



# Improvements in Perceived Health Status among Consumers of a Vitamin and Essential Mineral Supplement Combination

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**Abstract:** National health surveys have revealed that large segments of the general population may be deficient in several nutrients. Vitamin and mineral supplementation may help address some of these deficiencies. However, differences in vitamin and mineral forms may preclude the general application of findings from previous studies due to variability in bioavailability and efficacy. Given these limitations, a retrospective health status survey was conducted to investigate the perceived health improvements experienced by consumers of a combination of two specific multivitamin and multimineral supplements. In each health status category, most people (56.18% or greater) experienced some level of improvement after daily ingestion of the vitamin and mineral supplements. Regarding perceived energy levels and/or stamina, 82.41% reported experiencing improvement. Most participants also experience positive changes in cognitive function (67.04%), skin quality (67.42%), feeling rested in the morning (66.29%), joint discomfort (67.77%), aches and pains (65.16%), and exercise recovery (67.81%). For many of the participants, improvements were first noticed after four weeks of daily supplement use. The results from our current study indicate that daily ingestion of the combination of the two multivitamin and multimineral dietary supplements leads to noticeable improvements in perceived health status and quality-of-life.

**Keywords:** Vitamin supplement; mineral supplement; health status; retrospective survey

## 1. INTRODUCTION

Micronutrients are essential to maintaining human health. Some vitamins provide hormone-like functions, such as vitamin D. Others serve as enzyme cofactors, while some provide antioxidant functions [1]. Often, individual vitamins contribute in multiple ways towards maintaining homeostasis. Essential minerals influence muscle and nerve function, regulate water balance amongst various tissues, and are important components of enzymes, hormones and transport proteins [2, 3]. Of course, these are just a few examples of the important functions of vitamins and essential minerals. Deficiencies of these micronutrients have been long known to cause disease and death. Even before the presence of vitamins was fully understood, certain food groups were known to be effective in treating diseases associated with nutrient deficiencies. Scurvy is, perhaps, one of the best-known examples. In the 1700s, citrus fruits were found to be very helpful in preventing the onset of this disease [4]. Since ancient times,

many farmers understood intuitively that certain agricultural practices improved the availability of minerals to crops. But it wasn't until the 17th and 18th centuries that experimental evidence became available which demonstrated the importance of mineral nutritional in plant growth [5]. This understanding then expanded to include the role of minerals in animal health in the early 20th century [6].

Despite our improved understanding of the nutritional needs of the human body, micronutrient deficiency is an ongoing public health challenge around the world. In many developing nations, this is a particularly difficult and persistent issue [7]. Even among more economically developed countries, inadequate micronutrient intake remains a significant contributor to disease burden [8]. As such, public health policy and the efforts of food and nutrition industries are important in combating this ongoing problem.

In addition to preventing disease or death, daily intake of nutrients may enhance or improve overall health. Since 1992, the US Public Health Service recommended that pregnant women supplement their diets with folic acid and folate to prevent neural tube defects in babies [9]. Meta-analyses involving dozens of studies have demonstrated that multiple micronutrient supplementation in pregnant women is associated with improvements in preterm birth, small-for-gestational age (SGA) and low birth weight [10]. Micronutrient supplementation is also helpful in several other situations [11].

The overall health benefits of micronutrient supplementation in the general population are controversial. While many studies report specific benefits of individual nutrients, the various forms of vitamins, provitamins and sources of minerals adds considerable variability to bioavailability and efficacy, thus confounding efforts to apply meta-analyses to many published studies with unequal nutrient sources. One example is the finding that absorption of calcium citrate is greater than calcium carbonate in certain situations [12]. Another example is the observation that cholecalciferol ingestion is more effective at improving vitamin D status in the body than ergocalciferol [13]. Considering these types of limitations, it is more prudent to draw conclusions from studies on the benefits of specific formulations. The purpose of the current study was to investigate the perceived health improvements experienced following daily ingestion of a combination of unique multivitamin and multiminer dietary supplements, Nutrifii™ Optimal-V™ and Optimal-M™ (PartnerCo, Midvale, Utah, USA).

