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EMOTION, PERSONALITY, USE OF MUSIC IN EVERYDAY LIFE AND MUSICAL PREFERENCES

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Abstract

The use of music in everyday life (UofM) is an area with growing interest. Scales for the measurement can be criticized despite their reliability and validity. Additionally, the association of UofM with personality theories has not been carried out thoroughly. Within an ongoing project, the IAAM (Inventory for the measurement of Activation and Arousal modulation by Music) has been constructed. Within the existing study, the reliability and validity of the IAAM-scales are to be examined. The assignment of the IAAM-scales to the biological based BIS-BAS-model (Gray & McNaughton, 2000) should be proven against the explanation of the IAAM-scales by the personality model of Eysenck (1967). Further hypotheses derived from the IAAM-model and past studies are to be tested. 180 undergraduate students completed the IAAM EPP-D, PANAS, BIS/BAS-Questionnaire and the GWPQ-S. Musical preferences were also recorded. Beside item and scale analyses, explorative orientated hypotheses of the scale-personality association were examined by correlation analyses. Using stepwise hierarchical regression analyses, the assignment of the IAAM-scales to both competing biological personality models were tested. Results show that all Cronbach's alpha coefficients of the IAAM-scales are lying above 0.84. The correlation analyses partially confirm the assumed dependencies between the IAAM-scales, personality and music preferences. Regression analyses do not clearly support the integration of IAAM scales into the BIS-BAS-model. Further analyses due to a general problem in measuring the theoretical supposed structure of the personality space by means of used personality questionnaires. Beside this theoretical problem, the IAAM-scales again seem to be reliable and valid and do have strong personality dependencies. This means that the learned strategies of UofM serve as an action theoretical approach to link the effects of music on the brain emotionally with personality based affect susceptibility and behavior.

Keywords: use of music, personality, music preference

1. Introduction

The use of music in everyday life (UofM) is an area with growing interest. Many studies on this topic show that music is used directly or indirectly for influencing the emotional processing of existing states, modulation of momentary attention and concentration faculties and inducing or sustaining social relations (e.g. DeNora, 1999; Sloboda & O'Neill, 2001; Hargreaves & North, 1999; North & Hargreaves, 2004; Juslin & Laukka, 2004; Vorderer & Schramm, 2004; Hays & Minichiello; 2005, Saarikallio & Erkkilä 2007; Saarikallio, 2008; Schäfer & Sedeleier, 2009). All these and other qualitative and quantitative studies imply the existence of underlying nomothetic UofM dimensions. Furthermore studies due to the possibility that UofM may have a strong personality impact. With respect to existing personality theories and models (Eysenck, 1967; Costa & McCrae, 1992), using the MI, (Uses of Music Inventory) Chamorro-Premuzic et al. (2007, 2009, 2012) significant correlations between neuroticism and UofM for emotion regulation were demonstrated. This means that people with high emotional susceptibility use music more intensively and/or frequently to influence

