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## Extending Cognitive Pragmatics: Social Mechanisms of Mind Transformation

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### Abstract

In this article we propose an extended approach in terms of Cognitive Pragmatics (CP) to the explanation of the development of the higher cognitive processes. Therefore, we explain in terms of CP how linguistic and pre-linguistic social practices shape the mind. CP, as we understand it here, presents a broader transdisciplinary position covering developmental psychology, primatology, comparative psychology, cultural psychology, anthropology

and philosophy. We present an argumentation for the thesis that CP provides an explanation to the origins and developmental mechanisms of some of the higher mental functions unique to humans. Thus, we want to extend the notion of CP beyond its standard definition by emphasizing the transformative component of communicative acts. In our approach, CP first and foremost examines the cognitive mechanisms underlying social pre-linguistic and linguistic communication. Secondly, it explores how this communication reorganizes and transforms cognitive abilities and processes. We would like to extend the tasks of CP as well, because its goal is not only to describe cognitive processes that enable communication, but also to explain the social mechanisms of the transformation of mind and cognition. We provide an example of the said mechanisms of the development of higher cognitive functions through the account of metacognition.

## Introduction

Cognitive Pragmatics (CP) is an answer to the question regarding the cognitive basis for the pragmatic relation of the user-language-world (Horn, 2004; Noveck & Sperber, 2004; Turnbull, 2003). What is mostly emphasized in the definition of CP is that “it is the study of the mental states of people who are engaged in communication” (Bara, 2010, p. 1). One of its main features is “basing the analysis of communicative interactions on mental states”, which means “first and foremost, examining individual motivations, beliefs, goals, desires, and intentions” (Bara, 2010, p. 1). This approach to CP, despite being an endeavor fruitful in scientific findings, shows only one side of the proverbial coin, that is, descriptions of the mental processes engaged in communication. The other side of the coin is that engagement in acts of communication transforms and reorganizes the structure of a given mind. The emphasis on this second aspect is important because it does not only answer the question of what cognitive abilities facilitate in the case of pre-lingual and lingual communication, but also how engagement in social interaction and the acquisition of sign use affects the formation – or as we call it – *transformation* of a given human mind (Tomasello, 2014; Kern & Moll, 2017; Żuromski, 2020, 2020a).

In our perspective, language is treated as more than a tool (Sperber et al., 1995) to express mental states. It is a complex *socio-cultural artefact*, that came to be partly because of cumulative cultural evolution (Tomasello,

1999, 2014; Sterelny, 2016; Christiansen & Chater, 2016). In order to acquire it, one needs specific cognitive abilities (i.e., joint attention: Racine & Carpendale, 2007a, 2007b; Carpendale et al., 2007), social experience (common ground: Clark, 1992, 1996) and it also requires taking part in social practices such as joint attentional frames (Tomasello, 1999). This view on language and social practice can be traced to Lev Vygotsky (1999), who differentiated elementary mental functions such as perception or memory, and higher cognitive abilities such as “voluntary attention”.<sup>1,2</sup> He postulated about the latter that they are a result of the transformation of elementary mental functions, which is possible due to the internalization of social interactions mediated by language.<sup>3</sup> The final result of such advancements is the mediation of cognitive processes and therefore the self-regulation of the subject.

With its emphasis on such elements as the *cognitive* role of a sign, language and *social interactions* (language and pre-language), their *transformative* character for cognitive processes, and its influence on achieving higher cognitive functions, CP is distinguished from cognitive semiotics

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<sup>1</sup> For an extended discussion see Toomela (2016). See also Table 2 below and the discussion in the context of Dual-Process Theory.

