

ORIGINAL ARTICLE

Better Quality of Life When Nasal Breathing of Snoring Men Is Improved at Night

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Objective: To evaluate whether improved nasal breathing changes the quality of life in snoring men and improves the female sleeping partners' well-being in the morning.

Design: During 1 month, 42 heavily snoring men slept with a nostril dilator. Before and after 1 month, the snorers rated their daytime tiredness and completed the Nottingham Health Profile questionnaire. Female sleeping partners rated the snoring, the quality of their sleep, and their sense of well-being in the morning. A population sample was used for comparison.

Setting: The Central Hospital, Skövde, Sweden.

Results: The snorers' quality of life before the study was

significantly worse ($P < .001$) than that of the comparison population and improved significantly ($P = .001$). The men were significantly ($P < .001$) less tired during the day when their nasal airflow was increased. Female sleeping partners had significantly ($P = .005$) better sleep and an improved sense of well-being in the morning during the test period. Both were correlated with a significant reduction in the snoring ($P < .001$).

Conclusions: When nasal breathing of snoring men was improved at night, their quality of life was significantly improved. The female sleeping partners had a reduction in sleep disturbance that correlated well with an improvement in their own sleep and feelings of well-being in the morning.

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WHEN A MAN visits his physician because of snoring, it is sometimes at the urging of his female partner, who has asked him to seek advice because she suffers more from his snoring than he does. The man might not be aware of the connection between his daytime tiredness and his snoring.¹ He might also have an impaired quality of life without realizing it.

In recent decades, well-being has been related increasingly to quality-of-life determinations, which measure social, physical, and emotional functions, all of which affect well-being. Quality of life can relate to a wide range of subjective sensations.²

Many factors may influence a person's feeling of well-being, such as lifestyle, age, sex, weight, standard of living, and health services in the community. Most quality-of-life instruments are designed to be applied to a wide range of health problems, but they have limitations. They may not focus on a specific quality-of-life aspect (reduced sensitivity), and clinically important changes may escape identification.³ When a standardized quality-of-life instrument is unsuitable for a specific issue we wish to evaluate, a visual analog scale (VAS) can be used as a supplementary instrument. This makes it possible to observe small

changes, as has been shown in follow-up studies after palatoplasty surgery.^{4,5}

Snoring is common in patients with partial or total obstruction of the nasal passage, causing disturbed sleep architecture and sleep fragmentation, including associated daytime tiredness.⁶ When nasal breathing is improved, snoring decreases.^{7,8} Because a nostril dilator immediately influences nasal airflow and nighttime sleep, the device efficiency can be easily evaluated before and during a test period.

The purpose of this study was to evaluate quality of life in snoring men and to determine whether improved nasal breathing at night in these men had any effect on their quality of life and daytime alertness. We also wanted to determine how the female sleeping partners' sleep was affected by the snoring and whether their well-being improved when the snoring men could breathe more easily through their nose.

RESULTS

The total mean NHP score for all the dimensions was 13.5 for the snorers and 6.0 for the control group ($P < .001$). In the emotional reactions dimensions, the snorers had a mean value of 15 compared with 8 for the control subjects ($P = .02$). The energy dimension had a mean score of 37 for the

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PATIENTS AND METHODS

PATIENTS

From the outpatient waiting list for snorers at the Department of Otorhinolaryngology, Central Hospital, Skövde, Sweden, 42 men who lived in the region and were willing to test a nostril dilator at night for 1 month were selected.⁹ All the patients were healthy, apart from their snoring problem, and none had nasal polyps or symptomatic septal deviation. The mean age was 45 years (range, 28-62 years), and the mean body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters [kg/m^2]) was 26 (range, 20-39). Five men did not return after 1 month.

REFERENCE GROUP

The control subjects, who lived in the region, were selected from the MONICA (MONItoring of trends and determinants in Cardiovascular diseases) Population Study. This study was designed to measure morbidity and mortality of coronary heart disease and stroke in different populations. Seven hundred eighty-six men aged 25 to 64 years were randomly selected from the population.¹⁰ The mean age was 45 years and the mean BMI was 25.4 (range, 15.5-42.7).

STUDY DESIGN AND QUESTIONNAIRE

The patients were informed about the study by letter. After they agreed to participate, they were sent home with the Nottingham Health Profile (NHP) questionnaire and a VAS for rating drowsiness or alertness experienced during the day. Female sleeping partners were asked to rate 3 different variables—the man's snoring, their own quality of sleep, and their own well-being in the morning—using the VAS. In the enclosed instructions, the respondents were asked to answer the questionnaire according to how they perceived these aspects of their lives during the past week. They were then given an appointment for a medical examination at the Department of Otorhinolaryngology, where the questionnaire was checked to make certain that all the items had been answered.

