

TOWARDS THE STUDY OF EMBODIED METER IN SWEDISH FOLK DANCE

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ABSTRACT

The interrelation of playing and dancing is central for understanding performance practice in Swedish folk music, as it plays an important role for the metric and rhythmic qualities of *spelmansmusik*, and playing for dancing is considered a key competence for musicians in this tradition. As part of a research project into performance practice, sound, video and motion capture (MoCap) data were recorded from live performances of three musicians and two dancers in different combinations. In addition, dancing to two recordings by an influential musician and to live and pre-recorded beat clapping was recorded.

This paper incorporates measurements and visualizations of performance data in combination with performer participation and interviews. As a starting point for our project, we focus on metric qualities in a historical recording, and on the dance movement patterns to a Swedish polska style with asymmetrical beat patterns. For this paper - as a preliminary investigation into the material - the recordings of one dancer dancing to an isochronous clapped beat, and to a recording by an influential player have been used for comparison of a central movement pattern in dancing. The findings show that asymmetric beat patterns contained in the recording cause wider variation among the movement patterns when compared to the patterns observed to isochronous clapping. Considering the performers reactions towards using MoCap as a tool for viewing and discussing their performances, we propose further investigations by combining scientific, ethnomusicological and artistic research methods into the research of performance practice in folk music.

1. INTRODUCTION

Triple-meter music forms like the Swedish polska and the Norwegian springar/pols/springleik are central in folk music and dance traditions in the Nordic countries. In Sweden, historical references to "polish dances" date back to the 16th century (Gustafsson, 2016) and these music and dance forms have been a main focus for collectors and researchers of folk music. The term *polska* encompass local substyles and variations, but can for the common variant of *rundpolska* generally be described as a couple dance in triple time including two parts: *försteg*, most commonly a couple walking forward side by side, stepping on beat one and three, and, second, *omdans* (turning), where "the couple is rotating clockwise around its own axis and at the same time anti-clockwise around the room" (Nilsson, 2017). In this, one turn of the clockwise rotation is completed over one measure.

Research on meter and rhythm in polska and related music - including some suggestions for typologies for music and dance types - took into account various aspects of

music and dance: patterns of metrical markings, rhythmical variations, melodic rhythms, articulations and dance movements of the different styles. Styles that include asymmetric beat patterns, like some Swedish polska styles and Norwegian springar/pols/springleik styles have attracted special attention (Sandvik, 1943; Groven, 1971; Ahlbäck, 1989; Kvifte, 1999; Blom, 1993; Johansson, 2009; Haugen, 2017). Johansson (2017) discusses empirical research approaches on asymmetrical rhythm including suggestions for future research and points at the lack of measurement and analyses of different styles, different performers and situations (e. g. playing for dancing) and the lack of experimental studies including the performers view on dance interaction, timing, synchronization, learning practices etc.

Ahlbäck (1986, 1989) has formulated a Folk Music Theory approaching meter and rhythm in Swedish folk music, which has been a major contribution for the emerging folk music educations in Sweden (Ahlbäck et al., 2009). Ahlbäck (2003) discussed asymmetric beat in the polska, with reference to folk music collector Einar Övergaard's (1871-1936) ambiguity on where to place the downbeats in his notations of asymmetric polska tunes in Elverum, Norway (Övergaard & Ramsten, 1982). Ahlbäck exemplified how different metrical interpretations can be achieved by ways of articulation and foot-tapping and discussed asymmetric beat patterns in relation to melodic/rhythmical structures in some early Swedish and Norwegian polska recordings.

The Norwegian ethnomusicologist Blom's pioneering approach to draw curves depicting the typical patterned libration of the body's center of gravity (*sviktkurva*) in different dances, is a well-established concept among folk dancers and folk dance researchers in the Nordic countries. Libration patterns for various Norwegian folk dances were illustrated in Blom (1993). These were obtained from Blom's observations - as an experienced fiddler and dancer - of step combinations and the oscillations of rising and falling movements (*thesis and arsis*) in the different dances.