## **2. MATERIALS AND METHODS**

### **2.1. Study Products**

Optimal-V contains the following nutrients (and amounts per serving): vitamin A (2250 µg RAE); vitamin C (650 mg); vitamin D3 (25 µg); vitamin E (125 mg); vitamin K (45 µg); thiamin (14 mg); riboflavin (14 mg); niacin (25 mg NE); folic acid (850 µg DFE); vitamin B12 (200 µg); biotin (150 µg); pantothenic acid (45 mg). It also contains inositol, acerola cherry powder, grape seed extract, bromelain, and a powdered vegetable blend (broccoli leaf and flower, carrot, tomato, beet root, spinach

leaf, cucumber, brussels sprout, cabbage leaf, celery leaf, kale leaf, asparagus shoot, green bell pepper, cauliflower, parsley, and wheat grass).

Optimal-M contains the following nutrients (and amounts per serving): calcium, as citrate (75 mg); potassium, as iodide (150 µg); magnesium, as amino acid chelate (100 mg); zinc, as citrate (10 mg); selenium, as methionate (100 µg); copper, as gluconate (1 mg); manganese, as gluconate (2.5 mg); chromium, as niacinate (200 µg); and molybdenum, as sodium molybdate (25 µg). It also contains citrus bioflavonoids, N-acetyl cysteine, rutin, resveratrol, green tea leaf extract, quercetin, hesperidin, pomegranate fruit extract, choline bitartrate, alpha lipoic acid, inland sea trace minerals, boron citrate, lutein, lycopene, and a blend of plant powders (broccoli, carrot, tomato, beet root, spinach, cucumber, brussels sprout, cabbage leaf, celery leaf, kale leaf, asparagus shoot, green bell pepper, cauliflower, parsley, wheat grass, rosemary leaf extract, olive leaf extract, and cinnamon bark extract).

### **2.2. Health Perception Survey**

#### *2.2.1. Participants*

Study participants were identified through sales records. Those who had purchased the vitamin and mineral supplements (Optimal-V and Optimal-M) were contacted via email. Those agreeing to participate in this study were sent a link to an online survey designed to gather relevant information. Informed consent was obtained from each participant. Demographic information (age, gender, country/region of residence) and duration of supplement use were collected from the participants.

#### *2.2.2. Survey*

Participants were instructed to select one of several agreement options—strongly agree, agree, somewhat agree, somewhat disagree, disagree, strongly disagree, not applicable—in response to the request, “Please consider how you felt before you started taking the dietary supplement for the following statements.” The statements presented to participants are described in Table 1. Those enrolled in the study were also asked to select a level of improvement experienced—no improvement, very little improvement, some improvement,

good improvement, great improvement—relative to the statements, when prompted with the request, “Now, please consider your experience after you started taking the dietary supplement. Rate the level of improvement you may be experiencing with the following health statement.” The next question asked

was, “Approximately, how long did it take for you to notice this improvement?” In response, participants selected the appropriate length of time—less than 1 week, 1 week, 2 weeks, 3 weeks, 4, weeks, 5 weeks, 6 weeks, 7 weeks, 8 weeks, more than 8 weeks.

**Table1.** Health statements to which survey participants were asked to respond by selecting one of several agreement options.

Health statement
Brain fog and/or a lack of memory function
A lack of energy and/or stamina
Dull, sagging and/or wrinkled skin
Trouble feeling rested after waking up in the morning
Joint discomfort
Trouble with flexibility
Aches and pains in my bones and/or joints
Trouble recovering after exercising

**2.3. Statistical Analysis**

Response rates and summary statistics were calculated. Improvements in perceived health and duration of supplement ingestion until the appearance of noticeable improvements were investigated. Pearson’s chi-square tests were used to evaluate changes in health status after ingesting Optimal-V and Optimal-M when compared against initially reported health status agreement statements. In this study, “very little improvement” was not considered a positive change. Only those reporting “some improvement” or better were included in the positive improvement rates.

64 years old (31), 45-54 years old (26), 35-44 years old (22), and 25-34 years old (7). One person preferred to not provide her age. The number of females enrolled was 79, with 22 males. Three people preferred to not provide their biological sex.

**2.4. Ethics Review and Approval**

After review for compliance with the recommendations of the National Research Council of the National Academies and as outlined by the American Association for Public Opinion Research, the survey was approved by an ethics committee [14].

**3.2. Perceived Health Status**

Percentages of participants reporting varying levels of improvement after taking Optimal-V and Optimal-M are summarized in Table 2. In each health status category, most people (56.18% or greater) experienced improvement. This was especially noteworthy for improvements in energy and/or stamina wherein 82.41% reported experiencing at least some improvement. Among the specific levels of improvement, “Good improvement” was the most frequently indicated (35.16%). Only 17.58% felt that there was no real noticeable change in their energy levels or stamina. The percentage of those who felt that they had a lack of energy and/or endurance prior to taking Optimal-M and Optimal-V was 74.72%. However, 7.69% more people experienced improvements in energy or stamina. This suggests that energy levels were improved even among those who did not agree that this was a health concern in their lives.

