

Controlled Induction of Negative and Positive Emotions by Means of Group Singing

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Abstract

Studies have shown that singing can induce positive emotions. On the other hand, the controlled induction of negative emotions has been demonstrated only during listening to music. The present work investigates whether preselected songs could be used to induce specifically positive and specifically negative emotions during singing in groups. In an experimental study design with controlled randomization, the emotions of participants before and after singing preselected songs was recorded by means of a battery of questionnaires (visual analog scale of current mood, Positive and Negative Affect Schedule). Emotions after singing negative songs fell significantly on the visual analog scale from $M = 6.23$ to $M = 5.21$. Emotions while singing the positive songs increased from $M = 6.57$ to $M = 7.84$ ($p < .05$). This indicates that positive and negative emotions can be induced by means of appropriate song material.

Keywords

singing, emotion, music

Singing makes people happy. In the German-speaking region, approximately 1.99 million singers are organized in roughly 31,000 choirs in the three major choral associations alone (Deutscher Chorverband [German Choral Association], 2009; Chorverband Österreich [Austrian Choral Association], 2009; Schweizerische Chorvereinigung [Swiss Choral Association], 2009). These figures do not include the innumerable occasions for informal singing in groups. Thus singing seems to be a very important leisure activity. One reason for this could be that singing influences well-being on different levels. In particular, the positive emotions induced by singing might play a decisive role. McCraty, Atkinson, Rein and Watkins (1996) demonstrate that even listening to music can trigger positive emotions. Their study also clearly shows that the type of stimulating material selected exerts an influence on positive emotions.

However, positive effects during singing seem to appear only among amateurs. As demonstrated by Grape, Sandgren, Hansson, and Theorell (2003) in a comparative study, no positive effects on the emotions could be detected among professional singers. In this study, the emotional status was ascertained by means of a visual analog scale (VAS). The bipolar scale comprised five ranges: sad-joyful, anxious-calm, worried-elated, listless-energetic, and tense-relaxed (Grape et al., 2003).

Singing not only is more effective in inducing positive emotions but also exerts immediate influence on the direction of the emotional change. Identical stimulating material can have

opposite effects on active singers compared with passive listeners. Thus Kreutz, Bongard, Rohrman, Hodapp, and Grebe (2004) demonstrate that the same stimulating material can result in an increase of positive emotions in the singing group, whereas the listening group displays an increase of negative emotions. On the other hand, the lyrics do not play a decisive role in the induction of emotions. It is always the melody of a piece of music that determines the emotions. Although the lyrics exert a moderating influence, they are unable to switch the direction of the effect of the melody (cf. Omar Ali & Peynircioglu, 2006). It must be noted, however, that the effect and the efficiency of induction of emotions also depends on the concept used to define and measure emotions.

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Approaches to the Measurement of Emotions

A number of different approaches to measuring emotions are described in the literature. The first step must be to decide which of the existing categorizations of emotional aspects should be used as the basis of the investigation. An overview of this has been published by Sloboda and Juslin (2005). The categorical approach assumes the existence of clearly distinguishable and demarcated categories. The emotions detected in this way are frequently described as basic emotions. However, these vary considerably from author to author. The total number of distinct emotions varies between three and eight, whereby joy, anger, sadness, fear, and disgust are generally agreed upon.

On the other hand, the dimensional approach presents the emotions as values along a bipolar scale (for example active-passive, negative-positive). These are suitable for the representations of continual changes.

The most frequently used method for measuring emotions is the subjective estimation and evaluation of the emotions (Sloboda & Juslin, 2005), because it is economical and records emotions directly. However, this method suffers from the disadvantage that concepts of emotion differ, leading to problems in comparing studies and in the structural validity of the scales used to measure emotions (Sloboda & Juslin, 2005). Physiological parameters, such as skin resistance, electrocardiogram, and electroencephalogram, despite having a greater degree of comparability than subjective evaluations, do not correlate with the perceived emotions (McCraty et al., 1996; Sloboda & Juslin, 2005).

In addition to the way emotion is measured, the induction of emotion itself also plays a major role in the study:

If a piece of music is judged to be sad, in other words, linked with sad connotations or allusions, the emotions are localized in the music. If one feels sadness while listening to a piece of music, the emotions are localized in oneself. (Sloboda & Juslin, 2005, p. 792)

Sloboda & Juslin (2005) therefore differentiate two ways of representing emotion: induction based on the musical structure and induction during musical performances. A very meager state of research is something these two approaches have in common. "Further research is clearly necessary before it will be possible to decide which of these alternative explanations is the more plausible" (Sloboda & Juslin, 2005, p. 806), because analysis of the musical structure lacks the standard forms of representing the structure that would make such an investigation possible. A piece of music whose structure conforms to expectations appears to induce positive emotions. Emotional contagion apparently plays a significant role in induction by the type of musical performance (Kimura, Daibo, & Yogo, 2008; Sloboda & Juslin, 2005). The listener's opinion of the music being offered exercises a moderating influence.