Haugen (2017) used Motion Capture (MoCap) recordings of Norwegian *Telespringar* performances to explore the relation in time between vertical oscillation periods - libration curves - obtained from markers on the dancers hips with the foot-tapping and body movement of a *hardingfela* (fiddle) player. Haugen found a stable correlation between the foot-tapping of the player and the libration curves of the dancers which was taken as an indication of a

shared embodied asymmetric meter (long-medium-short). Haugen also showed that the local minima and maxima points of the librations were not in synchronization with the foot-tapping. From this Haugen suggested a modified libration curve for Telespringar, similar in shape but shifted in relation to the beats compared to the one suggested by Blom (1993) - which had the local minima and maxima points aligned with the beats. Another approach was used by Mårds (1999), where, as described by Haugen (2014), dancers were recorded with MoCap while at the same time moving on force plates used to measure the weight pressure of the steps. The player's foot tapping was also registered by a pressure mat but no sound was recorded. This showed similar results for the shape of libration patterns as Haugen (2017) and Blom (1993). Bakka (2014) suggested further comparisons of pressure measurements with libration patterns to determine how these correspond to the perception of musical beat in the dance. Naveda & Leman (2010) have suggested a topological analysis for representing spatiotemporal relations of dance and music gestures in some popular dance forms.

Haugen (2017) showed that MoCap recordings can offer a useful analytical approach to meter and body movement in Telespringar. However, MoCap studies of other styles, including *polska*, remain yet to be presented. As an additional difficulty, whereas Haugen assumed that the libration pattern remains constant throughout the performance, this is likely not to hold for polska styles with two-part structures and with a larger variance to the degree of beat asymmetry.

The present study focuses on a style of polska historically connected to players and dancers from the region of Orsa in Dalarna, Sweden. The fiddle player Gössa Anders Andersson (1878-1962) is a central influencer for this style, as indicated by the large number of published recordings (Musica Svecia, 1999; Andersson et al., 1998; Musica Svecia, 1995) and notations (Andersson, 1922; Forslund, 1921) with him as performer. Filmed recordings of the dance *Orsapolska* covering a time period of 1947-2000 have been presented in Norman et al. (2000) among which a silent film of Gössa Anders playing for dancing in 1947 is a key influence for the performers in this study. These films offer interesting examples on how performances of Orsapolska have varied, for instance, with the tempo being considerably lower in the later recordings. The beat patterns in Orsapolska are often asymmetric, but in a different way than the Telespringar: the beat patterns in Gössa Anders' playing have been shown (Ahlbäck, 1989) to fluctuate between two main beat patterns, one symmetric (three isochronous beats) and one asymmetric (short-long-medium). Ahlbäck (1989) has suggested the use of additive time signatures of 9/16 to express these two patterns in music notation: 3+3+3/16 and 2+4+3/16, respectively. These categorizations of beat patterns should not be regarded as a prescription of precise beat proportions over time, but rather as perceived categorical proportions between beats, where in the asymmetrical beat pattern the short first beat being roughly half the duration of the second beat. These con-

