

**STM 1969**

**Dimension Analysis of Emotional Expression in Music**

*By Lage Wedin*

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# Dimension Analysis of Emotional Expression in Music

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The validity of using experimental techniques in aesthetic research has been questioned by asserting the private, intangible nature of individual aesthetic experience (Bollough, 1908; Mainwaring, 1941). The discussion appears to have its roots in a limited approach to the concept of aesthetics.

Osgood (1957) has made a valuable distinction between the study of aesthetics as *communication* and the *creation* of aesthetic products. While the latter should—and will—remain an art, the former, like other behaviour, is open to scientific investigation and any instrument, quantitative or otherwise, that can facilitate such study is to be welcomed.

An aesthetic product, like ordinary speech communication, has a dual nature, being the result of a response in the 'sender' as well as a stimulus to the 'receiver'. This stimulus has a cognitive content but differs from speech stimuli in that its 'connotative meaning' tends to predominate over its 'denotative meaning' owing to the large interindividual variation in the processes of coding and de-coding. "In the aesthetic attitude we linger over the sensations as pure sensations, following the reverberations of the sound, inhaling deeply of the aroma, tracing the movements and feeling the brightness" (Hevner, 1937*a*).

When it comes to music as a conveyor of information, opinions differ. On the one hand there are those who react strongly to the idea of music as the "language of the emotions" and who emphasize its autonomous, exclusive nature—'absolutists' (Meyer, 1957)—asserting that the aesthetic value and meaning of music lie solely in its form.

This formalistic, purist approach is opposed, on the other hand, by a group of theoreticians—'referentialists' (Meyer, 1957)—who emphasize music's capacity for expression. Music, they assert, has meaning in terms of an extramusical world of emotional states (Sherborne, 1966). Without subscribing to Wagner's claim that music "illuminates everything in heaven and on earth" it is held that the aesthetic experience arises from the *meaning* contained in the music and communicated to the listener in the form of an emotion or an idea. The music itself is an abstract, predicative pattern but when experienced, this pattern generates a subject emotion in the listener.

The primary manifestations of genuine emotion—physiological reactions, blushing, rapid breathing, visceral reactions—are of course seldom associated with an aesthetic experience. It is rather a question of a description of the music



or the musical experience (after learning) in an abstract emotional language—in terms of moods and emotions. The listener projects his previous experiences, his attitudes and to some extent his current mood onto the musical tone picture, which thereby acquires content.

Many experiments have been made to elucidate the capacity of music for emotional expression. Hevner conducted a series concerning the affective value of key, pitch, tempo, rhythm, harmony and melody (Hevner, 1935*a*, 1935*b*, 1936, 1937*b*). She constructed eight categories of emotionally coloured adjectives, which the subjects then used for rating musical excerpts, their ratings being related to musical characteristics that were varied systematically. Hevner's list of adjectives was subsequently revised by Farnsworth (1954), who found ten categories. In a similar study Campbell (1942) used as many as twelve categories of emotional adjectives and chose musical stimuli to correspond as distinctly as possible to these categories. He found close agreement between the subjects' ratings and his own. Even though the prior establishment of rating categories is bound to control the responses to some extent, it is clear that within a culture, certain music elicits relatively stable emotional response patterns. Several studies supporting this observation are cited by Lundin (1967, p. 160).

Watson (1942) concluded from an extensive study that music has different types of meaning for different listeners (cf. also Jensen, 1965), thereby relating the perception of music to aspects of the psychology of personality. Watson distinguishes between five types of meaning: *objective* (correlated directly with the physical stimulus itself—simple and complex perceptions), *imaginal* (creating imaginary situations which might be represented by the music), *associational* (interpreting the music in terms of some concrete experience), *abstract* (characterizing the music in terms of a mood) and *subjective* (interpreting the music in terms of the way it affects the subject himself). In a study of the 'abstract' meaning Watson used fourteen categories of emotional words and found that the subjects displayed a good ability to perceive and distinguish *shades of meaning* in expressions of emotion at an early age. This ability is nevertheless developed by learning, indicating that the phenomenon is clearly subject to *cultural* influence. Although definite individual and situational variation emerges from certain studies (e.g. by Morey, 1940; Sopchak, 1955), it seems meaningful to talk about emotional aspects of the experience of music in general. A further point is that certain 'fundamental' emotional dimensions (e.g. sorrow—joy) are easier to define than others and that some types of music elicit more uniform response patterns than other types (Rigg, 1937; Hampton, 1945).

New methods introduced during the Forties eliminated some of the weaknesses of the introspective techniques used before then. In particular *factor analysis* brought with it a measure of mathematical objectiveness. Two main types of experimental data have been used as a basis for factor analysis in aesthetic research. One consists of *indirect* ratings involving the assessment of general aspects of stimuli. Such data may comprise, say, subjective preference ratings in comparisons between stimuli with no definition of the components, subjective similarity ratings between stimuli or quantitative subjective judgements of quality. In these

cases the subjects are assumed to perform a kind of weighting together of constituent factors—without having to define these explicitly—on familiar assessment continua. Examples of such studies are those by Eysenck (1940, 1941) on the experience of pictorial art, by Henkin (1955, 1957) on musico-technical factors in music as aesthetic stimuli, by Wedin (1969) on historical style dimensions in music and by Eisler (1966) on the analysis of sound-reproducing systems in psychological dimensions. The other type of experimental data is derived from *direct* ratings of stimuli with reference to particular characteristics chosen in advance by the investigator. This method places greater demands on the verbal and analytical ability of the subjects but it does not oblige them to make comparative judgements (such as occur in indirect rating), which may be experienced as frustrating in view of the nature of the stimuli (Valentine, 1914).

Gundlach (1935) was the first to use factor analysis of direct ratings of aspects of aesthetic stimuli, the subjects being asked to judge music with the aid of seventeen categories of emotionally coloured, descriptive adjectives. Rank correlations between all pairs of categories were calculated on the basis of the frequency with which they were related to different musical excerpts. Using a technique for factor analysis developed by Thurstone, Gundlach found that the primary factor in his experiment covered dynamic aspects of the music, connected among other things with tempo and rhythm.

In time a method was developed which came to be known as 'Osgood's semantic differential' (Osgood, 1957; for a brief description see Osgood & Suci, 1955). In principle, stimuli are rated on a number of scales of the type 'strong—weak', 'cold—hot', etc., and the correlations between these scales are subject to factor analysis. The result is a considerably simplified descriptive system that serves to explain most of the variation. (The reader interested in the factor analysis is referred to Elmgren, 1955, or Fruchter, 1954.)

Versions of this technique have been used in other fields besides purely semantic problems, for instance in the analysis of personality structure (Osgood & Luria, 1954), facial expression (Osgood, 1966; Hastorf, Osgood & Ono, 1966), attitudes and evaluations (Osgood & Tannenbaum, 1955; Osgood, Ware & Morris, 1961), odours (Yoshida, 1964), pictorial art (Pickford, 1948; Osgood, 1957 p. 291), poetry (Gunn, 1951) and music (Gray & Wheeler, 1967). In their examination of folk songs, Gray & Wheeler detected three factors: 'evaluation', 'potency' and 'complexity'.

