

Is there an Embodiment of Perceived Motion? Emotional Congruence for Two Patterns as a Matter of Fact

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Abstract- Emotional congruence and Embodiment have been well documented in literature (Barsalou, 2008, 2009; Casasanto & Dijkstra, 2010). Certain dimensions of stimuli such as Horizontality seem linked to the reading direction of an individual (Phaf & Rotteveel, 2009), while others seem rather bound to biologically programmed factors such as life detectors in the environment (Westhoff & Troje, 2006). Authors of the present paper aimed to contribute theoretically to this debate by presenting a brief review of the literature and reflecting upon previous findings whereas implementing the question of Motion, for which they believe certain patterns could be embodied.

Keywords- Emotional Congruence; Embodiment; Verticality; Horizontality; Motion

I. INTRODUCTION

Contrary to the common idea that Communication is essentially verbal, introduced in the society by psychoanalysts, studies on Communications' ins and outs showed that most of it is played by non-verbal components^[1]. Thus, certain stimuli seem more related to certain emotions, this is commonly referred to as *emotional congruence*^[2]. As a reminder, Bower asked participants to recall childhood memories while they were experiencing either a happy or a sad mood, both induced by hypnosis. On the following day, he asked them to judge the positivity/negativity of recalled events. Results showed that in the "happy mood" condition, 92% were judged as pleasant events whereas in the "sad mood" condition, 55% were judged as sad events. Basically, the term "congruence" defines the relationship between an emotional state and a cognitive outcome. Research showed that motion patterns executed by political figures could influence the assessment of their personality^[3]. This finding was already present in ancient Greek scriptures such as in Aristotle^[4] who stated that an orator could lead the crowd more efficiently by using facial mimicry and body gestures. The Roman philosophers Cicero^[5] and Quintilian^[6] also noticed the potency of facial and body movements on the speech cogency. All these authors reminded the reader that communication in humans is essentially non-verbal and hence, it is important to comprehend what impacts on the perception of a viewer. Therefore, the aims of the present paper were (i) to briefly summarize the literature about embodiment, and (ii) try to comprehend the Motion/Emotion interactions as if they were results from the previously stated phenomenon. As said by Musso^[7], Communication is made of a source which transmits a message to a receiver through a channel. A point that is often forgotten by the source is the repercussion that the receiver holds on her via feedbacks. This involves the idea that invoking positive emotions in the audience when making a presentation should lead to better results in terms of performance and persuasion. Hence, one could wonder about how to convey positive emotions in a reader/viewer^[8] or even a patient in the case of psychotherapies. This is probably why research on embodiment has become such an issue these past 10 years.

Embodiment or Embodied cognition can be defined as a reflection of the argument that the motor system influences our cognition, just as cognition influences bodily actions. A considerable body of research in the field of Embodied or Grounded Cognition^[9, 10] has demonstrated how certain dimensions of perceived stimuli are related to emotional processes. Among them, the most documented are probably the Verticality, Horizontality and Flexion/Extension dimensions^[11]. We shall refer to the last dimension as "executed Movement" in this paper. As we are interested in non-verbal visual perception only, the dimensions which are presented are the Verticality and Horizontality consistencies. It is argued, by presenting literature points which emphasize the emotional congruence linked to perceived motion, that certain Motion patterns could also be embodied.

II. VERTICALITY AND EMOTIONAL CONGRUENCE: THE UP VS. DOWN "ANCESTRAL" PROBLEM

Authors showed that vertical motion of the participant's head induced a better recall for words than horizontal motion^[12]. In their study, participants had to learn words that were presented to them in auditory form via headphones. During the presentation of these words the participants had to shake, nod or make circular motion with their heads. Results indicated that head-shaking and circular motion produced approximately the same effect namely, a bad recall for words. Instead, head-nodding induced a better recall for words, which suggested that executed vertical motion was related to better performances. Therefore, a Conceptual-Motor Compatibility (CMC) seems to exist in the way that the concepts represented by words were strongly related to the motor action that was performed. In line with this assumption, Stepper and Strack^[13] demonstrated that after successfully achieving a task, adopting an upright body posture led to more pride than adopting a slumped-down posture.