**3. RESULTS AND DISCUSSION**

**3.1. Participant Demographics**

A total of 104 adults enrolled in the trial. Age ranges and the number of corresponding participants, in parentheses, were as follows; 75 years or older (2), 65-74 years old (15), 55-

**Table2.** Percentages of participants reporting varying levels of improvement after taking Optimal-V and Optimal-M

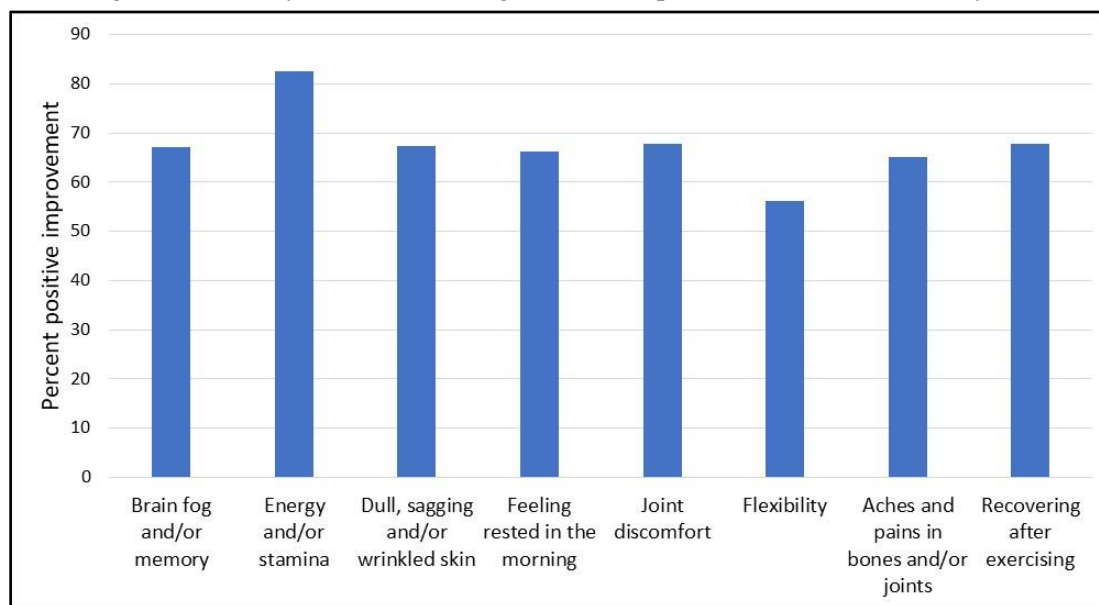
Health statement	Level of Improvement				
	Great	Good	Some	Very little	No
Brain fog and/or a lack of memory function	13.19	21.98	31.87	13.19	19.78
A lack of energy and/or stamina	19.78	35.16	27.47	5.49	12.09
Dull, sagging and/or wrinkled skin	7.87	24.72	34.83	10.11	22.47

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Trouble feeling rested after waking up in the morning	10.11	25.84	30.34	11.24	22.47
Joint discomfort	13.33	23.33	31.11	13.33	18.89
Trouble with flexibility	8.99	17.98	29.21	21.35	22.47
Aches and pains in my bones and/or joints	13.48	25.84	25.84	13.48	21.35
Trouble recovering after exercising	11.49	24.14	32.18	10.34	21.84

The next major health categories in which significant percentages of participants reported some improvement or better were brain fog/and or a lack of memory function (67.04%), skin quality (dull, sagging and/or wrinkled) issues (67.42%), feeling rested in the morning (66.29%), joint discomfort (67.77%), joint or bone aches and pains (65.16%), and recovery after exercise (67.81%); see Figure 1. The total percentages of people experiencing improvement in each of these categories was very similar, differing

by less than three percent. The fraction of those that reportedly experienced great improvement in each of these categories varied between 11.67 to 20.69%. This range is less than the percentage reporting great improvement in energy and/or stamina (24.00%). Approximately one-quarter to one-third of the participants reported experiencing either good improvement or some improvement in cognition, skin quality, feeling rested in the morning, joint discomfort, aches and pains, and exercise recovery.



