

## Basic Body Rhythms: From Individual to Interpersonal Movement Feedback

Sabine C. Koch, University of Heidelberg

**Abstract.** This chapter provides an overview of embodiment approaches departing from a static and moving toward dynamic body feedback. It outlines the influence of kinesthetic movement feedback in individuals and tactile movement feedback in interpersonal situations, using movement qualities and movement rhythms as independent variables. Research on the causal influence of afferent feedback from the body on affect, attitudes, and cognition is extended into the dynamic realm and systematized into the separate influence of movement shape and movement quality. Movement quality – with movement rhythms as its most basic aspect – is an important component of an embodiment framework. Rather than with the “what” it deals with the “how” of movement. The empirical studies described here outline implications of movement qualities both on an individual and on an interpersonal level.

Embodiment research in psychology is thriving. Building on the phenomenological philosophy of Merleau-Ponty (1962), embodiment approaches shift the focus from the former computational model of human experiencing and behavior to the more organismic view (Semin & Smith, 2008; Smith & Semin, 2004), stressing that the body plays a central role in thinking, feeling, perceiving and acting (Barsalou, 1999; Niedenthal et al., 2005).

One important premise of embodiment research is the bidirectionality assumption (Izard, 1977; Laird, 1984; Neumann & Strack, 2000; see Figure 1). This assumption puts forth that not only do we express our thoughts and feelings in motor behavior (expression function; cf. Darwin 1872), but motor behavior is also causally influencing affect and cognition via body feedback (Adelman & Zajonc, 1987; Zajonc & Markus, 1984). This body feedback on the kinesthetic level is not only functional for survival, but also causally relevant for the experience of empathy (Lipps, 1903), or beauty (aesthetic experience; e.g., Leder et al., 2004), by providing resonance in the living body (Merleau-Ponty, 1962).

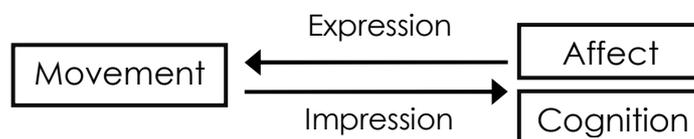


Figure 1: Bidirectionality assumption between motor system and cognitive-affective system; afferent body feedback (impression) plays a causal role in perception of emotion, formation of attitudes and behavior regulation

(cf. Wallbott, 1982; Zajonc & Markus, 1984)

### **1. Body feedback effects**

Body feedback experiments have been showing that our bodily behavior can change our perceptions, emotions, cognitions or reaction times in certain tasks (for a systematic overview see Hatfield et al., 1994). Strack, Martin and Stepper (1988), for example, had their participants hold a pen either between their teeth or between their lips and found that participants holding the pen between their teeth judged a cartoon that was given to them as a dependent measure more funny than participants who held the pen between their lips. They see the reason for this effect in the fact that the facial muscles you need for smiling are inhibited in the lip condition. Riskind (1984) showed that participants who sat in a slumped position (spine bowed with head hanging down) versus an upright position (spine upright with head held high) recall more negative life events when asked to generate memories. The mechanism that is assumed to be responsible for these effects is proprioceptive combined with exteroceptive body feedback (Neumann & Strack, 2000). All these experiments assume that afferent feedback from the body plays a causal role in the experience of emotions, the formation of attitudes, as well as in cognition and behavior regulation (Adelman & Zajonc, 1987; Zajonc & Markus, 1984).

Psychological research has succeeded to integrate formerly singular approaches on body feedback and the body-related effect into an overarching embodiment approach, by the extension of the cognitive model of knowledge representation (Niedenthal et al., 2005). However, embodiment researchers have not yet fully recognized the basic meaning of movement (dynamic, qualitative aspects) within this new paradigm.

### **2. From static to dynamic**

We are moving beings. Conversely, embodiment research has long been looking at static body feedback (Laird, 1984; LaFrance, 1985; Riskind, 1984; Rossberg-Gempton & Poole, 1992). The challenge of the hour in embodiment research is to integrate dynamic body feedback as an independent variable and to extend the definition of embodiment to the dynamic realm. This is what our research set out to do.

Cacioppo and colleagues with their arm flexion and arm extension experiments (1993) have brought a dynamic component into body feedback research by employing force either toward the body or away from the body (see also Neumann & Strack, 2000; Raab & Green, 2005; Wentura, Rotermund & Bak, 2000). They had their participants either press on a table from below (a held approach movement) or press on a table from above (a held avoidance movement) while they showed valence-free Chinese ideographs to them. Participants with the held approach movement later rated these stimuli as significantly more positive than participants in the held avoidance condition. The authors explain this in an evolutionary fashion by pointing out the ontogenetic and phylogenetic functional value of bringing good things (such as good food and

benevolent people) toward the body and pushing bad things (such as bad food and maleficent people) away from the body, emphasizing the lifelong practice of these actions.

Wells and Petty (1980), as well as Förster and Strack (1996), in their “head shaking experiments” had earlier been working with dynamic movement. They demonstrated the motor-congruency effect that participants – presumably testing earphones – categorized positive words faster while nodding, and categorized negative words faster when shaking their heads. However, the researchers did not take into account the influence of movement qualities within their manipulation. Scholarly work has very rarely included movement quality as an independent variable. As an exception we can name the research of Aronoff and colleagues (1992), Maass and Suitner (2010), and Wallbott (1985) for movement qualities, and Hatfield et al. (1992) for vocal qualities related to emotions (see also Hatfield et al., 1994).

