Journal of Movement Arts Literacy

Volume 4
Number 1 *Voices of Notators: Approaches to Creating a Score*

Article 6

2018

Processing Emotional Expression in the Dance of a Foreign Culture: Gestural Responses of Germans and Koreans to Ballet and Korean Dance

Zi Hyun Kim
German Sport University Cologne, zh5735@hotmail.com

Hedda Lausberg
German Sport University Cologne, h.lausberg@dshs-koeln.de

Author Credentials
Zi Hyun Kim, PhD
Hedda Lausberg, MD, PhD

Processing Emotional Expression in the Dance of a Foreign Culture: Gestural Responses of Germans and Koreans to Ballet and Korean Dance

Abstract
Artistic dance differs between cultures with regard to the formal movement repertoire and methods to represent dancer's emotions. The present study explores how differently the spectators perceive the dance scenes of their own and foreign cultures. We showed German and Korean participants sad and happy dance scenes of the French ballet *Giselle* and Korean dance *Sung-Mu*. To learn the perceived thoughts and feelings of the participant from the dance scenes, we analyzed the frequency of their hand movements and gestures, which were accompanied by verbal descriptions of the participant's appreciation immediately after observation of the dance stimuli. The videotaped hand movements and gestures were coded by two independent certified raters with the well-proven NEUROGES® system. The ANOVA analysis revealed that the German participants executed significantly more gestures than the Korean participants for sad Sung-Mu and happy Giselle. Concerning the function of the gesture, Koreans showed significantly more deictic gestures than Germans for *Sung-Mu* dance. The German participant showed a cross-cultural effect for sad Sung-Mu and an in-group effect for happy Giselle, while the Korean participants showed a clear in-group effect for Sung-Mu of their own culture. Therefore, we assume that the relation of cross-cultural versus in-group advantage effects is strongly influenced by the intensity of the spectator's feelings during the perception of each dance stimulus.

Keywords
perception, dance, culture, gesture, hand movement

Different dance styles have been developed in different cultures to provide emotional as well as aesthetic expressions.[1] The differences in social identities reflected in the different dances are not limited to the movement repertoire per se, but also include costumes, music, masks, etc.[2] In European ballet, for example, the dancer's costume fits close to the body and, hence, movement repertoire is easily visable, including turns, jumps, and pointe work. In contrast, in Korean traditional dance, the dancer's body and face are not directly visible. A lavish costume overlays the dancer's body and a peculiar hat hides the face. Thus, the dancer's figure and movement can only be inferred from the motion of the garment, and, on the other hand, the dancer's movement is limited by the costume. The dancer moves slowly and uses no jumps and no running.

There are fewer studies of how such disparate dance forms can invoke different perceptions of dance because the dance form has been considered a culture-specific pattern. However, it is noteworthy that ballet has gained widespread popularity in Korea, in spite of the cultural unfamiliarity of the dance form. This interesting finding might be a basis for researching dance perception.

More recently, experimental research has focused on the spectators' perception of dance. Catherine Stevens et al. studied the spectators' reactions to contemporary dance by using the Personal Digital Assistant, with which participants entered their spontaneous opinion on the dance sequences that they watched.[3] Both the visual elements, such as stage decoration and costume, and the acoustic elements, such as music and sound, equally contributed to the spectators' enjoyment.[4] However, the acoustic elements had a stronger impact on the spectators' emotional reactions than the dance movements. On the other hand, Corinne Jola et al. studied spectators' kinesthetic empathy using transcranial magnetic stimulation (TMS) and qualitative audience interviews.[5] They presented three live solo performances to the participants: ballet, Indian Bharatanatyam, and a non-dance dramatic exerpt, and investigated whether stronger responses as measured by TMS corresponded to stronger kinesthetic responses as inferred from

---

1. Darlene O'Cadiz, *Dance and Cultural Diversity.* (San Diego: Cognella Academic Publishing, 2013): 7.

2. Jane C. Desmond, "Embodying Difference: Issues in Dance and Cultural Studies," *Cultural Critique* 26, (Winter, 1993–1994): 36.

3. Catherine Stevens et al., "Methods for Measuring Audience Reaction," In the *Proceedings of the International Conference on Music Communication Science*, (2007, December): 155.

4. Renee Glass and Catherine Stevens, "Making Sense of Contemporary Dance: An Australian Investigation into Audience Interpretation and Enjoyment Levels," (2005): 7. http://www.iar.unicamp.br/lab/luz/ld/C%EAnica/dan%E7a/Artigos/Making%20Sense%20of%20Contemporary%20Dance.pdf.

5. Corinne Jola, Shantel Ehrenberg, and Dee Reynolds, "The Experience of Watching Dance: Phenomenological-neuroscience Duets," *Phenomenology and the Cognitive Sciences* 11, no.1, (2012): 17.

the interviews. The authors, however, reported some general qualitative discussions, because they could not find significant relationships between the cortical excitability measured by TMS and the "kinesthetic responses" from interviews. In neuroimaging studies with functional magnetic resonance imaging (fMRI), professional audiences with their own experience of ballet or capoeira showed a higher cerebral activity than amateur audiences did when they observed ballet or capoeira movements.[6] In a later study using the same stimuli of ballet and capoeira movements, but with an enlarged sample including six more male naïve participants, Beatriz Calvo-Merino et al. studied the participants' cerebral activation pattern with fMRI and their aesthetic perception with a questionnaire registering five aesthetic dimensions.[7] Significant correlations between cerebral activity and aesthetic experience were found only for the aesthetic dimension of like versus dislike. The participants showed a significantly higher activity in the bilateral occipital and the right premotor cortices, when they observed the dance movements that they liked the most compared to those that they did not like. The authors, therefore, suggested a possible role of visual and sensorimotor cortex in an "automatic aesthetic response" to dance.

Studies on how spectators correctly identify the emotional connotation expressed in dance movements were carried out by Sheila Brownlow et al.[8] Experienced and novice dancers (32 per each group) assessed dance choreographies that had been specially developed to express the emotions of happiness and sadness. Both happy and sad dances had the same number of kicks, turns, and leaps but remarkably different rhythm changes. The dance designated as sad consisted of slow and low-energy movements. The happy dance consisted of similar movements, but was performed faster and more energetically. Four dancers (2 females and 2 males) individually performed each of the happy and sad dances, and the motions of dancers' main joints were registered by a point-light technique. All participants consistently judged the choreography of the happy dance as happier, stronger, and more dominant than that of the sad dance. Likewise, Misako Sawada, Kazuhiro Suda, and Motonobu Ishii investigated the relationship between emotional expression and movement parameters such as speed, force, and directness.[9] Ten female dancers expressed three emotions, namely joy, sadness, and anger, by altering their arm movements. Twenty-two

6. Beatriz Calvo-Merino et al., "Action Observation and Acquired Motor Skills: An fMRI Study with Expert Dancers," *Cerebral Cortex* 15, (2005): 1244. doi: 10.1093/cercor/bhi007.

7. Beatriz Calvo-Merino et al., "Towards a Sensorimotor Aesthetics of Performing Art," *Consciousness and Cognition* 17, no. 3, (2008): 911. doi: 10.1016/j.concog.2007.11.003.

8. Sheila Brownlow et al., "Perception of Movement and Dancer Characteristics from Point-light Displays of Dance," *Psychological Record* 47, no. 3, (1997): 411.

9. Misako Sawada, Kazuhiro Suda, and Motonobu Ishii, "Expression of Emotions in Dance: Between Arm Movement Characteristics and Emotion." *Perceptual and Motor Skills* 97, no. 3, (2003): 697.

naïve observers accurately perceived each emotion based on the dancers' arm movements. Hence, the authors suggested that emotions could be reliably inferred from the quality of arm movements in dance.

Thus far, there are no systematic studies of cross-cultural differences in the perception of emotion expressed in dance, but cultural studies on emotional expression in general strongly suggest that the culture of the observer would also effect the perception of dance. David Matsumoto and Paul Ekman investigated the perceived emotional intensity of American and Japanese participants during the observation of facial expressions of anger, disgust, joy, fear, and sadness.[10] Americans scored higher in all categoies than the Japanese, with the exception of disgust, which scored lower. Japanese participants gave the highest score for the emotion disgust while Americans did so for the emotions joy and sadness. In a meta-analysis on the influence of culture on emotional perception, Hillary Elfenbein and Nalini Ambady demonstrated a cultural in-group advantage.[11] Observers identified emotions in other individuals better if the individual belonged to the same culture as the observer. Nevertheless, Matsumoto criticized this concept because of insufficient empirical evidence.[12] However, José Soto and Robert Levenson also reported a similar advantage for specific ethnic groups within a culture, such as European Americans and Chinese Americans.[13] In contrast, African Americans and Mexican Americans did not show such an advantage. Based on a literature review on point-light animations of movement for the cross-cultural perception of dance, Bernhard Fink et al. assumed that there might be a "shared taste in body movement perception across cultures, which is attributable to adaptations and which is independent of socio-cultural effects."[14]

The above review strongly suggests that cultures might differ in their appreciation of culture-specific dance forms[15,16] as well in their perception of the

10. David Matsumoto and Paul Ekman, "American-Japanese Cultural Difference in Intensity Ratings of Facial Expressions of Emotion," *Motivation and Emotion* 3, no. 2, (1989): 143. doi: 10.1007/BF00992959.

11. Hillary A. Elfenbein and Nalini Ambady, "On the Universality and Cultural Specificity of Emotion Recognition: A Meta-analysis," *Psychological Bulletin* 128, no. 2, (2002): 203. doi: 10.1037//0033-2909.128.2.203.

