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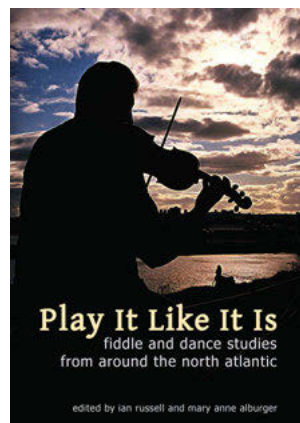
Play It Like It Is

Fiddle and Dance Studies from around the North Atlantic

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Making the music dance: dance connotations in Norwegian fiddling

JAN PETTER BLOM

Fiddle music traditions of the countries and peoples adjoining the North Atlantic/North Sea have several features in common. One of them is functional: they are all basically dance music. However, when comparing the Scandinavian and the other North Sea traditions, significant regional differences in style pertaining to patterns of rhythm and bowing are apparent. The hypothesis is that such stylistic dissimilarities are reflections of the music's functional relation to distinct – and equally dissimilar – folk dance traditions within physically adjacent areas. This assumption provokes/invites empirical questions central to my discussion: namely, how music is constrained and informed by the dance, and *vice versa*, and how fiddlers make 'dance-talk' on their instruments.

By implication, these questions are also relevant to the more general theoretical problem of meaning in music. This article, then, discusses briefly some methodological problems involved in dealing with these questions, and suggests a model for the analysis of the dance-music interface.¹ More specifically, this article focuses on the analysis of rhythm with particular reference to aspects of traditional Norwegian dance and fiddle music.

Translations of idioms

It is a well-known psychological observation that different perceptual domains and communications media might constitute unified systems of experience. (Compare the wealth of metaphorical associations in music theory and discourse.) In accordance with these observations my article is based on the assumption that a particular rhythm in one realm is translatable into another realm by analogy, which implies that rhythm, in the abstract, exists as a unified system of experience and deep-structural knowledge. For my purpose it is essential, therefore, to distinguish terminologically between the level of musical form, gestures, or figures on the one hand, and the level of content or conceptualization on the other.

The concept of rhythm

As Robert Walser rightly observes:

Rhythm has been particularly neglected in Western theories of musical meaning. This is usually explained in terms of the difficulty of generalizing rhythmic concepts except at the simple metric level. But it is also because it is in rhythm that the relationship of bodily experience to musical gesture is most apparent.²

Walser relates this to the general denial of the body in art music discourse due to the common fear of music's 'feminising' effect, one of sensual subversion to reason. For my purpose, his distinction between the level of musical appearances or figures (gestures) on the one hand, and the bodily experience-based concepts and meanings inferred from these gestures on the other, is in line with my way of thinking. However, for the purpose of empirical investigation the problem of definition remains.

Etymologically, rhythm (Greek: *rhythmos*) means flow (consider for example the English term *river*, the river Rhine and the Scandinavian verb *renne* or *rinne* means flowing, pouring, etc., and other derivatives). Human body movements, however, cannot flow like water. For anatomical and physiological reasons they consists of sequences of opposites: the regular *contraction: expansion* of the heart muscle, constituting the durational sequence of unevenly divided units (approx. 1:2-1:2-1:2 etc.), or the *expansion/contraction* of the lungs during relaxed breathing (approx. 1:1-1:1 etc.), are examples of elementary rhythms. An equally fundamental, but more complex, rhythm is the combined *sucking* and *biting* movements of the newborn baby.³ As shown by the curves below (see Figure 1) the sucking produces a wave-like rhythm while biting is angular. These different structures are nevertheless coordinated in the relationship of 1 against 3.