The snoring men were informed about the function of the nostril dilator (Nozovent, Prevancure Ltd, V. Frölunda, Sweden), which they then slept with every night for 1 month (**Figure 1**). Before the second visit 1 month later, the patients again completed the NHP questionnaire and the VAS about daytime alertness. The female sleeping partners rated the same 3 variables as before the test. They were told to evaluate only the last week of the test period.

The control subjects were sent the questionnaires and asked to return them after they had been completed. The questionnaires were checked for completeness at the following examination at the Sahlgrenska University Hospital, Göteborg, Sweden.

The ethics committee at Sahlgrenska University Hospital approved the study.

NOTTINGHAM HEALTH PROFILE

The NHP is a generic, well-accepted instrument used to measure physical, social, and psychological distress associated with medical, social, and emotional problems. The NHP was developed at Nottingham University, Nottingham, England, and has been extensively tested for reliability and validity.¹¹⁻¹³ It has also been translated into most European languages according to British standards, with due attention to the linguistic and conceptual differences of the various cultures.¹⁴

The NHP consists of 38 questions, each with a yes or no response reflecting the patient's degree of distress in 6 dimensions: emotional reactions, sleep, energy, pain, physical mobility, and social isolation.

The items in each dimension have been weighted relative to one another according to their influence on quality of life. The answers have then been summarized to produce a maximum score of 100, indicating the presence of all possible problems within the dimension, with 0 indicating no problems. In the same way, the dimensions can be summarized to produce a total value for the quality of life, in which 100 indicates the worst quality of life, and 0 indicates the best.

VISUAL ANALOG SCALE

A VAS consists of a straight line, 100 mm in length, that gives a score from 0 to 100. The end points are defined by words denoting the extreme opposites of the attribute to be measured. Four VASs were used during this test, 1 for the snoring man and 3 for the female sleeping partner. The respondents were asked to rate the following variables: (1) the snoring man's experience of daytime tiredness (0 indicates alert; 100, drowsy), (2) the woman's estimation of the man's snoring (0 indicates no snoring; 100, continuous snoring), (3) the woman's own quality of sleep (0 indicates good; 100, bad), and (4) the woman's own well-being in the morning (0 indicates thoroughly rested; 100, very tired).

The women were asked to consider only how the noise of snoring from the men influenced their sleep and well-being in the morning.

STATISTICAL METHODS

Comparisons between the control and the snoring groups were made using the Mantel test,¹⁵ with the elimination of the influence of the variables age and BMI. Two-tailed tests were used. For the analysis of values before and during the test of the device, the Fisher exact test for paired comparisons was used.

snorers and 9 for the control group ($P < .001$). In the other dimensions—sleep, pain, physical mobility, and social isolation—the mean scores were all higher for the snorers than for the control group, but not significantly so.

After 1 month of nostril dilator use, the snorers had scores in the energy dimension and total scores that were significantly reduced (**Figure 2** and **Figure 3**).

When the snoring men rated their daytime tiredness on a VAS, the mean score before the study was 58. It was reduced to 43 after 1 month of nostril dilator use ($P < .001$). At the same time, 27 men (64%) rated their daytime tiredness above 50 VAS points before the test, and 12 (28%) did so after 1 month of using the nostril dilator.

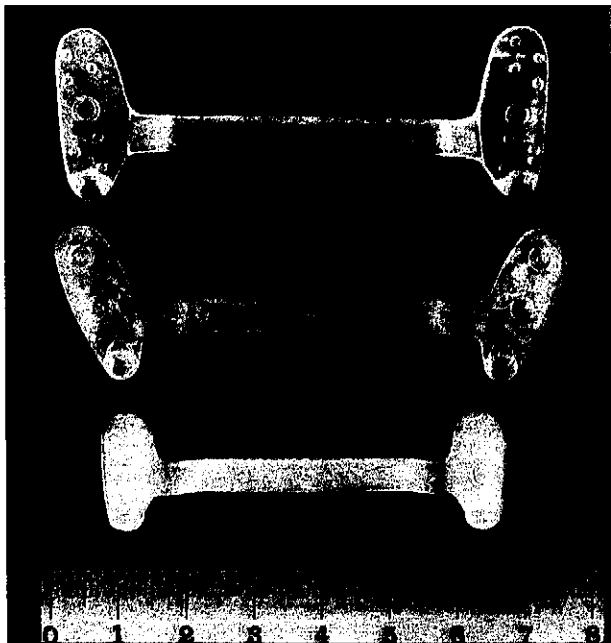


Figure 1. The nostril dilator used in the study exists in 3 different sizes. The size that provided the most comfort was chosen for each patient.

