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# Mirror Neurons and (Inter)subjectivity: Typological Evidence from East Asian Languages

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## Abstract

Language is primarily constituted by action and interaction based on sensorimotor information. This paper demonstrates the nature of subjectivity and intersubjectivity through the neural mechanism and typological evidence of sentence-final particles from East Asian languages and extends to the discussion of the relationship between them. I propose that intersubjecivity is a kind of embedded or nested interpersonal synergy grounded in mirror neurons. By means of shared motor information and embodied simulation, one's self models can be generated in which other self-models are embedded. With the process of embedded interpersonal synergies, the relationship between synergies might be concerned to produce mutual shaping of meaning between speaker and hearer. Accordingly, I propose a hypothesis that the more intersubjective markers a language has, the more embedded or nested interpersonal synergies it has. This proposal opens new perspective on the understanding of the nature of language communication and (inter)subjectivity.



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## 1. Introduction

What is the essential nature of language communication? Is it a means of conveying information from one person to another (Fodor, 1975; Locke, 1996; Saussure, 2013)? Is it an internal computation or symbolic representation mechanism (Clark, 1996; Gibbs, 1987; Horton, 2005)? Does it primarily constitute action and interaction grounded in sensorimotor information (Chemero, 2009; Glenberg & Gallese, 2012; Glenberg & Robertson, 1999)?

All these issues have attracted more and more attention and increasing discussion. In these issues, subjectivity and intersubjectivity of language are most closely related to the essence of language communication and are the greatly concerned topics in linguistics for decades. However, the nature of subjectivity and intersubjectivity is still less well understood, especially the neural substrate and mechanism. The present paper is aimed at demonstrating the nature of (inter)subjectivity through the neural mechanism and typological evidence from East Asian languages which paves the way to a better understanding of the nature of (inter)subjectivity in languages. This neuroscience perspective opens a new perspective on the understanding of the nature of language communication and (inter)subjectivity.

The next section reviews the action-based approach of language and the interpersonal synergy in language communication. Section 3 reviews mirror neurons and (inter)subjectivity as well as the relationship between them. Section 4 discusses the typological evidence of sentence-final particles in East Asian languages and extends to relevant language phenomena to demonstrate subjectivity and intersubjectivity and the relationship between them. Section 5 concludes that intersubjecivity is a kind of embedded or nested interpersonal synergy grounded on mirror neurons. Subsequently, I propose a hypothesis concerning intersubjective markers, embedded interpersonal synergies, and pragmatic inference. Finally, I conclude the typological evidence and the hypothesis, and then discuss the future research directions.

## 2. Action and Interpersonal Synergy

### 2.1. Action and Language

Representational theory of language with the framework conceptualized by internal data and logic reasoning holds the view of conveying information and symbolic computation. Representational account believes that language is represented by abstract forms and is fundamentally a means of conveying shared situation and experiences (Abbott, 2008; Grice, 1989; Saussure, 2013). However, representational theory is increasingly challenged by an approach based on ‘embodied action’ (Chemero, 2009; Varela, Thompson, & Rosch, 1991; Wilson & Golonka, 2013).

In cognitive science, the ongoing ‘pragmatic turn’ denotes a distinctive action-oriented paradigm which suggests that cognition should not be understood as providing models of the world, but as action-based model and being grounded in sensorimotor information. Varela et al. (1991) first defined cognition as ‘embodied action’, arguing that cognition is a set of processes about determining possible actions and a capacity of generating structure by action. According to this embodied account, language meaning is the result of our interactions with the outside world and language connects all the possible actions in a network. There are a lot of increasing evidence to support the strong links between action and language. The main reason of focusing on the relation between language and action is that the basic function of cognition is the control of actions. The solution of contextually appropriate action might be extended to contextually-appropriate language through selective pressure of evolution.

There is plenty of evidence to support the strong links between action and language. Glenberg and Robertson (1999) demonstrated the importance of action systems to language comprehension which was demonstrated by Glenberg and Kaschak (2002) and Zwaan and Taylor (2006) as well. And Glenberg, Sato, and Cattaneo (2008)

demonstrated that the plasticity caused by motor system might affect the process of concrete and abstract language. Moreover, motor activation occurs very soon after a stimulus is presented, and only 22 msec after peak activation in auditory temporal areas (Pulvermüller, 2010). This early activation is difficult to regard motor effects to reflect motor imagery because understanding is completed but might reflect the embodied simulation of language understanding. The action-based approach claims that action and language are strongly connected and action goal, intention, and context are all vital to language processing.

