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THE LANGUAGE OF OTHERS MIRRORRED IN THY FACE:

THE ROLE OF POLITICAL AFFILIATION IN AUTOMATIC FACIAL EFFECTS

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Abstract

People have a tendency to automatically respond to facial expressions of others in a mimicry like fashion by corresponding a smile with a smile or a frown with a frown. Mirror mechanisms are believed to instantiate such an effect at the neural level making it difficult to control or suppress. But what is facial mimicry for? Research considers it an important social tool which subtly facilitates social interactions and strengthens social bonds by acting like a natural 'social glue' (Lakin & Chardandt, 2005). However, literature has demonstrated that we do not mimic everybody to the same extent and that social factors importantly modulate such automatic mirror effect (Fischer & Hess, 2013). That is, facial mimicry is sensibly enhanced towards people we like, have a positive attitude towards or share the same interaction goals with and is decreased towards people we dislike, have negative attitudes or compete with.

If clear evidence is available on the effect of non-verbal behavior (e.g., emotion faces) on automatic facial mimicry, little is known about the role of verbal behavior (e.g., emotion language) in triggering corresponding facial effects. Interestingly, a recent study (Foroni & Semin, 2009) showed that facial mirroring effects can be extended to verbal stimuli referring to facial expressions of emotion. For instance, reading verbs referring directly to facial expressions (e.g., 'smile' and 'frown') significantly activates the zygomaticus major (smile muscle) and corrugator supercilii (frown muscle) sites respectively, same as when viewing smiling and frowning faces. These findings are the first to demonstrate that not only pictures of emotion faces but also verbal representations of facial expressions of emotion are able to elicit mirroring facial activity on corresponding facial muscles. Importantly, they highlight that automatic facial activation in response to others' emotion faces pertains not only to the domain of non-verbal but also to that of verbal behavior.

Whereas, we know a lot about the role of social factors such as attitudes and social

affiliation on automatic facial mimicry, no evidence exists on whether these factors modulate automatic facial effects even through the medium of language. The goal of the present research is to address this gap by investigating the role of verbal behavior in triggering automatic facial effects depending on whether verbal stimuli are attributed to members of different political groups. Beyond the general effect of emotion verbs, we are specifically interested in the association of those verbs with social actors such as left-and right-wing political leaders and how that influences the automatic facial response of readers of left-and right-wing political orientation. Three studies using facial electromyography (EMG) were designed to address this issue.

Specifically, **Study 1** investigated the role of interpersonal verbs referring to positive and negative emotion expressions encoded at different levels of abstraction in eliciting differential activation levels in corresponding facial muscle sites of frowning and smiling (corrugator supercilii and zygomaticus major respectively). We examined whether descriptive action verbs (DAVs) and state verbs (SVs) that expressed positive and negative emotional behaviors of a third person would differentially trigger corresponding facial muscle activation in a reader. Results showed that emotion expression verbs encoding facial actions at different levels of abstraction had a differential elicitation effect on corresponding facial muscles.

Study 2 went further by examining the role of verbs expressing positive and negative emotional behaviors of political leaders in modulating automatic facial effects in readers of same-or opposing-wing. Previous research demonstrated that political attitudes of participants modulate automatic facial responses to happy and angry faces of politicians. However, whether such modulation passes through the medium of language remains unaddressed. We investigated whether the matched or mismatched political affiliation of participants and politicians of left-and right-wing orientation modulates automatic facial activation effects triggered by positive and negative emotion expression verbs. Facial activity was EMG assessed over the corrugator supercilii (brow) and zygomaticus major (cheek) muscle sites. Results revealed that political affiliation significantly influenced the level of corresponding facial muscle activation triggered by emotion expression verbs as participants reacted with more congruent and significantly enhanced facial muscle activation to smiles and frowns of ingroup compared to outgroup politicians.

In **Study 3** we investigated whether reading verbs referring to happiness displays of ingroup or outgroup politicians induces qualitatively different smile patterns in the faces of readers. Previous research showed that smiles of politicians are equally mimicked by supporters and opponents alike, as indicated by activity in the zygomaticus major. However, no study addressed whether political affiliation influences whether smiles of ingroup politicians will be corresponded by a more sincere (e.g., Duchenne) smile pattern relative to those of outgroup politicians. We addressed this issue by examining whether smile expressions attributed to ingroup politicians will induce a more sincere smile response among readers of same political wing relative to smile expressions attributed to outgroup politicians, as revealed by co-activation of the orbicularis oculi (eye corner, Duchenne marker) and zygomaticus major (cheek) muscle sites. Results demonstrated that people facially respond differently towards verbs expressing happiness displays of ingroup compared to outgroup politicians by revealing a more sincere smile towards ingroup politicians and a more false one in response to outgroup politicians.

Taken altogether, our results are the first to show that the role of political affiliation in modulating automatic facial effects only passes through verbal means and is revealed at a fine-grained level by making not only quantitative but also qualitative differences in automatic facial reactions of readers.

I. GENERAL INTRODUCTION

Automatic facial mimicry is the tendency to mimic facial expressions of emotions we observe in others. At its basics it is considered as a motor resonance mechanism relying largely on mirror neuron substrates which instantiate it at the neural level making it difficult to control or suppress. However, recent research has demonstrated that social factors importantly modulate facial mimicry by acting as natural facilitators or inhibitors. That is, facial mimicry is sensibly enhanced towards people we like, have a positive attitude towards or share the same interaction goals with and is decreased towards those we dislike, have negative attitudes or compete with (Hess & Fischer, 2013). Facially mimicking others is considered to subtly signal affiliation and a basic approach tendency towards others (Lakin & Chartrandt, 2005). Therefore, sharing attitudes, goals and the same social affiliations makes it easier to communicate and mimic facial expressions of one another with respect to people with whom we don’t have that much in common.

Facial mimicry is considered an important social tool which powerfully influences social interactions, albeit functioning in subtle ways. Indeed, it is considered an important means in the repertoire of non-verbal communication relying mainly on non-verbal behavior like facial expressions of emotions. That is, facial mimicry is automatically and unconsciously triggered by mere exposure to another person’s emotion expressions, whether dynamically displayed in face-to-face communication, presented in video clips or simply shown in photographs. If clear evidence is available on the effect of non-verbal behavior (e.g., emotion expressions) on automatic facial mimicry, little is known about the role of verbal behavior (e.g., emotion language) in triggering corresponding facial effects. Interestingly, a recent study by Foroni & Semin (2009) showed that facial mirroring effects can be extended to verbal stimuli referring to emotion faces. For instance, reading verbs referring directly to facial expressions (e.g., ‘smile’ and ‘frown’) significantly activates the zygomaticus major (smile muscle) and corrugator supercilii (frown muscle) sites respectively same as when viewing smiling and frowning faces. In this study, participants were exposed to descriptive action verbs (DAVs) which refer directly to facial expressions of emotion (e.g., to smile, to frown) and adjectives (ADJs) referring to these expressions at a higher level of abstraction (e.g., funny, annoying). Although verbs and adjectives were presented singularly without any other contextual information on a monitor they were able to elicit corresponding facial muscle activity on readers in a similar way as when viewing emotion faces. Between the two linguistic categories (DAVs and ADJs) action verbs had the strongest elicitation effect over corresponding facial muscles compared to adjectives which elicited a much lesser facial activity. However, their study did not include an important verb category, that of state verbs (SVs) which implicate emotional states in a most relevant and direct way.

The findings by Foroni & Semin (2009) are the first to demonstrate that not only pictures of emotion faces but also verbal representations of facial expressions of emotion are able to elicit mirroring facial activity on corresponding facial muscles. Importantly, they showed that beyond perceptual features of stimuli (e.g., human faces of emotion) conceptual representations of those features (e.g., words referring to smile and frown expressions) seem to similarly trigger corresponding facial activity. Such evidence is of particular relevance to the facial mimicry research. Whether automatic facial effects in response to emotion faces result from bottom-up (e.g., perceptual) or more top-down processes (e.g., conceptual representations) is a much debated issue and evidence on language-based or semantically driven facial muscle activation speaks most directly of the sensitivity of automatic facial effects to conceptual factors.

Most revealingly, this study highlights the fact that automatic facial activation in response to emotion faces pertains not only to the domain of non-verbal but also to that of verbal communication. The very defining characteristic of humans as social beings, language is the most important tool humans have ever developed and refined to not only communicate with others but also to influence them towards attaining personal and shared goals. Language is the most pervasive means to attain and maintain political support. Increasingly in the modern world people rely on language-based channels and media to communicate and share important ideas with others.

In this respect, the study by Foroni and Semin (2009) represents a major advance with regard to the facial mimicry research by extending the phenomenological realm of automatic facial effects to the neglected domain of verbal communication. By showing that verbs have the same power to elicit corresponding facial activation same as visual stimuli they built a natural bridge between the domains of non-verbal and verbal communication and mirroring facial effects. Consequently, their work opened up a whole new avenue of research by pointing out at the possibility that automatic facial mimicry, together with the paraphernalia of effects and related moderating factors may all pass through the medium of language. The aim of this research is to follow this avenue and examine automatic facial effects in response to verbal stimuli. Whereas a lot is known on the role of social factors such as attitudes and social affiliation on automatic facial mimicry, no evidence exists on whether these factors modulate automatic facial effects even through the medium of language. The goal of the present research is to address this gap by investigating the role of verbal behavior in triggering automatic facial effects depending on whether verbal stimuli are attributed to members of different political groups. Beyond the general effect of emotion verbs, we are specifically interested in the association of those verbs with social actors such as left-and right-wing political leaders and how that influences the automatic facial response in readers of left-and right-wing political orientation.

We will address this issue by first reviewing the relevant literature accumulated in this field of research, focusing specifically on underlying mechanisms and social moderators of facial mimicry. The literature review points out to a neglected aspect in the facial mimicry research which, relying mostly on pictures of emotion faces has circumscribed the phenomenon to the domain of non-verbal communication. Importantly, it highlights the tight interplay between perceptual and conceptual processes in automatic facial mimicry by examining the complex involvement of low-level sensorimotor and emotional resonance mechanisms on the one hand, and higher-order processes like social cognition on the other.

The present research aims to investigate the role of social cognition in modulating automatic facial effects through verbal means. Specifically, we examine whether verbal behavior of members of different political groups elicits differential facial muscle activation levels in readers of same-or opposing political orientation. Three studies using facial electromyography (EMG) were designed to address this issue.

Study 1 addresses the role of interpersonal verb categories referring directly to emotion expressions in triggering differential automatic facial effects. Specifically, we examine whether descriptive action verbs (DAVs) and state verbs (SVs) that expressed positive and negative emotional behaviors of a third person would differentially trigger corresponding facial muscle activation in a reader.

Differently from Foroni & Semin (2009) who examined DAVs and ADJs we consider a neglected verb category, that of state verbs (SVs) which importantly implicate emotions. We attribute verbs to a third person thus providing a minimally interpersonal context. We use DAVs that unambiguously map the direct perceptual features of facial expressions of emotion (to smile, to frown) and SVs that have direct reference to the felt emotion states most commonly mapped on those expressions (to enjoy, to enrage). Notably, both sets of verbs have a direct reference to the specific facial expressions of smiling and frowning. Facial activity is EMG assessed over the corrugator supercilii (brow) and zygomaticus major (cheek) muscle sites.

By examining automatic facial effects within two verbs categories (DAVs and SVs) we importantly extend findings of Foroni & Semin (2009) to a wider verbal repertoire while providing a more stringent testing condition of their effect on automatic facial reactions. Furthermore, by presenting target verbs as attributed to a third person we offer a minimally interpersonal context which further extends the ecological validity of our research.

Study 2 goes further by examining the role of verbs expressing positive and negative emotional behaviors of political leaders in modulating automatic facial effects in readers of same-or opposing-wing. Previous research demonstrated that political attitudes of participants modulate automatic facial responses to happy and angry faces of politicians (Bourgeois & Hess, 2008; Mc. Hugo, Lanzetta & Bush, 1991). However, whether such modulation passes through the medium of language remains unaddressed. We address such gap by investigating whether verbs referring to emotion expressions (to smile, to enjoy) attributed to either left-or right-wing politicians induce differential activity levels in corresponding facial muscles of a reader of either left-or right-wing political affiliation. Four politicians are selected, two representing left-wing and two representing right-wing political parties. We examine whether the matched or mismatched political affiliation of participants and politicians of left-and right-wing orientation modulates automatic facial activation effects triggered by emotion expression verbs.

In a novel way, we investigate the role of political affiliation in modulating automatic facial effects through verbal means. Language is the most pervasive means to attain and maintain political support and political interaction relies principally on verbal media. Importantly, we extend previous research on automatic facial effects in response to politicians' faces by using verbal stimuli, thus covering an essential but most neglected aspect of political interaction which relies on verbal channels.

Study 3 addresses in a finer grained analyses whether verbs depicting smiles of ingroup politicians are facially responded to with a qualitatively different pattern of smile compared to smile depictions of outgroup politicians. Previous research (Bourgeois & Hess, 2008) showed that smiles of politicians are equally mimicked by supporters and opponents alike, as indicated by activity in the zygomaticus major, putatively due to the adaptive function of smiles in social interaction and the low social costs that smiling incurs on the mimicker. However, no study addressed whether political affiliation influences the quality of the smile that people will display in response to an ingroup politicians' smile as opposed to that of an outgroup politician. That is, no study has examined whether smiles of ingroup politicians will be corresponded by a more sincere (e.g., Duchenne) smile relative to outgroup politicians, as revealed by the co-activation of orbicularis oculi (Duchenne marker) in addition to zygomaticus major muscle site. Moreover, no evidence exists on whether such effect can be revealed through the medium of language.

The present experiment addresses this issue by investigating in a high-resolution analysis the effect of political affiliation on modulating automatic facial reactions to politicians' smiles at a finer-grained level. Specifically, we examine whether reading the verb "smile" as attributed to ingroup or outgroup politicians induces qualitatively different smiles in the faces of readers. Importantly, we extend previous research on Duchenne smiles, which relied mostly on picture stimuli by specifically examining whether the Duchenne marker can be revealed while participants are facially responding to verbs representing "smiling" facial expressions. We apply a micro-analytic approach to investigate the role of political affiliation in making not just quantitative but also qualitative differences in automatic facial reactions to politicians' smiles.

II. THEORETICAL BACKGROUND

2.1 Defining characteristics of facial mimicry

Facial mimicry or the tendency to automatically imitate other people's facial expressions plays an exceptional role in social interaction. Implicating the interface between self and other, automatic facial mimicry is an inherently social phenomenon. At its basics it is thought to reduce the natural social distance between people creating an immediate psychological resonance and acting as a smooth operator in social interactions. For instance, facially mimicking others is believed to play an important role in the vicarious experience of other people's emotions, a process also known as *emotion contagion* (Hatfeld, Cacioppo & Rapsen, 1994). Furthermore, research shows that automatic facial mimicry and emotion contagion are critical foundation blocks for more complex social abilities such as *empathy* (for recent reviews see, Deceety, 2011; Preston & de Waal, 2002). Beyond mere motor imitation of others' facial expressions automatic facial mimicry reflects a deeper emotional and cognitive attunement with others. It facilitates social interactions, strengthens social bonds and operates as a subtle regulator of peoples' interactions in different social contexts. Non-consciously mimicking facial expressions of others is believed to create a more fluid communication between people signaling an approach tendency and affiliative intent and reflecting more specifically people's interaction goals. Subsuming the findings on the generally positive effects of automatic facial mimicry on social interactions some authors have termed it 'a natural social glue' (for recent reviews see, Chartrand & van Baaren, 2009; Chartrand, Maddux, & Lakin 2005).

However, recent research shows that people do not facially mimic everybody to the same extent and all the time. For instance, disliked others and outgroup members are usually not mimicked or mimicked to a lesser extent than liked or unknown others. It is suggested in this body of research that facial mimicry may serve as a sign of inclusion or exclusion thus reinforcing group boundaries. In a subtle way facially mimicking others signals that boundaries between self and other have become permeable; the fact that I automatically reproduce the other's facial expressions on myself indicates that the natural social distance that exists between people can be immediately bridged. Conversely, lack of mimicry signals that such boundaries are more rigid than permeable thus serving as a subtle cue for people to keep their distance. In some cases, people might even frown automatically at the smile of someone they dislike. In other cases they might put up a smile when observing a friend's sad expression (a phenomenon also known as '*counter mimicry'*) as a signal of encouragement. Such findings suggest that rather than a 'natural' facial mimicry is more of a socially sensitive and selective 'glue' and may operate as a subtle regulator of people's interactions in various social contexts. Most importantly, these finding also indicate that social cognition significantly influences whether and to what extent people automatically mimic others' facial expressions. Interestingly, they point out at a complex interplay between bottom – up processes such as motor resonance, emotional contagion on the one hand and more top – down process involving social cognition on the other.

2.2 Underlying mechanisms of facial mimicry

2.2.1 Motor Resonance and Emotion Contagion

There is extensive research linking facial mimicry with emotion expression and emotion experience. People usually smile when feeling joy and frown when they are distressed or in anger. Because of such high correspondence between facial muscle activation and emotional experience facial mimicry has been considered as a primitive 'emotion contagion' mechanism (Hatfield, Cacioppo, & Rapson, 1993). That is, because facial expressions are usually expressions of emotions by facially mimicking others we not only imitate their facial expressions but also automatically 'catch' and share their emotions directly without any conscious effort and any form of cognitive mediation.

However, not all facial activation can be linked with the corresponding emotion experience. Facial expressions are also context-dependent and do not always reflect emotions. For instance people usually frown when reading, an effect believed to be resulting from the cognitive load involved. In the same lines, a smiling face does not always signal an enjoyable emotion as sometimes people smile to convince others that enjoyment is occurring when it is not, for example when wanting to hide, moderate, or mask a negative affect (e.g., contempt, social embarrassment, or an inappropriate affect; see Niedenthal et al. 2010 for a discussion on different types and meanings of smiles). Indeed, early research on facial mimicry contends that automatic facial mimicry is not to be linked with emotion experience at all but should considered simply as an instance of motor imitative behavior (Chartrandt & Bargh 1999). However, most studies taking such perspective, widely known as the perception-action model of facial mimicry fail to clearly disentangle motor from emotional processes.

Other research has consistently linked facial mimicry with research on emotion contagion considering it as a prime mechanism through which emotions pass from one person to the other. According to Hatfield et al. (1993, 1994) emotion is believed to be transferred from target to observer through spontaneous mimicry of the target's expressions. In their view 'emotion contagion' is a process that relies on a motor (non-emotional) facial matching of expressions between observer and observed. That is, mere perception of the other's facial expression activates the observer's own neural representations of that expression. Hence, motor activation of the corresponding facial expressions in the observer triggers via afferent feedback the corresponding emotional state (Oberman, Winkielman, & Ramachandran, 2007). Nevertheless, how facial mimicry exactly relates to emotional experience and sharing of other's emotions varies across studies.

For instance, part of studies take the perspective that perception of facial stimuli triggers fast processing of the emotional content of facial expressions and as a result corresponding facial reactions ensue. In this perspective, facial reactions are subsequent to emotional processes triggered upon perception of facial stimuli rather than preceding and/or causing them. Because emotional stimuli are most salient to the organism they are perceived and processed in much faster way compared to other type or neutral stimuli. Therefore the emotional content gleaned from facial expressions elicits emotion reactions in an observer at very early stages (Moody et al. 2007) meaning that people resonate emotionally first and this gives rise to corresponding (and sometimes not) facial expressions. Emotion contagion takes place very rapidly, even upon unconscious perception of emotional stimuli (Tamietto & deGelder, 2009) and consequently causes efferent processes to activate corresponding facial expressions (Cacioppo & Gardner, 1999; Dimberg, 1997; Moody et al. 2007).

These accounts similarly posit a causal link between facial mimicry and emotion experience. However, they differ in the role accorded to facial muscle activation in emotion experience. According to the 'facial feedback hypothesis' facial expressions are an important mechanism in generating and moderating the experience of emotion via afferent feedback (for a review see McIntosh, 1996). Consistent with this notion a number of studies have used various facial mimicry manipulation paradigms (for example, by holding a pencil with their mouth, applying facial masks that block facial muscle activation and more recently using Botox injections) to show that facial muscle activation plays indeed an important role in facilitating recognition and experience of emotions (Niedenthal et al., 2001; Oberman et al., 2007; Hennenlotter et al., 2009).

These studies showed that blocking facial muscles impairs people's ability to fairly recognize and experience emotions. Similarly, inducing facial activation corresponding to smiling by asking people to hold a pen with their front teeth causes them to judge cartoons as funnier relative to the face-free condition (Martin and Strack, 1989; Foroni & Semin, 2012). Such findings showed that facial muscle activation is indeed involved and plays a critical role in high level processes such as emotion recognition and evaluative judgments (Foroni & Semin, 2009).

Consistent with behavioral findings neuroscience evidence suggests facial mimicry could be considered as an instance of a more general "mirroring" phenomenon. Evidence shows involvement of the mirror neuron system during both production and observation of facial expressions. An fMRI study by Carr et al. (2003) found that subjects passively observing emotion-expressive faces displayed neural activation in the premotor cortex and neighboring regions which are normally activated during production of the same facial expressions. These findings suggest that simply observing someone else's facial expressions leads not only to automatic facial effects but also to similar neural activation as when producing the facial expression in first person. Hence, beyond simple motor resonance facial mimicry could also involve complex high level processes facilitating and further reinforcing not only emotional sharing but also spontaneous understanding between people.