Research Questions and Hypotheses

In earlier research, several studies have already examined the effect of passively heard music and singing on emotions in

connection with different physiological correlates. The experimental variation involved the sample (professionals vs. amateurs) or the method used to administer the stimulating material (listening to music or singing oneself). Up to now, there has been no investigation of how varying the stimulating material influences the emotional effect during singing.

The present study was therefore designed to investigate whether it is possible by varying the stimulating material to induce specifically positive or specifically negative emotions during singing.

Hypothesis 1: It is possible to induce positive and negative emotions specifically by means of singing.

The corresponding null hypothesis states that it is not possible to induce positive and negative emotions specifically by means of singing.

Method

Questionnaire Usability Test (Survey 1)

A first survey was designed to investigate whether the chosen questionnaires are suitable for the subject matter being investigated. In the manner of Grape et al. (2003) and Kreutz et al. (2004), a group of amateur singers ($N = 12$) was presented during a singing meeting with the set of questionnaires before singing and after 45 min of singing.

Participants (Survey 1)

All 12 singers (10 females, 2 males) of a singing meeting took part in the first survey. One data set was removed because the participant was too young (11 years) to complete the questionnaire without help (leaving 9 females, 2 males). The mean age of the participants was 49 years, ranging from 29 to 72 ($N = 11$; $M = 49$ years, $SD = 13.84$; range = 29 to 72).

Questionnaires (Survey 1)

In the first survey, the stimulating material was tested using the German version of the Positive and Negative Affect Schedule (PANAS; Krohne, Egloff, Kohlmann, & Tausch, 1996). The advantages of this instrument are that it is internationally proven and is also available in a German version. Sociodemographic variables were also recorded, such as gender, age, self-assessment of own singing competence, and information about the number of hours of organized singing per week.

PANAS. Scales used were Positive Emotions (PA) and Negative Emotions (NA). The reliability and validity of the instrument were tested and confirmed by Crawford and Henry (2004) in a very large nonclinical sample ($N = 1,003$) in the United Kingdom. The independence of the PA and NA scales assumed by the PANAS authors was not confirmed (Crawford & Henry, 2004).

Implementation (Survey 1)

Recruitment of the participants. For the questionnaire usability test (Survey 1), the participants of a singing group were asked to complete the questionnaires before and after singing.

Performance of the stimulating material. For testing the questionnaires (Survey 1), the chosen performance schedule was that familiar to the group: initially sung by the leader, then sung by the group with guitar accompaniment.

Survey to Test the Stimulating Material (Survey 2)

Five experts (choir leaders and leaders of singing meetings) were asked to put forward proposals for identifying songs that specifically induce negative emotions. Seven titles were chosen from those suggested. Selection criteria were that the songs are simple to sing and as little known as possible.

To ensure the greatest possible comparability, songs specifically inducing positive emotions and songs inducing negative emotions, depending on the musical style and the language used, were selected. See Tables 1 and 2 for songs used for the survey.

The titles were normalized to the same volume level, and the pauses between the titles were extended to 6 s to give the participants time to answer two items. The entire sequence of titles

Table 1. Songs Selected for Targeted Induction of Negative Emotions and Order of Performance

Song title	Duration	Order of performance in the experiment	
Wade in the Water	1:56	1	8
Steal Away	2:32	2	9
Sad Lisa	3:42	3	10
Return Again	3:54	4	11
We All Come From the Goddess	3:04	5	12
May the Circle Be Open	2:30	6	13
Swing Low	2:50	7	14

Table 2. Songs Selected for Targeted Induction of Positive Emotions and Order of Performance

Song title	Duration	Order of performance in the experiment	
This Land Is Your Land	2:26	1	8
Go Tell It on the Mountain	3:03	2	9
He's Got the Whole World in His Hands	2:04	3	10
Lucky Lips	2:44	4	11
Oh When the Saints Go Marching In	1:49	5	12
Singin' in the Rain	2:58	6	13
If You Want to Sing Out	2:47	7	14

was then duplicated and appended to the first sequence. This not only increased the total duration but also tested whether the respective change appeared again reliably.

The titles were burned on audio CDs in the order given above. The text of the songs was transcribed completely (including all repeats). In this way, every participant received 14 sheets of text.