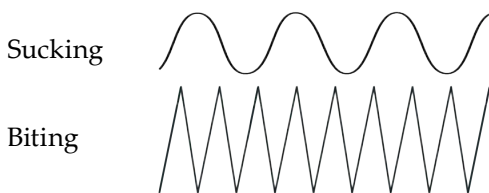


Figure 1 Sucking and Biting (after Bartenieff)⁴

Other binary contrasts constituting units of rhythm are movements like *bending versus stretching* and *twisting versus untwisting*. Depending on the moving body part, they generate moving shapes in different planes, and around vertical or horizontal axes, such as *up and down*, from *side to side*, *back and forth*, and actions like walking and running, pushing and pulling, and so on, the character of which depends on speed, weight, and force (intensity) variables and on whether the movements are direct or flexible. In this terminology there is a rhythm whenever these movement opposites

are performed recurrently at regular intervals, showing continuity and periodicity as if they are flowing. Rhythms in other words are built on contrasts performed in such a way that they appear or are experienced as continuous or flowing. By the same token, many actions and movements during daily activities are arrhythmic, whereas rhythms normally characterize the performance of repetitive movements or actions whether they 'come naturally' or represent naturally constrained adaptations to technological and/or artificial circumstances. On considering the background of common usages and definitions, particularly within fields like biology, kinetics, and psychology, I assume that the above conceptualisation of rhythm is far from surprising.

Because rhythms serve to economize mental energy they are felt to be relaxing and pleasant. Such rhythms are, furthermore, commonly appreciated as a rich resource for aesthetic experience and trance. As emphasized by Edward T. Hall, referring to empirical studies by W. S. Condon, R. L. Birdwhistell and others,⁵ synchrony (*'sync-ing'* or *'being in sync'*) is an essential, panhuman, often 'out of awareness', non-verbal communicational form in dyads or small groups. Being 'in sync' communicates good social feelings and togetherness and thereby serves to strengthen group bonds. 'Syncing' is, of course, more than just keeping time; it is about rhythm, it is about the syncing of swinging bodies having a particular dynamic quality, which, in Charles Keil's terms, is essential to participation, both in its literary and its metaphorical sense.⁶ Considering these social and psychological functions, it is no wonder that rhythms are important expressive means in art and ceremony.

The problem of representation

In my view the character of particular rhythms, as defined above, depends on three aspects or independent variables:

- 1 Frequency (i.e. tempo)
- 2 Relative weight
- 3 Structure: the system of time/force relationships within the flow

Thus the wave-like versus the angular rhythms of the sucking-biting baby are analogical representations of different rhythmic structures, namely metres.

In music theory, rhythm is rarely conceptualized and studied in these terms. More often, and mainly related to conventions of musical notation, rhythm is defined as everything pertaining to the segmentation of time in contrast to melody and harmony. This applies both with regard to sequences of single tone values as well as to groupings of tones at different levels, irrespective of the principles by which they are inferred and given bodily significance. Consequently, groupings of tone values defined in terms of metre tend to be inconsistently applied by composers as well as transcribers of folk music. For example, according to conventional notation a march moves in 4/4 metre, which obviously denotes melodic groupings and their articulation, but has absolutely no significance with regard to the regular distribution of rhythmic accents. Characteristically all beats in a march are inferred

and intended to be equally emphasized (since marchers are not supposed to be limping along with different weight on each foot in a sequence of two or four steps). Confusing melodic and rhythmic groupings are actually quite frequent in musical notation. Metrical signatures, therefore, do not consistently serve to distinguish experientially significant differences and similarities with regard to the structure of rhythms.

Let me expand this point by referring to two ways of representing the Scandinavian *reinlender* or *scottish*, a well known couple dance introduced during the nineteenth century. Commonly the music is written in 2/4 metre (M.M. $\frac{1}{4} = +/-70$). The traditional fiddler, however, puts equal stress on each quarter note; the metre should therefore rather be written in 2/8. Furthermore, the fiddler actually tends to play with unevenly divided beats (2:1 or 1:2), which means that the 2/8 should preferably be changed to 6/16 metre (see Figure 2).



Figure 2 The metre of the *reinlender* or *scottish* as notated (2/4) and as played (6/16)

The 6/16 style of playing conforms to the rhythmic oscillations of the dancers' centre of gravity (see below), the content of which is the patterned consecutive stretching and bending leg movements while performing the typical steps of the *reinlender*.

In spite of the apparent inadequacies of the notation, fiddlers who play from the score still unconsciously perform the *reinlender* with the correct swing; it comes naturally because fiddlers have an internalized knowledge of the rhythmic character of the dance. The general lesson here, essential to my theory, is that rhythm largely belongs to the field of tacit and embodied knowledge based on motor experiences.