The semantic expressions for the fundamental emotional dimensions have been traced back to nine factors (Ekman, 1955) or, using a different method on the same data, to seven types (Dietze, 1963), while further analysis showed that these clusters could be reduced to three main groups: 'rejection', 'acceptance' and 'disturbance'. This trio is highly reminiscent of Schlosberg's (1952) two dimensions in facial expression ('pleasant-unpleasant', 'acceptance-rejection') and a third ('sleep-tension') which he added later (1954). Three factors comparable to Schlosberg's dimensions of emotion were also found by Block (1957) in an Osgood analysis of semantic expressions of emotion. As pointed out by Osgood (1966), many experiments with facial expression have isolated similar structures of pri-



mary emotions. The difficulty generally lies in deciding how many factors are required to explain the essential part of the variance, a decision which factor analysis leaves largely to the investigator's discretion.

Phenomenological methods, as mentioned above, have disclosed as many as seventeen categories of emotional words for describing musical expression. At the same time, however, there are many indications that the variation can be explained in terms of a few dimensions only. The present investigation is an attempt, using factor analysis, to elucidate the dimensional structure of emotional expression in music—or the semantic structure of a non-technical, 'abstract' (Watson, 1942) description of music.

## Method

An experiment was made in which the subjects judged musical excerpts with the aid of a number of emotional adjectives. Correlations were calculated between the rating scales and between the musical excerpts over the rating scales. The correlations were then submitted to factor analysis.

The purpose of the *factor analysis* is to trace correlations between variables to a minimum number of dimensions (factors), which should serve to describe and predict the relationship between the variables. The method may be illustrated in terms of a model of a  $k$ -dimensional space where  $k < n$ ,  $n$  being the number of variables and  $k$  the number of independent factors (coordinate axes) that account for the variance in the table of correlations between all variables. Each variable is thus represented by a vector in this  $k$ -dimensional space ( $n$  vectors) and the relationship between variables is represented by the cosine of the angle between the vectors. The *factor loadings* express the size of the variables' projection on the coordinate axes, i.e. how much the variable contains of the psychological attribute represented by the factor. The analysis also shows, in the form of *factor scores*, how much weight the factors have in each stimulus, by comparing all the stimuli's content of each factor. In other words, the factor score denotes (in the form of a standard score) how much of a factor that is expressed in each musical excerpt in relation to all the excerpts used in the experiment.

The calculations involve breaking up the raw data matrix  $R$  (musical excerpts  $\times$  rating scales) from the subjects' ratings ('How happy?', 'How relaxed?', etc.) into a factor loading matrix  $L$  (factors  $\times$  rating scales) and a factor score matrix  $S$  (musical excerpts  $\times$  factors). Transposing the factor loading matrix so that the rows replace the columns and vice versa and denoting the resultant matrix  $L'$ , the basic equation for the factor analysis can be written

$$R = SL'$$

### Material

It was originally intended to confine the investigation to the purely emotional content of the music. An inventory of applicable attributes showed, however, that many of the very common adjectives were difficult to use with a strict

definition of emotional content. The selection of variables was therefore based on the criterion of an experimentally determined measure of the attribute's suitability in a subjective description of music. It is thus in a wide sense that the rating scales are said to describe emotional content of music, i.e. a sort of perceptual description in terms with emotional associations.

With the help of studies cited above and some complementary experiments of my own, a preliminary list of 150 adjectives was drawn up comprising emotionally 'subject-related' words (e.g. glad, unhappy and exalted), subjective 'object-related' words (e.g. brilliant, sparkling and grand) and a few words of a more conventionally classificatory nature or with a definite situational association (e.g. romantic, religious).

In addition, 35 musical excerpts of 30–45 seconds duration were selected after listening to a large number of recordings, chiefly of so-called 'serious' music, partly of a programmatic nature. The general criteria for this selection were: (1) wide dispersion in conceivably relevant musical factors such as instrumentation, age, tempo, rhythm, harmony, etc., (2) high intrastimulus homogeneity, i.e. the homogeneity of each excerpt (over time) with respect to the relevant factors, and (3) avoidance of direct verbal influence by choosing only instrumental or non-verbal vocal music (with one exception where the words were unintelligible).

The final selection of rating scales and musical stimuli was made in two preliminary experiments.

*Preliminary experiment P1.* The 35 excerpts were presented with the list of 150 adjectives to 49 subjects (mostly psychology students with little or moderate musical training). Their task was to describe each excerpt with ten words taken from the list or their own vocabulary. Ratings were then made of the suitability of each word for describing the excerpt in question. This rating was combined with the total frequency of use to form the final selection criterion.

*Preliminary experiment P2.* It was important to examine the structure of the adjective list to ascertain its essential descriptive categories. To this end the list was presented to 20 subjects (psychology students), who were instructed to divide it into the minimum number of categories such that each word in a category displayed greater similarity on the average with the other words in that category than with the rest of the words in the list. Pair relationships were calculated for all words as the proportion of the subjects who placed the pair in the same category. This matrix of  $p$ -values was subjected to a form of cluster analysis developed by McQuitty (1957, 1961; Dietze, 1963) and known as typal analysis. This method has the advantages of simplicity, rapidity, moderate demands on scale level and a completely objective determination of the number of clusters or types according to the definition of 'impure type': a subgroup of items where each member displays greater affinity with at least one other member of the subgroup than with any other outside the subgroup. A disadvantage—as will be seen from Table 1—is that since an item's cluster membership is determined solely by the highest correlation, a dimension is liable to be divided into a number of rather similar clusters. In other words, the method does not produce independent dimensions.



Table 1. Typal analysis of preliminary list of adjectives (28 clusters, 8 types) compared with classifications by other authors. Each cluster or category is represented by two characteristic words or a comprehensive term.

	Wedin (28 clusters, 8 types)	Hevner (8 categories)	Campbell (12 categories)	Watson (14 categories)
A. Gaiety	gay, glad exuberant, elevated	gay, playful glad, happy	gayety joy	playful, mischievous happy, glad v. happy, exuberant amusing, funny
B. Melancholy	unhappy, despairing sad, tragic sorrowful, doleful brooding, introspective longing, yearning (anxious, uneasy)	dark, doleful	sorrow yearning	sad, mournful tragic, desolate
C. Rage	raging, furious incensed, angry warlike, martial	(emphatic, majestic)	rage (assertion)	—
D. Fear	frightening, uncanny fiendish, diabolical	—	cruelty	—
E. Solemnity	solemn, dignified majestic, grand	solemn, lofty emphatic, majestic	solemnity (assertion)	serious, reverent kingly, pompous
F. Religiousness	religious, sacral stately, divine			dignified, stately
G. Exaltation	jubilant, triumphant agitated, exalted wild, stormy impetuous passionate seductive, enticing (mysterious, strange)	agitated, triumphant	eroticism joy	exciting, stirring v. exciting, sensational pleading, passionate
H. Softness	tender, mild tranquil, relaxed loving, romantic pleasing, friendly	dreamy, gentle peaceful, tranquil	calm tenderness	peaceful, calm  (mysterious, strange)

However, types of a higher order can be obtained in a hierarchy by repeating the procedure on the basis of the similarities between the clusters.