2.2.2 Empathy

Evidence from social psychology shows that automatic mimicry is indeed a socially pervasive phenomenon and facilitates not only emotional but also cognitive attunement between people. In their seminal study, Chartrand and Bargh (1999, study 3) tested the hypothesis that the more people mimic others the more they become attuned to their mental states. Results showed that mimicking others facilitates the process of taking their perspective, bodily and mentally so. Indeed, recent research on empathy considers automatic facial mimicry as primitive or 'rudimentary empathy' (e.g., Preston & de Waal, 2002). Despite general disagreement regarding the mechanisms underlying empathy it is widely agreed that at its basics it involves spontaneous understanding of other people's states and that this is somehow related to motor, emotional and neural resonance mechanisms (see Decety, 2011 for a recent review). Many studies have demonstrated a robust link between automatic facial mimicry and empathy (see Sonny-Borgstrom, 2003; 2008; Stel, van Baaren and Vonk, 2008; Cheng & Chartrand, 2003; Estow et al., 2006; Van Baaren et al. 2003; 2004). Consistent with the behavioural evidence neuroscience studies have shown vicarious activation of the same brain areas when people observe others' facial expressions of pain, (Singer et al., 2004; Jackson et al., 2004) or disgust (Wicker et al., 2003). This parallels findings of mirror-neuron systems found in humans in which internal action representations associated with our own actions are similarly triggered when we observe or hear of someone else engaging in those very same actions (Gallese et al., 1996; Rizzolatti, Foggasi, & Gallese, 2001). Neural theories of empathy pose similar 'perception-action' mechanisms at the basis of empathy, whereby merely attending to another person's state automatically activates the observer's own relevant conceptual representations (i.e., concepts, memories, feelings) which enable not only mirroring the other but understanding him/her as well as if from the inside (i.e., empathy, Preston & de Waal, 2002). In this view, empathy is seen as neurally implemented by several *simulative* (as if) mechanisms, including motor, affective and cognitive processes (see Iacoboni, 2009 for a review of cognitive mechanisms of imitation and empathy). That is simply observing someone engaged in an action or emotion experience automatically triggers related brain and bodily states corresponding to those actions and emotions in the perceiver, a natural process which facilitates an immediate resonance with the other.

Several fMRI and TMS studies suggest that similar networks of motor and emotional brain areas are activated during perception of emotional faces and simulated experience of emotions (Carr et al., 2003; Wicker et al., 2003; Avenanti et al., 2005; Avenanti & Aglioti, 2006). Overall these findings provide evidence that automatic facial mimicry is intimately linked not only with vicarious emotion but also empathic understanding of others and that these phenomena do rely on substantially common neural substrates.They are considered to underlie social life and streamline social interactions, albeit occurring at a non-conscious level.

2.3 Social moderators of facial mimicry

2.3.1 Affiliation

Facially mimicking others is considered as a signal of affiliative intent and as expressing a general approach tendency towards others. As a result, interaction partners become more alike, more attuned to one another's emotional and cognitive states and their social interaction benefits by getting smoother and more efficient (Chartrand & Bargh, 1999; van Baaren et al., 2004). A number of studies have shown that automatic mimicry has positive consequences for the mimicker, the mimickee and the social interaction at large (Stel, Blascovitch, McCall, Mastop, van Baaren & Vonk, 2010; Chartrand & Bargh, 1999). Although most of the data refer to behavioral mimicry more generally (e.g. Cheng & Chartrand, 2003; Lakin & Chartrand, 2003; Chartrand & Bargh, 1999) recent studies show that these findings apply also to the specific domain of facial mimicry. Likowski, Muhlberger, Seibt, Pauli & Wyers (2008) investigated the influence of positive and negative attitudes on facial mimicry. Participants were shown neutral, happy and sad facial expressions of three avatar characters who were previously described as neutral, positive and negative characters and facial mimicry was EMG measured. Results showed that positive characters were mimicked more whereas negative characters elicited less and even incongruent facial reactions.

In an early study Mc. Hugo et al., (1991) investigated whether common attitudes towards political leaders of opposing parties influence mimicry of facial expressions. Participants were shown brief television excerpts of two politicians as facial activity was EMG measured. When attitudes towards the politician were positive facial mimicry was enhanced. Interestingly, smiles were mimicked about equally by both supporters and opponents of politicians. This study was replicated by Bourgeois & Hess (2008, study 1) who showed that people are more likely to mimic facial expressions of persons with whom they share the same political or sport affiliation. Their findings also confirmed that mimicry of smiles does not differ substantially across different political groups. Affiliation goals, whether explicit or implicit enhance automatic facial mimicry as people tend to mimic more those whom they like and want to affiliate with (Stel et al., 2010).

Overall, these studies provide evidence that social affiliation facilitates facial mimicry and that facial mimicry in turn has a general positive impact on social interactions by enhancing liking and strengthening social bonds. However, such a positive effect seems to be a default process where people already have a positive attitude, or at least a neutral one towards others, but does not easily extend to outgroup members and disliked others (Hess et al., 2001). Importantly, in the case of negatively stereotyped others facial mimicry and its positive correlates of liking and affiliation are inhibited (Likowski et al., 2008; Yabar et al., 2006). Such findings show that beyond and before emotional content, social information about others is very rapidly processed and activation of cognitions and representations of others seems to moderate embodied effects even at the level of automatic facial mimicry. These data suggest that people might use facial mimicry as a strategic means for achieving social interaction goals, albeit in an automatic and non-conscious way and that it may serve as a subtle reinforcing of existing social bonds. Unobtrusive facial mimicry may subtly signal that boundaries between self and other are easily permeable as in the case of ingroup members and liked others. Conversely, absence of mimicry may subtly signal that self-boundaries are held rigidly tight to keep outgroup members or disliked others at safe distance.

2.3.2 Facial mimicry and group membership

Research shows that in-group interactions are characterised by enhanced automatic mimicry given that in group members share a common repertoire of nonverbal behaviors which makes it easier to affiliate and use for this purpose without excessive planning or effort (Lakin et al., 2003). In contrast, cross-group interactions are generally characterized by lack of mimicry (Chartrand & van Baaren, 2009). Several studies have examined the relation between automatic facial mimicry and group membership with the general finding that facial expressions of ingroup members induce more congruent facial reactions compared to those of outgroup members (van den Schalk et al., 2010). For instance, Herrera et al., (1998) found reduced and even incongruent facial reactions towards members of other ethnic groups. Interestingly, the more negative were their attitudes, the more participants showed incongruent patterns of facial activity.

More recently, Mondillon, Niedenthal, Gil & Droit-Volet (2007) analysed the impact of group membership on automatic facial mimicry of anger expressions using a *temporal estimation task* as an indirect measure of facial mimicry. Previous research using such task has shown that individuals typically overestimate duration represented by angry faces probably due to increased arousal (Droit-Volet et al., 2004). This overestimation, however, is not observed when imitation of the facial expressions is inhibited, suggesting that other processes mediate changes in arousal (Effron, Niedenthal, Gil, & Droit-Volet, 2006). In separate studies, Chinese and French Caucasian participants were presented with Chinese and Caucasian angry and neutral faces for short and long standard durations. For Caucasian participants results revealed a tendency to overestimate the length of presentation of angry expressions compared to neutral expressions of Caucasian faces (ingroup) and not of Chinese ones (outgroup). This implies that ingroup angry expressions were mimicked and outgroup expressions were not. In contrast, this bias in time perception was not observed for Chinese individuals who imitated faces of both ingroup and outgroup members about equally.

Bourgeois and Hess (2008) examined whether individuals were more likely to mimic facial expressions of persons with whom they shared the same political (study 1) or sport preferences (study 2). Overall, results showed that happy faces were equally mimicked for ingroup and outgroup members, whereas sad and angry faces were mimicked only for ingroup members (study 1) or they were not mimicked at all (study 2). Van de Schalk et al. (2010) examined the hypothesis that mimicry of different emotional expressions is moderated by group membership on the basis of the assumption that people converge towards emotional displays of ingroup members, and diverge from emotional expressions of outgroup members. Group membership was manipulated as student of psychology (ingroup) or economics (outgroup). They found that both anger and fear expressions were mimicked more when displayed by ingroup compared to outgroup members.

Consistent with behavioral findings, neuroscience evidence suggests that an ingroup bias in automatic facial mimicry might be neurally hardwired. In an EEG study Gutsell & Inzlich (2010) investigated the neural processes underlying vicarious activation of brain centers during perception of an action performed by ingroup as compared to an outgroup member. Results showed similar motor cortex activity during observation of the ingroup but not of the outgroup member's actions. This study suggests that the capacity to spontaneously mimic and step into another person's 'mental shoes' may be limited to the ingroup and may not be readily available to outgroup members, at least not without conscious and active effort. The similarity and familiarity associated with belonging to the same social group, the sharing of common goals and experiences make it more likely and easy for ingroup members to immediately resonate with each-other bodily, emotionally and mentally. Altogether these findings support the general assumption of an ingroup bias in the mimicry of facial expressions. However, they do not provide a clear and convergent pattern of results as sometimes ingroup anger faces are not mimicked and sometimes incongruent facial reactions are observed in response to ingroup sad faces (i.e smiles, Likowski et al., 2011) This may be due to the fact that different facial expressions acquire different meanings in different social contexts and hence mimicking the same facial expression might mean different things and serve different social functions.

2.3.3 Facial mimicry and contextual goals

The social environment provides a rich array of social cues that naturally trigger people to mimic more in some situations and less in others. Experimental evidence was first provided by Lanzetta & Englis (1989) who examined facial mimicry in an explicit competition and cooperation condition. Participants were asked to play an investment game with either a competitive or a cooperative partner (confederate). When participants believed they were playing with a cooperative confederate facial mimicry was enhanced, whereas when playing with a competitive confederate they showed a counter-empathic response (i.e., wincing in response to smiles of confederate). Similarly, Vanman, Paul, Ito, & Miller (1997) observed that the negative facial reactions towards pictures of outgroup members tended to increase when participants were in a competition setting.

In their study, Likowski et al., (2011) asked participants to play a computer game of dice with an avatar who represented either a competing or a cooperative partner while facial mimicry of happy, sad and angry facial expressions was EMG measured. Results showed less mimicry and even incongruent facial reactions to happy and sad facial expressions in the competition condition compared to the neutral condition. Moreover, incongruent facial reactions were found for anger and sad displays in both cooperation and competition conditions.

Wyers et al., (2010) presented participants with avatar faces of happy, neutral, and sad expressions after they were primed with competition related or neutral words. EMG records of facial activity revealed mimicry of happy and sad faces in the neutral condition but not in the competition condition. Notably however, although facial muscular reactions were modulated in intensity by competition priming (i.e frowning muscle activity in reaction to happy faces) they did not turn into full-fledged incongruent facial reactions. This may be due to the implicit competition paradigm used in this study compared to the explicit competitive gaming the study of Lanzetta & Eaglis (1989).

Overall these findings show that facial expressions are context-dependent and that automatic facial mimicry is sensitive to social context. Specifically, in cooperation settings facial mimicry is enhanced as a signal of affiliation. This however does not occur for those facial expressions that have a clearly non-affiliative meaning (i.e. anger). It is plausible that in cooperative settings mimicry of negative facial expressions may be suppressed and mimicry of positive expressions may be encouraged as an automatic switch on/off effect aimed at maintaining successful interactions. For instance, mimicry of ingroup sad facial expressions is inhibited as it may not be functional to achieving cooperation goals. By the same token, in competitive settings masking one's face by showing less mimicry and even incongruent facial expressions in response to the outgroup (Lanzetta & Eaglis, 1989; Wyers et al., 2009; Likowski et al., 2011) may be more functionally appropriate to achieving the higher order goal of success. These findings indicate that facial expressions are differentially mimicked as a function of context specific goals as their particular meaning is contingent upon them.

2.4 Facial mimicry a fine-grain evaluation tool

One of the most elegant functions of facial mimicry in social interaction, as suggested by recent research is that of differentiating fine-grained meanings of facial expressions observed in others. Facial expressions of emotions are not context-free although much of the research in facial mimicry treats them as such. The meaning of facial expressions of emotion is very much dependent on who the person flashing the expression is, to whom that expression is addressed and the wider context in which the expression is flashed out or perceived (Hess, 2013). For instance a smiling face can signal positive emotion, but people can also smile to convince another person that positive emotion is being felt when in fact it is not. People do this all the time and for many different reasons, from hiding or masking a negative affect to simply boosting positive outcomes of a social interactions. Being able to tell a true from a faked smile can prevent people from being deceived, from being inappropriate in a formal social situation, or from starting a potentially frustrating collaboration with a person with no truly cooperative intents (see Miles, 2009; Johnston et al., 2010).Therefore the ability to discriminate between felt and faked facial expressions is a crucial social skill and critical to effective coping with a complex social world.

Niedenthal et al., (2010) propose that people recognize true and false smiles by actually mimicking them. That is, people arrive at evaluating the veracity and/or meaning of a smile based on how that mimicked smile actually feels. Embodied simulation accounts propose that observers automatically mimic other people's facial expressions, experience the related emotions themselves, and consequently attribute them to the other person (see Goldman and Sripada, 2005). Thus, the simulation model proposes facial mimicry to function as an evaluation tool meaning that smile recognition is based on first-person emotional experience which serves as direct grounding (on the self) of what the other is feeling. It follows that if mimicry is blocked by the inhibition of facial muscles of the mimicker this latter will be impaired in the capacity to reliably differentiate true from false smiles observed in others.

In one study, authors showed students pictures of smiling people some of which were genuine and others fake. The students could readily tell the difference between them only when they were free to mimic the smiles. When asked to hold a pencil between their lips and hence have their smiling muscles blocked the students had a much harder time recognizing true from fake smiles. In a recent study, Maringer et al. (2011) provided preliminary evidence in favor of the notion that facial mimicry can facilitate recognition of smile authenticity. Two groups of participants were presented with smiles of different dynamic qualities known to be associated with “true” or “false” smiles, and were asked to rate them on a scale of genuineness. For half of the participants facial mimicry was blocked by asking them to hold a pencil with their lips, whereas the other half was able to freely mimic the smiles. In the mimicry condition, participants who saw true smiles rated them as more genuine compared to participants who saw false smiles. In the mimicry-blocked condition, no difference was found in the authenticity ratings between participants who saw true and false smiles. In a second study authors manipulated social context of smiles as such where true versus fake smiles would either be expected (stereotypical) or not. Same as in study one facial mimicry was blocked for half of the participants who were asked to hold a pen with their lips and ratings of smiles on a genuineness scale were collected. Results showed that when mimicry was blocked conceptual knowledge about the social context affected true-false judgments of smiles. Instead, when participants were free to mimic the smiles the effect of such stereotypic knowledge was nullified. These finding suggest that beyond simply mirroring others' facial expressions by default automatic facial mimicry involves high cognitive processes such as making fine-grained evaluations and judgments of the particular meanings of facial expressions in given social contexts. Most importantly, they also suggest a role of such embodied simulation processes on overriding effects of conceptual knowledge and stereotypes.

2.4 Theoretical Accounts of Facial mimicry

2.4.1 Simply Mirroring or Simulating Others

Several theories have been proposed to account for the existing data on automatic facial mimicry. The perception–action account of facial mimicry posits that mere perception of another person's actions can influence our behavior in a direct and unmediated manner, such that we automatically behave as we perceive. Mirror mechanisms are believed to be the putative neural instantiation of such direct link (for a review see, Dijksterhuis & Bargh, 2001; Rizzolati et al., 2005; Gallese et al., 2009). In this view, mimicry represents the perception–behavior link at its most basic level, that is, a purely motor process that involves no intermediation of abstract concepts or cognitive operation such as specific trait or stereotype inference (Chartrand et al., 2005). In this sense, it is important to distinguish between automatic mimicry of observable and subtle behavior of another person and automatic behavior resulting from trait inference and stereotype activation. As shown in this review, most research on automatic facial mimicry fails to clearly differentiate between bottom-up stimulus induced facial reactions and more top-down or conceptual based facial muscle activations.

If on the one hand the perception-action account explains minimal conditions for automatic facial mimicry, on the other hand it does not account for the data referring to more complex social interactions. For instance, it is not clear why in some cases we facially mimic others and in some we don't or even show incongruent facial activation, as when interacting with people we dislike, members of outgroups or when we see sad faces of people we are cooperating with (Likowski et al., 2010). These data suggest that beyond simple mirroring of others' actions and states implied by the perception action link, facial mimicry also involves cognitions and conceptual knowledge about the observed actor elicited by specific social contexts. Such knowledge seems to moderate the extent to which we readily resonate bodily, emotionally and cognitively with some people but fail to do so with others in particular situations (Likowski et al., 2011, Maringer et al., 2011; Niedenthal et al., 2011).

The notion that by simulating on ourselves behaviours we observe in others we can understand their mental states, sensations and emotions as if they were our own is at the heart of the embodied simulation model of facial mimicry (Niedenthal et al., 2010; Niedenthal, 2007; Gallese, 2006; Rizzolatti & Craighero, 2004). Research has demonstrated that mimicking another person's facial expressions involves the simulation, at least in part, of the corresponding feeling state (Carr et al., 2003; Gallese et al., 2004) which is importantly implicated in understanding others. In this perspective, perceiving another person's facial expression is believed to trigger the motor activation of the same facial expression in the observer, which activates via afferent feedback, the simulation of states in the motor, somatosensory and introspective systems. This simulation is then used as a *multimodal representation of meaning* of the given facial expressions on which the perceiver then bases current interpretation or judgment. In this sense, the perceiver/mimicker automatically re-enacts the (wider meaning of) perceived event as if it were experienced in first person while relying on own experience or prior conceptual knowledge that might further facilitate such process (see Goldman, 2006). Thus, embodied simulation provides a better account as to why we readily and bodily simulate the experience of some people as those of our own group for instance, and in some contexts more than in some others.

2.5 Looking Beyond the Facial Mirror

Considered altogether the findings reviewed here show that mirroring processes such as motor resonance, emotional resonance and simulations are automatic and functional foundations of sociality. These processes form a basic platform for social life and seamlessly streamline all social interactions. As shown in this review automatic facial mimicry has developed as part of the repertoire of human social skills to serve as a strategic means in social interactions, performing functions that go beyond simple mirroring towards fine-grained evaluations of nuanced meanings of social cues. Such ability is a critical social skill and crucial to the efficient navigation of the complex social world. Beyond mere mirroring it reflects a complex interplay between emotional, cognitive and behavioural processes that seamlessly modulate the occurrence of such subtle automatic effect.

III. EMPIRICAL STUDIES

STUDY 1. Unfolding the role of verbal behaviour in automatic facial effects

3.1.1 Introduction

It is well established that people have a natural tendency to spontaneously respond to facial expressions of emotions of others in a mimicry fashion. That is, perceiving a smile or a frown elicits the corresponding facial expressions in the observer in an automatic way that cannot be easily controlled or suppressed (Dimberg, Thunberg, & Elmehed, 2000). This phenomenon of facial mimicry is a relevant aspect of non-verbal communication (Dimberg & Thunberg, 1998). Such mirroring activation is believed to influence peoples' emotional experience, their understanding of their own and others' emotional states (Niedenthal, 2007) and to shape their judgments (Winkielman, Niedenthal, & Oberman 2008).

Recent behavioral and neuroscience findings suggest that not only perceiving but also thinking about emotions and using emotion language is associated with corresponding activation of facial expressions (Burbridge, Larsen & Barch, 2005; Carr et al., 2003; Winkielman, Niedenthal, & Vermeulen, 2009). Previous research (Winkielman et al., 2009) showed that conceptual processing of emotions involves bodily reactions as indicated by automatic facial expressions of emotions. Consistent with this idea, evidence suggests that conceptual processes whether top down or bottom up (e.g., language comprehension) involve partial mental simulation of the semantic content that calls upon the same neural activity that substantiates the literal action, perception and emotion (Barsalou, 2008).

The processes underlying automatic facial mimicry have been explored from a theoretical framework of embodiment according to which perceptual, conceptual, emotional and bodily responses are intimately linked through the embodied nature of mental representations (Barsalou 2008; Niedenthal, 2007; Smith and Semin, 2004). Recent evidence showed that emotion concepts influence perception and encoding of facial expressions. Halberstadt, Winkielman, Niedenthal, and Dalle (2009) presented participants with ambiguous facial expressions of emotions pared with emotion and non-emotion words and found that emotion concepts shaped perception and encoding of emotionally ambiguous emotion faces and related embodied facial reactions. From an embodied cognition perspective, these findings show that perception of emotion expressions can be concept-driven and that automatic facial reactions are not only percept but also concept-dependent.

The view that conceptual processes such as language shape perception of emotion and corresponding embodied reactions is an integral part of the embodied cognition account. In this account language is fundamentally grounded in sensorimotor and interoceptive experiences and has representations that rather than being abstract preserve modal properties related to perception and action in real life contexts. Consistent with the idea that perception of affective stimuli (emotion faces) and semantic stimuli (emotion words) similarly activate corresponding facial muscles in a selective way recent research demonstrated that reading words that describe emotions (e.g., nouns and adjectives) selectively activates facial muscles: negative emotion words activate the corrugator supercilii (frown muscle) and positive emotion words activate the zygomaticus major (smile muscle) site (Larsen, Norris & Cacioppo, 2003; Niedenthal et al., 2009).

Notably, language serves as a means to reduce the ambiguity inherent in most research using pictures of emotion faces. For instance, fear faces are very often mistaken for anger displays (Moody et al., 2007). As observed by William James (1890) not all instances that people call ‘anger’ look alike, feel alike or have the same neurophysiological signature, and the psychological phenomena commonly referred to by words like ‘anger’ are not expressed in fixed patterns of facial behavior. Beyond the facial display of emotion states, it is very probable that the most common denominator about any emotional event be the use by all subjects of a common word denoting it (e.g., anger, Barret, Lindquist & Gendron, 2007). Indeed, the use of semantic stimuli referring to emotion faces may importantly circumvent much of the ambiguities related with the research relying on pictures of emotion faces.

Interestingly, the compatibility between the pictorial stimuli (emotion faces) used in the facial mimicry research and emotion language stimuli used in studies on embodied cognition was recently examined by Foroni and Semin (2009). In their study, verbs and adjectives referring directly to facial expressions of emotions (e.g., "to smile", "happy") were presented to participants as their facial activity was EMG measured at the corrugator supercilii and zygomaticus major muscle sites. They chose descriptive action verbs (DAVs) and adjectives (ADJs) on the basis of the linguistic categories identified by the linguistic category model (LCM; Semin & Fiedler, 1988) according to which four linguistic categories are distributed along a concrete-abstract dimension. Descriptive action verbs (DAVs; e.g., "to smile", "to frown") are the most concrete and refer to a specific and observable behavior that retains reference to the body part that "performs" the action ("to smile" always involves the mouth). At the highest level of abstraction are adjectives (ADJs; e.g., "funny", "serious") that describe highly abstract dispositions or characteristics of a person. Being highly interpretive and detached from specific situations, adjectives have no specific reference to an object or situation but represent an action at the highest level of abstraction. Based on this model, Semin and Foroni predicted that DAVs referring directly to facial expressions of emotions such as 'to smile' and 'to frown' would have a stronger elicitation effect on the corresponding muscles of smiling and frowning (zygomatic major and corrugator supercilii respectively) because they encode these facial actions at the most concrete level of abstraction relative to ADJs such as 'funny' and 'annoying'. Indeed, results clearly demonstrated that action verbs such as 'to smile' and 'to frown' significantly activated the smiling and frowning facial muscles respectively same as if perceiving images of human faces flashing the same expressions. No such effect was found for adjectives putatively on the grounds that they represented those facial expressions at a higher level of abstraction. These results were interpreted in line with the notion of embodied effects of language, although from an embodied cognition perspective is it not quite clear why words (e.g., adjectives) representing facial expressions of smiling and frowning at a higher level of abstraction should not be similarly associated with corresponding facial effects. Indeed, one of the central notions of embodied cognition is that even highly abstract representations are bodily grounded in sensorimotor, affective and cognitive states (Barsalou, 2008). It may be that adjectives used in that study (e.g., comical, funny, entertaining, annoying, irritating, frustrating) do not have clear reference to the related facial actions of ‘smiling’ and ‘frowning’ and therefore encoded different facial actions altogether.

