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Comparison between Choir Singing and Group Discussion in Irritable Bowel Syndrome Patients over One Year: Saliva Testosterone Increases in New Choir Singers

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Singing in a choir is very popular in the Nordic countries. This activity has been associated with increased longevity [1], and it induces feelings of relaxation and energy [2]. Several studies have shown beneficial psychological and/or biological effects of singing [3–7]. A study by our own group [8] has shown that a singing lesson (practicing singing individually) is associated with increases in relaxation, energy and joy, as well as an elevated oxytocin concentration in serum [9]. Low levels of oxytocin have been observed in irritable bowel syndrome (IBS) in adults [10].

IBS is a common gastrointestinal disorder that is influenced by psychological factors [11]. Merely talking to IBS patients about difficult matters may influence endocrine functions of importance to the symptoms [10]. Group-based information events, including group talk as well as behavioural therapy, have been shown to be of some benefit compared to the distribution of written IBS information [12–14].

Repeated stress responses [15] correspond to reactions that are needed in energy mobilisation. At the same time, anabolic/regenerative processes in the body are inhibited [16, 17]. Anabolic/regenerative processes are reflected for instance in the blood concentration of testosterone. Recently, it has been shown that fluctuations in the 'free' blood concentration (not bound to proteins in the blood) of testosterone are closely mirrored in saliva [18]. The anabolic/regenerative activities are of central importance to our ability to withstand adverse effects of long-lasting stress [19]. Accordingly, processes that stimulate anabolic/regenerative processes may reduce the effects of stress.

Advertisements for subjects with a verified IBS diagnosis were made in a daily newspaper and in the patient union journal. It was explained before the start that the participants would be random-

ly allocated either to a choir group meeting or an information/discussion group meeting, in both cases once a week for a year.

The choir group met once a week, starting in May 2006 and ending in May 2007. A professional music teacher and music therapist served as the group's paid leader. Every session lasted for 1.5 h. It started with a number of breathing, voice awareness and relaxation exercises, and continued with choir singing, periodically (from the start) in 2 voices (low and high parts). Training in producing tones at the correct pitch was part of the exercises. There was a break after the first half of the session.

The information group also met once a week during the initial stage, but after half a year the frequency of the meetings was reduced to 3 per month. An information group leader who had been trained by the patient union served as the paid leader.

Participants in both groups received information pamphlets (7 books) – 'living with IBS'. This had been produced before the study period by the leader of the information group. After 6 months, there were 16 participants in both groups (corresponding to 56 and 57% in the choir and information groups, respectively). After 12 months, there were 13 participants in the choir (46%) and 14 (52%) in the information group.

Saliva sampling took place before the start, and then 6, 9 and 12 months afterwards. On each test occasion, saliva specimens were collected upon awakening, half an hour later, at the end of the working day, before the event (choir and information respectively), after the event, and finally at bedtime (i.e. 6 samples in total). Saliva was collected in Salivette tubes, centrifuged, frozen within 24 h of collection and then kept at -60°C until analysis. The saliva testosterone concentration was assessed by means of the Spectria RIA (a coated-tube immunoassay for testosterone; Orion Diagnostica Oy, Spoo, Finland). The intra- and inter-assay coefficients of variation never exceeded 7%.

Two-way ANOVA (mixed model) provided information regarding significance in time trends and differences between the groups, as well as in differences in time trends between the groups (interactions). At least 10 subjects in each cell were required for statistical analyses. Kurtosis and skewness for nlog (natural logarithm) testosterone were between -0.57 and 0.56 (kurtosis) and between -0.57 and 0.72 (skewness), respectively (means of 6 logarithmically transformed assessments on the 4 occasions).

