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ABSTRACT

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Keywords

Emotion regulation, multidimensional scaling, music preference

INTRODUCTION

Music plays an important role in everyday life (Motte-Haber, 1985). Recent studies have shown that adolescents as well as adults listen to music for at least three hours a day (Ehlers, 1989). The main reason why people engage themselves with music seems to be, at least in part, the emotional experiences elicited by listening to music. According to Gabrielsson (1991), musical stimuli are among the most intensive triggers of emotions. Indeed, listening to music may lead to measurable psychophysiological reactivity patterns (e.g. Sloboda, 1991; Krumhansl, 1997; Nater et al., 2005; Nater et al., in press). Emotions evoked by the

listening of music can be lined up on a dimensional level by differentiating them on a valance-arousal-dimension (Krumhansl, 1997; Nyklicek, Thayer & Van Doornen, 1997). Emotional reactions to musical stimuli seem to be very stable within and between participants and are only weakly influenced by musical expertise (Bigand et al., 2005).

Thus, music is a well qualified medium for the investigation of emotions (Sloboda & Juslin, 2001). Newer studies are using music as suitable stimuli for the induction of different emotional states (e.g. Nater et al., in press; Gomez & Danuser, 2004), thus providing an ecologically valid approach for the examination of emotions, since people are used to judge their affective reactions to music (Gaver & Mandler, 1987).

Since music seems to be successful in triggering emotions, it might be assumed that music can be used by listeners to regulate their current state of emotions. A study by Gallup and Castelli (1989) investigated 1007 Americans which were asked which behavior they chose to release themselves from a depressed state of mood: 77% of the participants reported to use distraction and *listening to music*. Consequently, Thayer et al. (1994) state that music not only serves mood regulation in general, but is also useful in changing bad mood, reducing nervousness and tension or fear.

The construct "emotion regulation" refers to the processes by which individuals influence which emotions they have, when they have them, and how they experience and express those (Gross, 1998). Emotion regulation can be aware, unaware, automatic or controlled. It can be either before, during or after the appearance of emotions. Whereas emotion regulation is generally examined in the context of current states of emotion, recent research has focused on emotion regulation as a trait (Mohiyeddini, in prep.). The dispositional emotion regulation style is a construct which describes the characteristic way of emotional regulation of an individual in different emotional situations. It can be differentiated by three different dimensions: 1) the *hedonistic dimension*, which implies that one wants to maintain and intensify positive emotional states, as well as attenuate negative emotional states and transform them into positive ones ("mood repair"), 2) the *distress-augmenting dimension,* which implies that negative emotional states become intensified or alternatively maintained ("mood-congruency effect"), as well as transform positive emotional states into negative ones, and 3) the *emotional moderation dimension*, which implies that negative as well as positive emotional states are sought to be diminished (Mohiyeddini, in prep.). Research on emotion regulation and listening to music is relatively scarce. Cantor and Zillmann (1973) were able to show that the actual state of mood of the listener of music might influence the situational music preference. Their results show that the previous emotional situation has an essential influence on subsequent listening

behavior. However, no study so far has examined dispositional emotion regulation and listening to music.

In the current study, we therefore set out to investigate whether emotion regulation style is related to music choice in emotional situations.

Pre-Study

In a pre-study, music stimuli and emotional situations were selected. After an explorative survey on music pieces that might help regulate emotional states and on situations that might be emotionally charged, an expert panel rated the appropriateness of the stimuli for inclusion in the current study. To validate the judgments of the expert panel, we conducted a pre-study in which 25 respondents rated a total of 40 musical stimuli on two seven-point scales ranging from *displeasure* to *pleasure* (V) and from *sedation* to *arousal* (A). The emotional states in a total of 16 circumscribed situations were rated on seven-point scales ranging from *unpleasant* to *pleasant* (V) and *not at all activated* to *very activated* (A). Additionally, the participants stated whether they knew the music pieces well, a little or not at all.

There were two criterions for the selection of the musical stimuli for the main study: (1) to avoid idiosyncratic associations, the songs must not be known to participants, and (2) the stimuli have to show a clear tendency in the valence as well as in the arousal dimension. Eleven of the 40 song clips were excluded because more than 10% of the participants knew them at least a little. From the remaining 29 songs five songs for the four combinations of valence and arousal poles were selected showing the clearest tendency in the particular direction (see Table 1).