The result of the typal analysis is presented in Table 1. (In the following, primary types are termed ‘clusters’ and secondary types ‘types’.) The 150 words in the list form 28 clusters and 8 types. There is a not unexpected similarity between this result and previous investigations.

In this context it should be noted that categories in other studies have been formed with the subjects listening to music, whereas in experiment P 2 above the subjects were simply told to imagine that the words were intended to describe music. The gaps in the table may therefore reflect the choice of musical stimuli. Furthermore, the categories in P 2 were constructed by psychology students with only a moderate interest in music, whereas Watson’s, for instance, are based on assessments by musical specialists.

Table 2. The musical stimuli employed, with characteristics from the preliminary experiment (P 1) and the general type represented (P 2).

No Excerpt from	Some characteristics (P 1)	Type of emotion (P 2) (see Table 1)
1. Ravel: Bolero (E. Ansermet/L’Orchestre de la Suisse Romande)	emphatic, grand, triumphant energetic, inspiring	E, G
2. Lidholm: Riter (Rites), Offerdans 2 (Sacrificial Dance 2) (S. Ehrling/The London Symphony Orchestra)	violent, wild, dramatic, vehement, raging	G, (C)
3. Tschaiowsky: Concerto for Piano and Orch. no. 1, Bb min. op. 23, Andante non con moto e molto maestoso. (G. Centini, Pi., R. Jones/ Das Philharmonische Orchester)	grand, emphatic, majestic, proud, solemn	E
4. Ives, Charles: The unanswered question (L. Bernstein/New York Philharmonic)	doleful, serious, mournful, dark, melancholy	B
5. Grieg: Peer Gynt, Prelude op. 23 no. 1 (O. Fjellstad/The London Symphony Orchestra)	dreamy, peaceful, mild, lyrical, melancholy	H, (B)
6. Bach, J. S.: Christmas Oratorio, “Jauchzet frolocket auf, preiset die Tage” (H. Grischkat/Stuttgart Choral Society/The Suebian Symph. Orch.)	majestic, solemn, dignified, jubilant, sacral	E
7. Bach, Ph. E.: Sonata for flute and harpsichord, no. 6, G maj., Allegro (J.-P. Rampal, flute/R. Veyron-Lacroix, harpsichord)	light, lively, playful, glad, airy	A
8. Grieg: Peer Gynt, suite no. 1, In the hall of the mountain king. (See no. 5)	vehement, stormy, dramatic, furious, raging	G, (C)
9. Handel: Concerto Grosso, D maj., op. 6, no. 5, Largo (The Mozart Society Players)	pleasing, soft, peaceful, harmonious, gracious	H
10. Strauss, J.: Liebeslieder (W. Boskowsky/Vienna Philharmonic Orchestra)	inspiring, glad, happy, lively, exuberant	A
11. Buxtehude: Chorale, “Ach Herr mich armen Sünder” (J. Brenneke, organ)	religious, lofty, dignified, serious, tranquil	F, (E, B, H)
12. Alfvén: Symphony no. 4, C min., op. 39, Från havsbandet (G. af Malmborg, sopr., S.-E. Vikström, ten., N. Grevillius/ Stockholm’s Philharmonic Orch.)	impetuous, plaintive, melancholy, passionate, languishing	G, B
13. Chopin: Fantasie-Improptu, C# min., op. 66 (Käbi Laretei, piano)	playful, airy, exuberant, glad, lively	A
14. Ellington-Hackett: Sentimental Blues (Bobby Hackett)	relaxed, pleasing, harmonious, peaceful, calm	H
15. Debussy: Prélude a l’après-midi d’un faune (M. Rosenthal/Orch. du Théâtre National de l’opéra de Paris)	peaceful, mild, dreamy, delightful, romantic	H
16. Blomdahl: Chamber Concerto for piano, wood wind and percussion (H. Leygraf, piano, S. Ehrling/The London Symphony Orchestra)	uneasy, unrestrained, wild, agitated, violent	G
17. Honegger: Pacific 231 (See no. 1)	fateful, ghostly, uncanny, ominous, doleful	D, (B)
18. Grieg: Peer Gynt, suite no. 2, Ingrid’s abduction and lament (See no. 5)	serious, melancholy, heavy, tragic, dark	B
19. Rossini: La Boutique fantasque, (ballett), Can Can (E. Ansermet/London Symphony Orchestra)	exuberant, lively, elevated, emphatic, violent	A, (G)
20. Bach, J. S. – Swingle: Harpsichord Concerto, F min., Largo (Swingle Singers)	pleasing, relaxed, lovely, dreamy, friendly	H

*Main experiment*

Several criteria guided the selection of *stimuli* for the main experiment, which for practical reasons had to be limited to 20 excerpts. (1) Dispersion over different dimensions of experience. Here it proved difficult to find music that can be described in terms of type C, Rage. A couple of examples had only weak associations



with this type. Otherwise, all types are represented by at least one excerpt. (2) Homogeneity of emotional expression within each excerpt. Frequencies and suitability ratings from P2 show the type of expression represented by each excerpt and provide a measure of the relative aptness with which the corresponding adjectives describe the music or the impression made by this. In addition, the measure of similarity from the categorization of words (P2) is used to calculate a homogeneity index for each excerpt, consisting of the average similarity between all the ten most suitable words for describing the excerpt in question (in accordance with P1). Using these criteria and taking into account the ratings of the difficulty of describing the excerpts (P1), a selection was made comprising the 20 pieces presented in Table 2.

*Rating scales* were chosen so that the most suitable and frequent descriptions of each excerpt were included in sequence. In order to make the semantic material as comprehensive as possible, the scales were supplemented with words from clusters excluded by the above procedure but which nevertheless featured among the ten most suitable descriptions in the preliminary experiment. All but two of the clusters ('fiendish, diabolical'; 'incensed, angry') were thus represented among the final selection of 40 rating scales presented in Table 3.

*Subjects.* The experiment was conducted with about a hundred psychology students and some seventy students attending summer courses in music at two folk high schools. The two groups (designated P and M respectively) differed significantly in their answers to a questionnaire on interest in and knowledge of music. Group M included a number of professional musicians and music teachers, while the majority were music students or amateur musicians (schoolchildren and adults with various professions).

*Procedure.* It proved impracticable to have each subject rate all forty of the variables and consequently the reply sheet was divided in half, with 20 variables in each half. Variables 1-20 were rated by half the subjects in each group (P and M) and variables 21-40 by the other half. These subgroups were matched with respect to their interest in and knowledge of music as measured by the questionnaire. As a result of this matching, some subjects were excluded and the correlation calculations were accordingly based on ratings by 44 psychology students and 30 music students for each set of variables.

