Music, mental disorder and emotional reception behavior

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Abstract

Objective: Current research based on neurobiological findings provides evidence for direct effects of music on the modulation of activation and arousal. In the current study associations between the functional-receptive use of music in everyday life on specific diagnostic groups of mental disorders (according to the international classification of disorders, ICD-10) were ascertained.

Methods: n=55 patients with addictive, schizophrenic, affective, neurotic, and personality disorders (mean age 46 ± 14 years) of the Department of Psychiatry and Psychotherapy of the University of Marburg/Germany were included. The „Inventory for the assessment of Activation- and Arousalmodulation through Music“ (IAAM) was used to ascertain the dimensions: Relaxation (RX), Cognitive Problem Solving (CP), Reduction of negative Activation (RA), Fun Seeking (FS) and Arousal Modulation (AM). Data were compared by ONEWAY analysis with healthy control populations (n=187 students aged age 21 ± 3 years; n=106 adults aged 43 ± 6 years).
Results: Significant differences were found with respect to diagnostic groups and the control samples for the parameter RX (p<0.001), CP (p<0.001), RA (p<0.001), FS (p<0.001), but not for AM. Further analyses with respect to possible sex and age influences results in specific patterns of the use music for emotion modulation in these five scales compared to the patient groups (p<0.001).

Discussion: The results suggest that patients with mental disorders clearly tend to use more music for RA, RX and CP than control samples, while healthy young persons tend to an increased positive stimulation. However, positive stimulation is reduced especially in patients with personality disorders, where a strong RA by music is apparent. In particular patients with addictive disorders, but also patients with schizophrenic disorders show for all parameters high scores. In contrast, patients with affective disorders demonstrate a lack of RA.

Conclusion: This first study provides preliminary hints, that the functional-receptive use of music for the modulation of emotional activation processes in patients with mental disorders is quantifiable. Further studies with respect to findings in different mental disorders on the basis of this approach are warranted.

KEYWORDS: music, reception, psychiatric disorders, activation, emotion, arousal modulation, relaxation, cognitive

1. Introduction

The high impact of music on psyche and therefore on mental disorders is unchallenged. Since ancient times music is an integral part of cure processes in many cultures. Therefore, music reception should play a crucial role within the dynamic of mental disorders, and hence for the course and
therapy of mental disorders (Sheratt, Thornton & Hatton, 2004; Gebhardt & von Georgi, 2007). Especially on the basis of a multitude of recent neurophysiological studies demonstrating impacts of music – not only on the cortex – but also directly on basic emotional systems (Panksepp & Bernatzky, 2002), one should expect differences of modulation of emotions by use of music between different patient groups with mental disorders. This assumption goes in line with recent studies explaining the conscious everyday life use of music by means of a neurobiological approach (von Georgi, Grant, von Georgi & Gebhardt, 2006a).

Investigating the current state of research on the impact of music on psychological dimensions three separate categories have to be differentiated: studies on (a) active and (b) receptive/passive music therapy and (c) on the functional-receptive, everyday life use of music, as an interactional process. The latter being the concern of the current study refers to the fact that listening to music is mostly preceded by an active action which is associated with more or less conscious individual-specific aims of action (Leontyev, 1978; Frese & Sabini, 1985; Hacker, 1994), which are based on learned behavior and personality dispositions. In the following some aspects of these three categories will be addressed with respect to healthy subjects and patients suffering from non-psychiatric or mental disorders.

Studies on healthy individuals provide evidence for links between music preferences and personality dimensions (Rentfrow & Gosling, 2003; von Georgi, Grant, von Georgi & Gebhardt, 2006b) or between types of music (e.g. excitative versus sedative) and aroused feelings or physiological responses of heart rate, respiration and blood pressure (Iwanaga & Moroki, 1999, Blood & Zatorre, 2001). A reduction of anxiety levels was found in healthy subjects exposed to their preferred musical selections (Salamon et al., 2003). In a meta-analysis a significant decrease of arousal due to stress was found by use of music alone or music assisted
relaxation techniques (Pelletier, 2004). It also could be shown that in the presence of music, the cortisol level ceases to increase after a stressor (Khalfa et al., 2003). Hereby the association of stress coping strategies and the use of music seems to be influenced by socio-psychological covariables (von Georgi, König & Gebhardt, in press).

