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Perceiving a negatively connoted stimulus imply enhanced performances: the case of a moving object

Abstract: *Most studies on verticality's embodiment showed that up positions were related to positive emotions whereas down positions were related to negative ones (Meier & Robinson, 2004). Research on motion perception found that a parabolic motion both induced animation attribution (Tremoulet & Feldman, 2000) and implied negative feelings (Chafi, Schiaratura, & Rusinek, 2012; Podevin, 2009; Podevin, Chafi, Rusinek, & Békaert, 2012). We hypothesized that seeing a parabolic downward motion will increase both the memorization for words and the execution's speed of a serial subtraction compared to a parabolic upward motion. Results showed that the downward motion had enhancing effects both on the serial subtraction and on the number of recalled words, independently of their valence. These findings are interpreted as marking processes related to an adaptive behavior in response to a negative stimulus.*

Key words: *motion perception, negative stimulus, cognitive performances*

Introduction

Many studies highlighted a direct link between valence and verticality. Research showed different ways of investigating verticality. Certain works focused on towards vs. away of the body motor action (Alexopoulos & Ric, 2007; Brouillet, Heurley, Martin, & Brouillet, 2010 a; Chen & Bargh, 1999; Solarz, 1960; Wentura, 2000), others focused on vertical vs. horizontal motor action (Förster & Strack, 1996; Tom, Pettersen, Lau, Burton, & Cook, 1991; Wells & Petty, 1980), another range of studies centered their works on upright vs. slumped-down body postures (Stepper & Strack, 1993), and a final sub-field of verticality research concerns the up vs. down perception (Casasanto & Dijkstra, 2010; Meier & Robinson, 2004; Wapner, Werner, & Krus, 1957). Therefore, two links are to distinguish in the relationship between verticality and emotion: the perception/emotion and the emotion/action links. These two relationships could be put one after the other on a sequential frieze, namely, the perception would be the first step towards emotion and then action. For instance, Alexopoulos and Ric (2007) investigated the effects of emotional words' presentation on the reaction times of the extension vs. flexion of an arm, which is clearly an emotion/action study. Besides, Meier and Robinson (2004)

investigated the effects of the vertical position of emotional words on the speed in assessing these words, which rather refers to the perception/emotion link. To date, no study has ever focused on the perception/emotion/cognition link by investigating the effects of perceived motion's verticality on the memorization of emotional stimuli. This is exactly what authors were challenged to do in this paper, i.e., they shall investigate the upward vs. downward motion perception and their consequences on the memorization of emotional words. Hence, contrary to studies like the one of Casasanto and Dijkstra (2010) where participants had to execute a motion, the present study aims at showing the link between a seen motion and cognitive/psychomotor components linked to emotions. One could question the viability and the eminence of raising such a postulate about the verticality of a perceived motion and the experience of emotion-related cognitions and actions.

A possible explanation concerning the relations between affect and the vertical position is represented by the developmental prospect of Piaget and Inhelder (1969). According to these authors, development is based on the early sensorimotor representations. In line with this assumption, Gibbs (1992) noted that most Psycholinguists agreed on the fact that physical metaphors are useful in the representation of abstract concepts, and in the representation

of emotional concepts. It is nowadays assumed that these concepts are grounded in embodied and situated knowledge (Lakoff & Johnson, 1999). According to this postulate, one can very easily understand why people are "consumed by love" or "down and sad" (Barsalou, 2008; Crawford, 2009; Richardson, Spivey, Barsalou, & Mc Rae, 2003). Authors such as Borghi and Cimatti (2010) think that syntax and semantics of languages are based on physical experiences, and they argue that many theorists took this assumption as a strong background (e.g., Lakoff, 1987; Lakoff & Johnson, 1980, 1999; Langacker, 1987, 1991). Lately, Bonfiglioli, Finocchiaro, Gesierich, Rositani, and Vescovi (2009) showed that "questo" ("this") and "quello" ("that") are related to distinct motor referents. Effectively, participants were faster when "this" referred to close objects whereas "that" referred to far objects. This result was recently replicated in the emotional field. For instance, Brouillet, Heurley, Martin, and Brouillet (2010 b) showed that the "YES/NO" emotional verbal response (Brouillet & Syssau, 2005) influenced reaction times of a vertical motor action (i.e., pushing vs. pulling). This underlines that the very basic "YES/NO" answer had differential effects on movement and action planning.