This provides further support for the idea that an upward motion or position shall improve positive emotions of the protagonist. This raises the following question: “Will an object in the upper part of the visual field induce more positive emotions than if it were in the lower part?” This question had been answered for the first time by Wapner, Werner, and Krus^[14]. These authors randomly informed high school students that they received an A or an F score in an exam. Students were then asked to equally bisect a luminous square. The study found that those who received an A showed an upward bias while those who received an F demonstrated a downward bias. This indicates that inducing a positive mood in participants should induce a bias to see things as upper than when people were induced to experience a negative mood. More recently, another study reported similar results. Using an adult sample, Meier and Robinson^[15] showed that positive words were processed faster when presented in an up position whereas negative words were processed faster when presented in a down position. Results of the above-mentioned experiments all lend support to the hypothesis that upward objects are seen as more positive and downward objects are processed as more negative. Henceforth, playing on that dimension during a presentation could improve the effects of the induced emotions. One could imagine presenting positive images, words or movie clips in the upper part of the screen and their negative counterparts in its lower part. As stated and observed by Meier, Hauser, Robinson, Kelland, Friesen, and Schjeldhal^[16], even divinity-related cognitions are highly linked to vertical perceptions as gods are always seen as up in the skies or “Kingdom of Heaven” while devils are perceived as down in hell, whatever the civilization and related mythology. This cultural reference of perception concerning cognitions linked to verticality is impressive. Another embodied dimension is probably induced by the acquisition of language: Horizontality.

III. HORIZONTALITY EMBODIMENT AS CORE CONSEQUENCES FROM READING ACQUISITION

Chokron and De Agostini^[17] studied how reading habits can influence aesthetic preferences. They demonstrated that people with a left-to-right reading habit (i.e., French) exposed a preference for rightward stimuli while individuals with a right-to-left reading habit (i.e., Israelis) preferred leftward stimuli. These findings show that horizontal directionality of an object can influence aesthetic affects implied by this object. Spalek and Hammad^[18] showed the very same bias in an experiment on English and Egyptian participants: English showed a left-to-right bias while it was inverted for Egyptians (i.e., right-to-left). Nicholls, Orr, Okubo, and Loftus^[19] showed that the spatial bias for a Likert scale was always true in the descending way, namely, individuals definitely agreed more when the scale was descending (i.e., 5=>1) than when it was ascending (i.e., 1=>5). This finding is particularly interesting as most of the emotional scales [e.g., PANAS; 20] are ascending. This could mean that results found by most researchers in Psychology would be biased by the directionality of the scales. It could also explain why studies investigating the subjective aspects of emotions show quite weak findings. Scales that shall be built in the future could, for example, both use normal and inverted items in order to permit the checking of such a dimension. Furthermore, Eder and Rothermund^[21] link both the Verticality and Flexion/Extension to what they call *Stimulus-Response Compatibility Effects*. In fact, these effects are similar to those obtained when there is a CMC. Namely, Eder and Rothermund assume that the upper and lower positions could have acquired affective valence thanks to their frequent association with flexion and extension. According to the literature [e.g., 22], positive emotions facilitate flexion (i.e., approach) responses while negative emotions facilitate extension (i.e., avoidance) responses. Hence, the executed Movement responses became a tool for measuring the emotional dynamics involved. Naturally, it has to be coupled with either physiological (e.g., Heart Rhythm Variability) or self-reports in order to ensure that the Flexion/Extension fits well with the presupposed affiliated emotions. This is exactly what Phaf and Rotteveel^[23] investigated in relation to the Horizontality dimension. They observed that Dutch participants (i.e., left-to-right readers) were faster in executing a flexion for a left-to-right arrow than for a right-to-left one. These participants also explicitly described the left-to-right arrow as more positive than the right-to-left one. Therefore, it seems that reading habits highly condition the relationships between Horizontality and emotions.