The action-based approach claims that action and language are strongly connected and action goal, intention, and context are all vital in language processing. It is worth noting that, action and semantics are strongly connected as well in many related models. Action planning does not only need low-level processes of motor control, but also relies on the use of semantic knowledge (Hoeren et al., 2013; Noppeney, 2008; Pulvermüller, 2013). I might conclude that action language processing may affect overt execution and motor expertise may affect action language processing, thus, action control and execution need semantic and pragmatic knowledge at the same time.

### 2.2. Action and Interpersonal Synergy

Accordingly, language does not reduce to action and movement alone, but primarily constitutes both action and interaction. From neuroscience perspective, interaction is structured by neuromuscular assemblages called synergies which are a kind of "naturally selected chunks of self-organizing behavior" (Kelso, 2009, p.88). In a living system, synergies are often embedded or nested, that is, synergies are often subcomponents of other synergies (Latash, 2008; Riley, Richardson, Shockley, & Ramenzoni, 2011). Thereby, interaction is primarily organized by muti-level bodily coordination (Cowley, 1994, 2014); and interactions such as intentional speech arises as a kind of interpersonal synergy (Kelso, Tuller, & Fowler, 1982).

As being analogous to the different concerns about semantics and pragmatics, action and interpersonal synergy might be investigated from this viewpoint likewise. Action and synergy also ground on the same resources of sensorimotor information. But action is more concerned in the sensorimotor movement, while synergy focuses on the bodily coordination.

For instance, making an utterance such as a question is often intended to shift the addressee's attention, and the addressee often answers via sensorimotor coordination. When the speaker asks the question "Are you hungry?", s/he is intending to shift the hearer's attention to this situation. Then the addressee might answer with bodily coordination such as nodding or shaking head or hand but not specific words. The interlocutors' bodily coordination is coordinated through skillful muti-level mutual sensorimotor engagement (Dale, Fusaroli, Duran, & Richardson, 2014; Wallot & Van Orden, 2011). The conversation involves not only vocal-auditory coordination but eye, torso, and limb coordination between persons (Fowler, Richardson, Marsh, & Shockley, 2008). Thus, on an embodied account, language is primarily constituted of both action and interaction. By means of complicated interaction and intricate coordination, language is improvised as a kind of interpersonal synergy (Cowley, 1994, 2014; Cowley & Harvey, 2015; Wallot & Van Orden, 2011).

It is worth noting that the focus on interpersonal synergy leads to a lot of relevant interesting issues in pragmatics such as subjectivity and intersubjectivity which are most closely related to the embedded nature of interpersonal synergy and the essence of language communication I intend to discuss in detail. Thereby, below I am turning to subjectivity and intersubjectivity which are the significant emphases in interpersonal pragmatics and the biological neuron basis for them.

## 3. Mirror Neurons and (Inter)subjectivity

### 3.1. Mirror Neurons

The neurobiological basis for the language-based

modulation of the motor system is most likely related to the properties of a set of neurons, the so-called mirror neurons (Fogassi et al., 2005). Mirror neurons, as observed in macaque brains, fire both when the animal manipulates an object in a specific way and when it sees another animal perform an action that is more or less similar. Such neurons were originally found in macaque monkeys, in the ventral premotor cortex area F5, and later also in the inferior parietal lobule (Fogassi et al., 2005; Gallese, Fadiga, Fogassi, Rizzolatti, 1996).