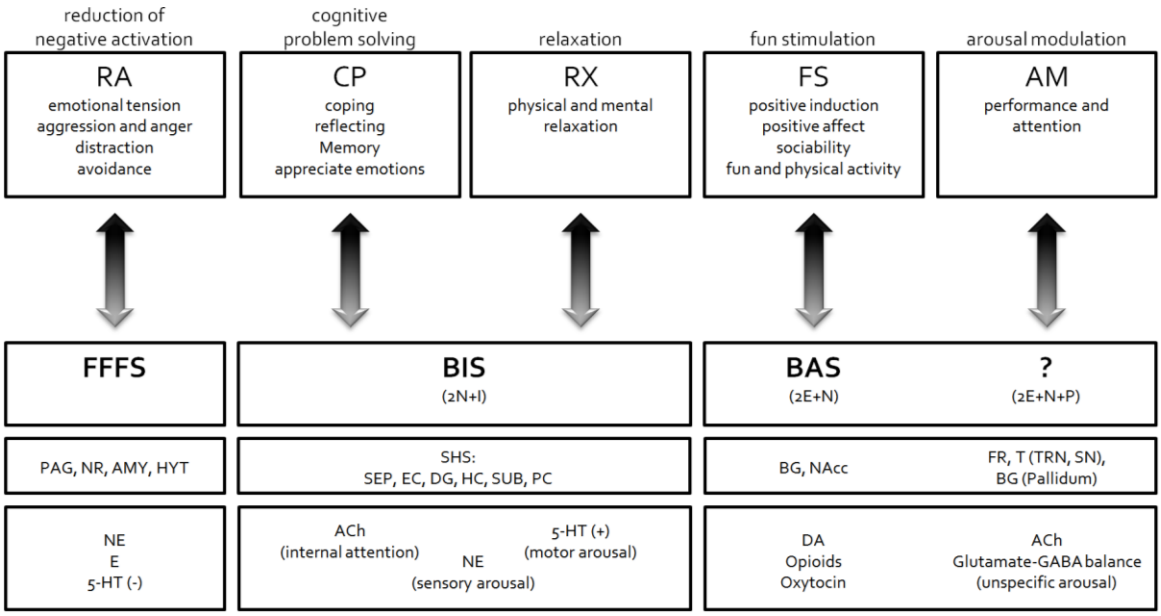

Figure 1. Model of activation and arousal modulation with music (AAM-micromodel) (von Georgi, 2013, in press) (5-HT: 5-hydroxytryptamine; ACh: acetylcholine; AMY: amygdala; BAS: behavioural approach system; BG: basal ganglia; BIS: behavioural inhibition system; DG: dentate gyrus; E: epinephrine; EC: entorhinal cortex; E: extraversion; FFFS: fight-flight-freezing system; FR: reticular formation; GABA: gamma-amino-butyric acid; HC: hippocampus; HYT: hypothalamus; I: introversion; N: neuroticism; NAcc: nucleus accumbens; NE: norepinephrine; NR: raphe nuclei; P: psychoticism; PAG: periaqueductal grey; PC: posterior cingulate; SEP: septum; SUB: subiculum; SHS: septo-hippocampal system; SN: subthalamic nucleus T: thalamus; TRN (thalamic reticular nucleus) (revised model according to von Georgi et al., 2005; 2006b (p.59).

existing emotions and situational affects. Surprisingly the role of extraversion is still unclear. On the basis of the arousal hypothesis, extraversion should be correlated with UofM for background stimulation. This could only be shown in one study. However extraversion seem to be more correlated with a low UofM for emotion regulation. In addition to reliability and validity aspects of the MI, the intercorrelation of extraversion and neuroticism may be additionally responsible for this result. Using the Positive and Negative Affect Schedule (PANAS-state) and the MI, Getz et al. (2012), significant correlations were reported between positive Affect (PA) and UofM for background stimulation as well as between negative Affect (NA) and UofM for emotion regulation. Because of the covariance between the PANAS state and trait scales, these results may also be interpreted in terms of extraversion (PA) and neuroticism (NA) (Watson, 2000).

Contrary to the theoretical framework of Chamorro-Premuzic, the scales of the IAAM (Inventory of Activation and Arousal-Modulation by Music), which is also a questionnaire for the measurement of UofM, are explicitly integrated into the components of the neurophysiological personality model of Gray & McNaughton (2000) (see also: Corr, 2004, 2008). The IAAM does have five scales with ten items per scale and was constructed in 2002 and first presented in 2004 (von Georgi et al., 2004). These five scales measure the UofM for *relaxation* (RX) (e.g. I listen to music when I want to get away from reality, want to find my inner self, need strength not to give in too quickly, want to feel freed of all my burdens), *cognitive problem solving* (CP) (e.g. miss someone, feel hurt by others, need to think about myself, try to solve my problems, want to think about my future), *reduction of negative activation* (RA) (e.g. see no other way out of my problems, want to let out my bottled up anger, when I fear that I could hurt others right now, want to really express my emotions), *fun stimulation* (FS) (e.g. am feeling happy, am in the mood for a good party, want to meet up with my friends, feel like dancing) and *arousal modulation* (AM) (e.g. need to concentrate, have to perform tasks that require my full

mental attention, am reading a difficult or exhausting book, need to retain important facts in my memory). All items are answerable on a five-point Likert (0=not at all to 4:very often). An English translation of all IAAM-items is published within von Georgi (2006b, 36-37).