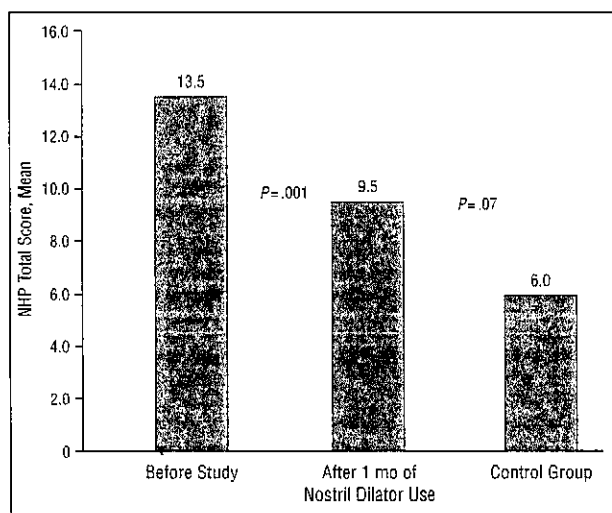


Figure 3. The mean total scores on the Nottingham Health Profile (NHP) (all 6 dimensions) before the study and after 1 month of nostril dilator use. Scores are compared with those of the population sample. 0 indicates the best quality of life; 100, the worst quality of life. Health Profile (NHP) for snorers before the study and after 1 month of nostril dilator use at night. Scores are compared with those of the control group. 0 indicates normal energy; 100, no energy.

When the women considered only how the men's snoring noise had influenced their sleep and well-being, 30 (71%) of them rated their quality of sleep as poor, with a VAS value above 50, and 34 (81%) said that they were tired in the morning (VAS value of well-being above 50) because of the men's snoring.

The female sleeping partners gave a mean pretest value of 83 to the noise of snoring. After 1 month, the value had decreased to 63 ($P < .001$). The mean pretest value for the women's quality of sleep was 66 on the VAS; this was reduced to 53 ($P = .005$). The women's well-being in the morning gave a mean score before the study

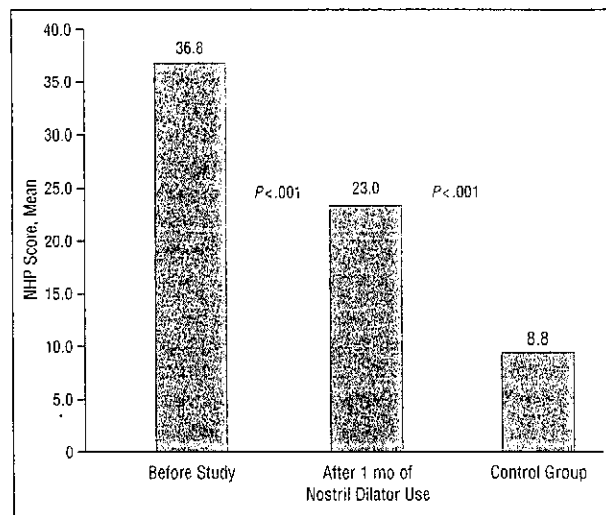


Figure 2. The mean scores in the energy dimension of the Nottingham Health Profile (NHP) for snorers before the study and after 1 month of nostril dilator use at night. Scores are compared with those of the control group. 0 indicates normal energy; 100, no energy.

