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Music helps addicted patients to reduce negative emotions in everyday life

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Abstract

Introduction: The study aimed to explore the impact of the use of music in the everyday life of those dependent on substance abuse.

Methods: A psychiatric population (n=190; 111 female; mean age of 37.4±13.3 years) was examined using the IAAM (inventory for the assessment of activation and arousal modulation through music) to measure the situation-dependent everyday life use of music, the SKI (self-concept inventory) for personality dimensions and the GAF score (Global assessment of functioning). Group differences of patients with and without substance abuse were assessed.

Results: Substance abuse was identified in 28 patients (14.7%). Patients of this group showed a lower functioning level (p=0.045) and reported they listened more to music for relaxation (p=0.018) and cognitive problem solving (p=0.047), more under the influence of psychotropic drugs (p<0.003) and–after the onset of the mental disorder–more to loud music (p=0.005) than patients without substance abuse (n=162).

Discussion and conclusion: Psychiatric patients with substance abuse use music particularly to reduce negative emotions compared to psychiatric patients without substance abuse. This result can be discussed on the basis of the reward system which is influenced by both psychotropic substances as well as by music. The results have a substantial relevant clinical impact and therapeutic conclusions have been drawn. Further studies are warranted.

Keywords: Music, emotion modulation, mental disorders, addiction disorders, cognition, arousal, reward system

Introduction

Since ancient times music has been a communication medium with probably the highest emotional influence on the human being, leading to great pleasure. It is therefore alleged to have a great impact on the reward system (see [1]). In this regard, music is closely related to psychotropic substances in the effect it has and the nearness to addiction disorders is striking. In fact, a multitude of musicians are known to have problems with substance abuse. At the same time, peer groups of adolescents often define themselves on the basis of music preferences as well as on the consumption of psychotropic substances [2-4]. The effects of psychotropic substances are specifically constituted in combination with music, e.g., in rave parties [5] and are well known to be associated with mental disorders. In a study on tobacco smoking in 152 high school and college students, a higher preference for music associated with anxiety and depressed mood was found among smokers [6].

In our previous studies strategies to modulate negative and positive emotions by music could be identified, as well as differences in reception behavior among diagnostic groups of mental disorders and in comparison to control groups [7-10]. Due to the particular impact of psychotropic substances on emotion modulation, the aim of the current study was to assess addiction-related aspects in music reception behavior in a psychiatric population. Given the cross-sectional design of this study, it is not possible to test a priori hypotheses; however, there were three main topics, which were explored in this study:

1. Activation and arousal modulation strategies with and

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without the diagnosis of substance abuse.
2. Impact of personality dimensions and of the global functioning level.
3. Influence of further socio-demographic or specifically music-related parameters with respect to the onset of mental disorder.

Methods

Subjects

Of n=190 patients (111 female; mean age 37.4±13.3 years, range 18-82 years) admitted to the Department of Psychiatry and Psychotherapy of the Philipps-University of Marburg/ Germany n=12 patients (6.3%) had a diagnosis of psychoactive substance use (F1 group of ICD-10 [11]). The other patients suffered from affective disorders (F3; n=66; 36.4%), neurotic, stress-related and somatoform disorders (F4; n=46; 24.2%), disorders of adult personality and behavior (F6; n=34; 17.9%), schizophrenia spectrum disorders (F2; n=22; 12.2%), behavioral syndromes associated with physiological disturbances and physical factors (F5; n=6; 3.2%), organic disorders F0 (n=3; 1.6%) and disturbance of activity and attention in adulthood in one case (diagnosis of F9; n=1; 0.5%). For the current research question we separated the total study sample into two groups: the addiction disorder (AD) group and non-addiction disorder (NAD) group. The AD group consisted of 28 patients (14.7%): 19 patients (10.0%) showing a dependence syndrome as main diagnosis or as comorbidity (n=7; 3.7%) as well as 9 patients with harmful use as comorbidity. The diagnoses of these patients were: dependence syndrome due to alcohol (n=9; 4.7%), sedatives or hypnotics (n=5; 2.6%), cannabinoids (n=3; 1.6%) and due to multiple drug use (n=2; 1.1%), as well as harmful use of alcohol (n=3; 1.6%), cannabis (n=3; 1.6%) and multiple substances (n=3; 1.6%). Nicotine dependence as sole substance misuse was not included in the AD group due to the widespread prevalence. The 16 patients with substance abuse as comorbid disorder had diagnoses of the following ICD-10 diagnostic groups: F2 (n=3), F3 (n=5), F4 (n=5), F6 (n=3). Socio-demographic data are shown in **Table 1**. The AD group comprised significantly more male (n=19) than female (n=9) patients compared to the NAD group which had more female (n=102) than male (n=60) patients (Chi-Quadrat=9.3; p=0.003). Gender and age within the total sample did not correlate significantly.