The musical excerpts were played in random order, each excerpt being presented twice in the space of about 5 minutes, during which the ratings in all variables were noted down. The order in which the rating scales were presented was chosen at random and separately for each subject. The variables were also separated on the reply sheet in order to discourage direct comparisons between the ratings in different variables. The subjects were instructed to try to make a new decision for each variable and to disregard the ratings of the preceding excerpt.

Each subject made one rating of each variable/characteristic and excerpt. The ratings represent the subject's assessment of *how much of the characteristic* (glad, serious, violent, etc.) the excerpt contains. The ratings were made on a scale from 0 to 10, where 0 means that "the excerpt does not contain any of the char-

Table 3. Factor analysis of rating scales; varimax rotated factor matrices for psychology students (P) and music students (M).

Variable	P			M		
	Factor			Factor		
	I	II	III	I	II	III
1. Serious (Allvarlig)	-0.15	-0.93	0.24	-0.16	-0.93	0.25
2. Relaxed (Avspänd)	-0.93	0.30	0.00	-0.94	0.18	-0.12
3. Pleasing (Behaglig)	-0.72	0.42	0.35	-0.94	0.14	0.07
4. Dreamy (Drömmande)	-0.93	-0.20	-0.08	-0.82	-0.38	-0.21
5. Doleful (Dyster)	0.04	-0.97	-0.03	-0.02	-0.96	-0.04
6. Vehement (Häftig)	0.96	0.18	0.04	0.93	0.30	-0.03
7. Powerful (Kräftfull)	0.82	-0.06	0.51	0.84	0.18	0.44
8. Playful (Levnadfull)	0.08	0.90	-0.32	0.15	0.84	-0.38
9. Impetuous (Lidelsefull)	-0.27	-0.65	0.34	-0.29	-0.76	0.00
10. Light (Ljus)	-0.52	0.82	0.00	-0.58	0.71	-0.16
11. Majestic (Majestätisk)	0.29	-0.25	0.88	0.39	0.01	0.87
12. Inspiring (Medryckande)	0.27	0.81	0.16	0.39	0.81	0.03
13. Soft (Mjuk)	-0.97	0.06	0.00	-0.94	-0.19	-0.10
14. Uneasy (Orolig)	0.92	-0.08	-0.34	0.92	0.08	-0.31
15. Grand (Pampig)	0.56	-0.04	0.79	0.58	0.24	0.70
16. Religious (Religiös)	-0.15	-0.35	0.54	-0.17	-0.26	0.67
17. Exuberant (Sprudlande)	0.38	0.88	-0.02	0.42	0.85	-0.09
18. Peaceful (Stilla)	-0.86	-0.41	0.01	-0.73	-0.60	-0.04
19. Violent (Väldsam)	0.96	0.10	0.05	0.95	0.19	0.01
20. Fateful (Ödesmättad)	0.43	-0.81	0.19	0.58	-0.76	0.08
21. Seductive (Förförisk)	-0.73	0.31	-0.15	-0.45	0.12	-0.48
22. Glad (Glad)	0.07	0.92	0.13	0.02	0.95	0.15
23. Solemn (Högtidlig)	-0.24	-0.22	0.90	-0.29	-0.14	0.92
24. Warlike (Krigisk)	0.88	-0.11	-0.17	0.92	-0.02	-0.19
25. Lively (Livlig)	0.73	0.64	-0.01	0.57	0.74	-0.04
26. Airy (Lätt)	-0.43	0.85	-0.12	-0.40	0.83	-0.15
27. Mild (Mild)	-0.95	0.03	-0.12	-0.90	-0.22	-0.14
28. Unhappy (Olycklig)	-0.45	-0.83	-0.01	-0.19	-0.93	-0.05
29. Unrestrained (Otyglad)	0.83	0.22	-0.31	0.84	0.21	-0.35
30. Furious (Rasande)	0.90	0.04	-0.13	0.90	0.08	-0.11
31. Sad (Sorglig)	-0.49	-0.81	0.03	-0.38	-0.85	-0.02
32. Ghostly (Spöklik)	0.52	-0.60	-0.41	0.63	-0.49	-0.41
33. Stormy (Stormande)	0.92	0.26	0.08	0.90	0.30	0.02
34. Triumphant (Triumferande)	0.68	0.57	0.40	0.59	0.61	0.46
35. Yearning (Trånande)	-0.81	-0.35	-0.15	-0.73	-0.49	-0.18
36. Strange (Underlig)	0.51	-0.43	-0.60	0.54	-0.42	-0.46
37. Agitated (Upphetsad)	0.92	0.26	-0.12	0.90	0.34	-0.12
38. Sublime (Upphöjd)	-0.06	0.18	0.92	-0.29	-0.01	0.91
39. Melancholy (Vemodig)	-0.77	-0.59	0.03	-0.54	-0.78	-0.05
40. Wild (Vild)	0.91	0.29	-0.11	0.89	0.37	-0.14
Variance	18.15	11.67	5.15	17.35	12.22	5.11

acteristic/expression in question" and 10 that "the excerpt contains a very great deal of the characteristic".

The scales, unlike Osgood's, are thus unipolar, the reason being that bipolarisation at this stage would have to be based on the investigator's discretion and feeling for language. Accordingly it seemed more appropriate, in this initial



investigation, to let the factor analysis reveal any bipolarity that may exist among the variables.

## Results

The medians of the subjects' ratings can be utilised in two ways (medians were employed rather than arithmetical means because of the irregularities in the distribution of the ratings): (1) Each characteristic is expressed to different extents in different excerpts in accordance with the subjects' ratings. This results in a profile for each rating scale over excerpts, making it possible to calculate the correlation between variables ( $r_{vij}$ ) over stimuli. (2) Each excerpt is accorded a profile over rating scales, giving a summary description of the subjects' experience of the music. The relationship between music stimuli can be expressed in a correlation over rating scales ( $r_{mij}$ ).

The dispersion of the ratings varies greatly from combination to combination of variables/excerpts (the quartile deviation ranges approximately from 0.5 to 7.0). There is usually agreement about when an attribute is inadequate. According to all subjects, for instance, excerpt 5, the prelude to Grieg's 'Peer Gynt', does not possess the qualities 'warlike', 'unrestrained' and 'furious'. Agreement is less general, on the other hand, concerning *how* much an excerpt contains of an attribute that the majority consider it possesses. Furthermore, there is greater agreement over perceptually simple qualities such as 'peaceful' and 'lively' than over more complicated emotions such as 'unhappy' or 'impetuous'. This is no doubt largely connected with difficulties of semantic interpretation on top of variations in musical appreciation. Owing to these factors, the distribution of the ratings varies greatly, from normality to pronounced skewness or complete rectangularity, though there is no instance of definite bimodality (i.e. that the subjects form two groups with diametrically opposed opinions).

It is reasonable to assume certain differences in appreciation between groups P and M (Watson, 1942). These differences are demonstrated best by the factor analysis, which was therefore performed on each group in turn.