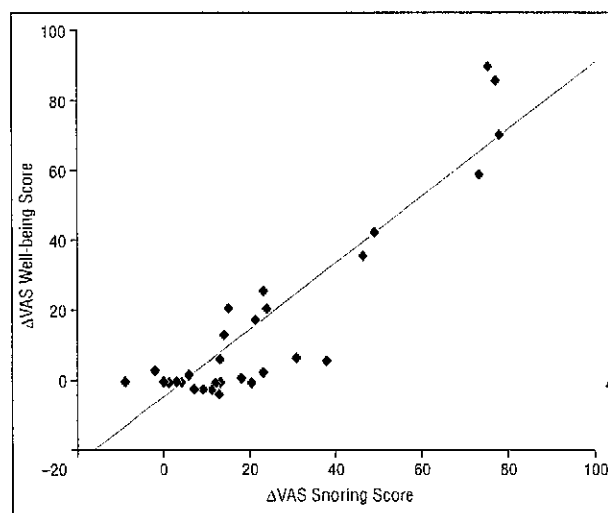


Figure 4. After male snorers used the nostril dilator every night for 1 month, snoring was rated by the female sleeping partners using a visual analog scale (VAS) (0 indicates no snoring; 100, continuous snoring). They rated the average snoring as it was before the test and during the test period. They also rated their own well-being in the morning, only considering the effects of the noise of the snoring, using a VAS (0 indicates thoroughly rested; 100, very tired). The difference between the 2 snoring scores is presented on the abscissa; a positive score (value > 0) shows a decrease in snoring. In the same way, the difference between the female sleeping partners' 2 well-being scores in the morning is shown on the ordinate; a positive score shows less tiredness in the morning ($r = 0.92$; $y = 0.98x - 5.46$; $P < .001$).

of 70 on the VAS, whereas it was 55 ($P = .006$) after 1 month, when the men slept with dilated nostrils.

There was a significant correlation ($P < .001$) between the decrease in the men's snoring and the improvement in the women's quality of sleep. This also applied to the decrease in snoring and the improvement in well-being in the morning (**Figure 4**).

COMMENT

Many snorers are known to be tired during the day. Little is known, however, about the effect snoring has on a snor-

er's quality of life, not to mention that of the sleeping partner. In this study, we found significantly impaired quality of life when we compared the results with those of a population sample. This was most pronounced when it came to the assessment of energy, which might explain why snorers suffer from daytime tiredness.

After 1 month of improved nasal breathing, the snoring group reduced its mean score significantly and experienced a better quality of life. In the energy dimension, there was a significant decrease in the score from 36.8 to 23.0 ($P < .001$). The control group, however, still had a lower score, indicating that widening the nose did not completely cure the snorers in 1 month.

The NHP has been widely used during the past 2 decades as an instrument to evaluate health-related quality of life in many different medical conditions. The original version has been adapted to the Swedish population,¹⁴ and data from a large Swedish population study¹⁰ are available for comparison.

About two thirds of the snorers are regarded as being tired during the day because they scored more than 50 on the VAS when they were asked whether they felt drowsy or alert. When nasal breathing improved, fewer than a third had a score above 50.

Breathing through the nose during sleep is important and must not be ignored when the cause of snoring is analyzed. Silent sleep cannot be expected if there is high airflow resistance in the nose.⁹ The nostril dilator we used in the study increased the airflow through the nasal cavity by an average of 24%.¹⁶

That snoring diminished⁷ and arterial oxygen saturation increased⁸ when nasal breathing was facilitated may be due to a minor degree of pharyngeal collapse.⁹ In addition, nitric oxide has recently been found^{17,18} to be produced in the nasal airway and, when inhaled, to have an effect on vascular pulmonary regulation, resulting in enhanced arterial oxygenation. This could affect sleep at night and quality of life during the day.

When we asked the female sleeping partners how the snoring influenced their sleep, we found that 34 women, or 81%, were tired in the morning. This is twice the percentage that Stradling et al¹⁹ found in the partners of "often" snorers in a population sample. The female sleeping partners' quality of sleep and their well-being in the morning improved during the 1 month when the men could breathe more easily through the nose. There was also a significant correlation between the decrease in the men's snoring and the improvement in the women's quality of sleep; they slept better and were less tired in the morning.

Little information is available about women's quality of sleep and well-being in the morning when their sleeping partners are snoring men. The women sometimes ask their partners to visit a physician, who examines the snorer but usually pays no attention to the women's problems during the night. Any assessment of snoring by self-report has to be limited because snorers may be unaware of their snoring; it is, therefore, recommended that spouses be routinely asked about their own sleep difficulties.²⁰ Hoffstein²¹ stresses this by saying that it is obvious that questions about snoring should be addressed to the sleeping partner.

In this study, the female sleeping partners were asked to rate the average snoring from 0 to 100 on a VAS, which makes it possible to observe small changes. This type of scale has been used in follow-up studies after surgery.^{4,5}

The present study underlines the importance of the effect of snoring on the quality of life of a snoring man and the sense of well-being in the morning of his female sleeping partner. Snoring obviously interferes with daily life, and it may be a problem for the whole family. A limitation with the study might be that it was not a blinded assessment. It is impossible to perform a blinded study because the snorers have to use a visible nasal device. The study also showed that, when nasal breathing is improved in snoring men, snoring decreases, and both the snorer and his female sleeping partner may benefit the following day from this.

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