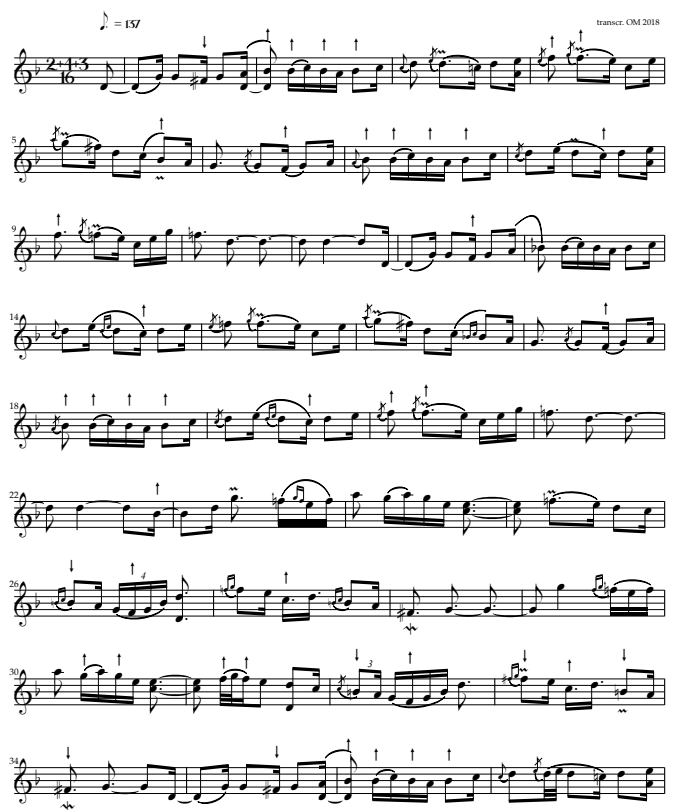


Figure 1: Lorikpolskan played by Gössa Anders, first round.

ceptual categories are mirrored in music notation, as exemplified in Figure 1, and relate directly to the categorical successive note durations. Kvifte (1999) and Johansson (2017) questioned the use of the beat ratio of 2:4:3, arguing that it would cause an adaption to a oversimplification of the asymmetric beat structure among musicians in the tradition. This would not hold unless musicians used notation as their only source for interpreting the music, and not as Ahlbäck (1989) suggested, in combination with other approaches to musical meter. It could also be questioned whether such alleged changes in tradition should be ascribed to notation systems or for example the emergence of new cross-genre ensemble forms (introducing instruments new to the tradition, like percussion and plucked string instruments in accompaniment functions).

2. RESEARCH MOTIVATION

Strategies, tools and methods for learning the skills of dancing and playing for dancing have for a long time been developed in the teaching of performance practice¹, however much of this remains tacit or oral knowledge. This paper is the beginning of a dissertation project on the interaction of musicians and dancers as one key element in performance practice of traditional Swedish folk dance tunes, (*spelmansmusik*). The project is part of ongoing research on performance practice in Swedish folk music where the performers' understanding, knowledge and skills are cen-

¹ One example in compulsory courses on dancing and playing in Folk Music Programs at Kungl. Musikhögskolan, Stockholm

tral for enabling a deeper understanding and formulation of knowledge. This is attempted by the researchers themselves being participants as performers and by performers contributing to the analysis of their own performance recordings. The aim is to formulate tools and concepts for performance practice that will be evaluated through situated performance practice: in teaching situations and by extension in performance situations involving music and dance interactions. Thus, the larger objective of gaining knowledge on performance practice is approached through a combination of scientific, folk music theoretical, ethnographic and artistic research methods.

In this project, experimental methods based on MoCap analysis are applied for measuring and analyzing performance and interaction parameters in combination with performer interviews. This paper presents only a small part of the collected body of experimental data, in a preliminary comparison of the dance movements of one dancer in two different settings, with the purpose to explore analysis methods for further use in the research project. The basic questions that we will address this way are:

1. How far do the libration patterns differ between the two phases (walking, turning) of the dance?
2. What are the timing characteristics of the non-isochronous beats in the recordings?
3. What insights can be obtained from libration patterns of a dancer, when dancing to a static recording with strongly varying beat patterns?

In the following, we describe the complete data collection process in Section 3, and provide subsequently preliminary results from an analysis of part of the obtained data in Section 4.