As for Verticality, the educational program throughout language acquisition ought to be more important than other factors. Certain people would ponder on whether these processes are innate or learnt. However, as for the chicken-egg riddle, which consists in guessing whether the chicken or egg appeared first, it is impossible to know if language induced the Verticality/Horizontality effects or biological predispositions involved the use of such metaphors in language. According to Ramachandran^[24], the evolutionary process of humans gave chronologically rise to: (i) tool use, (ii) use of fire, (iii) use of shelters, (iv) language, and (v) use of theory of mind. Hence, one can easily assume that biological determinants had their substance quite before the occurrence of language. In order to be a bit more convinced about this postulate, one needs to find a non-verbal stimulus which triggers emotional dynamics. As a matter of fact, this has already been done by Rizzolati, Fadiga, Gallese, and Fogassi^[25] who showed that a Macaque monkey looking at another one executing an action had certain neurons (i.e., mirror neurons) firing as if it were the witness himself who made the action. These results were also found in humans^[26]. One way of investigating such a complex topic was to work on neurologically troubled patients and this is exactly what Ramachandran did during his career. Whilst most research on mirror neurons hypothesized that they were innately present in the brain, very recent research^[27] evidenced that they are probably rather the outcome of sensorimotor simulations. Noteworthy, it is the same mechanism of sensorimotor simulation which is hypothesized to be the cause of embodiments^[28]. According to Cook who relied on many studies^[29, 30, 31], it is rather because of conditioning that results on mirror neurons were obtained than because of an innate endowment, and as a matter of fact, above-mentioned studies reported that sounds associated to an action sometimes activated mirror neurons even more than the execution of action itself. In fact, sensorimotor associations and biological substrates are interactants, but the associations seem necessary for discharging in mirror neurons. It therefore could

be interesting to study the perception of an action not only in terms of human/animal actions but also to bend over more basic, elementary movements with the following query: “Is there an embodiment of perceived Motion such as there are embodiments of Verticality and Horizontality?”

IV. LATE PLEAS IN FAVOR OF EMBODIMENT OF PERCEIVED MOTION

The first authors who investigated plain movements were Heider and Simmel^[32] and Michotte^[33]. These authors found that motion from several simple figures was never interpreted as only geometrical and almost always as an interaction between the presented moving objects. Noteworthy, these studies have recently been interpreted as over-extensions of a theory of mind. Heberlein and Adolphs^[34] showed that a patient with bilateral amygdala damage did not anthropomorphize moving objects in the film from Heider and Simmel^[32]. Yet, they did not investigate the effects of a single trajectory from a lonely object on the interpretation of participants, a work that was somewhat executed by other scientists^[35, 36]. It seems that certain kinetic structures are more related to certain emotions and Rimé *et al.* demonstrated that there was an intercultural consensus. In fact, the participants were shown eight different kinetic structures of motion and they had to assess the emotionality of each structure. Rimé *et al.* mentioned that there is a consensus between American, Belgian and Zairian participants without giving more detail on the kinetic patterns. Visch and Tan^[37] showed that movements from objects with slight angle deviations were classified into drama and action films, while movements of larger angle deviations were rather classified into comedy. Before these authors, Tremoulet and Feldman^[38] exposed participants to the plain motion of a white disk on a dark background and observed that individuals were prone to attribute animation to the disk when changes of speed and direction were combined. Looking at the literature, it is easy to infer that animation attribution and emotional perception are highly intertwined. In short, one needs potential animation attribution to experience an affective stance towards the seen motion, or at least, one needs to raise the question of animation. For Troje and Westhoff^[39], a “Life detector” could exist in the brain of terrestrial animals. In line with this assumption, authors showed that a four-day-old infant was already able to discriminate between a biological and a non-biological motion^[40]. That latter emphasizes the innateness of animation attribution and its would-be precedence over emotional activations on the ontogenetic timeline. However, as Dessalles^[41] stated it for language, there might also be an instinct for relevant motion detection. This could partially explain the findings of Méary *et al.* as a four-day period is a very small amount of time after birth. Lorenz^[42] showed that ducklings which had just come into being followed the first moving object (*i.e.*, walking Lorenz or a rolling ball) they saw and continued to follow it as if it were their mother. He therefore talked about the *imprinting* phenomenon, which can be defined as the footprint of biological processes shown in early behaviors. While ducklings interpreted a moving duck-like shape when it went toward front like their duck mother, they probably interpreted the same shape as an eagle when it came backward (*i.e.*, towards them), if one refers to their panic attitudes.