The German version of the PANAS was used as the dependent variable. After each song, a VAS was answered on the actual emotional status (see Table 3 for survey design).

Table 3. Experimental Design of the Survey for Testing the Stimulating Material (Survey 2)

	T1	Intervention	T2
Group 1	Cover page (pre)	Singing negative songs (2 × 7)	Cover page (post)PANAS
Group 2	PANAS	Singing positive songs (2 × 7)	

Note: T1 = before singing; T2 = after singing; PANAS = Positive and Negative Affect Schedule (German version; Krohne, Egloff, Kohlmann, & Tausch, 1996).

Implementation

Recruitment of the participants (Survey 2). A choir was selected for the survey of the stimulating material. Care was taken that the survey leader was known neither to the choir nor to the choir leader.

Participants (Survey 2). All 27 singers of a choir took part in the second survey. The mean age of the participants was 29 years, ranging from 15 to 70 ($N = 27$; 17 females, 10 males; $M = 29$ years, $SD = 10.63$).

Allocation to the Study Groups and Randomization

When the participants in the study arrived, they were immediately given the questionnaires. These were held together by means of colored adhesive strips (visible only from the back). Instruction and completion of the questionnaire took place in the group as a whole before the start of the study. Division into the two experimental groups then took place randomly on the basis of the colored adhesive strips. Up to this point, neither the study leader nor the participants could know who belonged to which group.

Performance of the Stimulating Material

To hold constant important aspects of emotional contagion during the induction of emotions (Sloboda & Juslin, 2005), commercial recordings of the songs were used for testing the stimulating material (Survey 2). These were played by means of a CD player, external amplifier, and speakers. This ensured that a standardized procedure was followed (e.g., length of titles, pause durations, volume).

Results

Questionnaire Usability Test (Survey 1)

Descriptive statistics. All the participants take part in organized singing for less than 4 hr per week. The mean of the self-assessed singing competence is 4.8 on a nonsubdivided 10-level scale. The highest value is 8.5, and the lowest is 0 ($M = 4.8, SD = 2.38$).

Inference statistics. The mean of the self-estimation of the actual mood before the singing is 6.5. After the singing, the mean is 8.2. The t test for paired samples is highly significant ($p < .001$; see Figure 1). With respect to emotional change, significant changes ($p < .05$) were found in PANAS scales, as indicated in Table 4.

Figure 1 Comparison of the emotions before and after the singing (M) in the visual analog scale (Survey 1).

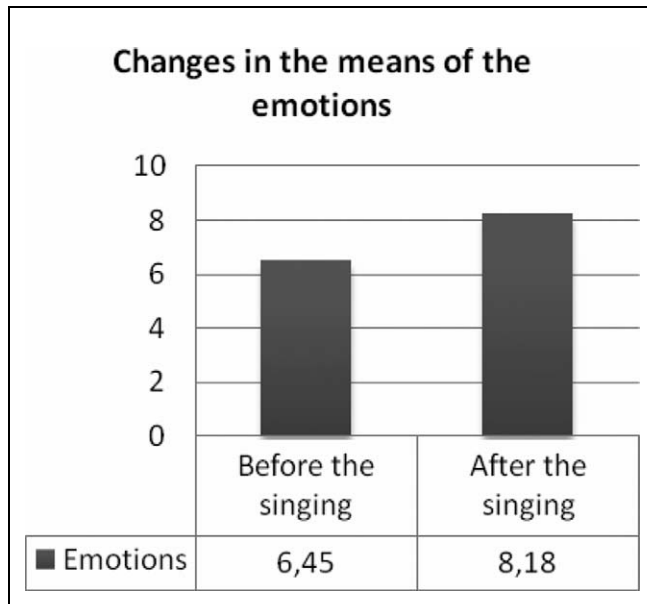


Table 4. Significant Changes (t Test for Paired Samples) in Individual PANAS Scales

Emotion	Before singing		After singing	
	M	SD	M	SD
Active	3.3	.90	4.3*	.46
Strong	2.9	.88	3.6*	.50
Animated	3.0	.77	4.5*	.69
Proud	2.1	.83	3.4*	.81
Irritated	1.7	.90	1.1*	.30
Enthusiastic	2.9	.73	4.3*	.79
Attentive	3.3	.90	4.3*	.65

Note: PANAS = Positive and Negative Affect Schedule (German version; Krohne, Egloff, Kohlmann, & Tausch, 1996).
* $p < .05$.