A neglected aspect of the LCM model offers perhaps a more appropriate set of abstract terms referring specifically to facial expressions of emotions. The interpersonal verb repertoire comprises two additional verb categories, interpretive action verbs (IAVs; e.g., “to help”, “to hit”) and state verbs (SVs; e.g., “to love”, “to hate”) both encoding actions in increasingly abstract terms relative to DAVs. Specifically, IAVs refer to specific behavioral events but they are slightly more abstract because they also involve interpretation or evaluation. SVs go one step further as they denote enduring mental states (emotional, affective) and have no direct reference to a specific action or situation. As such, SVs are not temporally or situationally bound and among interpersonal verbs they represent actions at the highest level of abstraction. Notably, SVs entrench emotions in an important and direct way by referring specifically to emotion states, such as “joy” or “ anger”. Given such a direct reference to emotion states (e.g., joy or anger) which can have direct psychophysiological manifestations in facial muscle activation (e.g., smiling and frowning muscles respectively) we considered whether this category of interpersonal verbs could have a bearing on automatic facial activation of respective muscles of smiling and frowning, albeit representing such actions at a very abstract level.

Up to now, language-triggered facial muscle activation (using EMG) has been measured only while reading verbs and adjectives referring to facial expressions of emotions (Foroni & Semin, 2009). In that study verbal stimuli were presented singularly in the infinitive form and without any other contextual information. Moreover, a difference in facial EMG reactions could be shown only between action verbs having direct reference to facial expressions of emotion and adjectives referring loosely to these latter, but not between different categories of verbs referring directly to facial expressions of emotion but encoding them at different levels of abstraction.

The present study aimed to fill this gap by specifically exploring the role of interpersonal verbs having a direct reference to facial expressions of emotions but differing in the level of abstraction as far as representation of the target facial expressions is concerned. By so doing, we not only further extend the paradigm used in Foroni and Semin (2009) but provide a more stringent testing condition of the LCM model predictions from an embodied cognition perspective. Specifically, we examined whether descriptive action verbs (DAVs) and state verbs (SVs) that expressed emotional behaviors of a third person would differentially trigger corresponding facial muscle activation in a reader. To our knowledge no study has looked so far at automatic facial reactions to different categories of interpersonal verbs.

Based on the LCM two sets of interpersonal verbs were selected: a set of DAVs that unambiguously map the direct perceptual features of facial expressions of emotion (to smile, to frown) and a set of SVs that have direct reference to the felt emotion states most commonly mapped on those expressions (to enjoy, to enrage). Notably, both sets of verbs have a direct reference to the specific facial expressions of smiling and frowning. However, according to the LCM such reference is more abstract in the case of SVs as emotion states like ‘joy’ and ‘rage’ are more linked to dispositional or enduring characteristics and are not situational or temporally bound (Barret, 2006; Semin & Fiedler, 1988). Importantly, in our study verbs were presented in the present tense as expressed by a third person so as to more stringently examine the role of interpersonal verbs (e.g., "Mario smiles", "Mario is enraged"). Notably, presenting target verbs as attributed to a third person offers a minimally interpersonal context which further extends the ecological validity of our research.

3.1.2 Overview

The first experiment aimed to examine automatic facial effects (measured with EMG) during reading of verbs referring to expressions of emotions. Specifically we investigated whether different categories of verbs referring to positive and negative emotion expressions may trigger significantly different levels of activity in corresponding facial muscles involved in expression of emotions. In addition to DAVs referring directly to facial expressions we considered a neglected verb category, that of SVs that importantly implicate emotions. Two specific facial expressions of emotion were considered (smiling and frowning) together with two basic emotion states most commonly associated with these expressions (joy and anger) and facial activity was EMG assessed over the corrugator supercilii (brow) and zygomaticus major (cheek) muscle sites.

We expected readers’ facial responses to be sensitive to the emotion expression represented by the verbs, as indicated by significantly higher levels of corrugator activity triggered by negative emotion verbs and significantly higher levels of zygomaticus activity triggered by positive emotion verbs (Hypothesis 1). We also predicted that facial activation levels in response to emotion verbs would be influenced by the verb category. Specifically, based on Foroni and Semin (2009) we expected that DAVs, given their more direct and unambiguous reference to the facial expression of frowning, would have a stronger effect on facial muscle activation with negative DAVs differentially activating corrugator supercili relative to positive DAVs (Hypothesis 2a). However, based on the research on emotion language and research on facial mimicry, considering the direct reference of SVs to the emotional states and corresponding facial expressions, it would also be plausible to expect that SVs would have a similarly pronounced effect on corresponding facial muscle activation. Thus, the alternative hypothesis was that corrugator supercili would be significantly elicited by negative SVs relative to positive SVs (Hypothesis 2b). By the same token, we predicted a stronger effect of positive DAVs on activation of the smiling muscle site, namely zygomaticus major, relative to negative DAVs (Hypothesis 3a). Given the direct reference to facial expressions of SVs we also predicted that positive SVs, could have a stronger triggering effect on the smiling muscle site compared to negative SVs (Hypothesis 3b).

3.1.3 Method

Participants

Twenty undergraduate students of the University of Bologna (17 females, 3 males; mean age 22 years old) volunteered to participate in the experiment for academic credit. All subjects had normal or corrected-to-normal vision and were ignorant of the real purpose of the experiment.

Stimulus Material

The stimulus materials consisted in 12 Italian verbs (6 action verbs and 6 state verbs) related to positive and negative emotion expressions. For positive expressions of emotions, we used DAVs to smile (*sorride*), to laugh (*ridere*), and to grin (*ridacchiare*) and SVs to enjoy (*gioire*), to be excited (*rallegrarsi*), and be enthused (*entusiasmarsi*). For negative emotional expressions, we used DAVs to frown (*corrucciare*) and synonym verbs (*aggrottare*) and (*accigliarsi*) and SVs get angry (*arrabbiarsi*), infuriate (*infuriarsi*), and irritate (*irritarsi*). English translations in some cases are approximate, as no precise correspondence is available. Verbs were presented in the present tense and as attributed to a third person (e.g., "Mario sorride"). In the end, our stimulus material consisted in subject-verb sentences where the subject was an unknown individual and the verb referred to either positive or negative emotion expressions.

Earlier research showed that because of the slower processing of verbal material (e.g., Snodgrass & McCullough, 1986) distinct facial reactions to semantic stimuli arise between 1,000 and 2,000ms after stimulus onset (e.g., Foroni & Semin, 2009; Larsen, Norris, & Cacioppo, 2003). Therefore we expected our facial activation data to reach significance levels after the first 1000ms of exposure to the target verbs.

Procedure, Apparatus, and Data Acquisition

Participants reported individually for participating in a study on language categories. They were told that they would complete a computer task where they would be asked to read and evaluate a series of verbal stimuli on a likability scale. In order to shift attention from the electrodes and possible reference to facial muscle activity participants were also told that the study concerned measuring skin conductance levels during word reading which would be recorded via sensors placed on the face (e.g., Dimberg et al., 2000). After signing the consent form the EMG electrodes were placed on the left side of the face. Participants were then asked to start the computer task which consisted in sequential presentation of verbal material on a monitor and subsequent evaluation. In order for participants to familiarize with the computer task 10 practice trials were administered prior to the start of the experiment.

During the experiment the verbal stimuli were presented in a random order with E-prime software (Psychology Software Tools, Pittsburgh, PA) on a monitor located approximately 1m from the participant. Each trial started with a fixation point (500ms) that was followed by a baseline interval of 2s and then the stimulus word for 3s. Participants evaluated each stimulus by clicking with the mouse on an evaluation scale appearing on the monitor after each word and staying on the screen until the participant rated each target verb. After the evaluation there was an inter trial interval of 250ms, and the next trial began. The task was included in order to ensure that participants paid attention to the target stimuli. It consisted in reading the target verbs and reporting how much they liked it on a 5 point Likert scale from 1 (*I don't like it at all*) to 5 (*I like it very much*). The task was selected based on evidence consistent with the embodiment perspective of cognition that the nature of the task influences whether embodied simulation will be used and that not all reading tasks may involve engagement of embodied resources. For example, simple verification tasks (e.g., indicating whether the target word is written in upper or lower case) can be performed using 'shallow' strategies that do not necessarily involve embodied simulation (Niedental et al., 2009; Solomon & Barsalou, 2004). As suggested from previous work (Niedenthal et al., 2009), when people are required to evaluate the meaning of emotion concepts they bodily simulate perceptual states involved in real life interactions with those concepts. Accordingly, we decided to use an evaluation task so as to encourage the engagement of somatosensory resources on part of the subjects during processing of emotion expression verbs.

For each participant three blocks of stimuli were presented with each block containing all of the 12 emotion expression verbs and 6 neutral verbs in random order, resulting in 72 stimuli presentations altogether. During verb presentation, facial muscle activity was measured using miniature Ag/AgCl surface electrodes (4mm) attached on the left side of the face, over the corrugator supercilii (brow) muscle the zygomaticus major (cheek) and the orbicularis occulii (eye corner) muscle regions according to the guidelines established by Fridlund and Cacioppo (1986).

The skin was cleaned with disposable pads (70% alcohol and pumice) and prepared for electrode placement to reduce skin impedance to less than 10 kV. The raw EMG activity was measured with Biopack Systems MP36 data acquisition unit at a sampling rate of 1000 Hz using three bipolar channels and a gain of 1,000. Raw data were rectified offline and filtered with a 10 Hz low cutoff filter, a 200 Hz high cutoff filter and a 50 Hz notch filter.

After the computer task the manipulation checks and a questionnaire was completed. Finally, participants were asked about their ideas regarding the true purpose of the experiment. No one of the participants was aware of the hypotheses, and none suspected that facial muscular reactions were measured. They were then debriefed and dismissed.

Dependent variables

Manipulation checks

To check whether positive emotional expressions were rated as more positive than negative emotional expressions participants were asked to assess the stimulus verbs on valence on a 7-point Likert scale from 1 (*very positive*) to 7 (*very negative*).

Evaluative rating

Participants were asked to evaluate each emotion behavior appearing on the monitor as depicted by the target subject-verb sentences on a 5-point Likert scale from 1 *(I don't like it at all)* to 5 *(I like it very much)*. Evaluative ratings were given by clicking on the above scale appearing on the monitor after the presentation of each target stimulus.

Facial EMG

Facial muscle activation was assessed using EMG measurement over the corrugator supercilii (brow) and zygomaticus major (cheek) muscles sites. EMG scores were expressed as change in activity from the pre stimulus level defined as the mean activity during the last second before stimulus onset (1000ms before stimulus onset). Phasic facial responses (in microvolts) were scored and averaged over intervals of 500ms during the 3s of stimulus presentation. Trials with an EMG activity above 8 μV during the baseline period and above 70 μV during the stimuli presentation were considered as artifact and were removed from analyses (less than 5 %). On the collected EMG data we excluded less than 5 % from the analyses using the SD method (Wilcox, 1992) with the criterion value standing at 3 standard deviations per muscle in order to assure variance homogeneity and attenuate the impact of highly reactive individuals on the overall score. Before statistical analysis, EMG data were collapsed over the 12 trials with the same emotional expression for linguistic category and facial reactions were averaged over the 3 seconds of stimulus exposure.

3.1.4 Results

Manipulation check

Data from 2 participants were excluded from analyses due to missing values. To test whether positive emotional expressions were rated as more positive than negative emotional expressions, participants' ratings of stimulus valence were entered in a 2 (valence: positive, negative) × 2 (linguistic category: DAV, SV) repeated measures ANOVA. Results revealed that positive emotion verbs (*M* = 6.05; *SD* = 0.12) were rated as more positive than negative emotion words (*M* = 2.23; *SD* = 0.08), $F(1, 17) = 749.4$, $p < .001$, $\eta^2 = .978$. There was a significant two way interaction of valence and linguistic category indicating that valence ratings differed significantly across linguistic category, $F(1, 17) = 70,08$ $p < .001$, $\eta^2 = .805$. Pairwise comparisons (based on LSD tests) revealed that positive SVs (*M* = 6.45; *SD* = 0.13) were rated as more positive than positive DAVs (*M* = 2.72; *SD* = 0.12), $p < .001$, whereas negative SVs (*M* = 1.74; *SD* = 0.7) were rated as more negative than negative DAVs (*M* = 2.04, *SD* = 0.40), $p < .001$.

Evaluative Ratings

Data from 6 participants were excluded from analyses due to missing values.

Participants' evaluations of each emotion behavior as depicted by the subject-verb phrases were analyzed in a 2 (emotion expression: positive, negative) × 2 (linguistic category: DAV, SV) repeated measures ANOVA. Results revealed that positive emotion verbs were liked significantly more (*M* = 4.16; *SD* = 0.10) than negative emotion words (*M* = 1.82; *SD* = 0.09), $F(1, 13) = 157.3$, $p < .001$, $\eta^2 = .924$. There was a significant two way interaction of emotion expression and linguistic category indicating that the reported liking of subject-verb phrases differed according to linguistic category, $F(1, 13) = 21{,}750$ $p < .001$, $\eta^2 = .626$. Specifically, participants reported more liking for positive SVs (*M* = 4.46; *SD* = 0.29) relative to positive DAVs (*M* = 3.86; *SD* = 0.59), $p = .001$, whereas they reported less liking for negative SVs (*M* = 1.61; *SD* = 0.51) relative to negative DAVs (*M* = 2.04; *SD* = 0.40), $p = .002$.

Facial Reactions

The data were first analyzed in a 2 (emotion expression: positive, negative) × 2 (linguistic category: DAV, SV) × 2 (muscle: corrugator, zygomaticus) repeated measures ANOVA. Results revealed a significant two way interaction of emotion expression and muscle indicating that the facial muscles were not homogeneously activated across emotion expression verbs, $F(1, 19) = 6.024$, $p = .024$, $\eta^2 = .241$, that supported Hypothesis 1. Corrugator showed higher levels of activation in response to negative emotion verbs (*M* = .95; *SE* = 0.02) compared to positive emotion verbs (*M* = .021; *SE* = 0.02), $p = .024$. Whereas, no significant difference was observed in zygomaticus activation in response to positive emotion verbs (*M* = .042; *SE* = 0.02) compared to negative emotion verbs (*M* = .016; *SE* = 0.02), $p = .254$. In addition, when participants read negative emotion verbs they showed a significantly higher corrugator activity relative to the activity registered over zygomaticus major, $p = .041$. No significant difference was observed in corrugator supercilii and zygomaticus activation levels when participants read positive emotion verbs, $p = .500$.

There was a significant two way interaction of emotion expression and linguistic category which is not relevant to our hypothesis and will not be further discussed, $F(1, 19) = 4.531$, $p = .047$, $\eta^2 = .193$. No other effect gained significance, all *p*s > .185.

The follow up analysis focused on the activity of the individual facial muscles. Separate analyses of variance were performed for the corrugator supercilii and zygomaticus major muscle sites.

Corrugator supercilii

Hypothesis 1 was confirmed by the main effect of emotion expression indicating that participants showed significant activation of the corrugator supercilii muscle when reading negative emotion expressions verbs ($M = .107$; $SE = 0.03$) relative to positive emotion expression verbs ($M = .008$; $SE = 0.02$), $F(1, 19) = 8.074$, $p =.010$, $\eta^2 = .298$. Hypothesis 2 was confirmed by the almost significant two-way interaction of emotion expression and verb category, $F(1, 19) = 3.478$, $p = .078$, $\eta^2 = .155$. Pairwise comparisons (based on LSD tests) revealed that negative DAVs elicited significantly higher activation levels of the corrugator supercilii ($M = 0.15$; $SE = 0.06$) relative to positive DAVs ($M = - 0.03$; $SE = 0.03$), $p = .013$, providing support for Hypothesis 2a. No significant differences in corrugator activity was found for negative SVs ($M = 0.06$, $SE = 0.04$) relative to positive SVs ($M = 0.05$; $SE = 0.02$), $p = .75$. That is, participants showed significant frowning when reading negative DAVs relative to positive DAVs but their corrugator activity did not significantly differ when reading negative SVs relative to positive SVs (Fig.1). No other effect reached significance, all *p*s > .106. These findings are in line with our hypothesis that negative DAVs referring directly to the facial expression of frowning should elicit higher corrugator activity relative to positive DAVs.

Zygomaticus major

Hypothesis 2 was confirmed by the almost significant two-way interaction of emotion expression and verb category F(1, 19) = 4.018, p = .059, η2 = .175. No other effect reached significance, all ps > .109.

Pairwise comparisons (based on LSD tests) revealed that when participants were reading SVs zygomaticus activity was significantly higher in response to positive (M = .095, SE = 0.04) relative to negative verbs (M = .002, SE = 0.02), p = .038. No significant differences in zygomaticus activity was found for positive DAVs (M = .022, SE = 0.03) relative to negative DAV's (M = .007, SE = 0.02), p = .648. Hypothesis 3b was supported: Participants showed significant smiling when reading positive SVs relative to negative SVs but their zygomaticus activity did not significantly differ when reading positive DAVs relative to negative DAVs (Fig.2).

In sum, participants showed significant smiling when reading positive SVs relative to negative SVs but their zygomaticus activity did not significantly differ when reading positive DAVs relative to negative DAVs.

Figure 1. *Corrugator activity in response to positive and negative DAVs and SVs.*

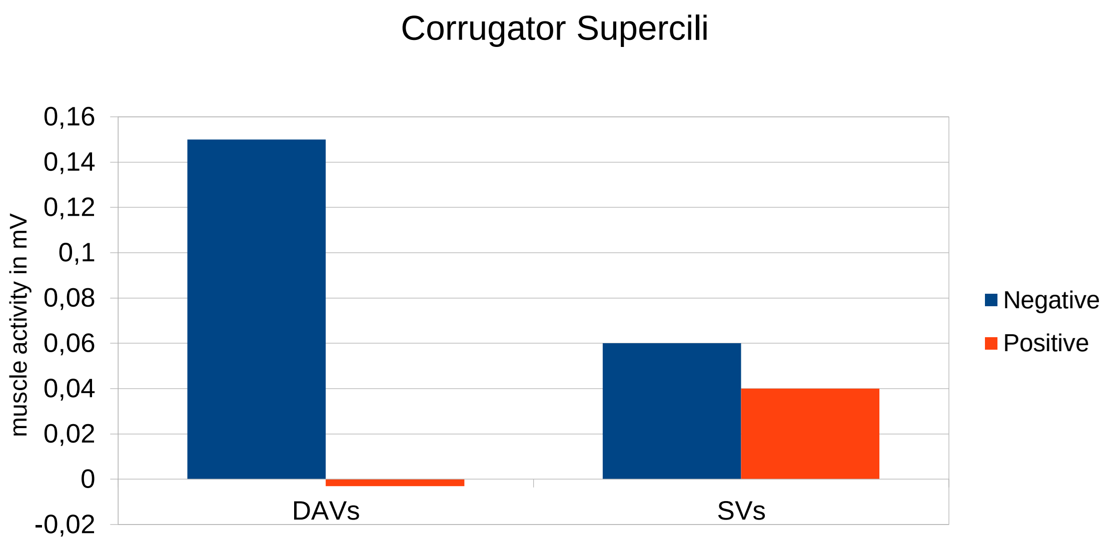
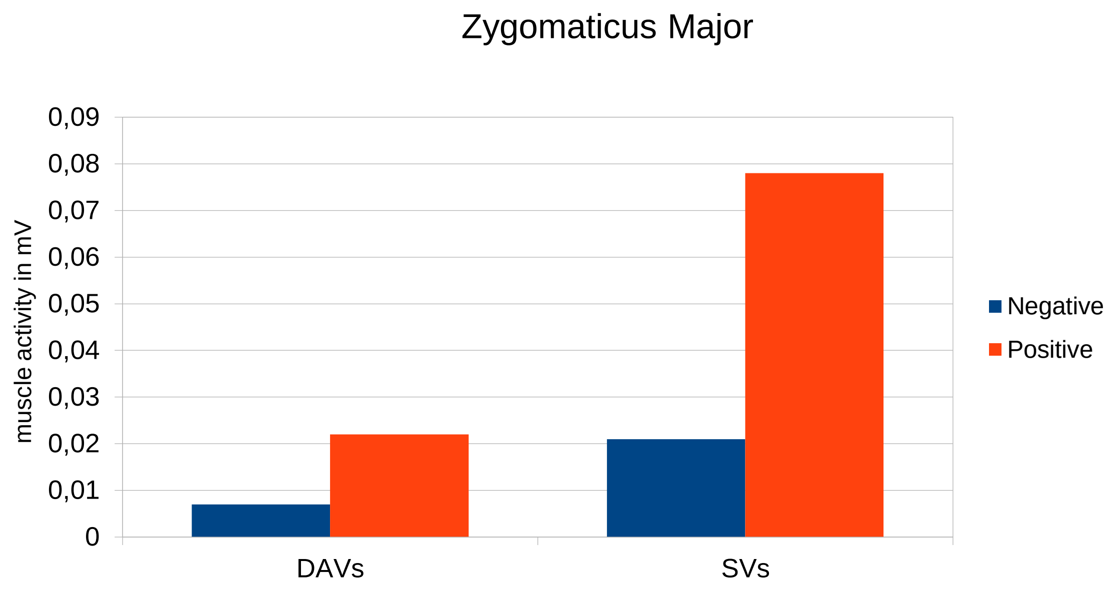


Figure 2. *Zygomaticus activity in response to positive and negative DAVs and SVs.*



Overall Mimicry index

In order to obtain overall indexes of mimicking facial responses to emotion verbs we subtracted the EMG muscle response to incongruent emotion verbs (e.g., the corrugator response to positive emotion verbs; the zygomaticus response to negative emotion verbs) from the EMG muscle response to the congruent emotion verbs (e.g., the corrugator response to negative emotion verbs; the zygomaticus response to positive emotion verbs). Overall indexes of mimicry were obtained per each muscle, per each linguistic category. That is, we obtained two indexes of 'frowns' for the corrugator supercilii activation in response to DAVs and SVs respectively, and two indexes of 'smiles' for the zygomaticus major activation in response to DAVs and SVs respectively. The four mimicry indexes were submitted to a 2 (muscle: corrugator, zygomaticus) × 2 (linguistic category: DAVs, SVs) repeated measures ANOVA.