**Figure 1.** Percentages of respondents that reported any level of improvement in each health category. Improvement rates vs. initial health status were significant for all categories ( $P < 0.001$ , except  $P = 0.006$  for brain and/or memory).

Regarding flexibility, most participants also reported experiencing at least some improvement (56.18%). But this was about 10% less than what was reported for the other categories, with it being about 26% less than energy and/or stamina. The largest single improvement level reported for flexibility was “some improvement” (29.21%). The numbers of those to have reported experiencing “great improvement” or “good improvement” were only about 8.99% and 17.98%, respectively. Thus, it appears that flexibility is benefited from vitamin and mineral supplementation, but not as dramatically as the other seven health categories. Even so, improvement rates were significant for all health categories ( $P < 0.001$ , except  $P = 0.006$  for brain and/or memory)

when compared with initial reported health status.

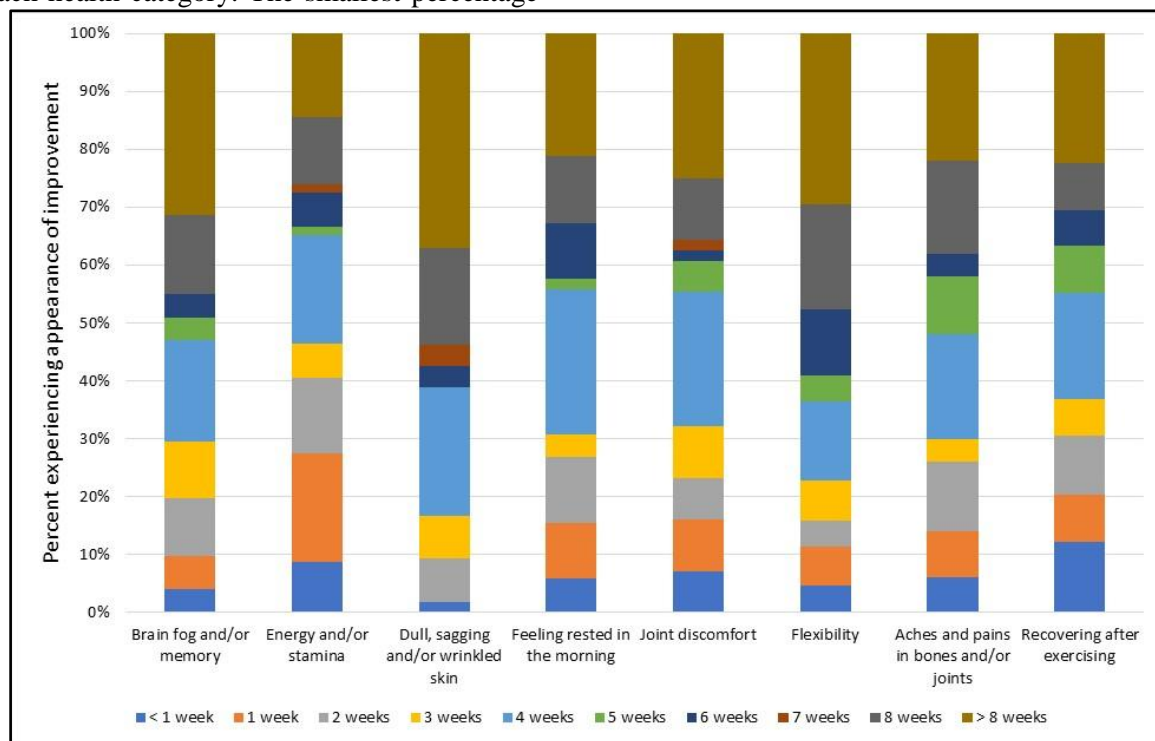
For each health category, the relative percentage of participants who first noticed improvements at specific times after they began taking Optimal-V and Optimal-M are shown in Figure 2. For improvements in recovery after exercising, 12.24% of participants reported feeling a change in less than one week. For all other health categories, the percentages who noticed improvements in less than one week ranged from 3.92 to 8.70%. By the end of the first week, 18.84% reported feeling improvements in energy and/or stamina. But again, the percentages noticing improvement by the end of the first week were



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less than 10% in the other health categories. During the second week, the numbers noticing improvement increased much more for energy and/or endurance (13.04%), feeling rested after waking (11.54%), aches and pains (12.00%) and recovery after exercise (10.20%). During the third week, less than 10% noticed any initial improvements. But during the fourth week, there were even greater numbers of people who began to feel improvements in each health category. The smallest percentage

to do so during this time was 13.64% for improvements in flexibility. The percentages for brain fog and/or memory function (cognitive function), energy and/or endurance, aches and pains, and recovery after exercise were approximately 18% each during this time. There were from 22.22% to 25.00% who reported that they first noticed improvements in skin quality, feeling rested, and joint discomfort by the end of the fourth week.



