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Emotional Responses to Single-Voice Melodies: Implications for Mobile Ringtones

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Abstract: Emotional responses (i.e., valence, arousal and liking) to single-voice melody versions that were systematically varied along five music structural characteristics (i.e., mode, tempo, articulation, appoggiatura and subito piano) were studied. The results suggest that differential emotional responses can be produced by simple manipulations on structural characteristics of a ringtone melody. For example, the subjects evaluated the major mode versions as more pleasant than the minor mode versions and the fast versions as more arousing than the slow versions. The fast and legato versions, in turn, produced the highest liking ratings. The results have direct implications for ringtone composing and arrangements.

Keywords: Mobile phone, Ringtone, Melody structure, Emotional responses

1 Introduction

The amount of mobile phones has rapidly expanded in the past few decades. There are currently over 1 billion mobile phones in the world. Alone in Europe the spending on mobile content was €590 million in 2001, and is estimated to grow to €18.9 billion in 2006 (Wacklin, 2002). About 10 billion SMS messages are sent every month in Europe, and in US consumers already buy more than 50,000 ringtones each day for about $1 per ringtone. It has been predicted that by 2003, ringtones will become the leading B-to-C premium content delivered over wireless devices. That amounts to $50 million per year for the industry (Luna, 2002).

The uses of mobile phones have become widespread over last few years. In addition to talking with another person, mobile phones are also used in various other ways (e.g., browsing internet, sending text messages, and listening to radio). The multimedia and entertainment properties are continuing to expand in the 3rd generation handheld devices that are able to support full multimedia applications.

The ringtones' original function was simply to inform the mobile user of the incoming call. However, many modern phones can be customized with a personalized ringtone. The user has a wider variety to choose from and with a unique ringtone, it is easier to distinguish one phone from another.

Ringtones can be anything from natural sounds (e.g., a cuckoo) and single-voice melodies to full musical compositions (e.g., polyphonic ringtones). The most common ringtone format, the RTTL (Ringing Tones Text Transfer Language), makes it possible to adjust the tone properties such as tempo (e.g., fast or slow) and articulation (e.g., legato or staccato). By modifying the individual tones in a ringtone it is also possible to compose melodies in different modes (e.g., in major or minor mode). In addition, the MIDI format that is supported in the newest phones practically makes it possible to adjust all the main musical parameters, such as more subtle musical characteristics (e.g., appoggiaturas and subito piano).

However, though the ringtone business has become big, there seems to be no studies on what kind of ringtones people prefer and use. There is also a lack of studies on ringtone melody characteristics and emotional responses. And yet it is reasonable to claim that the emotional attractiveness (e.g., liking, pleasantness, and arousingness) of the ringtones is

one of the main reasons for people to customize them and send them to their friends.

2 Aims

The purpose of the present study was to examine emotional responses to melodies that were varied systematically in regard to five, easily in the phone customisable structural properties. The emotional responses that were of interest in the present study included the valence, arousal and liking dimensions of emotion. The concept *valence* refers to positive or negative (pleasantness or unpleasantness) characteristics of an object or situation, whereas *arousal* refers to the intensity of an emotional experience. Liking, in turn, describes the subjective attractiveness of the object.

To study how sensitive listeners are to different kinds of musical parameters, three common (i.e., mode, tempo, articulation) and two more discrete musical parameters (appoggiatura, and subito piano) were examined. Previous studies suggest that major mode is related to positive emotions (e.g., happiness), whereas minor mode is related to negative emotions (e.g., sadness; Hevner, 1936; Gerardi and Gerken, 1995). It has also been suggested that slow tempos are most effective in eliciting responses in the dignified, calm and serene types of adjectives (i.e., low arousal) while fast tempos arouse reactions in the happy-gay, exciting-restless types (i.e., high arousal; see Rigg, 1940). Therefore, it was expected that subjects would rate the major melody versions as more positive than the minor melody versions. It was also predicted that the fast tempo, staccato articulation, and versions including appoggiaturas, would be rated as more arousing than slow tempo, legato, and non-appoggiatura versions, because they increase the amount of tones per minute, and might therefore be perceived as more active. In regard to liking, it was predicted that subjects like what they consider as positive and arousing, that is, fast tempo and major mode melody versions.

3 Method

3.1 Subjects

Subjects were 28 Finnish men ($\underline{n}$ = 12) and women with varying educational backgrounds, who ranged from 20 to 32 years of age ($\underline{M}$ = 26). They listen to (mainly popular) music approximately once a day or more frequently. Thirty percent of the subjects reported being familiar with the classical music. The subjects were fluent users of computers and had normal visual and hearing capabilities. They participated in return for a movie ticket.