It is assumed that emotional words, as highly efficient in triggering sensorimotor simulations (Power & Dalgleish, 2008), will interact with the verticality of perceived motion. Therefore, it was needed to specify what type of motion should be used in the present experiment. It is nowadays clear that motion patterns do not all possess the same emotional potential (Chafi, Schiaratura, & Rusinek, 2012; Podevin, 2009; Podevin, Chafi, Rusinek, & Békaert, 2012; Rimé, Boulanger, Laubin, Richir, & Stroobants, 1985; Tagiuri, 1960; Visch & Tan, 2009). According to Podevin et al. (2012), visually perceiving a parabolic motion (see Figure 1) has incidental emotional consequences, particularly concerning emotional attribution which is negative.
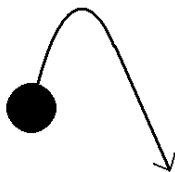
Figure 1. The parabolic [downward] motion used in Chafi et al. (2012), Podevin et al. (2012), and Podevin (2009). Noteworthy, the upward motion depicts exactly the same pattern but in the inverse direction.

In Tremoulet and Feldman (2000), participants were asked to determine whether a simple object (i.e., a cylinder or a circle) was a living particle or an inanimate object which parasites the so-called microscope image. Results show that participants attributed animation to the object when speed and direction changed simultaneously, giving rise to a parabolic trajectory of motion. These findings show that the parabolic motion has a particular status as it is able to draw a perception of animation out of a totally inanimate object. In line with previous findings, Podevin (2009) showed that

the perception of such a pattern of motion not only induce animation attribution, but directly impacts the cognitive and emotional systems. Effectively, Podevin et al. (2012) showed that the parabolic motion executed by a black disk on a white background improved memory for positive words compared to other patterns of motion in an adults' sample. In a children's sample (age ranged from 9 to 12 years old), Podevin (2009) demonstrated that no smile was added to the disk when participants watched the parabolic motion contrary to the drawing of a smile when other patterns of motion were seen. Podevin et al. (2012) also showed that the parabolic motion was interpreted as negative by adults. Chafi et al. (2012) did hypothesize that this motion could be processed by the human visual system as a signal preparing the individual for a would-be negative emotional dynamics, which could explain the search for positive information in the environment (Rothermund, Voss, & Wentura, 2008). This latter gives a possible interpretation for the findings concerning the better recall of positive words in the study of Podevin et al. (2012). The origin of such a signal could come from the pre-wiring of certain brain networks such as Seligman (1971) proposed in his preparedness theory. Furthermore, the activation linked to such a signal should be measurable via behavioral and cognitive tasks as it enters as an input to influence the output of the organism.

Because in the present study, the parabolic motion will not be compared to other forms of motion but the only difference between the two presentations are "direction of motion", authors will not expect the same results as in the research of Podevin et al. (2012). Namely, the present study aims to show that different vertical directions (i.e., upward vs. downward) of the parabolic motion will have different effects on the processing of emotional words (i.e., positive vs. negative vs. neutral) and speed of serial subtraction (i.e., before vs. after seeing motion). Thus, the first hypothesis is that the downward motion will increase the overall number of recalled words compared to the upward motion. Because the upward motion is processed more positively than the downward motion (see Casasanto & Dijkstra, 2010), the difference between both motion should not be observable in terms of valenced words as in the study of Podevin et al. (2012) but rather in terms of general performance. Hence, it is also postulated that the downward motion shall increase the speed of backward counting compared to the upward motion.

Method

Participants

Three hundred and thirteen undergraduate students (272 women, forty-one men, Mage = 21.58; SD = 3.87) in Psychology at the University of Lille – North of France UDL3 took part in the present study. They were divided into three groups depicting "Motion condition" as following: 105 saw the upward motion, 107 saw the downward motion and 101 saw no motion. Concerning their recruitment, a hundred and forty-seven participants passed

the experiment as a required assignment in their University course. The other hundred and sixty-six participants were randomly recruited in the buildings of the University. The only inclusion criterion was to have a normal or corrected-to-normal vision. All the participants gave their written consent.