We wanted to go further with the research on dynamic movement feedback. For reasons of external validity it seemed to be indicated to work with actual movement instead of static postures in experimental settings. In everyday life, it is rather artificial to hold a certain posture for more than a minute. We are most of the time in motion. Employing movement makes the designs more realistic, but also more complex. Theories of body philosophy (Merleau-Ponty, 1962; Sheets-Johnstone, 1999; 2009) and movement analysis (Laban, 1960; Kestenberg 1995) suggest that next to movement shape (e.g., approach vs. avoidance), *movement quality* must be taken into account as a second factor of influence in such designs. Movement qualities such as quick, slow, strong, light, smooth, sharp, etc. develop throughout life (and can occur in a more automatic or a more deliberate way). We decided to start with the most basic movement qualities that have been described in clinical and developmental movement analysis: the movement rhythms (Kestenberg, 1995; Loman, 1998). Movement rhythms are periodic alternations in tension and relaxation of the muscles. They play a role in dynamic body feedback on an individual and an interaction level, for example in human communication. Here, we investigated their role in *kinesthetic* and *haptic* body feedback.

### **3. A theory of movement rhythms**

Theories of movement analysis suggest movement qualities and movement shape to be factors of equal influence in perception and production of a movement. Movement shapes fall into open and closed shapes, directional movement, movement toward or away from the body, and growing and shrinking movements (e.g. to move upward, downward, to widen, to narrow, to enclose or to spread (Kestenberg, 1995; Laban, 1960). Movement qualities generally fall into smooth and sharp movement rhythms, indulgent and fighting movement qualities, or relaxed and tense movement as Judith Kestenberg conceptualized it in the Kestenberg Movement Profile (KMP; Kestenberg, 1995).

In her theory, as a sub-category of indulgent and fighting movement

qualities, Kestenberg distinguishes 10 basic movement rhythms<sup>1</sup> that correspond to physiological and psychological needs of a person (Kestenberg, 1995; Kestenberg Amighi et al., 1999; Kestenberg & Sossin, 1979). These rhythms refer to the constant changes of tension and relaxation in our bodies (tension-flow). They fall in two basic categories: indulgent rhythms (libidinal; with smooth reversals/transitions) and fighting rhythms (aggressive; with sharp reversals/transitions). An overview of the rhythms as distinguished in Kestenberg's theory is graphically provided in section 7.2. Grounded on psychodynamic developmental theory, the rhythms – as the most basic movement qualities – are assumed to originate in the psychosexual zones: mouth, anus, bladder, internal and external genitals (in developmental sequence). Each indulgent rhythm, serving playful exploration of a new movement quality, is followed by a fighting rhythm, serving separation from this quality (cf. Erickson, 1950). Rhythms can be observed from fetal stage on throughout life and serve the function to express needs and affect (mostly without conscious awareness). They have thus primary body feedback and communicative function. Indulgent rhythms indicate the giving into a situation, yielding to an experience and are characterized by smooth transitions in tension-flow; fighting rhythms indicate the direct focusing on a goal, serving separation and dissociation and are characterized by sharp tension-flow transitions. Rhythms can be written in a graph on a time line by use of kinesthetic empathy, i.e. transforming the tension flow in the observed person into ones body, arm, and hand writing (i.e., the pen as extension of one's own body), resulting in graphs with either smooth or sharp transitions. The inter-rater reliability of the Kestenberg rhythms has been demonstrated in several studies with Cronbach's Alphas > .80 (Koch et al., 2002; Koch, 2006; Sossin, 1987).

The investigation of smooth vs. sharp rhythms is not a brand new phenomenon in psychological research. Poffenberger and Barrows showed in 1924, that smooth and sharp forms – such as the ones received from rhythm writing – were related to states such as sad, joyful, calm, irritated, angry, playful, weak to a high degree of agreement (dead was related to the straight line; see Figure 2).

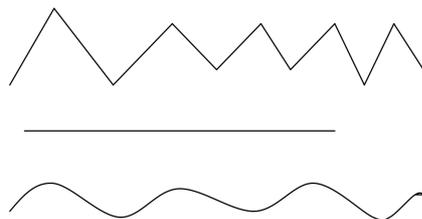


Figure 2: Sharp, straight and round forms of Poffenberger and Barrows (1924; compare Johnson, 2008) resemble smooth and sharp rhythms in Kestenberg rhythm writing (Kestenberg & Sossin, 1979; cf. Figure 6).

<sup>1</sup> The 10 rhythms corresponding to 10 developmental movement stages are: sucking, biting, twisting, straining/releasing, running/driftting, starting/stopping, swaying, surging/birthing, jumping and spurting /ramming.

These forms can be intermedially transformed into dance, music and other art modalities. Resulting forms are based on kinesthetic resonance that causes according inner qualities (Merleau-Ponty, 1962). We also find the distinction between smooth and sharp in the classical Gestalt experiments of Köhler (1929). Köhler asked his participants to assign the names of *bouba* and *kiki* to two geometric forms – one round curved ink blot and one sharp edged star. Ninety-five to 98% of the participants assigned *kiki* to the sharp edged form and *bouba* to the round curved one. The effect was replicated in many studies – also interculturally – including one study with two and a half year olds (Maurer et al., 2006). In addition, Bar and Neta (2006) found that attitudes toward everyday objects were more positive when they were presented with soft edges instead of sharp edges. Köhler (1929) described a similar effect for smooth and sharp forms and their relation to musical sounds.