Principles of analysis

The perspective on music-dance interface advocated above is founded on what can be labelled a motor theory of musical rhythm, for which I find support among philosophers like Klages,⁷ musicological phenomenologists like Becking and Steglich,⁸ and experimental psychologists like Stetson, Isaachs and Fraisse.⁹ The theory implies the assumption that culture specific movement styles of a social group represent shared kinaesthetic experiences embedded in its musical forms of expression, thus constituting the implicit and shared background knowledge from which socially appropriate rhythmic actions/reactions are generated.

Norwegian and other Scandinavian traditional couple dances are basically locomotory. Kinesiology informs us that human locomotion is based on the

alternation between *stretching* and *bending* movements of the weight carrying leg (synchronized rotational movements around the hip, knee and ankle joints) acting on the body's centre of gravity. Continuity, periodicity, or flow generates simultaneous oscillations in three-dimensional space. According to Steindler the combined up-down, forward-backward oscillation represents approximately 95% of total energy expenditure per step.¹⁰ Of this the vertical component expends +/- 70% depending on movement style. These considerations therefore justify the application of a model, which depicts the *structural aspect* of a particular rhythm, that is, *metre*, as curves representing movements of the body's centre of gravity as functions of vertical space or amplitude (*s*) and time (*t*).

Figure 3 presents empirical models of two dance metres, that is, the normal elastic gait and the traditional Norwegian waltz respectively. For the purpose of structural comparison the curves are represented in the form of straight lines. The horizontal dotted line represents the neutral level, that is, the ordinary upright position with straight legs. Capital letter **A** (Greek: *arsis*) is chosen to represent the movement up and the letter **T** (Greek: *thesis*) to represent the movement down. All rhythmic structures in the vertical dimension, therefore, constitute cycles based on the two-phasic |T:A| movement, that is, a wave or swing constituting a complete cycle and natural element of a rhythm. This element can preferably be called a 'beat' in the context of contrasts between such elements within a metre. Although contributing to the character of the flow in terms of their duration and speed, the significance of each particular movement phase (**T** or **A**; 'down-beat' or 'up-beat') depends on its immediate environment of opposites within the syntagmatic chain.

For the purpose of further description the colon [:] is used consistently to signify the relation [T:A] in contrast to the bar [|] which stands for the relationship [A|T]. Parallel bars refer to the rate of movement speed or accent [A||T]. By maintaining the meaning of the colon and bar the contextual positions of A vs. T can be replaced by signs representing related events such as musical notes or numbers referring to the segmentation of time, and so on.

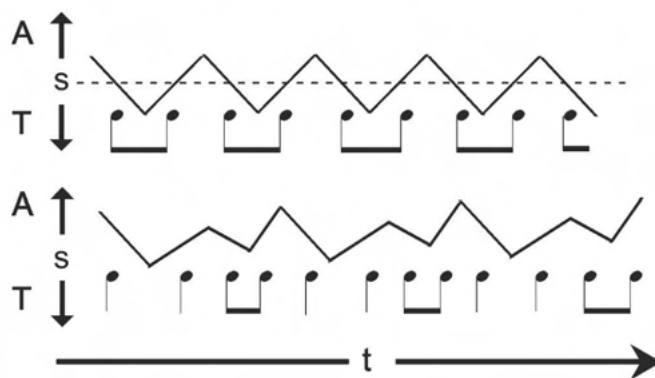


Figure 3 Two dance metres: the normal elastic gait and the traditional Norwegian waltz

Note that models based on these principles of representation are:

- 1 Homologues with observable empirical events
- 2 Combine the *digital* either/or coding with that of analogy or continuity
- 3 Signify qualitative differences and similarities between units making up a structure in terms of greater than/smaller than
- 4 Secure both the uniqueness of the description and its comparability

Each curve of the model shows significant differences and similarities between the movement phases in terms of their relative duration, amplitude (above or below the zero line) and speed (s/t relationships), which constitute the characteristic |T:A| elements and their combinations. The difference between the gait and the waltz is most striking. Whereas the gait represents a *simple rhythm*, in which the structural element |T:A| equals the *unit* of rhythm, that is, the period or cycle of a rhythm or measure, the waltz unit of rhythm are periods (measures) of two heterogeneous elements ($3/4 = 2/4 + 2/8$), and represents what I prefer to call a *compound rhythm*: || T: A | T:A || = || 2:2 | 1:1 || (see Figure 4).