12. David Matsumoto, "Methodological Requirements to Test a Possible In-group Advantage in Judging Emotions Across Cultures: Comment on Elfenbein and Ambady (2002) and Evidence," *Psychological Bulletin* 128, no. 2, (2002): 241.

13. José A. Soto and Robert W. Levenson, "Emotion Recognition across Cultures: The Influence of Ethnicity on Empathic Accuracy and Physiological Linkage," *Emotion* 9, no.6, (2009): 875. doi: 10.1037/a0017399.

14. Bernhard Fink et al., "Integrating Body Movement into Attractiveness Research," *Frontiers in Psychology* 6, Article 220, (2015): 3. doi: 10.3380/fpsyg.2015.00220.

15. Jola et al., (2012), 39.

16. Calvo-Merino et al., (2008), 914.

emotional content of dance[17]. However, thus far no studies have investigated the mutual influence of these two factors, i.e. how cultures differ in their perception of different emotions when they are expressed in the dance form of a different culture. Given that, in fact, in natural settings these two factors are intertwined, the present study explores cultural differences in the perception of emotion when it is expressed in the dance form of the participant's own culture as compared to a foreign culture.

The perception of dance is a complex subject that is debated through diverse theoretical model [18] and is difficult to measure appropriately. Neuroimaging methods such as fMRI and TMS display brain activity in reaction to dance stimuli. However, they are of limited value when the aim is a more complex analysis of the spectator's impressions of emotional dance.[19,20,21] On the other hand, the subjective character of questionnaires is a well-known constraint for objective measurement of impressions and feelings.[22] Furthermore, pre-structured questions hardly cover the variety of subjective perceptions.[23]

The spectator's hand movements and gestures that accompany her/his description of dance provides an immediate and objective insight into her/his cognitive and emotional processing of the dance scenes.[24,25] In addition, gesture is more reliable in case of gesture-speech mismatches and can reflect unspoken thoughts and feelings.[26] In an extensive review, Lausberg provides ample evidence that hand movements and gestures that accompany speech reflect cognitive and emotional processes.[27] As an example, the mental perspective which a speaker takes on spatial scenery (i.e., observer viewpoint versus character viewpoint), can be inferred from his gestures.[28] If the gesturer mentally adopts

17. Sawada et al., (2003), 697.

18. Aili Bresnahan, "The Philosophy of Dance." In *The Stanford Encyclopedia of Philosophy Archive*. ed. Edward N. Zalta (Winter, 2016 Edition): 16. https://plato.stanford.edu/ntries/dance/.

19. Jola et al., (2012), 39.

20. Calvo-Merino et al., (2008), 911.

21. Silvia A. Bunge and Itamar Kahn, "Cognition: An Overview of Neuroimaging Techniques," *Encyclopedia of Neuroscience* 2, (2009): 1066.

22. Elaine Fox, *Emotion Science: An Integration of Cognitive and Neuroscientific Approaches*. (Basingstoke, U,K.: Palgrave Macmillan, 2008): 39.

23. Calvo-Merino et al., (2008), 918.

24. Adam Kendon, *Gesture: Visible Action as Utterance*. (UK: Cambridge University Press, 2004): 8.

25. Hedda Lausberg, *Understanding Body Movement and Gesture: A Guide to Empirical Research on Nonverbal Behavior*. (Frankfurt a.M., Germany: Peter Lang, 2013): 36.

26. Susan Goldwin-Maedow and Martha W. Alibali, "Gesture's Role in Speaking, Learning, and Creating Language," *Annual Review of Psychology* 64, (2013): 275.

27. Lausberg, (2013), 36.

28. Davis McNeill, *Hand and Mind: What Gestures Reveal about Thought*, (Chicago: University of Chicago Press, 1992): 123.

the observer viewpoint (also bird's eye view) his gesture depicts observed scenes as if the gesturer is watching them as an outsider, e.g., like describing someone on the street walking by use of moving index and middle finger. In contrast, if the gesturer mentally adopts the character viewpoint, he performs the gesture as if he was acting himself, e.g., he pantomimes. Thus, gestures are externalizations of mental images of motion qualities like speed, force, and directness.[29] As such, they are particularly suited to express impressions of motions in space, such as dance.

In the present study, we compared the hand movement behaviors of Germans, as an example of European culture, and Koreans, as a representative of East Asian culture, during verbal descriptions of their thoughts and feelings in response to dance scenes of their own and foreign cultures with different emotional contents. As outlined above, previous studies have used different methods and focused on different aspects of hand movement behavior in order to investigate the influence of dance form and emotion, respectively. Accordingly, our study hypotheses refer to different aspects of hand movement behavior.

Based on studies by Calvo-Merino et al., which found[30] that an observer shows stronger brain activity for familiar dances, an in-group effect of emotion studies by Elfenbein and Ambady,[31] and studies by Soto and Levenson,[32] we assume that concerning Dance Form, Koreans and Germans will show more hand movements for their own Dance Form than for the foreign one. In light of the process of dance perception, we thereby expect that Germans and Koreans, by priority, execute more hand movements with diverse visual appearances, e.g., more general motor activity of the hands than anti-gravity posture, more conceptual movement than self-regulating movement, more movement into space, which is a general gesture, than self-touch, and more gesture of form presenting function with respective movement types than the other one. Hence, in detail, we hypothesize that Germans will show more general motor activity of hands than Koreans for the Western dance, while Koreans will execute more motor activity than Germans for the Korean dance. By analogy, the same assumptions are valid for the conceptual movement, the gesture, and so forth. Further, with reference to the studies of Brownlow et al.[33] and Sawada et al.,[34] who showed that the positive emotion is identified by the spectators better than negative ones, and the cross-cultural studies on the perception of emotion between American and

29. Sawada et al., (2003), 697.
30. Calvo-Merino et al., (2008), 914.
31. Elfenbein and Ambady, (2002), 203.
32. Soto and Levenson, (2009), 875.
33. Brownlow et al., (1997), 411.
34. Sawada et al., (2003), 697.

Japanese participants by Matsumoto and Ekman,[35] we assume that concerning the perception of emotion, Germans in comparison to Koreans will show more hand movements such as general motor activity, conceptual movement, gesture, and gesture of emotional function with respective movement types for the happy dances. The combination of dance form and emotion leads to the overall assumption that Germans and Koreans will execute more hand movements such as general motor activity, conceptual movement, gestures, especially with form presenting and emotional function for the happy dance of their own culture. As an example of a detailed hypothesis, it can be assumed that Germans will show more conceptual hand movement than Koreans for the happy Western dance. Further hypotheses on the other movements can be constructed in the same way.

Methods

Participants

The sample included 30 Korean (14 female, 16 male) and 30 German (16 female, 14 male) students between the ages of 20 and 35 years (M = 26.15, SD = 3.82 years). All participants were recruited through flyers posted on the campus of the German Sport University Cologne and the University of Bonn, Germany, and they were paid for their participation in the study. All participants gave written consent before the investigation.

The Korean students had all grown up in Korea, and moved to Germany for study purposes except for five female participants, who had finished their study in Korea and stayed in Germany for other purposes. The German students had all grown up in Germany. Twenty-two Germans and 21 Koreans had visual experience with ballet dance prior to this testing. However, only 1 German and 17 Koreans had experienced Korean dance before. According to their own statements, all participants were right-handed.

Stimuli

Videos of the French ballet, *Giselle*[36] (a romantic ballet in two acts, and created by Jean Coralli and Jules Perrot in 1841), and the Korean traditional dance, *Sung-Mu*[37] (a pre-13th century Korean ritual dance of unknown origin, quite possibly

35. Matsumoto and Ekman, (1989), 143.

36. Evan Alderson, "Ballet as Ideology: Giselle, Act II," *Dance Chronicle* 10, no. 3, (1986): 290–304.

37. Hyun Soon Baek, "A Study on Dance Motions and Techniques of Sung-Mu: Focusing on Lee Mae-Bang Important Intangible Cultural Property No. 27. [in Korean with English abstract]." *Korean Journal of Physical Education* 41, (2002).

created by Buddhist monks) constituted the stimulus materials. Figure 1 shows snapshots of representative dance movements of the four dance scenes used for this study. To minimize the difference in the performance quality, *Giselle* dance scenes performed by the Russian ballerina Svetlana Lunkina, and *Sung-Mu* dances performed by Mae Bang Lee, a male dancer, who is designated as an Important Intangible Cultural Property for *Sung-Mu* (No. 27) in Korea were selected as stimuli. The Sung-Mu can be danced by both female and male dancer. Click here to view a video revealing excerpts from the four dances.