The ANOVA of saliva testosterone (nlog) showed a significant time effect, but no difference in means between the groups. In addition, there was a strong 2-way interaction illustrating that the

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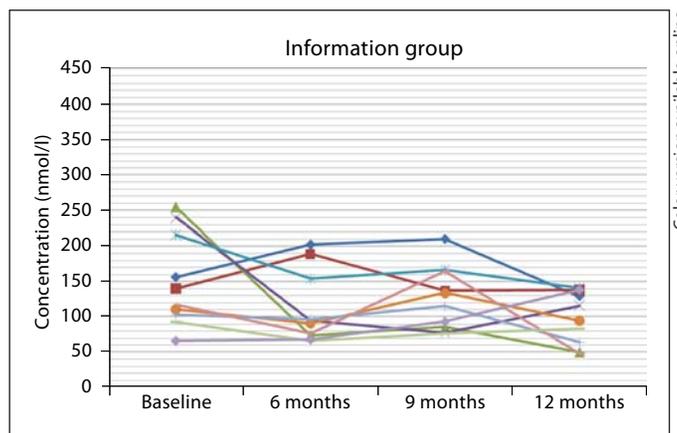
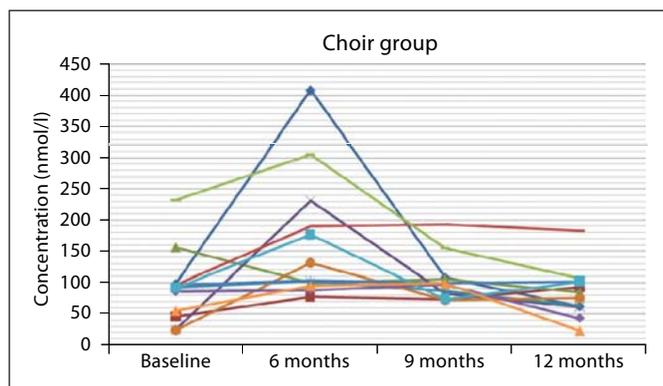


Fig. 1. Geometric means of 6 assessments of saliva testosterone concentrations in all subjects present at each assessment day at baseline and 6, 9 and 12 months later. Each subject is displayed as a line. The graphs show that in the choir group there was an arithmetical increase in concentration from before the start to 6 months later in 10 subjects, a decrease in 1 subject, and unchanged level in 1 subject. During the same period in the information group, there were generally much smaller changes, with an increase in 2 subjects and a decrease in 8 subjects.

variations in the choir group were significantly more pronounced than those in the information group ($F_{\text{group}} = 1.36$, $p = 0.26$; $F_{\text{time}} = 4.06$, $p = 0.01$; $F_{\text{interaction (group} \times \text{time)}} = 5.22$, $p = 0.003$). Gender-separated analyses and exclusion of 4 female participants below the age of 50 years (premenopausal ages) made no difference to the results. Figure 1 shows the geometric means of saliva testosterone concentrations of the 6 assessments for each individual present on all assessments (before the start, as well as 6, 9 and 12 months after the start).

Saliva testosterone concentration during the waking hours of the day from the choir singers showed an increase after 6 months, when compared to before the interventions. The most likely interpretation is that the highly significant peak in the choir group after 6 months is associated with the intervention itself. However, the statistical power may have been too low, and in possible future studies larger numbers of subjects should be included. That saliva testosterone concentration increases during the initial experience of a combination of tango music and dancing has recently been shown in men and women [20].

Attrition was a problem; however, the groups had similar levels of attrition and the participants gave similar reasons for leaving their respective groups.

The saliva testosterone concentrations differed between men and women. However, analyses both with and without inclusion of male subjects were performed, and the conclusions were the same.

The evaluation of possible effects on IBS in this study has been published elsewhere, and it indicated that the choir intervention may have been clinically more favourable [21].

In summary, our findings have to be replicated in larger studies. Despite the study's weaknesses there is a clear indication that choir singing once a week induces a state of stimulated regeneration during the first half-year in IBS patients, but that in this particular case this effect did not last until the end of the year.

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