3.2 Materials

Two different kinds of melodies (i.e., Kreisler's sonata and Stravinsky's theme from symphony in Eb) were used (see figure 1 and 2).

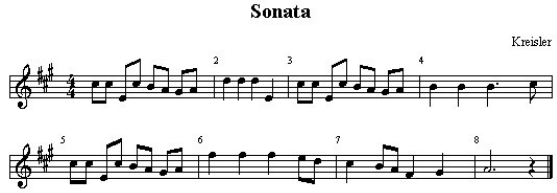

Figure 1. Notation of Kreisler's sonata for violin, "schön Rosmarin" (transposed to A-Major).

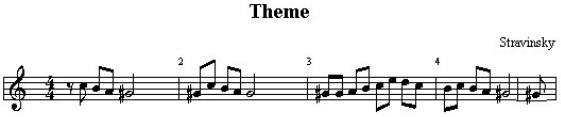

Figure 2. Notation of Stravinsky's theme from symphony in Eb, op.1 part 3 (transposed to A-Minor).

All the possible combinations (32) were formulated from both melodies in regard to mode (i.e., A-major or A-minor), tempo (i.e., slow [56 bpm] or fast [140 bpm]), articulation (i.e., staccato or legato), appoggiatura (i.e., non-appoggiatura or appoggiatura) and subito piano (i.e., non-subito piano or subito piano; see La Rue, 1970, for a detailed description of these music structural characteristics).

Melodies were composed in MIDI and recorded to wave-format using a xylophone sound. To fully control the sound quality and dynamics it was not possible to play the melodies directly in or record them from a mobile phone. However, the newest phones support Midi format, whereas in the older phones the tone colour characteristic may differ from the ones used in the present study. However, given that the tone colour characteristic was not of the primary importance in the present study, but the structural properties of the melodies, the colour characteristic is not likely to have an influence to the results.

The melody presentation and data collection was performed by the Presentation stimulus delivery software (Neurobehavioral systems, Inc., USA) in Dell Dimension XPS B1000 computer with a Wave-terminal 2496 professional sound card. Melodies were presented in random order at comfortable volume level and listened with Hosa HDS-388 headphones.

3.3 Measures

The subjects rated their emotional reactions in terms of valence and arousal to each of the melodies using 9-point pictorial scales presented on a computer screen. These scales resemble P. J. Lang's (1980) Self-Assessment Manikin. The subjects also rated liking of the melody using a 9-point scale that was also presented on a computer screen.

Background variables (e.g., level of music education and familiarity to classical music) were assessed with a questionnaire.

3.4 Data analysis

All data were analyzed by the General Linear Model (GLM) Repeated Measures procedure in SPSS, with categorical independent variables (i.e., familiarity to classical music), each in turn, as a between subjects factor. The analyses included five within-subject factors, i.e., mode (2 levels: major, minor), tempo (2 levels: slow, fast), articulation (2 levels: legato, staccato), appoggiatura (2 levels: no, yes), and subito piano (2 levels: no, yes).

3.5 Procedure

After a brief description of the experiment, the subject filled out the questionnaire concerning the background factors. Then he or she was instructed that different kind of versions of two distinct melodies would be presented. After each melody, the subject rated the melody on valence, arousal, and liking dimensions. The experiment was conducted in a quiet room that was dimly illuminated during the experiment.

4 Results

Because of high amount of analyses, there exists a potential error to get statistical significant results by chance. To minimize this potential error in results, only the main effects and two-way interactions in level $p < .01$ or higher are presented and discussed.

4.1 Valence ratings

The GML Repeated Measures analysis revealed significant main effects for mode, $F(1,27) = 54.72$, $p < .001$, and tempo, $F(1,27) = 102.35$, $p < .001$, in predicting valence ratings. Major mode and fast tempo versions were rated as more positive than minor mode and slow tempo versions (for mode Ms = 5.32 and 4.23, respectively; for tempo, Ms = 5.65 and 3.91, respectively).

The GML Repeated Measures analysis also revealed a significant Mode x Level of musical education interaction in predicting valence ratings, $F(1,26) = 11.47$, $p < .01$. Especially the higher musically educated subjects rated the major mode versions as more positive than the minor mode versions (for higher musically educated, Ms = 5.46 and 3.92, respectively; for lower musically educated, Ms = 5.21 and 4.47, respectively).