### Factor analysis, rating scales

The correlations between all pairs of rating scales ( $r_{vij}$ ) were submitted to factor analysis and rotated on the varimax principle. The eigenvalues and the distribution of variance over factors point to three main factors for both groups of subjects. Since the structure of the first three factors remained stable even after further rotation and the variance of the other factors rotated was slight and specific, the results presented here concern the rotation of three factors (Table 3), which between them cover 87 % of the total variance in the psychology as well as the music group. The factor scores, which indicate how well the content of the factors is expressed by each musical excerpt, are given in Table 4.

The factor loadings can be used to interpret the factors in semantic terms and this interpretation can be checked against the factor scores, which describe how well each factor is expressed in each musical excerpt.

Table 4. Factor score matrices from factor analysis of rating scales; psychology students (P) and music students (M).

Excerpt	P			M		
	Factor			Factor		
	I	II	III	I	II	III
1. Ravel	1.13	0.15	1.44	1.09	0.17	0.85
2. Lidholm	1.82	-0.28	-0.72	1.85	-0.08	-0.84
3. Tschaikowsky	-0.06	0.17	1.56	0.13	0.20	1.80
4. Ives	-0.45	-1.46	-0.66	-0.30	-1.34	-0.80
5. Grieg: Prelude	-1.19	0.48	-0.17	-1.08	-0.85	-0.38
6. Bach, J. S.	0.41	0.04	1.62	0.25	0.35	2.23
7. Bach, Ph. E.	-0.33	1.55	-0.61	-0.46	1.64	-0.24
8. Grieg: Hall of Mountain King	1.65	0.26	0.50	1.73	0.17	0.12
9. Handel	-0.79	0.21	0.47	-0.89	0.44	0.95
10. Strauss	-0.13	1.41	0.57	-0.44	1.50	0.19
11. Buxtehude	-0.67	-1.15	1.32	-0.66	-1.37	1.44
12. Alfvén	-0.18	-1.09	-0.14	-0.28	-0.96	0.12
13. Chopin	-0.42	1.31	-0.59	-0.60	1.28	-0.82
14. Ellington	-1.18	0.34	-1.17	-1.10	0.12	-1.20
15. Debussy	-1.24	0.09	-0.49	-1.18	-0.03	-0.74
16. Blomdahl	1.48	-0.15	-1.85	1.48	0.10	-1.27
17. Honegger	0.94	-1.52	-1.25	1.14	-1.38	-0.72
18. Grieg: Ingrid's Lament	-0.31	-1.52	0.79	-0.16	-1.57	0.24
19. Rossini	0.82	1.68	0.00	0.67	1.51	-0.16
20. Swingle Singers	-1.31	0.44	-0.63	-1.19	0.11	-0.79

Factor I, which accounts for more than half of the common factor variance, is bipolar and characterised in groups P and M as follows. (The variables are presented in rank order according to the size of their loading. This applies to all the tables of this type in the text below, including those based on factor scores.)

Negative pole		Positive pole	
P	M	P	M
soft	pleasing	violent	violent
mild	relaxed	vehement	vehement
relaxed	soft	uneasy	uneasy
dreamy	mild	stormy	warlike
peaceful	dreamy	agitated	stormy
yearning	yearning	wild	furious
melancholy	peaceful	furious	agitated
seductive		warlike	wild
pleasing		unrestrained	powerful
		powerful	unrestrained
		lively	

Factor I has to do with *energy flow, level of activation, tension*; it can be summarily designated DYNAMICS; pleasing relaxation—violent agitation. The dimension, which is reminiscent of Osgood's 'Intensity' (1966) and Schlosberg's 'Activation' (1954), covers types C, G and H in the list of adjectives (Table 1).



Factor I also carries traces of the listeners' emotional *evaluations*, i.e. expressions for private reactions such as pleasant – unpleasant, attractive – repellent. As value expressions were excluded in the selection of variables, however, this aspect of appreciation could not be studied in the analysis, the main purpose of which concerned descriptions of the music's content.

Factor I is chiefly represented by the following excerpts:

Negative pole (pleasant, relaxed)		Positive pole (vehement, violent)	
P	M	P	M
(20) Swingle Singers (15) Debussy	(20) Swingle Singers (15) Debussy	(2) Lidholm (8) Grieg, Hall of Mountain King	(2) Lidholm (8) Grieg, Hall of Mountain King
(14) Ellington (9) Handel (11) Buxtehude	(5) Grieg, Prelude (9) Handel (11) Buxtehude	(16) Blomdahl (1) Ravel (17) Honegger (19) Rossini	(16) Blomdahl (17) Honegger (1) Ravel (19) Rossini

The structure is almost the same in both groups. The correlation between the groups is 0.99 for factor loadings as well as for factor scores.

*Factor II* is bipolar and accounts for about one third of the common factor variance.

Negative pole		Positive pole	
P	M	P	M
doleful serious unhappy fateful sad	doleful serious unhappy sad melancholy impetuous fateful	glad playful exuberant airy light inspiring	glad exuberant playful airy inspiring lively light

Factor II concerns happy – sad moods such as *glad – sad*, *playful – doleful*, *light – dark*. It also comprises the type of 'dark mood' that carries some form of threat. The factor is designated GAIETY—GLOOM. It bears some resemblance to the 'Pleasantness' dimension found in numerous experiments with emotional expressions. It covers types A and B in the list of adjectives (Table 1).

Factor II is chiefly represented by the following excerpts:

Negative pole (dark, doleful)		Positive pole (light, playful)	
P	M	P	M
(18) Grieg, Ingrid's Lament (17) Honegger (4) Ives (11) Buxtehude (12) Alfvén	(18) Grieg, Ingrid's Lament (17) Honegger (11) Buxtehude (4) Ives (12) Alfvén (5) Grieg, Prelude	(19) Rossini (7) Bach, Ph. E. (10) Strauss (13) Chopin	(7) Bach, Ph. E. (19) Rossini (10) Strauss (13) Chopin

Once again, the result is surprisingly consistent. The correlations between the groups are 0.97 and 0.98 for factor loadings and factor scores respectively.

*Factor III* accounts for 15 % of the common factor variance and its chief loadings are positive.

P	M
sublime solemn majestic grand	solemn sublime majestic grand

The factor also has moderate loadings in 'religious', 'powerful' and 'triumphant'. The dimension combines *solemnity* and *dignity*, *powerful magnificence* and *serious worthiness*. It can be summarily designated SOLEMN DIGNITY and covers types E and F in the list of adjectives (Table 1).

The dimension seems to be specifically musical. I have not found it demonstrated as a fundamental factor in other investigations into other means of emotional expression. (To some extent it may be compared with Osgood's 'Potency factor', 1955.)

Factor III is represented by the following excerpts:

P	M
(6) Bach, J. S. (3) Tschaikowsky (1) Ravel (11) Buxtehude	(6) Bach, J. S. (3) Tschaikowsky (11) Buxtehude (9) Handel (1) Ravel

Excerpts with low scores in this factor were e.g. (16) Blomdahl, (14) Ellington, (2) Lidholm, (17) Honegger, (4) Ives and (20) Swingle Singers. The correlations between the groups are 0.96 and 0.93 for factor loadings and factor scores respectively.