Table 5. Significant Changes (t Test for Paired Samples) in Individual PANAS Scales in Both Experimental Groups: Survey of the Stimulating Material (Survey 2)

Emotion	Before singing		After singing	
	M	SD	M	SD
Positive group				
Interested	3.1	1.07	3.8*	0.96
Confused	2.7	1.59	1.7*	0.99
Negative group				
Joyfully excited	2.5	1.20	3.3*	0.86
Angry	1.5	0.52	1.0*	0.00
Animated	2.2	1.14	2.9*	0.80
Irritated	1.7	0.63	1.1*	0.28
Determined	3.6	0.87	2.6*	1.12

Note: PANAS = Positive and Negative Affect Schedule (German version; Krohne, Egloff, Kohlmann, & Tausch, 1996).
* $p < .05$.

Table 6. Mean and Ranking List of Emotionality in the Songs Sung for Survey 2

Song title	Group	Mean emotion after singing	Rank
Oh When the Saints Go Marching In	Positive	8.22	1
He's Got the Whole World in His Hands	Positive	7.97	2
Lucky Lips	Positive	7.91	3
Singin' in the Rain	Positive	7.91	4
Swing Low	Negative	7.66	5
If You Want to Sing Out	Positive	7.21	6
This Land Is Your Land	Positive	7.08	7
Go Tell It on the Mountain	Positive	6.84	8
May the Circle Be Open	Negative	6.41	9
Return Again	Negative	6.18	10
Wade in the Water	Negative	5.79	11
Sad Lisa	Negative	5.73	12
We All Come From the Goddess	Negative	5.42	13
Steal Away	Negative	4.83	14

Survey of the Stimulating Material (Survey 2)

The survey took place using a mixed choir during the course of a routine practice.

Descriptive statistics. The participants sing on average 2.8 hr per week, ranging from 2 to 5 hr ($M = 2.8, SD = 1.09$). The mean of the self-assessed singing competence is 5.8 on a non-subdivided 10-level scale. The highest value stated is 10, and the lowest is 0 ($M = 5.85, SD = 2.05$).

Inference statistics. With respect to emotional change, significant changes ($p < .05$) were found in PANAS scales, as indicated in Table 5.

There were no significant differences between the pre- and posttest values of the means of the main categories (PA and NA). Emotions were evaluated for both performances of each

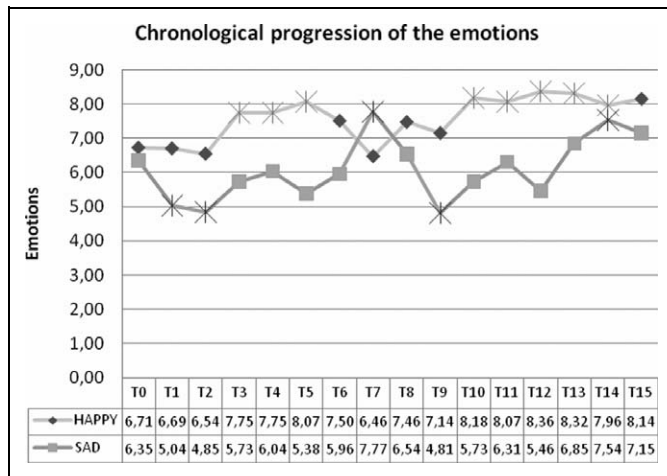


Figure 2. Chronological progression of the emotions (significant changes from the initial value are marked by stars). T₀ = before the singing; T₁₅ = after singing all the songs.

song. The songs were then ranked from the highest positive evaluation (Rank 1) to the most negative evaluation (Rank 14). See Table 6 for rankings.

In the chronological progression (Figure 2), it becomes especially apparent that contrary to expectation, the emotion induced by Song 7 (= 14), which was presented as negative, was evaluated as clearly positive. Table 7 and Figure 3 show an analysis of the top four negative and positive titles.

Discussion

The results of the questionnaire usability tests confirm the results obtained in other studies, which demonstrate that singing in a group leads to an increase in positive emotions (e.g., Grape et al., 2003).

In agreement with the hypothesis, it proved possible in the survey of the stimulating material to induce positive emotions. However, a different situation was revealed by the effect of those songs intended to induce negative emotions. At first glance, it appeared as though these also generated positive emotions. However, Table 6 shows that a single song (“Swing Low”) has a completely different effect from what was expected. Although this song was assigned to the group of songs intended to induce negative emotions, it induced positive emotions during the experiment. This situation is also evident in the chronological progression (see Figure 2).