In humans, running such experiments involving emotions is a complex issue for infant participants. Podevin^[43] showed that children aged from 9 to 12 years-old were likely to give an emotional connotation to three specific patterns of motion executed by a dark disk in a white background. Based on the same experimental paradigm, Chafi, Schiaratura, and Rusinek^[44] exposed healthy adults to emotional faces which moved along these three trajectories of motion (*i.e.*, Wave-like vs. Parabolic vs. Translational) (see Figure 1).

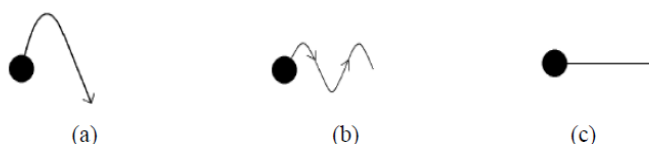


Fig. 1 The three patterns of motion used in [43, 44, 45].
(a) Parabolic, (b) Wave-like, and (c) Translational

Chafi *et al.*^[44] showed, as Podevin^[43], that a wave-like motion is related to positive emotions while a parabolic motion is related to negative ones. In their study, the emotional intensities of a surprised and a happy faces were enhanced when these faces executed a wave-like motion. Invertly, the emotional intensity of a sad face was improved when it performed a parabolic motion (see Figure 2).

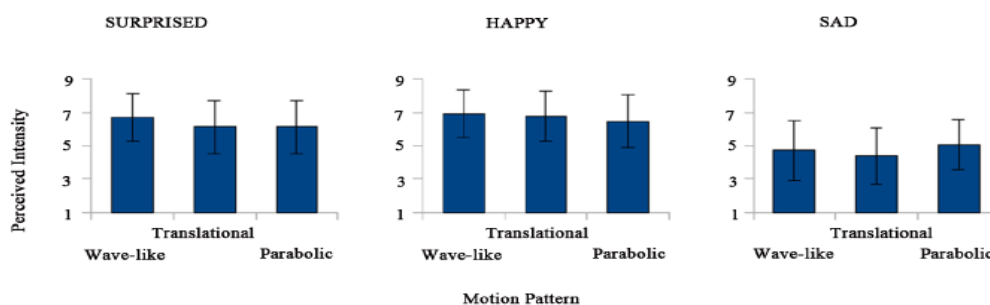


Fig. 2 Perceived intensity means and standard deviations for Surprised, Happy and Sad faces from [44]

With regards to the translational motion, whether it was in [43] or in [44], this pattern had a neutral or slightly positive connotation. More recent studies of Podevin *et al.* [45] showed that the above-mentioned patterns of motion not only possess emotional connotations but also influence the performances at cognitive and psychomotor tasks. Regarding the memorization task, results indicated an interaction between the type of words (positive vs. negative vs. neutral) and the type of motion (wave-like vs. parabolic vs. translational). However, this interaction did not lead to expected outcomes: the parabolic motion increased the percentage of recalled positive words whereas the wave-like motion increased the percentage of recalled negative words (see Figure 3). As a psychomotor task, authors used a serial subtraction and showed that the wave-like motion led to better results than the parabolic and translational motion.

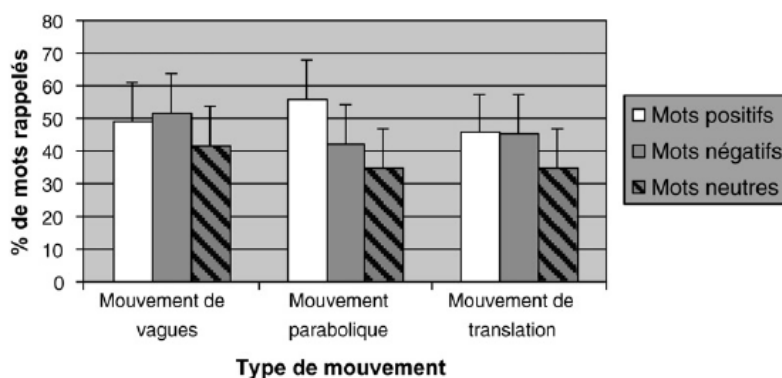


Fig. 3 Percentage of recalled words depending on the type of motion (“Mouvement de vagues” = wave-like motion, “Mouvement parabolique” = parabolic motion, “Mouvement de translation” = translational motion) and the type of words (“Mots positifs” = positive, “Mots négatifs” = negative, “Mots neutres” = neutral) from [45]

Taken together, late findings on elementary motion research [43, 44, 45] suggest that the same kind of emotional congruence introduced by Bower [2] could be responsible for the observed effects.