Results revealed a significant interaction of muscle activation and linguistic category, $F(1, 19) = 5.622$, $p = .028$, $\eta^2 = .228$, indicating that the mimicry response was different for the two linguistic categories. No other effect reached significance, all *ps* >

.299. Pairwise comparisons (based on LSD tests) revealed a significantly higher mimicry of the corrugator supercilii in response to DAVs (*M* = .184, *SE* = 0.06) relative to SVs (*M* = .014; *SE* = 0.04), *p* = .078. That is, participants' frowns in response to DAVs were significantly more enhanced relative to their frowns in response to SVs. The inverse pattern was observed for zygomaticus major activity which reached a higher level of activation in response to SVs (*M* = .093; *SE* = 0.04) relative to DAVs (*M* = .015; *SE* = 0.03), *p* = .059. Participants' smiles were significantly more enhanced in response to SVs relative to DAVs. Additionally, DAVs elicited a more differentiated activity between corrugator supercilii and zygomaticus major, *p* = .036. Whereas SVs elicited activity in both facial muscles about to the same extent, *p* = .194.

3.1.5 Discussion

In this study we aimed to investigate the role of interpersonal verbs referring to positive and negative emotion expressions in triggering automatic activation in corresponding facial muscle sites of frowning and smiling (corrugator supercilii and zygomaticus major respectively). In line with our expectations the EMG data revealed that emotion valence had a significant effect on corresponding facial muscle activations. That is, negative emotion verbs elicited activity over the corrugator supercilii to a much larger extent than positive emotion verbs. The reverse pattern was observed for zygomaticus major, which registered the highest level of activation in response to positive relative to negative state verbs.

Interestingly results showed that verbs encoding facial actions at different level of abstraction had a differential eliciting effect on corresponding facial muscles of frowning and smiling. Specifically the activity of corrugator supercilii (the frowning muscle) was higher in response to negative DAVs as compared to positive DAVs. For zygomaticus major (the smiling muscle) the asymmetrical pattern was observed with positive verbs belonging to the SV category eliciting higher level of activation compared to negative SVs. As revealed by results on the mimicry facial activation, corrugator supercilii (the frowning muscle) was significantly activated in response to DAVs as compared to SVs. For zygomaticus major (the smiling muscle) the asymmetrical pattern was observed with verbs belonging to the SV category eliciting the strongest mimicry effect compared to DAVs.

The manipulation check revealed a significant difference in valence ratings between DAVs and SVs. Positive SVs were rated as significantly more positive than positive DAVs whereas negative SVs were rated as significantly more negative than negative DAVs. Liking ratings of the emotional displays confirm such an asymmetrical pattern with positive SVs being reportedly liked more than positive DAVs and negative SVs being liked significantly less than negative DAVs.

It can be concluded that among verbs referring directly to negative emotion expressions the category that represents the most concrete encoding (DAVs) of the target facial expressions had the strongest effect on triggering activity over the corresponding frowning muscle (corrugator supercilii). Instead, for verbs referring directly to positive emotion expressions it was the verb category which encoded facial expressions at the most abstract level of representation (SVs) that had the strongest triggering effect on the activity of the smiling muscle (zygomaticus major). These results are the first to demonstrate in a stringent experimental fashion that facial muscle activation in response to positive and negative emotion verbs can be influenced by the level of abstraction at which such verbs encode target emotion expressions. They are partially in line with the results reported by Foroni and Semin (2009) who found that negative action verbs (DAVs) had the highest triggering effect over the corrugator supercilii muscle site, but diverge from their findings reporting a similar pattern of effects of positive DAVs over the activation of zygomaticus major.

Notably in their study Foroni & Semin (2009) presented verbs in the infinitive form without any contextual information. It is probable that reading verbs such as 'to smile' or 'to frown' lead participants to make self-referenced inferences related to personal experiences when feeling or displaying the given emotions. A great deal of literature on social cognition demonstrated that in the absence of any other information people rely on self-anchoring heuristics to retrieve and process information. Although authors assert that the main aim of their study was that of testing the commensurability of semantic stimuli with pictorial stimuli (emotion faces) used in the facial mimicry research it is not quite clear how reading the verb 'to smile' might induce readers to make inferences similar to those one makes when viewing someone else's smiling face.

We considered that presenting verbs in the present tense and as attributed to a third person provides a minimally interpersonal context which facilitates the process of making inferences about others. By specifically referring emotion verbs to another person we offer higher compatibility with the facial mimicry research relying on emotion faces. From this perspective, it may be that as our participants read subject-verb sentences they made quick inferences about the unknown person displaying emotion expressions on the basis of properties of the verbs representing those expressions at different levels of abstraction. According to LCM model, DAVs encode action at the most concrete and situationally specific level whereas SVs are unbound situationally and temporally referring to actions at the level of emotion states and more enduring dispositions. It is plausible that an unknown character that 'rejoices' (feels positive emotions) be perceived as more positive than an unknown character that 'smiles' (people smile for all kinds of reasons). By the same logic, an unknown character that is 'enraged' may be perceived more negatively than an unknown character that 'frowns' (frowning not necessarily implies negative emotion, hence a threatening signal).

These results fit well with the assumed functionality of facial mimicry to create liking and facilitate social contacts (Lakin et al., 2003). It is well established that people tend to mimic more the people they like compared to the people they dislike and they tend to mimic facial expressions of positive characters more than those of negative characters (Likowski et al., 2007). Thus when presented with un unknown person that feels positive emotions participants may have perceived him in more positive terms and therefore showed enhanced facial activation. But when presented with un unknown person that feels negative emotions participants may have perceived him in more negative terms, hence a decreased facial activation was shown. Therefore, an enhanced tendency to mimic positively perceived others and lack of mimicry towards characters perceived negatively makes perfect sense. In a recent study Gregg, Seibt, and Banaji (2006) found that implicit attitudes could even be formed through abstract supposition. This suggests that in the present study, emotion verbs attributed to unknown subjects may have led participants to form implicit attitudes towards them. Importantly, the present results were obtained using verbal stimuli in a minimally interactional context with no actual or implied interaction.

We believe that level of abstraction of verbs representing emotions is not the only moderator of corresponding facial activation effects. Another possible mediator could be attention: paying more attention to a stimulus should enhance corrugator activity. However, the available evidence suggests a preferential attention to negative as opposed to positive stimuli (Dijksterhuis & Aarts, 2003; Öhman, Lundqvist & Esterves, 2001). Thus, attention alone cannot explain why negative DAVs had the strongest facial effect relative to negative SVs which were considered as more negative by participants. Another possible mediator could be word familiarity: unfamiliar stimuli should elicit stronger corrugator activity relative to familiar stimuli. It is therefore possible that negative DAVs because of their direct reference to face parts "to frown - "si acciglia", "si corruccia" be less familiar than negative SVs which refer to emotion states "to get angry - si arrabbia", "si infuria". Especially negative DAVs ("si acciglia", "si corruccia") may have been perceived as less familiar that positive DAVs ("sorride", "ride"), hence triggering more corrugator activity.

Since we were interested in investigating DAVs referring directly to facial expressions and SVs referring to corresponding emotion states we were tied to these particular terms and could not control for potential familiarity effects of our stimuli. Further research will be needed to clarify this issue.

In sum, our results show that automatic facial reactions can be modified by verbs that represent facial expressions of emotion at different levels of abstractions. Together with the results by Foroni and Semin (2009) they provide evidence that verbal stimuli referring to expressions of emotion lead to a change in automatic and corresponding facial behavior same as pictures of emotion faces. Importantly, we extend their findings to a wider verb repertoire and a minimally interpersonal context providing a more ecologically valid evidence.

STUDY 2. The role of political affiliation in modulating automatic facial effects through the medium of language

3.2.1 Introduction

Facially mimicking others is considered as a signal of affiliative intent and as expressing a general approach tendency towards others. It makes interaction partners become more alike, more attuned to one another's states rendering the overall interaction much smoother and efficient. This has lead authors to consider facial mimicry a 'natural social glue' (Chartrandt et al., 2005). Revealingly, social cognition and social goals powerfully modulate facial mimicry effects, such that people are more sensitive towards others with whom they share affiliations, attitudes and common goals (Hess and Fischer, 2013). Research demonstrates that people tend to show increased mimicry of facial expressions of others towards whom they have a priori positive attitudes (Likowski et al., 2007; Mc. Hugo et al.,1991), whom they like and share the same goals (Likowski et al., 2012) or the same social group affiliations (Bourgeois and Hess, 2008; Mondillon et al., 2007; Job van den Schalk 2010; Vanman et al., 1997). Consistent with these findings neural studies have shown that although automatic and running largely on mirror neuron substrates, motor resonance triggered by the perception of others' actions seems to be modulated by the similarity between observer and observed (Liew, Han and Aziz-Zadeh, 2010).

In-group interactions are characterized by enhanced automatic mimicry given that group members share a common repertoire of nonverbal behaviors which makes it easier to affiliate and use for this purpose without excessive planning or effort (Lakin et al., 2003). In contrast, cross-group interactions are generally characterized by lack of mimicry (Chartrand & van Baaren, 2009). Interestingly, counter-empathic facial responses are often found in response to disliked others. In an early study, Herrera, Bourgeois and Hess

(1998) found that negative racial attitudes towards members of an ethnic out-group resulted in reduced facial activation to pictures of outgroup members. Interestingly, the more negative their racial attitudes towards the outgroup members were, the more they showed incongruent facial reactions, i.e. a facial activation pattern contrary to common mimicry reactions (e.g., smiling at expressions of sadness). As suggested by behavioral and neural studies, social cognition such as simply categorizing others as belonging to the same or a different social group significantly influence the extent to which we automatically and readily resonate mentally, emotionally and bodily with them (Gutsell & Inzlich, 2010). Indeed, categorization of others as ingroup or outgroup takes place within milliseconds of exposure to socially relevant stimuli with little or no effort or conscious control (Bargh, 1997).

One of the most complex forms of social affiliation is represented by political affiliation understood as an interrelated set of cognitions, emotions, attitudes and behaviors gravitating towards ideas and worldviews that can powerfully bring people together or divide them. Political affiliation constitutes an important part of our social identity (Huddy, 2001). People participate in political parties, take part in elections and are involved in myriad decision making processes whether by openly supporting or tacitly sharing political ideas of a particular political wing or leader. Beyond mere and rapid categorization of others as belonging to the same (ingroup) or opposing (outgroup) political group, political affiliation reflects a complex set of attitudes, emotions and behavioral dispositions that can be revealed at both explicit and implicit levels. Two EMG studies have specifically investigated the role of political attitudes in modulating automatic facial mimicry. In an early study Mc. Hugo, Lanzetta and Bush (1991) had participants watch brief television excerpts of President Reagan and senator Hart while they were displaying intense smiles, mild smiles and angry facial expressions and EMG measured facial activity. Results revealed that Regan smiles induced higher mimicry among supporters relative to non-supporters, while no significant differences were found for the his anger displays. Whereas positive and negative facial displays of senator Hart induced no differential levels of zygomaticus major and corrugator supercilli muscles among supporters and opponents. Authors interpreted these findings in view of the prior attitudes held by participants towards target politicians. That is, most subjects were neutral or mildly favorable towards senator Hart, and hence did not differentiate in their facial responses to his facial displays. On the other hand, participants' attitudes towards president Regan were more polarized and this was reflected in the differential facial responses of supporters relative opponents. However, such differential facial activation was not revealed for all Regan's facial displays but only in response to the intense smile. As pointed out by (Bourgeois & Hess, 2008) the two politicians differed in their general appeal with Reagan being a much more charismatic and rather expressive person compared to senator Hart. Therefore, it is possible that non-supporters of Reagan found him fake or overly flamboyant and thus did not mimic his smile displays.

More recently, Bourgeois and Hess (2008) showed participants pictures of happy and angry faces of two Quebec politicians, equally matched in general appeal, Bouchard representing the Quebec separatist point of view and Charest representing the political position of federal unity. Participants were all in favor of Bouchard's political position. In contrasts to findings by Mc. Hugo et al. (1991) results showed that angry faces were mimicked only when displayed by Bouchard whereas smiles were equally mimicked by participants when displayed by both politicians alike. Authors interpreted the lack of difference in mimicry of smiles in terms of the baby-face characteristics of the opposing-wing politician, or the potentially lower social costs that mimicry of smiles involved for the mimicker, albeit of different political orientation.

Although these results provide evidence on the sensitivity of facial EMG to reveal differentiated responses of participants towards same or opposing wing politicians these studies did not clearly manipulate political attitudes. It may be that single politicians were principally perceived in terms of personal characteristics rather than as representative of a particular political wing and the possibility that participants were facially reacting towards target politicians' facial features rather than their political group cannot be ruled out completely. Furthermore, in those studies the stimulus material consisted in naturally occurring facial displays of target politicians, whether dynamic as shown in video clips or static as show in pictures. Apart from the inherent ambiguity of the facial stimuli, the quasi-experimental design used in those studies does not allow for clear conclusions whether political attitudes modulate automatic facial mimicry.

Previous research demonstrated that semantic stimuli referring to emotion facial expressions (e.g., verbs like 'to smile', 'to frown') are commensurable with faces displaying emotion expressions (Foroni & Semin, 2009) as far as triggering automatic facial effects is concerned. Whereas these authors examined the general effect of emotion verbs on facial muscle activations they did not examine whether social attribution of emotion verbs also influence automatic facial effects. To our knowledge no study has looked so far at whether reading verbs representing emotion expressions of politicians belonging to opposing political parties significantly modulates corresponding facial muscle activity in a reader.

3.3.1 Overview

The present research aimed to address this issue in a novel way by examining whether emotion verbs referring to positive and negative facial expressions attributed to politicians would induce differential facial muscle activity in a reader much in a similar way as pictures of politicians showing positive and negative emotion displays. Notably, utilizing semantic stimuli referring to facial expressions of emotion importantly circumvents much of the ambiguity inherent in facial mimicry research regarding the questionable validity of using pictures of emotion displays, whether computer generated or produced by real actors. Moreover, previous studies did not examine whether political affiliation influences automatic facial reactions through the medium of language.

In this study four politicians were selected, two representing left-wing and two representing right-wing political parties. We specifically examined whether the matched or mismatched political affiliation of participants and politicians of left-and right-wing orientation modulates automatic facial activation effects triggered by emotion expression verbs. In a novel way we examined whether political affiliation not only influences automatic facial effects but it does so even through the medium of language. The general prediction was that mere exposure to subject-verb sentences depicting ingroup or outgroup politicians as flashing positive and negative emotion expressions would significantly influence corresponding facial muscle activation in readers, same as if viewing politicians' faces. Importantly, our research aims to extend automatic facial effects found in previous studies on politicians' faces to language-based stimuli. Language is the most pervasive means to attain and maintain political support and political interaction relies principally on language-based media.

Specifically, we investigated whether verbs referring to emotion expressions (to smile, to enjoy) attributed to either left-or right-wing politicians induce differential activity levels in corresponding facial muscles of a reader of either left-or right-wing political affiliation. Same as in experiment one, we considered two specific facial expressions of emotion, smiling and frowning, and two basic emotion states associated with these expressions, happy and angry (see, Dimberg et al., 2000). We assessed facial muscle activation by means of electromyographic (EMG) measurement over the corrugator supercilii (brow) and zygomaticus major (cheek) muscle sites.

Two sets of verbs referring to emotion expressions (6 positive and 6 negative) and having a clear reference to the specific facial expressions of smiling and frowning were used as attributed to either a left-or right-wing politician. Four Italian politicians' names (two left-wing and two right-wing) were selected based on a pretest. Finally, subject-verb sentences were created where the subject was either a left-or right-wing politician and the verb referred to either a positive or negative emotion expression (e.g., ‘Bersani smiles’, ‘Alfano frowns’). Participants of left-and right-wing political affiliation read the target subject-verb sentences while their facial muscle activity was EMG measured and were asked to indicate subsequently how much they liked the phrase for each trial. After the computer task manipulation checks and a questionnaire were given to assess participants’ political attitudes, their attitudes towards target politicians, and to assess individual differences in empathy and expressivity levels.

To explore whether the influence of political affiliation on automatic facial effects is linked with attitudes towards and emotions participants feel towards target politicians we asked them to report their attitudes, evaluate the emotional behavior displayed by politicians and report on felt emotions towards target politicians. The design was a 2 (participant political affiliation: left-wing, right-wing) × 2 (target politician: left-wing, right-wing) × 2 (emotion expression: positive, negative) × 2 (facial muscle: corrugator S., zygomaticus M.) with the last three factors as *within subjects.*

Drawing from previous literature showing that political attitudes and group membership modulate automatic facial mimicry we expected matched and mismatched political affiliation between participants and politicians of left-and right-wing orientation to have a significant effect on language based automatic activation of corresponding facial muscles. That is, we expected that emotion verbs attributed to in-group politicians would elicit higher facial muscle activation levels in a reader of the same political affiliation relative to emotion verbs attributed to out-group politicians. Specifically, we predicted that participants would show higher corrugator activity when reading negative emotion verbs attributed to the in-group politicians relative to reading negative verbs attributed to out-group politicians (Hypothesis 1) and that they would show higher zygomaticus activity when reading positive emotion verbs attributed to in-group politicians relative to positive verbs attributed to out-group politicians (Hypothesis 2). Additionally, we predicted that participants would show significantly higher levels of the corrugator supercilii in response to negative relative to positive verbs attributed to ingroup politicians but expected no significant difference when reading verbs attributed to outgroup politicians(Hypothesis 3). Similarly, we expected that zygomaticus activation level would be significantly higher in response to positive relative to negative verbs attributed to ingroup politicians but not when emotion verbs are attributed to outgroup politicians (Hypothesis 4).

3.2.2 Method

Participants

Participants were pre-tested for political affiliation in order to exclude those who did not have a definite left- or right-wing political orientation. About six months before the main part of the experiment was carried out, first-year psychology students (N = 170) completed a questionnaire that asked for their opinions on a variety of specific political issues, and also included the following item: ‘Please indicate your political orientation on the below scale’. The response alternatives were presented in a Likert-scale ranging from 1*(left-wing)* to 7 *(right-wing)*. Participants in the actual experiment were then recruited from among those students who responded below ‘3’ (Left Political Orientation), and those who responded above ‘5’ (Right Political Orientation).

Fifty four undergraduate students of the Alma Mater Studiorum, University of Bologna (43 females, 11 males; *M* = 20 years old) participated individually in the study for academic credit. Of these, 29 declared a left-wing political orientation and 25 a right-wing political orientation. All participants reported having normal or corrected-to-normal vision and were unaware of the real purpose of the experiment.

Stimulus Material

Same as in Experiment 1 we used 12 Italian verbs referring to emotion expressions (e.g., 6 positive and 6 negative). For positive emotion expressions, we used action verbs (DAVs) to smile (*sorridere*), to laugh (*ridere*), to grin (*ridacchiare*) and state verbs (SVs) to enjoy (*gioire*), to be excited (*rallegrarsi*), and be enthused (*entusiasmarsi*). For negative emotional expressions, we used the DAVs to frown (*corruccciare*) and synonym terms (*aggrottare*) and (*accigliarsi*), and SVs to become angry (*arrabbiarsi*), infuriate (*infuriarsi*), and irritate (*irritarsi*). (English translations in some cases are approximate, as no precise correspondence is available.)

Each target verb was attributed to left-and right-wing politicians who were selected through a pretest on 30 undergraduate students. Four politician names were selected on the basis of the highest frequencies of citation. These were: Bersani (cited by 24 participants and representing the 85% of the sample) and Renzi (cited by 21 participants, representing the 80% of the sample) representing the left-wing political party of PD (Partito Democratico) and Berlusconi (cited by 26, representing the 90 % of the sample) and Alfano (cited by 23, representing the 85 % of the sample) representing right-wing political party of PDL (Popolo della Libertà). Our stimulus material consisted in subject-verb sentences where the subject was either a left-or right-wing politician and the verb referred to either positive or negative emotion expressions (e.g., ‘Bersani smiles’, ‘Alfano frowns’).

Procedure

Participants reported individually in the laboratory for participating in a study on the language of politics. They were told that the study was structured in two sessions in which there would be given a computer task followed by a questionnaire. The computer task consisted in reading a series of subject-verb sentences with reference to politics presented on a monitor and evaluating them on a likability scale. In order to shift attention from the electrodes and possible reference to facial muscle recording participants were also told that the study concerned measuring skin conductance levels during word reading which would be assessed via sensors placed on the face (e.g., Dimberg et al., 2000). Following the computer task participants would be given the manipulation check and a questionnaire assessing their political attitudes, their attitudes towards target politicians as well as participants' individual traits of empathy and expressivity.

After signing the consent form the EMG electrodes were placed on the left side of the face. Participants were then asked to start the computer task which consisted in sequential presentation of verbal material on a monitor and subsequent evaluation. In order for participants to familiarize with the computer task 10 practice trials were administered prior to the start of the experiment.

During the experiment the verbal stimuli were presented in a random order with E-prime software (Psychology Software Tools, Pittsburgh, PA) on a monitor located approximately 1 m from the participant. Each trial started with a fixation point (a cross appearing in the center of the monitor for 500ms) that was followed by a baseline interval of 2s and then the stimulus phrase (e.g., "Bersani smiles") for 3s. Participants evaluated the extent to which they liked each target sentence by clicking with the mouse on an evaluation scale appearing on the monitor after the sentence and staying on the screen until the participant rated each target stimulus. After the evaluation there was an inter trial interval of 250ms, and the next trial began.

For each participant three blocks of stimuli were presented with each block containing all the 12 emotion expression verbs and 6 neutral verbs attributed to 4 left-and right-wing politicians in random order, resulting in 72 stimuli presentations altogether.

After the computer task manipulation checks and a questionnaire assessing participants attitudes on a multiplicity of measures were completed. Finally, participants were asked about their ideas regarding the true purpose of the experiment. No one of the participants was aware of the hypotheses, and none suspected that facial muscular reactions were measured. They were then debriefed and dismissed.