Ramachandran and Hubbard (2001) put forth that the *kiki/bouba*-effect has implication for the evolutionary development of language, since it suggests that the naming of objects is not totally arbitrary (the function of quality of voice not even taken into account yet). Due to its intermodality the effect is also of interest in research on synesthesia. Synesthesia is the experience of one sensual input in more than one sense, such as the hearing of colors or the tasting of words. It offers one approach to investigate consciousness and its processes. By creating additional sensual experiences in untypical channels, the synesthetic experience can contribute to investigate qualia (e.g., Gray et al., 2002; Gray; et al., 1997).

In clinical movement analysis, the basic distinction of fighting and indulgent movement qualities (Laban & Lawrence, 1947/1974) and smooth vs. sharp rhythms (Kestenberg, 1995) is assumed to correspond to different psychological needs as meaning correlates (Kestenberg, 1995). The round, smooth transitions can be observed in playful exploration and indulgent situation, where one yields into the pleasure of the movement (such as jumping for the joy of jumping and twisting for the joy of twisting). The sharp rhythms can be observed in situations where fighting, controlling, or vigilant behavior is functional. They serve the voluntary following through with a goal, against the bodily tendency to relax. We used Kestenberg's theory (1995) to operationalize movement qualities.

In our empirical studies, our general aim was to investigate the meaning of the movement qualities, particularly, whether indulgent rhythms vs. fighting rhythms were basic dimensions of movement with differential implications for cognition and affect. In a second step, we then combined movement qualities with the better investigated factor of movement shapes (here: approach and avoidance motor behavior) to explore their single contribution to differential affect and attitudes. And in a third step, we investigated interpersonal implications of movement rhythms on person perception, particularly affect and judgment of personality characteristics.

#### 4. Establishing movement quality as a source of influence on affect

In order to test movement quality as a source of influence we first conducted a number of experiments on the influence of smooth vs. sharp rhythms on affect and cognition. In our first study (Günther, 2006;  $n=60$ ), 30 participants were instructed to spring (jumping rhythm as in elastically hopping) vs. kick (spurting/ramming rhythm as in kicking an imaginary ball), while performing a word categorization task with a wireless mouse. We were able to show that that jumping rhythm (smooth, indulgent) vs. spurting/ramming rhythm (sharp, fighting) caused congruent affect in participants ( $p < .05$ ): smooth rhythms caused more positive affect (i.e., more relaxed, joyful, indulgent, peaceful, playful feelings as measured by the KMP-affect questionnaire, Koch & Müller, 2007), sharp rhythms caused more negative affect (i.e., more tense, intruding, fighting, aggressive, retaining feelings). We chose these particular movement rhythms for the first study because they were particularly easy to observe and embody (due to their large size). Because of their high intensity they were particularly clear and easy to distinguish from one another. No effect was found on the cognitive measure.

In a second study ( $n=60$ ), we replicated this effect with two different movement rhythms (swaying vs. biting/starting-stopping rhythm) to make sure that the results are not specific to the movement rhythms used in study 1. Variables, design, cover story, procedure and hypotheses of study 2 were parallel to those of study 1. Participants sat on a table and either swung their legs when performing a categorization task or pulled both feet up and down while performing the task. As in study 1, results indicated an effect of the affective measure ( $p < .01$ ), and no effect of indulgent vs. fighting rhythms on the cognitive measure (recognition of faces; neither online –in direct categorization- nor offline from memory). When participants performed indulgent movement they felt more relaxed, joyful, etc.; when they performed fighting movement they felt tenser, more aggressive, etc.

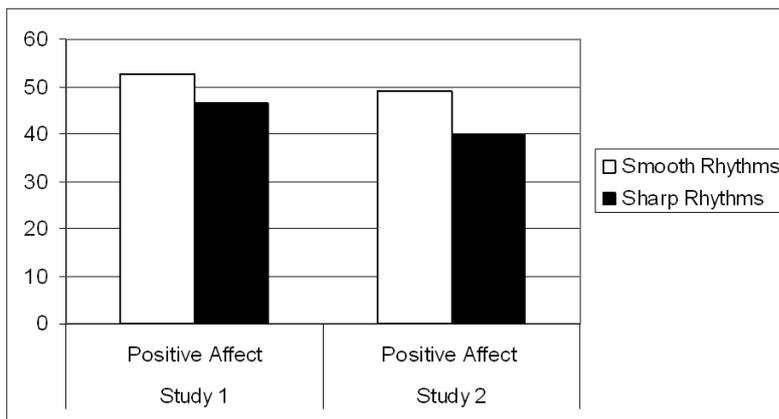


Figure 3: Effects of movement rhythms on affect; the y-axis yields the approximated sum scores on the brief KMP-affect questionnaire (Koch & Müller, 2007).

Study 2 replicated the results of study 1 suggesting that indulgent vs. fighting rhythms and movement qualities are the underlying basic dimensions to which the effect can be traced back. Single movement rhythms are thus subcategories for specification of affect.

In sum, these studies indicated that the basic movement dimensions (indulgent vs. fighting rhythms) are linked to the affect system. Cognition – as operationalized here – remained unaffected. Generally, we were encouraged to carry our studies further.