Because of several reasons, which will not be discussed here, the authors do use the term *emotion modulation* instead of *emotion regulation* or *mood regulation* in connection with UofM and the IAAM-scales. The main reason why is because this term emphasizes undirected qualitative aspects of UofM rather than directed quantitative. This means people use music for a qualitative modulation and less for intensifying or attenuating existing affects and emotions (regulation) (von Georgi, in press).

In the assumed theoretical model (Fig. 1), the IAAM scales RX and CP are assigned to the behavioral inhibition system (BIS/Anxiety), RA to the fight-flight-freezing system (FFFS) and FS and AM to the behavioral approach system (BAS/Impulsivity) (see Figure 1 which is the revised version of the original model by von Georgi et al. (2006a, 2006b)). It is assumed that people with high susceptibility in one of these neurophysiological components tend to learn to use music across different situations for the modulation of their frequently and fast arising emotions and affects within situations.

Because of the inconsistent results of the AM scale, this dimension is explained by the Glutamate-GABA-imbalance hypothesis of schizophrenia (Carlsson et al., 1997, 2001): some people are using music as a background stimulus to provoke a constriction of the thalamic filter to enhance concentration processes (von Georgi et al., 2006b; von Georgi, in press). In an unpublished study, people with AM values above the median possess significantly more errors of omissions when completing the d2-Test (Brickenkamp & Zimmer, 1998) without music (n=195) (von Georgi et al., 2008).

Meanwhile there are a sum of studies evaluating the reliability and validity of the IAAM scales with respect to different musicological questions. In all published and unpublished studies, Cronbach's α lies between 0.86 and 0.92 (von Georgi, 2013, in press). Retest reliability (six weeks) lies between 0.85 and 0.91 (von Georgi et al., 2006b) and three of the five scales (RX, RA, FS) are clearly fitting the Rasch model (von Georgi et al., 2006b, 2009b). With respect to the question of the role of UofM for different aspects of everyday life, IAAM scales are additionally correlated with health (von Georgi et al., 2006a, 2006b, 2009a, submitted), psychiatric illness (Gebhardt et al., 2007, in revision), the a possible effect of music therapy (Silina et al., 2012), subjective music chill-sensations (Kunkel et al., 2007) and indeed with personality variables as predicted and musical preferences.

The existing studies mentioned above implicate that RX, CP and RA are related to variables like emotional lability (neuroticism), negative affectivity (NA-trait) and the measurement of the susceptibility of the behavioral inhibition system (BIS/Anxiety) (see fig. 1). RA seems to have an additional aggression/anger aspect, which may be explained by the conjunction with the fight-flight-freezing system (active avoidance). FS is clearly related to extraversion, positive affectivity (PA-trait) and the behavioral approach system (BAS) (see fig. 1). Finally the AM scale goes along with a trait mixture of positive and negative emotions and does have relations with trait constructs like irrational beliefs and strange performance conviction (von Georgi, in press).

However, although these and other studies due to the possibility of the assumed theoretical explanation of the IAAM-dimensions, there is in no study a direct statistical comparison between the model of Gray & McNaughton and another personality model. Within the existing results, all intercorrelations between the IAAM-scales and different personality scales that have been used, can be interpreted alternatively on the basis of the well-known model by Eysenck (1967) and others (e.g. Rammsayer, 2004). This model postulates two basic biological systems which are held responsible for two different personality types: neuroticism (susceptibility of the limbic system) and extraversion (arousal-hypothesis or dopamine-hypothesis). Because of the rotation of the two dimensional personality system of Gray (Anxiety/BIS vs. Impulsivity/BAS) by 30° into the introversion-neuroticism region (see Gray & McNaughton, 2000; Corr, 2007), the majority of the studies with the IAAM show that BIS- and BAS-susceptibility as well as neuroticism and extraversion are correlated with the used

criterion variables (e.g. health, music preference).