Stimuli

The parabolic motion pattern was taken from studies in elementary motion's perception which ensured that it was strongly related to negative feelings (see Chafi et al., 2012). Its speed was 3.2 cm/s in both the upward and downward conditions. The downward pattern displayed an ascending trajectory with an angle of 42° followed by a descending trajectory with the same angle, i.e., 42°. Concerning the upward motion, it drew exactly the same characteristics as the downward one, except that it showed the inverted directions (i.e., descending and ascending). The 24 words (i.e., 8 positive, 8 negative and 8 neutral) used in the present experiment were validated by Leleu (1987) and utilized in the studies of Podevin et al. (2012). These authors ensured that words were matched for words' length, frequency of usage and strength of emotion (e.g., Liberté [positive], Injustice [negative] and Fruit [neutral]). The presentation's order of words was of course counterbalanced so that different words' lists were displayed to different individuals.

Measures

Measurements were the same as in Podevin et al. (2012), namely, two serial subtractions and a recall of words were made on a 4-pages brochure. The first page consisted in a general instruction. The second page (1st serial subtraction) contained an empty table in which participants had to count backwards. The third page (2nd serial subtraction) also contained an empty table provided for participants' backward counting. For both serial subtractions, participants were asked to count backwards from left-to-right. The fourth page (recall of words) consisted in an empty page with the following instruction: "Try to recall by express as many words as possible, you have 2 minutes". The 2-minutes period was measured via a stopwatch included in the used software.

Procedure

Each participant sat in front of a seventeen inches computer screen on which the serial subtractions' starting numbers, motion, and emotional words appeared. The distance between the computer screen and the participant's head was approximately 50 cm. On the first instruction's screen, participants were told that before the experiment itself, they had to count backwards by threes and by express as fast as possible during one minute and starting from the number that was to appear. After that first serial subtraction, another instruction's screen warned the participants that words would appear and that their only task was to watch and memorize them. This learning phase consisted in repeatedly watching a parabolic motion (i.e., downward, upward or no motion) in which the black disk simply moved in the direction of the arrow in Figure 1 and was followed by an emotional word (i.e., positive, negative or neutral). Each motion lasted 5 sec. and each word appeared at the very center of the screen during 500 msec. In the no-motion condition, participants only saw a white screen for 5 sec between each word. After the learning phase, another instruction's screen warned participants that they had to perform a second serial subtraction during one minute. Finally, the test phase lasted two minutes during which participants had to recall every word they saw in the learning phase.

Analyses

For the hypothesis on the serial subtraction, a 2 (Serial subtraction's moment) × 3 (Motion Condition) analysis of variance ANOVA using a within-subjects design for the first factor was performed. Concerning the emotional words' hypothesis testing, a 3 (Motion Condition) × 3 (Words' Valence) ANOVA using a within-subjects design for the second factor was carried out.

Results

The first ANOVA revealed a main effect of Motion Condition, $F(2, 310) = 3.97$; $p<.02$, which showed that the downward motion increased the number of digits (M=21.06; SD=6.69) compared to the no-motion condition (M=18.81; SD=5.68), $p<.03$ using Scheffé tests, Cohen's $d = 0.37$. However, no differences in the number of digits were found between the downward and the upward motion (M=19.82; SD=5.96), $p=.30$.
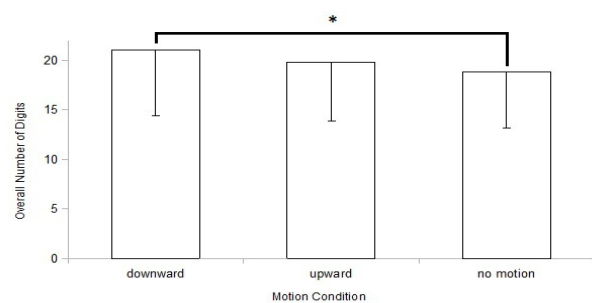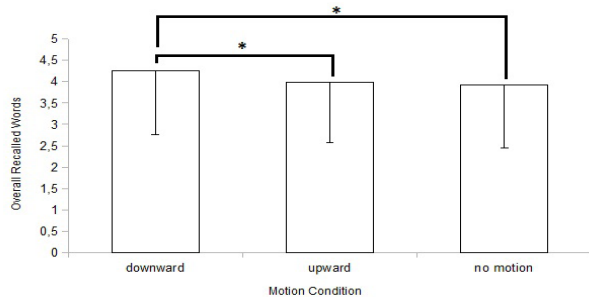