When one talks about an Emotion-Motion congruence, this means the implied idea that perceiving a plain elementary motion could induce emotional dynamics. Data found by Podevin *et al.* [45], and others, would only be the tip of the iceberg. More generally, we believe that congruence effects are the reflection of one dimension’s embodiment. For instance, one could say that the relationships between an up position and positive words and between a down position and negative words [15] do not only reflect the embodiment of Verticality, but first of all showed strong congruence effects between the position and the emotional valence of presented words. As stated previously, the dimensions that are considered to be embodied are Verticality, Horizontality and executed Movement [11]. To these, we could potentially add certain perceived Motion. In effect, Casasanto and Dijkstra [11] linked an upward movement of the arm with positive emotions and a downward movement of the arm with negative emotions. However, these authors do not mention a potential embodiment of movement. Instead, they only discuss the embodiment of Verticality to which their findings effectively gave support. From their results, the embodiment of executed Movement [46], and recent findings on elementary motion [44, 45], an embodiment of perceived motion is supported. With regards to the modeling of the relationship between Motion and Emotion, we believe that the “Associative Pathway” in the SPAARS model of Power and Dalgleish [47] could quite well represent the interactions between perceiving an elementary motion and experiencing emotional dynamics.

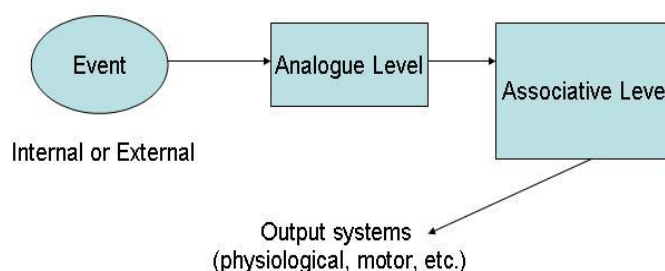


Fig. 4 The Associative Pathway in the SPAARS model of [47]

Effectively, the Associative Pathway does not require the activation of the Schematic Level (*i.e.*, appraisal) but only relies on the activation of associative networks, hence giving rise to emotional processes implied in the Output systems. The generation of emotion is explained by associative activations but these networks do not exclude a parallel appraisal which could take place in the Schematic level. Associative networks’ effects can be put to light easily in experiments investigating the relationships between the executed Movement response and another embodied dimension. Therefore, we suggest that future research could investigate the CMC between pushing vs. pulling a lever and parabolic vs. wave-like motion.

V. CONCLUSIONS

In sum, we think that embodiments are often reflected throughout emotional congruence. Thus, for a healthy European adult, the “dimensional modality/emotional valence” associations highlighting embodiments are: up/positive, down/negative, left-to-right/positive, right-to-left/negative, flexion/positive, extension/negative, wave-like/positive, and parabolic/negative. We showed that perceived Motion (*i.e.*, wave-like vs. parabolic) is an embodied dimension as much as executed Movement (*i.e.*, flexion vs. extension). This result is in line with recent findings in Neurosciences, especially in research investigating mirror neurons^[24, 27]. Future research should study the link between perceived Motion, executed Movement, Verticality and Horizontality.