### **5. The joint influence of movement qualities and movement shape on affect and attitudes**

In the next two studies, in addition to the affect measure, an evaluation measure was introduced: participants were presented valence-free Chinese ideographs in a learning phase while they were doing an approach or avoidance movement combined with an indulging vs. fighting rhythm (4 conditions), and then had to evaluate the ideographs in a judgment phase (cf. Cacioppo et al., 1993). These studies stem from the research tradition of the influence of approach and avoidance motor behavior on attitudes. In the experiment by Cacioppo and colleagues (1993) participants either performed an approach movement, that is an arm flexion where they pressed their palms against the downside of a table, thereby mobilizing force upward and toward the body or an avoidance movement, that is an arm extension where they pressed their palms against the surface of a table, thereby mobilizing force downward and away from the body. While performing the movement, participants watched a series of 24 initially valence-free Chinese ideographs. When they later evaluated the ideographs on a scale ranging from -2 to +2 (very negative to very positive), participants in the approach condition evaluated the ideographs more positively than participants in the avoidance condition. Cacioppo and his colleagues (1993) interpreted this finding as a direct effect of motor behavior on attitude. Their evolutionary explanation is that during ontogenesis we learn to take in good things and to push away bad things (e.g., food, other persons, etc.). This life-long learning process causes a *conditioned evaluative preparedness* of our cognitive-affective system. This system in turn enables us to differentiate "on a preconscious level between toxic and nourishing stimuli and provide the appropriate response." (Eberhard-Kaechele, 2007).

In the third study ( $n=40$ ) we wanted to replicate the findings of Cacioppo and colleagues (1993), and to introduce movement qualities (smooth vs. sharp rhythms) as a second independent variable. This allowed us to see whether movement quality (indulgent vs. fighting rhythms) or movement shape had the greater influence on attitudes and affect and whether moderations of one by the other occurred (Figure 4).

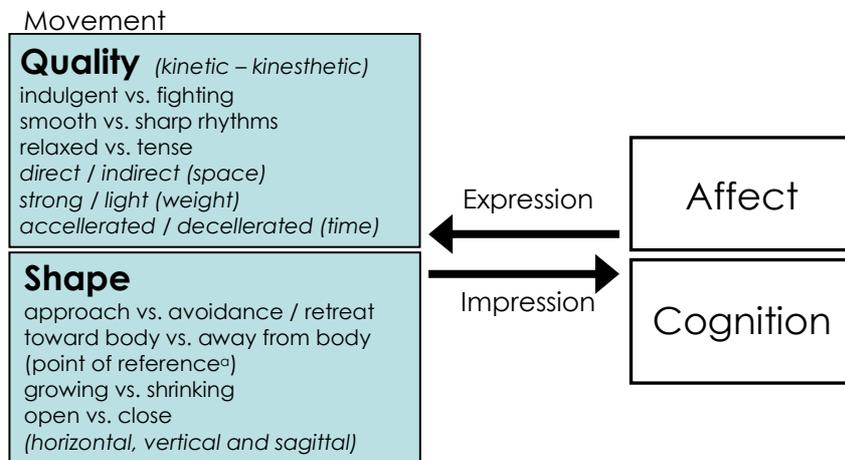


Figure 4: Extended bidirectionality model: Cognition and affect play a central role in movement behavior and both movement shape and movement quality play a causal role in the perception of emotions, the formation of attitudes and behavior regulation (impression side). <sup>a</sup>Self-referential movement must be distinguished from object-referential movement and can be easily altered under instructions of perspective change (Markman & Brendl, 2005; Seibt et al., 2008).

We used a more dynamic manipulation than Cacioppo and colleagues (1993). Since we were interested in the effects of movement proper rather than mere expense of force or muscle activation, we introduced four movement conditions. Participants were instructed to move their arms rhythmically either toward the body or away from the body (palm direction oriented accordingly) in either smooth rhythms or sharp rhythms (video examples were provided and we asked them to imitate the movement until they had understood it). We hypothesized two main effects: one for movement shape (approach vs. avoidance), and one for movement quality (smooth vs. sharp rhythms): Indulgent quality –just as approach movement– was hypothesized to cause more positive attitudes and affect. Dependent variables were the offline-evaluation of 12 of the Chinese ideographs from the original experiment (cognitive measure), an open affect question and the 12 affect items from studies 1 and 2 (affective measure).

Results indicate that the movement condition had a systematic influence on attitudes and affect. While movement shape (approach vs. avoidance) had no influence on attitudes, it had a systematic influence on affect ( $p < .05$ ): after approach movements participants felt significantly more relaxed, peaceful, etc. independent of rhythm employed; after the avoidance movement they felt significantly more tense, aggressive, etc. Movement rhythms had no influence on the affective measure, but influenced attitudes in a systematic way: participants judged the initially valence-free ideographs significantly more positively in the indulgent condition than in the fighting condition ( $p < .05$ ). The interaction of movement rhythms and shapes was marginally

significant for the cognitive measure ( $p < .01$ ). The influence of shape on affect was predicted by KMP-theory (Kestenberg, 1995) just the way it occurred in the experiment, yet the influence of rhythms on attitudes was new. The marginal interaction of movement rhythms and shape could suggest that rhythm is a moderator for shape or vice versa. Overall, the effect size was small and the sample too small to generalize from. Therefore, study 4 replicated study 3 with a larger sample ( $n=66$ ).

On the basis of the findings from study 3, we hypothesized a main effect for both movement shape (approach vs. avoidance) and movement quality (indulgent vs. fighting rhythms) on affect and attitudes. Just as in study 1 and 2, participants received the information that the study investigated the effects of physical arousal on the perception of different stimuli and that they were in the low-arousal condition. The focus of attention was thus distracted from the movement qualities. Independent and dependent variables were exactly the same as in study 3.