Patients gave written informed consent; the study was approved by the Ethics Committee of the University of Marburg.

Table 1. Socio-demographic data of the AD (addiction disorder) and NAD (non-addiction disorder) group.

Dependent variable		Independent variable	
		AD group (n=28)	NAD group (n=162)
Age	Mean age	35.1±10.4	38.8±13.7
Gender**	Male	n=19	n=60
	Female	n=9	n=102
Family status	Married	n=3	n=52
	Single	n=18	n=80
	Divorced/Separated	n=4	n=17
	Widowed	n=2	n=9
	Missing n=5	--	--
Number of children	0	n=19	n=93
	1	n=4	n=22
	2	n=2	n=30
	3	n=3	n=6
	4	n=0	n=3
	Missing n=8	--	--
School leaving examination	No	n=0	n=2
	Junior high school	n=6	n=42
	Secondary school	--	--
	Leaving certificate	n=9	n=45
	High-school diploma	n=9	n=49
	University degree	n=3	n=23
	Missing n=2	--	--
Current profession	Job	n=6	n=59
	Jobless	n=11	n=26
	Housewife/man	n=1	n=19
	Pensioner	n=3	n=14
	Pupil	n=0	n=2
	Student	n=4	n=32
	Trainee	n=3	n=6
	Missing n=4	--	--

**p<0.010

Assessment and instruments

The patients received self-assessment questionnaires. The "Inventory for the assessment of Activation and Arousal modulation through Music" (IAAM) with 62 items on a 5-point-scale showing high reliability and validity [12-15] was used to measure the situation-dependent everyday use of music according to the parameters Relaxation (RX), Cognitive Problem Solving (CP), Reduction of negative Activation (RA), Fun Seeking (FS) and Arousal Modulation (AM). Personality dimensions were assessed by means of the self-concept inventory (SKI [16]). The SKI is designed to register that part of the personality which results mainly from interpersonal interaction. The 5 scales, each containing 8 bipolar items on a 7-point-scale, cover the following dimensions with sufficient reliability coefficients (Cronbach's Alpha): ego-strength vs. insecurity (E-I) (sense of personal and existential security together with the lack of feelings of anxiety; α=0.79), attractiveness vs. marginality (A-M) (self-assessment of own worth in social groups; α=0.90), confidence vs. reserve (C-R) (attachment capacity and intimacy; α=0.85), orderliness vs. insouciance (O-I) (degree of structuring in personal environment; α=0.78) and enforcement vs. cooperation (E-C) (self-assessment of assertiveness in social groups; α=0.74). The Global Assessment of Functioning scale (GAF [17]) was used to assess the global functioning of the patients. Another short questionnaire gathered data on musical socialization, subjective impressions on emotional modulation, substance abuse and the volume of music listened to and the duration of listening to music per day before and after the onset of

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the mental disorder. Furthermore, data on the psychiatric disorder were taken from the medical records.

