Experiential and non-experiential routes of motor influences on affect and evaluation

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Introduction

This chapter focuses on motor influences on affect and evaluation. Previous research has shown that the impact of facial, postural, and behavioral expressions on judgment and evaluation is experientially mediated. This research was inspired by the so-called "facial feedback theory," which holds that feelings are not only a cause but also a consequence of specific motor programs. However, recent research suggests that motor programs can also influence affective processes without a mediating experience. It is therefore necessary to distinguish between two different routes of motor influences that serve different functions: a fast route that triggers either the approach or the avoidance system, and a slow route on which subjective experiences mediate motor influences on evaluative judgements. The following chapter describes the two routes of motor influences and discusses the implications of drawing a distinction between them.

Feeling and knowing

Phenomenal experiences play an important role in our daily life. Perceptual experiences, for example, constitute the interface between individual and environment and an unbiased image of external events guarantees successful interaction. Although we are used to trust our senses there are occasions in which we are deluded. For instance, when we come from a bright place outside into a dark room one might at first gain the impression that the room is darker than it might be after a short while. To the extend that we know that this phenomenon is a result of adaptation of cells in the retina, judgments of the brightness might not be based on this immediate experience. Instead, one might use her/his knowledge about adaptation to correct the judgment. Importantly, however, although one might know that her/his senses are deceived the experience remains unchanged.

Such illusions illustrate that occasionally one=s knowledge and one=s experience are in conflict. Because experience can be conceived of as necessary component of feelings, similar conflicts can arise between what one knows and what one feels. These conflicts can occur because feelings and knowledge possess different properties. To take these different properties into account we have suggested that knowledge and feelings hinge on different mental representations (Strack & Gonzales, 1993; Strack & Neumann, 1996). Feelings predominantly rely on experiential representations that may vary in intensity and cannot be "true" or "false". In contrast, knowledge is coded in noetic representations that are activated in an all-or-none fashion and have a definite truth value. Thus, noetic representation can be characterized by using what we know about associative memory. Experiential representations, however, possess perceptual properties in that they are, for example, subject to adaptation (Helson, 1964). Because of these perceptual qualities one should have conscious access to these representations. Noetic representations on the other hand do not have to possess this property necessarily. Similar assumptions about the representation format of feelings and knowledge were advocated by Buck (1980) and by Johnson and Multhaup (1992). Note, however, the assumption that feelings and knowledge are represented differently diverges from conceptualizations that propose a common representation for both mental entities (e.g. Bower, 1981).

Experientially mediated motor influences

As a subset of subjective experiences, feelings are immediately given and refer to perceptual experiences (Strack & Neumann, 1996). Many approaches have proposed that feelings arise from different forms of cognitive processing (for an overview see Clore, Schwarz & Conway, 1994). For example: emotions can be conceived of as an end product of the evaluation of the significance of one=s circumstances (e.g. Lazarus, 1984; Roseman, 1984), whereas so called cognitive or non-affective feelings - like familiarity or the feeling of knowing - are a byproduct of cognitive processing (Koriat, 1994; Miner & Reder, 1994).

However, cognitive processes are not the only source of feelings. Motor programs such as facial, postural, and behavioral expressions can also elicit feelings. According to William James= well-known assertion, emotional experience follows, rather than precedes, emotional behavior. Charles Darwin (1872/1965) advanced a somewhat similar view, arguing that bodily expressions might intensify feelings, while their suppression might attenuate them. By now, considerable evidence has accumulated in support of the assumption that facial and postural expressions can exert an influence on subjective feelings (for a review see Adelman & Zajonc, 1989). Dissenting views, however, exist on how these expressions influence emotional responses. Laird (1974) has advocated the view that a self-perception process

mediates the impact of expressions on subjective experience. According to this position, individuals have to infer their subjective experience from their expression when internal cues are weak. One important precondition for such inferences to occur is that people be aware of the meaning of their facial expression.

A number of non-inferential mediating mechanisms have been proposed as an alternative view (Buck, 1980; Ekman, Levenson & Friesen, 1983; Levenson, 1992). Several studies do, indeed, support this approach, suggesting that expressions are capable of eliciting feelings even in the absence of an inferential process. In one such study, Strack, Martin, and Stepper (1988) manipulated the contraction of the zygomaticus muscle while subjects rated cartoons on their funniness. For this purpose, participants had to hold a pen in their mouth, which either facilitated or inhibited smiling. More specifically, one group hold the pen between their teeth (facilitating smiling) whereas the other group hold it between their lips (inhibiting smiling). Although participants did not recognize the meaning of their facial expression, they judged cartoons to be funnier when smiling was facilitated than when smiling was inhibited. In a similar vein, Zajonc, Murphy, and Inglehart (1989) demonstrated that pronouncing vowels which required participants to either facilitate smiling (pronouncing the vowel Ae≅) or inhibit smiling (pronouncing the German vowel Aü≅) exerted a congruent impact on the speakers= affective experiences. In sum, these studies demonstrate that it is not necessary for an individual to recognize the meaning of an activated motor program for it to influence the subjective experience. Hence, inferential processes do not necessarily mediate motor influences on feelings.