<sup>2</sup> Returning to Vygotsky’s ideas does not mean regressing to the psychology of the 1930s. We are currently experiencing a renaissance of his ideas, especially among researchers who want to explain uniquely cognitive human abilities in a social context (Tomasello, 2019; Heyes, 2019). For example, Tomasello describes his Shared Intentionality Theory as A Neo-Vygotskian Theory (this is the title of the entire 11th chapter: Tomasello, 2019) and shows that it is a theory that overcomes some of the weaknesses of alternative positions such as Individualistic Theories and Sociocultural Theories. As Tomasello points out: “Shared intentionality theory is a Vygotskian theory because it is focused not on all of human psychology but only on uniquely human psychology, and it explains uniquely human psychology mainly in terms of the unique forms of sociocultural activity in which individuals engage over the life course. But we have attempted to fashion a modernized *neo*-Vygotskian theory by invoking an evolutionary approach to human ontogeny in which individuals are biologically adapted in specific ways for engaging in their species-unique forms of sociocultural activity” (Tomasello, 2019, p. 304).

<sup>3</sup> In his research on higher mental functions, he focused his attention on signs (as the broader category of “psychological tools”) and, in particular, on speech. However, both can be understood as the “Vygotskian cognitive conception of language” (Ferryhough, 2008, 2009). For more details on the idea of “language as a psychological tool that can augment pre-existing cognitive capacities” or more generally, “the language that ‘gets into the head’ to transform our prelinguistic thought processes [...]” see: Ferryhough (2008, p. 230; 2009, p. 42).

understood as “transdisciplinary [...], field focused on the multifaceted phenomenon of meaning” (Zlatev, 2015, p. 1043).<sup>4</sup>

Cognitive semiotics accentuates the question of which cognitive processes participate in meaning-making, whereas for CP, most relevant remains the role of the sign and social interactions (language and pre-language) in the context of the creation of cognitive abilities. This way of thinking, while not obvious, is gaining more and more traction. One of the reasons for its lack of obviousness is the separation of natural language from cognition. In cognitive science, lately the following view has been dominant:

Cognition consists in the manipulation of language-like structures according to formal rules. Since cognition is ‘linguistic’ in itself, according to this view language is just a complex communication system and does not influence cognitive processes in any substantial way (Mirolli & Parisi, 2009, p. 517).

In this place, voice is given to approaches that focus on *social interactions* (linguistic and pre-linguistic) as a source of the mechanisms for creating cognitive abilities, and especially higher mental functions, such as *mindreading* (Garfield, Peterson & Perry, 2001; Carpendale & Lewis, 2004, 2006; Heyes & Frith, 2014; Heyes, 2018; Tomasello, 2002, 2018, 2019, 2020; O’Madagain & Tomasello, 2019; Moore, 2020). Researchers that were ahead of their time, such as Vygotsky, and contemporary ones, such as Tomasello or Heyes, asked questions about sources of distinctively human cognitive abilities, they conducted empirical studies on complex mechanisms of their creation and development and set the category of cognitive processes that arise in such ways. And so, for Vygotsky, it was higher cognitive functions, for Tomasello processes and actions structured by social interactions based on shared intentionality, and finally, for Heyes, “cognitive gadgets”:

New cognitive mechanisms [...] have emerged, not by genetic mutation, but by innovations in cognitive development. These novelties have been passed on to subsequent generations, not via genes, but through social learning; people with a new cognitive mechanism passed it on to others through social interaction [...] They are “gadgets” rather than

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<sup>4</sup> See Zlatev (2011, 2012, 2015), Konderak (2018).

“instincts” (Pinker, 1994), because, like many physical devices, they are products of cultural rather than genetic evolution (Heyes, 2018, p. 2).

In the light of these definitions of pragmatics and their reference to social cognitions, we formulate the aim of this paper, which is to present an argumentation for the thesis that CP provides an explanation for the origins and developmental mechanisms of the higher mental functions unique to humans. Thus, we want to extend the notion of CP beyond its standard definition by emphasizing the transformative component of communicative acts. In our approach, CP first and foremost examines the cognitive mechanisms underlying social pre-linguistic and linguistic communication, which generalizes the aforementioned Bara’s account. Secondly, it explores how this communication reorganizes and transforms cognitive abilities and processes. We would like to extend the tasks of CP as well, because its goal is to not only describe cognitive processes that enable communication, but also to explain the social mechanisms of the transformation of the mind and cognition (Żuromski, 2020, 2020a). We would like to provide an example of the social mechanisms of the development of higher cognitive functions through the account of metacognition: “Metacognition is tuned for social interaction by social interaction” (Heyes et al., 2020, p. 359).