Music in non-psychiatric diseases has been studied predominantly on a therapeutic basis. For example, active music therapy is effective on motor, affective and behavioral functions, e.g. in patients with Parkinson's disease (Pacchetti et al., 2000). In patients undergoing hemodialysis active music therapy may be applied as a method of nursing intervention contributing the improvement of quality life by reducing anxiety and depression (Kim, Lee & Sok, 2006). But also merely the reception of music induces relaxation before and after surgery or diagnostic procedures, helping to save sedative drugs, what results in a positive effect for the course of the illness (Mok & Wong, 2003; Good et al., 2005; Siedliecki & Good, 2006). Cancer patients are as well interested in receptive music therapy and their interest and preference were associated with negative affect, anxiety, age, perceived intervention-specific benefits, barriers and self-efficacy (Burns et al., 2005). Further, pleasant music contributes to pain relief, where the personal preference seems to be an influential factor (Lai, 2004; Mitchell & MacDonald, 2006; Roy, Peretz & Rainville, 2007). One study found more power and less pain, depression and disability by use of music in patients with chronic non-malignant pain than the control group (Siedliecki & Good 2006).

Studies on patients with mental disorders revealed significant effects of active and receptive music therapy. Koger, Chapin & Bronts (1999) found in a meta-analysis of 21 empirical studies on subjects suffering from symptoms of dementia an overall significant effect of music therapy, while another meta-analysis of 5 studies displayed inconclusive
results, possibly due to poor methodological quality of the examined studies (Vink, Birks, Bruinsma, Scholten, 2004). Meta-analyses of quantitative studies on music therapy in children and adolescents with autism (9 studies; Whipple, 2004) or psychopathological symptoms (11 studies; Gold, Voracek & Wilgram, 2004), however with methodological deficits, showed overall efficacy of both active and receptive music therapy without significant differences (Whipple, 2004), in particular for patients with behavioral and developmental disorders (Gold, Voracek & Wilgram, 2004). Further, results from a metanalysis of 19 studies with a total of 543 patients suffering from psychotic symptoms indicate a significant reducing effect on symptoms of psychosis irrespective whether active or passive music therapy was applied (Silverman, 2003), whereas according to a more recent meta-analysis of 4 studies with merely moderate methodological quality active music therapy may be more affective in patients with psychosis (Gold, Heldal, Dahle & Wigram, 2005).

Apart from such studies evaluating active or passive music therapy, almost no systematic scientific data on the functional-receptive use of music in everyday life of individuals suffering from mental disorders exist. For example, current psychobiological models of addictive disorders are focused on the capability of drugs to cause a pathological exploitation of the neural rewarding system often combined with the use of music, e.g. by means of rave parties (Nencini, 2002), and with aggressive behaviors (Chen, Miller, Grube & Waiters, 2006). According to a study on tobacco smoking in a group of 152 high school and college students a higher preference for music associated with anxiety and depressed mood among smokers was found (Poslusza, Burtowy & Palusinski, 2004).

 Altogether, music studies on patients concentrate predominantly on active or in part passive (i.e. receptive) music therapy, but have ignored largely examining the active everyday life use of music, which is for
example mirrored by preference behavior. Studies on the functional-receptive effect of music were restricted predominantly to “ad hoc” surveys, the situation-dependent rating of presented music examples (see Gembris, 2002) or to more general effects, e.g. stress reduction effects (see Pelletier, 2004). No differentiation of music effects on different diagnostic groups of patients with mental disorders within one representative general psychiatric patient population has been carried out so far. However, especially this music reception behavior might have a crucial impact on psychological dimensions highlighting the need for a comprehensive assessment of patient needs and preferences prior to intervention (see also Burns et al., 2005). The investigation of variables influencing the use of music in patients with mental disorders should not only lead to a better insight in psychopathological processes, but also have an important impact on the development of empirically based music therapy concepts.