Expressions can influence not only affective feelings but non-affective feelings as well. For example, furrowing the brow might induce the feeling of mental effort (Larsen, Kasimatis, & Frey, 1992; Stepper & Strack, 1993; Strack & Neumann, in press). Moreover, such proprioceptive influences on subjective feelings are documented not only for facial actions, but also for postures. Stepper and Strack (1993) observed that success in an achievement task resulted in more elevated feelings of pride when the positive feedback was received in an upright as opposed to a slumped position.

Feelings induced by specific motor actions can be the basis for subsequent judgments. The unobtrusive manipulation of the human smile, as developed by Strack et al. (1988), for example, has been shown to influence such diverse judgments as the perceived guilt of a person (Bodenhausen, Kramer & Süsser, 1994), the evaluation of an ambiguous social situation (Martin, Harlow & Strack, 1992), and the impression made by a job applicant (Berkowitz, Jaffee, Jo & Troccolli, 1999). Moreover, the feeling of mental effort induced by furrowing the brow influenced judgments about one's own self-assertiveness (Stepper & Strack, 1993) and judgments of fame (Strack & Neumann, in press).

Taken together, these findings suggest that the influence of motor programs on evaluative and nonevaluative judgments is mediated by feelings. The underlying mechanism apparently operates without a semantic categorization and without syllogistic inferences.

Non-experientially mediated motor influences

Interestingly, however, recent research suggests that subjective experiences and feelings do not always mediate motor influences on evaluative judgments. Several studies have demonstrated that the isometric flexion and extension of the upper arm influences evaluative processes in the absence of affective experiences (Cacioppo, Priester & Berntson, 1993; Förster & Strack, 1997; Priester, Cacioppo & Petty, 1996). In one of these studies, neutral Chinese ideographs presented during arm flexion were subsequently evaluated more

favorably than ideographs presented during arm extension (Cacioppo, Priester & Berntson, 1993). Because arm flexion is usually more closely coupled temporally with the consumption of desired goods, the authors argue that movements towards the body, such as arm flexion, can be interpreted as approach behavior, whereas movements of the hand away from the body can be interpreted as avoidance behavior. Most importantly, participants did not report having any affective experience as an effect of the muscle contraction.

In a similar vein, head movements were shown to exert an influence on evaluative judgments without a mediating affective experience. Wells and Petty (1980) asked participants to move their head either horizontally or vertically while being exposed to a persuasive message. Such head movements are habitually performed in Western cultures to indicate agreement or disagreement. Wells and Petty (1980) found that moving the head horizontally while listening to persuasive messages led to more negative attitude, while nodding the head vertically resulted in a more positive attitude towards the attitude object.

More recently, Förster and Strack (1996) demonstrated that these movements might also exert an influence on recognition performance. They found that participants who were induced to move their head vertically while encoding positive and negative words showed enhanced recognition of positive words. In contrast, participants who moved their head horizontally while encoding were better at recognizing negative words. Further analysis revealed that this effect was due to discrimination whether a word was presented in the learning list, but not to a response bias. This enhanced ability to discriminate words that are compatible with the currently activated motor program was not mediated by a change in the subjective experiences. Förster and Strack (1996) found no evidence that head movements influenced affective experience.

In sum, a variety of movements exert similar influences on evaluative judgments and memory performance. Although behavior is highly varied, many researchers regard its motivational basis as having a much simpler, two-factor organization (Cacioppo, Gardner & Berntson, 1997; Davidson, Ekman, Saron, Senulis & Friesen, 1990; Lang et al., 1990; Miller, 1959). According to these models, the motivation to approach pleasant objects and withdraw from unpleasant or hostile objects possesses a central function in the regulation of one=s needs. For example, Lang et al. (1990) argue that behavior is driven by two distinct motivational circuits that direct the deployment of primitive approach and withdrawal behavior. In line with this notion, it is reasonable to assume that the cognitive and behavioral components are closely interconnected within each of these two separate motivational systems.