Table 1. The selected 20 music pieces for the main study with standardized values of the ratings on dimensions valence (V) and arousal (A).

	Artist	*Titel*	*V*	*A*
A	Chris De Burgh	Discovery	0.80	-0.86
B	Ennio Morricone	La Libertad from "Alibi"	1.40	0.77
C	Megadeth	Take No Prisoners	-1.20	1.49
D	Vangelis	Light and Shadow	-0.65	-0.70
E	Soundtrack	Legends of the Fall	1.06	-1.30
F	Gioacchino Rossini	La Cenerentola	1.40	1.15
G	Faith No More	Jizzlobber	-1.80	0.99
H	Chris De Burgh	A Rainy Night in Paris	-1.02	-1.10
I	Keane	Bedshape	0.32	-1.10
J	Glen of Guinness	Shores	2.18	0.72
K	Ennio Morricone	Exorcist II	-0.91	1.11

L	Georges Bizet	Hör ich die Stimmen im Traum	-0.46	-1.13
M	Glen of Giunness	The Bold Fenian Men	0.25	-0.89
N	Carl Maria von Weber	Aufforderung zum Tanze	1.51	0.79
O	Entombed	Left Hand Path	-2.24	1.61
P	Georg Friedrich Händel	Organ Concert	-0.24	-0.91
Q	Soundtrack	Medal of Honor	0.95	-0.50
R	Humate	Love Stimulation	1.10	0.82
S	Faith No More	Caffeine	-1.43	1.01
T	Sade	Pearls	-0.35	-1.34

Angry at the boss	-0.96	0.74
Bad day	-0.72	-0.12
Wrongful accusation	-1.17	1.04
Monotonous work	-0.65	-0.58

The analysis of the ratings for the situation descriptions showed that all 16 situations were rated in the intended fashion and were therefore suitable for the application in the main study. The distinction on the valence dimension was obvious, but there was a tendency to rate situations with negative valence higher on the arousal dimension. One situation (Partnership crisis, see below) that was meant to be a V- A- situation had a positive value on the arousal dimension with standardized values (see Table 2). However, this situation had a significant lower value on the arousal dimension than all designated V- A+ situations.

Table 2. Short descriptions of the 16 emotional situations with standardized values of the ratings on dimensions valence (V) and arousal (A).

Short situation description	*V*	*A*
Passing an exam	1.19	0.76
Relaxing evening	0.83	-1.41
Dispute with partner	-0.90	0.99
Failed lecture	-1.14	-0.12
Going to a party	0.78	0.46
Cozy Sunday	0.85	-1.82
Partnership crisis	-1.26	0.33
Preparing for a date	0.89	1.17
Romantic dinner	1.16	-1.26
Traffic jam	-1.06	0.79
Winning a prize	1.07	0.69
Barbecue	1.10	-1.67

Main study

The aim of the main study was to investigate the role of emotion regulation style in choosing music in emotionally laden situations. The validated music pieces and situation descriptions of the pre-study were used.

Subjects

Eighty-nine students of the University of Zurich participated voluntarily. Their age was between 20 and 30 years. They were no professional musicians and had no hearing problems and no psychiatric problems.

Procedure

At the beginning of the study, the participants sat down at a computer and listened to all 20 music pieces twice. The pieces were presented via head phones. The instruction was to put oneself in the given emotional situations. For each of the 16 situations, the musical stimuli which were represented as text fields on the monitor (e.g. Song A) had to be positioned on a vertical visual analogue scale ranging from *I surely would not listen to this song in this situation* (bottom) to *I would listen to this song in this situation* (top). While placing a text field via drag-and-drop mechanism, the particular music piece was played. If the participants were satisfied with the positioning of the musical stimuli, they could go on to the next situation. In total, every subject had to make 320 judgments (16 situations * 20 musical stimuli), lasting on average 30 minutes.

Questionnaire

Every participant filled out the Inventory for Regulation of Emotion (German: Inventar Emotionsregulationswirksamkeit, IERW; Mohiyeddini, in prep.). This questionnaire assesses dispositional regulation styles for three postulated dimensions: hedonistic (HED), distress-augmenting (DIS) and emotional moderating (MOD) emotion regulation.