Statistical procedures

As statistical procedures group differences between AD and NAD patients were assessed by two-tailed Student's t-tests for continuous and two-tailed chi-quadrat-tests for dichotomous variables. In this exploratory study the term "significant" was used for results with a p-value of ≤0.05. The data were analyzed using Statistical Package of the Social Sciences (SPSS 18.0 for Windows) software.

Results

Group differences

The investigation of group differences in IAAM/SKI scales and the GAF score revealed the following significant differences (see **Table 2**): Patients of the AD group showed higher values of RX and CP (p=0.018/0.047) as well as more confidence (or less reserve, respectively) (C-I; p=0.019) and a lower GAF (p=0.045) than patients without substance abuse. The other IAAM/SKI scales showed no significant differences between these both groups.

The evaluation of the chi-quadrat-tests on categorical variables of the third questionnaire on specific items concerning music reception revealed the following results (see **Table 3**): Before and after the onset of a mental disorder patients of the AD group consumed more alcohol (p=0.003/p<0.001), nicotine (p=0.002/p<0.001) and cannabis/cocaine/ecstasy (p=0.002/p<0.001) while listening to music than patients of the NAD group. Moreover, AD patients listened more to loud music than NAD patients after (but not before) the onset of a mental disorder (p=0.005).

AD and NAD patients did not differ with respect to whether they had learned an instrument, were professional musicians, or to the role of music in their family, whether they considered themselves musical and whether music had a certain impact in their lives. Both in the time before as well as after the onset of a mental disorder AD and NAD patients did not differ regarding the following variables: choosing that music which helps for mood modulation, preferring text or music, listening to music more actively vs. hearing it in the background, duration of music reception, consumption of caffeine.

Table 2. Results on significant differences between addiction disorder (AD) group and non-addiction disorder (NAD) group in IAAM/SKI scales and the GAF score (global assessment of functioning).

	AD group	NAD group			
	Mean value±S.D.	**Mean value±S.D.**	**T**	**Df**	**Significance**
RX	26.9±9.3	22.2±9.5	2.40	165	p=0.018
CP	24.0±11.1	20.0±9.1	2.00	163	p=0.047
C-R	38.4±10.4	33.0±11.0	2.37	166	p=0.019
GAF	52.9±7.6	57.1±10.4	2.97	186	p=0.045

RX: Relaxation; CP: Cognitive problem solving (both IAAM scales); C-R: Confidence vs. reserve (a SKI scale); GAF: Global assessment of functioning

Discussion

Patients with drug abuse do not differ from other patients with other psychiatric disorders with respect to musical socialization or to the role they attribute to music in their life. Before and after the onset of a mental disorder AD patients consumed more alcohol, nicotine or cannabis/cocaine/ecstasy while listening to music than did NAD patients. However, AD patients seem to draw more strongly on music for relaxation and cognitive problem solving than patients with other mental disorders. Interestingly, AD patients do not use music for fun seeking in contrast to healthy individuals [**8**].

We interpret these results that AD patients, who also showed more confidence and less reserve, respectively (C-R), than NAD patients, might have an intensified approach to music as a very strong emotional stimulus in the same way as they use psychotropic substances as a strong stimulus. In this context it has to be mentioned that the personality dimension of more confidence and less reserve, acquired through the self-assessment questionnaire, might already reflect the psychological conditions under the influence of psychotropic substances; e.g., patients might feel more self-confident when they have consumed alcohol or tranquilizers.

By means of positron emission tomography Blood & Zatorre [**18**] observed that the highly pleasurable experience of "chills" ("shivers-down-the-spine") is associated with cerebral blood flow increases and decreases in brain regions thought to be

Table 3. Significant differences between the addiction disorder (AD) group and the non-addiction disorder (NAD) group in categorical variables.