Drawing on these assumptions, it is possible to maintain that the link between affect and motor action might be bidirectional. In fact, there is a considerable amount of evidence that the predisposition for approach or avoidance varies depending on the valence of the processed information. For example, Lang et al. (1990) demonstrated in several studies that defensive reflexes, which can be regarded as a predisposition for overt avoidance responses, are differentially modulated by the valence of currently processed affective information. More specifically, they found that the amplitudes of the blink reflex elicited by startle probes are augmented if affectively negative pictures are the focus of processing. In contrast, if affectively positive information is processed, the blink reflex will show relative inhibition. The two motivational systems are apparently sensitive to the valence of the affective input. Thus, whenever a motivational system is activated by affective information, the individual is prepared to act accordingly.

Such effects, however, are not restricted to automatic reflexes. Although affective

information processing should not automatically elicit behavioral intentions (Bargh, Chen & Burrows, 1996), it is conceivable that affective information processing might influence the execution of overt behavior. Thus, approach or avoidance movements should be initiated faster toward affectively compatible objects than towards incompatible ones. This assumption was examined in an early study in which participants were required to move cards with words that were mounted on a movable stage either towards or away from themselves (Solarz, 1960). Results revealed that movements towards the body were initiated faster with pleasant than with unpleasant words. In contrast, unpleasant words were pushed away faster than pleasant words.

Likewise, in a recent study by Chen and Bargh (1999), participants had to evaluate words on the computer screen as "good" or "bad" in meaning by either pushing or pulling a lever. Consistent with Solarz=s (1960) findings, participants were faster at pulling a lever towards them if they were exposed to affectively positive words. Conversely, pushing a lever was executed faster when negative words appeared on the screen. In a further study, Chen and Bargh (1999) demonstrated that this stimulus-response compatibility effect does not depend on the conscious evaluation of the presented words. Although the word evaluation task was replaced by the task of eliminating the word as soon as it appeared on the screen by either pushing or pulling a lever, the same pattern of results appeared. The authors conclude that the automatic evaluation of objects in our environment has the function of preparing the individual to act even in the absence of goal-directed processing.

Taken together, there is evidence that affective processing directly facilitates compatible and inhibits incompatible approach/avoidance behavior. From that point of view, the pervasiveness of the often-observed automatic evaluation of objects in our environment might serve adaptive purposes insofar as this mechanism might prepare the individual to act appropriately (Chen & Bargh, 1999). Moreover, activated motor programs of approach or avoidance influence affective processing. Thus, decreasing (increasing) the distance towards an object might facilitate (inhibit) the processing of positive affective concepts and inhibit (facilitate) the processing of negative affective concepts. Importantly, it is not necessary that an affective experience emerge from this mechanism. Such an assumption provides a parsimonious and conclusive explanation for the observed motor influences on evaluative judgments (Cacioppo et al. 1993; Wells & Petty, 1980) and recognition (Förster & Strack, 1996). However, up to now the evidence for such a mechanism has been only indirect, because previous findings allow for the alternative explanation that either categorization or storage processes are influenced by the execution of approach or avoidance behavior.

To provide a test that motor programs associated with approach and avoidance exert an impact on the categorization of affective information, we conducted a study in which participants had to categorize adjectives that appeared on the computer screen (Neumann & Strack, 1999). While classifying words as either "positive" or "negative," participants were required to press one palm either on the top or on the bottom of the table. The manipulation of the palm, which was adopted from Cacioppo et al. (1993), was intended to activate either the approach or the avoidance system. Given that the two motivational systems can be activated by isometric contractions of the upper arm, affective processing should be facilitated in a compatible combination of affect and motivational system. Therefore, we expected participants to be faster in classifying evaluatively positive adjectives while contracting their flexor muscle, and to be faster in categorizing negative adjectives while contracting the tensor muscle.

Insert Figure 1 about here

The results show that participants were indeed faster in categorizing positive words while contracting their flexor muscle (see Figure 1). They were also faster in classifying negative words while contracting their tensor muscle. This can be taken as a first piece of evidence that motor programs of approach and avoidance exert a direct impact on the categorization of affective information.

If one assumes that head movements exert the same impact on the categorization task, it is likely that the behavioral input has to be categorized in terms of approach or avoidance in order to exert this influence. As an alternative explanation, Zajonc and Markus (1984) presented a "hard interface" approach, which holds that motor movements in themselves posses a representational function that can influence other representations without a cognitive or experiential mediation. From this point of view, contractions of the tensor or flexor muscle in themselves can be regarded as a representation of movements towards or away from an object, which in turn directly influences evaluative processes.

