THE AFFECT OF SHORT MUSICAL SEQUENCES WITH DIFFERENT MELODIC CONTOURS

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1. INTRODUCTION

The relationship between musical structures and affect (emotion) has been of ongoing interest since at least Hevner (1935, 1936a, 1936b). Hevner explored the relationship between musical structure and affect by manipulating one aspect of musical structure at a time, and having participants rate the affect. For example, Hevner manipulated pitch height by taking pieces written in the high key and transposing them down an octave to a lower key, and vice versa (1936a). Two groups of participants then rated either the modified or original version. Differences in ratings were considered the "affect" or emotion conveyed by the musical structure. For pitch height, for example, high pitch was rated as "graceful" and "sparkling" and low pitch was rated as "sad" and "heavy". Hevner repeated this procedure for manipulations of mode (major vs. minor), tempo, harmony, rhythm, and melodic contour (ascending versus descending melodies). Hevner's results indicated a significant relationship between affect and all musical structures except melodic contour. That is, Hevner results for melodic contour were "not clear-cut, distinct or consistent" (1936b, p. 268). Hevner, however, did observe a trend for ascending and descending melodies to be rated differently (1936b).

Reporting "trends" for melodic contour is quite common. For example, Schubert (2004) reported a trend for ascending sequences to be rated as more happy than descending sequences. However, research reporting a significant and reliable relationship between contour and affect is rare. A possible reason for this lack of significant results is that most research has employed long, complex ("ecologically valid") musical pieces. That is, often the stimuli chosen is a classical composition written by a famous composer (e.g. Mozart or Bach). However, in pieces like these, many attributes are changing: rhythms, tempos, harmonies, et cetera. It can become difficult to tease the influence of the musical structure of interest from all the background variation. Additionally, in long pieces it becomes increasingly difficult to establish which musical event is producing which response. Thus, melodic contour may be best studied under conditions in which most other structures of music are kept constant, and musical pieces/sequences are kept short.

In fact, Gerardi and Gerken (1995) tested this hypothesis by using short (4 measure) monophonic sequences with a constant rhythm and approximately constant mean pitch height (octave). Gerardi and Gerken's results indicated that ascending sequences were rated as significantly more happy than descending sequences for college aged participants, but not for 5 or 8 year olds. Thus, Gerardi and Gerken showed that a significant relationship between melodic contour and affect can be demonstrated when short simple sequences of music are used. Unfortunately, the assessment of affect was limited to happy-sad.

Most research in this area has focused on the influence of ascending versus descending sequences with a limited set of affect terms. However, there are more possible melodic contours in music than just ascending or descending. For instance, Huron (1996) found in his analysis of the different types of contours that the melodic arch (in both its regular and inverted form) occurred equally as often as ascending and descending contours. In addition, there are more dimensions to affect than happy-sad.

The current study extends the study of the relationship between contour and affect by using more varieties of contours and more affects. Ascending/descending, arch and more complex, musically valid, 8-note contours were designed and then modeled with polynomial equations of the form $y = a_0 + a_1x + a_2x^2 + a_3x^3 + a_4x^4$. In this, y represents pitch height, x time, and the coefficients (a_0, a_1, a_2, a_3, a_4) capture different aspects of the shape of the contour. For reasons of space, only a_0, a_1, and a_2 are discussed in this work. Listener ratings of affect on ten 3-point affect scales were then compared to these coefficients.

2. METHOD

2.1 Participants

Two groups of fifty participants participated in this study. Both groups were exposed to the same 16 sequences, but different affect scales. Participants (25 male) had a mean age of 19.2 years, and all reported some musical experience, with the average participant reporting having played about 3 instruments (counting voice), with an average of 5.4 years on their most preferred instrument. The groups did not differ demographically.

2.2 Procedure & Stimuli

Each group rated a set of sixteen 8-note sequences on six affect scales. The set of 16 sequences was designed to be contained within the two octaves above and below middle C (C4), with an equal number of sequences above

and below C4. All sequences began and ended on C, were monophonic, were equi-temporal, and were played at a constant tempo. Some sequences were designed to be linear (ascending or descending), some were arches, and some had more complex melodic contours.

Participants rated every possible affect scale / musical sequence combination twice, for a 16 (sequence) x 6 (affect scale) x 2 (times) design. The list of affect scales for each group is presented in Table 1. Note that both groups were exposed the scales "contentment-joy" and "hesitation-confidence".

3. RESULTS

The regression coefficients were calculated for each of the sixteen sequences, and then correlated to the mean responses provided by the participants. Table 1 shows the correlations for each of the polynomial coefficients (a_0, a_1, a_2) to each affect scale.

Table 1. Correlation between Pitch Height Coefficient and Responses (across all musical sequences) for Groups 1 & 2.

	Affect Scales	a_0	a_1	a_2
1	contentment-joy	.688***	.042 ns	-.115***
	hesitation-confidence	.471***	.019 ns	-.109***
	pensiveness-playfulness	.680***	.070*	-.100***
	delicacy-strength	-.345***	.031 ns	.050 ns
	irritation-calmness	-.511***	-.063 ns	.030 ns
	excitement-boredom	-.700***	-.067 ns	.094***
2	contentment-joy	.672***	.092**	-.114***
	hesitation-confidence	.403***	.068 ns	-.130***
	passivity-aggression	.091*	.132***	.003 ns
	questioning-answering	-.019 ns	-.134***	-.076*
	surprise-expectation	-.543***	-.120***	.108**
	energy-tranquility	-.617***	-.121**	.086*

Notes: [1]a_0 captures information about pitch height, and a positive coefficient means that the second affect is associated with higher pitches. [2]a_1 captures information about the linear ascending or descending nature of the sequence, and a positive coefficient means that second affect is associated with a positive slope. [3]a_2 captures information about the arch and a positive coefficient means that an inverted arch is associated with the second affect term. [4]shaded cells indicate repeated affect scales.

These correlations were approximately the same for both Groups 1 and 2. Both pitch height (a_0) and melodic arch (a_2) correlated to affect scales contentment-joy and hesitation-confidence. However, for ascending/descending (a_1) music, Group 2 rated ascending sequences as conveying joy, but Group 1 did not.

These correlations further indicated that higher pitch / octave (a_0) was associated more with ratings of joy, confidence, playfulness, delicacy, irritation, excitement, aggression, surprise and energy. Ascending sequences (a_1) were associated with ratings of playfulness, joy (for Group 2), aggression, questioning, surprise and energy. A melodic arch that rises than falls (a_2) was associated with ratings of joy, confidence, playfulness, exciting, answering, surprise, and energy.

4. DISCUSSION

The current results replicated the results of previous research (e.g. Gerardi & Gerken, 1995) by indicating that ascending sequences were ascribed more positive ratings (i.e. joy) than descending sequences. The current study additionally considered the role of the melodic arch and indicated that not only do listeners ascribe consistent affect ratings to arches, but they may do so more readily for arches than they do for ascending / descending sequences. In this design, however, pitch height (octave) not melodic contour appeared to be the most emotional salient feature of music (more significant responses for a_0). This occurred despite the fact that all sequences were contained between two octaves.

Future research should consider the role of melodic arches in studies of affect.

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AUTHOR NOTES

This work was conducted while Joshua Salmon was a Master's student at Dalhousie University, under the supervision of Dr. Bradley Frankland.