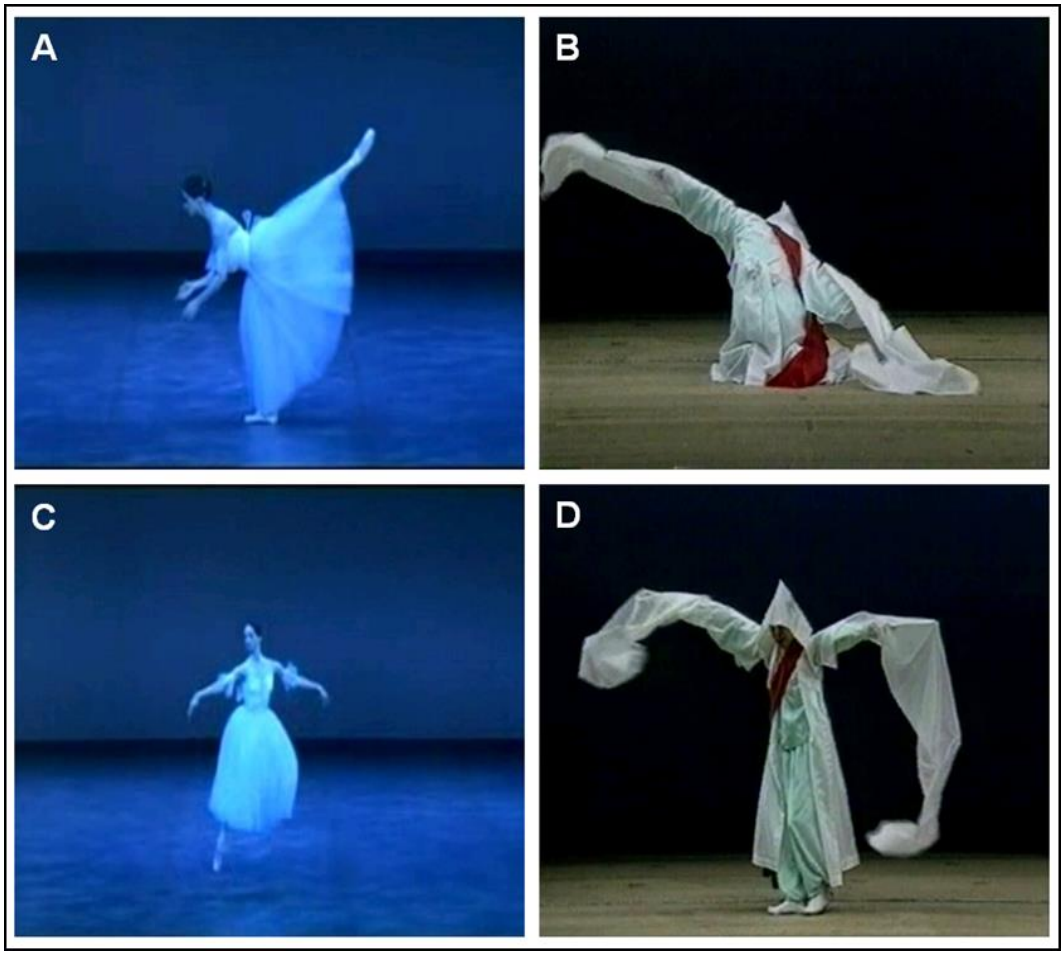

Figure 1. Snapshots of representative dance pose of the four dance stimuli: A. Sad Giselle, B. Sad Sung-Mu, C. Happy Giselle, D. Happy Sung-Mu. (A click of the cluster of photos provides a link to a video clip of exceprs of the four dances.)

The two dance forms, the ballet *Giselle* versus the Korean *Sung-Mu*, differ e.g., in costume and motion: In *Giselle*, except for the soft tutu, the costume fits close to the dancer's body and the face is visible, enabling the spectator to

observe all facets of the dancer's body movement and facial expression. In contrast, in the Sung-Mu dance, the dancer is dressed in a lavish costume with extended long sleeves, which overlay the dancers' body, and a distinctive hat makes the dancer's face invisible. Thus, the dancer's body figure and movement can only be inferred from the motion of the garment. The motions of these over-long sleeves, which are moved by wooden sticks that the dancer holds in the hands as extensions of the arms, play a key role in the expression of emotion in the Sung-Mu dance. Because of the lavish Korean costume, the dancer of Sung-Mu makes small steps, no jumps, and no fast turns, and represents the dancer's feeling mainly using diverse movements of the long sleeves. In contrast, in the ballet *Giselle*, the expression is generated by motions of the dancers' arms, legs, and torso, in accordance with the designated dance techniques, such as *entrechat* etc. As compared to *Giselle*, *Sung-Mu* is less dynamic, because the tempo of the dance is slower.

However, both dance forms share the fact that certain movement qualities, e.g. Deceleration or Strength, are used to lend an emotional content to the dance. For *Giselle*, the movements of the dancer for the happy dance scene are speedier and repetitive compared to the sad scene, while the dancer of *Sung-Mu* differentiates the happy and sad scene mainly by the speed and repetition of spreading out and swinging the long sleeves. In general, *Sung-Mu* is less dynamic than Giselle, because the inherent dance rhythm is slower than Giselle and the costume overlaying the dancer's body limits dynamic movements.

From each dance form, a happy and a sad scene were chosen. In order to control for confounding factors, the sad and happy scenes of *Giselle* und *Sung-Mu* respectively, were matched in terms of the performance space of the dancer, the dance technique, and the costume. The only aspect that differed between the sad and happy scenes were the dynamics of the dance movements. Sustained and heavy movements characterize the sad dance scenes, while quick and strong movements make the happy dance scenes faster and more energetic.[38] Dynamic movements are here defined as body movements that show changes in the Effort Qualities of Flow, Space, Time and Weight, as defined by Rudolf Laban.[39]

Further evidence that the respective movement dynamics were associated with sad and happy emotions were taken from the choreographed interpretation of each dance scene. Table 1 provides essential information about the dance scene of the four video clips. The video clips were prepared without sound in order prevent the study participants from being influenced by the music that accompanied the dance.

38. Brownlow et al., (1997), 414.

39. Rudolf von Laban, *The Mastery of Movement* (4th rev. ed.). (Tavistock, U.K.: Northcote House, 1988).

Table 1. Characteristics of the Four Dance Stimuli

Label of stimulus	Length	Short description of the dance scene
Sad Giselle	38 s	Giselle dances with longing for Prince Albrecht.
Sad Sung-Mu	57 s	Buddhist monk dances with suffering from religious sorry of the human life.
Happy Giselle	51 s	Giselle dances with love for Prince Albrecht.
Happy Sung-Mu	72 s	Buddhist monk expresses happiness resulting from religious enlightenment.

Procedures

Each participant was placed in a chair 3.5 m in front of a video camera (Panasonic, Model: SD = R-H85). The participants were videotaped in full-length body shots during the whole experiment. The four videos of the dance scenes were projected without sound onto a screen with a size of 1.2 m x 1.6 m (height x width) located on the participant's left side. The experimenter, who is the first author, had her chair positioned outside of the camera angle at a distance of 2 m of the participant's right side. After the presentation of each video, she asked the participant to describe his/her thoughts and feelings evoked by the dance scene. The experimenter listened to participant silently without interactive communication. The participants were not informed about the emotional connotation of the dance stimuli and about the fact that hand movement and gesture were subject to investigation in the study.

Materials

The video recordings of each participant were divided into four clips. Each video clip contained the participant's description of one dance scene. Altogether, 240 video clips ($M \pm SD = 63.7 \pm 18.4$ s) were prepared for the analysis.

Measurements

The participants' hand movements and gestures during the verbal description of their thoughts and feelings evoked by the dance scene were submitted to analysis using the encoding system NEUROGES®.[40] The present study is not grounded in

40. Hedda Lausberg, *The NEUROGES® Analysis System for Nonverbal Behaviour and Gesture*: *The Complete Research Coding Manual with Interactive Video Learning Tool*. (Frankfurt a.M., Germany: Peter Lang, 2018).

linguistic gesture research and it does not aim at investigating how Korean and German participants verbally refer to the stimuli. Hence, the content of the verbal description was not analyzed. The present study is in the tradition of the microanalysis of nonverbal behavior. It not only examines gesture, but also self-touch, shifts, actions, etc. as an expression of mental states, cognitions, and emotions.[41,42] We aim to explore how Koreans and Germans respond nonverbally to the dance scenes as nonverbal stimuli. As empirical studies in individuals with aphasia[43] or callosal disconnection[44] as well as the occurrence of gesture-speech mismatches[45] evidence, gesture can be generated in the complete absence of speech competence and, if appropriate methods with an independent, non-biased analysis of speech and gesture are administered, gesture is often found to convey different, sometimes even contradictory information, to the verbal content. Finally, the seminal cultural studies on gesture by David Efron were conducted without reference to the verbal content.[46] Thus, while the present study examines the nonverbal response to nonverbal dance stimuli, the investigation of the participants' verbal reference to the stimuli is not the aim of the present study.

NEUROGES is a behavioral analysis tool for hand movement including gesture and is combined with the annotation tool ELAN.[47] The NEUROGES system enables an objective and reliable analysis of hand movement behavior independent of speech.[48] The NEUROGES values match the hand movements types from previous studies, e.g., gestures are equivalent to *in space* units, and self-touches are equivalent to on body units and so forth.[49] Unlike traditional systems for the analysis of nonverbal behavior and gesture, the assessment

41. Charles Darwin, *The Expression of the Emotions in Man and Animals* (2nd ed.). (London: Penguin Books, 1890/2009).

42. Norbert Freedman, "The Analysis of Movement Behavior During the Clinical Interview." *Studies in Dyadic Communication* (1972), 153–175.

43. Katharina Hogrefe et al., "Co-speech Hand Movements During Narrations: What is the Impact of Right vs. Left Hemisphere Brain Damage?" *Neuropsychologia* 93, (2016): 176.

44. Hedda Lausberg, et al., "Speech-independent Production of Communicative Gesture: Evidence from Patients with Complete Callosal Disconnection." *Neuropsychologia* 45, no. 17, (2007): 3092.

45. Goldwin-Maedow and Alibali, (2013): 265.

46. David Efron, *Gesture, Race and Culture: A Tentative Study of the Spatio-temporal and "Linguistic"Aaspects of the Gestural Behavior of Eastern Jews and Southern Italians in New York City, Living Under Similar as Well as Different Environmental Conditions*, sketches by Stuyvesant van Veen. (The Hague: Mouton, 1972).