Dependent measures

Facial EMG

Facial muscle activity was measured using miniature Ag/AgCl surface electrodes (4mm) attached on the left side of the face according to the guidelines established by Fridlund and Cacioppo (1986). All pairs were referenced to a forehead electrode placed near the midline. The skin was cleaned with disposable pads (70% alcohol and pumice) and prepared for electrode placement to reduce skin impedance to less than 10 kΩ. The raw EMG activity was recorded with Biopack Systems, MP36 data acquisition unit at a sampling rate of 1000 Hz using two bipolar channels and a gain of 1,000. Raw data were rectified offline and filtered with a 10 Hz low cutoff filter, a 200 Hz high cutoff filter and a 50 Hz notch filter. Corrugator Supercilii was employed to assess frowning and Zygomaticus Major was employed to assess smiling.

Manipulation check

To check participants' political orientation we asked them to answer on the following item: "Where would you locate yourself politically in a continuous scale of political identification from 1(*left*) to 7 (*right*)?".

To check whether the target politicians were considered as left- or right-wing politicians, participants were asked how much Berlusconi, Alfano, Renzi and Bersani represented the right- and the left-wing respectively on a 7-point Likert scale from 1 *(not at all)* to 7 *(very much)*.

Participants assessed the stimulus verbs on valence on a 7-point Likert scale from 1 (*very positive*) to 7 (*very negative*).

Evaluative rating

Participants were asked to evaluate the emotion behavior of each target politician as depicted by the target subject-verb sentence on a 5-point Likert scale from 1 *(I don't like it at all)* to 5 *(I like it very much)*. Evaluative ratings were given by clicking on the above scale appearing on the monitor after the presentation of each target stimulus.

Attitudes towards politicians

Participants' attitudes in terms of liking towards each of the four political leaders was measured asking "How much does Bersani (vs. Renzi vs. Alfano vs. Berlusconi) represent your political ideas?", "How much do you like target politician?", "Would you be content if target politician won in the coming elections?". Responses were given on 7-point Likert scale from 1 *(not at all)* to 7 *(very much).*

Emotions

Participants' emotional attitudes towards target politicians were assessed through a PANAS scale consisting of 6 primary emotions (3 negative and 3 positive). The respondents indicated the degree to which thinking about the target politician elicited the given emotion on a 7-point Likert scale from 1 *(not at all)* to 7 *(very much).*

Individual difference measures

Since there is evidence that high empathic and high expressive subjects tend to show stronger facial reactions (Sonnby-Borgström, Jönsson, & Svensson, 2003), empathy was assessed with the Davis Interpersonal Reactivity Index *(IRI)* and Expressivity with the Berkeley Expressivity Questionnaire *(BEQ)*, Italian version.

3.2.3 Results

Manipulation checks

All left-wing participants reported being left-wing (M = 1.95, SD = 0.56) whereas all right-wing participants reported being right-wing (M = 5.44, SD = 0.71). All participants recognized left-wing target politicians as being representative of the left-wing political party and right-wing politicians as being representative of the right-wing political party. One-sample t-tests showed that Alfano (M = 4.74; SD = 1.41) and Berlusconi (M = 5.46; SD = 1.26), were considered as representing the right-wing, $t(53) = 24.9$, $p < .001$, and $t(53)$ =

31.6, $p < .001$, respectively. Bersani ($M = 4.83$; $SD = 1.38$) and Renzi ($M = 4.51$; $SD = 1.34$) were considered as representative of the left-wing, $t(53) = 25.6$, $p < .001$, and $t(53) = 24.7$, $p < .001$, respectively.

One sample t-tests showed that that positive emotion verbs were considered as very positive ($M = 5.59$; $SD = 0.70$), $t(53) = 16.6$, $p < .001$, and negative emotion verbs were considered as very negative ($M = 2.50$; $SD = 0.60$), $t(53) = -18.2$, $p < .001$.

Attitudes towards target politicians

The three items concerning participants' personal attitudes towards each target politician measuring the extent to which participants felt represented by, liked and would be happy for the electoral victory of target politicians were aggregated to obtain overall indexes of participants' liking of the four politicians (Bersani Cronbach's $\alpha = .87$; Berlusconi Cronbach's $\alpha = .94$; Alfano Cronbach's $\alpha = .91$; Renzi Cronbach's $\alpha = .82$).

Following t-tests assessing participants' liking of each target politician revealed that left-and right-wing participants reported significantly different liking rates for target politicians. Berlusconi was liked more by right ($M = 4.20$; $SD = 1.74$) than left oriented participants($M = 1.10$; $SD = 0.42$) t(53) = 9.13, $p < .001$. Similarly, right oriented participants liked more Alfano ($M = 3.35$; $SD = 1.69$) than left oriented participants did ($M_{\text{left}} = 1.27$; $SD_{\text{left}} = 0.49$) $t(53) = 6.30$, $p < .001$. Bersani was liked to a greater extent by left oriented ($M = 4.78$; $SD = 1.08$) than right oriented participants ($M = 2.42$; $SD = 1.44$) $t(53) = -6.68$, $p < .001$. This indicates that target politicians were generally liked more by same-wing participants relative to opposing-wing participants. Notably however, left-and right wing participants reported similar liking for left-wing politician Renzi($M_{\text{left}} = 4.48$; $SD_{\text{left}} = 1.41$; $M_{\text{right}} = 4.32$; $SD_{\text{right}} = 1.74$) $t(53) = -3.79$, $p = .706$, indicating that Renzi was equally liked among same-wing and opposing-wing participants.

In sum, results revealed significant differences in participants' attitudes towards each target politicians who generally received higher liking rates by same-wing participants relative to opposing wing participants. However, there was an unexpected lack of difference in participants' liking rates towards Renzi (left-wing politician) who was the only politician to be globally liked by all participants irrespective of their political affiliation.

Emotions

Data from 13 subjects were excluded due to missing values. The data were analyzed in a 2 (participant political affiliation: left-wing, right-wing) × 2 (emotions: positive, negative) × 4 (target politician: Berlusconi, Bersani, Alfano, Renzi) ANOVA with repeated measures on the last two factors. The main effect of emotion valence revealed that, when thinking about left-and right-wing target politicians, participants reported more negative emotions (M = 3.36; SD = 0.13) relative to positive emotions (M = 2.78; SD = 0.11), $F(1, 41) = 9.467$, $p = .004$, $\eta^2 = .191$. Reported emotions differed significantly across target politicians as indicated by the main effect of politician wing, $F(1, 41) = 14.18$, $p < .001$, $\eta^2 = .528$. This was further qualified by the significant three way interaction between emotion, politician wing and participant political affiliation, $F(1, 41) = 21.76$, $p < .001$, $\eta^2 = .632$. Pairwise comparisons (based on LSD tests) showed that left-wing participants reported feeling more positive emotions towards ingroup politicians ($M_{Bersani} = 4.16$; $SD_{Bersani} = 0.22$; $M_{Renzi} = 4.15$; $SD_{Renzi} = 0.35$) compared to outgroup politicians ($M_{Berlusconi} = 1.11$; $SD_{Berlusconi} = 0.26$; $M_{Alfano} = 1.23$; $SD_{Alfano} = 0.23$), all ps < .001. Additionally, when thinking about ingroup politicians, left-wing participants reported significantly higher rates of positive emotions relative to negative emotions, all ps < .001. Right-wing participants reported feeling more positive emotions towards ingroup politicians Berlusconi and Alfano ($M_{Berlusconi} = 3.58$; $SD_{Berlusconi} = 0.19$; $M_{Alfano} = 2.92$; $SD_{Alfano} = 0.16$) compared to left-wing politicians Bersani ($M_{Bersani} = 2.28$; $SD_{Bersani} = 0.16$), all ps < .001. Notably, right-wing participants' reported positive emotions for Renzi ($M_{Renzi} = 4.15$; $SD_{Renzi} = 0.35$) did not significantly differ from their reported emotions towards ingroup politicians (right-wing) all ps >.109.

Evaluative ratings of politicians' emotion expressions

To test whether the emotional behavior displayed by target politicians as depicted in the subject-verb sentences elicited evaluative judgments in the reader, we asked participants to rate each emotion display of target politicians on a liking scale. The self-report data were analyzed in a 2 (participant political affiliation: left-wing, right-wing) × 2 (emotion expression: positive, negative) × 4 (target politician: Berlusconi, Alfano, Bersani, Renzi) × 2 (linguistic category: DAV, SV) ANOVA with repeated measures on the last three factors.

Results revealed the main effects of politician wing, $F(1, 53) = 7.905$, $p = .007$, $\eta^2 = .132$, emotion expression, $F(1, 53) = 6.161$, $p = .016$, $\eta^2 = .106$ and linguistic category, $F(1, 53) = 24.093$, $p < .001$, $\eta^2 = .317$. When politicians expressed SVs ($M = 4.16$; $SD = 0.10$) they were generally liked more than when expressing DAVs ($M = 1.82$; $SD = 0.09$).

The politician wing × participant political affiliation, $F(1, 53) = 26.105$, $p < .001$, $\eta^2 = .334$, and the three-way emotion expression × politician wing × participant political affiliation interactions were significant, $F(1, 53) = 25.670$, $p < .001$, $\eta^2 = .331$. They were qualified by the significant four-way interaction, $F(1, 53) = 9.614$, $p < .001$, $\eta^2 = .156$.

We focused on pairwise comparisons that show differences in the liking that left and right oriented participants expressed towards left- and right-wing politicians as a function of the valence and the level of abstraction of emotional expressions. Left-wing participants reported more liking of left-wing politicians Bersani and Renzi when expressing positive emotion verbs ($M_{Bersani} = 3.66$; $SD_{Bersani} = 0.15$; $M_{Renzi} = 3.52$; $SD_{Renzi} = 0.17$) compared to right-wing politicians Berlusconi and Alfano when expressing positive emotion verbs ($M_{Berlusconi} = 1.72$; $SD_{Berlusconi} = 0.18$; $M_{Alfano} = 1.94$; $SD_{Alfano} = 0.15$), all ps < .001. When politicians expressed negative emotion verbs left-wing participants did not report different liking of ingroup politicians Bersani and Renzi ($M_{Bersani} = 2.51$; $SD_{Bersani} = 0.13$; $M_{Renzi} =$

2.45; SD_{Renzi} = 0.12) relative to outgroup politicians Berlusconi and Alfano ($M_{Berlusconi}$ = 2.87; $SD_{Berlusconi}$ = 0.18; M_{Alfano} = 2.69; SD_{Alfano} = 0.15), all ps > .05. Right-wing participants reported more liking of right-wing politicians Berlusconi and left-wing wing politician Renzi when expressing positive emotion verbs ($M_{Berlusconi}$ = 3.58, $SD_{Berlusconi}$ = 0.19; M_{Renzi} = 3.13, SD_{Renzi} = 0.19) compared to left-wing politicians Bersani and right-wing politician Alfano when expressing positive emotion verbs ($M_{Bersani}$ = 2.28; $SD_{Bersani}$ = 0.16; M_{Alfano} = 2.92; SD_{Alfano} = 0.16), all ps < .001.

In sum, participants reported more liking towards depictions of positive emotion relative to negative emotions of target politicians with positive emotion depictions inducing more differentiated evaluations among same-wing and opposing wing participants. That is, depictions of ingroup politicians' positive emotion were reportedly liked significantly more compared to depictions of outgroup politicians' positive emotions. Interestingly, there was an unexpected lack of difference in the case of Renzi's whose emotion depictions were similarly liked among same-and opposing-wing participants alike.

Facial effects

The EMG scores were expressed as change in activity from the pre stimulus level defined as the mean activity during the last second before stimulus onset (e. g., 1000ms before stimulus onset). Phasic facial EMG responses (in microvolts) were scored and averaged over intervals of 500ms during the 3s of stimulus presentation. Trials with an EMG activity above 8μV during the baseline period and above 70μV during the stimuli presentation were considered as artifact and were removed from analyses (less than 2%). Before statistical analysis, EMG data were collapsed over the 12 trials with the same emotional expression for left-and right-wing politicians. Facial muscle reactions were averaged over the 3 seconds of stimulus exposure.

On the collected EMG data we excluded less than 2% from the analyses using the

SD method (Wilcox, 1992) with the criterion value standing at 3 standard deviations per muscle in order to assure variance homogeneity and attenuate the impact of highly reactive individuals on the overall score. Separate analyses of variance were performed for the corrugator supercilii and zygomaticus major muscle sites.

Corrugator supercilii

The data recorded on the corrugator supercilii muscle site were entered in a 2 (participant political affiliation: left-wing, right-wing) × 2 (target politician: left-wing, right-wing) × 2 (emotion expression: positive, negative) × 2 (linguistic category: DAV, SV) ANOVA with repeated measures on the last three factors.

Results revealed the main effect of emotion verbs that supported our general prediction. Participants showed significantly higher activation of the corrugator supercilii muscle when reading verbs referring to negative emotion expressions (M = .091; SE = 0.02) compared to verbs referring to positive emotion expressions (M = .024; SE = 0.01), $F(1, 53) = 10.325$, $p = .002$, $\eta^2 = .166$.

Hypothesis 1 was confirmed by the significant three way interaction between emotion verb, politician wing, and participant political affiliation, $F(1, 53) = 9.844$, $p = .003$, $\eta^2 = .159$. Pairwise comparisons (based on LSD tests) revealed that participants of left-wing political affiliation showed a significantly higher activation of the corrugator supercilii in response to negative verbs attributed to left-wing politicians (M_{left} = .162; SE_{left} = 0.03) relative to negative verbs attributed to politicians of the opposing political wing (M_{right} = .035; SE_{right} = 0.03), $p = .002$. That is, left-wing participants showed increased frowning in reaction to the ingroup politicians' negative emotion verbs relative to the outgroup politicians' negative emotion verbs (Fig.1). No significant difference in facial activity was found for positive emotion verbs verbs attributed to ingroup politicians (M_{left}= .012; SE_{left} = 0.02) relative to outgroup politicians (M_{right} = .034; SE_{right} = 0.04), $p = .316$.

In addition, when reading emotion verbs attributed to ingroup politicians left-wing participants showed significantly higher corrugator activity in response to negative relative to positive emotion verbs, $p < .001$. No significant difference was found when left-wing participants read negative and positive emotion verbs attributed to outgroup politicians, $p = .986$. This confirms Hypothesis 3: that is, left-wing participants significantly differentiated in their automatic facial reaction between negative and positive verbs when they were attributed to ingroup politicians, but not when they were attributed to outgroup politicians.

Participants of right-wing political affiliation did not differentiate in their corrugator activation levels when reading negative verbs attributed to right-wing politicians ($M_{\text{right}} = .109$; $SE_{\text{right}} = 0.03$) compared to politicians of the opposing political wing ($M_{\text{left}} = .058$; $SE_{\text{left}} = 0.03$), $p = .236$ indicating that right-wing participants showed about the same amount of frowning in response to the negative emotion verbs attributed to the ingroup and outgroup politicians' alike (Fig.2). No significant difference in facial activity was found for positive emotion verbs verbs attributed to ingroup politicians ($M_{\text{right}} = .014$; $SE_{\text{right}} = 0.02$) relative to outgroup politicians ($M_{\text{left}}= .036$; $SE_{\text{left}} = 0.02$), $p = .357$. However, when reading emotion verbs attributed to ingroup politicians right-wing participants showed significantly higher corrugator activity in response to negative relative to positive emotion verbs, $p = .015$. No such effect was observed when participants read emotion verbs attributed to outgroup politicians In that case participants showed similar levels of activation of corrugator supercili in response to negative relative to positive emotion verbs, $p = .602$. This confirms Hypothesis 3: that is, right-wing participants frowned significantly more when reading negative compared to positive emotion verbs of the ingroup politicians, but did not significantly differentiate in their corrugator activity between negative and positive emotion verbs when these were attributed to outgroup politicians.

Figure 1. *Corrugator activity of left-wing participants in response to positive and negative verbs attributed to left-and right-wing politicians.*

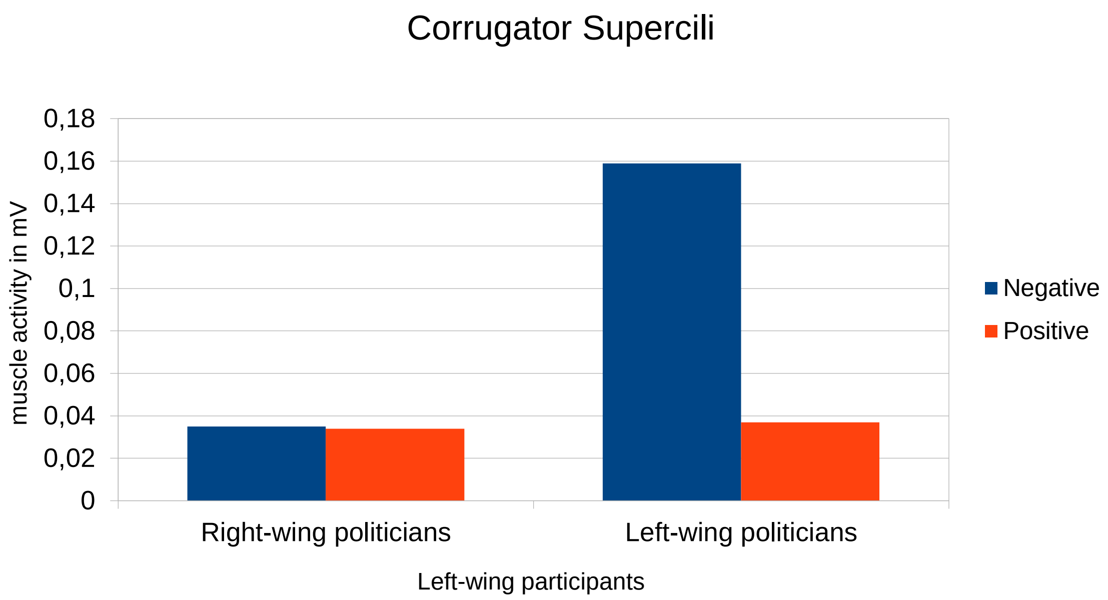
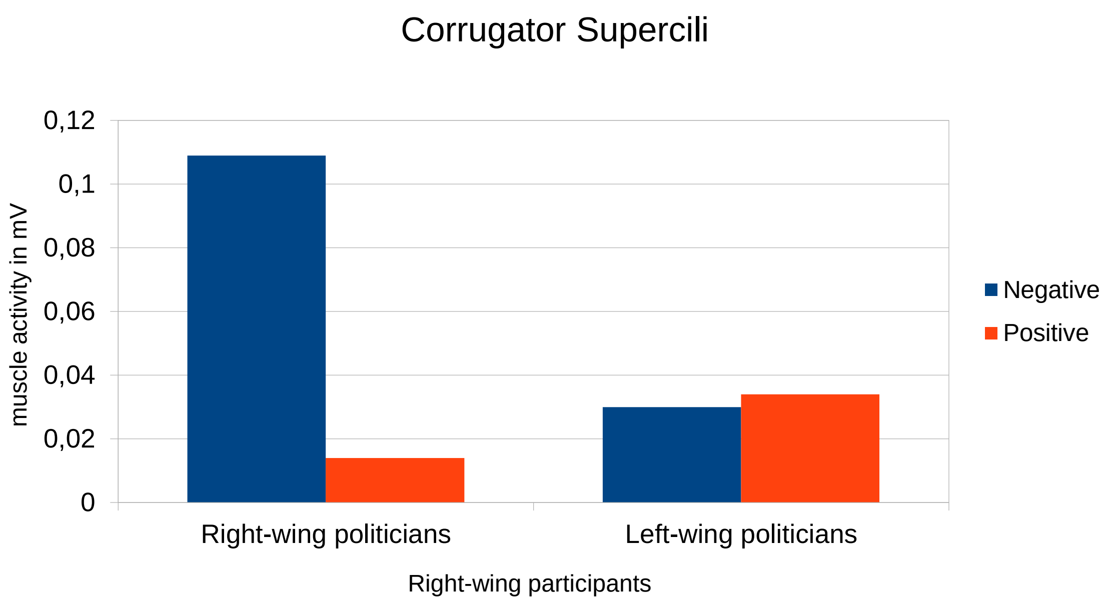


Figure 2. *Corrugator activity of right-wing participants in response to positive and negative verbs attributed to left-and right-wing politicians.*



Zygomaticus major

The data recorded on the zygomaticus major muscle site were analyzed in a four factor design with 2 (participant political affiliation: left-wing, right-wing) × 2 (target politician: left-wing, right-wing) × 2 (emotion expression: positive, negative) × 2 (linguistic category: DAVs, SVs) ANOVA with repeated measures on the last three factors.

Results of zygomaticus major activity revealed the main effect of emotion verbs, indicating participants showed significantly higher zygomaticus activation in response to positive emotion verbs (M = .111; SE = 0.02) compared to negative emotion verbs (M = .077; SE = 0.03), $F(1, 53) = 4.328$, p =.042, $\eta^2 = .077$.

Hypothesis 2 was confirmed by an almost significant three way interaction between emotion verb, politician wing and participant political affiliation, $F(1, 53) = 3.135$, p = .082, $\eta^2 = .057$. Pairwise comparisons (based on LSD tests) revealed that participants of right-wing political affiliation showed significantly greater activation of the zygomaticus major when reading positive emotion verbs attributed to right-wing politicians (M_{right} = .121; SE_{right} = 0.04) relative to positive emotion verbs attributed to left-wing politicians (M_{left} = .068; SE_{left} = 0.04), p = .085. No significant difference in the zygomaticus response was found for negative emotion verbs attributed to ingroup (M_{right} = .062; SE_{right} = 0.04) compared to outgroup politicians (M_{left} = .058; SE_{left} = 0.03), p = .925. That is right-wing participants showed increased smiling in reaction to positive emotion verbs of ingroup politicians relative to positive emotion verbs of outgroup politicians (Fig.3).

In addition, when right-wing participants read emotion verbs attributed to ingroup politicians their zygomaticus activation was significantly higher in response to positive relative to negative emotion verbs, p = .071. No such effect was observed when participants read emotion verbs attributed to outgroup politicians, p = .785. This confirms Hypothesis 4: that is, participants showed significantly different zygomaticus activation in response to positive and negative emotion verbs only when they were attributed to ingroup politicians but not when they were attributed to outgroup politicians.