### Extended understanding of Cognitive Pragmatics

Researchers who study the sign in the context of cognitive sciences see the need to distinguish “traditional semiotics” as a research field dealing with the general theory of the sign (Nöth, 1990, p. 14) from cognitive semiotics as a research field dealing with the sign/meaning in the context of cognitive processes and influence on behavior:

It is not a coincidence that cognitive semioticians indicate Jean Piaget, Lev Vygotsky, Merlin Donald and Michael Tomasello as “intellectual fathers” of cognitive semiotics (Konderak, 2018, p. 26).

Just as there are reasons to distinguish between “traditional semiotics” and “cognitive semiotics” (Zlatev, 2011, 2015; Konderak, 2018), in a similar way, one can distinguish between “traditional pragmatics” and “cognitive pragmatics” (Bara, 2010). In this article, we put CP above cognitive semiotics because we want to emphasize the research on the relationship of sign/

meaning, and cognitive processes/behavior in the context of dynamic social interactions. This understanding of CP can be found in the writings of Vygotsky, where he stresses that

Verbal stimuli directed toward the child himself, being transformed in the process of evolution from a means of stimulating another person to stimulating one's own behavior, radically reconstruct his whole behavior (Vygotsky, 1999, p. 25).

In pragmatics studies we can distinguish two classical approaches and a third, more avant-garde, which, however, would not be possible without the previous conventional accounts (Huang, 2017). The first, Anglo-American approach, is represented by the classical (Austin, 1962; Grice, 1989) and neo-Gricean pragmatics theory (Levinson, 2000; Huang, 2017), and relevance theory (Sperber & Wilson, 1995). In this approach, pragmatics is understood as the “systematic study of meaning by virtue of, or dependent on the use of language” (Huang, 2017, p. 2). The second is the European Continental approach, which refers to an interdisciplinary approach to language use (Verschueren, 2017). In this sense, linguistic pragmatics can be described as a new way of viewing the particular phenomena from different linguistic disciplines, rather than separating itself from them (Verschueren, 2017; Haberland & Mey, 1977). The combination of both Anglo-American and European Continental approaches has resulted in the newest look at pragmatics, sometimes called simply macro-pragmatics, due to its wide scope of research on language in all aspects, including social and cultural. Studies conducted by P. Brown and N.J. Enfield could be an example of such research (Stivers et. al., 2009).

In our approach, CP is to be understood as a relatively autonomic and interdisciplinary research field which studies *inter alia* the crucial issue of how linguistic social interactions generate and reorganize the cognitive processes of a subject. Thus, the aim of CP is not a pure description of linguistic behavior but an explanation in mechanism-based terms of the linguistic mediated transformation of cognitive processes. In our account of CP, we focus on what we consider to be two aspects of the same process: how language serves in inter-individual communication, and how it internalizes and then generates and reorganizes intra-individual cognitive processes. Conversely, separating the communicative role of the sign and its cognitive role as a medium of representation makes it difficult to understand the transformational

role of the sign in the cognitive system. Meanwhile, these two are closely connected, as Astington and Baird show:

Many species represent and communicate, but only humans use one and the same system for both representing and communicating. Human language is used both as an intra-individual representational system, on the one hand, and as an inter-individual communication system, on the other (Astington & Baird, 2005, p. 6).