One reason might be found in the fact that no reliable and valid psychometric instrument assessing the way of music reception and the use of music in everyday life has existed so far. Therefore, the “Inventory for the assessment of Activation- and Arousalmodulation through Music” (IAAM), has been developed in order to ascertain quantitatively the basic dimensions of the functional utilization of music for the modulation of emotional activation processes (von Georgi, Abou Seif, Grant & Beckmann, 2004; von Georgi, Grand, Adjormand & Gebhardt, 2005; von Georgi, Grant, von Georgi & Gebhardt, 2006a; von Georgi, 2007). Theoretically the basic dimensions of using music in everyday life are integrated into the neurophysiological model of Gray & McNaughton (2003), what enables the connection of different theoretical and empirical approaches as well as the linkage to neurophysiological research results (von Georgi, Grant, von Georgi & Gebhardt, 2006a). First empirical data
clearly show the development of personality-dependant strategies to modulate negative and positive emotions. These strategies can be measured and have direct positive influence on physical well-being (von Georgi, Grant, von Georgi & Gebhardt, 2006a, 200b; von Georgi, Cimbal & von Georgi, in press).

Thus, in the current study for the first time possible differences of functional-receptive effects of music of patients suffering from mental disorders categorized according to diagnostic groups to the International Classification of Disorders (ICD-10; Dilling, Mombour & Schmidt 2004) were assessed.

2. Method

STUDY SAMPLE: n=55 patients (32 female; mean age 46 ± 14 years) consecutively admitted at the Department of Psychiatry and Psychotherapy of the Philipps-University of Marburg/Germany were categorized according to the diagnostic groups of ICD-10 with mental and behavioural disorders due to psychoactive substance use (F1; n=7), schizophrenia, schizotypal and delusional disorders (F2; n=11), mood affective disorders (F3; n=21), neurotic, stress-related and somatoform disorders (F4; n=8) and disorders of adult personality and behavior (F6; n=8), while subjects of other ICD-10 diagnostic groups (e.g. organic, including symptomatic, mental disorders (F0); behavioral syndromes associated with physiological disturbances and physical factors (F5); mental retardation (F7); disorders of psychological development (F8)) were missing in this sample. The mean global functioning according to the Global Assessment of Functioning Scale (GAF; scale range 0 – 100; American Psychiatric Association, 1987) of the study sample was 51 ± 11.
CONTROL SAMPLES: (a) n=181 students (128 female; mean age 21 ± 3 years) of the first semester medicine (von Georgi, Cimbal & von Georgi, in press). (b) 106 adult persons (53 male; mean age 43 ± 6 years), recruited by chance out of selected middle-class companies, insurance institution as well as club associations (Lahn-Dill-Kreis, Kreis Gießen). Inclusion criteria of this control sample were a minimum age of 30 years and the patient's agreement to participate in the study. The majority was employed, married and had at least one child (von Georgi, König & Gebhardt, in press).

ASSESSMENT: „Inventory for the assessment of Activation- and Arousalmodulation through Music“ (IAAM) showing high reliability and validity (von Georgi, Grant, von Georgi & Gebhardt, 2006a; von Georgi, 2007) measured the situation-dependent everyday life 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). Further, the „Selbstkonzept-Inventar“ (SKI) (von Georgi & Beckmann, 2004) was used, its results are not demonstrated in the current composition.

STATISTICS: First, using univariate analysis of variance (ONEWAY analysis) the three samples were studies for significant differences in mean values. To exclude, that possible group differences do not display the result of influences of age or sex, all IAAM scales were corrected for the influence of these variables and using the unstandardized residuals ONEWAY analysis was carried out again. In a third step, in order to get differential findings with respect to the strength of use of music within the patient sample, possible differences of mean values considering diagnostic groups of the ICD-10 were assessed.
3. Results

Reliability assessment of the different scales (Cronbach’s Alpha) resulted in sufficient reliability coefficients of the scales RX, CP, RA, FS and AM for the student control sample (0.91; 0.91; 0.90; 0.86; 0.84), the adult control sample (0.92; 0.91; 0.90; 0.87; 0.86) as well as the patient sample (0.90; 0.89; 0.92; 0.88; 0.86). Thus, also in the current study there is good evidence for the reliability of these scales.