Participants of left-wing political orientation did not significantly differentiate in their zygomaticus response to positive emotion verbs attributed to left-wing (M_{left} = .135; SE_{left} = 0.04) relative to right-wing politicians (M_{right} = .120; SE_{right} = 0.04), p = .591, indicating that they smiled about equally in response to positive expression verbs of both ingroup and outgroup politicians. No significant difference in the zygomaticus response was found for negative emotion verbs attributed to ingroup (M_{left} = .063; SE_{left} = 0.02) compared to outgroup politicians (M_{right} = .127; SE_{right} = 0.04), p = .108. That is, left-wing participants showed about the same amount of smiling in reaction to positive emotion verbs attributed to ingroup and outgroup politicians alike (Fig.4).

In additionally, when reading emotion verbs attributed to ingroup politicians participants' zygomaticus activity was higher in response to positive relative to negative emotion verbs, p = .050. No such effect was observed when participants read emotion verbs attributed to outgroup politicians with zygomaticus activity showing similar levels of activation in response to positive and negative emotion verbs alike, p = .815. This confirms Hypothesis 4: that is, participants showed significantly different zygomaticus activation in response to positive and negative emotion verbs only when they were attributed to ingroup politicians but not when they were attributed to outgroup politicians.

In sum, results of corrugator supercilii revealed that both groups of participants showed higher sensitivity towards negative expressions relative to positive expressions of ingroup politicians. However, only left-wing participants clearly differentiated between negative expressions of ingroup relative to outgroup politicians. Right-wing participants did not show significantly different corrugator activity in response to negative expressions of ingroup compared to outgroup politicians.

Results of zygomaticus activity revealed that both left-wing and right-wing participants clearly show higher sensitivity towards positive emotion expression relative to negative emotion expressions of ingroup politicians. However, left-wing participants did not differentiate in their zygomaticus response to positive emotion expressions of ingroup compared to outgroup politicians. In contrast, right-wing participants' zygomaticus activity showed a marginally significant difference (*p* = .085) in response to positive emotion expressions of ingroup relative to outgroup politicians.

Figure 3. *Zygomaticus activity of right-wing participants in response to positive and negative verbs attributed to left-and right-wing politicians.*

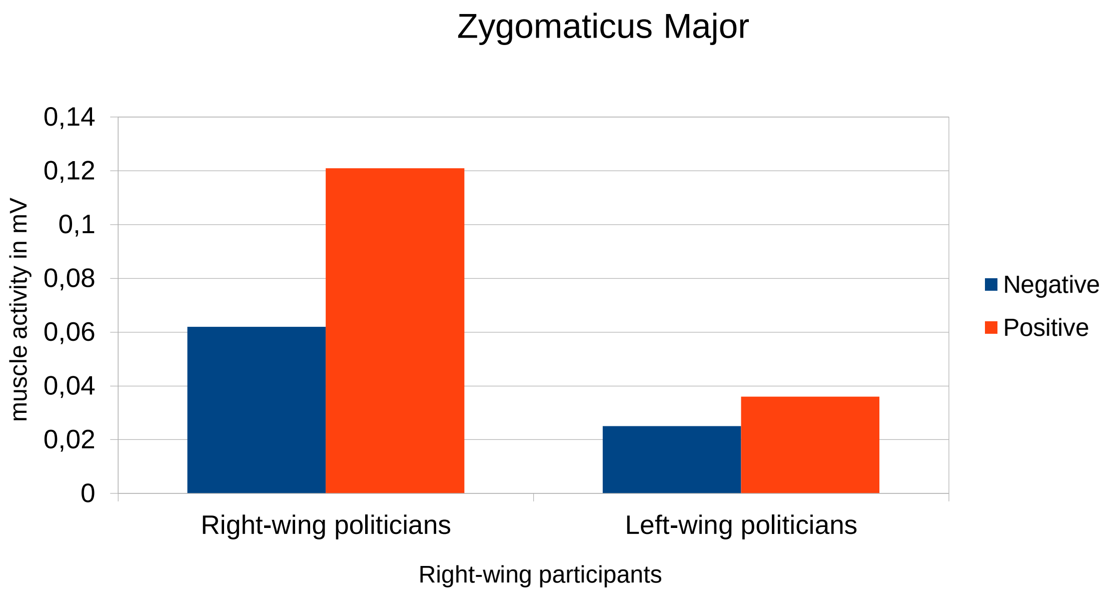
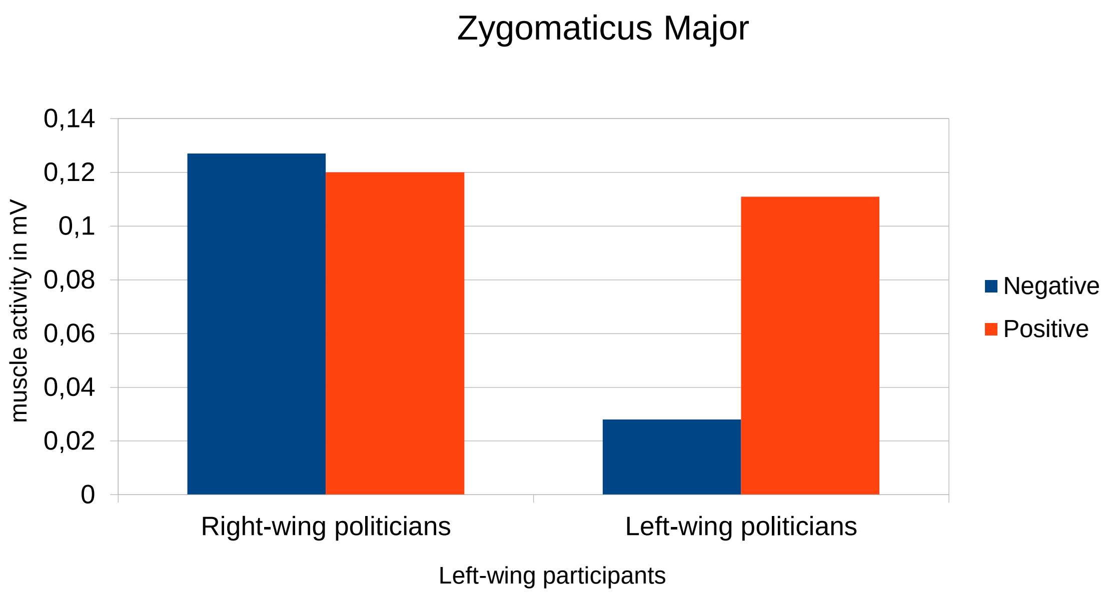


Figure 4. *Zygomaticus activity of left-wing participants in response to positive and negative verbs attributed to left-and right-wing politicians.*



Examining right-and left-wing differences in facial reactions

The unexpected findings on the relatively high liking of Renzi (left-wing politician) on behalf of both left-and right-wing participants alike led us to consider the possibility that the lack of difference in corrugator activation and the marginally significant effect found for zygomaticus activity among right-wing participants may be due to the particularly favorable attitudes they held towards Renzi. In order to further disentangle and rule out such potentially confounding effect we performed the same analysis on the EMG data excluding participants' responses to Renzi. The same ANOVAs were performed for corrugator supercilii and zygomaticus major muscles separately.

Corrugator supercilii

Results revealed the main effect of emotion verbs indicating that participants showed significantly higher activation of the corrugator supercilii muscle when reading verbs referring to negative emotion expressions (*M* = .124; *SD* = 0.03) compared to verbs referring to positive emotion expressions (*M* = .013; *SD* = 0.02), $F(1, 53) = 5.57$, $p = .022$, $\eta^2 = .097$

Hypothesis 1 was confirmed by the significant three way interaction between emotion verb, politician wing, and participant political affiliation, $F(1, 53) = 9.93$, $p = .003$, $\eta^2 = .160$. As expected, pairwise comparisons (based on LSD tests) revealed that participants of both left- and right-wing political affiliation showed a significantly higher activation of the corrugator supercilii in response to negative verbs attributed to politicians of the same political wing ($M_{left} = .159$; $SD_{left} = 0.04$; $M_{right} = .109$; $SD_{right} = 0.03$) compared to negative verbs attributed to politicians of the opposing political wing ($M_{left} = .035$; $SD_{left} = 0.03$; $M_{right} = .030$; $SD_{right} = 0.04$), $p = .078$, $p = .004$ respectively. That is, participants showed increased frowning in reaction to the ingroup politicians' negative emotion verbs relative to the outgroup politicians' negative emotion verbs. However, there was no significant difference between ingroup attributed positive verbs ($M_{right} = .014$; $SD_{right} = 0.02$; $M_{left} = .037$; $SD_{left} = 0.03$) and outgroup attributed positive verbs ($M_{right} = .034$; $SD_{right} = 0.03$; $M_{left} = .034$; $SD_{left} = 0.02$), $p = .522$, $p = .928$ respectively.

In addition, when reading emotion verbs attributed to ingroup politicians participants showed significantly higher corrugator activity in response to negative relative to positive emotion verbs, $p = .015$ and $p = .006$ respectively. No such effect was observed when participants read emotion verbs attributed to outgroup politicians. In that case participants showed similar levels of activation of corrugator supercili in response to negative relative to positive emotion verbs, $p = .923$, $p = .986$ respectively. These findings support Hypothesis 3.

Zygomaticus major

Results of zygomaticus major activity revealed the main effect of emotion verbs, indicating that participants showed significantly higher zygomaticus activation in response to positive emotion verbs (*M* = .097; *SD* = 0.02) compared to negative emotion verbs (*M* = .060; *SD* = 0.02), *F*(1, 53) = 4.67, *p* =.035, η^2 = .082.

There was a main effect of linguistic category, indicating that zygomaticus was activated more when participants read SVs (*M* = .107; *SD* = 0.03) relative to DAVs (*M* = .050; *SD* = 0.01), *F*(1, 53) = 4.94, *p* = .035, η^2 = .087.

There was a main effect of politician wing, indicating that zygomaticus was activated more when emotion verbs were attributed to right-wing (*M* = .107; *SD* = 0.03) compared to left-wing politicians (*M* = .050; *SD* = 0.01), *F*(1, 53) = 6.40, *p* = .014, η^2 = .110

Hypothesis 2 was confirmed by a significant three way interaction between emotion verb, politician wing and participant political affiliation, *F*(1, 53) = 5.46, *p* = .023, η^2 = .095. as expected, pairwise comparisons (based on LSD tests) revealed that participants of right-wing political affiliation showed significantly greater activation of the zygomaticus major when reading positive emotion verbs attributed to right-wing politicians (*M* = .121; *SD* = 0.04) relative to positive emotion verbs attributed to left-wing politicians (*M* = .036; *SD* = 0.03), *p* = .028. No significant difference in the zygomaticus response was found for negative emotion verbs attributed to ingroup (*M* = .062; *SD* = 0.04) compared to outgroup politicians (*M* = .025, *SD* = 0.02), *p* = .375. That is right-wing participants showed increased smiling in reaction to positive emotion verbs of ingroup politicians relative to positive emotion verbs of outgroup politicians.

In addition, when participants read emotion verbs attributed to ingroup politicians their zygomaticus activation was significantly higher in response to positive compared to negative emotion verbs, *p* = .071. No such effect was observed when participants read emotion verbs attributed to outgroup politicians. That is, participants showed no significantly different zygomaticus activation in response to positive and negative emotion verbs attributed to outgroup politicians, *p* = .730. These findings support Hypothesis 4.

Participants of left-wing political affiliation did not significantly differentiate in their zygomaticus response to positive emotion verbs attributed to left-wing (M_{left} = .111; SD_{left} = 0.03) relative to right-wing politicians (M_{right} = .122; SD_{right} = 0.04), p = .815, indicating that left-wing participants smiled about equally in response to positive expression verbs of both ingroup and outgroup politicians. Interestingly however, zygomaticus was significantly activated when left-wing participants read negative emotion verbs attributed to right-wing politicians (M_{right} = .127; SD_{right} = 0.04) as compared to negative verbs attributed to left-wing politicians (M_{left} = .028; SD_{left} = 0.02), p = .013. That is, left-wing participants showed increased smiling in response to expression of negative emotions of outgroup politicians revealing an incongruent facial reaction pattern towards these latter.

Additionally, when reading emotion verbs attributed to ingroup politicians participants' zygomaticus activity was higher in response to positive relative to negative emotion verbs, p = .011. No such effect was observed when participants read emotion verbs attributed to outgroup politicians with zygomaticus activity showing similar levels of activation in response to positive and negative emotion verbs, p = .815. This supports Hypothesis 4.

3.2.4 Discussion

In a novel way we investigated the role of political affiliation in modulating automatic facial effects in response to verbs referring to positive and negative emotional displays of political leaders. Up to now no study has addressed whether political attitudes modulate automatic facial activation through verbal means. We investigated whether reading of left- or right-wing politicians displaying happy and angry emotions would trigger differential automatic activation in corresponding facial muscle sites of frowning and smiling (corrugator supercilii and zygomaticus major respectively) in readers of left-or right political affiliation.

We were also interested to explore whether the influence of political affiliation of automatic facial effects is linked with attitudes and emotions towards target politicians. The self-report data revealed that positive attitudes (e.g., liking) and positive emotions tend to gravitate around shared political affiliation. That is, left-wing participants reported more liking and feeling positive emotions towards ingroup politicians relative to outgroup politicians. A similar pattern was also observed among right-wing participants with ingroup politicians being liked more and associated with more positive emotions relative to outgroup politicians. However, self-reports of right-wing participants revealed unexpectedly high liking rates and positive emotions towards outgroup politician Renzi indicating a generally positive attitude similar to that reported on other in-group politicians. This can be explained by the particular time period during which data were collected (September – November, 2013) coinciding with Renzi gaining a lot of ground among not only left-wing but also right-wing voters in Italy.

Very interestingly, our EMG data were in line with the self-reports suggesting that the automatic facial response is a sensible mirror of complex social cognitions and motivations such as political affiliation. Results revealed that political affiliation significantly influenced the level of corresponding facial muscle activation triggered by emotion expression verbs. That is, negative emotion verbs referred to ingroup politicians elicited activity over the corrugator supercilii (frowning muscle) to a much larger extent than negative emotion verbs referred to outgroup politicians. A similar pattern was observed for zygomaticus major (smiling muscle) with positive emotion verbs attributed to ingroup politicians eliciting the highest level of activity relative to positive emotion verbs attributed to outgroup politicians.

Whereas this pattern was very clear for right-wing participants, left-wing participants did not differentiate between positive emotion verbs of ingroup and outgroup politicians. That is, they smiled about equally in response to positive emotion verbs attributed to left- and right-wing politicians. Very interestingly, they showed significant smiling in response to negative emotion verbs of outgroup politicians, a pattern which has been general linked to counter-empathic responses (Likowski et al., 2012; Herrera et al., 1998).

A possible explanation of the difference between left- and right-wing participants in the zygomatic responses (the smile muscle) may involve personality differences in ingroup loyalty. Conservatives are generally considered as being more loyal or sensitive to authority figures and as more adept on showing ingroup loyalty than liberals. Research examining political ideology as motivated social cognition tries to link cognitive styles with political orientation highlighting that whereas conservative ideology relies more on individuals, liberals are more likely to attend to social cues. It is plausible from this perspective that the lack of difference observed only among left-wing participants in the zygomaticus activation in response to smile displays of right-and left-wing politicians may reflect such factors. Research shows that happy facial displays of politicians are much valued over anger displays as they are taken to indicate affiliative and egalitarian approach to leadership (Boehm, 1999). As argued by Fischer & Hess (2013) of all emotion facial expressions smiles are the ones that involve the least (if no) social costs for the mimicker. Indeed, our findings are in line with those of Bourgeois and Hess (2008) who found that happy facial displays of same-and opposing wing politicians were equally mimicked by participants.

Our findings are in line with similar studies on the recent Italian political landscape. Interestingly, Liuzza, Vecchione, Crostella, Caprara, Aglioti (2011) used a gaze-cuing paradigm in which the distractor was the face of Italian left-and right-wing politicians, to examine whether gaze-following behavior of Italian voters was influenced by political affiliation. Two right-wing (Berlusconi and Vespa) and two left-wing (Di Pietro and Prodi) politicians were selected and used as distractor faces presented to left-and right-wing participants. Results showed that the stronger catching power of the ingroup political character gaze on voters occurred only among right-wing voters, who were influenced by

Berlusconi and Vespa more than by left-wing politicians Di Pietro and Prodi. By contrast, no significant effects of in-group political character's gaze were found among left-wing voters.

Another possible explanation of the lack of difference in facial activation found among left-wing participants in response to happy facial displays of ingroup and outgroup politicians could be related to strongly negative attitudes of left-wing participants towards outgroup politician Berlusconi. For instance, Lang, Reenwald, Bradley and Hamm (1993) observed that not just pleasant stimuli, but also unpleasant stimuli rated as disgusting elicit significant activity over the zygomaticus major. In the same lines, Larsen et al., (2003) found that the most unpleasant stimuli elicited more activity over the zygomaticus major than more middling stimuli. One possibility is that reading of Berlusconi's emotion behavior may have elicited feelings of disgust among left-wing participants and therefore, enhanced their zygomaticus activity. Moreover, increased activity registered in the smiling muscle in response to negative emotion verbs referred to outgroup politicians further confirms that left-wing participants were reacting counter-empathically to emotion verbs of outgroup politicians. The counter-empathic facial response indicates that left-wing participants may be feeling contentment when reading of outgroup politicians being angry and frowning. The phenomenon of taking pleasure in misfortunes of others, also known by the German term *schadenfreude* or the much older Latin saying '*mors tua, vita mea'* fits especially well with the political context. There are studies (Castellani and Corbetta, 2008) showing that Italian left-wing voters particularly detest the right-wing leader Berlusconi, which may be a plausible explanation of such a strong counter-empathic effect found among left-wing participants.

It is plausible that the lack of difference on the zygomaticus activation registered by left-wing participants in response to happy facial displays of ingroup and outgroup politicians be related to the particularly flamboyant character of right-wing politician

Berlusconi. That is, it is possible that left-wing participants when reading of 'Berlusconi smiling' may in fact have inferred a particularly fake and posed kind of smiling. Research on spontaneous (felt) and posed (fake) smiles has shown no significant difference in zygomaticus activity in response to both types of smiles. That is, true smiles and fake smiles are equally mimicked as indicated by the zygomaticus major activation. However, a distinction between these type of smiles is revealed at a finer-grained level by orbicularis oculi activation (the eye corner muscle) which is contracted only when a smile is truly felt. Hence, it is plausible that although left-wing participants showed the same amount of zygomaticus activation in response to smile displays of both left-and right-wing politicians they may have been perceiving them at different levels of authenticity. An empirical testing of this hypothesis would be measuring the co-activation of orbicularis oculi muscle site in response to positive emotion displays of ingroup and outgroup politicians. This possible explanation will be empirically tested in study 3.

Altogether, these findings are the first to show that facial responses are a very sensitive mirror of complex social cognitions which not only modulate such automatic effects, but do so even through the medium of language. Most tellingly, we provide evidence that political affiliation influences automatic facial reactions to emotional displays via conceptual processes like language. By so doing, we extend previous findings on the automatic facial reactions to politicians' faces to a much neglected but very important domain of social and political interaction which relies on verbal channels.

STUDY 3. A true smile or false smile towards ingroup and outgroup political leaders?

3.3.1 Introduction

A puzzling finding emerging from study 2 showed that left-wing participants facially responded to verbs depicting smile expressions of ingroup and outgroup politicians with similar levels of zygomaticus activation. In order to go deeper into this evidence, study 3 investigated whether smile responses to verb depicting smiles of outgroup politicians is simply performed through the zygomaticus activation, indicating a less sincere or felt smile, whereas smiles responses to verbs depicting smiles of ingroup politicians additionally involve orbicularis oculi activity (e.g., Duchene marker), indicating a more sincere smile pattern. This assumption relies on an intriguing corpus of evidence on smiles and what they mean.

There is tremendous variability in the facial display of smiles, a fact that has intrigued researchers for decades. Various taxonomies of smiles have been proposed suggesting that smiles can be differentiated based upon subtle configural changes, the emotional basis and the different social functions that they serve (Niedenthal, Mermillod, Maringer, & Hess, 2010; Ekman & Friesen, 1982). There is more to a smile than positive dispositions as it can reflect real enjoyment (felt smiles), but also a tendency to mask negative emotions (fake smiles), to attenuate emotions (controlled smiles), or even show negative affect altogether as in the case of contemptuous smiles, or dominance smiles.

Beyond the disposition of the displayer, smiles reflect the social ecology of the situation (Fridlung, 1997). Accordingly, different smile types should occurs in different contexts and have different consequences (Mehu, 2011). It follows that, the respondent's interpretation of the smile depends not only on accurate reading of the subtle configural characteristics of the particular smile display, but also on a wider appraisal of the event that relies on cognitive evaluations of the particular situation and the relation between displayer and observer (Scherer, Mortillaro, & Mehu, 2012).

Interestingly, recent research suggests that another way of accurately interpreting the subtle meaning of smiles is through facially mimicking them (Niedenthal et al., 2010). These authors propose a Simulation of Smiles Model (SIMS) according to which people arrive at evaluating the veracity and/or meaning of a smile based on its mimicry and how that smile feels. Facially mimicking others' facial expressions functions as a finer-grained evaluation tool and, if blocked (e.g., by inhibiting facial muscles), the person will be impaired in the capacity to differentiate true from false smiles. In one study (Niedenthal et al., 2009), students were shown pictures of smiling people some of which were genuine and others fake, Half of participants were asked to hold a pencil with their lips in order to block facial muscles. Results showed that when participants' facial muscles were blocked and they were unable to mimic they had a much harder time telling true from fake smiles, whereas they could readily tell the difference between smiles only when they were free to mimic them. These findings suggest that facial mimicry may actually involve high cognitive processes such as making fine-grained evaluations and judgments of the particular meanings of facial expressions in given social contexts.

In a recent study Maringer et al. (2010) examined the role of complex cognitions and facial mimicry on perception of different type of smiles. Participants were shown 'true' (e.g., Duchene) smiles and social context was manipulated such that a smile would either be expected (stereotypical) or not. Facial mimicry was blocked for half of the participants. Then, they were asked to provide ratings of smiles on a genuineness scale. Results showed that conceptual knowledge and stereotypes affected true-false judgments of smiles only in the mimicry blocked condition and that this effect was nullified when mimicry was possible. That is, when participants were free to mimic they did not report significantly different rates of authenticity of smiles. In sum, smiles can take different forms and reflect non only dispositions of the person displaying them but also the complex social context in which they occur. By the same token, facial reactions to smiles reflect not only a dispositional but also a social-cognitive reading of the perceived smile as well as the bodily grounding of the particular meaning it locks within (Hess & Thibault, 2009; Niedenthal et al., 2010).