One method testing the scale-model-assignment is to evaluate the win in prediction by calculating stepwise hierarchical regression analyses (SHR). This is because a factor rotation of 30° is equivalent to a linear combination (Bortz & Schuster, 2010). In terms of regression analysis, this means the first term must be held constant while adding the second term ($Y=b_0 + b_1X_1 + b_2X_2$). For example, the scale RX (see fig. 1) should be best predicted by neuroticism (N) if the Eysenck model is correct for this scale. Otherwise RX may be better predicted by neuroticism (N) adding introversion (negative extraversion): RX=N+(-E). In case of the IAAM-FS-scale a better prediction should be observed by adding neuroticism (FS=E+N) than by extraversion alone (FS=E) (see fig. 1).

2. Method

2.1. Hypotheses

Explorative hypotheses: 1a) do RX, CP and RA correlate with variables indicating an emotional lability or an increased BIS susceptibility? 1b) additionally RA should have additional active avoidance components; 1c) is FS correlated with variables indicating a positive affectivity, sociability and BAS susceptibility? 1d) Is AM correlated with scales measuring aspects of psychoticism; 2) on the basis of existing studies, a musical preference for hard music should be correlated with RA and rhythmic and energetic forms of music with FS.

Hypotheses: Using stepwise hierarchical regression analyses (SHR), the following regression models were tested against each other (p: probability; N: neuroticism; I: introversion (-E); E: extraversion; ⇨: regression on IAAM-scale X).

H1a: p[N⇨RX] > p[(N+I)⇨RX];
H1b: p[N⇨CP] > p[(N+I)⇨CP];
H2: p[N⇨RA] > p[(N+I)⇨RA];
H3: p[E⇨FS] > p[E+N]⇨FS
H4: p[P⇨AM] > [P+(E+N)]⇨AM

H2 and H4 are explorative hypotheses. Especially H4 is derivate from the discussion about the possible rotation of the anxiety- and impulsivity-axis into psychoticism space (e.g. see Zuckerman, 1991, p. 138).

2.2. Procedure

180 undergraduate students of medicine (141 female and 38 male) with a mean age of 20.8 years (SD=3.35; Md=20; min=18; max=40) participated in this study (M_f= 20.6 years (SD=3.59; Md=20; Min=18; Max=40); M_m=21.8 years (SD=1.95; Md=21; Min=19; Max=28). The participants were instructed to complete the following questionnaires: IAAM (von Georgi et al. 2006); EPP-D (Eysenck Personality Profiler - German version: Eysenck et al., 1998); BIS/BAS-Questionnaire (Carver & White, 1994; German version: Strobel et al., 2001); PANAS trait version (Watson et al., 1988; German version: Krohne et al., 1996) and a first German translation of the GWPQ-S (Gray-Wilson Personality Questionnaire - short form by Slobodskaya et al., 2003) which must be reanalyzed by factor and scale analyses because of their low reliability. Additionally the participants were asked about their favorite music preference using the 15 subgenre by Rentfrow & Gosling (2003) as forced choice question (which music do you generally prefer?).

3. Results

3.1. Reliability of the IAAM

Computing Cronbach's α as an indicator of scale reliability (internal consistency) all IAAM-scales are sufficient reliable and above 0.80: RX: α=0.92; CP: α=0.90; RA: α=0.88; FS: α=0.83; AM: α=0.86. With respect to AM, all scales are normally distributed (p>0.05; Kolmogorov-Smirnov-Test).