47. Hedda Lausberg, and Han Slöetjes, "Coding Gestural Behavior with the NEUROGES-ELAN System," *Behavior Research Methods* 41, no. 3, (2009): 847. doi:10.3758/BRM.41.3.841.

48. Hedda Lausberg, and Han Slöetjes, "The revised NEUROGES-ELAN system—An Objective and Reliable Interdisciplinary Analysis Tool for Nonverbal Behavior and Gesture," *Behavior Research Methods* 48, no. 3, (2016): 993. doi: 10.3758/s13428-015-0622-z.

49. Lausberg, (2013), 66–67.

process is algorithmic and based on a systematic analysis including several operationalized categories. The Kinesic module (Module I), which consists of three assessment steps (Activation, Structure, Focus) that build up on each other, provides data on kinesic behavior in general. It enables us to investigate our hypotheses concerning cultural differences in hand movement behavior in general, such as general motor activity of the participants' hands, conceptual hand movement, and gesture. The Gesture and Action module (Module III), which consists of the Function and Type assessments, enables us to investigate our specific hypotheses on cultural differences among diverse gestures with specific functions based on different uses of the hand.

Furthermore, NEUROGES can embrace the supra-cultural aspects with a universal pattern of gestural expression of participants who speak different languages. Correspondingly, the NEUROGES system had been proven effective in distinguishing nonverbal and gestural behavior of different cultures, such as German and Papuan cultures.[50] Furthermore, the NEUROGES Function category has been developed based on the Efron system, which had been originally employed for cultural studies.

In seven steps comprising the coding algorithm shown in figure 2, the ongoing stream of hand/arm/shoulder movements (hereafter called hand movements) is segmented and classified into more and more fine-grained movement units. At each assessment step (category), specific movement criteria, which are based on psychological and neuropsychological research, are applied in order to segment the behavior and to classify the resulting units of diverse movement values. The seven assessment steps are grouped into three modules: Module I (steps 1–3) deals with aspects of hand movement behavior related to specific neuropsychological processes. For example, the Structure category (step 2), with five classifying movement values, *irregular*, *repetitive*, *phasic*, *aborted*, and *shift*, provides information about the structure of the hand movement by analyzing the trajectory. *Phasic* movements consist of a transport, a complex, and a retraction phase. When the complex phase is dominantly characterized by a repetitive execution of the trajectory, such movements are called *repetitive*. Both *phasic* and *repetitive* movements are based on conceptual processes. They differ from *irregular* movements, which do not show a structured trajectory.[51,52] The

50. Harald Skomroch et al., "Patterns of Hand Movement and Prosodic Behavior across Language Groups." *Workshop on Mapping Multimodal Dialogue 2,* (Leuven, Belgium, 2014, November).

51. Lausberg, (2013), 118-120.

52. Hogrefe et al., (2016): 181.

53. Kerstin Petermann, Harald Skomroch, and Daniela Dvoretska, "Calculating Temporal Interrater Agreement for Binary Movement Categories," In *Understanding Body Movement: A Guide to Empirical Research on Nonverbal Behavior,* ed. Hedda Lausberg (Frankfurt a.M., Germany: Peter Lang, 2013): 253–260.

Focus category (step 3), with six values (e.g., *within body, on body, in space* etc.), refers to attention processes by analyzing the location where the hand acts. The analyses of the Structure and Focus categories are concatenated resulting in concatenated StructureFocus values. Module II (steps 4–5) focuses on the laterality of hand movement behavior, including complex aspects such as dominance. It thereby addresses questions of hemispheric specialization and inter-hemispheric cooperation. Module III (steps 6–7) analyzes the function of the hand movement values like *emotion/attitude, emphasis, egocentric deictic, pantomime, form presentation, spatial relation presentation* and *motion quality presentation*, etc. Notably, just as in the Modules I and II, the Module III analysis is based on the visual appearance of the movement only, which refers to those aspects of the function of a hand movement that are predetermined by its form.

The coding algorithm, the precise definitions of the movement criteria, and the values are described in detail in a coding manual (available from the second author). For its application with ELAN (https://tla.mpi.nl/tools/tla-tools/elan/), the coding sheet of NEUROGES has been transformed into an ELAN template file (http://www.neuroges-bast.info). The video submitted to analysis is linked with the NEUROGES-ELAN template and then the behavior is segmented by tagging units and annotating them with a value.

Two independent NEUROGES certified raters analyzed the participants' hand movement behavior with NEUROGES. The raters were not informed about the aims and hypotheses of the study. Furthermore, the videos were analyzed without sound to avoid possible influences by the speech on the raters. The first rater coded 100% of the data whereas the second rater coded 25% of the data to establish inter-rater agreement (IA).

IA for the Activation category was calculated as the ratio between the total length of overlaps from both annotators and the total length of movement units from both annotators (Compare Annotators' Ratio).[53] IA on all other NEUROGES categories of Module I was established calculating the EasyDIAg Cohen's kappa.[54] The EasyDIAg Cohen's kappa not only takes into account the categorization of values but also the temporal overlap of the raters' annotations. In addition, the raw agreement was measured, which represents the number of agreement on cases divided by the total number of cases.[55] The Compare Annotators' Ratio scores, the EasyDIAg Cohen's kappa scores, and the raw agreement scores for the NEUROGES values are presented in the Appendix. A

54. Henning Holle, and Robert Rein, "EasyDIAg: A Tool for Easy Determination of Interrater Agreement," *Behavior Research Methods* 47, no. 3, (2015): 837. doi: 10.3758/s13428-014-0506-7.

55. Henning Holle, and Robert Rein, "Assessing Interrater Agreement of Movement Annotations," In *Understanding Body Movement and Gesture. A Guide to Empirical Research on Nonverbal Behavior*, ed. Hedda Lausberg (Frankfurt a.M., Germany: Peter Lang, 2013): 263.

current review of the inter-rater reliability of the NEUROGES system, which included 18 empirical studies employing the NEUROGES-ELAN system, was taken as a frame of reference for the assessment of the inter-rater agreement scores for the present study.[56] With reference to this review, the agreement scores in the present study (see Appendix) reveal a substantial strength of inter-rater reliability.

Statistical Analyses

The frequency score (number/minute) of each NEUROGES hand movement value is the dependent variable in this study. The independent variables are the within-subject factors Hand (left, right), Dance Form (*Giselle*, *Sung-Mu*), Emotion (sad, happy), and the between-subject factor Culture (German, Korean). The main-effects of the within- and between-subject factors and effects of the interactions of the subject factors on the frequency score of each hand movement value were analyzed by repeated measures ANOVA, which was conducted separately and stepwise for each NEUROGES category using SPSS (IBM SPSS Statistics Version 22). To meet the requirements of ANOVA, only those NEUROGES values that had been displayed by at least 10 individuals of each Culture per dance stimulus were included in the statistics.

For technical reasons NEUROGES is designed to measure the hands separately, i.e., in the NEUROGES-ELAN tiers the behavior registered separately for the right and left hand. Accordingly, the raw data output consists of right and left hand data, and in the statistics the factor Hand constitutes a within-subject factor. However, in the present study, Hand laterality is not the subject of investigation and therefore, effects of Hand are not reported.

For control of the type I error rate for multiple pairwise comparisons, the conservative Bonferroni adjustment was used for all analyses of this study.[57]

56. Lausberg and Slöetjes, (2016), 983.

57. Keenan A. Pituch, and James P. Stevens, *Applied Multivariate Statistics for the Social Sciences: Analyses with SAS and IBM's SPSS* (6th ed.). (New York: Routledge, 2016): 281.