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REFERENCES

- [1] L.T. Schiaratura. La communication non verbale dans maladie d'Alzheimer. *Psychologie & NeuroPsychiatrie du Vieillissement*, 6, 1-6, 2008.
- [2] G.H. Bower. Mood and memory. *American Psychologist*, 36, 129-148, 1981.
- [3] M. Koppensteiner, & K. Grammer. Motion patterns in political speech and their influence on personality ratings. *Journal of Research in Personality*, 44, 374-379, 2010.
- [4] Aristotle. *The Works of Aristotle Translated into English Under the Editorship of WD Ross*, 12 vols. Oxford: Clarendon Press. (4th century B.C.) (1908-1952).
- [5] M.T. Cicero. *Selected Works*, Penguin Books Ltd, Great Britain, (1st century B.C.) 1971.
- [6] M.F. Quintilian. *Quintilian's Institutes of Oratory; Or, Education of an Orator*. J. S. Watson. London: G. Bell and Sons, (1st century A.D.) 1856. Print.
- [7] P. Musso. *Télécommunications et philosophie des réseaux*. PUF, 1998.
- [8] B.H. Detenber, R.F. Simons, & G.C. Bennet. Roll' Em: the effects of picture motion on emotional responses. *Journal of Broadcasting & Electronic Media*, 42, 112-126, 1998.
- [9] L.W. Barsalou. Grounded cognition. *Annual Review of Psychology*, 59, 617-645, 2008.
- [10] L.W. Barsalou. Grounded cognition: Past, present, and future. *Topics in Cognitive Science*, 2, 716-724, 2010.
- [11] D. Casasanto, & K. Dijkstra. Motor Action and Emotional Memory. *Cognition*, 115, 179-185, 2010.
- [12] J. Förster, & F. Strack. Influence of Overt Head Movements on Memory of Valenced Words: A Case of Conceptual-Motor Compatibility. *Journal of Personality and Social Psychology*, 71, 421-430, 1996.
- [13] S. Stepper, & F. Strack. Proprioceptive determinants of emotional and nonemotional feelings. *Journal of Personality and Social Psychology*, 64, 211-220, 1993.
- [14] S. Wapner, H. Werner, & D.M. Krus. The effect of success and failure on space localization. *Journal of Personality*, 25, 752-756, 1957.
- [15] B.P. Meier, & M.D. Robinson. Why the Sunny Side is Up, Associations Between Affect and Vertical Position. *Psychological Science*, 15, 243-247, 2004.
- [16] B.P. Meier, D.J. Hauser, M.D. Robinson, C. Kelland Friesen, & K. Schjeldhal. What's "Up" with God? Vertical Space as a Representation of the Divine. *Journal of Personality and Social Psychology*, 93, 699-710, 2007.
- [17] S. Chokron, & M. De Agostini. Reading habits influence aesthetic preference. *Cognitive Brain Research*, 10, 45-49, 2000.
- [18] T.M. Spalek, & S. Hammad. The Left-to-Right Bias in Inhibition of Return Is Due to the Direction of Reading. *Psychological Science*, 16, 15-18, 2005.
- [19] M.E.R. Nicholls, C.A. Orr, M. Okubo, & A. Loftus. Satisfaction Guaranteed. The effect of Spatial Bias on Responses to Likert Scales. *Psychological Science*, 17, 1027-1028, 2006.
- [20] D. Watson, L.A. Clark, & A. Tellegen. Development and validation of brief measures of positive and negative affect: The PANAS scale. *Journal of Personality and Social Psychology*, 54, 1063-1070, 1988.
- [21] A.B. Eder, & K. Rothermund. When do motor behaviors (mis)match affective stimuli? An evaluative coding view of approach and avoidance reactions. *Journal of Experimental Psychology: General*, 137, 262-281, 2008.
- [22] K. Roelofs, B.M. Elzinga, & M. Rotteveel. The effects of stress-induced cortisol responses on approach-avoidance behavior. *Psychoneuroendocrinology*, 30, 665-677, 2005.
- [23] R.H. Phaf, & M. Rotteveel. Looking at the Bright Side: The Affective Monitoring of Direction. *Emotion*, 9, 729-733, 2009.
- [24] V.S. Ramachandran. *The Tell-Tale Brain: A Neuroscientists' Quest for What Makes Us Human*. New York: W. W. Norton & Company, 2011.
- [25] G. Rizzolatti, L. Fadiga, V. Gallese, & L. Fogassi. Premotor cortex and the recognition of motor actions. *Cognitive Brain Research*, 3, 131-141, 1996.
- [26] J. Grezes, J.L. Armony, J. Rowe, & R.E. Passingham. Activations related to "Mirror" and "Canonical" neurones in the human brain: a fMRI study. *NeuroImage*, 18, 928-937, 2003.