**TABLE 1. Results of the ONEWAY-analyses of the five IAAM-Scales**

<table>
<thead>
<tr>
<th>IAAM-Scale</th>
<th>Model</th>
<th>Students M</th>
<th>SD</th>
<th>Adult M</th>
<th>SD</th>
<th>Patients M</th>
<th>SD</th>
<th>F(DF=2)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX</td>
<td>RD</td>
<td>20.48</td>
<td>8.78</td>
<td>15.84</td>
<td>9.35</td>
<td>23.24</td>
<td>9.39</td>
<td>13.99</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>UR</td>
<td>0.14</td>
<td>8.72</td>
<td>-2.44</td>
<td>9.44</td>
<td>4.70</td>
<td>9.24</td>
<td>10.67</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CP</td>
<td>RD</td>
<td>19.93</td>
<td>9.14</td>
<td>12.80</td>
<td>8.74</td>
<td>21.56</td>
<td>9.37</td>
<td>25.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>UR</td>
<td>0.23</td>
<td>9.04</td>
<td>-2.90</td>
<td>8.83</td>
<td>5.57</td>
<td>9.20</td>
<td>14.77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>RA</td>
<td>RD</td>
<td>19.42</td>
<td>9.23</td>
<td>12.77</td>
<td>8.63</td>
<td>20.71</td>
<td>10.69</td>
<td>20.50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>UR</td>
<td>-0.13</td>
<td>9.30</td>
<td>-2.33</td>
<td>8.70</td>
<td>5.51</td>
<td>9.94</td>
<td>12.20</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>FS</td>
<td>RD</td>
<td>27.52</td>
<td>8.22</td>
<td>21.39</td>
<td>8.25</td>
<td>21.31</td>
<td>8.55</td>
<td>23.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>UR</td>
<td>0.51</td>
<td>8.01</td>
<td>-0.48</td>
<td>8.22</td>
<td>-0.75</td>
<td>8.93</td>
<td>0.73</td>
<td>0.484</td>
</tr>
<tr>
<td>AM</td>
<td>RD</td>
<td>10.36</td>
<td>6.66</td>
<td>9.62</td>
<td>6.79</td>
<td>12.74</td>
<td>7.94</td>
<td>3.32</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>UR</td>
<td>-0.41</td>
<td>6.57</td>
<td>-0.46</td>
<td>6.77</td>
<td>2.66</td>
<td>7.85</td>
<td>4.06</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Legend: RX: relaxation; CP: cognitive problem solving; RA: reduction of negative activation; FS: fun seeking; AM: arousal modulation; Model: raw data (RD) vs. by age and sex adjusted uncorrected residuals (UR); M: mean; SD: standard deviation; ONEWAY: results of the one factorial variance analyses; F: F-value; DF: degrees of freedom; p: significance level

The first analyses of possible mean differences without considering an impact of sex and age result in significant differences (p<0.001) between the control samples and the clinical sample for all IAAM scales except for the AM scale (table 1). In particular significant increased mean values of the clinical patient group were found for the RX, CP and RA scales, which assess a modulation of negative emotional states. For FS the general findings indicate that especially students attempt to modulate posi-
positive emotions by music. It must be emphasized, that these results may be hampered by the influence of sex and age differences. The following multiple regression analyses displayed except for the scale AM significant associations with age and sex of the pooled samples (see table 2).