Contemporary conceptions treat the “inter-individual communication system” as a result of the expressive function of the “intra-individual representational system” or as irrelevant in explaining its cognitive basis. In our take, this order of explanation is one-sided. Vygotsky emphasized this element by saying that speech should not be limited to expressive functions (communication of internal states) because then “the whole individual-psychological aspect and the whole transforming internal activity of the word simply remain apart” (Vygotsky, 1999, p. 67). That is why we would like to propose the reversal of this order of explanation according to the *first between, then within* principle. This principle is an abstraction of Vygotsky’s *general genetic law of cultural development*:

Every function in the cultural development of the child appears on the stage twice, in two planes, first, the social, then the psychological, first between people as an intermental category, then within the child as a intramental category [...]. Genetically, social relations, real relations of people, stand behind all the higher functions and their relations (Vygotsky, 1997, p. 106).

The origin of higher psychological functions lies in language-based social interactions. A sign incorporated into the natural developmental process and adopted by the child (within the cultural developmental line) reorganizes i.e., transforms the cognitive system and its elementary mental functions, such as attention, memory, perception, and thinking, into higher functions. We call this the transformational conception of the sign. The best known example of research on this law was Vygotsky’s work (Vygotsky, 1987, Wertsch, 1985) on verbal thinking (inner speech) and describing it as a gradual process of internalization stemming from social speech, through private speech (or egocentric speech, in terms of Piaget) and finally, arriving at inner speech. In case of the process of internalization, as

Vygotsky emphasized, the function of language changes as well. In the very beginning, it serves as a function meant for the behavior control of others (social speech), and then as an executive and self-regulation function for cognitive processes and behavior (private and inner speech). More in line with contemporary thought, Fernyhough (2008, 2009) suggests that both the order of explanations and Vygotsky's research on verbal thinking give us an insight into the processes of dialogical thinking, which have their source in external (social) dialogue.

Today, this idea has been developed by Tomasello; however, it emphasizes social pre-linguistic interactions structured by the skills and motivations of *shared intentionality* (Tomasello, 2015, 2016, 2019). The aforementioned array of abilities has a uniquely human character and enables cooperation, language acquisition, and the creation of culture. It also serves a transformative role: "participation in interactions involving shared intentionality transforms human cognition in fundamental ways" (Moll & Tomasello, 2007, p. 7; Kern & Moll, 2017). The crucial element in Tomasello's Shared Intentionality Theory is the description of how social interactions structured by shared intentionality create new type of representations, inferences and self-control (Tomasello, 2015). In particular, Tomasello explains the transformational concept of the sign where, on one hand, social interactions in tandem with the sign change the child's representations towards the world (child → world). On the other hand, the very same elements change the dispositions of the child towards its own behavior and self (child → mind). A child, while acquiring language skills, can participate in a specific type of discourse – what Tomasello calls "Perspective-Shifting Discourse" (Tomasello & Rakoczy, 2003; Tomasello, 2018, 2020; O'Madagain & Tomasello, 2019) – to exemplify: disagreements, clarification sequences, didactic interactions, and reflective discourse. In order for a child to understand the communicative intention of the interlocutor, "she is led to examine her own thinking from the perspective of the other" (Tomasello, 1999, p. 172). Whereas "[i]nternalizing the view of the other on her own view then leads the child to [...] the ability to self-monitor her own cognitive processes" (Tomasello, 1999, p. 172).

Thus, CP should also explain the formation of cognitive abilities – primarily uniquely and specifically human, and not only the description of cognitive abilities underlying communication. The demonstration that the scope of CP research objects should also include those phenomena



that have not been considered in it so far, is not arbitrary or only postulated, but is a consequence of this broadening of the understanding of the concept of CP. That is, the fact that CP deals with phenomena that have not been considered in it so far, is a consequence of broadening the understanding of the concept of CP, because it takes into account not only the research on cognitive abilities that lay in the foundation of social language interactions. As Vygotsky (1997), Fernyhough (2008) and Tomasello (2014; 2019) show, if said interactions are formed by abilities such as shared intentionality, then that might lead to the transformation and reorganization of a single mind and therefore, of its capacities – a transformation from elementary to higher mental functions. In our approach, shared intentionality is a mechanism of the transformation of the mind (Kern & Moll, 2017; Żuromski, 2020), and one of the main goals of CP is to provide the explanation of the nature, taxonomy, and structure of such mechanisms.<sup>5</sup> The term “transformation” encompasses not only ontogenetic domains and mechanisms, but also evolutionary and socio-cultural ones (Tomasello, 2014, 1999; Wertsch, 1985). As an example, in the case of the ontogenetic domain, one can refer to the theory of Tomasello and his colleagues:

