

The Singer's and the Clinician's Perspective on Vitamin B₁₂ Treatment for Vocal Benefits

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Summary: Introduction. There is a belief among vocalists that there are voice benefits from vitamin B₁₂ treatment. Yet there are no previous reports regarding vitamin B₁₂ effects on voice.

Objectives. To assess the prevalence of vitamin B₁₂ use among singers and their beliefs regarding vitamin B₁₂ therapy.

Methods. Anonymous online survey administered to singers, singing-teachers, speech-language pathologists, and laryngologists.

Results. A total of 192 participants completed the surveys; 128 singers (68 singing-teachers, 30 speech-language pathologists) and 64 laryngologists. Among singers, 12% have perceived voice benefits from vitamin B₁₂ treatment taken for any reason. Four percent used vitamin B₁₂ for voice benefits; all perceived voice benefits as a result. The leading voice benefits were improved stamina, reduced effort, confidence, and control. Nineteen percent of the singers would recommend vitamin B₁₂ treatment to a friend; 15% of the singing-teachers would recommend it to a student. Among laryngologists, 33% been asked by a singer to prescribe vitamin B₁₂ for voice benefits; 9% have prescribed it in the past. Yet only 3% would you recommend it to a patient.

When asked "Do you believe vitamin B₁₂ therapy improves vocal performance?" 31% of the singers responded "Yes," compared with none in the laryngologists. When asked "Do you think the singing community believes vitamin B₁₂ therapy improves vocal performance?" 26% of the singers responded "Yes," compared with 53% of the laryngologists ($P = 0.0002$).

Conclusions. There is a discrepancy between the singers' and the laryngologists' beliefs regarding vocal benefits perceived by vitamin B₁₂. Blinded randomized trials are required to verify or refute this belief.

Key Words: Singing—Vocal performance—Cobalamin—Vitamin B₁₂—Complementary medicine.

INTRODUCTION

Vitamin B₁₂, also referred to as cobalamin, is an important nutrient required for the body to carry out essential functions, such as erythropoiesis, metabolic conversion of proteins and fat, and supporting the normal function and development of nerve cells.¹ In general, the average diet supplies about 5-15 mg of vitamin B₁₂ each day. Vitamin B₁₂ deficiency results in the impairment of vitamin B₁₂-dependent enzyme activities and an increase in byproduct levels. For example, impairment of methionine synthase and L-methylmalonyl-CoA mutase activities results in elevated homocysteine and methylmalonic acid levels, respectively.^{2,3} Vitamin B₁₂ deficiency is common; about 6% of those aged 60 years or older in the United States are vitamin B₁₂ deficient, with prevalence increasing with age.⁴ Vitamin B₁₂ deficiency has an expansive range of clinical manifestations and disorders. It is completely inclusive of the human lifespan, affecting fetus' and child's development through one's elderly years, with dementia being a common manifestation.⁵ The disordered erythropoiesis may result in megaloblastic anemia. Vitamin B₁₂ is involved in the formation of the myelin sheath, and profound deficiencies of vitamin B₁₂ have been found to cause

neurologic damage.^{6,7} In addition, vitamin B₁₂ deficiency can predispose to DNA damage; therefore, it was suggested in the past to be an associated risk of developing cancer.⁸ Furthermore, studies have been conducted linking low levels of vitamin B₁₂ to mood changes, such as depression.⁹⁻¹¹ The other manifestations related to vitamin B₁₂ deficiency include osteoporosis in postmenopausal women, gastrointestinal symptoms, such as glossitis, decreased appetite, and constipation; and skin lesions, such as skin hyperpigmentation, vitiligo, and hair changes.^{12,13}

Nevertheless, scientific literature connecting vitamin B₁₂ with laryngeal disorders or function is limited. Vitamin B₁₂ deficiency was suggested to correlate with chronic cough and laryngeal hyperresponsiveness.¹⁴ There have been cases that demonstrated vocal fold paralysis as a neurologic manifestation of vitamin B₁₂ deficiency.^{15,16} In addition, there are some sparse reports that metabolic alterations in homocysteine, folate, and vitamin B₁₂ levels associate with laryngeal carcinogenesis and leukoplakia.^{17,18}