Mirror neurons discharge when an individual performs an object-related action and when s/he observes the same or a similar action done by another individual. This property points to a mechanism for action or intention understanding (Rizzolatti & Craighero, 2004). What matters most in driving a mirror neuron's discharge is the goal-related motor act irrespective of the movements required to accomplish it. This piece of evidence lets many authors link mirror neurons to the representation of goals of actions (Craighero, Metta, Sandini, Fadiga, 2007; Rochat et al., 2010). Fogassi et al. (2005) further found that some mirror neurons in parietal cortex (PC) of monkeys are selective to high-level goals which indicate that the mirror system is sensitive to goals at different levels. The mirror neurons have a hierarchical organization. High-level goals refer to the neural representation of desired outcomes that have a high rank in the hierarchical organization of action. Goals refer to the neural representation of desired outcomes that have a lower rank in the behavioral hierarchy and are more concrete. At a high level of the hierarchy are action intentions. At a lower level, these intentions are realized by an integrating set of goal-related motor acts. Given the supporting evidence above, I might consider that goals play a key role in the selection of mirror system. Thus, the hierarchically organized representation of actions in the brain relies on the representation of their goals. Kilner (2011) suggested that prefrontal cortex (PFC) plays a prominent role in the representation of high-level goals and extends it with the notion that "intentions and goals" are represented in PFC at multiple levels of abstraction. Above all, mirror neurons are closely involved in the process of action semantics to code intentions and goals. Accordingly, in contrast to the representation account, action based approach otherwise proposes the hierarchical structure of language based on action control and is concerned with action goal, context, intention, and mirror neurons.

### 3.2. Subjectivity and Intersubjectivity

The concept of subjectivity and subjectification from the diachronic viewpoint is developed by Traugott (Traugott, 1980, 1995, 2003). Differing from Traugott (1980, 1995, 2003), Langacker (1990, 1998) proposed the synchronic concept of subjectivity and subjectification. I will focus on the diachronic concept of them in this paper. Subjectification is a mechanism by which meanings are recruited by the speaker to encode and regulate attitudes and beliefs, i.e., subjectivity meanings (Traugott, 2010).

Neuroscience perspective on subjectivity holds that inputs from the different sensory modalities are dynamically integrated and coordinated with existing representations in the brain. And when a system represents itself as being directed toward an object, subjectivity takes place (Metzinger, 2009). This happens when control over the focus of attention is gained and an inner image of oneself as actually representing is generated (Metzinger, 2009). Since mirror neurons are linked to the representation of goals of actions, they play an important part not only in action semantics but also in subjectivity.

Individual subjectivity might be related to the concept of intersubjectivity. It has been developed by Traugott (2003) too. According to Traugott (2003), intersubjectification is the semasiological process whereby meanings to encode or externalize implicatures regarding speaker's attention to the self of addressee. Once meanings are subjectified, they may be recruited to encode meanings centered on the addressee (intersubjectification) to generate intersubjectivity meanings (Traugott, 2010).

I have mentioned above that mirror neurons are

involved in the process of action semantics to represent intentions and goals and subjectivity. What's more, the mirroring mechanism for action represents instantiations of embodied simulation which provide a new approach to investigate intersubjectivity (Gallese, 2011). Mirror neuron system could have potentially facilitated the generation of self-models in which other self-models are embedded. By means of shared motor information and embodied simulation one's action can be mapped to other's representations. This kind of generated simulation by the relations of brain-body system representation drawing from shared motor information could form the basis of understanding others' mental states (Gallese, Keysers, & Rizzolatti, 2004; Metzinger, 2009).

To summarize, both subjectivity and intersubjectivity are closely related to mirror neurons, and intersubjectivity might be grounded on the mirroring mechanism. By means of shared motor information and embodied simulation grounded on mirror neurons, one's action can be mapped to other's representations and can generates embedded self-models or embedded interpersonal interaction. This proposal opens a new perspective on the understanding of language subjectivity and intersubjectivity. Based on these assumptions, I will move to the supporting typological evidence from East Asian languages in the next section.

## 4. Typological Evidence

### 4.1. Sentence-Final Particles

Sentence-final particles are a suitable case for intersubjectivity in East Asian languages. I will investigate three main East Asian languages, that is, Mandarin Chinese, Japanese, and Korean.

Typologically, the three languages are topic-prominent (Li & Thompson, 1976), but Mandarin Chinese is an isolating language, and Japanese and Korean are agglutinating languages. Since the sentence-final particles do not correlate with the specific syntactic features, it seems that typological differences do not play a major role. Thereby, it is reasonable to investigate the final particles from pragmatic perspective alternatively.