We argue for the importance of processes of shared intentionality in children’s early cognitive development. We look briefly at four important social-cognitive skills and how they are transformed by shared intentionality. In each case, we look first at a kind of individualistic version of the skill – as exemplified most clearly in the behavior of chimpanzees – and then at a version based on shared intentionality – as exemplified most clearly in the behavior of human 1- and 2-year-olds. We thus see the following transformations: gaze following into joint attention, social manipulation into cooperative communication, group activity into collaboration, and social learning into instructed learning (Tomasello & Carpenter, 2007, p. 124).

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<sup>5</sup> Kern and Moll (2017) make an important distinction between the additive account of collective intentionality / shared intentionality (SI / CI) and the transformative account of SI / CI and argue that the contemporary debate on SI / CI – in particular the “Big Four” of the canonical representatives of the debate on SI / CI: John Searle (1990, 1995, 2010), Margaret Gilbert (1989, 2013), Michael Bratman (1999, 2014), and Raimo Tuomela (2007, 2013) – assumes an additive account of SI / CI, mainly due to a different assumption, i.e., methodological individualism. A polemic with this argument is contained in (Żuromski, 2020).

In Tomasello's theory, "transformation" means that there are some basic capacities that we share with great apes, such as individual intentionality. Additionally, humans have developed the specific skills and motivations of shared intentionality, which are unique for their species. The collision of those two paths of evolutionary development creates unique and specifically human cognitive abilities i.e., social cognition, communication, cultural learning, collaboration, and prosociality, as the result of constructive process of at least three components:

- a) the "maturation component" (the nine-month revolution) – children gain cognitive abilities that are uniquely human and take part in shared intentionality;
- b) social experience – through their social interaction structures by shared intentionality, children form new abilities such as cognitive representations, inferences, and self-control;
- c) executive self-regulation (the individual, social self-regulation, and normative self-governance) – capacities and experiences lead to active regulation and the control of cognitive processes i.e., coordinating conflicting perspectives.

And so, one of the tasks of CP is the formulation of hypotheses concerning the mechanisms that generate higher psychological functions. In the following sections of this paper, we would like to extend the tasks of CP with an explanatory component. Moreover, we would like to take a closer look at the capacities of metacognition (e.g., self-knowledge, self-regulation, reflection) as something that is developed as the result of social interaction, namely "the ability to take others' perspectives on the self" (Tomasello, 1999, 2019; Carpendale et al., 2007).

### Mechanistic explanations in CP

The goal of extended CP is a mechanism-based explanation of phenomena rather than just their description. According to the mechanistic conception, explaining a given phenomenon consists in formulating a hypothesis regarding the mechanisms underlying this phenomenon (Bechtel & Richardson, 1993; Bechtel, 2008; Craver, 2009). The mechanism here "consists of entities and activities organized in such a way that they are responsible for this phenomenon" (Illari & Williamson, 2011, p. 120). Therefore, we treat the previously mentioned approaches to the higher psychological

functions of Vygotsky, Fernyhough and Tomasello as a description of the socio-linguistic transformative mechanisms underlying cognitive processes. CP understood this way requires the adoption of interactive explanation relying on social interaction playing an enabling or constitutive role (De Jaegher et al., 2010; Rochat, 2009).