4.2 Arousal ratings

The GML Repeated Measures analysis revealed a significant main effect for tempo in predicting arousal ratings, $F(1,27) = 208.26$, $p < .001$. As illustrated in figure 3, the fast tempo versions were rated as more arousing than the slow tempo versions.

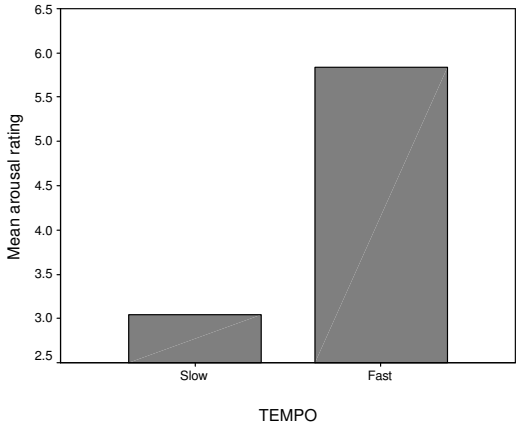

Figure 3. Mean arousal ratings for slow and fast melody versions.

4.3 Liking ratings

In predicting liking ratings, significant main effects for tempo, $F(1,27) = 39.35$, $p < .001$, and articulation $F(1,27) = 8.99$, $p < .01$, was found. The subjects liked the fast versions more than the slow versions (Ms = 4.70 and 3.54, respectively) and the legato versions more than the staccato versions (Ms = 4.23 and 4.01, respectively). The GLM Repeated Measures analysis also revealed a significant Appoggiatura x Familiarity to classical music interaction in predicting liking ratings, $F(1,26) = 11.26$, $p < .01$. Subjects that were more familiar to classical music liked the appoggiatura versions more than the non-appoggiatura versions (Ms = 4.9 and 4.5, respectively), whereas among subjects that were less familiar to the classical music the opposite was true (Ms = 3.8 and 3.9, respectively).

5 Discussion

As expected, the results support previous findings that have found that major mode is related to positive emotions and fast tempo is related to high arousal.

Especially, the higher musically educated rated the major mode versions as more positive than the minor mode versions. The result is reasonable, given that higher musically trained are more familiar to the connotations of music, and more trained in making major and minor mode discriminations.

However, in regard to the fast tempo finding, there may also have been a repetition effect. Given that, in the present study there were 32 variations of both melodies, the subjects might have found the fast versions as more positive because the listening task moved along quicker.

The hypothesis about liking ratings, which stated that subjects like what they rate as pleasant and arousing, was only partially supported. As expected, the subjects liked the fast versions more than the slow versions. In regard to mode, it seemed that a part of the subjects liked the major versions and the others the minor versions. However, it has been suggested that even though minor mode is usually linked to negative emotions (e.g., sadness), it can also be experienced as pleasurable and aesthetically more interesting than major mode (Perez, 2001).

It was also found that the subjects liked the legato versions more than the staccato versions and that subjects who were more familiar to classical music preferred the appoggiatura melody versions more than the non-appoggiatura versions. Legato articulation (i.e., notes are played for their full length) is smooth and gives and impression of flowing rhythm, whereas the staccato articulation (i.e., notes are punctuated and shortened) gives an impression of firm rhythm. Hevner (1936) found that firm rhythms were rated as vigorous and dignified, whereas flowing rhythms were rated as happy and tender. Thus, it may be argued that in the present study, the flowing rhythm versions better fitted to the present context (i.e., listening melodies from a computer). In regard to appoggiatura, the results suggest that the subjects that are more familiar to classical music are more sensitive to music structural features that are typical to classical music, and therefore liked the appoggiatura versions more than the non-appoggiatura versions.

The basic music structural characteristics (i.e., mode, tempo and articulation) had the main influences to the differences in the emotional responses, whereas the more discrete parameters (appoggiatura and subito piano) had only little or no impact. The results suggest that generally music listeners are sensitive to the very basic musical parameters, whereas the more subtle features matter to those listeners that are more familiar to them and the music genre in question. This view was supported by the result concerning the major and minor prompted pleasantness ratings among lower and higher musically trained and the liking ratings on appoggiatura vs. non-appoggiatura versions among subjects that were familiar to classical music.

The present paper seems to be the first to examine the link between ringtone characteristics and subjective ratings. It was found that by simple manipulations on structural characteristics of ringtone melody, significant differences in emotional responses could be produced. The results have direct implications for ringtone composing and arrangements.

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