In general, singers and voice professionals often seek complementary and alternative treatments to improve, enhance, or heal their vocal folds. We have observed among some singers and voice professionals a belief that there are vocal benefits from cobalamin treatment. Consequently, some singers and voice professionals may request cobalamin injections to improve or enhance their vocal capabilities. Nonetheless, there are no available data that illustrate any effects of cobalamin deficiency or treatment on voice performance. In this current study, we sought to assess the legitimacy of our primary observation, and to assess the prevalence of the belief that there are vocal benefits from vitamin B₁₂ treatment, among singers. We also wished to assess the prevalence of vitamin B₁₂ treatment among singers. Our secondary

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aim was to compare the singing community beliefs with those of physicians who specialize in voice.

MATERIALS AND METHODS

Following submission to the University of Southern California Institutional Review Board committee, the study was granted an exemption as a research imitating an anonymous survey procedure. The authors developed and distributed two surveys, one for singers and one for laryngologists, using the SurveyMonkey website (<https://www.surveymonkey.com>). The singers' survey consisted of 21 questions and was advertised on websites and social media targeting singers. The primary question on the advertisement inviting subjects to participate in the survey and the first question in the survey was "Are You a Singer?" This question was used to exclude from the survey anyone who did not self-declare as a singer. Furthermore, the survey included additional questions regarding the participants' singing experience that were also used to exclude nonsingers from the survey. The survey was designed by the authors with the assistance of an experienced statistician to provide data about the subjects' singing background and routine, as well as their experience and beliefs regarding vitamin B₁₂ treatment for voice benefits. The survey was available between March and May 2017. The second survey was developed for laryngologists, and was distributed by a personalized email invitation sent to physicians who were known to laryngology associations in the United States of America. Eighty-seven laryngologists were invited to participate in the survey. The survey consisted of six questions designed to elicit the subjects' laryngology experience as well as their knowl-

edge and beliefs regarding singers and vitamin B₁₂ treatment for voice benefits. This survey was available between May and June 2017.

Categorical variables were described using frequency and percentage. Continuous variables were described using mean, standard deviation, and range. For comparison of categorical variables between two groups, the chi-square test was applied. A *P* value of 0.05 or less was considered statistically significant. Statistical calculations and analyses were performed using Microsoft Excel 2010 (version 14.0) and SPSS Statistics 20.0 (IBM SPSS Statistics for Windows, IBM Corp., Armonk, NY).

RESULTS

Singers' survey

There were 128 responses, all were singers and found suitable for analysis. Thirty of the respondents (23%) were also speech-language pathologists (SLPs), 68 (53%) were also singing teachers, and one (0.8%) was also a physician. Eighty-three percent (106) of the participants were females and three quarters of them (96) were living in the United States of America. Of the participants, 62.5% (80) were 18–34 years old. The average singing experience was 20.3 ± 13.0 years (range 1–60). The primary singing genre was classical for 63% (80) of the participants, followed by musical theater for 19% (24). Further descriptions of the participants in the singers' survey can be found in Table 1.

Twelve percent (15) of the singers responded that they have perceived voice benefits from vitamin B₁₂ treatment they have taken in the past (for any reason). Four percent (5) of the singers

