

Physiological Changes after One Month of Exclusive Supplement Consumption and Exercise: A Case Study

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Abstract: An extreme protocol including one month of intense exercise (HIIT (high intensity interval training)) and exclusive supplement consumption, i.e. no food, was undertaken by one participant, in order to understand the effects of one month of exercise without eating any food. The purpose was to acquire some initial data for future studies so that better exercise programs may be designed for both time-restricting athletic programs, and individuals who wish to combine fast fat-reduction and the improvement of their physical form. There was a parallel methodological goal to examine changes synthetically and not analytically, that is, to compensate for a gap in literature in regard to the absence of synthetic models. Changes in the participant (male, 34 y.o., 72 kg, BMI: 22.9) included a 21.20% relative reduction in body fat (3.9% in absolute values), a 2.6% reduction in body weight coupled with a 1.8% increase in fat-less mass, a 10% increase in maximum leg extension and a 6% increase in maximum chest press. Blood creatinine (+56%) and blood urea (+35%), as well as SGOT (serum glutamic oxaloacetic transaminase) (+45%), SGPT (Serum Glutamic Pyruvic Transaminase) (+75%) and Lymphocytes (+45%) were markedly increased. HIIT and exclusive supplement consumption, intermittent fasting and hypocaloric diet for one month drastically affected the individual in this case study by drastically improving his physical form, at the cost of worsening important biochemical markers.

Key words: high intensity interval training, intermittent fasting, supplements, hypocaloric diet.

1. Introduction

Athletes seek to make the most of brief periods of time to improve their physique in order to prepare for competitive events.

Food supplements are an important constituent of athletic diets providing benefits that nutrition, alone, may not provide—at least in the quantities needed and in the time constraints which both athletes and non-athletes may be subject to [1, 2]. However, the gap in the literature remains: how effective are supplements in general [3]? To what extent can supplements support an athlete? This question will be explored in our study.

HIIT (high-intensity interval training) is effective in improving strength and endurance parameters, as well

as other health indicators [4, 5]. It is considered to be highly effective in improving power output, flexibility, endurance, coordination, metabolic markers in health and disease, and well-being [6-9]. In this case study HIIT, intermittent fasting and hypocaloric consumption will be combined. The aim is to evaluate the effect of food supplements combined with extreme dietary restrictions in an exercising individual for the period of one month. The results will provide a reference point for better designing such protocols, as well as answering the question: “how effective is a shock protocol?”

Pilates is a milder form of (therapeutic) exercise targeting core strength and flexibility, stressing correct breathing and posture, while opting for lower-back safety and rehabilitation [10-12]. The selection of the two forms of exercise was, therefore, complementary: HIIT was thought of as the main form of exercise, while Pilates served as a safety measure to ensure

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correct posture rehabilitation, and thus the least possible injuries; indeed, the second week of protocol A the individual developed an acute pain in his right deltoid, which healed after no more than three days and without refraining from training activities.

The protocol also included a form of intermittent fasting (not receiving any calories for 15 hours each day, 19.00-11.00) and of a mild hypocaloric diet (receiving less calories than recommended). Both practices are believed to improve energy-levels, general health, immune system efficacy and fitness [13-16].

Finally, basic epistemology calls for two types of models: analytic and synthetic ones. Literature usually investigates parameters in isolation, which is fine if, and only if, synthetic ones are also examined. In this study, the effects of several parameters are examined synthetically, i.e. all in unison and not one-by-one.

2. Materials and Methods

In this case study one participant (34 y.o., 72 kg, height: 179 cm, BMI: 22.9) completed a 30-day long protocol consuming only food supplements, while intermittently fasting within the context of a hypocaloric diet. The subject was a healthy, well-trained former national-level tennis player and now veteran tennis player, as well as tennis trainer. No recent injury or neurological disorder of any kind were reported. The subject was the corresponding author, so no consent-related matters ensue. The HIIT exercise included a 40-minute training session split into 30-sec bouts of whole body intense exercise followed by 10 seconds break. Every 10 minutes, a 2-minute break took place. Pilates training lasted 45 minutes and it included medium-intensity exercise, interchanging on a Cadillac and Reformer Pilates bed. Table 1 presents the daily intake of all nutrients.