**Figure 2.** Percentages of participants who first noticed improvement at specific times after ingestion of Optimal-V and Optimal-M.

During weeks 5, 6 and 7, only small percentages of people reported feeling a positive change in health status. The exceptions are aches and pains (10.00% by week 5) and flexibility (11.36% during week 6). In five of the health categories, no one reported the beginning of noticeable improvements during week 7. During week 8, the percentages noticing the appearance of improvement ranged from 8.16% to 18.18% across the categories. With the exceptions of energy/endurance and feeling rested in the morning, the largest numbers of people didn't experience noticeable improvements until after 8 weeks. Cognitive improvements were first noticed by 31.37% after two months of daily ingestion of the vitamin and mineral supplements. With flexibility, the corresponding value was 29.55%. For joint discomfort and aches and pains, it was 25.00%

and 22.00%, respectively. Among those reporting improvements in exercise recovery, 22.45% felt that this did not seem to appear until after two months.

Improvements in skin were not felt by 37.04% until after 8 weeks of Optimal-M and Optimal-V ingestion. In fact, 83.33% of those who reported experiencing at least some improvement in dull and/or sagging skin did not notice the benefit until week 4 or later. That greater numbers did not notice improvement before this time is not surprising. Skin cell turnover occurs from 28 to 60 days, depending on age[15]. Further, collagen synthesis and replenishment in the skin are processes that occur over extended periods[16]. As such, it is expected that skin benefits could require longer amounts of time before improvements begin to be noticeable. The

higher percentages associated with later improvements in other soft tissue-related categories, such as flexibility, joint discomfort and aches, are expected for the same reason. Time is required to synthesize new collagen, and micronutrients are vital to this process [17].

Vitamins and minerals play a very important role in energy metabolism and cognition (Tardy 2020). Therefore, it should be no surprise that most respondents report improvements in the relevant health status categories. The fact that most participants reported initial trouble with brain fog and/or a lack of memory function and a lack of energy and/or stamina indicates nutritional deficits in their diets that were subsequently ameliorated with continued ingestion of Optimal-M and Optimal-V. This is also borne out by the observed high positive response rates in each health status category after having taken these vitamin and mineral supplements. Further, the large increases in the number of people reporting the appearance of benefits after 4 weeks of supplement use indicate that nutritional deficiencies may have been prevalent among the participants prior to their use of Optimal-M and Optimal-V. While specific symptomatic improvements may occur within a couple days of supplementation in cases of severe malnutrition, such as alleviation of confusion and lethargy in those with scurvy, more time is required for other conditions [18]. Anemia may be caused by insufficient dietary vitamin B-12 intake. If not addressed, this may lead to weakness, dizziness, shortness of breath and even nerve damage. Clinical improvements may require months or years after initiation of daily vitamin B-12 supplementation [19]. These previous examples indicate that some health status categories may be improved rather quickly with micronutrient supplementation while others require much more time. In our study, the timing of initial appearance of positive changes fits within this pattern.

#### 4. CONCLUSION

Data reported in the National Health and Nutrition Examination Survey (NHANES) indicates that more than 90% of the US population does not ingest adequate amounts of vitamin E. Only 44% receives adequate daily magnesium, while only 56% ingests the recommended amount of vitamin A. There are

also large portions of the population that are not consuming enough vitamin C, vitamin B6, and zinc [20]. Therefore, it is important that consumers have access to additional sources of micronutrients if they are unable to obtain these through the food they typically eat, whether due to poor food choice or other factors. The results from our current study indicate that micronutrient supplementation leads to noticeable improvements in quality of life and perceived health status. These benefits may be experienced in less than one week, such as with energy and endurance, or may require more time to develop as nutrient status of the body is restored to healthy levels with repeated daily supplementation. Whatever the individual circumstances, the high percentage of perceived positive health changes among participants of this study reveal that the nutrients available in Optimal-M and Optimal-V are effective in improving quality of life.

#### 5. COMPETING INTERESTS

The authors are employed in the research and development department of Partner.Co, a distributor of Optimal-V and Optimal-M.

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