TABLE 1.
Population Description for the Singers' Survey

Total; N (%)		128 (100%)
Age in years; N (%)	18-24	30 (23.4%)
	25-34	50 (39.1%)
	35-44	18 (14.1%)
	45-54	16 (12.5%)
	55-64	11 (8.6%)
	65-74	3 (2.3%)
Smokers; N (%)		3 (2.3%)
Primary singing genre; N (%)	Classical	80 (62.5%)
	Country	2 (1.6%)
	Gospel/Church	3 (2.3%)
	Musical theater	24 (18.8%)
	Pop	3.1% (4)
	Rock	1.6% (2)
	Other	10.2% (13)
Residence; N (%)	United States of America	96 (75.0%)
	Europe	13 (10.2%)
	Australia	7 (5.5%)
	Other	12 (9.4%)
Singing experience in years; mean ± SD		20.3 ± 13.0
Singing teachers; N (%)		68 (53.1%)
Average number of singing hours per wk; mean ± SD		9.8 ± 8.6
Singing teachers; N (%)		68 (53.1%)
SLP; N (%)		30 (23.4%)
Both SLP and singing teachers; N (%)		9 (7.03%)

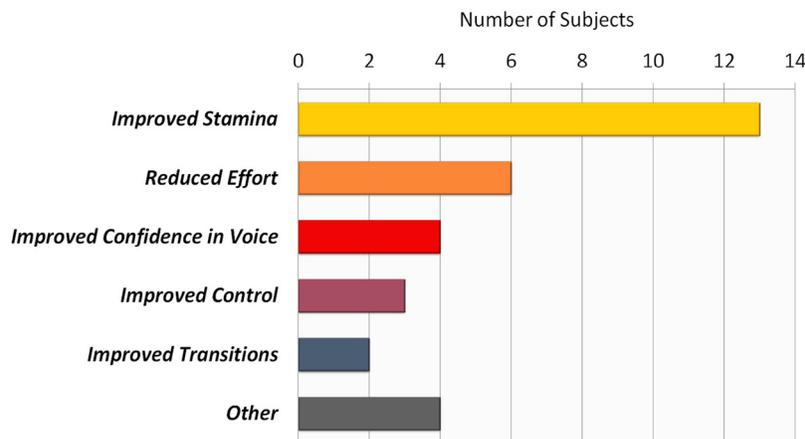


FIGURE 1. The prevalence of perceived voice benefits from vitamin B₁₂ treatment as described by the 15 participants who used vitamin B₁₂ in the past.

admitted they have used vitamin B₁₂ for voice benefit, and all five said they perceived voice benefit as a result of this treatment. The most commonly described voice benefits were improved stamina (13 subjects) followed by reduced effort (six subjects). Further details about the voice benefits described by these 15 subjects can be found in Figure 1. Nineteen percent (24) of the singers said they would recommend vitamin B₁₂ treatment to a friend. Fifteen percent (10) of the singing teachers said they would recommend vitamin B₁₂ treatment to a student. Four singers mentioned that while they were taking vitamin B₁₂ treatment for medical (non-voice) indication, they did not notice any improvement in their vocal performance.

Laryngologists' survey

Sixty-four laryngologists responded to the survey and were found suitable for analysis. The average number of the participants' years in laryngology practice was 14.2 ± 8.2 (range 3–38). Thirty-three percent (21) of the laryngologists said they have been asked by a singer patient to prescribe vitamin B₁₂ for voice benefits, and 9% (6) said they have prescribed vitamin B₁₂ for voice benefits in the past. Yet only 3% (2) said they would you recommend vitamin B₁₂ treatment to a singer patient for voice benefits.

Comparison between singers and laryngologists

When asked, "Do you believe vitamin B₁₂ therapy improves vitality of vocal performance?" 33% (32) of the non-SLP singers and 27% (8) of the SLP singers responded "Yes," whereas 0% (0) of the laryngologists responded "Yes" (P value < 0.0001). When asked, "Do you think the singing community believe vitamin B₁₂ therapy improves vitality of vocal performance?" 24% (24) of the non-SLP singers and 30% (9) of the SLP singers responded "Yes," compared with 53% (34) of the laryngologists ($P = 0.0002$ and $P = 0.040$, respectively). When asked, "Would you recommend vitamin B₁₂ treatment to a friend for voice benefits?" 17% (17) of the non-SLP singers and 23% (7) of the SLP singers responded "Yes," compared with 3% (2) of the laryngologists who said they would recommend vitamin B₁₂ treatment to a singer patient for voice benefits ($P = 0.006$ and $P = 0.002$, respectively) (Figure 2).