3. METHODOLOGY AND DATA

For the recording sessions, an experimental setup similar to Haugen (2017) was applied. Two dancers and three musicians were recorded in five different musical setups (described below). The recordings were made in the PMIL-studio at KTH, using an Optitrack Motion Capture recording system² of 16 infra-red cameras recording at a frame rate of 120 frames/second. The motion data were saved together with an aligned sound recording from the room. All sessions were in addition to this filmed with two cameras. The participating dancers were Ami Dregelid and Andreas Berthold, both teachers at the School of Dance and Circus, Uniarts, Stockholm (DoCH) and the Royal College of Music in Stockholm (KMH). The musicians were Erika Frisell, Sven Ahlbäck and Olof Misgeld - all teachers at the Department of Folk Music, KMH. All dancers and musicians are experienced performers and familiar to the style.

² <http://optitrack.com>

3.1 Setups

1. The first setup had each dancer dancing solo to a track of looped beat claps. The loop was constructed from three slightly different sounding claps, providing an isochronous three-beat cycle at 138 BPM, the mean tempo of the two recordings with Gössa Anders used in setup 3. The dancers were asked to dance in two different ways for the different takes - one time only walking (försteg) and the second time with turning (omdans).
2. The second setup had each dancer dancing solo to a clapped beat, this time performed live by a musician. The tempo was steady but affected by the interaction as the musician was watching the dancer during the take. The dancers were asked to do both walking and turning as they liked.
3. The third setup had each dancer dancing solo to two recordings of Gössa Anders: Lorikspolskan and Polska efter Pellar Anna³. Also here the dancers were asked to vary the dance movements between walking and turning.
4. The fourth setup had each dancer dancing solo to each of the three musicians. The musicians were all playing the same two tunes as in the recordings with Gössa Anders. Here, the dancers and musicians were instructed to play and dance well together as they would normally do, which then included both walking and turning in the dance.
5. Finally, the two dancers were dancing as a couple to each musician, walking and turning together - the most typical way to dance polska.

The purpose of these different setups was to get a set of data for comparing the correlation of dance movements to music in takes that, (a): did or did not involve non-isochronous beat patterns, (b): did or did not involve musical context apart from beat markings (clapping), and (c): did or did not involve the interaction between musician and dancer(s). In this paper, a preliminary study of a small part of this dataset is presented, focusing on the second and the third setup. This choice is motivated by the goal to document the typical libration patterns of the dancers in the second setup, and the comparison of these patterns with the ones that emerge from the dance to a recording.

3.2 Annotating the music

The two tunes by Gössa Anders were manually annotated with beat times using Sonic Visualizer⁴. Beats were placed by listening for the articulation, (bow turns and/or ornamentation) and moving the marker to the start of each note considered to correspond to a beat. The basis for these annotations were the transcriptions of the pieces using the notation software ScoreCloud⁵ (Figure 1 shows one example). The beat patterns in the two polskas played by Gössa Anders are, as shown by Ahlbäck (2003) and Johansson (2009) non-isochronous, and the proportion of each beat within each bar varies. Using Ahlbäck's model of two main

³ First recorded in 1950 (Andersson, 1950), re-issued on CD (Andersson et al., 1998)

⁴ <https://www.sonicvisualiser.org>

⁵ <http://scorecloud.com>

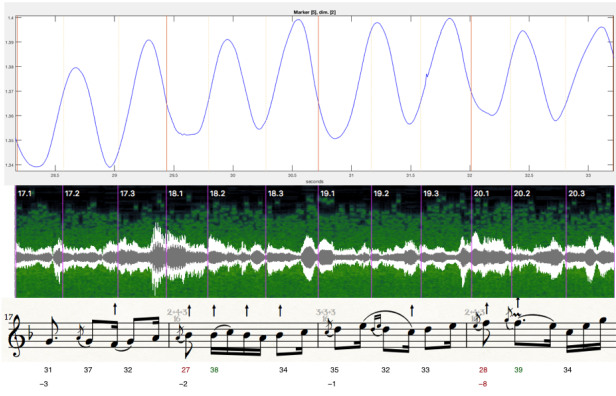


Figure 2: Libration pattern, sound envelope and music notation. Rows of numbers below show beat proportions and measure length deviations from the mean.

beat patterns all bars were classified into two categories, determined by the proportion of the first beat to the bar length, as described in Section 4.1.