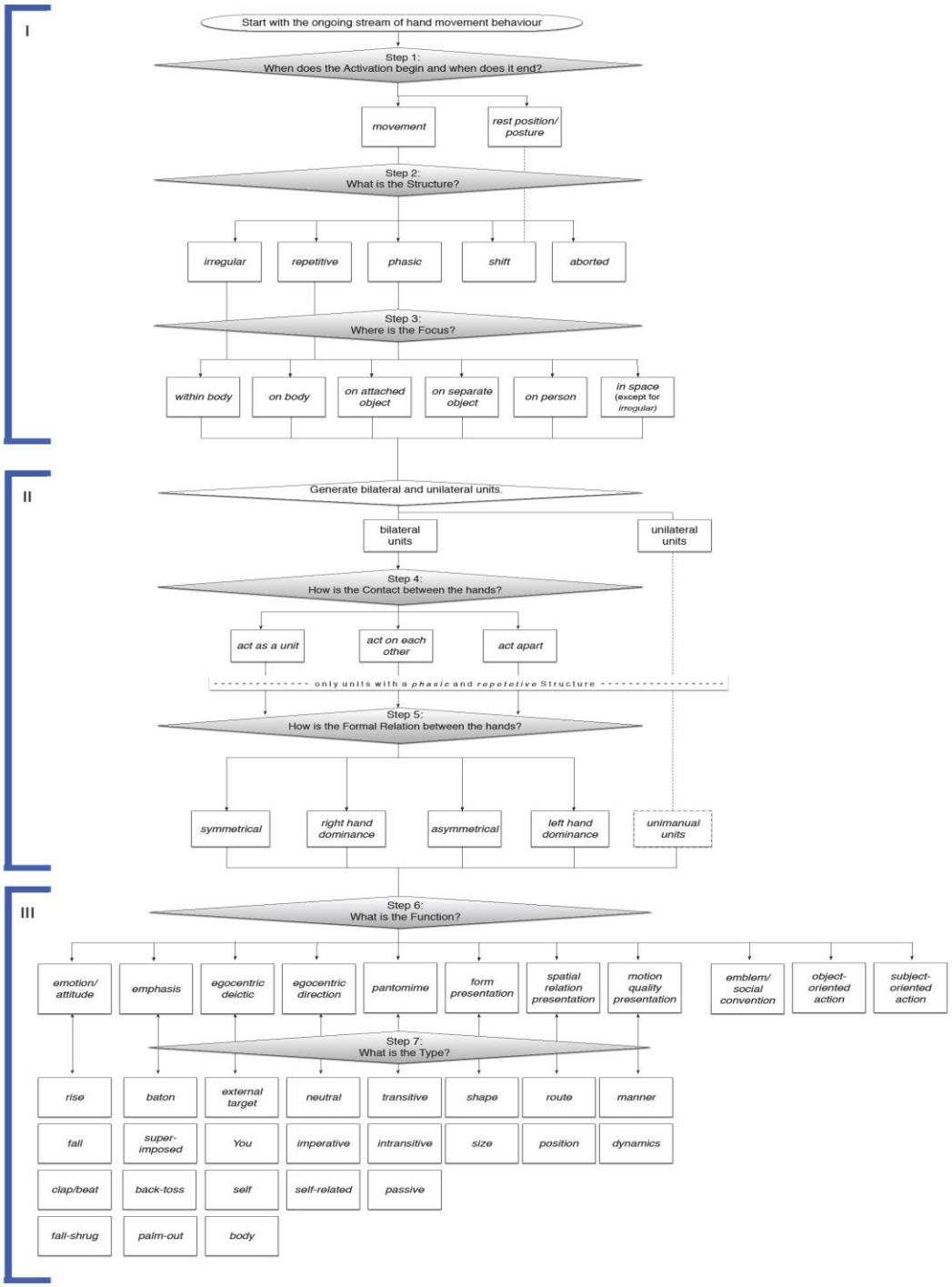

Figure 2. Algorithmic analysis of the NEUROGES system (Lausberg and Slöetjes, 2016).

Results

In the Results section, we present our findings of hand movement behavior concerning the hypotheses on dance form, emotional content, and the combination of dance form and emotional content, i.e., the cultural differences in the perception of emotion, when it is expressed in the dance form of one's own culture as compared to a foreign culture, for each NEUROGES category. As results of repeated measures ANOVA for each NEUROGES category, all significant main-effects of the within-subject factors and effect of its interactions with the between-subject factor Culture using F-value, degrees of freedom (df), p-value and the partial eta-squared (η_p^2) are reported. Univariate tests and post-hoc pairwise comparisons are specifically provided for significant interactions of the within-subject factors with the between-subject factor Culture.

Activation Category

Frequency distribution revealed that more than 10 participants of each cultural group executed the *movement* units.

The multivariate repeated measures ANOVA showed significant effects of the within-subject factor Dance Form (F = 3.95; df = 1, 58; p = .052; η_p^2 = .064) as a trend, Emotion (F = 6.34; df = 1, 58; p = .015; η_p^2 = .099), and of the interaction of Dance Form x Emotion (F = 11.5; df = 1, 58; p = .001; η_p^2 = .165) on the frequency of *movement* units.

Further, there was a significant effect of the between-subject factor Culture (F = 10.3; df = 1, 58; p = .002; η_p^2 = .151) and of the interaction Emotion x Culture (F = 4.44; df = 1, 58; p = .039; η_p^2 = .071) on the frequency of *movement* units.

Post-hoc pairwise comparisons revealed that the German participants executed significantly more *movement* units than Korean for the happy dance scenes ($M \pm SD$ = 7.58 ± 0.44; 5.13 ± 0.44) (p = .000). Furthermore, Germans showed significantly more *movement* units for the happy scenes ($M \pm SD$ = 7.58 ± 0.44) than for the sad scenes (6.27 ± 0.47) (p =.002).

Structure Category

Frequency distribution showed that the precondition of the execution by more than 10 participants for each cultural group was fulfilled for all five Structure values *aborted*, *irregular*, *repetitive*, *phasic*, and *shift*.

The multivariate ANOVA revealed a significant effect of the within-subject factors Dance Form (F = 3.92; df = 5, 54; p = .004; η_p^2 = .266), Emotion (F = 7.96; df = 5, 54; p = .000; η_p^2 = .424), and of the interaction of Dance Form x

Emotion was significant (F = 2.94; df = 5, 54; p = .020; η_p^2 = .214) on the frequency of the five Structure values.

There was a significant effect of the between-subject factor Culture (F = 9.0; df = 5, 54; p < .001; η_p^2 = .454) and of the interaction Dance Form x Emotion x Culture on Structure category (F = 4.4; df = 5, 54; p = .002; η_p^2 = .29).

The univariate tests delivered a significant interaction Emotion x Dance Form x Culture on the frequency of *phasic* (F = 120.3; df = 1, 58; p = .000; η_p^2 = .207) and *repetitive* units (F = 28.4; df = 1, 58; p = .021; η_p^2 = .088).

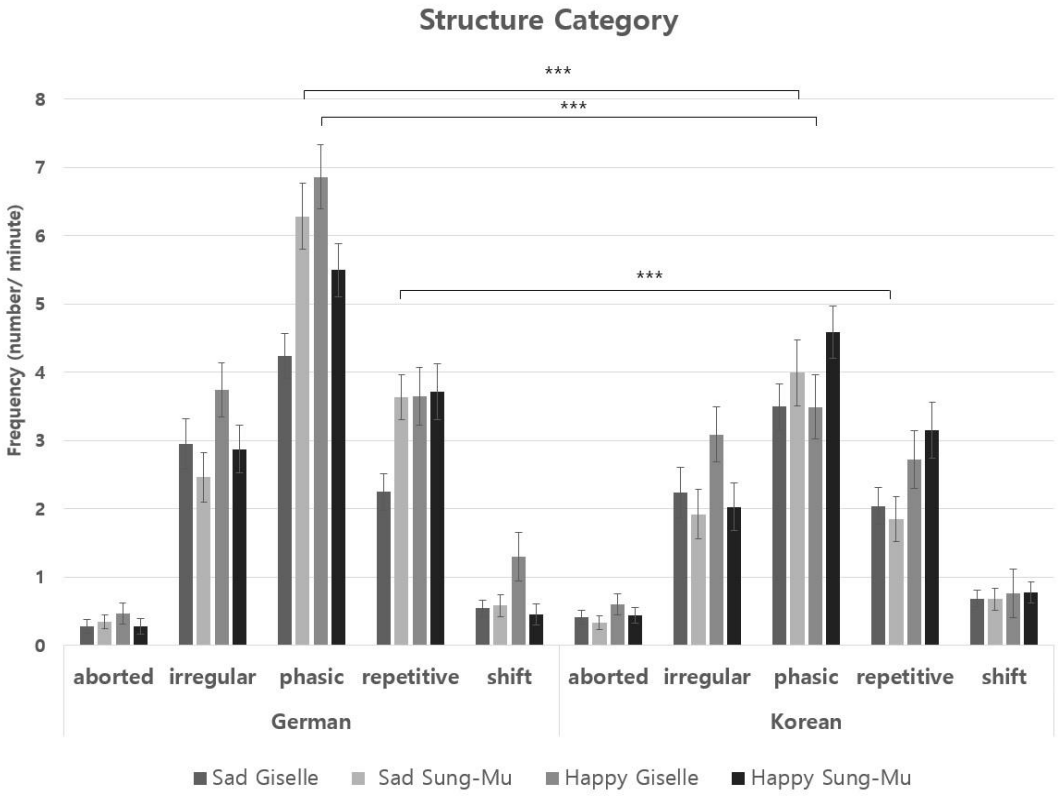

Figure 3. A number of Structure value units per minute executed by Germans and Koreans for the Dance Scene (sad Giselle, sad Sung-Mu, happy Giselle, and happy Sung-Mu). The description of the hand movement in the legend occurs from left to right bar for each stimulus. Error bars indicate the calculated standard errors. (: p < .05; **: p < .01; ***: .000 ≤ p < .001) Bonferroni adjustment was used for multiple comparison analysis.*

Post-hoc pairwise comparisons revealed that German participants carried out significantly more *phasic* units than Korean participants for happy Giselle ($M \pm SD$ = 6.28 ± 0.48; 3.99 ± 0.48) (p = .001) and for sad Sung-Mu ($M \pm SD$ = 6.86

± 0.47; 3.49 ± 0.47) (p = .000). Germans showed also significantly more *repetitive* units than Koreans for sad Sung-Mu ($M \pm SD$ = 3.64 ± 0.33; 1.85 ± 0.33) (p = .000). Figure 3 shows these results graphically.

Comparing to sad Giselle, Germans executed significantly more *phasic* units for sad Sung-Mu ($M \pm SD$ = 6.28 ± 0.48; 4.24 ± 0.33) (p = .000) and *repetitive* units ($M \pm SD$ = 3.64 ± 0.33; 2.25 ± 0.27) (p = .002). They also showed significantly more *shift* units for sad Sung-Mu than sad Giselle ($M \pm SD$ = 0.58 ± 0.16; 0.54 ± 0.13) (p =.021). In addition, Koreans carried out significantly more *repetitive* units for happy Sung-Mu than happy Giselle ($M \pm SD$ = 3.16 ± 0.41; 2.72 ± 0.42) (p = .003).

Focus Category

Frequency distribution showed that the precondition of the execution by more than 10 participants for each cultural group was fulfilled for two Structure values *on body* and *in space* of the six Focus category values.