One of the most extensively studied smile is the enjoyment smile otherwise known as 'Duchenne smile' being named after Duchenne de Boulogne who was the first to note that a smile characterized by co-activation of zygomaticus major (cheek) muscle and orbicularis oculi (eye corner) muscle is indicative of truly felt positive emotion (Duchenne, 1876/1990). Also known as 'true smiles', Duchene smiles have been found to be strongly correlated with feelings of enjoyment and happiness (Surakka & Hietanen, 1998; Ekman, Davidson, & Friesen, 1990) as well as behaviors concerning approach and cooperation (Mehu, Grammer, & Dunbar, 2007).

The authenticity of emotion is believed to be indicated particularly by the presence (or absence) of activity of the orbicularis oculi muscle site, the so called Duchenne marker. As discussed in much research on smiles, the zygomaticus major activation is a necessary but not sufficient component of felt (e.g., Duchenne) smiles in which positive emotion is signaled to others (Stewart, Mehu, & Bucy, 2010; Niedenthal et al., 2010). Indeed, false smiles are believed to be indicated by zygomaticus but not orbicularis activation and are generally associated with negative affect (Ekman, 2009). Beyond the objective configuration of different type of smiles, how observers perceive them is sensibly influenced by contextual information which plays and important role in the interpretation of their meaning. Therefore, we can expect that the interpretation of the meaning of given smiles (whether felt or false) and the attribution of emotions by viewers will be affected by the specific context in which smiles are displayed and the relation between smiler and observer. It is very likely that all smiles being equal, whether the person displaying it is an ingroup or an outgroup politician would influence how smiles are perceived in terms of positive affect and how they are mimicked by an observer. In turn, ingroup politicians' smiles will most likely be associated with higher levels of positive emotions relative to outgroup smiles. At the level of facial muscular activation, this difference should be revealed in different smile patterns observed in respondents' automatic facial reactions. That is, it can be expected to find co-activation of orbicularis oculi (Duchenne marker) in addition to zygomaticus major in response to ingroup politicians' smiles as indicative of a truly felt smile, whereas the absence of such marker in the facial response to outgroup politicians' smiles should indicate a false smile.

Up to now, no study has looked at whether political affiliation of a perceiver influences perception and automatic facial effects in response to politicians' smiles at such a fine-grained analysis. Bourgeois and Hess (2008) found no difference in the mimicry of smiles of in-group and out-group politicians as indicated by similar activation levels of zygomaticus major. In similar lines, results from experiment two showed that left-wing participants did not differentiate in their zygomaticus response when reading smile depictions of ingroup and outgroup politicians. However, it is very plausible that respondents may have been facially responding to politicians' smiles in a differential fashion altogether, indicatively at the level of orbicularis oculi activity.

Notably, previous research on Duchene smiles has relied mostly on picture stimuli (Kruhumber, Likowski and Wyers, 2013) but no study has examined whether the Duchenne marker can be revealed while participants are facially responding to verbs representing "smiling" facial expressions. Moreover, no study has investigated whether reading the verb "smile" as attributed to ingroup or outgroup politicians induces qualitatively different smiles in the faces of readers. We intend to address this issue in a novel way by examining whether participants differentially respond to depictions of smiles of ingroup and outgroup politicians as indicated by presence (or absence) of the Duchenne marker.

3.3.2 Study Overview

The third experiment was designed to examine at a finer grained analysis whether verbs referring to positive and negative facial expressions (smiles, frowns) attributed to ingroup politicians induce differential facial activation patterns in a reader as indicated by the presence or absence of the Duchene marker. Specifically, we investigated whether verbs referring to positive facial expressions of emotions (to smile) attributed to either left- or right-wing politicians induce different smiling patterns in corresponding facial muscles of a reader of the same political wing.

We considered two specific facial expressions, smiling, and frowning together with the emotion states most commonly associated with them such as happiness and anger (see, Dimberg et al., 2000). We assessed facial muscle activation by means of electromyographic (EMG) measurement of the orbicularis oculi (eye corner) and zygomaticus major (smile) muscle sites. Facial activity over the corrugator supercilii (brow) site was also recorded. As shown by previous research smiles serve an adaptive function in social interaction as they induce positive emotions while incurring no social costs on the mimicker. Research shows that smiles of outgroup politicians are often corresponded (Experiment 2; Bourgeois & Hess, 2008). However, no study has investigated whether smiles of ingroup or outgroup politicians trigger differential patterns of facial muscle activation as revealed at a finer grained level by the co-activation of the orbicularis oculi (Duchenne marker) in addition to the zygomaticus major muscle site. Moreover, no study has examined whether ingroup and outgroup politicians' smiles differentially elicit smile facial muscles while passing through the medium of language. We intend to investigate this issue by taking a micro analytic approach to subtle differences in facial responses to verbs depicting "smiles" of ingroup and outgroup politicians as indicated by the presence or absence of the Duchenne marker.

We considered orbicularis oculi activity as the best approximation for EMG recording the Duchene smile (enjoyment smile) in a reader while being presented with positive and negative verbs referring to facial expressions of smiling and frowning attributed to ingroup and outgroup politicians. Two muscle sites were employed to assess two different patterns of smiling, zygomaticus major (social smile) and orbicularis oculi (enjoyment smile). Activity of corrugator supercilii was also measured since we were interested in the co-variation of activation patterns revealed in the three facial muscles in response to the smile expressions.

In order to achieve maximal compatibility with the research on Duchene smiles we only verbs having direct reference to facial expressions of smiling and frowning. Participants read subject-verb sentences where the subject was either left-or right-wing politician followed by a positive or negative verb referring directly to facial expressions while their facial muscle activity was EMG measured. We were also interested in examining the relationship between facial and emotional reactions to the target politicians. In addition, participants' subjective ratings of the target facial expressions were obtained with respect to valence and likability. After the computer task manipulation checks and a questionnaire was administered to assess participants' political attitudes, their attitudes towards target politicians, their emotion states.

We expected group membership defined in terms of matched or mismatched political affiliation of participants and politicians of left-and right-wing orientation to have a significant effect on differential activation of smiling muscles. Specifically, we predicted that participants would show differential zygomaticus activity in response to positive relative to negative emotion verbs when verbs are attributed to in-group politicians. No significant difference was expected in zygomaticus activity for positive and negative emotion verbs attributed to outgroup politicians (Hypothesis 1). Similarly, we predicted the same pattern for orbicularis oculi activity, with it being activated significantly more in response to positive relative negative emotion verbs attributed to ingroup politicians (Hypothesis 2). No difference was expected when emotion verbs are attributed to outgroup politicians. In addition, we predicted that participants would differentiate between smiles of ingroup and outgroup politicians as indicated by orbicularis oculi activity. That is, reading positive emotion verbs attributed to in-group politicians should trigger significantly higher activity levels of orbicularis oculi relative to the same verbs being attributed to outgroup politicians (Hypothesis 3). For zygomaticus activity, we predicted a significant difference in muscle activation in response to ingroup relative to outgroup attributed positive emotion verbs (Hypothesis 4). No significant difference was expected in orbicularis and zygomaticus activation in response to negative expression verbs of ingroup compared to outgroup politicians. For corrugator activity we predicted a significant difference in muscle activation in response to ingroup relative to outgroup attributed negative emotion verbs and no difference in response to positive emotion verbs (Hypothesis 5). Additionally, predicted significant muscle activation in response to negative relative to positive emotion verbs attributed to ingroup politicians (Hypothesis 6). No difference was expected when emotion verbs are attributed to outgroup politicians.

3.3.3 Method

Participants

Thirty left-wing undergraduate students of the University of Bologna (27 females, 3 males; *M* = 22 years old) participated individually in the study for academic credit. Participants were pretested for political affiliation following the same procedure as in Study 2. All participants reported being left-wing and had scores below 3 on a political identification scale from 1 *(left)* to 7 *(right).* All subjects reported having normal or corrected-to-normal vision and were ignorant of the real purpose of the experiment. Data from 4 participants were excluded from analysis due to electrode displacement.

Stimulus Material

Same as in experiment 2 we used 6 Italian verbs referring to emotion expressions (e.g., 3 positive and 3 negative). For positive emotional expressions, we used action verbs to smile (*sorridere*), to laugh (*ridere*), to grin (*ridacchiare*) and for negative emotional expressions we used action verbs to frown (*corrucciare*) and synonym terms (*aggrottare*) and (*accigliarsi*). (English translations are approximate, as no precise correspondence is available.) Each target verb was attributed to names of four left-and right-wing politicians. Same as in experiment two, our stimulus material consisted in subject-verb sentences where the subject was either a left-or right-wing politician and the verb referred to positive and negative emotion expressions (e.g., 'Berlusconi smiles', 'Bersani frowns').

Procedure

Participants reported individually in the laboratory for participating in a study on the language of politics. They were told that the study was structured in two sessions consisting in a computer task and a questionnaire. The computer task consisted in reading a series of sentences with reference to politics presented on a monitor and evaluating them on a likability scale. In order to shift attention from the electrodes and possible reference to facial muscles participants were also told that the study concerned measuring skin conductance levels during word reading, which would be assessed via sensors placed on the face (see e.g. Dimberg et al., 2000). After signing the consent form the EMG electrodes were placed on the left side of the face. Participants were then asked to start the computer task which consisted in sequential presentation of verbal material on a monitor and subsequent evaluation. In order for participants to familiarize with the computer task 10 practice trials were administered prior to the start of the experiment.

During the experiment the verbal stimuli were presented in a random order with E-prime software (Psychology Software Tools, Pittsburgh, PA) on a monitor located approximately 1 m from the participant. Each trial started with a fixation point (a cross appearing in the center of the monitor for 500ms) that was followed by a baseline interval of 2s and then the stimulus phrase (e.g., “Bersani smiles”) for 3s. Participants reported on how much they liked the target stimulus by clicking with the mouse on an evaluation scale appearing on the monitor after the stimulus and staying on the screen until the participant rated each target verb. After the evaluation there was an inter trial interval of 250ms, and the next trial began.

For each participant three blocks of stimuli were presented with each block containing all the 6 emotion expression verbs and 6 neutral verbs attributed to 4 left-and right-wing politicians in random order, resulting in 48 stimuli presentations altogether.

After the computer task the manipulation checks and a questionnaire assessing participants’ attitudes on a multiplicity of measures was completed. Finally, participants were asked about their ideas regarding the true purpose of the experiment. No one of the participants was aware of the hypotheses, and none suspected that facial muscular reactions were measured. They were then debriefed and dismissed.

Dependent measures

Facial EMG

Facial muscle activity was measured using miniature Ag/AgCl surface electrodes (4mm) attached on the left side of the face according to the guidelines established by Fridlund and Cacioppo (1986). All pairs were referenced to a forehead electrode placed near the midline. The skin was cleaned with disposable pads (70% alcohol and pumice) and prepared for electrode placement to reduce skin impedance to less than 10 kΩ. The raw EMG activity was recorded with Biopack Systems, MP36 data acquisition unit at a sampling rate of 1000 Hz using two bipolar channels and a gain of 1,000. Raw data were rectified offline and filtered with a 10 Hz low cutoff filter, a 200 Hz high cutoff filter and a 50 Hz notch filter. Orbicularis Oculii was employed to assess enjoyment smiles and

Zygomaticus Major was employed to assess social smiling. Measurement of Corrugator supercilii activity was taken to asses facial reactions to negative expression verbs.

Manipulation check

To check participants' political orientation we asked them to answer on the following item: "Where would you locate yourself politically in a continuous scale of political identification from 1(*left*) to 7 (*right*)?".

To check whether the target politicians were considered as left- or right-wing politicians, participants were asked how much Berlusconi, Alfano, Renzi and Bersani represented the right- and the left-wing respectively on a 7-point Likert scale from 1 *(not at all)* to 7 *(very much)*.

Participants assessed the stimulus verbs on valence on a 7-point Likert scale from 1 (*very positive*) to 7 (*very negative*).

Subjective rating

To measure participant's experience of pleasure towards the given stimulus they were asked to rate each subject-verb sentence on a 5-point Likert scale from 1 *(I don't like it at all)* to 5 *(I like it very much)*. Participants reported by clicking on the above scale appearing on the monitor after the presentation of each target stimulus.

Attitudes towards politicians

Participants' attitudes in terms of liking towards each of the four political leaders was measured asking "How much does Bersani (vs. Renzi vs. Alfano vs. Berlusconi) represent your political ideas?", "How much do you like target politician?", "Would you be content if target politician won in the coming elections?" Responses were given on 7-point Likert scale from 1 *(not at all)* to 7 *(very much).*

Emotions

Participants' emotional attitudes towards target politicians were assessed through a PANAS scale consisting of 6 primary emotions (3 negative and 3 positive). The respondents indicated the degree to which thinking about the target politician elicited the given emotion on a 7-point Likert scale from 1 *(not at all)* to 7 *(very much).*

3.3.4 Results

Manipulation checks

All participants reported being left-wing (M = 1.96, SD = 0.66). All participants recognized left-wing target politicians as being representative of the left-wing political party and right-wing politicians as being representative of the right-wing political party. One-sample t-tests showed that Alfano (M = 5.19; SD = 1.05) and Berlusconi (M = 5.73; SD = 0.96), were considered as representing the right-wing, $t(25) = 25$, $p < .001$, and $t(25) = 30.3$, $p < .001$, respectively. Bersani (M = 4.92; SD = 1.16) and Renzi (M = 4.80; SD = 1.20) were considered as representative of the left-wing, $t(25) = 21.7$, $p < .001$, and $t(25) = 20.4$, $p < .001$, respectively.

One sample t-tests showed that that positive emotion verbs were considered as very positive (M = 5.44; SD = 0.69), $t(25) = 39.7$, $p < .001$, and negative emotion verbs were considered as very negative (M = 3.16; SD = 0.71), $t(25) = 22.6$, $p < .001$.

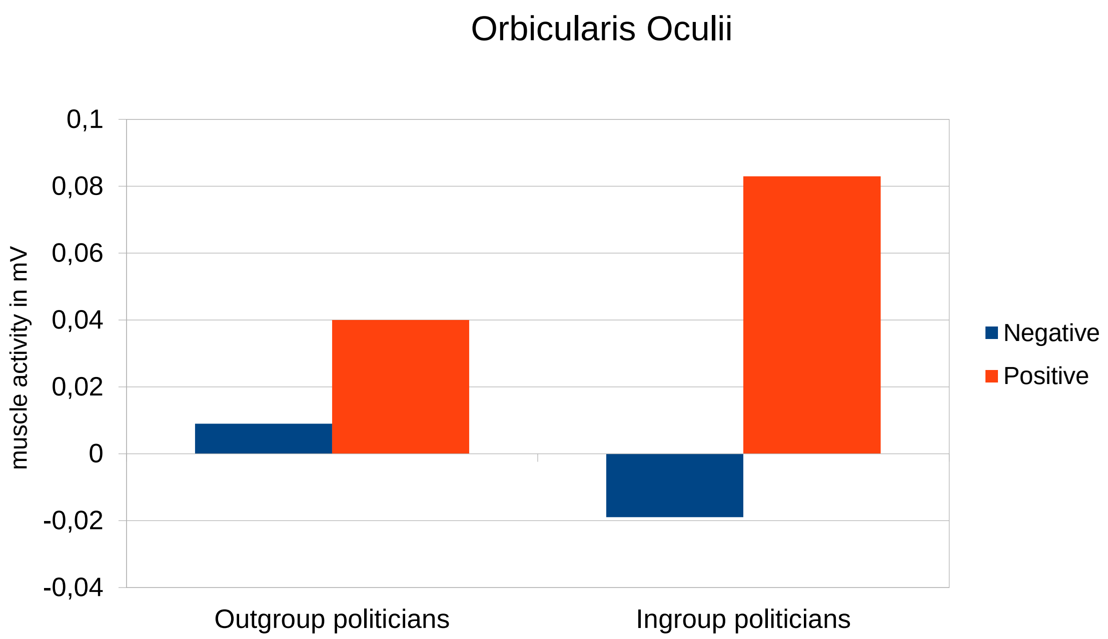
Facial effects

The EMG scores were expressed as change in activity from the pre stimulus level defined as the mean activity during the last second before stimulus onset (e. g., 1000ms before stimulus onset). Phasic facial EMG responses (in microvolts) were scored and averaged over intervals of 500ms during the 3s of stimulus presentation. Trials with an EMG activity above 8μV during the baseline period and above 70μV during the stimuli presentation were considered as artifact and were removed from analyses (less than 2 %). Before statistical analysis, EMG data were collapsed over the 12 trials with the same emotional expression for left-and right-wing politicians. Facial muscle reactions were averaged over the 3 seconds of stimulus exposure. Separate analyses of variance were performed for the orbicularis oculi, zygomaticus major and corrugator supercilii muscle sites.

Orbicularis Oculi

The data recorded on the orbicularis oculi muscle site were entered in a 2 (emotion expression: positive, negative) × 2 (target politician: left-wing, right-wing) repeated measures ANOVA. Results revealed the main effect of emotion expression verbs indicating that participants showed significantly higher activation of the orbicularis oculi muscle site when reading verbs referring to positive facial expressions of emotions (*M* = .062; *SE* = 0.02) compared to verbs referring to negative facial expressions of emotions (*M* = - .002; *SE* = 0.02), $F(1, 25) = 6.312$, $p = .019$, $\eta^2 = .202$. Although the interaction was not significant, we conducted separated paired-samples t-tests for orbicularis activation in response to ingroup and outgroup emotional expressions. Results revealed that when reading emotion expressions attributed to ingroup politicians participants showed higher orbicularis activity in response to smile (*M* = .083; *SD* = 0.13) as compared to frown depictions (*M* = -.019; *SD* = 0.14),$t(24) = 3.483$, $p = .002$ (Fig. 1). No such effect was observed when participants were reading smiles (*M* = .040; *SD* = 0.21) and frowns (*M* = .009; *SD* = 0.23) attributed to outgroup politicians, $t(24) = .622$, $p = .540$. No significant difference was observed between smile depiction of ingroup relative to outgroup politicians, $t(24) = 1.168$, $p = .254$. This supports Hypothesis 3 indicating that participants differentiated between ingroup politicians smiles and frowns as suggested by the Duchene marker but not between outgroup politicians smiles and frowns, as indicated by the absence of such marker.

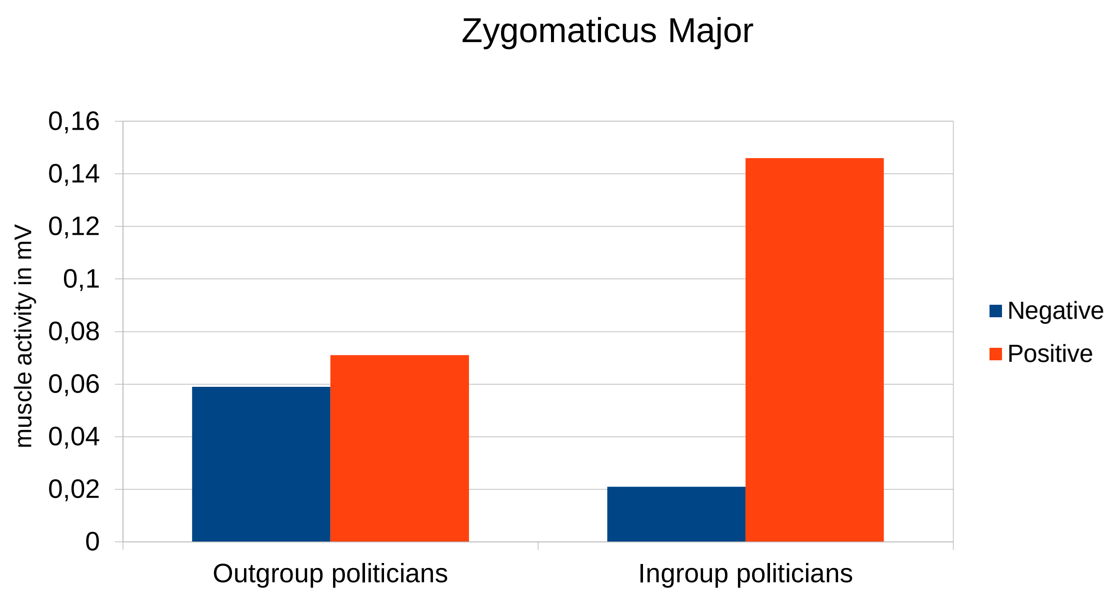
Figure 1. *Orbicularis activity in response to positive and negative verbs attributed to ingroup and outgroup politicians.*



Zygomaticus major

The same analysis was performed for the zygomaticus major. Results revealed that the main effect of emotion verbs was almost significant, indicating that zygomaticus tended to be more activated when participants read verbs referring to positive emotion expressions (M = .102; SE = 0.02) compared to negative emotion expression verbs (M = .045; SE = 0.03), $F(1, 25) = 3.988$, p =.057, η^2 = .138. Although the interaction was not significant, we conducted separated paired-samples t-tests for zygomaticus activation in response to ingroup and outgroup emotional expressions. Results revealed that when participants read emotion expressions attributed to ingroup politicians they showed a tendency to a higher zygomaticus activity in response to smile (M = .146, SD = 0.21) as compared to frown depictions (*M* = .021, *SD* = 0.14), *t*(24) = 1.756, *p* = .092. No such effect was observed when participants read smiles (*M* = .059, *SD* = 0.11) and frowns (*M* = .071, *SD* = 0.14) attributed to outgroup politicians, *t*(24) = -.289, *p* = .775. This supports Hypothesis 4. No significant difference was observed between smile depiction of ingroup relative to outgroup politicians, *t*(24) = .994, *p* = .330 (Fig.2).