I propose that sentence-final particles in East Asian languages are a prominent characteristic of subjective and intersubjective markers. Because subjectification and intersubjectification are based on pragmatic inference (Traugott, 2010), intersubjectivity indicates some features of pragmatic inference. Pragmatic inference often occurs in the interaction between language speakers and hearers which requires interpersonal interaction and coordination to be concerned and generate intersubjectivity simultaneously. Language employs intersubjective markers to conventionalize the pragmatic inferences and produce conventionalized mutual shaping of meanings between speakers and hearers and to mark them by intersubjective markers. As based on pragmatic inferences, their function indicates the interaction in a concrete context in terms of inference. Therefore, their interpretations are only contingent to the ongoing context, rather than pre-given context-free meanings. By means of indicating how the utterance is to be processed in a specific context and linked to another utterance, speaker thereby can manipulate the communicative context in a specific way and structure the discourse. Below I will provide some proper evidence of particles in East Asian languages to support my proposal.

### 4.2. *yo* and *ne* in Japanese

In Japanese, the two most frequently used particles *yo* and *ne* have drawn much attention, as they are thought to add some additional meaning to interpreting the proposition of the sentence (Morita, 2005). According to Morita (2008), these particles' meanings of interaction are only understandable from their interactional context and contingent talk. Occurrences of these particles are often the result of speakers' subjective decisions regarding how to frame the discourse but not pre-given meanings regarding marking the information of propositions. Morita (2015) discussed the functions of *yo* and *ne* as resources for collaboratively negotiated stance building between participants for the discourse of current talk and ongoing talk, and the consideration of recipient. His data analysis

revealed that these particles do not articulate a single fixed denotational meaning; rather, their contextual effects highlight different aspects of interaction. Furthermore, the meanings of these particles emerge from the placement in a particular sequential position within an ongoing activity, and the placement itself is coordinated with other relevant elements of the ongoing talk, such as prosodic features, body movements, gestures, and facials which index participants' interactional concerns (Morita, 2015). Therefore, these particles are not inherently linked with specific pre-given meanings, but rather, only some of the meaning may be evoked in a particular situation. That's why there is no one proposed meanings of *yo* and *ne* across all instances in Japanese.

### 4.3. *le* in Mandarin Chinese

My proposal might be manifested in the sentence-final particle *le* in Mandarin Chinese too. The particle *le* is the most frequently used particle in Mandarin Chinese and attracted considerable attention (Chang, 2001; Chao, 1968; Huang 1988; Li & Thompson, 1981; Lu & Su, 2009; Van den Berg & Wu, 2006). Chao (1968) deems that *le* includes verbal aspect *le* and discourse particle *le* which should be treated separately. Li and Thompson (1981) argue that the context is important for understanding the various uses of *le* as coding current relevance. Huang (1988) claims that *le* is an aspect marker coding the concept of boundary or interruption. Chang (2001) argues that *le* is a focus marker of action. Van den Berg and Wu (2006) argue that *le* is a device to update the common ground. In line with Van den Berg and Wu (2006), Lu and Su (2009) analyze spontaneous spoken data and agree that *le* is a common ground coordination device. They propose that since the particle serves as a device of the speaker to update the common ground to adjust the hearer's mental model, *le* might be viewed as a subtle signal from the hearer as a recognition of the user's intention. From different perspectives, various researchers studied *le* and drew different conclusions. Nevertheless, from pragmatic and discourse perspectives, I agree with Lu and Su (2009) that sentence-final particle *le* in Mandarin Chinese is an intersubjective marker, but rather the speaker's strategy to update common ground (I will discuss the issue of common ground in detail in the next section). According to Lu and Su's (2009) data analysis, the claim of sentence-final particle *le* as an intersubjective marker is supported by three facts: the high percentage of *le* followed by a new turn, the acknowledgement of the speaker's intention and sign of participation, and the acknowledgement of the prior speaker's invitation to participate. That is, the speaker employs *le* to indicate recognition of the interlocutor and gives cues to participate the conversation; and the hearer might show the acknowledgement of the speaker's intention or invitation according to concrete context. In this sense, *le* is a resource for collaborative relationship between participants for the ongoing discourse of the current talk and show closely consideration of the other interlocutor. We might discover the similarity between *yo* and *ne* in Japanese and *le* in Mandarin Chinese. These particles are all often the result of interlocutors' subjective decisions on how to structure the discourse but not some specific pre-given and context-free meanings. Accordingly, these sentence-final particles all indicate the link to another utterance, interlocutor thus can manipulate the communicative context and frame the discourse based on pragmatic inference.