Results suggested a main effect of movement shape on affect and attitudes: Approach movements caused significantly more positive affect than avoidance movements ( $p < .01$ ) and a significantly more positive attitude toward the initially valence-free Chinese ideographs ( $p < .05$ ). Further, there was a significant interaction of movement shape and movement rhythm, suggesting that (a) fighting (but not indulgent) rhythms make a difference in the influence on affect: avoidance movement with fighting rhythms caused significantly more positive affect than approach movements with fighting rhythms (clashing movement quality and shape caused more aversive reactions); and that (b) indulgent qualities make the difference in the influence on attitudes: ideographs that had been learned with approach movements and indulgent rhythms were later on evaluated significantly more positively than the ones learned with avoidance movements and indulgent rhythms.

This effect of movement shape under smooth rhythms may be interpreted as due to the indulgent attitude smooth rhythms produce. Sharp rhythms create a fighting, and defensive attitude, thus possibly preventing the approach and avoidance information from unfolding its effect. Making the system not permeable enough to let the information pass. It can consequently be hypothesized that sharp rhythms overwrite approach and avoidance effects, while smooth rhythms bring them to full effect by raising the permeability ("Durchlässigkeit"; Lewin, 1935) of the organismic system. Furthermore, for both dependent variables, affect and attitudes, incongruence of movement quality and shape caused more negative reactions.

In sum, experiments 3 and 4 provide further evidence that the basic dimensions of the shape-system are related to affect and attitudes. There are hints to moderation and interaction processes between rhythms and shapes that need further exploration.

## **6. The influence of palm direction**

Finally, we conducted two studies, where we reversed the *palm direction*, resulting in incongruent shapes of arm movement and hand position (Koch, 2009). Movements were all performed in smooth rhythms (for better

permeability; Lewin, 1935).

Results suggest that palm direction alone did not exert an influence on affect or attitudes (only marginally for state-affect measured with the PANAS; Watson, Clark, & Tellegen, 1988). However, as expected, we found an effect of congruency of palm direction (toward body vs. away from body) and movement direction (approach vs. avoidance), with congruent shaping causing more positive affect ( $p < .05$ ; see Figure 5). The congruency of two movement shapes had thus a positive influence on the affect of participants.

Body feedback operates directly on the kinesthetic and haptic channel and indirectly on the visual channel via mirroring and mapping processes (employing kinesthetic empathy). On the kinesthetic channel, it provides feedback to the individual in the manner just reviewed. On the haptic channel, it directly transmits information from one person to another, as in an embrace or a handshake. In the next study, we investigated the communication of movement rhythms via handshakes.

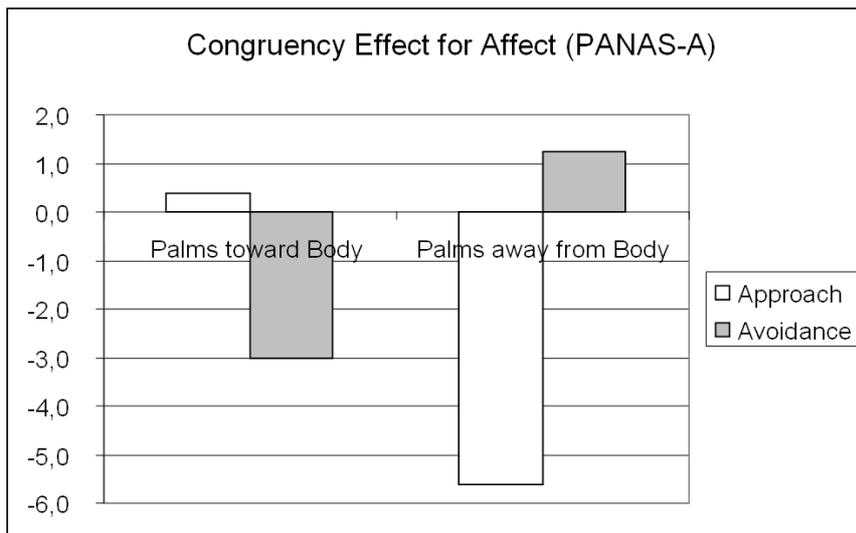


Figure 5: Congruency Effect (n=69): if palm direction and movement direction of the arms were incongruent more negative affect resulted; y-axis: positive digits indicate amount of positive affect, negative digits indicate amount of negative affect.

### 7. The interpersonal dimension: The influence of tactile feedback

In all studies described here, effects of movement have been observed on the affective or the evaluative measures, not on the cognitive ones. All studies so far had only included the proprioceptive-kinesthetic feedback on one's own affect and attitudes (individual level). To go one step further, we included the interactive processes and consequences of dynamic motor feedback. In this interactive study, we focused on the *haptic channel of communication* and investigated the communicative implica-

tions of movement rhythms.

Touch is a domain rarely investigated in the social sciences (for an exception see Schubert et al., 2008). Ashley Montagu (1971) had formulated how essential and central touch is for the development of a human being. He stated that "the personal identity has only insofar substance and structure, as it has its fundament in the reality of our bodily experiences." (Montagu, 1971). The sense of touch can already be observed in eight week old fetuses retreating after touch of the lips. At this point in time the embryo is only 2½ centimeters tall and has neither eyes nor ears. In agreement with Montagu (1971) on the role of tactile communication, Fuchs (2000; p. 114; author's translation) writes that "the reciprocity of the relation is in no other sense modality as pronounced as in the sphere of touch. Visual, auditory and the other "distance senses" use mediating means such as light and air. The skin is both the separating and the connecting interface, both sense organ (impression) and active communication organ (expression)."