3.3 Categorization of the dance

The dance varies between sections of walking and turning. Walking sections mostly include stepping on the first and third beat, with the left foot on the first beat, (in some parts stepping with the right foot on the first beat). Turning sections include turning with steps on the first (left foot) and third beat (right foot) and turning with stepping on the second (left) and third beat(right). The different sections were classified into the below categories, of which 1 and 2 are used in the following comparison in this paper. This is motivated by them being the most common movement patterns in the dance.⁶

1. Walking, beat 1 left foot, beat 3 right foot.
2. Turning, beat 1 left foot, beat 3 right foot.
3. Turning, beat 2 left foot, beat 3 right foot.
4. Other less frequent variations of the above.

The classifications are made to allow comparison of marker movements between different sections of the dance.

4. RESULTS

Figure 2 illustrates an example of the time series obtained from the data collection. In the upper part of the Figure, the vertical curve obtained from the marker of the dancer's upper back is plotted aligned with the beat annotations. The notation of the performed tune is provided in the lower part. Watching the libration in the upper part of the body of a dancer is a common approach among dance musicians, which motivated our particular choice regarding the selected marker. The depicted case, however, illustrates dance to a recording, and not a live music performance.

⁶ A small sample of the libration pattern from category 3 is depicted in Figure 2 and differs by containing two oscillation periods per measure instead of - as in 1 and 2 - three.

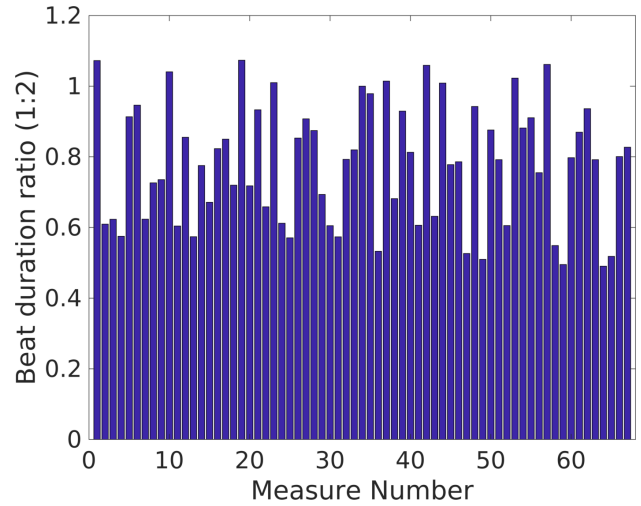


Figure 3: The ratio between the first and second beat duration in Lorikspolskan played by Gössa Anders.

In the example, measures 2 and 4 have a shorter first beat as reflected in the notation. Nevertheless, the libration patterns remain more or less constant throughout the measures of the depicted example. This implies that in this short example no musical interaction between the beat asymmetry in the recording and the dance could be observed. We will now further explore this relation between beat asymmetry and libration patterns.

4.1 Asymmetric beat in the playing of Gössa Anders

The plotted ratio between the beat duration of the first and second beat in Figure 3 confirms the variation in beat lengths of Gössa Anders' playing. As shown, a large proportion of the first beats align at around 0.6 of the length of the second beat, close to the 2+4+3 group suggested by Ahlbäck (1989). Other measures group around a larger ratio, however smaller than 1, and therefore not precisely isochronous. In Figure 4 the categorical classification of beats in two patterns is plotted in a boxchart. The threshold value to divide between 2:4:3 and 1:1:1 has been placed in the middle, at a bar proportion of 28 percent for the first beat. The chart in Figure 4 - which can be considered as a summary of Figure 3 - confirms a large frequency combination of a shorter first beat with a longer second beat, and the slightly shorter first beat in the supposedly isochronous class. Further recordings by Gössa Anders need to be examined to see if this is a general characteristics of his style.