Table 7. T Test for Paired Samples: Top Four Negative and Positive Songs Before and After Singing

	Paired differences		Standard error of the mean	95% CI of the difference		t	df	Sig. (two side)
	M	SD		Upper	Lower			
Self-evaluation of mood, negative songs	1.01923	1.57358	.43643	.06832	1.97014	2.335	12	.038
Self-evaluation of mood, positive songs	-1.26786	1.40300	.37497	-2.07792	-.45779	-3.381	13	.005

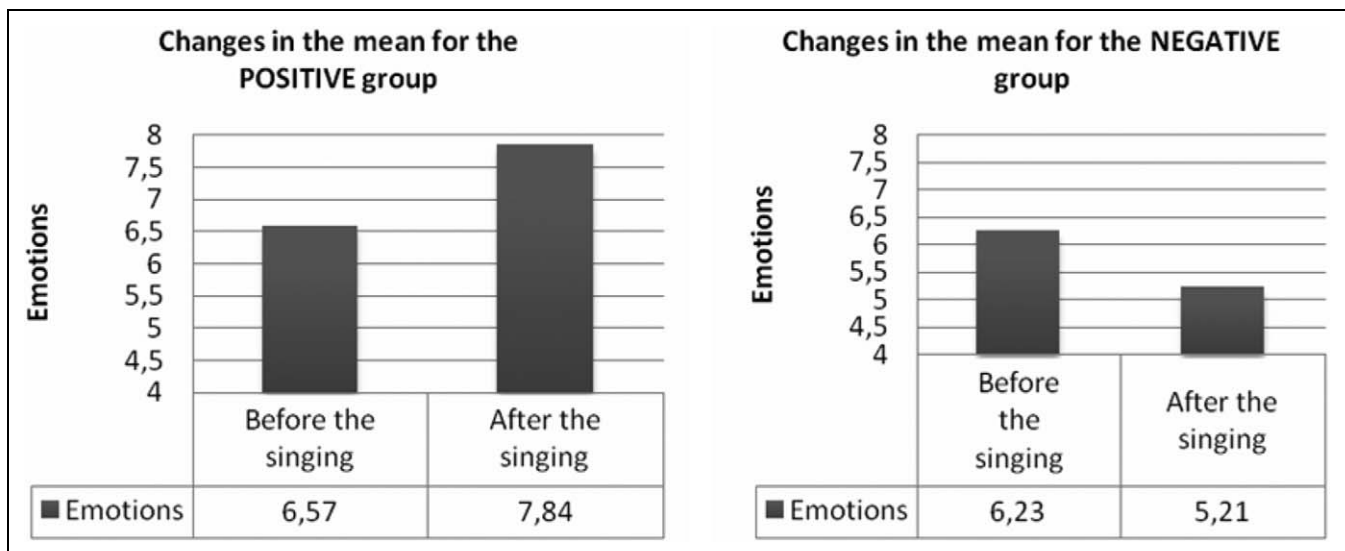


Figure 3. Comparison of the emotions in the two experimental groups before and after the singing (M) in the visual analog scale (Survey 2). Note: The difference in the mean is significant in both groups (p < .05).

If this song is eliminated, all the means of the positive group are greater than those of the negative group. Selection of the top four songs from each group for the analysis yields a clear, statistically significant result. Thus it is possible to specifically induce negative and positive emotions during singing and not only by listening to music (cf. Omar Ali & Peynircioglu, 2006).

At the same time, this effect—whether positive or negative—does not seem to be stable. In the chronological progression, it is clearly visible that one positive song is already sufficient to induce positive emotions immediately. The reverse effect is also clearly evident: One negative song suffices to induce negative emotions immediately. Because all the songs were performed twice, we can recognize that this effect is also stable on repetition.

One problem associated with the selection of song material is certainly the different degrees of familiarity of the songs. Even though the songs suggested by the experts were chosen because of their being as unknown as possible in the German-speaking region, it was still evident that the positively evaluated songs tended to be the more familiar ones. This aspect must be controlled during further studies. In addition, the possibly smaller effect of English lyrics on German-speaking singers cannot be transferred unconditionally to the English-speaking region. Even though the state of research into the emotion-stimulating effect of musical structures during singing is still relatively meager (Sloboda & Juslin, 2005, p. 806), it should be possible in future studies to investigate the songs for such common characteristics on the basis of the effects found.

What is the direct impact of the above results? The possibility of targeted control of emotions during singing means, for example, that choir leaders can use this as an active instrument during rehearsals. Even choir rehearsals at which the mood of the participants is bad can already be brightened up using a positive song. It should be possible to exploit the primacy-recency effect by placing a positive song at the beginning and at the end of the practice session as a contribution to ensuring that the rehearsal is remembered in the best light.

The situation during actual performances is more difficult. Although the effect can be used for transferring emotions from the singers to the audience, emotions that are presented too vigorously are not likely to improve the artistic quality of the performance.

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