The multivariate ANOVA showed significant effect of the within-subject factors Dance Form (F = 3.75; df = 2, 57; p = .003; η_p^2 = .116), Emotion (F = 10.4; df = 2, 57; p = .000; η_p^2 = .268), and of interaction Dance Form x Emotion (F = 4.8; df = 2, 57; p = .012; η_p^2 = .144) on the frequency of *on body* and *in space* units of the Focus category.

The ANOVA analyses showed also significant effect of the between-subject factor Culture (F = 12.2; df = 2, 57; p < .001; η_p^2 = .299) and of interaction Dance Form x Emotion x Culture on the two Focus values (F = 9.88; df = 2, 57; p = .000; η_p^2 = .257).

The univariate tests revealed significant effect of interaction Dance Form x Emotion x Culture on *in space* units (F = 185.8; df = 1, 58; p = .000; η_p^2 = .257).

Post-hoc pairwise comparisons showed that the German participants executed significantly more *in space* units than Koreans for sad Giselle ($M \pm SD$ = 4.33 ± 0.41; 2.93 ± 0.41) (p = .018), for happy Giselle (M ± SD = 7.55 ± 0.54; 3.49 ± 0.54) (p = .000), and for sad Sung-Mu (M ± SD = 6.71 ± 0.52; 3.48 ± 0.52) (p = .000). Furthermore, Germans executed significantly more in space units for sad Sung-Mu than sad Giselle (M ± SD = 6.71 ± 0.52; 4.33 ± 0.41) (p = .000), while Koreans for happy Sung-Mu than happy Giselle (M ± SD = 4.91 ± 0.53; 3.49 ± 0.54) (p = .014).

StructureFocus Concatenation

For the concatenated data of the Structure and Focus category, the frequency distribution of StructureFocus values showed that the precondition of the execution by more than 10 participants for each cultural group was fulfilled for

seven StructureFocus values *irregular within body, irregular on body, repetitive on body, repetitive in space, phasic on body, phasic on attached object,* and *phasic in space* among 11 values.

The multivariate ANOVA showed a significant effect of the within-subject factors Dance Form (F = 2.81; df = 7, 52; p = .014; η_p^2 = .275) and Emotion (F = 4.28; df = 7, 52; p = .001; η_p^2 = .365).

The ANOVA analyses revealed a significant effect of the between-subject factor Culture (F = 4.8; df = 7, 52; p = .000; η_p^2 = .392).) and of interaction Dance Form x Emotion x Culture (F = 3.74; df = 7, 52; p = .002; η_p^2 = .335).

The univariate tests provided significant effect of interaction Dance Form x Emotion x Culture for *phasic in space* (F = 120; df = 1, 58; p = .000; η_p^2 = .225) and *repetitive in space* units (F = 28.5; df = 1, 58; p = .027; η_p^2 = .365).

Post-hoc pairwise comparisons showed that Germans carried out significantly more *phasic in space* units than Koreans for sad Giselle (M ± SD = 3.4 ± 0.32; 2.28 ± 0.32) (p = .017), sad Sung-Mu (M ± SD = 5.2 ± 0.41; 2.87 ± 0.41) (p =.000), and happy Giselle (M ± SD = 5.93 ± 0.48; 2.49 ± 0.48) (p = .000). In addition, Germans showed significantly more *phasic in space* units for sad Sung-Mu than sad Giselle (M ± SD = 5.2 ± 0.41; 3.4 ± 0.42) (p = .000). Significantly more *repetitive in space* units were executed by Germans for sad Sung-Mu than sad Giselle (M ± SD = 3.0 ± 0.34; 1.85 ± 0.27) (p = .003), and by Koreans for happy Sung-Mu than happy Giselle (M ± SD = 2.45 ± 0.4; 2.0 ± 0.41) (p = .006), respectively.

Function Category

Frequency distribution of Function values showed that the precondition of the execution by more than 10 participants for each cultural group was fulfilled for seven Function values *emotion/attitude, emphasis, egocentric deictic, pantomime, form presentation, motion quality presentation,* and *subject oriented action* among 11 values.

The multivariate ANOVA provided a significant effect of Dance Form (F = 7.21; df = 7, 52; p = .000; η_p^2 = .492) and Emotion (F = 6.38; df = 7, 52; p = .000; η_p^2 = .462).

There was a significant effect of the between-subject factor Culture (F = 10.28; df = 7, 52; p = .000; η_p^2 = .581) and of interaction Dance Form x Culture (F = 2.38; df = 7, 52; p = .034; η_p^2 = .243).

The univariate tests revealed significant effect of interaction Dance Form x Culture for *egocentric deictic* units (F = 15.63; df = 1, 50; p = .000; η_p^2 = .212).

Post-hoc pairwise comparisons showed that Koreans executed significantly more egocentric deictic units than Germans for Sung-Mu dance (M ± SD = 0.91 ± 0.11; 0.39 ± 0.11) (p = .002). Koreans also carried out significantly

more egocentric deictic units for the dance form Sung-Mu than Giselle (M ± SD = 0.91 ± 0.11; 0.47 ± 0.08) (p = .000) (See figure 4).

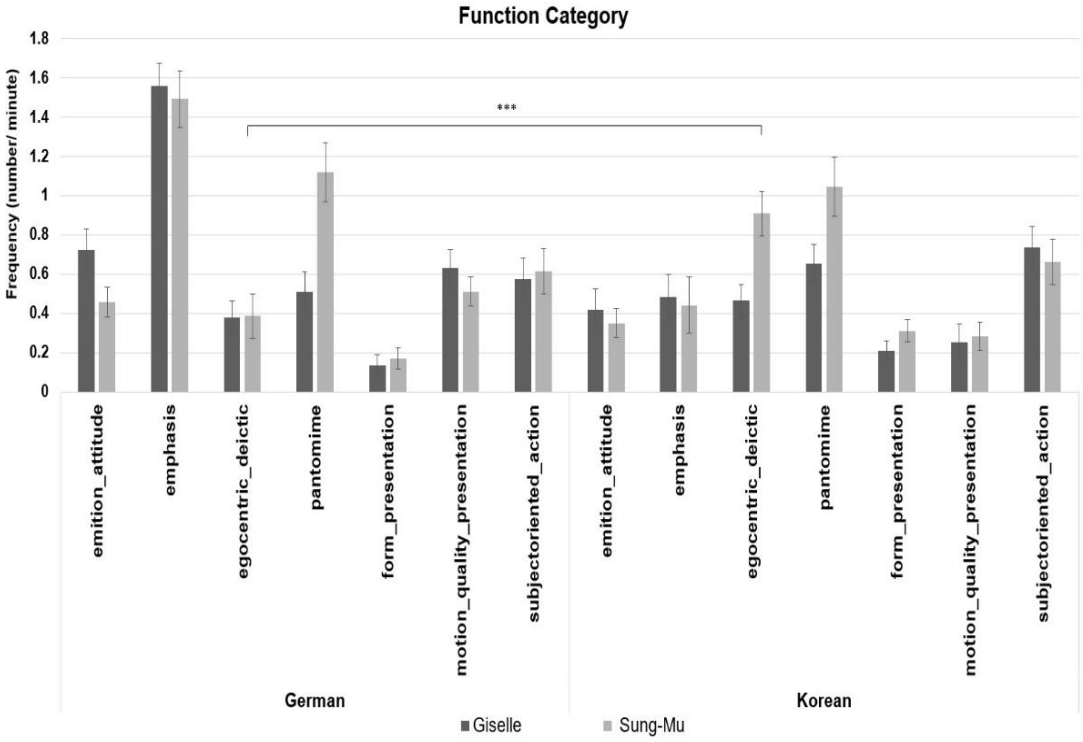

*Figure 4. A number of Function value units per minute executed by Germans and Koreans for the Dance Form (*Giselle, Sung-Mu*). Error bars indicate the calculated standard errors. (*: p < .05; **: p < .01; ***: .000 ≤ p < .001) Bonferroni adjustment was used for multiple comparison analysis.*

Type Category

Frequency distribution of Type values, which are related to the Function values, showed that the precondition of the execution by more than 10 participants for each cultural group was fulfilled for 15 Type values *shrug* and *closing* (*emotion/attitude*), *baton, superimposed, back toss*, and *palm out* (*emphasis*), *external target, self, body* (*deictic*), *transitive* and *intransitive* (*pantomime*), *shape* (*form*), *position* (*space*), *manner* and *dynamics* (*motion*) of 29 values. The multivariate ANOVA showed a significant effect of the within-subject factors Dance Form (F = 2.81; df = 7, 52; p = .014; η_p^2 = .275), Emotion (F = 4.28; df = 7, 52; p = .001; η_p^2 = .365), and the between-subject factor Culture (F = 4.8; df = 7,

52; $p < .001$; $\eta_p^2 = .392$). However, no significant effect of interaction with the factor Culture was calculated.

Discussion

The present study systematically investigated the hand movements and gestures of Germans and Koreans in response to sad and happy dance scenes of the Korean dance *Sung-Mu* and the French ballet *Giselle*. Below we discuss the results regarding our original hypotheses on cultural differences in the perception of dance form, of emotional content, and of the mutual influence of dance form and emotional content.

Effect of the Dance Form

Our hypothesis concerning cultural differences in the appreciation of the dance form was that Germans generally would show more motor activity of hands, more conceptual movement, more gesture, especially of form presenting function with respective hand types than Koreans for the ballet *Giselle*, while Koreans execute more of those hand movements than Germans for the dance *Sung-Mu*.