4.2 Libration patterns

The attempt has been to show the libration pattern of the center of body gravity from the dancers, as an indication of the embodied metric patterns (Haugen, 2017; Blom, 1993). To this end, the y-direction of the marker placed on the upper back between the shoulders of the dancers was selected for plotting. The patterns of the libration in walking and turning are depicted in Figures 5 and 6, for setups 2 (claps) and 3 (recording), respectively. The subfigures depicting walking and turning differ regarding their shape in both

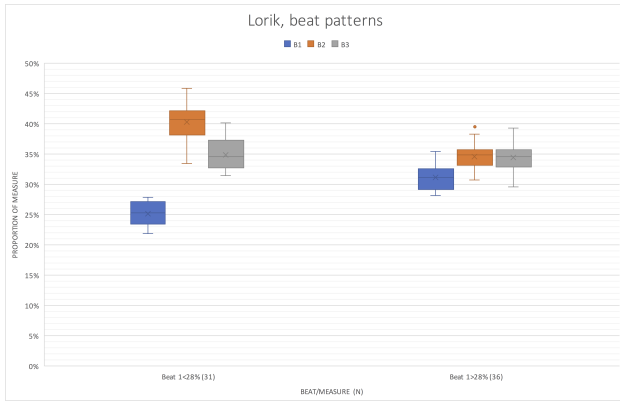


Figure 4: Beat proportions in Lorikspolskan, divided in accordance with the notation, in two beat patterns.

setups. Both figures from walking display a steady pattern of three oscillation periods within each measure, with the deepest points close to the first and third beat, where the dancer is stepping with her full body weight on one foot. There is also a vertical libration on the second beat in the turning (Figure 5b), however, smaller than in the walking in Figure 5a. A possible explanation of this could be the dancer - when turning - putting more emphasis to the horizontal rotation of the body than to the vertical libration on the second beat. The libration patterns to the clapping in Figure 5 are more coherent, while the patterns of dancing to the recording in Figure 6 are more varied and shifted in time. In Figure 5a, where the dancer is moving to the clapping, the second minima of the librations are slightly after the marked isochronous beat, whereas in the dancing to the recording Figure 6a the second minima are partly before the isochronous beat, which could indicate that the dancer relates to the variations in asymmetric beat patterns. To further address the question of the correlation between libration patterns and asymmetric beat variation, the recordings with live playing will be analysed in future work.

4.3 Interviews with performers

During the recording sessions and when watching their performances in the Motive software⁷, dancers and musicians were asked to comment on their performance. The performers expressed that watching their performance, using the possibilities to view from different angles and follow marker movements by assigning tails to the markers, was highly interesting, exciting and informative. Furthermore, watching performers as skeletons in the graphical rendering instead of watching a conventional film made it easier to focus on the movement. This triggered reflections and comparisons with concepts for describing and thinking about movements. In specific the observations of the variations in Figure 6a and Figure 6b correlate with the interview statement by Dregelid (2018) that "her experience was that she was not dancing with him (Gössa Anders)". At the time of the recording Dregelid said it might have been easier if Gössa Anders would have been