Figure 4 The waltz represented as a compound rhythm

In my view the fiddle music associated with this kind of waltzing signifies its rhythmic structure and tempo (M.M. $\frac{1}{4} = \pm 165$), the reason why it is experienced to be specific in character and easy to distinguish from, for example, the Viennese waltz.

Dancing 'with' the Hardanger fiddle

In some respects Norwegian folk music displays striking uniqueness in rhythm, tonality, and structure, the result of diverse local processes of fusion of new musical ideas with older, indigenous musical idioms. This is particularly true for the Hardanger fiddle music, associated with traditional courting and athletic dances, which survived the influence of the dominant waltz and polka genres of the eighteenth and nineteenth centuries.

The Hardanger fiddle (*hardingfele*), mostly used in western Norway and the central mountain valleys east of the high mountain range, differs from the violin with regard to essential features such as sympathetic strings, short neck, and flat fingerboard and bridge. In addition to the sound of the sympathetic strings, the peculiar harmonic and tonal character of the Hardanger fiddle music is mainly achieved by the application of a movable drone technique where all four strings, both open and stopped, serve as drones below or above the melody.

Within the Hardanger fiddle area the earlier couple dances in duple-time (2/4 or 6/8) are called *gangar* (*halling*) and *rull* and those in triple time (3/4) are called

springar. Such definitions in terms of duple and triple time are conventional but limited. In contrast to the common binary form of four-bar phrases, the architectural form of the fiddle tunes is frequently based on the sequencing of different repeated and transformed two-bar motifs, the tonality of which is ‘modal’ or non-harmonic in character. Furthermore the tunes also display characteristic and predictable cycles of bowing (see Figure 5).



Figure 5 ‘Håstadbøen’, a *gangar* tune from the Hardanger district¹¹

The various dances form integrated patterns of locomotion and co-operational interchanges between partners. Movements and postures are based on, exaggerate, conventionalize and transform the character of the normal floating gait. The flow of stretching and bending movements of the weight carrying legs show socially significant variability, both with regard to genre and local/regional styles. Dance movements are continuous without significant breaks or changes in metre or tempo and dancers combine few or many different step-figures into larger patterns depending on skill, mood, and circumstance. The structural and expressive emphasis on sexual dichotomy and complementarity, that is, male exhibitionism versus female modesty and reserve, is a major reason for classifying these dances as members of the historical courtship dances (German: *Werbe-Tänze*).

Metrical asymmetry in music and dance is a typical feature of the compound *springar* rhythms to the east of the central mountain ridge of South Norway, which separates the eastern from the western region where the *springar* dances display simple rhythms. Asymmetry varies predictably in such a way that any shortened beat is inversely proportional to the lengthening of the subsequent beat. It tends to cluster around the proportions 5:7.6, but is never and could not possibly be counted by the performers; they are matters of adaptation and feeling and cannot be reduced to precise quantitative relationships within a measure.

Metrical asymmetry is universal for districts to the east and variation in tempo is relatively insignificant. The behavioral style, however, and in particular the organization of the fundamental components of body movements from which rhythmic structures are generated, varies significantly between neighbouring communities.

Figure 6 compares three different local dance metres in accordance with the principles of representation discussed above. For the sake of comparison between items, variation is shown against the background of a set of invariant patterns: an arbitrary distribution of counts (1–3), their relative duration and typical closing formula of the music, which apply irrespective of local traditions.