An example of how we use rhythms in haptic communication is provided by Kestenberg Amighi et al. (1999). When we say goodbye to a dear friend we often embrace him/her starting with an indulgent smooth rhythm that can be observed as a gentle back rub. When the embrace is getting too long for one of us, the person starts to use a sharp fighting rhythm serving separation, indicating the wish to separate from the friend. Most friends intuitively understand this message and terminate the embrace, i.e., they gently separate. Only few individuals will not understand this completely nonverbal tactile message. Inspired by this example, we planned to investigate the influence of movement rhythms on interpersonal communication. However, since we did not want to strain our participants' privacy, we decided not to use an experimental setup with an embrace in the first place. We used the less intimate form of a handshake instead.

### 7.1 Communicative meaning of body rhythms in handshakes

Former studies on communication via handshakes (e.g., Bailenson et al., 2007; Chaplin et al., 2000) had found relations between motor properties and personality measures. Chaplin et al. (2000) had four trained confederates shake the hands of 112 participants judging the handshake. For the judges, a strong handshake was associated (more strongly) with *extraversion*, emotional expressiveness, and –for women only– with openness for new experience, and less strongly with shyness and *neuroticism*. On this basis, reliable behavior predictions were possible in this experiment. Bailenson et al. (2007) found in a virtual touch environment / human-machine interaction, that seven emotions could be recognized better than chance via handshakes, but worse as in face-to-face interaction.

In our study, we investigated for the first time the relation between movement rhythms and personality characteristics and the relation between movement rhythms and affect as transmitted through handshakes. We proceed from the proprioceptive level (individual) to the exteroceptive level (interpersonal) of analysis of dynamic movement

feedback. We assumed that movement rhythms would have specific effects on the judgment of affect in self and other (handshaking confederate), and further tested the influence of movement rhythms on judgment of personality characteristics, as hypothesized in the big five personality factors (Costa & McCrae, 1992).

We hypothesized that individuals distinguish affect and personality features of their interaction partners on the basis of smooth versus sharp movement rhythms. In particular, we assumed that participants would judge smooth rhythms as transmitting positive affect and sharp rhythms as transmitting more negative affect; and that smooth rhythms would be positively related to perceived openness, conscientiousness and agreeableness, whereas sharp rhythms would be related to perceived neuroticism of the partner.

### 7.2 Method: Providing handshakes and measuring reactions

Fifty-nine participants (37 women and 22 men; age:  $M = 24.2$ ,  $SD = 7.4$ ; range: 18 – 59) received a handshake from a female confederate, three times during the experiment, for 25 sec each time. Confederates used either three different smooth (condition 1) or sharp rhythms (condition 2). In a one-factorial between group design, 30 participants were randomly assigned to the “smooth rhythm” condition – receiving one out of three smooth rhythm-handshakes; 29 to the “sharp rhythm” condition – receiving one out of three sharp rhythm-handshakes; see overview in Figure 6).

## KMP-rhythms overview

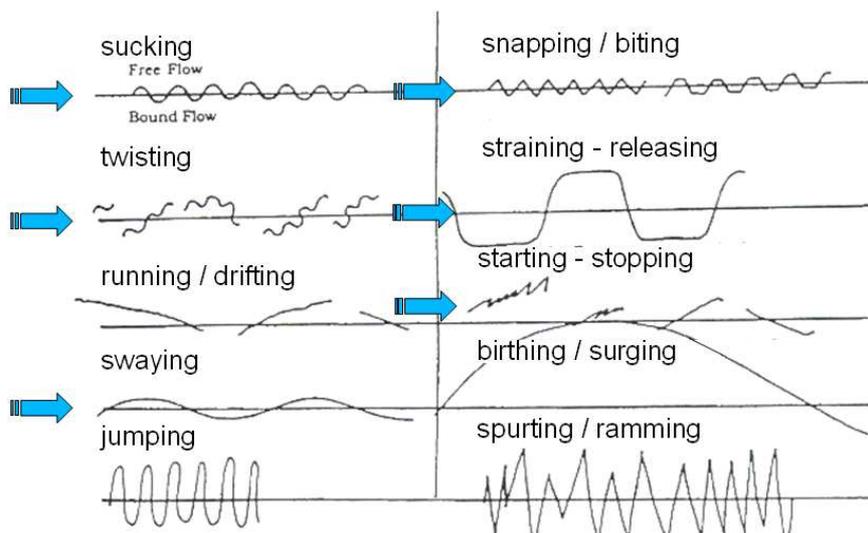


Figure 6: Movement rhythms employed in the handshake study indicated by blue arrows: three indulgent rhythms (sucking, twisting and swaying) vs. three fighting rhythms (biting, straining-releasing and starting-stopping); between-group design (n=59).