3.2. Correlation analyses

Table 1 gives the intercorrelations between the IAAM-scales and the personality variables and music preference. As one may see, RX, CP and RA are connected with an emotional instability such as neuroticism and BIS-susceptibility whereas the BIS-scale from the BIS/BAS-Questionnaire shows no intercorrelation with UofM. Moreover RA is correlated with impulsivity-aggression (GWPQ-S-new) and impul-

siveness (EPP-D) and do have a relationship with introversion on one hand and with BAS-susceptibility on the other hand. FS seems to be clearly connected to the scales measuring extraversion-relevant-behavior or BAS-susceptibility. AM does have connections with the subscales of psychoticism (caution: EPP-D are scales inverted relative to other personality scales).

Table 1. Intercorrelations of the IAAM-scales with personality scales and music preferences

questionnaire	scales	subscales	RX	CP	RA	FS	AM
GWPQ-S-org	BIS	passavoid	,164*	,162*	,201**	,145(*)	,102
		extinction	,116	,088	,071	-,076	,028
	BAS	approach	,066	,090	,207**	,073	,135(*)
		actavoid	,080	,104	,167	-,058	,183*
	FF	flight	-,048	-,042	-,017	,027	,104
		fight	,020	,054	,022	,082	-,090
GWPQ-S	BIS		,113	,117	,119	,071	,007
	BAS		,084	,116	,208**	,052	,212**
	passive reaction control		-,114	-,057	-,062	-,030	-,128(*)
GWPQ-S-new	anxiety		,257***	,230**	,256***	,117	,132(*)
	cognitive behavior control		-,024	,011	,072	-,098	,079
	impulsivity and aggression		,150*	,160*	,231**	,138(*)	,232**
BIS/BAS	BIS		,079	,096	,100	,054	-,002
	BAS		,123	,097	,118	,226**	,132(*)
		drive	,082	,020	,017	,183*	,037
		fun seeking	,116	,105	,151*	,289***	,216**
		reward responsiveness	,140(*)	,135(*)	,150*	,171*	,117
PANAS	positive affectivity (PA)		,155*	,114	,118	,217**	,077
	negative affectivity (NA)		,173*	,225**	,276***	,124	,219**
EPP-D	neuroticism - stability		-,251***	-,320***	-,285***	-,021	-,176*
		inferiority. - self esteem	-,137(*)	-,242***	-,218***	,024	-,074
		unhappy - happy	-,247***	-,346***	-,319***	-,027	-,265***
		hypochondria. - sense of health	-,279***	-,308***	-,297***	-,045	-,163*
		obsessive - casual	-,096	-,058	-,001	-,014	-,012
	extraversion - introversion		,066	,113	,197**	-,110	-,020
		active- inactive	,083	,144(*)	,229**	,028	,051
		sociable - unsociable	,043	-,001	,058	-,248***	-,128(*)
		assertive - submissive	,053	,063	,073	-,111	-,065
		ambitious - unambitious	,012	,115	,192**	,015	,079
	psychoticism		,088	,053	-,054	-,133(*)	-,216**
	(adventure/caution)	impulsive - control	-,181	-,176*	-,231**	-,343***	-,258***
		irresponsible - responsible	,009	-,058	-,103	-,161*	-,254***
		sensation seeking. - unadventure	-,046	,000	-,055	-,141(*)	-,195**
		tough-minded - tender-minded	,120	,153*	,029	,163*	-,073
		practical - reflective	,375***	,256***	,257**	,207**	,226**
music preference	reflexive & complex		,127	,061	-,022	,104	,112
	intense & rebellious		,084	,153*	,222**	,015	,107
	upbeat & conventional		-,066	-,114	-,085	-,187*	-,166
	energetic & rhythmic		-,119	-,094	-,128	,085	-,035

