

“Effect of Vegetarian Diets on Performance in Strength Sports”

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Abstract

Non-vegetarian or omnivore : eats foods of plant and animal origin, including meat, fowl ,eggs, milk and other dairy products, and fish.

Lacto-ovovegetarian: eats predominantly foods of plant origin, with milk and other dairy products and eggs being the only foods of animal origin. The available evidence supports neither a beneficial nor a detrimental effect of a vegetarian diet on physical performance capacity, especially when carbohydrate intake is controlled for. Concerns have been raised that an emphasis on plant foods to enhance carbohydrate intake and optimize body glycogen stores may lead to increases in dietary fiber and physic acid intake to concentrations that reduce the bioavailability of several nutrients, including zinc, iron, and some other trace minerals. Although there has been some concern about protein intake for vegetarian athletes, data indicate that all essential and nonessential amino acids can be supplied by plant food sources alone as long as a variety of foods is consumed and the energy intake is adequate. There has been some concern that vegetarian female athletes are at increased risk for oligoamenorrhea, but evidence suggests that low energy intake, not dietary quality. In conclusion, a vegetarian diet per se is not associated with improved aerobic endurance performance. Although some concerns have been raised about the nutrient status of vegetarian athletes, a varied and well-planned vegetarian diet is compatible with successful athletic endeavor.

INTRODUCTION

A vegetarian diet is inferior to an omnivorous. Diet for the maintenance of strength and muscular endurance. He based this assertion on his personal experience and observations of other rock climbers. I sent this message to The Sport science list for comment. Here is a summary of the debate, which I have updated with relevant references to published work and some additional issues.

Body Composition and Fitness of Vegetarians

Although it appears that vegetarian diets can provide adequate overall nutrient intake for endurance activity, specific components of the diet may have special importance in strength sports. For example, it is possible that in non-vegetarians, higher protein intakes, or protein specifically obtained from meat, lead to greater muscularity. Another possibility is that meat eating may lead to increased muscular hypertrophy in response to Resistance training. Several groups of researchers have addressed the issue of differences in body dimensions between vegetarians and omnivores. O'Connell et al. (1989) found that height of vegetarian children under 10 y was consistently lower than US reference values. However, Seventh Day Adventist children who had vegetarian diets did not differ substantially from their omnivorous peers in mean stature, weight, mid-arm circumference, triceps or biceps skin fold thickness, and weight-for-height (Tayer &

Stanek, 1989). The different findings in these two studies may derive from the inclusion of vegans in the former but not the latter study. Hebbelinck et al. (1999) conducted anthropometric analyses (stature, weight, skin fold thicknesses), puberty ratings (where appropriate), and physical fitness (handgrip strength, standing long jump, sit-ups in 30 s, and heart-rate recovery following a step test) of vegetarian children, adolescents and young adults in the Netherlands. Compared to reference values...

- Vegetarian adolescents were of significantly lower stature, weight and body mass Index, but there were no differences in stature or weight for the other age groups.
- Vegetarian children were of equal fitness, but vegetarian adolescents scored lower on standing long jump and 30-s sit-ups.
- Heart rate of vegetarian adolescents and young adults recovered substantially faster following the step test. Hebbelinck et al. concluded that vegetarian adolescents and young adults performed better at the cardio respiratory test, but the vegetarian adolescents scored lower on the strength and explosive power tests.

The possibility raised by the results of Hebbelinck et al.—that a vegetarian diet might actually lead to improved endurance performance compared to an omnivorous diet—was not supported in a review by Nieman (1999), who concluded that "some concerns have been raised about the nutrient status of vegetarian athletes, [but] a varied and well planned vegetarian diet is compatible with successful athletic endeavor". Nieman conceded that strength athletes probably need more protein than the US RDA of 0.8 mg/kg. His suggestion was 1.4-1.8 mg/kg, but he stated that even "vegan athletes can achieve optimal protein intake by careful planning, with an emphasis on protein-rich plant foods such as legumes, nuts and seeds, and whole-grain products". Nieman did point out one difference between omnivores and vegetarians of possible significance to performance in strength and explosive sports: intramuscular creatine concentration. Creatine in the form of creatine phosphate is a source of energy in highintensity exercise. Depletion of creatine phosphate is a cause of fatigue in repeated bout of such exercise, and possibly also in short-term endurance exercise. Vegetarians generally have less intramuscular creatine than omnivores (Maughan, 1995) because creatine is found only in muscle meat (providing an omnivore with about 1 g creatine per day), while the body itself produces a similar amount. Ironically, vegetarians may therefore derive greater benefit than omnivores from supplementation with creatine, but the benefit would presumably only make up for any lower level of performance in vegetarians before supplementation.

Does Meat-eating Benefit Strength Athletes?