The analysis showed no significant hand movement types that were considered in the hypothesis. However, the analysis result of the Function category revealed that Koreans executed significantly more *egocentric deictic* gestures than Germans for *Sung-Mu*. They also showed significantly more *egocentric deictic* units for *Sung-Mu* than *Giselle*. *Deictic* gestures, as defined as pointing gestures in NEUROGES, provide spatial information from the gesturer's egocentric perspective, referring to a concrete or abstract location.[58] Thus, *deictic* gestures do not depict or present a concept. Accordingly, the Koreans explicitly and primarily designate an actual object, which—in the present study—was the *Sung-Mu* dancer, who is identified by pointing to his location in the video clip projected. The higher number of pointing gestures in Koreans in response to the dance form of their own culture suggests that Koreans tend to show stronger effect of an in-group advantage in comparison with Germans.

Effect of the Emotion in Dance

Our hypothesis concerning cultural differences in the appreciation of sad and happy emotions was that concerning the perception of Emotion, Germans in comparison to Koreans would show more hand movements, such as general motor

58. Lausberg, (2013), 140.

activity, conceptual movement, gesture, and gesture of emotional function with respective movement types for the happy dances.

The analysis showed only significant result for the general motor activity of the hands. The German participants showed significantly more *movement* units, i.e. motor activity of the hands, than the Korean participants for the happy dance scenes. In both the *Giselle* and *Sung-Mu* dances, a greater strength and velocity of the movements, as well as more repetitions of dance movement, characterize the happy dance scenes as compared to the sad ones. Germans also displayed significantly more hand activity for the happy dance scenes than the sad scenes. This finding is interesting, in so far as can be generalized, that German spectators judge dance movements with happinesss using more intense movements than when they observe sad dances.[59]

Obviously, the faster movements of the happy dance scenes compared to the sad scenes stimulated the German group more strongly than the Korean group. This cultural difference in the frequency of the movement units seems parallel to findings of other emotion studies of European and Asian participants. In the study by Matsumoto and Ekman, Americans perceived emotions such as happiness and joy with higher intensity scores than the Japanese.[60] The behavioral responses of Koreans to the happy and sad scenes are similar. This could imply that, culturally, Koreans do not present strongly with nonverbal expression of their feelings between happy and sad dance scenes.[61] This may be a result of the social trend among East Asian people to experience, or respond equally, to the positive and negative feelings.[62]

Effect of the Interaction between Dance Form and Emotion in Dance

The combination of Dance Form and Emotion led to the overall assumption that Germans and Koreans would execute more hand movements, such as general motor activity, conceptual movement, gestures, especially with form presenting and emotional function for the happy dance of their own culture.

The analysis revealed significant results for conceptual hand movement and gesture. Germans showed significantly more *phasic* and *repetitive* Structure units than Koreans for sad Sung-Mu and happy Giselle. In addition, Germans showed significantly more *phasic* and *repetitive* units for sad Sung-Mu than sad Giselle. Both *phasic* and *repetitive* units are based to conceptual processes as

59. Brownlow et al., (1997), 411.

60. Matsumoto and Ekman, (1989), 143.

61. Fernández et al., "Differences Between Cultures in Emotional Verbal and Non-verbal Reactions." *Psicotheme* 12, (2000): 83–92.

62. Fox, (2008), 6.

evidenced by their trajectory with preparation, conceptual, and retraction phases. In the given experimental context, these are functionally gestures, actions, or discrete self-touches.

The fact that Germans displayed more conceptual hand movements in response to sad Sung-Mu, as compared to sad Giselle, which is technically more familiar, is likely to reflect that they were more emotionally engaged by the sad Sung-Mu to formulate their impressions by conceptual hand movements, despite the fact that *Sung-Mu* as a dance form is not familiar to them. The dance scenes differ in the movement forms used for the depiction of sadness. Sad Sung-Mu is characterized by slow successive motions from bowing down on the floor to standing up, in combination with a slow spreading-out of the long sleeves. In contrast, in *Giselle*, sequential slow and graceful movements of the legs and arms present the sadness. Concerning the performance of sad Sung-Mu, in particular inspired by the slow standing up in combination with the slow spreading-out of the long sleeves, some Korean have reported to imagine a butterfly that is just trying to fly into the sky from the ground.[63] It seems that Germans were more impressed by the perception of the dance movements of sad Sung-Mu because, in comparison to the sad Giselle, they might be more emotionally or aesthetically engaged by the sad Sung-Mu. Thus, here the cross-cultural effect[64] seems to overrun the in-group advantage.[65] Hence, it is assumed that the dominance of the cross-cultural effect over the in-group advantage effect, and vice versa, seems to shift in accordance with how strongly the observed dance scene stimulates the spectator independent of its cultural origin.

The Korean participants executed significantly more *repetitive* units for happy Sung-Mu than happy Giselle. These are functionally gestures and actions of self-touches that have a conceptual phase with a repetitive trajectory. As repetitive movements are known to rely on semi-automatic movement production, the Korean participants were inspired more strongly to generate semi-automatic hand movements when observing the dance form of their own culture. Thus, the increase of conceptual hand movements by Koreans, in response to the dance of their own culture, suggests an in-group advantage. While this concept has originally been described as the identification of emotions,[66,67] the present data suggests that it seems to apply, likewise, to the perception of emotions as conveyed by cultural dance forms.

Germans displayed significantly more *in space* units of the Focus category than Koreans did for sad Sung-Mu and happy Giselle. In addition,

63. Baek, (2002).
64. Fink et al., (2015), 3.
65. Elfenbein and Ambady, (2002), 203.
66. Soto and Levenson, (2009), 874.
67. Elfenbein and Ambady, (2002), 203.

Germans showed significantly more *in space* units for sad Sung-Mu than sad Giselle.

In space units, "directing to the space that is visually shared by the gesturer and the recipient," are functionally gestures.[68] Here again, Germans executed more gestures than Koreans did for sad Sung-Mu and happy Giselle. Germans showed more gestures for the sad dance scene of *Sung-Mu* than sad *Giselle* scenes of their own culture. As explained above, Germans were more engaged by the more fluid and slower dance movements of the sad Sung-Mu, such as the lines the scarved traversed in space and the emotions the gestures brought about because, compared to the sad Giselle, they might have been more engaged aesthetically and emotionally by the Sung-Mu for other reasons, such as the lines the scarved traversed in space and the emotions the gestures evoked.

Specifically, Germans showed significantly more *phasic in space* units than Koreans for sad Sung-Mu and happy Giselle. In addition, Germans showed significantly more *phasic in space* and *repetitive in space* units for sad Sung-Mu than sad Giselle.

Phasic in space and *repetitive in space* units are functionally gestures, i.e., these hand movements adopt different functions that are often complementary to the verbal utterances that they accompany: They may emphasize certain aspects in the verbal statements; point to concrete or imaginary locations; indicate directions; pantomime actions; or present forms, spatial relations, or motion qualities.[69] In general, Germans showed hand movement behavior similar to that of the Focus category.

In summary, our hypothesis that Germans, in comparison to Koreans, will show more conceptual hand movement and gesture for happy ballet was not proved. Rather Germans showed higher frequency of the conceptual hand movement and gesture than Koreans for sad Sung-Mu than sad Giselle, which indicates a clear cross-cultural effect of sad Sung-Mu on Germans.

With regards to the interpretation of our findings, the following limitations of the study must be considered. The number of participants, 30 from each culture, may be cause for concern in generalizing the present results for all Germans and Koreans. However, considering that all comparable studies mentioned in the introduction based their conclusions about cultural differences on even smaller numbers of participants, the sample size of the present micro-analytic study of nonverbal behavior should have been substantial. Additionally, we acknowledge that the calculated differences in gestures of the present study might be explained more precisely if the content of participants' statements in different languages could be more carefully matched by appropriate methods.

68. Lausberg, (2013), 122.
69. Lausberg, (2013), 139–148.

Conclusion

The present study using the NEUROGES system reveals that Germans and Koreans show significant differences in the hand movement and gestural responses during verbal descriptions of their impressions immediately after observing of happy and sad scenes of dances of their own and the other culture, notably the French ballet *Giselle* and the Korean dance *Sung-Mu*.

Germans revealed significantly higher frequency of *phasic* and *repetitive, in space*, and *phasic in space* movements than Koreans did for sad Sung-Mu and happy Giselle. Germans also provided a higher frequency of *phasic in space* and *repetitive in space* movements, which are functionally gestures, for sad Sung-Mu than sad Giselle. Thus, they showed a cross-cultural effect for sad Sung-Mu and an in-group effect for happy Giselle. In contrast, Koreans carried out significantly more *repetitive, in space* and *repetitive in space* movements for happy Sung-Mu than happy Giselle. Thus, they showed a clear in-group effect.

More specifically, the Korean participants showed significantly more *egocentric deictic* gestures than Germans for the *Sung-Mu* dance. Koreans did not gesturally depict the movements of the dance scenes but rather pointed to the scenes.

The general hypotheses that Germans in comparison to Koreans would show more hand movements for the ballet *Giselle* and happy Giselle were confirmed in part. Thereby, it has been assumed that Germans and Koreans would predominantly execute general motor activity, conceptual hand movement, gesture, and gesture of form presenting or emotional function with respective hand types. Germans showed a cross-cultural effect for sad Sung-Mu and an in-group effect for happy Giselle, while Koreans showed a clear in-group effect for Sung-Mu. Hence, we assume that the relation of cross-cultural versus in-group advantage effects is strongly influenced by the intensity of the spectator's feelings during the perception of each dance stimulus.