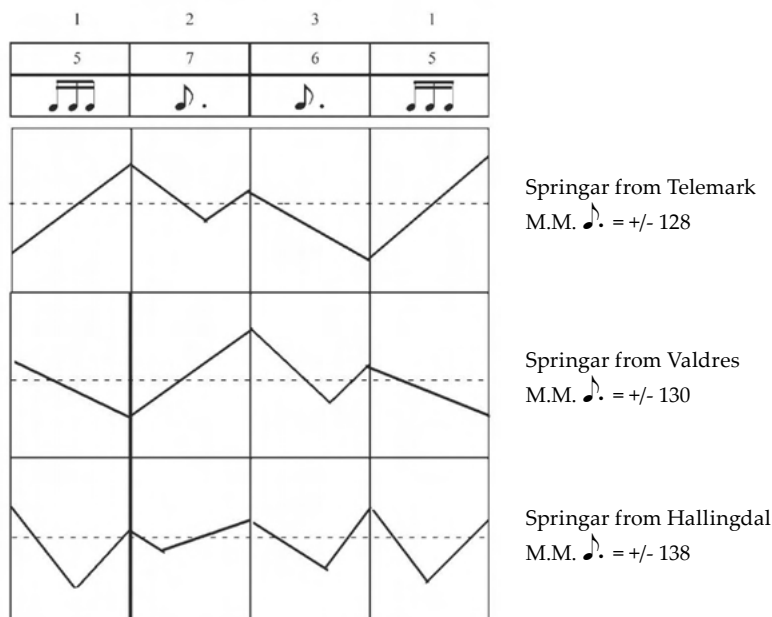


Figure 6 A comparison of three different local dance metres

Two of these, the *springar* from Valdres and from Telemark counties, have two beat measures, but are otherwise quite different structurally. The *springar* from Hallingdal on the other hand has measures of three beats, | T:A | x 3, in which the beat on count 2 is exceptionally light. In comparison the *valdres-springar* has a very marked *arsis* effort on count 2, in contrast to the *tele-springar* with its characteristic accentuated *arsis* on the short count 1 and a |T:A| structure on count 2.

Musically the variation in terms of local styles seems insignificant. Motifs, bow phrases and form are widely shared across regions and local communities. Nevertheless local/regional styles of playing are considered socially significant and the local identity of performed items are easily recognized by the competent listener, seemingly without any particular contextual information. The significance of small differences in stylistic quality is confirmed by the fact that fiddlers have difficulties in acquiring competence in more than one local style. From my experience, it seems that the identification of a particular local style depends on three sets of partly redundant variables:

- 1 Duration
- 2 Fiddlers regular foot beating accompaniment
- 3 Speed of bowing

The model shown in Figure 7 represents rough estimates of differences related to the distribution of these variables for the three different *springar* styles. The rhythmic character of the respective dances are represented in terms of a) the distributional relationships between beats, durations and movement phases, and b) the distribution of *accent vs weigh* variables, which are kept analytically distinct.

	Music			Dance		
Counts:	1	2	3	1	2	3
Duration:	5	7	6	5	7	6
Bowling speed:						
<i>Telespringar</i>		<	^>:< >			A ^TA T
<i>Valdresspringar</i>	^<	>	><	^T	A	TA
<i>Hallingspringar</i>	^>:<	>:<	>:<	^TA	TA	TA
Foot beating:						
<i>Telespringar</i>	[w]	s	s/m			
<i>Valdresspringar</i>	s	m	[s]			
<i>Hallingspringar</i>	s	[w]	m			

| - marks the separation between beats;
 ^ - accent, i.e. the most prominent beat in terms of sudden stress or force;
 || - weight, i.e. the heaviest beat, i.e. containing the largest flexion of the leg;
 s = strong; m = medium; w = weak; [] = occasionally skipped.
 increasing [<]; decreasing [>].
 (The system of notation is tentative and just partly adequate.)

Figure 7 Estimates of differences for *springar* styles

For example, the relationship <|^> in *Telespringar* indicates that the bowing on the upbeat (A), although initially light (see the foot beating), is increasing in speed towards the heavy downbeat (T) and is generally heavier than the upbeat in the context <||>. In contrast to these structures, the bowing on count 2 (upbeat) in *Valdresspringar* is initially heavy, but has a marked decrease in speed towards the following downbeat.