After the intervention, participants evaluated their own affect, the perceived closeness to the hand-shaker, the affect and personality of the hand-shaker as transmitted by the handshake, and their own personality. For personality ratings, we employed the personality questionnaire 24AM (with 24 items; Herzberg & Brähler, in prep.), measuring the big five personality dimensions (extraversion, openness, agreeableness, conscientiousness and neuroticism). For affect ratings, we employed the KMP-affect questionnaire (short version, 13 Items; Koch & Müller, 2007). The experienced closeness to the hand-shaker was measured with the item "How close did you feel to the person shaking your hand?" on a rating scale from 1 (not at all) to 6 (very much). In the end, participants provided demographic data and received some sweets for participation. The experiment lasted 30 minutes. Participants were randomly assigned to the conditions. The sequence of the handshakes was balanced (three sequences).

### 7.3 Results: Body rhythms transport information on affect and personality

A MANOVA yielded that in the smooth condition the handshaking confederate was judged as transmitting higher positive affect than in the sharp condition ( $p=.000$ ;  $\eta^2=.28$ ). In the smooth condition, the confederate was perceived as significantly more agreeable ( $p=.000$ ;  $\eta^2=.25$ ), open ( $p=.000$ ;  $\eta^2=.22$ ), and extravert ( $p=.004$ ;  $\eta^2=.14$ ; Figure 7). The experienced closeness to the confederate was higher in the smooth condition ( $p < .05$ ).

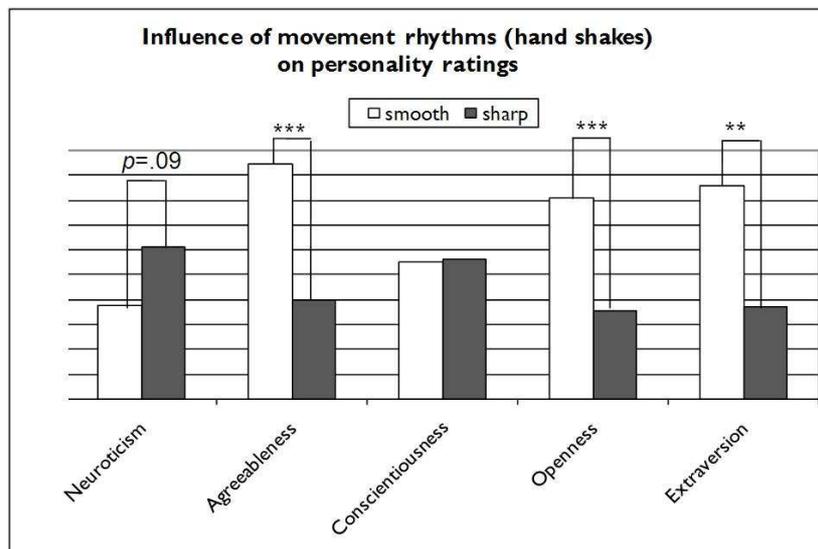


Figure 7: Personality ratings by handshakes in smooth vs. sharp rhythm; neuroticism  $p < .09$ ; personality measured with 24AM (Herzberg & Brähler, in prep) on a scale from 1 strong disagreement to 7 strong agreement; high values = high disposition;  $n=59$ ).

#### 7.4 Discussion: Embodied intercorporeality

Smooth vs. sharp movement rhythms in handshakes transmitted affect and personality characteristics identified by all participants in a similar manner. The hypotheses of the study were confirmed. More specifically, smooth rhythms conveyed agreeableness, extraversion, openness for new experiences and positive affect. They further transmitted a higher experienced closeness to the confederate. There was a tendency for sharp rhythms ( $p < .09$ ) to convey more neuroticism and negative affect. Participants high on neuroticism showed the most biased rating of the confederate. Participants' affect was not influenced significantly.

Limitations of the study concern external validity of handshakes provided in this manner: they are longer and different from handshakes in realistic settings. However, our aim was not to test handshakes per se, but the difference caused by tactile contact in smooth vs. sharp rhythms. Next to sharp and smooth reversals, future research should look more closely at intensity and amplitude of rhythms as carriers of meaning. Furthermore there is a stimulus sampling problem with just one experimenter providing the handshake (Wells & Windschitl, 1999). Thus, future studies in this line should vary experimenters to achieve intersubjective reliability of these findings. In future studies, it would also be indicated to include a control group without movement, but with bodily contact, into the study (just holding the participants' hand for the same amount of time than in the conditions carried out here). By this means the specific effects of the rhythms could yet be better experimentally separated from the mere effects of touch.

In sum, in the smooth rhythm condition, the handshaking confederate was evaluated as more agreeable, extravert and open for new experience. She further was attributed more positive affect than in the sharp rhythm condition. In the sharp rhythm condition, she was attributed more negative affect and marginally more neuroticism than in the smooth rhythms condition. This demonstration of the effects of haptic movement qualities on person perception (personality characteristics and affect) has important implications for research in personality and social psychology, opening a new field of investigation of intra- and interpersonal differences in the application of certain movement qualities and their implications. In communication research, the meaning of early parent-child interaction is of focal importance (Loman, 1998; Loman & Foley, 1996). Movement analysis offers possibilities to systematically investigate the influence of movement qualities and movement shapes on the communication with and the attitude toward interaction partners in family and work relations. Holding patterns in romantic relations and between mothers and infants (attunement and clashing) are two exemplary domains of interest that can be investigated with this paradigm.

### 8. The bigger picture:

#### 8.1 Taking interaction into account

The extension of the bidirectionality model into interaction is the next step (see Figure 8). For the understanding of others, mirroring and mapping on

the body level is necessary. Movement via kinesthetic resonance is the carrier of all sensorimotor experience and thus the primary modality of this “bridging” between persons (Merleau-Ponty, 1962; Sheets-Johnstone, 1999, 2009).