### 4.4. *na* and *maliya* in Korean

As an agglutinating verb-final language, Korean has an impressive inventory of sentence-final particles, marking diverse grammatical notions commonly associated with the verbal morphology such as tense, aspect, mood, and modality. Nevertheless, there are some intersubjective markers in Korean too. Among them, the functions and developments of final particle *na* and *maliya* in Korean reveal the similar pattern as intersubjective markers of Japanese and Mandarin Chinese. Particle *na* is one of the oldest grammatical markers in Korean with the original function as a verbal morpheme and variant patterns of functional extension. It's most frequent used function is politeness marker with the development from the speaker's tepid attitude about the statement to politeness marker due to

lack of compulsion (Rhee & Koo, 2015). The other important function is sentence-ender to show that speaker is exploratory about the situation and marks the speaker's indefiniteness. This pattern develops into a form lacking attention to the addressee and marks the speaker's superiority in hierarchical situation (Rhee & Koo, 2015). I suggest that these usages are all involvement with the interlocutors' interaction and coordination in a diverse context. Because they all express the speaker's attitude and take into account the addressee's reaction, they thereby are the result of interlocutors' subjective decisions and intersubjective interaction. Particle *maliya* in Korean is often treated as a discourse marker (Ahn, 1992; Lim, 1998; Noh, 1996). However, the interactional function has not been investigated thoroughly. Based on their contextual analysis, Ahn and Yap (2013) argued that *malia* has developed into a pragmatic marker which is used to signal that speaker intends to interactively negotiate common ground. They identified five discourse functions, i.e., emphatic marker, counterexpectation marker, speaker's negative feeling marker, new discourse topic shared between speaker and hearer, and pragmatic hedger (Ahn & Yap, 2013). In their data analysis, the emphatic marker is often used to evoke the participation of the addressee in the discourse; the counterexpectation marker is often used to express surprise and seek confirmation from addressee; the negative felling marker is often used to express negative felling and to point out to the addressee the violation of expected assumptions. There has been a semantic extension of the use of *maliya* in these three functions and the latter two are contextual reinterpretations of the first function (Ahn & Yap, 2013). The fourth function as a marker of new discourse topic shared between speaker and hearer is often used to introduce a new discourse topic and imply the address that the topic is familiar to both, it thereby seeks good cooperation from the addressee (Ahn & Yap, 2013). The last function of pragmatic hedger is often used to express the speaker's uncertainty about the addressee's attitude and take into account the addressee's reaction (Ahn & Yap, 2013). I might conclude that all these functions of *maliya* are means to invite the addressee to recognize the implication and indicate the interaction in a concrete context in terms of inference, thus, link to another utterance. That is, it is with the pragmatic inferences and contextual extensions to structure the discourse between the interlocutors.

To summarize, sentence-final particles in East Asian languages are prominent characteristics of subjective and intersubjective markers, indicating some features of pragmatic inference. Intersubjectivity implies a complicated interaction and intricate coordination and consideration of addressees to produce language meaning. Language conversely employs intersubjective markers to conventionalize the pragmatic inferences and produce conventionalized mutual shaping of meanings and mark them. Because some sentence-final particles show subjective and intersubjective features at the same time, below, I will move to the issue and typological pieces of evidence for the relationship between subjectivity and intersubjectivity.

### 4.5. The Relationship between Subjectivity and Intersubjectivity

The relationship between subjectivity and intersubjectivity has received a lot of hot debates from distinctive viewpoints based on various pieces of evidence across languages. It has been suggested that subjectification is widely involved and intersubjectification presupposes subjectification and follows it (Traugott, 1995, 2003; Visconti, 2013). The diachronic relationship between subjectification and intersubjectification is clearly proposed by Traugott (2003) that there cannot be intersubjectification without some degrees of subjectification. Nevertheless, there are some other suggestions about reverse tendencies of de-subjectification and intersubjectification without subjectification (Abraham, 2005; Adamson, 1995; Bisang, 2015). However, it cannot demonstrate the exact tendencies and limits convincingly without systematic quantitative studies.