The protocol required a full month of exclusive supplementation together with daily exercise sessions. Sundays were days-off. The main protocol consisted of two sub-protocols, A1 and A2, because half of the

week evening workouts did not take place. During each week, 4 days (Monday, Tuesday, Friday, Saturday) required double exercise sessions: one morning HIIT-session, and a milder one in the afternoon (Pilates). That was protocol A1. Protocol A2 consisted of the rest days of the week (Wednesday, Thursday), was no afternoon training session that took place.

2.1 Selection of Nutrients

While an adequate amount of protein consumption was an obvious goal, there were other considerations as well. A first group of nutrients was selected for its anabolic action: protein and creatine [17, 18]. A second group of nutrients was selected for its anti-catabolic action, namely L-glutamine and HMB [19, 20]. BCAA (Branched Chain Amino Acids) is considered by some researchers as both anti-catabolic and anabolic [21]. Other ergogenic aids and/or protective agents used included ubiquinol, acetyl L-carnitine, alpha lipoic acid, and beta-alanine [22-27]. A third group of nutrients had

Table 1 Daily intake of all nutrients, taken as supplements (see next table) resulting in an 1,300 calories energy-intake per day. Calories were calculated based on the values given by the manufacturer.

Nutrients	
Calories	1,300
Protein (whey, soya, pea) (g)	100
Carbohydrates/of which sugars (g)	50/5
Fat/of which saturates (g)	22/5
Creatine monohydrate (g)	12
Beta alanine (g)	2
3-hydroxy-3-methylbutanoic acid (HMB) (g)	2
L-Arginine (g)	3
L-Glutamine (g)	33
BCAA (g)	3
L-Glutathione (g)	1
Omega 3, 6, 9 (g)	3
CLA (conjugated linoleic acid) (g)	3
Ubiquinol (mg)	100
Acetyl L-carnitine (g)	2
Alpha lipoic acid (mg)	300
Acidophilus	4 bln live bacteria
Multi-guard sport* (tablets)	2
Electrolytes* (tablets)	1

* The brand-name of the vitamin-tablets (See Table 4).

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a more “supportive” role to ensure the safety and the well-being of the participant: vitamins, antioxidants & minerals, CLA, Omega 3, 6, 9, L-Glutathione and acidophila bacteria to help protect gut flora [28-30]. Finally, the intake of specific nutrients was programmed considering both synergy and incompatibility. Acetyl L-carnitine and alpha lipoic acid may complementarily promote mitochondrial synthesis and adipocyte metabolism [31]. Creatine and HMB also seem to have an additive effect [32]. Incompatible pairs included CLA and resveratrol (the latter being present under the label “Bioflavonoids” in “Multi-guard Sport” tablets), as well as alpha lipoic acid and benzoic acid [33-35]. In such cases, the incompatible supplements were not taken together. Table 2 provides the full supplementation protocol. Tables 3 and 4 present all the supplements used along with their lot identification numbers.

2.2 Workout Selection

A combination of HIIT and Pilates workouts have been selected. HIIT was chosen because it is a relatively new form of exercise and we wanted to investigate it further. Pilates was used because of its rehabilitative effects. HIIT consists of several intense multijoint training bouts of around 30-40 s of anaerobic work each, followed by short rest-intervals of about 10 s. The whole session lasted 40 minutes, with two minutes break every 8-10 minute of intense workout. The exercises varied each day but all of them were performed using free weights, medicine and Swiss balls, trampolines, ropes, exercise bands floor exercises (push-ups, crunches etc.), jumps, steppers, punchbag. Pilates training included both Cadillac and Reformer (they were alternated in each session). It lasted one hour (including warm up) consisting of mild-intensity Pilates workouts. Not all days included a Pilates workout: Protocol A1 included an afternoon Pilates training-session, whereas protocol A2 (Wednesdays and Thursdays) had no afternoon exercise at all.