RESULTS

Relationship between Kind of Music and Classes of Situation

The data were analyzed using nonmetric multidimensional scaling (MDS; Borg & Groenen, 2005). The proximities were city-block distances, i.e. for each pair of music pieces, the sum of differences of the averaged ratings over all situations was calculated. By means of MDS, these proximities can be transformed in a geometric configuration so that the rank order in the distances between the configuration points match as close as possible to the corresponding proximities of the songs. In the resulting map of the music pieces, stimuli with similar position are preferred (and rejected) in similar emotional situations, distant stimuli in different situations (see Figure 1).
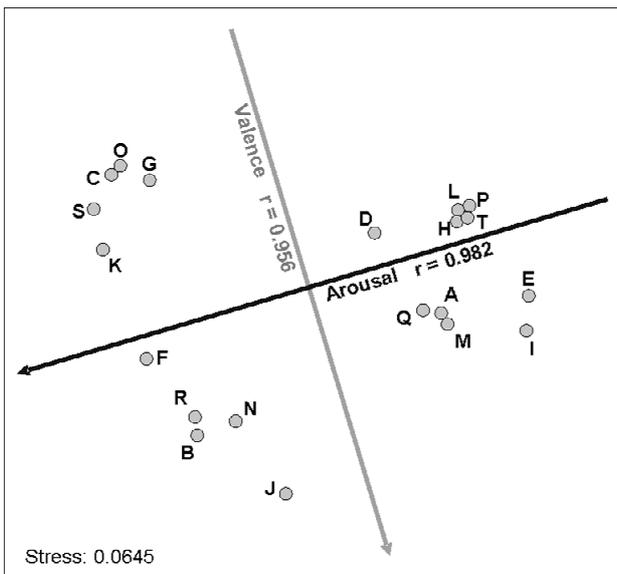

Figure 1. MDS solution for situation similarity of the song clips with property vectors for valence and arousal (see Table 1 for allocation of letters to songs).

The stress value (Kruskal, 1964) is an index that assesses the mismatch of proximities and corresponding distances. A stress value of 0.0645 is fairly low for the positioning of twenty stimuli in two dimensions[1]. This indicates that (1) depending on the emotional situation, the various music stimuli were differently preferred and (2) two dimensions seem to be sufficient to represent the important factors for choosing music in emotional situations.

Once a resulting configuration is given, properties of the stimuli can be fitted in this space using property fitting (Chang & Carroll, 1989), a procedure similar to a multiple regression with the coordinates of all dimensions as independent and the values of an external property rating as dependent variable. We used the average ratings of the musical stimuli on the dimensions valence and arousal as dependent variables. These properties can be illustrated as vectors in the multidimensional space (see Figure 1), al-

Figure 2. MDS solution with the positions of the emotional situations.

lowing further interpretation of the perceptual map (higher arousal or more positive valence in direction of the corresponding arrows). The high correlation coefficients ($r = .982$ for the arousal and $r = .956$ for the valence vector) indicate that the vectors fit extremely well in this configuration. Additionally, these two vectors are aligned orthogonally to each other, demonstrating the independency of the two concepts. Taking together, these observations suggest that the two most important factors in choosing music in emotional situations are valence and arousal.

To illustrate the interaction of emotional situation and choice of music, the situations were added to the map. This was done by fitting the situations one by one as additional objects into the configuration. As can be seen from Figure 2, the positions of these situations are mainly near musical stimuli with similar emotional meaning, i.e. there seems to be an emotional congruency of situation and music. Only the situation 'Monotonous Work' is placed in an area where it would not necessarily be expected according to its ratings on valence and arousal.

To explore this further, the ratings for the four kinds of music in each class of situation were averaged for each participant. The means and standard deviations of these values are listed in Table 3. For all classes of situations, the ratings for the emotionally corresponding kind of music was significantly higher than in the other three music categories (paired sampled t tests, one-tailed, all p's $< .001$), except for emotional situations with negative valence and low arousal, where music with positive valence and low arousal was rated higher, although not significantly ($t(88) = 0.85$, $p = .40$).

Table 3. Mean values and standard deviations of ratings for the four kinds of music in each class of situations.