A divergent prediction for these scenarios can be formulated if we take into account that information about approach and avoidance reflects the change in distance towards an object. Given that the change in distance contains the critical cue that triggers the motivational systems, this information is not only provided by proprioceptive cues but by visual cues as well. Thus, movement towards or away from an object can be monitored by visual as well as by proprioceptive cues. Therefore, assuming that approach and avoidance movements are centrally mediated, we can formulate the prediction that the two motivational systems are triggered also by visual patterns that signal approach or withdrawal. On the other hand, if the information is stored in the muscles itself, visual cues might be inappropriate to activate the motivational systems.

To test these predictions, the visual impression that one moves either towards or away from the computer screen was induced by a computer simulation. This was achieved through a background of concentric circles, which creates the impression that the observer is moving either forward or backward through a tunnel. The results in a pretest indicated that the impression of movement away from the screen was in fact induced when background circles moved from the center to the edge of the screen, whereas the impression of movement towards the screen was evoked when the background circles moved in the opposite direction. Moreover, participants did not report any reliable changes in their affective experience as an effect of their exposure to the computer simulation.

Because the computer simulation induced the expected impression, we used this procedure to test the assumption that visual cues are equivalent to proprioceptive cues in activating either the approach or avoidance system. We expected that the impression that one is moving towards the computer screen should facilitate the processing of positive concepts, whereas the impression that one is moving away from the computer screen should facilitate the processing of negative concepts.

Insert Figure 2 about here

As Figure 2 reveals, positive adjectives were categorized faster than negative adjectives when the background conveys the impression that one is moving towards the computer screen. In contrast, negative adjectives were categorized faster than positive adjectives when the person appeared to be moving away from the computer screen. These findings support

our assumption that affective processing is influenced by visual cues that signal approach or avoidance. Apparently, exteroceptive cues appear to be equivalent to interoceptive cues with regard to the elicitation of the two motivational systems.

Moreover, the fact that exteroceptive and proprioceptive cues exerted similar influences on affective processing renders it unlikely that the information about approach and avoidance is exclusively stored in the muscles (Zajonc & Markus, 1984). Rather, it seems that the various sensory inputs of visual and motor cues are projected onto the same dimension of increasing or decreasing distance. Such a conclusion, however, presupposes that visual input and proprioceptive feedback result in internal codes that share at least some aspects of their representational format. In fact, such a claim is strongly supported by findings demonstrating that spatial cues are automatically integrated in the execution of motor programs (Prinz, 1990). Drawing on this line of research, Prinz (1990) suggests that there is a common coding system for action that takes into account the spatial nature of the environment.

In the context of current research, this implies that representations that are sensitive to changes in the distance towards an object trigger motivational systems. The activation of such sensory-motor codes thereby facilitates the processing of compatible affect. However, although the findings presented so far demonstrate the expected congruency effect between motion direction and processed affect, these results are less conclusive about the underlying mechanism. As was previously argued, the activation of either the approach or the avoidance system implies that facilitative and inhibitory influences might be exerted on affective processing. Such an assumption can be derived from the notion that the two motivational systems guide the execution of antagonistic motor programs. That is, one can move towards an object or away from it, but it is impossible to move in both directions simultaneously. Hence, in order to guarantee that movements are executed successfully, it is not enough to activate the intended behavior, but it is also necessary to prevent competing concepts from controlling behavior. This can be achieved by a mechanism which not only activates the dominant action system (Shallice, 1978), but also inhibits the antagonistic response. Lang (1995) speculated whether inhibitory mechanisms might play a role in the context of approach and avoidance behavior. To shed some light on the question of whether both facilitative and inhibitory mechanisms contribute to the obtained effects, a third study was conducted. Here the same computer simulation was used to induce the impression that one is moving either towards or away from the computer screen. In contrast to the second study, however, a set of neutral target words was included.

Moreover, if the processing of affective information is immediately influenced by the direction of motion, the evaluation task should not play a mediating role. To test whether the obtained effect does not hinge on the intention to evaluate the target words, the evaluation task was replaced by a lexical decision task.

Insert Figure 3 about here

As is evident from Figure 3, aside from replicating the basic pattern of our previous findings, we obtained evidence for facilitative and inhibitory effects. That is, subjects responded faster to compatible conditions of affect and motion than to the control condition (neutral words). Incompatible conditions of affect and motion direction, however, drew a slower response than the control condition (neutral words).

