BA using for intramuscular hypertrophy level can show regardless of muscular economy at rate of buffering fast glycolytic sprint performance peak power increase for trials 4x30 wingate performance. Aerobic capacity regardless initial load 120% of VO2max in voluntary exhaustion of female cyclist 24% increase with training effectiveness low about lactate 5.76 mmol high intensity trial resulting of was obtained aerobic capacity 34% distal end volume increase anaerobic is noteworthy. Using of BA one day 1 gr non- contribution to performance improvement of muscle size contraction phases [27,28]. This stage short term and mean 55/Watt no significant that, evidence fatigue in post measurement accompanied to lactate accumulation 14.6 mmol as other reported high. Other BA supplements anaerobic isokinetic above 1 min time dependent contractile mechanism the type II fibers occured 41 J total working no considered imported difference protocol time dependent 4000m aerob performance but anaerob power high observed while increased 12.6 fatigue mmol lactate hgmm of stroke volume characteristic, limitation of working mean and standart deviation values was not specified [30]

After all, critical power has not been formed with BA-alanine using and carbonhidrate consumption short term 2-4 week can support as well as physiologic using no assumption ergogenic aid the short period competition and training times. In long term aerobic working modes for endurance cyclists should be macronutrition intake side effect paresthesia should not be overlooked [31]. Additional, total sprint supramaximal intensity compromise high capacity normalize power effort of short-work attribute mean age 24 and 28-day-6.4 g/day intake with recovery and injury risk of sportmenships [5]. For muscular efficient increase depending on the sprint performance protocols above ventilatory threshold should be BA supplements need to long-term showing effective training periods and 25 year and 8-week/800 mg [10].

Therefore, fast contraction period 180-degree repetition 30 mechanics muscular efficient use of BA supplements in cyclists increased in performance their concluded age 27 and 4-week/127.4 g [18] Conclusion, short-term muscular efficient performance power output shown is effect supplements in cyclist but periodization for long term strategies more effect is needed professional and international road cyclist.

5. Conclusions

In race and competition cyclist anaerob and aerob power the BA supplements exercise finalized protocol supplements doses. Peak races sprint exercise and training for reason should be true using limitation, therefore, long term periods BA supplements few research have been obtained. Peak BA included in muscle buffering strategies within 90-min [32]. Power factors when anaerob and aerob working capacity in future research for power output should lead to

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the linear effect and training period planning that may result in power out, lactate or hemodynamic parameter. Side effect factors another supplement combine or carbonhidrate status individual cyclists or team road cyclist's implementation are needed for develop. Limitation dose setting should be created according to athletes. Muscle mass and fatigue be limited in multiple energy sections.

Author Contributions: For research articles with one author all process has contributed to substantial work.

Acknowledgments: There were no authors conflicts of interest to declare. The contributions of authors included in the systemic section to carried out the examination of studies obtained findings analysis and draft table and graphs. Authors approved final this study. Authors also wish to thank their assistant professional cyclists in the design of this study.

Appendix A

The appendix is an optional section described source of a series of supplementary authors, appendixes compose of beta-alanine, sodium bicarbonate, nitric oxide, beta-hydroxy-beta-methylbutyrate.

Abbreviations: BA: Beta-alanine, CI: Confidence Interval, WMD: Weighted mean difference, HIT: High-Interval-Training, HCO3: Bicarbonate, MSLL: Maximal steady-state lactate, J: Joul, Le: Lactate elimination.

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