DISCUSSION

This survey revealed a common belief among singers that there are vocal benefits from cobalamin treatment, such as improved stamina, reduced effort, and confidence. This belief was similarly prevalent among singers who were SLPs, and those who were not. It is probable that this belief was spread from one singer to another, considering 20% of the singers acknowledged they would recommend cobalamin treatment for voice benefits to a singer friend. Singing teachers were also a very important source of distribution among the singing community, and approximately 15% of participating singing teachers responded that they would recommend cobalamin treatment for vocal benefits to a student. Although there is a common belief among singers and voice professionals that cobalamin treatment improves vitality of vocal performance, the laryngologists participating in our survey do not share this view, and therefore, would not prescribe it, nor would they recommend it, for that purpose.

It is unclear when and how this belief originated. Assuming this belief is correct and there are some vocal beneficial effects for vitamin B₁₂ treatment, these effects can be either direct or indirect, or conversely be attributed to placebo effect. Reviewing the literature revealed known effects of cobalamin on other similar tissues and organs that may explain comparable beneficial direct effects on vocal fold and laryngeal tissues. Cobalamin promotes the health of the integumentary system, which includes the skin, hair, and nails; it reduces the skin's redness, dryness, and inflammation,¹⁹ and can be used as part of treatment for various skin conditions such as psoriasis and eczema.^{20,21} On the other hand, the improvement of vocal capabilities may be attributed to cobalamin's indirect effects. In a clinical trial, researchers performed a double-blind, randomized, placebo-controlled study of vitamin B complex administration. After 16 weeks of treatment, significant differences were demonstrated in favor of the vitamin B complex over placebo for participants experiencing increased energy levels and reduced workplace stress.²² In another clinical trial, researchers performed a double-blind, randomized, placebo-controlled study to assess the results of a high dose of vitamin B complex and mineral supplementation. They determined that in men of full-time employment,

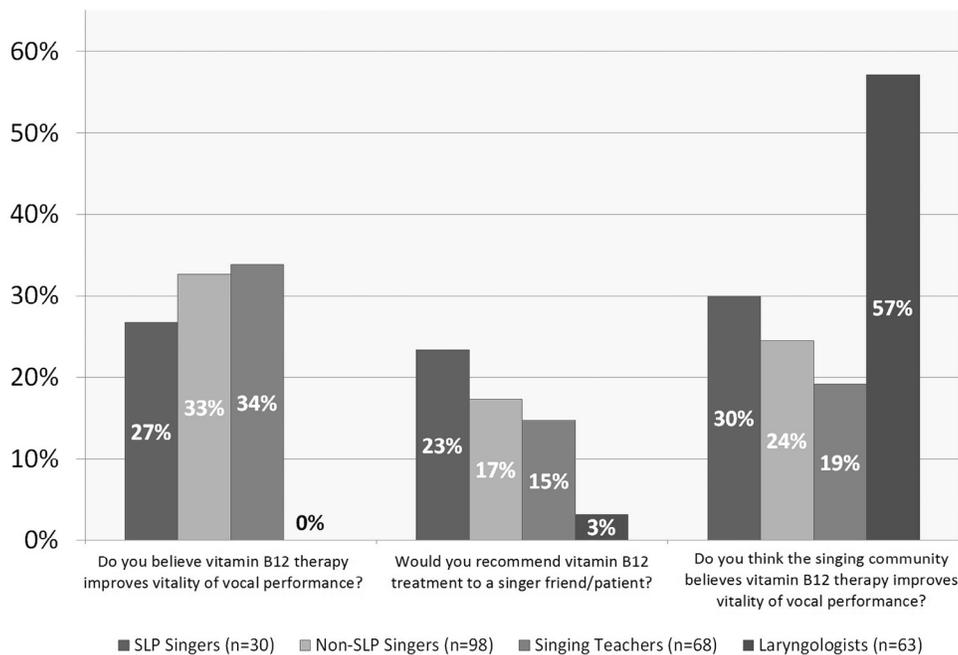


FIGURE 2. Rates of positive answers to the survey questions regarding vitamin B₁₂ voice benefits among different groups of singers and laryngologists.