Figure 2. Means of the overall number of digits from the serial subtractions for each motion condition. Standard deviations are represented in the figure by the error bars attached to each column.

Concerning the Serial subtraction's moment, another main effect was found, $F(1, 310) = 18.04$; $p<.0001$. The first serial subtraction (M=19.43; SD=5.93) was slower than the second one (M=20.41; SD=6.29), $p<.0001$ with Scheffé tests, Cohen's $d = 0.16$. Thus, independently of the Motion Condition, the main effect of the serial subtraction underlined a would-be learning effect from repeating the task as the second subtraction task was always faster than the first one.

The Serial subtraction's moment × Motion Condition interaction was far from being significant, $F(2, 310) = .66$; $p=.52$.

At that point, what comes out from our results is that: (i) there seems to be a learning effect between the two serial subtractions, (ii) it is likely that the downward motion played a part in the improvement of the 2nd task's speed. Henceforth, it was necessary to inspect the effects of Motion Condition on the Valence of recalled words. This analysis revealed a main effect of Motion Condition, $F(2, 310) = 3.47$; $p<.04$. Fisher's LSD tests showed that the downward motion ($M=4.25$; $SD=1.50$) increased the overall number of recalled words both compared to the upward motion ($M=3.99$; $SD=1.41$), $p<.05$, Cohen's $d = 0.18$, and to the no-motion condition ($M=3.92$; $SD=1.47$), $p<.02$, Cohen's $d = 0.22$. Noteworthy, Scheffé tests only emphasized the difference between the downward and control conditions, $p<.05$. These findings again emphasize the particular status of the parabolic downward motion as it improved the memorization of words compared to the upward and no-motion conditions, independently of words' valence.

Figure 3. Means of the overall number of recalled words for each motion condition. Standard deviations are represented in the figure by the error bars attached to each column.

Analyses also revealed a main effect of Words' Valence, $F(2, 310) = 20.31$; $p<.0001$. Scheffé tests showed that positive words ($M=4.32$; $SD=1.47$) were more recalled than neutral words ($M=3.67$; $SD=1.52$), $p<.0001$, Cohen's $d = 0.43$, but not differently recalled than negative words ($M=4.19$; $SD=1.52$), $p=.47$. In fact, neutral words were less recalled than both positive and negative words, $p<.0001$ using Scheffé tests. Hence, one can say that emotional words, whether they were positive or negative, were processed in another manner than neutral words were.

The Motion Condition × Words' Valence interaction was not significant, $F(4, 620) = .41$; $p=.79$.

Discussion

We hypothesized that a parabolic downward motion would have incidences on both the memorization of valenced words and serial subtractions. Results partly confirm our postulates. Effectively, the effect sizes were very small, a finding which weakens present data. However,

(i) the downward motion increased the overall number of recalled words compared to the no-motion and upward conditions, and (ii) the downward motion enhanced serial subtractions compared to the no-motion condition. No interaction was found significant, which is also a result that is consistent to our hypotheses. Nevertheless, present findings somehow contradict previous data (Podevin et al., 2012). Indeed, Podevin et al. (2012) showed that the downward motion significantly increased the number of recalled positive words and did not have any effect on serial subtractions when compared to a wave-like and a translational motion. Present study's results do not show any link between the positivity of words and the downward motion. Furthermore, the literatures on elementary motion's perception (Chafi et al., 2012; Podevin, 2009) and on Embodiment (Casasanto & Dijkstra, 2010; Meier & Robinson, 2004) both link a downward motion (or position) to negative emotions and negative emotional processes. According to the same literatures, an upward motion is strongly related to positive emotional processes.