In combination, our previous findings clearly suggest that in addition to the experientially mediated influence of motor programs on affective processing, an alternative route of impact

seems to exist. Apparently, sensory-motor programs influence affective processing in the absence of any affective feelings. We assume that non-experiential influences are mediated by two separate motivational systems of approach and avoidance. Supporting evidence comes from the finding that both interoceptive and exteroceptive cues can exert equivalent influences on affective processing. Although the experiments used different kinds of input, apparent movements away from one=s own body facilitated the processing of negative information. Conversely, apparent movements towards one=s own body facilitated the processing of positive information. Since the only common element between the information provided by interoceptive and exteroceptive cues is the direction of motion, it is likely that a central representation projects the neural information onto the same dimension of increasing or decreasing distance. Thus, in line with Cacioppo et al. (1997), we assume that the motivational systems associated with approach and avoidance operate within the CNS.

Implications for research on subjective experience

William James=s claim that emotional experience follows, rather than precedes, emotional behavior has been subject to much criticism (Cannon, 1927). Nevertheless, the basic premise that emotional expressions can influence subjective experience is corroborated by a considerable amount of research. The current chapter has focused on an extension of this view because recent research suggests that aside from specific emotional expressions, broader classes of motor programs exert an influence on affect and evaluation. In contrast to the traditional view, however, these motor actions influence evaluative judgements and memory performance without a concomitant affective experience. Thus, one might pose the question what determines whether motor influences on judgments are mediated by a subjective feeling or not? Experiential mediation presupposes that the contributing motor actions are specific to the feeling. Thus, a limited number of expressions are capable to trigger discrete affective and non-affective feelings (Ekman et al. 1983; Levenson, 1992). In contrast, a non-experiential mediation might be determined by many different action patterns that maps on the approach and avoidance dimension. The fact that approach or avoidance behavior is not specific to a specific feeling state or attitude might explain why this kind of motor action does not evoke subjective experiences. This does mean that unspecific behaviors are not capable to influence subjective experiences. However, as we will see in the last paragraph of this chapter in this case different mechanism trigger the experience.

One important feature of the experiential mediation is that the informational value of feelings can be called into question (Schwarz & Clore, 1996). Relevant research has demonstrated that the influence of affective feelings on evaluative judgments hinge on informational value of the subjective experience for the judgmental target. For example, individuals no longer rely on their subjective mood state to judge their life satisfaction if they recognize that this experience might have been due to the weather (Schwarz & Clore, 1983). Extending this logic to the automatic processing of affect, one might predict that the same discounting effects should be obtained in an affective priming paradigm (Murphy & Zajonc, 1993). This prediction was tested in a study by Winkielman, Zajonc and Schwarz (1997) in which participants had to evaluate unfamiliar Chinese ideographs that were preceded by a subliminal presentation of either smiling or frowning faces. Furthermore, a misattribution procedure was included in which participants were misinformed about the source of their assumed affective experience to the faces. Consistent with previous findings in affective priming research, they found that the ideographs were evaluated more favorably when preceded by a smiling than a frowning face. However, the misattribution manipulation had no

effect on the evaluation of the ideographs. Moreover, no evidence was obtained that the response to the ideographs resulted in an affective experience. One might therefore conclude that a consciously represented experience is a necessary precondition for misattribution effects to occur. Similarly, in none of our studies we did find any evidence that movements towards or away from the body induced affective experiences. Therefore, it is unlikely that motor influences mediated by either the approach or avoidance system could be subject to misattribution.

The mechanisms underlying motor influences

Both routes of motor influences result in phenomenal representations that can be regarded as the outcome of different underlying mechanisms. In this last paragraph we will describe mechanisms that might mediate motor influences on phenomenal representations. Basically, two different mechanisms can be distinguished: Motor actions can either directly trigger phenomenal representations or primarily influence the processing of external stimuli and thereby elicit a phenomenal representation (see Figure 4). The first mechanism was proposed by James (1890) who assumed that specific expressions might be sufficient to instigate feelings. In support of this assumption, recent research suggest that facial efference can directly evoke feelings (Adelman & Zajonc, 1989). For example, Stepper and Strack (1993) found that the contraction of the corrugator muscle is sufficient to induce the feeling of mental effort. Moreover, there is some evidence that unobtrusively induced smiles might have the potential to induce happy mood in the absence of a humor eliciting stimulus (Bodenhausen et al. 1994; Zajonc, Murphy and Inglehart, 1989).