However, postulating a certain order of explanation based on Vygotsky's idea can generate disputes characteristic of the social sciences, in particular regarding the proper methodology of social sciences or methods for explaining social facts. One of the main views in this argument is methodological individualism, which considers that "social phenomena [...] should be explained solely in terms of individual intentional states and the relations between those individuals" (Tollefsen, 2017, p. 392). This can stand in opposition with the aforementioned Vygotsky's rule (*first between, then within*) which posits a certain primacy to *interpsychological* relations over *intrapsychological* states. Responding to this objection, it is worth noting that mechanistic explanation and multilevel analysis allows for a new interpretation of the dispute over methodological individualism or micro-macro relationships in the social sciences. Within the social sciences, an approach has also been developed, since at least the 1970s, for mechanism-based explanation (Hedström & Ylikoski, 2010). However, as Ylikoski (2012, 2018) shows convincingly, applying the concept of explanation currently formulated by biology philosophers to the social sciences ends up shedding new light on old disputes, in particular between methodological holism and individualism or the dispute over micro-macro relations in the social sciences. From the point of view of mechanistic explanation, these arguments in the social sciences are based on assumptions that lose their suggestiveness in this explanatory scheme. In particular, the very position of methodological individualism takes the form of the thesis of intentional fundamentalism, stating that the intended intentional explanations are at a privileged explanatory level in the social sciences (Ylikoski, 2012, 2018). And as Thagard (2008, 2013) shows convincingly, in explaining cognitive processes, when referring to mechanism-based explanation, there are no privileged levels of explanation. An explanation of cognitive processes requires a simultaneous integration of various levels of explanation, such as molecular, neural, psychological, and social. In this context, CP would be situated at the social or interpersonal level of explanation, whose main object of study

are the mechanisms of the transformation of the mind (Żuromski, 2020; Żuromski, 2020a).

An example of theory – from beyond Vygotsky’s tradition and at the same time strongly rooted in contemporary cognitive science – that postulates an interpersonal or supra-personal level of explanation (and also specific (for this level) mechanisms such as cultural learning) for explaining specifically human cognitive abilities is the idea of “cognitive gadgets” by Cecilia Heyes. Heyes (2018) posits the argument that in order to explain “distinctively human cognitive mechanisms” we have to refer to not only a personal and sub-personal, but also supra-personal level of explanation (Cf. Shea, N. et al., 2014; Heyes et al., 2020; Heyes, 2018). Moreover, Heyes introduces a distinction that emphasizes her stance in an interesting manner, that is, the differentiation between the grist vs. the mills of the human mind. Her argumentation can be expressed in the following manner: We refer here to a supra-personal level of evolutionary explanation for specific creations and artefacts of mankind (the grist of the human mind) such as tools, behaviors, social practice (e.g., honey-gathering). At this level of explanation, we do not refer to processes connected with genetic evolution, but rather with cultural evolution, that is, processes such as cumulative cultural evolution, which enables the accumulation of innovation and its modification over generations. This way we can explain that humans not only create tools, but also advanced technology used for the creation of tools; that human can not only communicate with each other, but create complex symbolic systems such as mathematics; that human not only live in a society, but also through convention, social norms and language create institutions such as marriage, governments or countries (Tomasello, 2002, 2016). Such processes require specific forms of cooperation, communication and processes of learning to which many units are employed and on many levels. However, these specific forms of human activity – those that have been the subject of the intense empirical and theoretical research of the last decades, such as cognitive psychology, primatology, developmental psychology, and neuroscience – are based on distinctively human cognitive mechanisms (the mills of the human mind), including imitation, theory of mind, cultural learning, language, causal reasoning, episodic memory. Cultural evolution changes not only the grist but also the mills of the human mind (Heyes, 2019, p. 1).