For Natale and Hantas (1982) and Higgins, Bond, Klein, and Strauman (1986), the acceleration in the serial subtraction should be taken as marking an experienced positive mood. Yet, the downward motion was expected to be processed as a negative stimulus (Chafi et al., 2012; Podevin, 2009), and hence, it logically should have triggered a negative mood and bad performances compared to the upward motion. The results concerning the overall number of recalled words also emphasized the unexpected "positive effects" of being exposed to that motion. Effectively, Lee and Sternthal (1999) showed that a positive mood enhanced the learning of brand names compared to a neutral mood. De facto, the parabolic downward motion slightly enhanced performances both at the serial subtraction and the memorization of words, and this improvement could be related to a would-be positive mood experienced by participants. Another alternative explanation could be that observing such a "forceful" movement as the downward one could accelerate mental processes. It is clear that present results do not contradict such theoretical postulates as the parabolic downward motion effectively enhanced performances, whether they were cognitive (i.e., memorizing words) or psycho-motor (i.e., quickly counting backwards).

Present findings could also easily tie up with the concept of preparedness which was defended in the Neurological (Öhman & Mineka, 2001; Seligman, 1971), Social (Frijda, 2007) and Cognitive (Rothermund et al., 2008; Wentura, Voss & Rothermund, 2009) perspectives. For instance, Rothermund et al. (2008) assumed that emotional processing could be governed by a counter-regulation mechanism which prevents from emotional escalation and helps sustaining the motivational strain so as to strive for positive outcomes while avoiding failures. Wentura et al. (2009) also showed that this mechanism automatically allocates attention towards information that is inconsistent with an individual's current affective-motivational state. On this base, it is possible to explain the "positive effects" from the exposure to the parabolic downward motion.

Whereas it was assessed as negative (Chafi et al., 2012; Podevin, 2009; Podevin et al., 2012), it enhanced the overall number of recalled words and serial subtractions. These effects could be due to the counter-regulation mechanism, namely, the vision of a negative stimulus (i.e., the parabolic downward motion) could have implied the allocation of attention towards positive stimuli, whether they were extraneous (i.e., positive words) or internal (i.e., experienced positive feelings). An alternative explanation could be that participants drew their attention towards the beginning of the motion, namely, the ascending path. Such an interpretation would fit with most research on Embodiment as they link an upward motion with positive dynamics and not a downward one. For instance, Casasanto and Dijkstra (2010) showed that executing a downward movement with the arm involved more negative memories recalled. If present results were due to an embodiment of verticality, regular embodiment's findings should have been found. Instead, current findings link the parabolic downward motion with cognitive positive-like processes. This discrepancy could be due to the fact that motion was not performed but perceived in the present study, therefore giving rise to substantial differences in data with regular Embodiment research outcomes. The biggest limitation of the study remains the weak statistical results obtained, notably concerning effect sizes. We postulate that they are due to the nature of measurements as objective methods could help obtaining clearer findings.

Further research should investigate the experienced feelings during the exposure to the elementary motion in a more objective manner (e.g., Brain imagery) coupled with the subjective way (e.g., Subjective self-reports) so as to determine the exact effects of such a pattern of motion in comparison with other trajectories (e.g., wave-like, translational, right-to-left direction, etc.). Effectively, while mnesic and psychomotor tasks did not give rise to very conclusive outcomes, it is believed that Neurophysiology and Embodiment's paradigms could help in answering questions about elementary motion and their impact on cognitive-emotional processing.

Acknowledgements

References

Alexopoulos, T., & Ric, F. (2007). The Evaluation-behavior link: Direct and beyond valence. *Journal of Experimental Social Psychology*, 43, 1010-1016.

Alloy, L.B., Abramson, L.Y., & Viscusi, D. (1981). Induced mood and the illusion of control. *Journal of Personality and Social Psychology*, 41, 1129-1140.

Barsalou, L.W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences*, 22, 577-660.