**TABLE 2. Results of the regression analyses with age and sex on the five IAAM-scales**

<table>
<thead>
<tr>
<th>scale</th>
<th>R</th>
<th>F(DF=2)</th>
<th>p</th>
<th>age p(β)</th>
<th>Sex p(β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX</td>
<td>0.17</td>
<td>4.82</td>
<td>0.009</td>
<td>0.121</td>
<td>0.017</td>
</tr>
<tr>
<td>CP</td>
<td>0.25</td>
<td>10.75</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.026</td>
</tr>
<tr>
<td>RA</td>
<td>0.26</td>
<td>11.38</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.335</td>
</tr>
<tr>
<td>FS</td>
<td>0.36</td>
<td>24.08</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.003</td>
</tr>
<tr>
<td>AM</td>
<td>0.05</td>
<td>0.42</td>
<td>0.659</td>
<td>0.356</td>
<td>0.972</td>
</tr>
</tbody>
</table>

Legend: RX: relaxation; CP: cognitive problem solving; RA: reduction of negative activation; FS: fun seeking; AM: arousal modulation; R: multiple regression coefficient; F: F-value; DF: degrees of freedom; p: significance level; .p(β): significance level of the single β-coefficients for age and sex

Hereby, in the scale RX sex differences were predominant, in contrast to age differences in the case of RA. These results indicate, that relaxation by music is more used by females, whereas the reduction of negative emotional activation by music is mostly used by young persons. However, the scales CP and FS were found to be sex- and age-dependent. These strategies are mostly used by young females. Due to these results all scale values where corrected with respect to sex and age calculating unstandardized residuals. Table 1 displays descriptive statistical data as well as the results of ONeway analyses: it is recognizable, that except for the scale FS both uncorrected (RD) and unstandardized residual (UR) data lead to comparable results. Age and sex are therefore important covariables, however not influencing the existing group differences. One exception is the scale FS: the non-significant effect of uncorrected residuals provides evidence, that age and sex are influencing variables, which contaminate the differences between the three samples. It can be seen in table 1 that the uncorrected mean of the student sample compared to the
other samples is located much higher than the unstandardized residual mean. This finding is in particular important for the interpretation of the following analyses.

FIGURE 1. IAAM scale means of the unstandardized residuals

Legend figure 1: IAAM scale means of the unstandardized residuals (adjusted by age and sex) for the three groups (RX: relaxation; CP: cognitive problem solving; RA: reduction of negative activation; FS: fun seeking; AM: arousal modulation; (Scheffe-Test: ***: p≤0.001; **: p≤0.01; *: p≤0.05)
IAAM scale means based on unstandardized residuals

Figure 1 shows mean scores of the unstandardized residuals of the scales for the three samples. As in table 1 it can be found, that the clinical patient group use by far more often and pronounced music for modulation of negative somatic (RX), cognitive (CP) and activational (RA) emotional states compared to the control samples, except for the FS scale assessing positive stimulation through music. Thus, the question arises concerning possible differences among the different diagnostic groups of present mental disorders, because the increased scores of the patient sample do not necessarily display a general behavioral tendency of all patients.

**FIGURE 2.** IAAM scale means of the unstandardized residuals (adjusted by age and sex) for the control and patients sub samples and the results of the ONEWAY-analyses

Legend figure 2: IAAM scale means of the unstandardized residuals (adjusted by age and sex) for the control and patients sub samples and the results of the ONEWAY-analyses (F: F-value; p: significance level); ICD-10 (International classification of diseases; Dilling, Mombour & Schmidt, 2004) whereas F1: mental and behavioral disorders due to psychoactive substance abuse (n=7); F2: schizophrenia, schizotypal and delusional disorders (n=11); F3: mood (affective) disorders (n=21); F4: neurotic, stress-related
and somatoform disorders (n=8); F6: disorders of adult personality and behavior (n=8)); RX: relaxation; CP: cognitive problem solving; RA: reduction of negative activation; FS: fun seeking; AM: arousal modulation (Scheffe-Test: *: p ≤ 0.05).

Figure 2 shows the results of ONEWAY analyses and the unstandardized residual mean scores for the IAAM scales among each diagnostic group. With the exception of the scale AM highly significant effects of the groups were observed. In particular the increased values of the diagnostic group of “mental and behavioral disorders due to psychoactive substance abuse” (F1) and „schizophrenia, schizotypal and delusional disorders” (F2) were conspicuous with the first group showing predominantly clearly increased scores on the scales RX, CP and RA. Similarly, the slightly increased RA score in the case of „disorders of adult personality and behavior“ (F6) on the one hand and the decreased score of the scale FS in this group on the other hand are impressing.