		MUSIC			
SITUATION		V- A-	V- A+	V+ A-	V+ A+

V- A-	*M*	4.85	3.46	4.95	3.10
	SD	1.21	1.61	1.29	1.00
V- A+	*M*	3.18	5.39	3.19	3.19
	SD	1.39	1.86	1.35	1.05
V+ A-	*M*	4.59	2.26	5.83	3.56
	SD	1.26	1.29	1.21	1.06
V+ A+	*M*	2.59	3.68	3.72	5.15
	SD	1.11	1.78	1.25	1.46

Influence of Dispositional Emotion Regulation on Music Choice

To investigate the influence of dispositional emotion regulation on music choice, a correlational study was conducted. Each participant provided test scores on three dimensions of the IERW: hedonistic (HED), distress-augmenting (DIS) and emotional moderation (MOD) dimension. The correlation coefficients between these values and the individual average ratings in every combination of situation class and kind of music were calculated (see Table 4).

The highest correlation coefficient ($r = .322$) stands for the connection between emotional moderating regulation and the preference for music with positive valence and high arousal in situations with negative valence and high arousal (e.g. 'Angry at the boss'). This regulation style is also significantly correlated with preference for V+ A+ and V- A- songs in these situations, maybe in order to reduce situation-specific high arousal and / or negative valence. Furthermore, people with higher values on this regulation dimension rated V+ A- music higher in sad situations (V- A-) as well as in joyful situations (V+ A+).

Participants with high test scores on the hedonistic dimension favor cheerful, inciting music (V+ A+) in situations that already have positive valence and high arousal. In these situations particularly, they also reject V- A- music.

The distress-augmenting regulation style is related to rejection of V+ A+ music in situations with negative valence and low arousal. In V- A+ situations, this regulation style is positively correlated with the preference for emotionally congruent music and negatively correlated with hearing peaceful and quiet music (V+ A-).

In sum, this results show that dispositional emotion regulation has a modulating influence on music choice in emotional situations. However, this influence is only small[2] compared to the overall tendency to hear music that is congruent concerning valence and arousal in emotionally laden situations.

Table 4. Correlations of individual values on emotion regulation dimensions with average ratings of four dif-

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[2] Highest correlation of *r* = .322 explains only 10% of the total variance for preferences for musical stimuli in the specific situation class.

ferent types of music, for each class of emotionally laden situations (N = 89).

Situation	**V- A-**			
Music	*V- A-*	*V- A+*	*V+ A-*	*V+ A+*
HED	-.057	.069	.096	.009
DIS	.119	.015	.038	-.253**
MOD	.116	.080	.203*	.170†
Situation	**V- A+**			
Music	*V- A-*	*V- A+*	*V+ A-*	*V+ A+*
HED	-.044	.104	.056	.137
DIS	-.094	.170†	-.168†	-.013
MOD	.193*	.042	.281**	.322**
Situation	**V+ A-**			
Music	*V- A-*	*V- A+*	*V+ A-*	*V+ A+*
HED	-.050	.042	.031	.098
DIS	.092	-.048	.061	-.108
MOD	-.058	.058	.096	.166†
Situation	**V+ A+**			
Music	*V- A-*	*V- A+*	*V+ A-*	*V+ A+*
HED	-.147†	.086	-.004	.249**
DIS	-.027	.081	-.037	.129
MOD	.056	-.029	.251**	.053

Note: †$p < .10$, *$p < .05$, **$p < .01$, one-tailed.

DISCUSSION

Our results suggest that music is chosen in different emotional situations in a very specific manner. Depending on the characteristics of the emotional situation, different individually rated musical stimuli are preferred. This situational specific selection of different emotionally laden music stimuli is a clear indicator for the attempt of the listener to find individually suitable music for the support or the change of the actual state of mood (emotion regulation).

The situational specificity can be sufficiently explained by the emotional dimensions valence and arousal. It is therefore possible to predict with great accuracy the position of the musical stimuli in the chart, with the valance and arousal-values. Therefore, these two dimensions seem to be the most important criteria for the allocation of musical stimuli to different emotional situations.

The dispositional emotion regulation style is able to explain only 13.91 % of the variance, thus limiting the explanatory power of the situational choice of music. It certainly has a moderating effect; however, it remains to be seen whether this effect would not be larger, when investigating real emotions in real situations.

Taken together, we were successful in elaborating the relative contribution of emotion regulation in listening to music in emotionally charged situations.

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