		AD group (n=28) n (yes/no)	NAD group (n=162) n (yes/no)	Missing data (n)	Significance of difference
Consuming drugs while listening to music[b]	Alcohol	11/17	21/131	10	p=0.003
	Nicotine	21/7	64/89	9	p=0.002
	Cannabis, cocaine, ecstasy	7/21	7/146	9	p=0.002
Consuming drugs while listening to music[a]	Alcohol	12/16	18/30	14	n<0.001
	Nicotine	20/8	49/99	14	n<0.001
	Cannabis, cocaine, ecstasy	6/22	2/146	14	n<0.001
Loud music[a]	Listening to loud music	14/13	33/103	27	p=0.005

a: after onset of mental disorder; b: before onset of mental disorder

involved in reward, emotion and arousal, namely the ventral striatum, midbrain, amygdala, orbitofrontal cortex, and ventral medial prefrontal cortex. A MRI study underlined these findings as it showed a greater activation in the medial orbital frontal cortex, nucleus accumbens and ventral striatum as regions of the reward system in healthy controls compared to depressed patients and in association with favorite music[1]. Hereby, pleasure was positively correlated with activity in the left medial prefrontal cortex and negatively correlated with the middle temporal cortex and globus pallidus[1]. The reward system is strongly associated with the opiate system which is connected to pain. In a recent study we were able to show a significant reduction of pain ratings in patients with depressive disorders under the influence of music [**19**].

Another explanation for the enhanced emotion modulation strategies by means of music in patients with substance abuse could be the general behavior pattern in this diagnostic group, i.e., craving for high amounts of psychotropic effects compared to patients suffering from other mental disorders. This would imply that patients with substance abuse do not substantially differ in their emotion modulation strategies from other patients, merely to a more excessive extent. Also increased loudness after the onset of the mental disorder might reflect the impetus of enhancing emotion modulation strategies in order to reach a new equilibrium. The need for this strategy might be strong, because patients with substance abuse were rated on a lower global functioning level (GAF) than patients without addictive tendencies.

As a consequence, patients with addiction disorder could profit from music therapy. Accordingly, results of a prospective non-naturalistic and non-randomized pilot study without a control group suggest that music therapy in severely impaired patients with co-occurring mental illness and addiction is beneficial [**20**].

Conclusions

To our knowledge this is the first study to compare patients with substance abuse and patients with other mental disorders with respect to the use of music in the everyday life. The study represents a naturalistic examination, suggesting that patients with substance abuse listen more to music for relaxation and cognitive problem solving than patients with other mental disorders. During their illness they listened to louder music in combination with consuming psychotropic substances.

Limitations and strengths

One limitation is the cross-sectional design, instead of a prospective, controlled one. Therefore, causal relationships cannot be inferred and the the listed p-values are of an explorative nature. Another limitation is the imbalance of the AD and the NAD group. However, the data represent real world conditions and allow the assessment of group differences within a psychiatric population. The strength of this study is that instruments used have been well evaluated allowing now for an empirical approach on the basis of an emotional modulation concept.

List of abbreviations

AD: Addiction disorder
A-M: Attractiveness vs. marginality
AM: Arousal modulation
C-R: Confidence vs. reserve
CP: Cognitive problem solving
FS: Fun seeking
GAF: Global assessment of functioning
E-C: Enforcement vs. cooperation
E-I: Ego-strength vs. insecurity
IAAM: Inventory for the assessment of activation and arousal modulation through music
ICD: International classification of disorders
NAD: Non-addiction disorder
O-I: Orderliness vs. insouciance
RA: Reduction of negative activation
RX: Relaxation
SKI: Self-concept inventory

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	SG	MK	RVG
Research concept and design	✓	✓	✓
Collection and/or assembly of data	✓	✓	✓
Data analysis and interpretation	✓	✓	✓
Writing the article	✓	--	✓
Critical revision of the article	✓	✓	✓
Final approval of article	✓	✓	✓
Statistical analysis	✓	--	✓

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