Bibliography

Alderson, Evan. "Ballet as Ideology: *Giselle*, Act II." *Dance Chronicle* 10, no. 3, (1986), 290–304.

Baek, Hyun Soon. "A Study on Dance Motions and Techniques of *Sung-Mu*: Focusing on Lee Mae-Bang Important Intangible Cultural Property No. 27. [in Korean with English abstract]." *Korean Journal of Physical Education* 41, (2002), 487–498.

Bresnahan, Aili. "The Philosophy of Dance." In *The Stanford Encyclopedia of Philosophy Archive*. ed. Edward N. Zalta (Winter, 2016 Edition). https://stanford.library.sydney.edu.au/archives/win2016/entries/dance/.

Brownlow, Sheila, Amy R. Dixon, Carrie A. Egbert, and Rebecca D. Radcliffe. "Perception of Movement and Dancer Characteristics from Point-light Displays of Dance." *Psychological Record* 47, no. 3, (1997), 411–421.

Bunge, Silvia A., and Itamar Kahn. "Cognition: An Overview of Neuroimaging Techniques." *Encyclopedia of Neuroscience* 2, (2009), 1063–1067.

Calvo-Merino, Beatriz, Daniel E. Glaser, Julie Grèzes, Richard E. Passingham, and Patrick Haggard. "Action Observation and Acquired Motor Skills: An fMRI Study with Expert Dancers." *Cerebral Cortex* 15, (2005), 1243–1249. doi: 10.1093/cercor/bhi007.

Calvo-Merino, Beatriz, Corinne Jola, Daniel E. Glaser, and Patrick Haggard. "Towards a Sensorimotor Aesthetics of Performing Art." *Consciousness and Cognition* 17, no. 3, (2008), 911–922. doi: 10.1016/ j.concog.2007.11.003.

Darwin, Charles. *The Expression of the Emotions in Man and Animals* (2nd ed.). (London: Penguin Books, 1890/2009).

Desmond, Jane C. "Embodying Difference: Issues in Dance and Cultural Studies," *Cultural Critique* 26, (Winter, 1993–1994), 33–63.

Efron, David. *Gesture, Race and Culture:A Tentative Study of the Spatio-temporal and "Linguistic" Aspects of the Gestural Behavior of Eastern Jews and Southern Italians in New York City, Living Under Similar as Well as Different Environmental Conditions*, sketches by Stuyvesant van Veen. (The Hague: Mouton, 1972).

Elfenbein, Hillary A., and Nalini Ambady. "On the Universality and Cultural Specificity of Emotion Recognition: A Meta-analysis." *Psychological Bulletin* 128, no. 2, (2002), 203–235. doi: 10.1037//0033-2909.128.2.203.

Fernández, Itziar, Pilar Carrera, Flor Sánchez, Dario Paez, and Luis Candia. "Differences Between Cultures in Emotional Verbal and Non-verbal Reactions." *Psicotheme* 12, (2000), 83–92.

Fink, Bernhard, Bettina Weege, Nick Neave, Michael N. Pham, and Todd K. Shackelford. "Integrating Body Movement into Attractiveness Research." *Frontiers in Psychology* 6, Article 220, (2015), 1–6. doi: 10.3380/ fpsyg.2015. 00220.

Fox, Elaine. *Emotion Science: An Integration of Cognitive and Neuroscientific Approaches.* (Basingstoke, U.K.: Palgrave Macmillan, 2008).

Freedman, Norbert. "The Analysis of Movement Behavior During the Clinical Interview." *Studies in Dyadic Communication* (1972), 153–175.

Glass, Renee, and Catherine Stevens. "Making Sense of Contemporary Dance: An Australian Investigation into Audience Interpretation and Enjoyment Levels," (2005). http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.553.9501&rep =rep1&type=pdf.

Goldwin-Maedow, Susan, and Martha W. Alibali. "Gesture's Role in Speaking, Learning, and Creating Language." *Annual Review of Psychology.* 64, (2013), 257–283.

Hogrefe, Katharina, Robert Rein, Harald Skomroch, and Hedda Lausberg. "Co-speech Hand Movements During Narrations: What is the Impact of Right vs. Left Hemisphere Brain Damage?" *Neuropsychologia* 93, (2016), 176–188.

Holle, Henning, and Robert Rein. "Assessing Interrater Agreement of Movement Annotations." In *Understanding Body Movement and Gesture. A Guide to Empirical Research on Nonverbal Behavior*, ed. Hedda Lausberg (Frankfurt a.M., Germany: Peter Lang, 2013), 261–277.

———. "EasyDIAg: A Tool for Easy Determination of Interrater Agreement." *Behavior Research Methods* 47, no. 3, (2015), 837–847. doi: 10.3758/s13428-014-0506-7.

Jola, Corinne, Shantel Ehrenberg, and Dee Reynolds. "The Experience of Watching Dance: Phenomenological-neuroscience Duets." *Phenomenology and the Cognitive Sciences* 11, no.1, (2012), 17–37.

Kendon, Adam. *Gesture: Visible Action as Utterance*. (UK: Cambridge University Press, 2004).

Laban, Rudolf von. *The Mastery of Movement (4th rev. ed.).* (Tavistock, U.K.: Northcote House, 1988).

Lausberg, Hedda. *Understanding Body Movement and Gesture: A Guide to Empirical Research on Nonverbal Behavior*. (Frankfurt a.M., Germany: Peter Lang, 2013).

———. *The NEUROGES® Analysis System for Nonverbal Behaviour and Gesture: The Complete Research Coding Manual with Interactive Video Learning Tool*. (Frankfurt a.M., Germany: Peter Lang, 2018).

Lausberg, Hedda, and Han Slöetjes. "Coding Gestural Behavior with the NEUROGES-ELAN System." *Behavior Research Methods* 41, no. 3, (2009), 841–849. doi:10.3758/BRM.41.3.841.

———. "The revised NEUROGES-ELAN System—An Objective and Reliable Interdisciplinary Analysis Tool for Nonverbal Behavior and Gesture." *Behavior Research Methods* 48, no. 3, (2016), 973–993. doi: 10.3758/s13428-015-0622-z.

Lausberg, Hedda, Eran Zaidel, Robyn F. Cruz, and Alain Ptito. "Speech-independent Production of Communicative Gesture: Evidence from Patients with Complete Callosal Disconnection." *Neuropsychologia* 45, no. 17, (2007), 3092–3104.

Matsumoto, David. "Methodological Requirements to Test a Possible In-group Advantage in Judging Emotions across Cultures: Comment on Elfenbein

and Ambady (2002) and Evidence." *Psychological Bulletin* 128, no. 2, (2002), 236–242.

Matsumoto, David, and Paul Ekman. "American-Japanese Cultural Difference in Intensity Ratings of Facial Expressions of Emotion." *Motivation and Emotion* 3, no. 2, (1989), 143–157. doi: 10.1007/BF00992959.

McNeill, Davis. *Hand and Mind: What Gestures Reveal about Thought*. (Chicago: University of Chicago Press, 1992).

O'Cadiz, Darlene. *Dance and Cultural Diversity*. (San Diego: Cognella Academic Publishing, 2013).

Petermann, Kerstin, Harald Skomroch, and Daniela Dvoretska. "Calculating Temporal Interrater Agreement for Binary Movement Categories." In *Understanding Body Movement: A Guide to Empirical Research on Nonverbal Behavior,* ed. Hedda Lausberg (Frankfurt a.M., Germany: Peter Lang, 2013), 253–260.

Sawada, Misako, Kazuhiro Suda, and Motonobu Ishii. "Expression of Emotions in Dance: Between Arm Movement Characteristics and Emotion." *Perceptual and Motor Skills* 97, no. 3, (2003), 697–708.

Skomroch, Harald, Hedda Lausberg, V. Unterladstetter, M. Sandler, J. Strunk, and N. P. Himmelmann. "Patterns of Hand Movement and Prosodic Behavior across Language Groups." Workshop on Mapping Multimodal Dialogue 2, (Leuven, Belgium, 2014, November).

Soto, José A., and Robert W. Levenson. "Emotion Recognition across Cultures: The Influence of Ethnicity on Empathic Accuracy and Physiological Linkage." *Emotion* 9, no.6, (2009), 874–884. doi: 10.1037/a0017399.

Stevens, Catherine, Renee Glass, Emery Schuberr, Johnson Chen, and Heather Winskel. "Methods for Measuring Audience Reaction." In *Proceedings of the International Conference on Music Communication Science*, (2007, December), 155–158.

Appendix: Inter-rater Agreement (IA) Values

Inter-rater agreement values are measured by the Compare Annotators' Ratio (Activation category) and the EasyDIAg Cohen's Kappa (all other NEUROGES categories).

Module I-Activation values	Compare Annotators	
left-hand movement	0.85 ± 0.14	
right-hand movement	0.86 ± 0.14	
Module I-Structure values	EasyDIAg Cohen's Kappa	Raw agreement
irregular	0.67	0.89
repetitive	0.76	0.92
phasic	0.66	0.85
aborted	0.79	0.99
shift	0.63	0.96
Module I-StructureFocus values	EasyDIAg Cohen's Kappa	Raw agreement
irregular within body	0.53	0.99
irregular on body	0.75	0.93
irregular on attached object	0.47	0.99
irregular on object separate	0.57	1
repetitive within body	1	1
repetitive on body	0.75	0.97
repetitive on attached object	0.4	1
repetitive on separate object	0	1
repetitive in space	0.91	0.98
phasic within body	0.57	1
phasic on body	0.66	0.94
phasic on attached object	0.81	1
phasic on separate object	0.54	1
phasic in space	0.82	0.93