Barsalou, L.W. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617-645.

Bonfiglioli, C., Finocchiaro, C., Gesierich, B., Rositani, F., & Vescovi, M. (2009). A kinematic approach to the conceptual representation of this and that. *Cognition*, 111, 270-274.

Borghi, A.M., & Cimatti, F. (2010). Embodied cognition and beyond: Acting and sensing the body. *Neuropsychologia*, 48, 763-773.

Brouillet, T., & Syssau, A. (2005). Etude du lien entre l'évaluation de la valence et les réponses verbales dans une tâche de décision lexicale: les réponses oui et non sont-elles des réponses affectives? *Canadian Journal of Experimental Psychology/Revue Canadienne de Psychologie Expérimentale*, 59-4, 255-261.

Brouillet, T., Heurley, L., Martin, S., & Brouillet, D. (2010 a). The embodied cognition theory and the motor component of "yes" and "no" verbal responses. *Acta Psychologica*, 134, 310-317.

Brouillet, T., Heurley, L., Martin, S., & Brouillet, D. (2010 b). Emotion et cognition incarnée : la dimension motrice des réponses verbales "oui" et "non". *Canadian Journal of Experimental Psychology*, 64, 134-141.

Büchel, C., Price, C., & Friston, K. (1998). A multimodal language region in the ventral visual pathway. *Nature*, 392, 274-277.

Cannon, P.R., Hayes, A.E., & Tipper, S.P. (2010). Sensorimotor fluency influences affect: Evidence from electromyography. *Cognition and Emotion*, 24, 681-691.

Casasanto, D., & Dijkstra, K. (2010). Motor action and emotional memory. *Cognition*, 115, 179-185.

Chafi, A., Schiaratura, L., & Rusinek, S. (2012). Three Patterns of Motion which Change the Perception of Emotional Faces. *Psychology*, 3, 82-89.

Chen, S., & Bargh, J.A. (1999). Consequences of automatic evaluation: Immediate behavior predispositions to approach or avoid the stimulus. *Personality and Social Psychology Bulletin*, 25, 215-224.

Crawford, L.E. (2009). Conceptual metaphors of affect. *Emotion Review*, 1, 129-139.

Fincher-Kiefer, R. (2001). Perceptual components of situation models. *Memory and Cognition*, 29, 336-343.

Förster, J., & Strack, F. (1996). 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.

Freina, L., Baroni, G., Borghi, A.M., & Nicoletti, R. (2009). Emotive-concept nouns and motor responses: Attraction or repulsion? *Memory & Cognition*, 37, 493-499.

Gibbs, R.W., Jr. (1992). Categorization and metaphor understanding. *Psychological Review*, 99, 572-577.

Frijda, N.H. (2007). *The Laws of Emotion*. Mahwah, NJ: Lawrence Erlbaum Associates.

Glenberg, A.M., & Kaschak, M.P. (2003). The body's contribution to language. In B. Ross (Ed.), *The Physiology of Learning and Motivation*, V43 (pp. 93-126). New York: Academic Press.

Higgins, E.T., Bond, R.N., Klein, R., & Strauman, T. (1986). Self-discrepancies and emotional vulnerability: How magnitude, accessibility and type of discrepancy influence affect. *Journal of Personality and Social Psychology*, 51, 5-15.

Kemmerer, D. (1999). "Near" and "Far" in language and perception. *Cognition*, 73, 65-73.

Lakoff, G. (1987). *Women, fire and dangerous things: What categories reveal about the mind*. Chicago: Chicago University Press.

Lakoff, G., & Johnson, M. (1980). Conceptual metaphor in everyday language. *Journal of Philosophy*, 77, 453-486.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. Chicago: University of Chicago Press.

Langacker, R.W. (1987). An introduction to cognitive grammar. *Cognitive Science*, 10, 1-40.

Langacker, R.W. (1991). Foundations of cognitive grammar. *Descriptive Application*, Vol. II, Stanford, CA: Stanford Univ. Press.

Lee, A.Y., & Sternthal, B. (1999). The Effects of Positive Mood on Memory. *Journal of Consumer Research*, 26, 115-127.