Discussion

The model above is hypothetical, based on my own practical experience combined with casual observations. Tentatively it might serve the purpose as an 'ideal type', which is more or less adequate depending on musical circumstances. I do not claim, however, that the fiddler's music always and thoroughly contains analogous representations of dance rhythms. The interference of other musical factors is likely to blur or even counteract the expression of dance rhythms: patterns (cycles) of bowing have their own logic and serve both technical, mnemonic, and melodic

functions. Thus stress related to the bowing technique as well as to melodic and harmonic articulation, might interfere with the rhythmic accents.

However, when considering the musical performance as a whole the conveyed information about dance rhythms seems to be quite redundant (patterned). Consequently there will always be sufficient clues present at any particular time. For example, there seem to be significant co-variations within local styles between the distribution of tone values at the micro level and the pattern of accents described above; and furthermore, whereas bow phrasing motifs are widely distributed cross-locally, tentative surveys of the material indicate local preferences with regard to the selection of such motifs in the context of compound patterns or cycles. Figure 8 shows two closely related *springar* tunes, which illustrate what I consider typical contrasts and co-variations, and hence redundancies, within the system.



Figure 8 Two closely related *springar* tunes: a) Telemark (*Nisien*) and b) Valdres (*Fagerdalen*)¹²

From my point of view there are good theoretical reasons why such redundancies seem to be prevalent. Since the musical sound products, including the audible foot beatings, reflect (signify) different but simultaneously executed bodily actions, major rhythmic dynamic discrepancies between these movements are not expected. On the contrary, experimental research in biology¹³ and several studies of the relationships between speech and body movements¹⁴ show that different rhythms of the body tend to be in synchrony and hierarchically coordinated (see Figure 1). Referring to the theory of the neurophysiological unity of the organism, 'self synchronism' is considered normal and by implication the lack of rhythmic coordination is taken to signify mental disturbances. We therefore have reasons to believe that rhythmic structures are likely to be conveyed both through the audible foot beatings as well as the sound of the fiddle, since these sources of information by and large can be expected to be in synchrony. In addition, when emotionally involved in the dance situation, fiddlers tend to generate accompanying body movements (German: *mitbewegungen*)¹⁵ that are homologous to the swinging rhythm of the dance. Furthermore, whenever the music inspires the dancer, whenever the dance situation is a groovy experience in terms of real *participation*, there seems to be something to the music, the patterns of bowing, ornaments and 'micro rhythms' as performed, which can be phrased in terms of 'discrepancies'¹⁶ between the dynamic rhythmic profile of the music on the one hand and the sequences of beats on the other, that is, between the continuities and discontinuities as coexisting aspects of the rhythmic

structure. The aesthetic experience of a rhythm, in other words, depends on what happens between the beats.

Concluding remarks

The argument and analyses above are intended to demonstrate an empirical case where music and dance rhythms are non-arbitrary and mutually translatable structures based on analogies. Generally such systems can be expected whenever we are facing a densely integrated folk culture.

The paper might have left the false impression that I consider the fiddlers' performances to be planned acts of communication or conscious adaptations to the dancers' movements. It is true that communication takes place at a certain level. The fiddlers act in the role as leaders, controlling the tempo and the duration of the dance. They are concerned with synchrony but are not expected to make adjustments for the benefit of those who eventually do not keep pace with the music. Both fiddlers and dancers communicate by giving certain reciprocal signals of appeal demanding the emotional responses of the other party. The fiddlers demand adequate responses to their music and find it pleasing and inspiring whenever the dancing bodies are swinging in synchrony with their music. The reason why their music works in the group, however, is by and large not under conscious control. The music generally, and its rhythmic structure in particular, are expressions of embodied and tacit knowledge which are not accessible to manipulation for communicational purpose. 'Intentions' are immanent and basically therefore the fiddler is giving *off* information rather than communicating. In other words, the fiddler's function and position in the group depends on total involvement in the music, embracement of his/her role as an artist, and the fundamental ability to make the music dance.