Insert Figure 4 about here

The second mechanism, which was first advanced by Darwin (1872/1965), hinges on the combined influence of activated motor actions and external input. Unlike James, Darwin thus argued that motor programs could influence subjective experiences only in combination with an eliciting external event (see Figure 4). Support for this assumption comes from the Förster and Strack (1996) study, which demonstrates that the processing of affective words is influenced by motor actions. Further research reveals that cues signaling approach or avoidance motor actions exerts an influence on the categorization of affective information. Therefore, we assumed that the modulating function of motor influences might be due to the activation of either the approach or avoidance system. Moreover, we found that the compatibility mechanism operates automatically (dotted line in Figure 4) in that it does not depend on the goal to evaluate the external stimuli (see Experiment 3) .

Although subjective experiences result from the direct mechanism, this is not necessarily the case for the compatibility mechanism. Whether this mechanism evokes a subjective experience depends on both the activated motor action (see above) and the external input. For example, an upright position alone is not sufficient to elicited the feeling of pride (Stepper & Strack, 1993). Rather, motor actions exert a modulating influence on complex emotions only to the extend that the appropriate information is processed.

This framework provides a parsimonious and conclusive explanation for the observed motor influences in emotion and in attitude research (Adelman & Zajonc, 1989; Cacioppo et al. 1993; Wells & Petty, 1980). Further research has to find out whether the two mediating mechanisms in this framework present rather complementary than conflicted routes of influence. In principle, it might be conceivable that both mechanisms sometimes operate in

parallel.

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Figure 1

Experiment 1: Mean Response Latencies (in Milliseconds) as a Function of Somatic Activation and Valence of the Words