- [27] R. Cook. The ontogenetic origins of mirror neurons: evidence from “tool-use” and “audiovisual” mirror neurons. *Biology letters*, 7, 1744-1957, 2012.
- [28] T. Brouillet, L.P. Ferrier, A. Grosselin, & D. Brouillet. Action compatibility effects are hedonically marked and have incidental consequences on affective judgment. *Emotion*, 11, 1202-1205, 2011.
- [29] P.F. Ferrari, S. Rozzi, & L. Fogassi. Mirror neurons responding to observation of actions made with tools in monkey ventral premotor cortex. *Journal of Cognitive Neuroscience*, 17, 212-226, 2005.
- [30] C. Keysers, E. Kohler, M.A. Umiltà, L. Nanetti, L. Fogassi, & V. Gallese. Audiovisual mirror neurons and action recognition. *Experimental Brain Research*, 153, 628-636, 2003.
- [31] E. Kohler, C. Keysers, M.A. Umiltà, L. Fogassi, V. Gallese, & G. Rizzolatti. Hearing sounds, understanding actions: action representation in mirror neurons. *Science*, 297, 846-848, 2002.
- [32] F. Heider, & M. Simmel. An experimental study of apparent behavior. *American Journal of Psychology*, 57, 243-259, 1944.
- [33] A. Michotte. *La perception de la causalité* Louvain: Publications Universitaires de Louvain, 1946.
- [34] A.S. Heberlein, & R. Adolphs. Impaired spontaneous anthropomorphizing despite intact perception and social knowledge. *Proceedings of the National Academy of Sciences of the United States of America*, 101, 7487-7491, 2004.
- [35] B. Rimé, B. Boulanger, P. Laubin, M. Richir, & K. Stroobants. The Perception of Interpersonal Emotions Originated by Patterns of Movement. *Motivation and Emotion*, 9, 241-260, 1985.
- [36] R. Tagiuri. Movement as a cue in person perception. In H.P. David & J.C. Brengelmann (Eds.), *Perspectives in personality research* (pp. 175-195). New York: Springer, 1960.
- [37] V.T. Visch, & E.S. Tan. Categorizing moving objects into film genres: The effect of animacy attribution, emotional response, and the deviation from non-fiction. *Cognition*, 110, 265-272, 2009.
- [38] P.D. Tremoulet, & J. Feldman. Perception of animacy from the motion of a single object. *Perception*, 29, 943-951, 2000.
- [39] N.F. Troje, & C. Westhoff. The Inversion Effect in Biological Motion Perception: Evidence for a “Life Detector”? *Current Biology*, 16, 821-824, 2006.
- [40] D. Máry, E. Kitromilides, K. Mazens, C. Graff, & E. Gentaz. Four-Day-Old Human Neonates Look Longer at Non-Biological Motions of a Single Point-of-Light. *Plos ONE*, 2(1): e186. doi:10.1371/journal.pone.0000186, 2007.
- [41] J.-L. Desalles. Existe-t-il un instinct du langage? Modèles et controverses à propos de l’innéité de la communication humaine. 11ème Forum des Sciences Cognitives, 31 mars 2012, Paris (France), 2012.
- [42] K. Lorenz. Comparative studies of the motor patterns of Anatindae. In R. Martin (ed.), *Studies in Animal and Human Behaviour*, 2, 14-114. Methuen, London, UK, 1971.
- [43] G. Podevin. Influence des Mouvements Élémentaires sur les Processus Cognitifs Émotionnels. Doctoral dissertation, Université de Lille Nord de France UDL3, 2009.
- [44] A. Chafi, L. Schiaratura, & S. Rusinek. Three Patterns of Motion which Change the Perception of Emotional Faces. *Psychology*, 3, 82-89, 2012.
- [45] G. Podevin, A. Chafi, S. Rusinek, & J. Bekaert. Perception émotionnelle des mouvements élémentaires: incidence sur les processus mnésique et exécutif. *Psychologie Française*, 57, 223-235, 2012.
- [46] T. Alexopoulos, & F. Ric. The Evaluation-behavior link: Direct and beyond valence. *Journal of Experimental Social Psychology*, 43, 1010-1016, 2007.
- [47] M.J. Power, & T. Dalgleish. *Cognition and Emotion: From order to disorder* (second edition). Hove, U.K.: Taylor Francis, 2008.

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