Table 5. Factor analysis of musical excerpts; varimax rotated factor matrices for psychology students (P) and music students (M).

Excerpt	P			M		
	Factor			Factor		
	I	II	III	I	II	III
1. Ravel	0.50	0.07	0.82	0.62	-0.02	0.67
2. Lidholm	0.85	-0.05	0.33	0.88	-0.13	0.10
3. Tschaikowsky	-0.36	0.08	0.86	-0.10	0.10	0.93
4. Ives	-0.63	-0.69	0.08	-0.75	-0.47	-0.15
5. Grieg: Prelude	-0.94	-0.20	0.10	-0.94	0.09	-0.05
6. Bach J. S.	0.07	-0.02	0.80	0.10	0.18	0.86
7. Bach Ph. E.	0.24	0.89	0.14	0.07	0.91	0.11
8. Grieg: Hall of Mountain King	0.74	0.13	0.56	0.83	-0.06	0.36
9. Handel	-0.88	0.13	0.36	-0.74	0.43	0.38
10. Strauss	-0.17	0.83	0.47	0.02	0.89	0.34
11. Buxtehude	-0.68	-0.51	0.28	-0.83	-0.32	0.24
12. Alfvén	-0.43	-0.69	0.34	-0.78	0.38	0.25
13. Chopin	-0.33	0.83	0.15	-0.10	0.88	-0.03
14. Ellington	-0.87	0.20	-0.06	-0.81	0.33	-0.23
15. Debussy	-0.95	0.08	0.01	-0.90	0.25	-0.13
16. Blomdahl	0.84	0.04	0.09	0.89	-0.04	-0.05
17. Honegger	0.34	-0.71	0.24	0.25	-0.79	0.02
18. Grieg: Ingrid's Lament	-0.56	-0.70	0.40	-0.73	-0.55	0.17
19. Rossini	0.47	0.76	0.36	0.68	0.60	0.28
20. Swingle Singers	-0.93	0.23	0.04	-0.88	0.31	-0.16
Variance	8.44	5.13	3.43	9.27	4.68	2.82

#### Factor analysis, musical stimuli

Another way of processing the data is to utilise the variation between the excerpts. The correlations between the excerpts ( $r_{mij}$ ) over rating scales were submitted to factor analysis and rotated on the varimax principle. The analysis gave three or four factors in both groups of subjects but as three factors account for as much as 84 % of the total variance and the fourth factor simply involves a breakdown of the first bipolar factor into two unipolar factors, the results presented here concern the rotation of the first 3 factors. The factor loadings and factor scores are given in Tables 5 and 6.

The interpretation of the factors was undertaken by persons experienced in listening to music. They had access only to the factor loadings and the stimuli. The factor loadings in this analysis can be compared with the factor scores in the preceding analysis of rating scales, while the scores below can likewise be compared with the loadings above.

Factor I' is bipolar and accounts for 50 and 55 % respectively of the common factor variance in the psychology and music groups.

Table 6. Factor score matrices from factor analysis of musical excerpts; psychology students (P) and music students (M).

	P			M		
	Factor			Factor		
	I	II	III	I	II	III
1. Serious (Allvarlig)	-0.74	-1.62	1.42	-1.06	-1.31	1.07
2. Relaxed (Avspänd)	-1.63	0.93	-0.06	-1.33	1.30	-0.41
3. Pleasing (Behaglig)	-1.51	1.03	1.37	-1.57	1.22	0.75
4. Dreamy (Drömmande)	-1.58	-0.13	-0.41	-1.47	0.13	-0.51
5. Doleful (Dyster)	-0.14	-1.85	0.14	-0.58	-1.49	-0.22
6. Vehement (Häftig)	1.28	0.10	0.74	1.23	-0.12	0.27
7. Powerful (Kraftfull)	0.46	-0.29	2.21	0.55	-0.32	2.20
8. Playful (Lekfull)	-0.03	1.87	-0.58	0.57	1.71	-1.20
9. Impetuous (Lidelsefull)	-0.55	-0.87	0.61	-0.86	-0.62	0.38
10. Light (Ljus)	-1.03	1.73	0.22	-0.60	1.59	-0.12
11. Majestic (Majestätisk)	0.06	-0.55	1.38	0.13	-0.43	1.75
12. Inspiring (Medryckande)	-0.14	1.37	1.12	0.18	1.12	0.89
13. Soft (Mjuk)	-1.75	0.52	-0.24	-1.69	0.73	-0.43
14. Uneasy (Orolig)	1.22	0.37	0.09	1.08	-0.48	-0.53
15. Grand (Pampig)	0.28	-0.27	1.94	0.38	-0.15	2.04
16. Religious (Religiös)	0.11	-0.74	-0.88	-0.12	-0.46	-0.21
17. Exuberant (Sprudlande)	0.40	1.67	-0.05	0.76	1.34	-0.20
18. Peaceful (Stilla)	-1.55	-0.66	-0.63	-1.58	-0.44	-0.62
19. Violent (Väldsam)	1.34	-0.11	0.88	1.25	-0.45	0.41
20. Fateful (Ödesmättad)	0.15	-1.62	1.26	-0.05	-1.73	0.85
21. Seductive (Förförisk)	-0.29	0.30	-1.63	-0.03	0.19	-1.45
22. Glad (Glad)	0.10	1.50	-0.37	0.30	1.86	0.26
23. Solemn (Högtidlig)	-0.53	-0.36	1.06	-0.81	-0.12	1.97
24. Warlike (Krigisk)	1.35	-0.49	-1.04	1.22	-0.78	-0.80
25. Lively (Livlig)	0.96	1.37	0.60	1.22	1.50	0.26
26. Airy (Lätt)	-0.50	1.57	-0.97	-0.11	1.99	-0.96
27. Mild (Mild)	-1.29	0.33	-1.01	-1.24	0.47	-0.97
28. Unhappy (Olycklig)	-0.57	-1.30	-0.61	-0.61	-1.28	-0.53
29. Unrestrained (Otyglad)	1.26	0.14	-1.09	1.26	-0.20	-1.28
30. Furious (Rasande)	1.34	-0.24	-0.96	1.22	-0.61	-0.60
31. Sad (Sorglig)	-0.68	-1.39	-0.63	-0.79	-1.20	-0.76
32. Ghostly (Spöklik)	0.81	-1.01	-1.54	0.65	-1.42	-1.38
33. Stormy (Stormande)	1.26	0.18	0.14	1.32	-0.16	0.34
34. Triumphant (Triumferande)	0.79	0.76	0.56	0.74	0.56	1.19
35. Yearning (Trånande)	-0.72	-0.48	-1.15	-0.99	-0.22	-0.69
36. Strange (Underlig)	0.84	-0.70	-1.92	0.60	-0.91	-1.67
37. Agitated (Upphetsad)	1.34	0.27	0.06	1.28	-0.01	0.01
38. Sublime (Upphöjd)	-0.16	0.14	0.41	-0.57	0.06	1.41
39. Melancholy (Vemodig)	-1.33	-1.06	-0.30	-1.30	-0.97	-0.47
40. Wild (Vild)	1.40	0.34	-0.16	1.42	0.10	-0.04

Factor I' can be interpreted analogously to factor I in the analysis of rating scales. As in that case, the agreement between the groups is most striking (the correlation between factor loadings as well as between factor scores being 0.97).