Leleu, S. (1987). Un atlas sémantique de concepts d'émotion: normes et validations. Faculté de Psychologie et des Sciences de l'Education. Université Catholique de Louvain, Louvain-la-Neuve, Mémoire de Licence non publié.

Meier, B.P., & Robinson, M.D. (2004). Why the Sunny Side is Up, Associations Between Affect and Vertical Position. *Psychological Science*, 15, 243-247.

Natale, M., & Hantas, M. (1982). Effect of temporary mood states on selective memory about the self. *Journal of Personality and Social Psychology*, 42, 927-934.

Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review*, 108, 483-522.

Piaget, J., & Inhelder, B. (1969). *The Psychology of the child*. New York: Basic Books.

Podevin, G. (2009). Influence des Mouvements Elementaires sur les Processus Cognitifs Emotionnels. Thèse de Doctorat, Université de Lille Nord de France UDL3.

Podevin, G., Chafi, A., Rusinek, S., & Békaert, J. (2012). Perception des mouvements élémentaires : incidence sur les processus mnésique et exécutif. *Psychologie Française*, 57, 223-235.

Power, M.J., & Dalgleish, T. (2008). *Cognition and emotion: from order to disorder*. Hove, East Sussex, UK : Psychology Press, cop. 2008.

Richardson, D.C., Spivey, M.J., Barsalou, L.W., & McRae, K. (2003). Spatial representations activated during real-time comprehension of verbs. *Cognitive Science*, 27, 767-780.

Rimé, B., Boulanger, B., Laubin, P., Richir, M., & Stroobants, K. (1985). The Perception of Interpersonal Emotions Originated by Patterns of Movement. *Motivation and Emotion*, 9, 241-260.

Rothermund, K., Voss, A., & Wentura, D. (2008). Counter-Regulation in Affective Attentional Biases: A Basic Mechanism that warrants Flexibility in Emotion and Motivation. *Emotion*, 8, 34-46.

Rusinek, S. (2009). Désensibilisation de l'arachnophobie à l'aide d'une induction émotionnelle positive par le mouvement. 1er Congrès Français de Psychiatrie, Nice, décembre 2009.

Seligman, M.E.P. (1971). Phobias and preparedness. *Behavior Therapy*, 2, 307-321.

Solarz, A.K. (1960). Latency of instrumental responses as a function of compatibility with the meaning of eliciting verbal signs. *Journal of Experimental Psychology*, 59, 239-245.

Stanfield, R.A., & Zwaan, R.A. (2001). The effect of implied orientation derived from verbal context on picture recognition. *Psychological Science*, 12, 153-156.

Stepper, S., & Strack, F. (1993). Proprioceptive determinants of emotional and nonemotional feelings. *Journal of Personality and Social Psychology*, 64, 211-220.

Tagiuri, R. (1960). 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.

Tom, G., Pettersen, P., Lau, T., Burton, T., & Cook, J. (1991). The role of overt head movement in the formation of affect. *Basic and Applied Social Psychology*, 12, 281-289.

Tremoulet, P.D., & Feldman, J. (2000). Perception of animacy from the motion of a single object. *Perception*, 29, 943-951.

Visch, V.T. & Tan, E.S. (2009). Categorizing moving objects into film genres: The effect of animacy attribution, emotional response, and the deviation from non-fiction. *Cognition*, 110, 265-272.

Wapner, S., Werner, H., & Krus, D.M. (1957). The effect of success and failure on space localization. *Journal of Personality*, 25, 752-756.

Wells, G.L., & Petty, R.E. (1980). The effects of overt head movement on persuasion: Compatibility and incompability of responses. *Basic and Applied Social Psychology*, 1, 219-230.

Wentura, D. (2000). Dissociated affective associated priming effects in a lexical decision task: Responding with "yes" vs "no" to word targets reveal evaluative judgement tendencies. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, 26, 456-469.

Wentura, D., Voss, A., & Rothermund, K. (2009). Playing TETRIS for science counter-regulatory affective processing in a motivationnally "hot" context. *Acta Psychologica*, 131, 171-177.