In a diachronic dimension, Narrog (2012, 2015) recently posited speaker-orientation, hearer

orientation, and textual/discourse-orientation, and claimed that the order between these changes is not yet settled. In this paradigm, speaker-orientation is identical with subjectification, hearer-orientation is identical with intersubjectification, and textual/discourse-orientation signals coherence and creates textuality which might be both subjective and intersubjective. I agree with Narrog's (2012, 2015) proposal and take the account that both of them have the neurobiological basis on mirror neurons and there is no fixed entailment between them. I argue that there are different situations: Firstly, intersubjectivity is generated when one's action maps to other's representations and generates embedded self-models. In this first stage, intersubjectification presupposes subjectification. Bisang (2015) provided an instance of numeral classifers in Chinese to provide evidence for intersubjectification without subjectification which is contrary to my argument above. However, this instance is problematic and insufficient to support his argument. Bisang (2015) alleged that the process of individuating nouns for making them accessible to counting does not depend on taking a particular perspective of the speech-act participants. Since the bare classifier construction [CL N] has the function of definiteness and indefiniteness in some Sinitic languages, the emergence of the (in)definiteness function at the second stage of classifier development is an instance of intersubjectification without subjectification (Bisang, 2015). However, the referential [CL N] construction might not be developed from the individuation construction [Num CL N], but rather [Dem CL N] in which neutral demonstrative dropped. In this reasonable condition, classifiers can be deemed as quasi-article, and they can be used to mark the definiteness provided by the context (Chen, 2007). That is to say, the intersubjectification process is developed from the demonstrative meaning which has subjectification meaning in context but not the counting meaning.

Then, after intersubjectivity is generated, it might develop into subjectivity or/and intersubjectivity further according to the context based on distinctive functions of mirror neurons or other causes such as discourse organization, syntactic reanalysis, semantic extension etc. This tendency is taken place in Japanese direct question marker *ka* which has intersubjective meaning. When the direct question marker developed into an indirect form, the discourse-organizing meaning follows the intersubjective meaning (Kinuhata, 2012; Narrog, 2015). The above-mentioned particle *maliya* in Korean is also a suitable instance to illustrate this relationship. The usage of emphatic marker is more speaker-oriented which highlights a topic, assumption, or feeling concerned with the speaker. The usage as a marker of new discourse topic shared between speaker and hearer developed after the emphatic marker which is more addressee-oriented seeking for the agreement or empathy from addressee. Derived from the function of topic marking, the pragmatic hedging function of particle *maliya* serves the face needs of both of the speaker and hearer. This needs to take into consideration the face needs of the both interlocutors and the development is both subjective and intersubjective.

In a word, after intersubjectivity is generated, it is not a unidirectional change from subjectification to intersubjectification, but rather is mainly context and discourse determined. I will return to this point in the next section.

## 5. Concluding Remarks

### 5.1. The Nature of Intersubjectivity

Considering the above typological evidence from Asian languages, intersubjectivity implies complicated interactions and intricate coordination, features of pragmatic inference, and consideration of relationships between interactions and addressees to produce language meaning. I suggest that it is due to the nature of intersubjecivity which is a kind of embedded or nested interpersonal synergy grounded on mirror neurons.

Above all, unlike common ground, interpersonal synergy is the primary characteristic of intersubjectivity. What is called 'common ground' is the feeling of having shared knowledge, ideas,

or assumptions, which is a starting point of interpersonal communication from the perspective of representational theory (Abbott, 2008; Grice, 1989; von Fintel, 2008). Representational theorists often use common ground to explain how language understanding depends on shared internal knowledge and experiences. Rather, embodied approach takes the distinctive account based on action and coordination which alleged language is improvised as a kind of interpersonal synergy. There is no shared internal knowledge, i.e., the so called common ground, but mutual sensorimotor engagement and coordination. This framework is more powerful than representationalism because of the innate sensorimotor information mapping without need to presuppose a concept of common ground.

In a living system, synergies are often nested or embedded, that is, synergies are often subcomponents of other synergies. Here, I may refer to a similar embedded property in syntax, that is, syntactic recursion. According to Vicari and Adenzato (2014), the structure of goal-directed intentional action presents recursive mechanisms at the level of motor intentionality. Intentions are satisfied if and only if the corresponding action is realized in a specific way as a causal effect of the intention. And intentions have a self-embedding structure that, in complex intentions, can produce long-distance relationships between prior intentions and subsidiary actions. Then the central features of syntactic recursion are already present in motor intentionality. A related hypothesis that ties language to motor activities is that action properties are the basis of the grammar (Arbib, 2006; Pulvermüller, 2010; Pulvermüller & Fadiga, 2010). According to Rizzolatti and Arbib (1998), the exaptation of a mirror system for communication is based on the fact that the control and observation of an action show a prelinguistic grammar. Thereby, the neural circuits for controlling the hierarchy of goal-related actions were utilized to serve the function of language by selection pressure.