2.3 Strength Tests

Maximum strength was measured for chess press and leg extension one day before and two days after the completion of the protocol, in the morning, without eating any breakfast (see Table 5). The best-of-three

Table 2 The protocol followed.

Nutrients	Protocol A1	Protocol A2
Morning		
Acidophilus	4 bln live bacteria	4 bln live bacteria
Pre-workout 1		
BCAA (g)	3	3
L-Arginine (g)	0	3
WORKOUT	HIIT	HIIT
Post-workout 1		
L-Glutamine (g)	2	2
Electrolytes (tablets)	1	1
Midday		
Protein (g)	50	50
Carbohydrates (g)	25	25
Fat (g)	11	11
Creatine monohydrate (g)	6	6
L-Glutamine (g)	12	12
Beta alanine (g)	1	1
HMB	1	1
Multi-guard sport* (tablets)	2	2
Ubiquinol (mg)	100	100
Afternoon pre-workout		
L-Arginine (g)	3	0
WORKOUT	Pilates	No afternoon workout
Afternoon post-workout		
L-Glutamine (g)	2	0
Late afternoon		
Protein (g)	50	50
Carbohydrates (g)	25	25
Fat (g)	11	11
Creatine monohydrate (g)	6	6
L-Glutamine (g)	12.5	12.5
Beta alanine (g)	1	1
HMB (g)	1	1
Omega 3, 6, 9 (g)	3	3
CLA (g)	3	3
Acetyl L-carnitine (g)	2	2
Alpha lipoic acid (mg)	300	300
Night		
L-Glutamine (g)	5	5
L-Glutathione (g)	1	1

Table 3 Supplements used.

Supplements	Lot number
(Lamberts products)	
L-Glutathione complex 500 mg	F133830
Acetyl L-carnitine 500 mg	F128361
Alpha lipoic acid 300 mg	F133534
BCAA 500 mg	O39454
All in one chocolate powder	L7128
Pea protein powder	O39205
Multi guard sport	F131149
L-Arginine HCL 1 g	F131748
L-Glutamine powder	O40599
Omega 3, 6, 9 1,000 mg	O40468
CLA 1,000 mg	O39542
Acidophilus extra 4	O40531
Ubiquinol 100 mg	O39287
Non-Lamberts products	
BioRice natural drink (the bridge)	L7132X
HYDRO (electrolytes—BodyLab)	N/A

attempts were recorded, after 2 warm-up sets. Chest press was tested on a flat bench using a standard 20 kg bar. Leg extension was tested on a Technogym Element machine. RM (repetition maximum) was calculated based on Dohoney et al.'s protocol [36].

2.4 Biochemical Tests

Blood tests (see Table 5) were performed the same day with the strength tests, early in the morning, after a 12-hour fast. No alcohol, or caffeine-containing drinks, were consumed 48 hours before any measurement.

2.5 Anthropometry

Dual-energy X-ray absorptiometry (DEXA) scans were used to measure BMI, weight, fat (%), and fat-less mass (see Table 5).

3. Results and Analysis

The main finding was a significant reduction of the total body fat index (3.9% in absolute numbers or 20.20% improvement) without a proportional reduction in body weight, while there was even an approx. 1 kg increase in fat-less mass (Table 5). Strength gains were also noticed: Leg extension was improved by 10% (relative improvement) and chest press was improved

Table 4 Multi-guard sport.