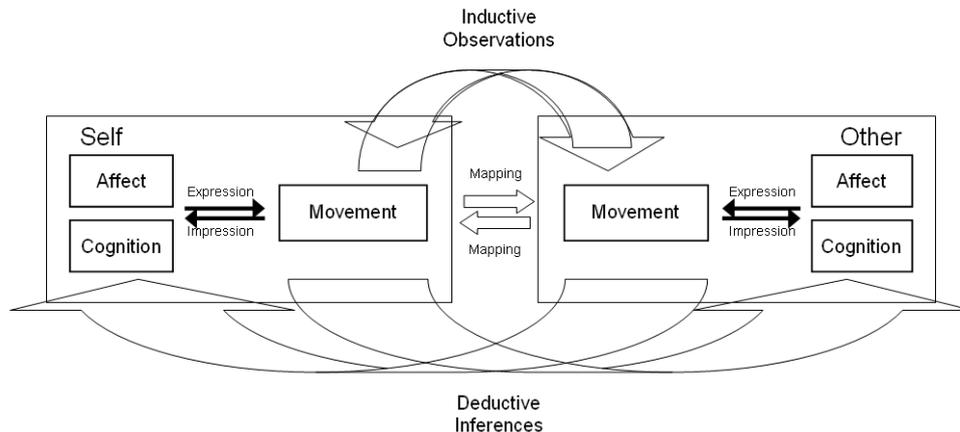


Figure 8: Interactional Bidirectionality Model (Koch, 2010); movement is seen in its primary function with kinesthetic resonance being at the basis of all other sensual perceptions and expressions including verbal production. Mapping can either lead to mirroring or to inhibition. The model applies to human conspecifics and implies the unity of perception and action (v. Weitzsäcker, 1940).

Other attempts to re-integrate the interaction aspect within embodiment research have been put forth by Semin and Cacioppo (2008), as well as De Jaegher and Di Paolo (2007). Semin and Cacioppo (2008) conclude “The converging research evidence we have selectively reviewed suggests that the architecture of the human perceptual and neural system is specifically designed for the recognition of movements of conspecifics in a privileged way.” While much of the evidence they review is a compilation of already existing knowledge the much needed “new” proposal is to go back to the social instead of the individual as the unit of analysis. De Jaegher and Di Paolo (2007) go one step further, employing an enactive approach that does not need the assumption of mental representations.

## 8.2 Communicative and clinical implications

There are multiple reciprocities between movement and meaning some of which have been addressed in our studies. In the future, it would be interesting to include the level of symbolization into our studies in order to better understand, for example, the clinical and communicative implications of movement.

In psychotherapy, the symbolic function of movement (as a nonverbal metaphor) is particularly relevant. In cases where verbal methods of psychotherapy prove not possible or useful, nonverbal methods gain importance in order to gain access to the patients' inner world and for the patients to gain access to their own emotions and problems. In body psychotherapy, arts therapies, mindfulness meditation,

and similar "embodied" approaches, therapy processes are possible entirely nonverbally (even though mostly verbalization is an important part of these therapies). The nonverbal part of the healing process is as of now not well researched and needs specification of theoretical grounding and methodological differentiation. Nonverbal processes are difficult to scientifically access, however, they are particularly interesting, since it is often in movement that the un-speakable, the not-yet-to-be-verbalized, becomes denser, expresses itself in nonverbal symbols and metaphors, and searches to break through to the verbal.

The clinical or communicative situation is a well-suited field to investigate and document the translational processes from the nonverbal-fleeting to the verbal-manifest. The body and the interpersonal space are the sites of these translations, their resonance the precondition of the experiencing of the qualia (Merleau-Ponty, 1962) on the individual level, and empathy (Lipps, 1903) on the interpersonal or intercorporeal level. The expressive level has functional as well as symbolic-representative aspects. Both play an important role in communication. Although in everyday life the functional aspects of movement and language predominate, in cultural forms such as dance and improvisation the symbolic-representational aspect plays a more important role. A secure space for expressive, symbolic movement is indispensable, for example, for psychiatric and psychosomatic patient groups that have suffered trauma or depression to return to their own vitality and bodily resonance. For many of them, therapy provided via nonverbal media such as movement, music, or art often seem to be particularly effective, as we have, for instance, demonstrated with a single dance intervention for depressive patients (Koch et al., 2007). Since in some diseases such as schizophrenia, dementia and autism this symbolic-representative function or the capacity for rhythm and resonance is impaired, for others this function has a great healing potential such as for trauma patients. It is particularly interesting to investigate the communicative use of movement qualities and rhythms and to train students in employing the already existing knowledge and methods in their work with these clinical groups.

## 9. Conclusions

The research compiled in this chapter shows that movement qualities and movement rhythms exert an important influence on individual affect and attitudes as well as on person perception. The dynamic component of movement needs to be taken into consideration in studies that operate with any form of movement as an independent variable. An extended definition of embodiment can be: "*Embodiment* denominates a field of research, in which the reciprocal influence of the *body* as a living, animate organism, as well as its *movements* (in quality and shape), and *cognition*, *affect* and *behavior* are investigated with respect to their expressive and impressive functions (individual, interactional and extended, i.e., including person-person and person-environment interactions)." The studies presented here provide a method for an experimental investigation of basic movement dimensions and their meaning. From here, scholars can take on the call to drive these attempts

further and build a firm knowledge base on the most important building blocks of the basic dimensions of movement.

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