RX: relaxation; CP: cognitive problem solving; RA: reduction of negative activation; FS: positive stimulation; AM: arousal modulation; GWPQ-S-org: original scales of the Gray-Wilson Personality Questionnaire constructed with items of the GWPQ-S (number of items: passavoid (i=2), extinction (i=3), approach (i=6), actavoid (i=4), flight (i=5), fight (i=8)); GWPQ-S : short version of the GWPQ (Slobodskaya et al., 2003); GWPQ-S-new: constructed new scales via factor and scale analyses of the GWPQ-S; BIS/BAS: German version of the BIS/BAS-scale (Strobel et al., 2001); PANAS (trait version) (German version of the Positive and Negative Affect Schedule: Krohne et al., 1996); EPP-D (German version of the Eysenck Personality Profiler: Eysenck et al., 1998). (*): p<0,08; *≤ 0,05; **: p≤0,01; ***: p≤0,001.

extraversion-relevant-behavior or BAS-susceptibility.

Table 1 gives the intercorrelations between the IAAM-scales and the personality variables and music preference. As one may see, RX, CP and RA are connected with an emotional instability such as neuroticism and BIS-susceptibility whereas the BIS-scale from the BIS/BAS-Questionnaire shows no intercorrelation with UofM. Moreover RA is correlated with impulsivity-aggression (GWPQ-S-new) and impulsiveness (EPP-D) and do have a relationship with introversion on one hand and with BAS-susceptibility on the other hand. FS seems to

A preference for hard & rebellious music is conjoint with the UofM for cognitive problem solving (CP) and reduction of negative activation (RA). Contrary to other studies with the IAAM, no correlation between fun stimulation (FS) and a preference for energetic & rhythmic music could be found. However a preference for upbeat & conventional music covaries with a low UofM for fun stimulation. This confirms the results of other IAAM-studies.

3.3. Regression analyses

The best predictor variables for SHR analyses were identified by using correlation and factor analysis of PA, NA, E and N.

Because of the significant intercorrelation of E with N (r=-0.36; p=0,001) and NA with PA (r=0.18 (p=0.014), NA und PA were selected for further analyses because of their lower correlation coefficient and independency from psychoticism. To provide independent predictor variables, the unstandardized residuals of the regression from PA on NA were used (NA_{res}).

SHR analyses do not confirm any of the formulated hypotheses clearly: No additive effect was found with respect to the prediction of RX. In this case adding PA leads to a better prediction of RX. All in all the following statistical results were observed: 1) RX is predicted by NA_{res} (p=0.095) with Δp=0,037 when adding PA (p=0.028); 2) CP and RA are predicted by N_{res} with p_{CP}=0.009 and p_{RA}<0.001. 3) FA is predicted by PA with p=0,004. 4) AM is predicted by P (p=0,004) with no win when adding PA (Δp=0,183) but a significant win when adding NA_{res} as third variable (Δp=0,004) with p<0.001.

4. Discussion

The missing affirmation of the formulated hypotheses at first implies that the model by Eysenck is better for explaining the different forms of UofM measured by the IAAM than the model by Gray could do. But further analyses reverse this interpretation. Predicting the BIS and BAS scales via NA_{res} and PA clearly results in remarkable contrary effects relatively to the theoretical assumptions (p<0.001):

NA_{res}+(-PA)⇨BIS and PA+(-NA_{res})⇨BAS.

The inspection of the geometric relation of the empirical and theoretical personality axis positions are leading to the possibility that especially a BIS-susceptibility is already measured by neuroticism equivalent scales. Because of many studies in personality research which are documenting an intercorrelation of emotional lability and introversion (see also the results of Chamorro-Premuzic et al. (2012) where neuroticism is correlated with extraversion as well), the study at hand does not give an empirical answer to which model better for the explanation of different UofM forms is. This means that an integration of the IAAM-scales into the model of Gray & McNaughton cannot be also rejected. Rather the existing correlation between N and E due to the accuracy of the model of Gray & McNaughton (2000).

Beside this theoretical discussion, the present study shows that UofM for emotion modulation is connected with personality variables and music preference. Further studies to evaluate a possible three way interaction of these variables in connection with additional variables like health, problem behavior or lifestyle should be done.

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