Factor I' represents *level of activation, energy flow, intensity and tension* in the music: tense-relaxed, vehement-mild, aggressive-gentle. It is designated TENSION/ENERGY (cf. factor I: Dynamics). This interpretation can be com-



Negative pole		Positive pole	
P	M	P	M
(15) Debussy (5) Grieg, Prelude (20) Swingle Singers	(5) Grieg, Prelude (15) Debussy (20) Swingle Singers	(2) Lidholm (16) Blomdahl (8) Grieg, Hall of Mountain King	(16) Blomdahl (2) Lidholm (8) Grieg, Hall of Mountain King (19) Rossini
(9) Handel (14) Ellington (11) Buxtehude	(11) Buxtehude (14) Ellington (12) Alfvén (4) Ives (9) Handel (18) Grieg, Ingrid's Lament		

pared with the characteristics of the excerpts concerned in the preliminary experiment P1. One pole was characterised as peaceful, mild, pleasing, relaxed, dreamy, tranquil and harmonious, the other pole as violent, wild, vehement, stormy, uneasy, unrestrained.

The factor scores verify this interpretation.

Negative pole		Positive pole	
P	M	P	M
soft relaxed dreamy peaceful pleasing melancholy mild	soft peaceful pleasing dreamy relaxed melancholy mild	wild warlike furious agitated violent vehement stormy unrestrained uneasy	wild stormy agitated unrestrained violent vehement warlike furious lively uneasy

Factor I and factor I' have been given different designations even though their content is the same in principle. This is chiefly on account of the different basis for the interpretations (semantic and musical respectively) and because no attempt has been made to modify the interpretations so as to fit a common designation. It also serves to illustrate the arbitrary nature of the method in the evaluation of results.

*Factor II'* is bipolar and accounts for about 30 % of the common factor variance.

The correlations between the groups are 0.96 and 0.97 for factor loadings and factor scores respectively.

The factor was largely interpreted with exactly the same attributes as were used to describe the excerpts in question in the preliminary experiment P1: light, glad,

Negative pole		Positive pole	
P	M	P	M
(17) Honegger (18) Grieg, Ingrid's Lament (4) Ives (12) Alfvén	(17) Honegger (18) Grieg, Ingrid's Lament	(7) Bach, Ph. E. (13) Chopin  (10) Strauss (19) Rossini	(7) Bach, Ph. E. (10) Strauss  (13) Chopin (19) Rossini

lively, playful, exuberant and exalted; heavy, dark, fateful, melancholy, tragic, doleful. The dimension is designated GAIETY – GLOOM; *light – dark, playful – doleful, glad – sad*.

The dimension is also open to a more technical interpretation in terms of VIVACITY and tone colour. One pole is characterised by dancing rhythm, rapidity and light tone colour, while the other is slow, viscous and dark. Here, too, it is a question of some form of activity, though not of the same type as in the preceding factor. Factor I' stands for a *dynamic* activity characterised above all by the immediate tension, whereas factor II' has to do with *motor* activity, i.e. speed of motion and change over time.

The factor scores verify the interpretation.

Negative pole		Positive pole	
P	M	P	M
doleful serious fateful sad unhappy	fateful doleful ghostly serious unhappy sad	playful light exuberant airy glad lively	airy glad playful light lively exuberant

*Factor III'* accounts for roughly one fifth of the common factor variance and its chief loadings are positive.

P	M
(3) Tschaikowsky (1) Ravel (6) Bach, J. S.	(3) Tschaikowsky (6) Bach, J. S.

The factor also has moderately high loadings in excerpts (8), (9), (10), (18) and (19). It stands for *pompous breadth, powerfulness, stateliness and solemnity*. The dimension is designated SOLEMN DIGNITY. Compare the characteristics in preliminary experiment P1: grand, powerful, majestic, solemn. Examples of excerpts that lack this quality are (14) Ellington, (20) Swingle Singers and (15) Debussy.



The correlations between the groups are 0.97 and 0.92 for factor loadings and factor scores respectively.

The factor scores also give a relatively unambiguous picture of Factor III'.

	P	M
	powerful grand serious majestic	powerful grand solemn majestic sublime

Discussion

The two factor analyses and the relatively free characteristics derived from the preliminary experiment P 1 give an overall impression of high consistency in the structure of musical expression. The content of the dimensions appears meaningful and the interpretations are also relatively unequivocal.

An interesting parallel is to be found in assumptions made by Ferguson as long ago as 1925 (Hevner, 1935*a*, p. 202). He regards two elements as being fundamental to all musical expression: (1) *suggestion of motion*, which is related to tempo and rhythm (cf. factor II'), and (2) *suggestion of stress* or tension (cf. factor I'), which is related among other things to the occurrence of dissonant harmonies. Factors I' and II' (or I and II) account for 70 % of the total variance in the present experiment.

It appears psychologically meaningful that the first two factors are both bipolar. The reason why the third factor appears to be unipolar may of course be that listeners do not experience any definite opposite to solemnity and dignity in music. At this stage, however, it seems more appropriate to surmise that the present excerpts did not contain this expression.

There is a striking similarity between the psychology students' and the music students' appreciations/descriptions of the music. It might even be suggested that the result is of some general value as a descriptive system. The correlations reported are, however, an unsatisfactory measure of this generality and it is more pertinent to look at the actual loadings for individual excerpts in the various factors. One can detect a faint tendency for the music group to express themselves in somewhat simpler, perceptual terms such as 'lively' and 'peaceful' compared with the psychology students, who are more prone to attribute the music more complicated moods such as 'sad' and 'impetuous'. Thus, excerpts (4), (12), (18) and (19) are characterised chiefly by factor I' among the music students but by factor II' among the psychology students.

It should also be remembered that the calculations have been made on group data and that the groups (P and M) differ demonstrably only in certain interest and knowledge factors, which were measured with an imperfect instrument.