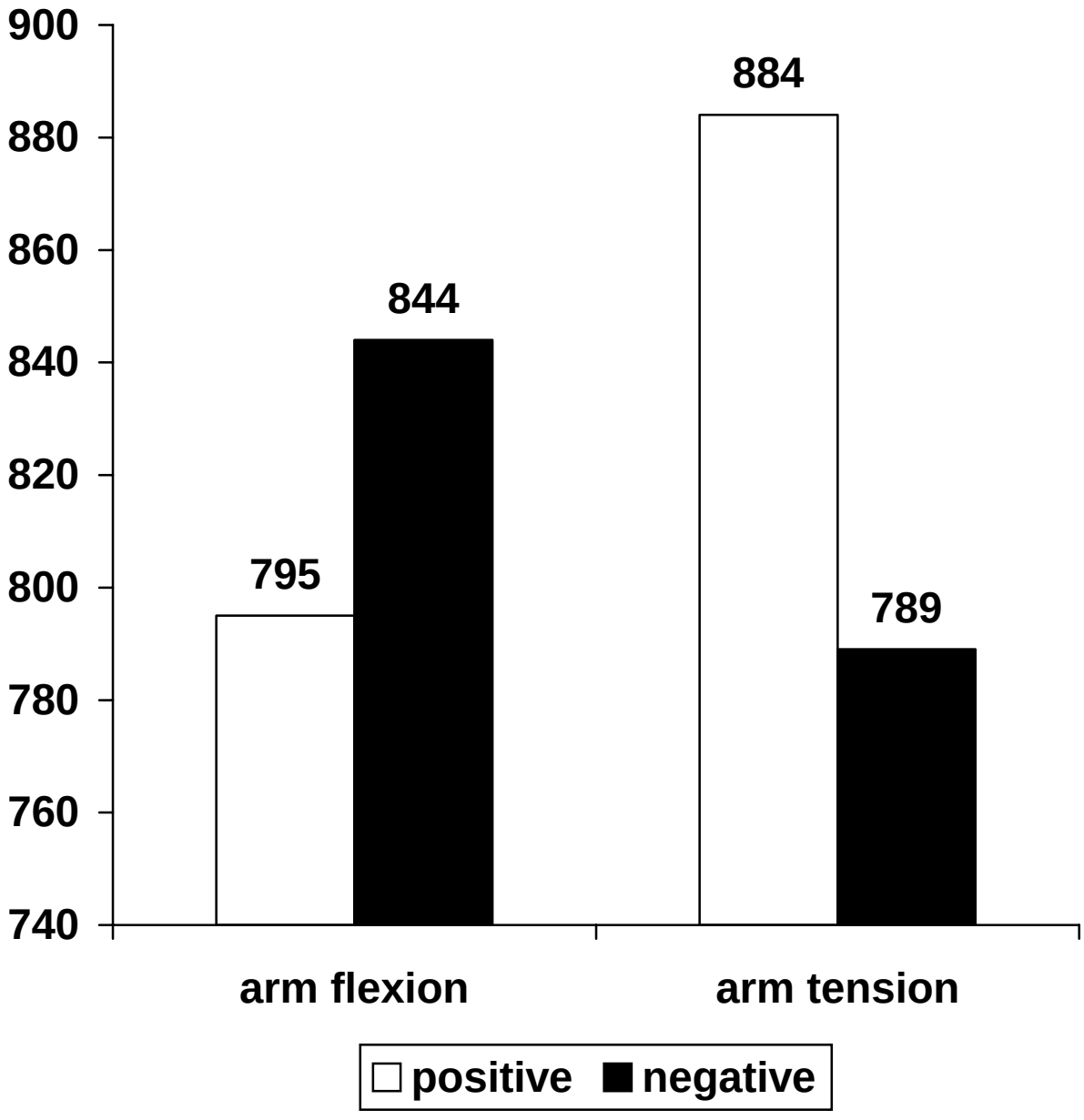

Figure 2

Experiment 2: Mean Response Latencies (in Milliseconds) as a Function of Movement Direction and Valence of the Words

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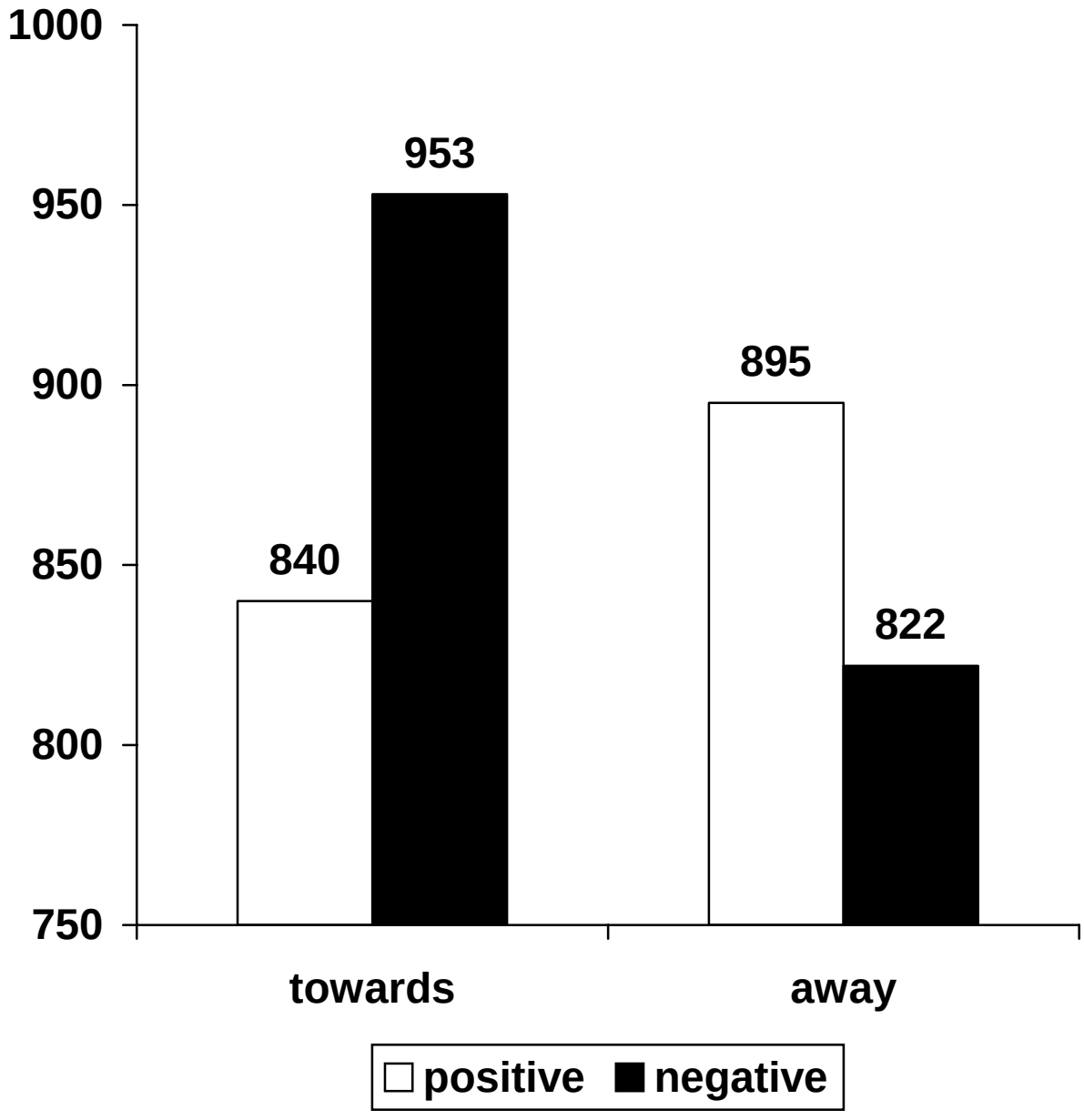
Figure 3