Notes

- ¹ Jan Petter Blom, 'Diffusjonsproblematikken og studiet av danseformer', in *Kultur og diffusjon; foredrag på nordisk etnografmøt 1960*, ed. Arne Martin Klausen (Oslo, Bergen: Universitetsforlaget, 1961), pp. 101–14; Jan Petter Blom, 'Principles of Rhythmic Structures in Balkan Folk Music', *Antropologiska Studier (Ethnomusicology Issue)*, 25–26 (1978), 2–11; Jan Petter Blom, 'The Dancing Fiddle: On the expression of rhythm in Hardingfele slåtter', in *Norwegian Folk Music I: Slåttar for the Harding Fiddle*, Vol. VII, ed. Jan Petter Blom, Sven Nyhus, and Reidar Sevåg (Oslo, Bergen, Tromsø: Universitetsforlaget, 1981), pp. 305–312; Jan Petter Blom and Tellef Kvifte, 'On the Problem of Inferential Ambivalence in Musical Meter', *Ethnomusicology*, 30, no. 3 (1986), 491–517.
- ² Robert Walser, *Running with the Devil: Power, Gender and Madness in Heavy Metal Music* (Hanover NH, London: Wesleyan University Press/University Press of New England, 1993), p. 48.
- ³ J. S. Kestenberg, 'The Role of Movement Patterns in Development I–III', *Psychoanalytic Quarterly*, 34 (1965), 1–36, and 36 (1967), 356–409.
- ⁴ Irmgard Bartenieff with Dori Lewis, *Body Movement: Coping with the Environment* (New York, London: Gordon and Breach, 1980).
- ⁵ Edward T. Hall, *Beyond Culture* (New York: Anchor/Doubleday, 1976), Chapter 5.

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- ⁶ Charles Keil, 'Motion and Feeling through Music' and 'Participatory Discrepancies and the Power of Music', in *Music Grooves*, ed. Charles Keil and Steven Feld (Chicago, London: University of Chicago Press, 1994), pp. 53–77.
- ⁷ See Ludwig Klages, *Vom Wesen des Rhythmus* (Kampen auf Sylt: Niels Kampmann Verlag, 1934).
- ⁸ Gustav Becking, *Der musikalische Rhythmus als Erkenntnisquelle* (Augsburg: B. Filser, 1928); Rudolf Steglich, *Die elementare Dynamik des musikalischen Rhythmus* (Nuremberg: University of Erlangen, 1930).
- ⁹ R. H. Stetson, 'A Motor Theory of Rhythm and Discrete Succession', I & II, *Psychological Review*, 12 (1905), 250-269, 293-335; Elcanon Isaacs, 'The Nature of the Rhythmic Experience', *Psychological Review*, 27 (1920), 270-299; P. Fraisse, *Les Structures Rhythmiques* (Louvain, Paris: Publications Universitaires de Louvain, 1956).
- ¹⁰ Arthur Steindler, *Kinesiology of the Human Body* (Springfield, Illinois: Thomas, [1955]).
- ¹¹ From Blom et al (1981), p. 199.
- ¹² From Blom et al (1981), pp. 55 and 53.
- ¹³ E. von Holst, 'Die relative Koordination als Phänomen und als Methode Zentralnervøser Funktionsanalyse', *Ergebnisse der Physiologie*, 42 (1939), 228–306.
- ¹⁴ See Albert E. Scheflen, 'The Significance of Posture in Communication Systems', *Psychiatry*, 27, no. 4 (1964), 316-331; A. T. Dittmann, 'The Body Movement: Speech Rhythm Relationship as a Cue to Speech Encoding', in *Nonverbal Communication: Readings with Commentary*, ed. Shirley Weitz (New York, London: Oxford University Press, 1974), pp. 169–81; William S. Condon and W. D. Ogston, 'Cultural Microrhythms', in *Interaction Rhythms: Periodicity in Communicative Behavior*, ed. Martha Davis (New York: Human Sciences, 1981), pp. 53–77.
- ¹⁵ See F. J. J. Buytendijk, *Allgemeine Theorie der menschlichen Haltung und Bewegung* (Berlin: Springer, 1956); Steglich (1930).
- ¹⁶ Keil (1994), pp. 53-77.