Multi guard Sport per 2 tablets	
Vitamin A	800 µg
Vitamin D	15 µg
Vitamin E	36 µg
Vitamin K	75 µg
Vitamin C	200 mg
Thiamin	3.3 mg
Riboflavin	4.2 mg
Niacin	32 mg
Vitamin B6	4.2 mg
Folic Acid	500 µg
Vitamin B12	7.5 µg
Biotin	150 µg
Pantothenic Acid	18 mg
Calcium	100 mg
Magnesium	376 mg
Iron	7 mg
Zinc	15 mg
Copper	1 mg
Manganese	4 mg
Selenium	200 µg
Chromium	200 µg
Iodine	150 µg
Choline Bitartrate	5 mg
Inositol	5 mg
Para amino benzoic Acid	7 mg
Rutin	30 mg
Citrus Bioflavonoids	30 mg
Green Tea Extract	50 mg
Grape Seed Extract	10 mg
Quercetin	25 mg

Table 5 Results of blood tests, maximum strength evaluation and anthropometry scanning.

Parameter	7/July/2017	7/August/2017 (vs. July)
HCT (hematocrite-%)	46.3	43.4 (↓2.9)
Fasting Glu (mg/dL)	89	77 (↓12)
Urea (mg/dL)	37	50 (↑13)
Creatinine (mg/dL)	0.96	1.5 (↑0.54)
Serum glutamic oxaloacetic transaminase (U/L)	11	16 (↑5)
Serum glutamic pyruvic transaminase (U/L)	8	14 (↑6)
Fe (µg/dL)	44	90 (↑46)
Weight (kg)	72	70.1 (↓1.9)
BMI	22.98	22.2 (↓0.78)
Fat (%)	18.4	14.5 (↓3.9 in abs. values or 21.20%)
Fat-less mass (kg)	59.42	60.47 (↑1.05)
Leg extension (kg × reps)	RM = 220 kg	RM = 242 kg (↑22 kg)
Chest press	RM = 80 kg	RM = 85 kg (↑5 kg)

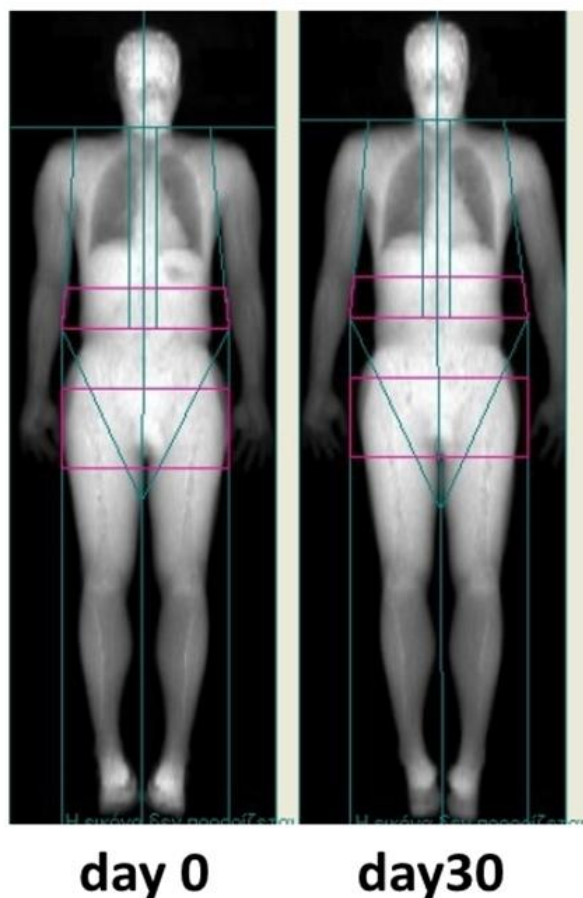


Fig. 1 Before and after the protocol.

by 6.25% (relative improvement). Fig. 1 shows the results of the protocol in a qualitative manner through a “before & after” DEXA-scan picture.

Blood tests revealed a stressed system, as all the measured parameters (urea, creatinine, SGOT (serum glutamic oxaloacetic transaminase), SGPT (serum glutamic pyruvic transaminase)) significantly increased—they almost doubled in many cases (see Table 5).