Experiment 3: Mean Response Latencies (in Milliseconds) as a Function of Movement Direction and Valence of the Words

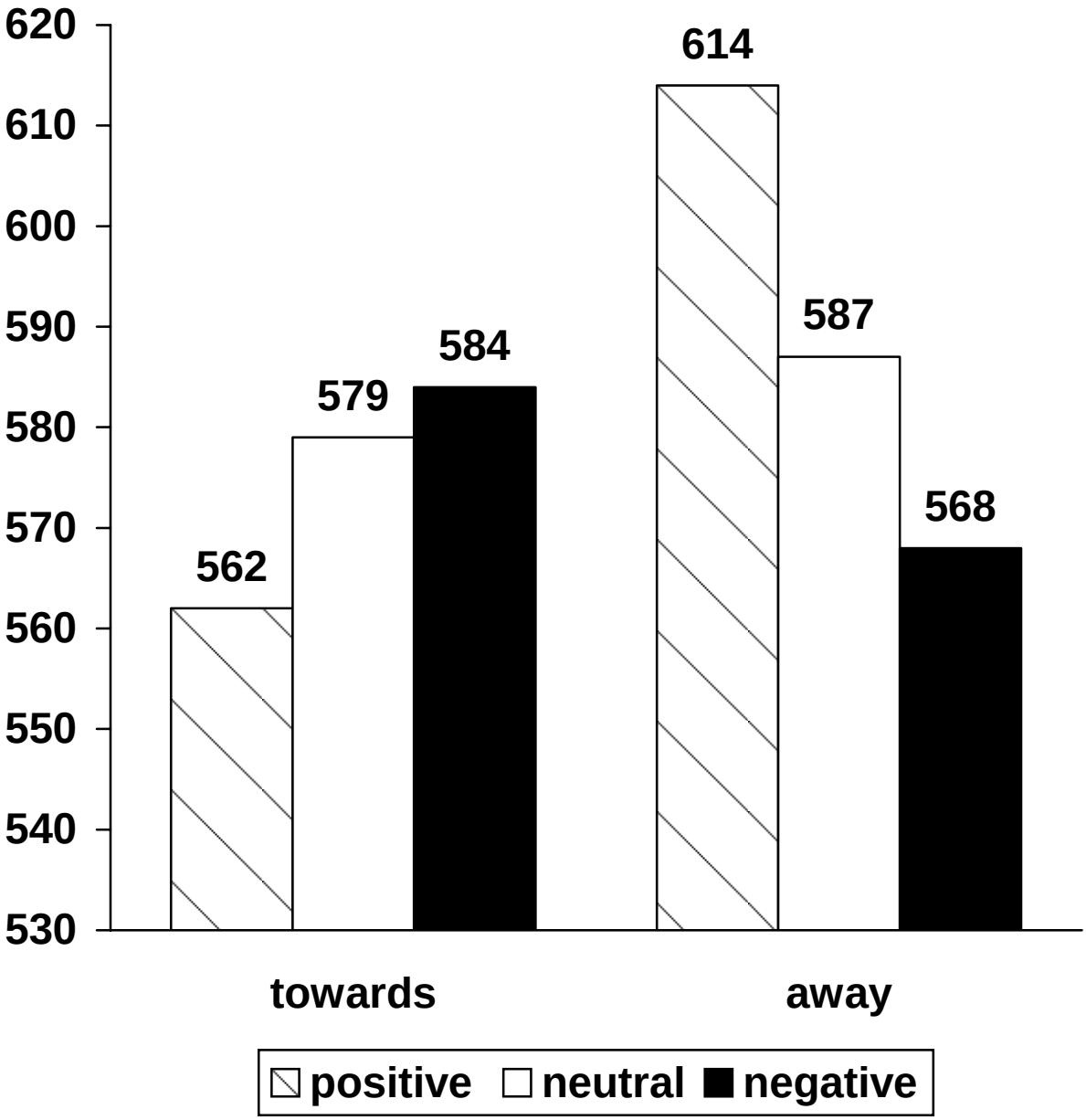


Figure 4

Two different mechanisms of motor influences on the phenomenological representation