there were cognitive and mood effects as a result of vitamin or mineral supplementation, such as improved ratings of stress, mental health, and cognitive performance.²³ Therefore, it is possible that the singers experienced subjective vocal benefits from cobalamin treatment secondary to increased energy and reduced stress.

Nevertheless, the belief among singers regarding vitamin B₁₂ voice benefits, as described in our survey by singers who used it in the past can be merely placebo effect. The most common effects that were described in the survey were improved stamina, reduced effort, and improved control, all of which can be attributed to placebo effect. Placebo effect has been implicated in athletes' performance, with the use of treatments such as anabolic steroids and sports hypnotism.^{24,25} Improved stamina or reduced fatigue by placebo effect was demonstrated in a clinical trial that demonstrated reduced perceived fatigue and significant increase in mean muscle work of quadriceps muscle when subjects were given placebo while deceptively were told it was a high dose of caffeine.²⁶

When estimating the prevalence of the belief in vitamin B₁₂ vocal benefits among the singing community, the laryngologists tended toward overestimation. Fifty-three of the laryngologists said they believe the singing community believes in vitamin B₁₂ vocal benefits, whereas only 31% of the singers participating in the survey stated they believe in vitamin B₁₂ vocal benefits. This raises a concern regarding how well we as voice health providers know our patients. Misperception of reality is a well-recognized phenomenon in the field of decision-making psychology and behavioral economics. As described by the Nobel prized psychologist, Daniel Kahneman, people tend to assess the relative importance of issues by the ease in which they are retrieved from their memory; this can be highly influenced by the existence of memorable events and the extent in which the issue occupies a person's mind, or conversations with others.²⁷

The results of our survey present a significant discrepancy between the singers' and the laryngologists' perspectives regarding vitamin B₁₂ vocal benefits; 31% of the participating singers believe it is indeed true, compared with none of the laryngologists. This discrepancy is most probably because of lacking empirical evidence on the effect of B₁₂ on the voice. There have been no controlled trials that have investigated the vocal benefits of cobalamin treatment; therefore, no evidence or support have confirmed or refuted these claims. A randomized, placebo-controlled trial is necessary to evaluate for improved vocal vitality or in contrast will help to avoid the use of unnecessary medication.

This study has several inherent limitations. The survey analyzes responses from a relatively small population sample; therefore, the results may not reflect a larger population. The survey for singers was published on social media; therefore, it is impossible to estimate the response rate. Although interesting, it is difficult to draw extensive conclusions from our survey's results, and one should be encouraged to further investigate.

The qualitative data presented here provide the first evidence on the existence of a belief regarding cobalamin treatment among the singing community. The results presented here should prompt further in-depth investigation regarding cobalamin treatment and other complimentary treatments for professional singers. It is our opinion that it is the academic laryngology and SLP communities' responsibility to provide scientific evidence for any complementary therapy, either to legitimize or refute its effects. In correspondence with the proven placebo effect on the performance of athletes, investigating the role of placebo effect on vocal performance in professional singers is also indicated.

CONCLUSIONS

The belief that there are voice benefits from vitamin B₁₂ treatment exists among singers. There is a discrepancy between the

singing and the laryngology communities' beliefs regarding vocal benefits perceived by vitamin B₁₂ treatment; with laryngologists' tendency to disagree with this belief. Laryngologists also demonstrated overestimation of the extent of the phenomenon of B₁₂ vocal benefits belief among singers. Blinded randomized controlled trials are required to verify or refute this belief.

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