The other important language configuration is embedded or nested interpersonal synergy. Interpersonal synergies also have a self-embedding structure that, in complex interpersonal synergies, can produce long-distance relationships between prior synergies and subsidiary synergies. The interlocutors have shared interactional history so that the synergies are inclined to be embedded or nested and the subsidiary synergies could take into account the prior synergies facilitated by the mirroring mechanism. After the embedded synergy of intersubjectivity is generated in the first stage, intersubjectivity afterward might develop into subjectivity or intersubjectivity further according to the context. Since the synergies are embedded and the subsidiary synergies can consider the prior synergies, the orientation of mutual shaping meanings could focus on the speaker or the addressee in the process of interactional synergies contextually but not unidirectional change only. Therefore, intricate interaction and coordination in discourse could cause the consideration of addressee to be an intersubjective marker, and could cause the consideration of speaker to be a subjective marker, even both. It is the intention of discourse structure leading these kinds of different processes according to the context. Here again, we can see the more convincing explanation of embedded synergies from the viewpoint of embodied account than common ground from representationalim, in that unidirectionality of intersubjectivity is questionable in some circumstances.

Additionally, intersubjectivity markers are the expressions often conveying emotions to others. Emotions are not pre-existing states that are located in individuals; rather, emotions are created intersubjectively between individuals and in specific contexts (Cronin, 2014). Some studies support that the processes of vocal emotion recognition involve universal principles (Nicholson, Takahashi, & Nakatsu, 2000; Pell, Paulmann, Dara, Alasseri, & Kotz, 2009). However, some other studies (Scherer, Banse, Wallbott, 2001; Vanbezooijen, Otto, & Heenan, 1983) report an in-group advantage that vocal emotions simulated by speakers of the same language are more accurately identified compared to the speakers of a different language. Therefore, beyond universality, language specific

prosodic or syntactic features and social aspects are also important in recognizing emotions (Beaupre & Hess, 2005; Elfenbein, Beaupre, Levesque, & Hess, 2007). Because intersubjective markers are often conveying emotions to others, I thus propose that some intersubjective markers such as sentence-final particles are a kind of language-specific emotional synergies' device. Thereby, in this process, not only individuals' sense of self in which interaction and emotions, but also our sensed, intersubjective language markers, intersubjective relations with others, and the social world in which we are situated are woven together.

**5.2. Universals**

Because of the common biological ground on mirror neurons, there exist some universals aroused from the embedded or nested interpersonal synergy. With shared motor information, embodied simulation, and embedded interpersonal synergies, interlocutors can produce mutual shaping of meaning through intersubjectivity.

I have talked about sentence-final particles in East Asian languages which are prominent characteristics of intersubjective markers. I have discussed that intersubjectivity indicates some features of pragmatic inference. Language thus employs intersubjective markers to conventionalize the pragmatic inferences and produce conventionalized mutual shaping of meaning, and intersubjectivity might indicate some universal features of pragmatic inference. Besides East Asian languages, many other languages show this kind of intersubjective pattern to some extent.

Final particles in English have not received enough attention and research yet. There is a limited number of final particles in English with ambiguous word-class membership and their grammatical status is undetermined. The word-class of final particles in standard English grammar is less established than in other languages; nevertheless, it displays some similar pragmatical features and similar evolution patterns of East Asian languages.

According to Haselow (2012), final particles in English occur in the syntactic periphery and may indicate subjective or intersubjective meaning components and thus provide a kind of comment on the propositional unit they accompany. For instance, final *then*, marks the utterance accompanied as a pragmatic inference drawn from prior discourse as violating expected type of contribution. Their function is adding procedural information, i.e., information indicating how the utterance is to be processed in a specific context and linked to another utterance (Haselow, 2012). Haselow (2012) thought that final particle does not merely represent factual information, for instance, final though, one standing in a contrastive relation to a preceding utterance. In this sense, the speaker can manipulate the communicative context in a specific way and structure the discourse. That is, intersubjectivity indicates some universal features of pragmatic inference and concern on long-distance relationships between prior synergies and subsidiary synergies. Furthermore, Haselow (2012) concluded that the emergence of final particles in English needs to focus on the fixing of discourse strategies. That is, in spoken discourse, speakers use lexical items to denote pragmatic functions and pragmatic inference and, in the next step, lexical items are syntacticized to form part of discourse constructional units.