⁷ <http://optitrack.com/products/motive/>

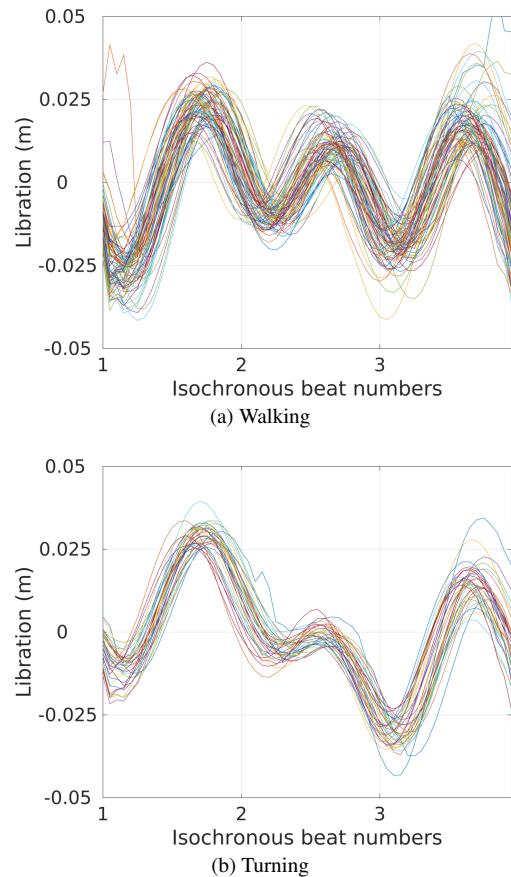


Figure 5: Libration patterns from the dancing to a clapped beat.

present in the room, so she could have watched his body movements while dancing. Further comparisons with the live recordings that contain musicians and dancers in interaction would be needed to address the question of how the dance movements correlates with non-isochronous beat patterns in realistic settings.

5. CONCLUSION

The accurate description of asymmetric beat patterns in polska music is a challenging task that may not be sufficiently addressed through the analysis of historical recordings. Recording performances with Motion Capture is assumed to allow for a more detailed analysis, taking into account bowing movements, bowing patterns and foot tapping. Using Motion Capture to plot libration patterns in the dancing is proposed as a method for examining how dancers relate to asymmetric beat patterns. The results indicate that (1) the libration patterns are consistent in shape inside the different sections of the dance by which they are assumed relevant for examining how dancers relate to musical beats. (2) The material confirms the variation in asymmetric beat patterns in this polska style. Including more recordings and the recordings with the musicians' interpretations of the same tunes is assumed to add to the presented findings on metrical characteristics. (3) The timing variations in the libration curves obtained from dancing to a recording with asymmetric beat suggest comparisons with the recordings of dancing to a live musician. A larger

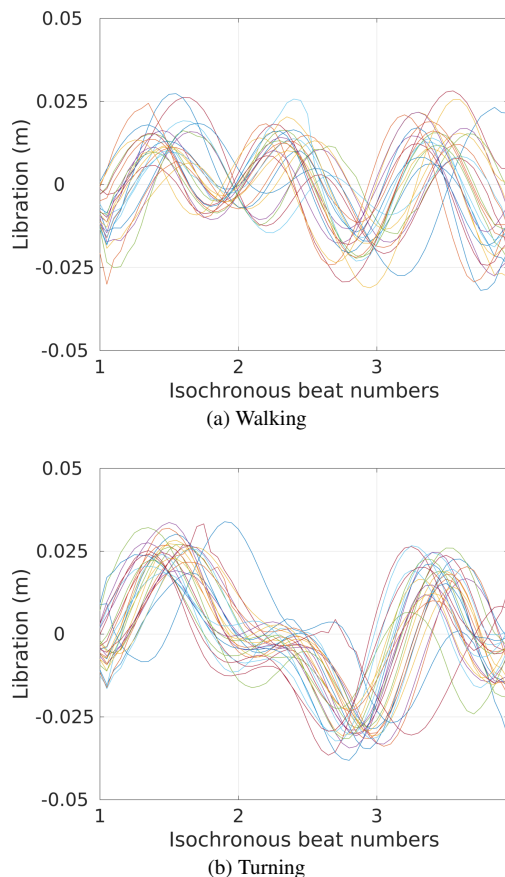


Figure 6: Libration patterns from the dancing to a recording.

analysis of the correlation of musical events with dance movements will facilitate a more detailed understanding of the relation between dance and music in the particular style. Using MoCap recording in a performer-participating setting seems from this first attempt rewarding and worth exploring further as a method for studying performance practice. In conclusion, the presented study is suggested as a starting point for further explorations of music and dance interaction in Swedish folk music.

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