Altogether, the results suggest already, despite of limited data, that not just the total study sample of patients suffering from mental disorders is characterized by an increased emotional modulation by music. In fact, according to the current state of the first analyses there are rather specific patient groups which seem to prefer influencing their affects using music, whereas other patient groups (mood (affective) disorders, neurotic, stress-related and somatoform disorders) seem to be modest compared to control samples.

4. Discussion

The results of this first study suggest that some patients with mental disorders clearly tend to use music more for reduction of negative emotional activation (RA), cognitive problem solving (CP) and somatic relaxation (RX) compared to the control samples, which show a higher positive
stimulation, in particular at young age (student sample). This finding indicates that healthy young persons might use music mostly in order to stimulate themselves positively, whereas patients with mental disorders might exhibit impairments in this skill. It has to be clarified in further studies – possibly for each diagnosis separately – whether these impairments play an additional role in the development of mental disorders or whether they represent an epiphenomenon. Salamon et al. (2003) believe, that within the general population, many people do not have an adequate self-understanding regarding what genre of music would best relax them. Thus, especially these individuals might be at higher risk for failure of a positive functional modulation of emotional activation processes. Music might therefore merely be used for influencing the psychic state as best as possible, e.g. by reduction of negative activation or might even be part of dysfunctional behavior strengthening psychopathological processes. Anyway, it is likely that these possible impairments are involved in both causal and maintaining factors of mental disorder leading in a dialectic manner towards a pathological process such as a vicious circle. Of course, not in each individual suffering from a mental disorder music has a substantial impact on pathological processes – some patients have never been listened very much to music in their life at all; however, music represents a valid correlate of the personal affective-cognitive-activational way of managing the efforts, every subject is exposed, and should therefore be of high interest for research. Psychotherapeutic experience suggest that, particularly in patients who deny music effects, music therapeutic approaches or comparably therapeutic strategies combining cognitive, affective and action-related dimensions (e.g. somatic psychotherapy) are indicated.

In particular, positive stimulation is reduced in patients with personality disorders (F6), where a strong reduction of negative activation by use of
music is apparent, probably in order to overcome with strong emotions or aggression. For example, what concerns patients suffering from borderline personality disorder, it is well known, that their efforts to downregulate high affective activation levels has got a high impact in psychopathology of these patients; the use of music is therefore a comparably functional skill in order to cope with such tension states and is even sometimes recommended as therapeutic intervention to avoid more dysfunctional behavior such as suicidal behavior. Additionally it could be shown, that persons with a high preference for heavy metal represent on the one hand indeed a personality that is allied with salient personality characteristics (psychoticism, sensation seeking), but on the other hand are characterized by a high psychological and somatic health (von Georgi, Cimbal & von Georgi, 2006a; von Georgi, König & Gebhardt, 2007). Compared to the present clinical sample, healthy persons with a high preference for hard music show a marked ability to stimulate themselves positively by means of music. This finding supports the present interpretation.

Mostly in patients suffering from addictive disorders (F1), but also schizophreniform disorders (F2) show high scores for all parameters (see figure). Accordingly, active listening to music may have a high functional impact on emotional modulation for some diagnostic groups of mental disorders – in case of addictive disorders possibly an addictive use of music in order to aim for a maximum effect on all parameters.

In contrast, patients diagnosed with affective disorders (F3) demonstrate a lack of RA. Because the study sample did not contain manic patients, one therapeutic implication is that depressed patients may be instructed to use music for reduction of negative affects, e.g. aggressions. Patients suffering from neurotic, stress-related and somatoform disorders (F4) seem to be mostly comparable with the healthy student sample, however
by far a lower score for FS. Or in other words, though patients suffering from neurotic, stress-related and somatoform disorders (F4) have nearly the same level of positive stimulation as the control group of on age 30 years, their levels of the remaining modulation strategies correspond more to the students group, meaning that there seems to be a disquilibrium, which might refer to impaired psychosocial and therefore age-dependent development stages. Finally, in this study the arousal modulation by means of music, focusing predominantly on concentration processes appears to have a lower impact (von Georgi, 2007; von Georgi, Cimbal & von Georgi in press).