In addition, intersubjectivity markers are expressions often conveying emotions to others which display some emotional universality (Zhu, 2016). Particle *maliya* in Korean as an emphasis marker might be used to emphasize speaker's feelings and elicit emotional reactions from the addressee. The usage of counterexpectation marker is often used to express surprise and seek confirmation from the addressee. Based on these functions, *maliya* developed into a negative emotion marker to intensify speaker's negative feeling especially to express complaint or annoyance and seek for addressee's empathy about his emotion (Ahn & Yap, 2013). In contrast to particle *maliya* in Korean, particle *ke* in Cantonese shows the very similar emotional characteristic of these kinds of final particles. Particle *ke* in Cantonese is also used as an

emphasis marker and can emphasize speaker's feelings. Also, particle *ke* is used to emphasize speaker's disbelief or surprise of counterexpectation in an interrogative context. It is interesting to see that there is another particle *ka* which is the combination of particle *ke* and particle *a* which is often used as a kind of pragmatic softener in Cantonese. Particle *ka* is often used to emphasize the speaker's surprise of deviation from speaker's expectation too. A similar development has taken place that particle *ka* may also be used as a negative emotion marker to express speaker's negative feelings especially complaint or dissatisfaction (Peng, 2014). I suggest that the similarity between the particles in the above two languages is because of the similar emotion synergy and its purpose. The interlocutors emphasize the relevance of utterance to counterexpectation and negative emotion for reminding contradiction of expected norms which is very important for effective coordination.

In brief, intersubjectivity indicates some universal features of pragmatic inference and consideration of relationships between action and emotion synergies grounded on mirror neurons across diverse languages.

### 5.3. Language Specific Peculiarities

Thus far, I have discussed the nature and the universal features of intersubjectivity. However, besides the universals across diverse languages, language specific and culture specific peculiarities have certain effects on intersubjectivity.

The grammar of East Asian languages is characterized by the economy to grammar and high relevance of pragmatic inference (Bisang, 2009, 2015). Since grammar is economic, it leaves more room to pragmatic inference than many other languages. Consequently, East Asian languages often have a simple surface structure but more complicated pragmatic inference. Since subjectification and intersubjectification is based on pragmatic inference (Traugott, 2010), it is not surprising to find more subjective and intersubjective markers in East Asian languages than in many other languages.

I will put forward a hypothesis here that the more intersubjective markers a language has, the more embedded or nested interpersonal synergies it has and the more it focuses on pragmatic inferences especially emotional expressions and interpersonal relationships. It implies that East Asian speakers give more consideration to interpersonal synergies and addressees so that this language device of pragmatic inference has already been conventionalized and penetrated these languages. So, more intersubjective markers and more embedded interpersonal synergies display the deeply shared interactional history of the whole language group. Nevertheless, there are not so many sentence-final particles in other languages such as French, German, and English. I believe this is because explicitness is more important and required in these languages; thereby, consideration of addressees and shared interaction history are not the key points to be conventionalized.

To summarize, the above languages with high emotional synergies often have the features of collectivist cultures or traditional features. High emotional synergies in languages lead people to pay more attention to the interpersonal relations to acquire harmonious social relations; thereby tend to develop collectivistic cultures. On the other hand, variant culture rules regulate emotional expressions and understandings which reveal the very complicated interaction between language and culture. I mainly demonstrated the nature of subjectivity and intersubjectivity through the neural mechanism and typological evidence from East Asian languages in the present paper. The relationship between mirror neurons and (inter)subjectivity proposed in this paper is but a first step requiring much typological evidence and theoretical development. More research is needed to account for the detailed interaction of language interpersonal synergy especially emotional interpersonal synergy and how pragmatic inferences hold the part in the procession of intersubjectivity. Moreover, the peculiars of intersubjectivity and the relationship between mirror neurons and intersubjectivity proposed in

this paper are but an initial step in this line of research. Future research should address neural mechanisms of mirror neurons, intersubjectivity, and emotional interpersonal synergy in detail.

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