In a message to the actually be less nutritious than an omnivorous diet, because "egg yolk, butter and liver... are a rich source of the fat-soluble vitamins and minerals, including trace elements that bind to the fat molecules". With reference to mountain climbing, an activity that would appear to require both endurance and strength, Campbell suggested that a possible disadvantage of vegetarian diets is the high carbohydrate content, which "will cause problems to mountain climbers who have sensitive insulin balance. Short-chain fatty acids from butter provide energy without creating insulin swings." However, oxygen availability decreases with increasing altitude, so one possible advantage of carbohydrate over fat or protein to mountain climbers is a slightly higher

return of energy for each mole of oxygen consumed. list, Andrew Campbell (Australia) argued that a vegetarian diet may Concern has also been expressed about a possible effect of high intake of phytoestrogens

(E.g. isoflavones found in soy) on testosterone in male vegetarians. For example, Weber et al. (2001) found that soy phytoestrogens induced testosterone reduction in male rats. However, according to Kurzer (2002), "...recent studies in men consuming soyfoods or supplements containing 40-70 mg/d of soy isoflavones showed few effects on plasma hormones..." These data do not support concerns about effects on reproductive hormones." Campbell and two other correspondents (Mathew Jordan from the University of Calgary and Mike Stone of Edinburgh University) were unaware of any vegetarians at the elite level of weightlifting, despite 30 years experience in Stone's case. No-one on the list offered any information about the prevalence of vegetarianism amongst female vs male strength athletes. Kathryn Russell (address not provided) argued that a perceived dearth of vegetarian weightlifters may not reflect a lack of effectiveness of the vegetarian diet for strength athletes; rather, the cultural/anthropological background of vegetarians may make them unlikely to take up strength sports. Norrie Williamson (address not provided) argued that, rather than exerting a true anabolic

Effect, meat consumption may induce a placebo effect. That is, a strength athlete who believes that eating meat improves performance may receive a psychological boost that disappears if a vegetarian diet is adopted. Williamson (and many other subscribers) called for controlled studies on this issue, not more anecdotal evidence. Deborah Shulman suggested that at least 12 weeks would be needed for studies comparing the effects on performance at strength sports of nutrient-rich vegetarian diets with those containing meat. Mike Stone pointed to evidence that strength-power athletes may need additional protein, which may be "easier" to obtain from animal sources. He also mentioned having seen unpublished data "indicating that testosterone concentration can be influenced by saturated fats in the diet (i.e., meat)". Russell countered by suggesting that if you remove from consideration those meat-eaters who also take dietary supplements, the pool of elite strength athletes might be markedly reduced; that is, the benefit may be coming from the supplements rather than the meat. David Driscoll (Australia) conducted a brief review of the literature available through a website that provides information for people active in strength training and bodybuilding. This literature pushes the view that low meat/low saturated fat/high vegetable protein

(e.g., soy) diets are associated with a marked reduction in testosterone (and, by implication, with reduced strength). Driscoll was not sure of the scientific quality of the information he found, and no-one on the list offered an assessment. A more authoritative source of information is the paper by Campbell et al. (1999), who conducted a 12-week study to compare the effects of a vegetarian diet with an omnivorous diet on changes in body composition and skeletal muscle size in older men

(51-69 y) in response to resistance training. There were substantial benefits for omnivores, who lost 6% fat mass, gained 4% fat-free mass, and increased Type II fiber area by 9% relative to the vegetarians. A trend towards higher total protein intake (self-reported) in the omnivores might explain the effects, but higher concentration of the anabolic hormone testosterone is more likely. Campbell et al. did not measure testosterone, but Raben et al. (1992) found higher testosterone in young men consuming a high-protein, meat-containing diet compared with those consuming a high-protein,

vegetarian diet. If testosterone is involved, a difference in total protein intake per se would not account entirely for Campbell et al.'s findings, because Volek et al. (1997) showed an inverse relationship between protein intake and testosterone concentration. The discussion on the mailing list went off on a tangent briefly when Bill Proulx claimed that many strength sport competitors are poorly informed about nutrition, while Matthew Jordan and Mike Stone argued that strength athletes, at least at the elite level, are well informed. Scott Naidus (address not provided) pointed out that nutrition is not a mature science, and that nutrient needs are not identical for every population group; in fact they differ even for individuals within each group. The existence of a plethora of dietary supplements with purported ergogenic effects only muddies the waters further. Naidus suggested that sound nutrition for the athlete is a balancing act between prepared foods and supplements vs fresh foods, and that this balance may vary from athlete to athlete.

Conclusions

Some aspects of the discussion appear (at least to me) to have been resolved:

- There are several kinds of vegetarianism. Each could have a different effect on strength.
- There appears to be a preponderance of meat-eaters among strength athletes at the elite level. It is unclear whether this preponderance arose from noticeable benefits of meat consumption, a placebo effect of meat consumption, the confounding influence of supplement consumption, or some other cultural effect unrelated to any real benefit to performance.
- The diets of gorillas, chimpanzees and paleolithic humans cannot be relied on to indicate the optimal diet for health and fitness for people generally, or for athletes in strength sports.
- The fact that vegetarian diets are associated with improved health outcomes
- Indeed, in one recent study of resistance training in older males, omnivores had a bigger gain in muscle mass than vegetarians.
- If meat consumption does enhance strength, the mechanism could be increased testosterone synthesis (possibly through intake of saturated fat) or increased storage of creatine phosphate in muscle.

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