Furthermore, the result of a factor analysis depends entirely on the limitations of the primary material. The samples of stimuli and rating scales employed here

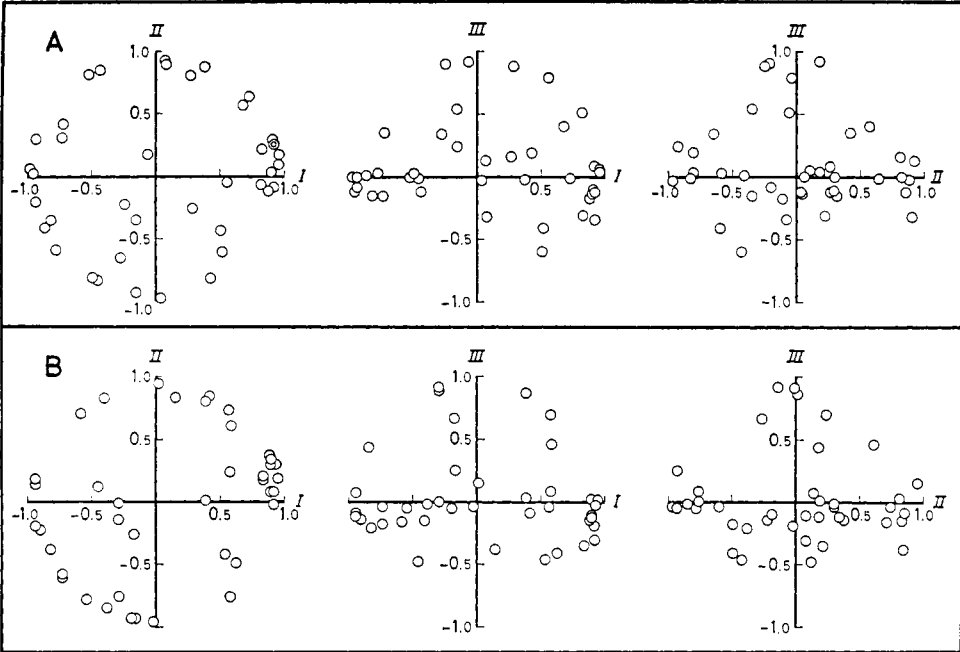


Fig. 1. Factor plots from factor analysis of correlations between *rating scales*. (A) Psychology students (B) Music students.

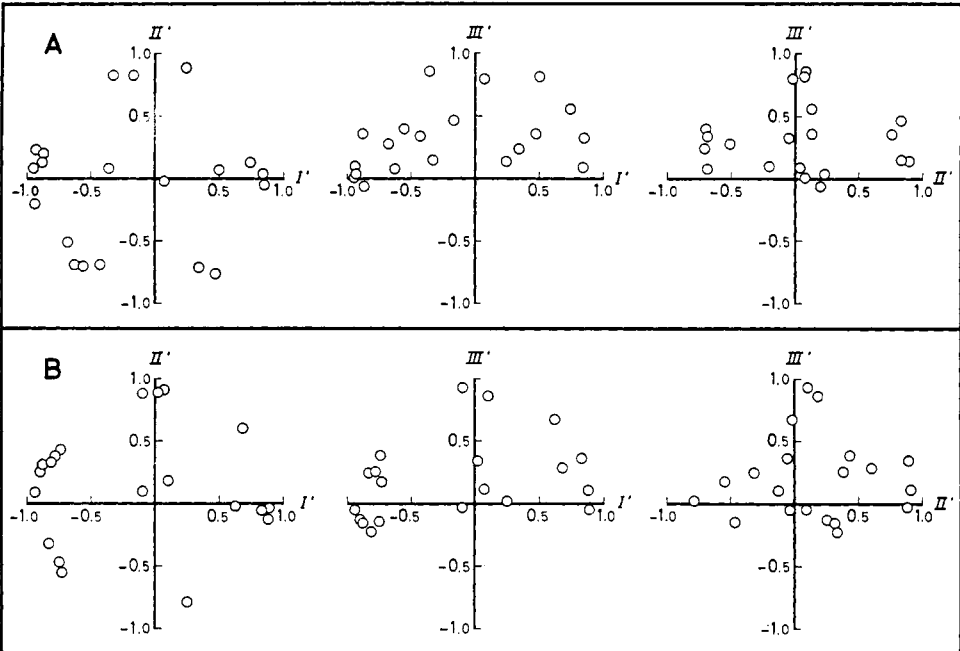


Fig. 2. Factor plots from factor analysis of correlations between *musical stimuli*. (A) Psychology students. (B) Music students.



are obviously not strictly representative. After all, the music was selected from a limited repertoire (serious music) and the procedure for selecting rating scales means that this selection is closely associated with the selection of music—as well as with a tradition in this type of research that is hard to evaluate.

The investigation should be regarded as an illustration of the usefulness of the method in such contexts. Parallel studies are required and in particular an investigation of the generality of the factor interpretations, before considering the possibility of generalising the results. The interpretation of factors is probably the least scientific part of a factor analysis and consequently the designations given to the dimensions should be treated cautiously. In an evaluative assessment the analysis of dimensions should be regarded in the first place as a *semantic* and psychological problem and less as a field for musical research.

If music is to be described in terms of the dimensions provided by the factor analysis, it must also be realised that the *factor loadings* are not mutually uncorrelated. Plots of the factor loadings are reproduced in Figs. 1 and 2.

Loadings in factors I' and III' correlate in the factor analysis of stimuli:  $r = 0.42$  and  $0.33$  in the psychology and music group respectively. This implies that music representing factors I' and III' has a certain amount in common in energy flow and powerfulness. In other words, it is mainly the degree of vehemence and agitation, and the degree of solemnity in the music that determine where the highest loading will occur.

There is also a weak correlation between factors I' and II' (P:  $r = 0.13$ ; M:  $r = 0.10$ ). This may be interpreted as indicating that music which is experienced as being melancholy and doleful also tends to make a peaceful, tranquil impression. The same applies to the relationship between factors I and II in the analysis of rating scales (P:  $r = 0.16$ ; M:  $r = 0.30$ ).

These correlations do not imply that the dimensions are not orthogonal (independent). The orthogonality is determined in the process of rotation. The correlation is probably mainly due to limitations in the sample of stimuli: few of the excerpts represent one dimension exclusively. (In the extreme case—a perfect linear correlation between the loadings in two factors—one factor would account for all the variance, but as long as there is a not inconsiderable amount of variance unaccounted for, it is preferable to rotate additional factors.)

## Summary

In an experiment on musical expression, 20 short excerpts were rated in 40 emotionally descriptive attributes. The correlations between rating scales and between the excerpts were submitted to factor analysis. Both analyses gave three factors, which could be accorded parallel interpretations. The dimensions were designated (I) DYNAMICS or TENSION/ENERGY. This factor stands for *level of activation, energy flow, intensity and tension* in the music (tense – relaxed, vehement – mild, aggressive – gentle). (II) GAIETY – GLOOM or degree of VIVACITY/LIVELINESS (light – dark, playful – doleful, glad – sad). (III) SOLEMN DIGNITY, which summarizes the impression of *pompous breadth, powerful magnificence and solemnity* (grand, majestic, solemn). No essential differences were detected between groups of subjects with different degrees of interest in and knowledge of music.

## Acknowledgements

This investigation was supported by a grant for ungraduated scientists at the university of Stockholm. The paper was translated from the Swedish by Mr Patrick Hort, M. A. I am indebted to Dr. Gunnar Goude for valuable discussions on the experimental and computational work and to Dr. Hannes Eisler for help and advice in programming problems and for placing some of his programs at my disposal.

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