4. Discussion

The main aim of this study was the examination of the effects of one month of exercise in a mild hypocaloric context. Such preliminary results could help in the design of more thorough studies both for athletes and overweight individuals. The most noticeable changes concerned the decrease in body fat. On the methodological aspect, this study may be

classified as “synthetic”, meaning that it shows how more than one factor interact. Studies that opt for better ecological validity should start synthetically, investigating interactions of less and less parameters (up to one) in follow-up protocols.

Other studies have shown no noticeable increase in creatinine levels while consuming creatine—the usual suspect for such an effect [18]. Heightened creatinine levels have been observed in cases of rhabdomyolysis with acute renal failure [37]. However, this is not the case here; CPK (creatine phosphokinase) was measured and found 154 U/L. Therefore, we theorize that the elevation of creatinine levels is a result of intensive exercise, creatine consumption and some kind of heat-stress and dehydration—even though we tried to consume an adequate amount of water (the protocol took place in August). The stress hypothesis is further supported by the marked change in lymphocyte/neutrophil ratio (an inversion of type was measured).

To the authors’ knowledge, it is the first time that total body fat and fat-less mass by means of DEXA are measured for a HIIT protocol. This HIIT-based study selects to measure, as well as strength gains. Other HIIT studies focus on aerobic endurance and endurance-related factors [38, 39]. The measurements revealed a marked decrease of total body fat without a proportional decrease in total weight (Table 5) with a marked increase in strength tests—even though much greater strength improvements would be expected in weight-based protocols with a normal, athletic nutrition. Apart from the impressive fat-loss, no other measurement revealed a change that would justify the painful experience of one month of hunger and deprivation (personal experience of the author). The supplements seem to have worked well; after all, completing the protocol, by itself, was a feat. Maybe—and that could be the purpose of another study—a balanced diet together with the supplements taken here could produce more impressive results in terms of muscle mass and strength gains. Only ten days

after the completion of the protocol, some form of supercompensation was observed resulting in a marked increase in body weight (+6%) coupled with a moderate increase in body fat (1.4% in absolute values). Finally, it should also be noted that Fe markedly increased (almost doubled). Fe was the only element measured. However, the only source of Fe was the vitamin-tablets consumed (Multi-guard sport). This might indicate that the nutrients did work; future studies may measure more parameters (cholesterol, hormones), or include more strength or endurance tests etc.

The pilot studies that preceded this main protocol consisted of similar protocols where just one meal/day was permitted (pilot study 1) or fasting was kept for 4 days/week (pilot study 2). No significant changes were measured in these studies.

4.1 Limitations

All in all, what motivated us to design this study was a naïve, yet interesting and never-answered-before question: What if someone eats only supplements for one month? The results were of two kinds: unexpectedly good (body fat reduction by 21.20%) and unexpectedly poor (biomarkers' deterioration). The initial goal was not to achieve maximum gains of any sort, but simply to examine what happens in such an extreme case. Apart from answering this simple question, some future directions did come up. It would be interesting to examine the same protocol but without caloric restriction (with or without intermittent fasting), or without caloric restriction but with vegan-, paleo-, or meat-based diets (with or without intermittent fasting).

5. Conclusions

- 30 days of exclusive supplement consumption, while intermittently fasting within the context of a hypocaloric diet, reduces fat while marginally boosting muscle mass and strength;
- The program may not be sustainable for longer periods, due to the catabolic environment that

eventually prevails;

- The protocol is too demanding psychology-wise and might elevate creatine and blood urea levels along with putting too much stress on bodily functions. Intermittent fasting and hypocaloric diet did not protect effectively against elevated bio-markers;
- The implementation of similar protocols looks promising due to the fat reduction plus capacity it maintained for intense workouts;
- The better ecological validity of this study is ensured by its synthetic approach; future studies may investigate more targeted combinations of parameters examined here.

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Conflicts of Interest

The authors did not report any conflicts of interest.

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