Figure 2. *Zygomaticus activity in response to positive and negative verbs attributed to ingroup and outgroup politicians.*



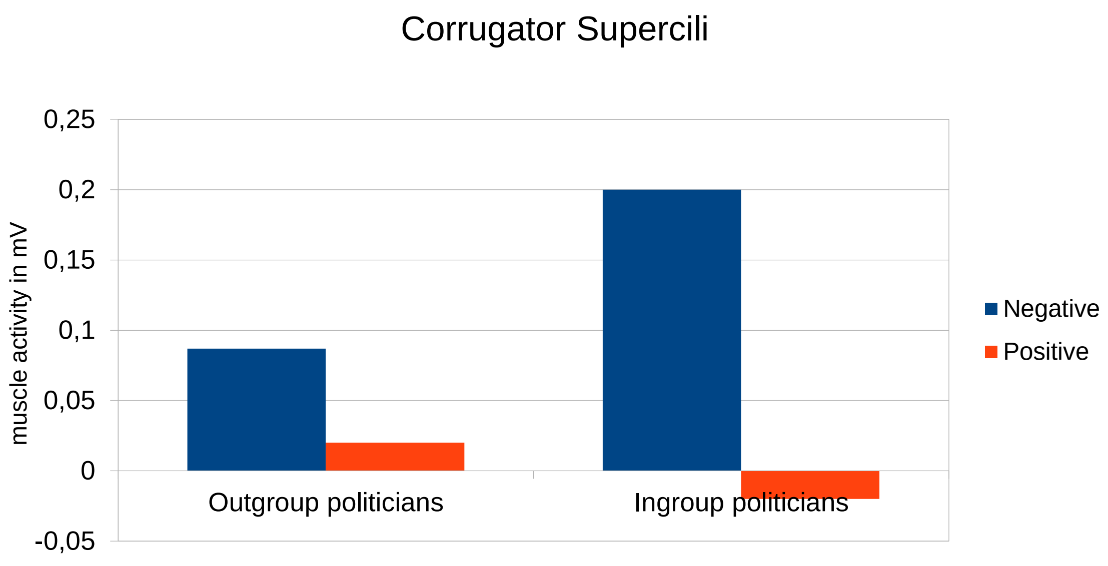
Corrugator supercilii

The same analysis was performed on corrugator supercilii. The main effect of emotion verbs was significant, indicating that corrugator was more activated when participants read verbs referring to negative emotion expressions (*M* = .143, *SE* = 0.03) compared to positive emotion expression verbs (*M* = -.010, *SE* = 0.03), *F*(1, 25) = 10.569, *p* =.003, η^2 = .306.

There was a significant interaction of emotion expression and political wing, *F*(1,

25) = 5.563, p =.027, η^2 = .188. Pairwise comparisons (based on LSD tests) revealed that corrugator activity was higher in response to verbs depicting frowns attributed to ingroup (M = .200; SE = 0.04) than to outgroup politicians (M = .087; SE = 0.03), p = .037. No such effect was observed when participants read verbs depicting smiles attributed to ingroup (M = -.022; SE = 0.04) and outgroup politicians (M = .002; SE = 0.03), p = .420, thus supporting Hypothesis 5. When participants read emotion verbs attributed to ingroup politicians they showed higher corrugator activity in response to frowns as compared to smile depictions, p = .002. A similar tendency was revealed by participants corrugator activity in response to outgroup attributed frown depictions relative to smiles, p = .067. Hypothesis 6 was supported by results showing that corrugator activity was higher for verbs depicting frowns when attributed to ingroup politicians but not outgroup politicians (Fig.3).

Figure 3. *Corrugator activity in response to positive and negative verbs attributed to left-and right-wing politicians.*



Subjective ratings of politicians' smile and frown depictions

To test whether participants liked to a different extent the smile displayed by target politicians of their own or opposite political orientation, self-report data were analyzed in a 2 (facial expression: smile, frown) × 2 (political wing: left, right) repeated measures ANOVA. Results revealed the main effects of political wing indicating that participants reported more liking of facial displays of ingroup (M = 3.06; SD = 0.06) compared to outgroup (M = 2.38; SD = 0.11) politicians, $F(1, 25) = 31.143$, $p < .001$, $\eta^2 = .555$. The interaction between facial expression and political wing was also significant, $F(1, 26) = 50.119$, $p < .001$, $\eta^2 = .667$. Pairwise comparisons (based on LSD tests) showed that participants reported significantly higher liking rates for the smiling of ingroup politicians (M = 3.65; SD = 0.12) compared to those of outgroup politicians (M = 1.88; SD = 0.15), $p < .001$. Additionally, participants reported lower rates of liking for frowning of ingroup politicians (M = 2.45; SD = 0.09) compared to those of outgroup politicians (M = 2.89; SD = 0.17), $p = .031$.

Attitudes towards politicians

The three items concerning participants' personal attitudes towards each target politician measuring the extent to which participants felt represented by, liked and would be content for the electoral victory of target politicians were aggregated to obtain overall indexes of participants' liking of the four politicians (Bersani Cronbach's $\alpha = .91$; Berlusconi Cronbach's $\alpha = .94$; Alfano Cronbach's $\alpha = .88$; Renzi Cronbach's $\alpha = .82$).

Following t-tests assessing participants' liking of each target politician revealed that ingroup politicians were liked more than outgroup politicians. Bersani: M= 4.70, SD= 1.05; t(25) = 15.98, $p < .001$; Renzi: M= 4.44, SD= 1.04; t(25) = 15.79, $p < .001$; Berlusconi: M

= 1.11, *SD* = 0.52; t(25) = 10.84, $p < .001$; Alfano: *M* = 1.29, *SD*= 0.51; t(25) = 12.71, $p < .001$. This indicates that ingroup politicians were liked more relative to outgroup politicians.

Emotions

Data from 8 subjects were excluded due to missing values. The data were analyzed in a 2 (emotions: positive, negative) × 4 (target politician: Berlusconi, Bersani, Alfano, Renzi) repeated measures ANOVA. The main effect of emotion valence revealed that participants reported more negative emotions (*M* = 3.69; *SD* = 0.14) relative to positive emotions (*M* = 2.70; *SD* = 0.11), $F(1, 17) = 22.413$, $p < .001$, $\eta^2 = .569$, irrespectively of the political orientation of the target Reported emotions differed significantly across target politicians as indicated by the main effect of politician, $F(1, 17) = 18.36$, $p < .001$, $\eta^2 = .786$. This was further qualified by the significant interaction between emotion and politician, $F(1, 17) = 88.505$, $p < .001$, $\eta^2 = .947$. Pairwise comparisons (based on LSD tests) showed that participants reported feeling more positive emotions towards ingroup politicians ($M_{Bersani} = 4.22$; $SD_{Bersani} = 0.25$; $M_{Renzi} = 4.29$; $SD_{Renzi} = 0.36$) compared to outgroup politicians ($M_{Berlusconi} = 1.09$; $SD_{Berlusconi} = 0.59$; $M_{Alfano} = 1.20$; $SD_{Alfano} = 0.77$), all *p*s < .001. Additionally, participants reported feeling less negative emotions towards ingroup politicians ($M_{Bersani} = 2.44$; $SD_{Bersani} = 0.24$; $M_{Renzi} = 1.96$; $SD_{Renzi} = 0.21$) compared to outgroup politicians ($M_{Berlusconi} = 6.20$; $SD_{Berlusconi} = 0.19$; $M_{Alfano} = 4.16$; $SD_{Alfano} = 0.23$), all *p*s < .001.

Correlational Analysis

To investigate whether automatic facial reactions to verbs depicting smiles and frowns of ingroup and outgroup politicians co-variated across facial muscles and were related with the reported liking of given expressions, experienced emotions and attitudes towards them we performed correlational analysis.

EMG scores revealed the expected pattern of co-activation of facial muscles. When participants read smile depictions of ingroup politicians there was a positive correlation between orbicularis oculi and zygomaticus major scores, r = 410, p = .041 and a negative correlation between orbicularis oculi and corrugator supercili scores, r = -511, p = .009. No correlation was found for smile depictions of outgroup politicians between orbicularis oculi and zygomaticus scores, r = 307, p = .136 as well as between orbicularis and corrugator supercilii scores, r = -255, p = .219. This indicates that there was co-activation of orbicularis oculi muscle (Duchenne marker) in addition to zygomaticus major when participants read ingroup politicians' smiles but not when they read outgroup politicians' smiles. Moreover, the negative correlation between orbicularis oculi and corrugator supercilii activation scores found only in response to smile depictions of ingroup politicians but not outgroup politicians' smiles further substantiates the notion that smile depictions of ingroup politicians elicited different configural facial responses among participants relative to smile depictions of outgroup politicians.

Correlations between facial EMG scores and self-reports on likability of facial displays, attitudes and emotions towards target politicians yielded no significant effect. However, significant correlations were found between self-report data on likability of smile displays and positive attitudes (p = .004) and positive emotions (p = .045) of ingroup politicians. Similarly, significant correlations were found between likability ratings of smile displays and attitudes (p = .025) and emotions (p < .001) of outgroup politicians.

3.3.5 Discussion

The present experiment examined in a novel way whether facial reactions to smiles and frowns of left-or right-wing politicians reveal different configural patterns depending on matched or mismatched political affiliation between politicians and participants. No evidence exists on whether political affiliation influences the quality of facial response to smiles of ingroup and outgroup politicians as indicated by co-activation of the orbicularis oculi (Duchenne marker) in addition to zygomaticus major. In a novel way we investigated whether such modulation is also revealed through the medium of language, that is by mere reading of same-or opposing-wing politicians displaying smiling and frowning facial expressions.

The EMG data revealed that participants reacted with an overall enhanced and congruent reaction pattern to smiles and frowns across all three facial muscles. This was the case especially for smile versus frown depictions of ingroup politicians which significantly elicited activity in the orbicularis oculi site as the defining feature of the ‘‘Duchenne marker’’. In line with our expectation zygomaticus activity was significantly enhanced in response to ingroup politicians’ smile depictions compared to frowns. Corrugator supercili scores revealed that participants frowned significantly more when reading frown depictions of ingroup compared to outgroup politicians. Moreover, corrugator was significantly inhibited in response to smile depictions of ingroup politicians. These results corroborate our previous findings of Experiment 2 with a large set of shared stimuli. In that study left-wing participants showed increased facial responses to ingroup politicians’ negative expressions compared to outgroup politicians’ negative expressions as indicated by differential corrugator activity, but no different activation levels of zygomaticus major in response to positive expressions of ingroup and outgroup poltiticians.

Overall, participants facially reacted with a more congruent and configurally different facial activation pattern towards smile depictions of ingroup compared to outgroup politicians. As revealed by correlational analysis participants’ EMG responses over the three facial muscles correlated significantly when they were exposed to smile depictions of ingroup relative to outgroup politicians. That is, participants showed the expected pattern of co-activation of orbicularis oculi (the Duchene marker) in addition to zygomaticus major in response to smile depictions of ingroup relative to outgroup politicians. Furthermore, orbicularis oculi activity was negatively correlated to corrugator activity which was inhibited in response to smile depictions of ingroup relative to outgroup politicians. The significant correlation between facial muscle responses along the expected pattern supports the notion that smile depictions of ingroup politicians elicited different configural facial responses among participants compared to smile depictions of outgroup politicians. No significant correlation was observed between facial muscle responses to smile depictions of outgroup politicians.

These findings are the first to point out that participants respond with a configurally different type of smile to smiles of same-or opposing-wing politicians, as indicated by the presence (or absence) of the Duchenne marker. Previous research showed that smiles of outgroup politicians are either not mimicked (Mc. Hugo et al., 1991) or mimicked to the same extent (Experiment 2; Bourgeois & Hess, 2008), but no study has addressed whether participants will show a more sincere smile (Duchenne smile) in response to smiles of ingroup compared to outgroup politicians. Moreover, no study has investigated whether different configural patterns of smiles (e.g., Duchenne or non Duchenne smiles) can be revealed in response to linguistic stimuli such as the verb "smile" attributed to ingroup and outgroup politicians.

Whereas our findings corroborate results from Experiment 2 which revealed that left-wing participants showed similar zygomaticus activation in response to smile depictions of ingroup and outgroup politicians, they importantly extent those findings to show that smile responses to smiles of ingroup and outgroup politicians are qualitatively different. Most tellingly, our results point out that smile responses of participants towards smile depictions of ingroup and outgroup politicians are not just quantitatively but most of all qualitatively different.

In fact, we did not find the expected difference between orbicularis activation in response to smile depictions of ingroup relative to outgroup politicians. However, the overall configural pattern of facial muscle activation observed in response to smile depictions of ingroup and outgroup politicians as indicated by the presence (or absence) of Duchenne marker and its co-variation with zygomaticus major and corrugator supercilii indicates that participants responded with a qualitatively different smile.

The fact that we didn't also find a quantitatively different smile, as indicated by similar levels of activation of orbicularis oculi and zygomaticus major in response to smile depictions of ingroup and outgroup politicians may be attributed to the type of stimulus material used in this study which consisted in semantic material depicting positive and negative facial expressions. Larsen et al., (2003) showed weaker facial effects of valence on tasks using sematic stimuli compared to tasks using affective pictures and sounds. Specifically, the effect of valence on zygomaticus major appears to be characterized by a threshold effect that not all stimuli can reach. While valence had the strongest effect on corrugator supercili with the effect being substantial in all tasks comprising pictures, sounds and words, no reliable effect on activity over the zygomaticus major could be shown in response to affective words. Notably, in this study DAVs depicting positive and negative displays of politicians were used. As shown by our previous findings (Experiment 1) negative DAVs had a strongest elicitation effect over corrugator supercilii relative to positive DAVs but no such effect could be revealed over the zygomaticus major, with positive DAVs eliciting similar facial activity levels relative to negative DAVs. It is therefore very plausible that our positive stimuli may have been unable to reach the necessary threshold of elicitation in the zygomaticus and orbicularis oculi muscles respectively, further in line with findings by Larsen et al., (2003).

In line with our expectations, judgment ratings were highly similar and corroborated our previous findings on positive and negative facial depictions of politicians (Experiment 2). In both studies, ingroup politicians' smiles received higher likability ratings and were associated with more positive emotion rates compared to outgroup politicians' smiles, consistent with the notion that these smiles are perceived as expressing felt positive emotion (e.g., Frank, Ekman and Friesen, 1993; Gosselin, Perron, Legault and Campanella, 2002).

In conclusion, our findings support the notion that facial reactions to smiles of ingroup and outgroup politicians are not just quantitatively but also qualitatively different. In a novel way we applied a micro-analytic approach to investigate the role of political affiliation in making qualitative differences in automatic facial reactions to politicians' smiles. Most tellingly, we showed that such a modulation runs not only through non-verbal channels but also through verbal means.

IV. GENERAL DISCUSSION

This line of research aimed to further investigate the role of verbal behavior in triggering automatic facial effects. More specifically we examined the interplay of verbal behavior and highly complex cognitive and social dimensions such as political affiliation in sensibly modulating automatic facial reactions in response to emotion verbs.

In **Study 1** we investigated the role of interpersonal verbs referring to positive and negative emotion expressions but encoding them at different levels of abstraction in eliciting differential activation in corresponding facial muscle sites of frowning and smiling (corrugator supercilii and zygomaticus major respectively). We considered a neglected verb category that implicates emotions in an important and direct way, that of state verbs (SVs). Very interestingly results showed that verbs encoding facial actions at different level of abstraction had a differential elicitation effect on corresponding facial muscles of frowning and smiling. Specifically the activity of corrugator supercilii (the frowning muscle) in response to negative terms was higher in response to DAVs as compared to SVs. For zygomaticus major (the smiling muscle) the asymmetrical pattern was observed with positive verbs belonging to the SV category eliciting the highest level of activation compared to positive verbs belonging to the DAV category.

The asymmetrical results of the effect of interpersonal DAVs and SVs on facial muscle activation could imply a close link with well documented asymmetry in language use in terms of negativity vs. positivity bias (Z. Jing-Schmidt, 2007). The negativity bias is the automatic tendency to pay significantly more attention to unpleasant relative to pleasant stimuli. That is, negative events have a greater impact on people's behavior than positive events. This asymmetry has been repeatedly reported in empirical evidence. For instance the negativity bias has been demonstrated to occur at very early stages of affective processing where the evaluative categorization, that is the differentiation between the negative and positive valence takes place (Ito et al., 1998; Smith et al., 2003). Indeed, the pervasiveness of the pattern has lead authors to consider it from the evolutionary perspective as a tendency expressing a species' evolutionary adaptation or fitness. For instance, Pratto and John (1991) argue that it is of evolutionary advantage that our attention is more and selectively tuned toward negative social information, such that it reflects an 'automatic vigilance strategy'. Indeed, research has demonstrated that threatening stimuli have the greatest impact on action tendencies relative to appetitive stimuli (Cannon, 1929).

Given the role played by negativity in selective attention it is plausible that our findings be interpreted in terms of the asymmetrical entrenchment of negativity in interpersonal verbs categories, such that negative DAVs are more entrenched than negative SVs. Hence, they are associated with significantly greater facial muscle activation. From this perspective, it is plausible that the category of concrete negative verbs is stronger and more entrenched than that of abstract negative verbs. On the contrary, the reverse pattern can be said to be true for positive language with the category of abstract terms being stronger than that of concrete positive terms. Indeed, the positivity bias assumes that people use more positive words over negative words because they are conform shared social standards and expectations. Moreover, in social interactions positive emotion states are more entrenched and more expected in communication relative to negative emotion states which may come as a shock or have negative consequences for the interaction. In interactions with others negative emotion states such anger have acquired a negative reputation such that in different cultures display rules require that anger be indeed subject of management on part of the individual. Therefore, the asymmetrical entrenchment of emotions can motivate and explain the asymmetrical facial activation effects triggered by SVs, such that positive SVs have highest impact compared to negative SVs and positive DAVs respectively. More than different level explanations, they suggest an implicit connection between the negativity bias as an evolutionary mechanism that tunes attention towards more concrete threats and the positivity bias as more of a socio cultural pattern which tunes attention towards desirables at the most abstract level, that can be conceptualized in terms of a continuum between nature and nurture.

Our results showed that automatic facial reactions can be modified by verbs that represent facial expressions of emotion at different levels of abstractions. Together with the results by Foroni and Semin (2009) they provide crucial evidence that verbal stimuli referring to expressions of emotion lead to a change in automatic and matching facial behavior same as pictures of emotion faces. We extend their findings in important ways to include a wider verb repertoire while more stringently testing the modulating role of linguistic abstraction in automatic facial activation. Most tellingly, we provide evidence of language-based automatic facial effects in a minimally interpersonal context, thus offering the maximal compatibility of verbal stimuli with non-verbal stimuli used in facial mimicry research.

In **Study 2** we examined in a novel way the role of verbs referring to positive and negative emotional displays of political leaders in modulating automatic facial effects in readers of same-or opposing-wing political affiliation. Our results are the first to show that the automatic facial response is a very sensible mirror of highly complex cognitive and social dimensions such as political affiliation. Results revealed that political affiliation significantly influences the level of corresponding facial muscle activation triggered by emotion expression verbs. Participants facially reacted to ingroup politicians' smiles and frowns with more congruent and significantly enhanced facial muscle activation compared to outgroup politicians.

Most revealingly, our findings on left-and right-wing differences in facial muscle activation towards ingroup and outgroup politicians interestingly point at the role of complex cognitive and social factors in sensibly modulating such automatic effect. From deep-seated political attitudes reflecting political ideology, to recently formed ones reflecting more contingent preferences for particular politicians, our findings clearly showed that automatic facial reactions reveal such attitudes at the most fine-grained levels. Taking a look at the current Italian political landscape and the developments of the last year, which have seen a rapid rise in power of left-wing politician Renzi, who became the leader of the left-wing party of PD and consequently Head of Government, our findings showed to have had a prophetic power by reliably predicting voters' political behavior by (at least) 6 months of advance.

Of particular interest is our finding on the counter-empathic facial reaction among left-wing participants who showed an increased smiling pattern in response to negative emotion verbs of outgroup politicians. Such counter-empathic response, also known by the German term *schadenfreude* refers to the phenomenon of taking pleasure in misfortunes of others, which fits especially well with the political context. As the much older Latin saying goes, in politics, '*mors tua, vita mea'* ! These findings fit well with evidence showing that Italian left-wing voters particularly detest the right-wing leader Berlusconi, whose excessive and flamboyant demeanor has earned him a reputation apt to yellow journals, nationally and internationally wide, all of which may be a plausible explanation of such a strong counter-empathic effect found among left-wing participants. In line with similar studies on the Italian political landscape (Liuzza et al., 2011) our results showed that the stronger catching power of the emotion behavior of ingroup politicians on automatic facial effects occurred only among right-wing participants, whereas such pattern was less clear among left-wing participants.

In **Study 3** we took a micro-analytic approach to address the puzzling finding emerging from study 2 with respect to left-wing participants who reacted with the same level of smiling (as revealed by the zygomaticus activity) to smiles of ingroup and outgroup politicians alike. Beyond the activation of zygomaticus (cheek muscle) we investigated whether reading the verb “smile” as attributed to ingroup or outgroup politicians induces qualitatively different smiles in the faces of readers, as revealed by co-activation of the orbicularis oculi (Duchenne marker) muscle site.

Politicians are well-known for their ability to mask their emotions and masterfully fake their smiles, therefore the political context does not offer the best context where sincere smiles will be expected. A recent study by Stewart and Dowe, (2012) examined different smiles of President Obama (e.g., felt, fake, controlled smiles) and showed that controlled smiles non only reduced participants interpretations of happiness/reassurance but also increased interpretation of anger/threat. Therefore, how politicians’ smiles are facially mimicked may vary according to how they are perceived and interpreted.

Our evidence showed in a novel way that people respond with qualitatively different smiles towards verbs depicting smiles of ingroup compared to outgroup politicians. Importantly, they point to the idea that politicians’ smiles might be functionally adaptive and not costly, but the way they are facially responded to will reflect complex cognitive and social dimensions. That is, smiles of ingroup politicians will be corresponded to with a more sincere smile, whereas a more false smiling pattern will be reserved to outgroup politicians’ smile expressions. These findings demonstrated in a more consistent and fine-grained level the role of political affiliation on modulation facial automatic effects triggered by language. Most importantly, they complete results of study 2 by adding a thinner layer to the analysis of automatic facial reactions in response to verbs depicting facial expressions of emotions of ingroup and outgroup politicians.

In conclusion, our results are the first to show that the role of political affiliation in modulating automatic facial effects not only passes through verbal channels but it is also revealed at a fine-grained level by making not only quantitative but also qualitative differences in automatic facial reactions of readers. Our findings speak most clearly to the tight interplay between perceptual and conceptual processes in automatic facial effects and the complex involvement of sensorimotor and emotional resonance mechanisms on the one hand and more sophisticated high-order cognitions like political affiliation on the other. The differences we find are best explained by such underlying processes involved in automatic facial activation. In sum, this research demonstrated that automatic facial mimicry is a very sensitive and curious kind of (social) mirror which sensibly reflects not just non-verbal but also verbal behavior of others while at the same time revealing highly complex social cognitions at the most fine-grained levels.

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