Following the development of modern brain research methods (PET, firm) it could be demonstrated, that music with its corresponding characteristics (e.g. tuning, dynamics, harmony, timbre etc.) addresses different cortical and basal structures of the central nervous system, which refer to positive or negative affects and emotions (Blood, et al., 1999; Blood & Zatorre, 2001; Tramo, 2001; Juslin & Sloboda, 2001; Panksepp & Bernatzky, 2002; Altenmüller et al., 2002; Kreutz et al., 2003). Especially the finding, that a sudden autonom reaction on negative stimuli can take place without any exact cortical representation (LeDoux, 2000), highlights the fact, that music is able to evoke and modulate emotional states independent from higher central cognitive processes (Panksepp & Bernatzky, 2002; Winkielman & Berrie, 2004). Hereby, musical stimuli have been shown to activate specific pathways in several brain areas associated with emotional behaviors and corresponding mental disorders, such as the insular and cingulated cortex, hypothalamus, hippocampus, amygdale, in ventral striatum, midbrain, orbitofrontal cortex and ventral medial prefrontal cortex (Blood & Zatorre, 2001; Boso, Politi, Barale & Enzo, 2006). These brain structures refer to reward/motivation, emotion and arousal and are known to be active in response to survival-related
stimuli such as food, sex and drugs of abuse. While regions as the amygdala or the ventromedial prefrontal cortex would be activated in unpleasant states such as anxiety, music might be able to modulate this activity and adjust the activity of additional structures known to cause positive emotions, e.g. structures of the reward system. In addition, according to neurochemical studies several biochemical mediators, such as endorphins, endocannabinoids, dopamine, nitric oxide and neurotrophins may play a role in the musical experience (see Boso, Politi, Barale & Enzo, 2006; Angelucci et al., 2007). Thus, there is a link of music with biologically relevant stimuli via their common recruitment of brain circuitry involved in pleasure and reward (Blood & Zatorre, 2001).

The above interpretations should be handled with care due to the low patient sample size of this present study. On the other hand this is the first study within this field and it should lead to further hypotheses and empirical based studies. However, data clearly show already at this time the above described tendencies, which are from both a theoretical and a clinical point of view easily comprehensible. These results are encouraging for continuing the systematic investigation with greater patient samples on the basis of this methodology.

**Conclusion:**

To our knowledge, this is the first study providing preliminary hints, that the functional-receptive use of music for the modulation of emotional activation processes in patients with mental disorders is quantifiable. In addition, for the first time differences between the use of music for modulation of emotions among diagnostic groups of patients suffering from mental disorders have been assessed. Overall these results suggest that patients with mental disorders display decreased positive stimulation by
use of music compared to (especially young) healthy probands. This finding indicates that healthy (young) persons might use music mostly in order to stimulate themselves positively, whereas (older) patients with mental disorders might exhibit impairments in this skill. On the other hand some clinical groups are showing a clear accentuation of the use of music to modulate negative emotional states. This may be an indication for the fact that music is used to try to reduce these emotional states. However, it is still an open question whether this affective behavior of reducing illness related negative psychological and somatic states really works. Perhaps it may also lead to a possible enhancement of the existing disorder.

Music probably represents a valid individual affective-cognitive-activation correlate and should therefore be of high interest for research. Further studies on music reception behavior differentiating according to the diagnoses of mental disorders on the basis of this approach are urgently warranted. The aim is to continue to reveal associations between specific music reception behavior, personality dimensions and diagnoses of mental disorders. In the long-term these findings should result in the development of corresponding empirically based diagnostic, preventive and therapeutic strategies with respect to the use of music. Finally, empiric evaluation studies of active and receptive music therapy are required.

References:


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