What are the evolutionary sources of these distinctively human cognitive mechanisms? Heyes claims, in this part of explanatory progression, that the

cultural and social aspect dissipates. There is a trend in research revolving around cognitive abilities, which means to explain the said abilities by positing “natural, innate modules” or “cognitive instincts” – adaptations to the environment that are genetically inherited. Heyes renounces this view and provides an argument that this standard view “doesn’t align with cognitive science evidence” (2018). As an example, she gives the ability to read and write (Heyes, 2018, 2019). For instance, the ability to read text is associated with specialized neurocognitive mechanisms. However, language came to prominence barely 5,000 to 6,000 years ago and in the scale of evolutionary processes it is far too little time for genetic evolution to have been the creation of such neurocognitive mechanisms. And so, another biological mechanism that can formulate such abilities is social or cultural transmission – cultural evolution (Lewens, 2015; Henrich, 2015). The ability to read and write are not “cognitive instincts”, but rather cognitive gadgets:

Cognitive gadgets are distinctively human cognitive mechanisms – such as imitation, mind reading, and language – that have been shaped by cultural rather than genetic evolution. New gadgets emerge, not by genetic mutation, but by innovations in cognitive development; they are specialized cognitive mechanisms built by general cognitive mechanisms using information from the sociocultural environment. Innovations are passed on to subsequent generations, not by DNA replication, but through social learning: People with new cognitive mechanisms pass them on to others through social interaction (Heyes, 2019, p. 1).

This quote gives a new innovative look at the mechanisms of the generation of cognitive abilities.

### Metacognition explained in terms of CP

We have already formulated the thesis that CP reveals mechanisms of transformation of the mind, especially in the case of social and language mechanisms of developing higher forms of cognition. Currently, we would like to consider metacognition as an exemplification of such a transformation. We understand metacognition as “cognition about cognition” (Shea et al., 2014), i.e., “representation or evaluation of a cognitive state or process” (Heyes et al., 2020, p. 350). In other words: “Metacognition applies to all processes that control and monitor cognitive functions. That also includes reflexive epistemic states” (Proust et al., 2013). One such ability is self-knowledge

(SK) understood as a subject's knowledge about his or her own mental states (Cf. Gertler, 2017; Peacocke, 1999; Schooler et.al., 2011; Neisser, 1988). Characteristic for this kind of metacognition is introspection, consisting in direct insight into the contents of consciousness as a method of acquiring knowledge about oneself. This method gives the subject the authority over his or her own mental states guaranteed by the privileged access to these states. Mistakenly, introspection can lead to the assumption that metacognitive states in SK are only internally constituted. Namely, typical of internalist models of self-knowledge is passing over the significance of the element external to the subject for the shaping of his or her knowledge about himself or herself. This crucial external element is the subject's social environment. The application of CP to SK is an attempt to overcome the internalist point of view in the formation of higher cognitive abilities.

Although SK arises owing to the subject's privileged access to his or her own mental states, and therefore has an individual dimension, it must be socially constituted to function properly (Pacholik-Żuromska, 2019). With the acquisition of language in the dyadic reciprocal interaction, a child acquires the ability to metacognition whilst developing metarepresentations (Cf. Brinck, 2013; Clark, 2005; Carruthers, 2009). In particular, metarepresentations create knowledge about the mental states of other people, albeit language practices function not only as an intersubjective tool to understand others, but also to understand oneself (Cf. Brinck, 2013). The commonly recognized non-social mechanisms of the formation of SK are perceptual and proprioceptive information processing. Both provide "implicit self-related information" (Musholt, 2012); however, SK requires also "explicit self-representation" (Musholt, 2012), which is formed due to participation in social language practices.

Implicit self-related information is present in infants under nine months of age. The formation of explicit self-representation begins around nine months of age. At that time, the ability to pay attention develops, allowing the child to follow the attention of others. Communication starts in a prelinguistic form parallel to the development of shared intentionality (one- to two-year-old children) allowing them to understand others as intentional agents. More developed communication skills accompany collective intentionality (four-year-old children), which in turn allows them to understand others as mental agents and to take others' perspectives on the self (Tomasello, 1999, 2019; Carpendale et al., 2007). This ongoing

process of natural cognitive development is accompanied by the development of language practices and leads to the highest level of cognition, namely SK as a socially constituted ability.

In the light of CP understood as a mechanism-based explanation, language practices are a tool for the acquisition of SK because they enable the confrontation of one's own perception with the perception of others. Thanks to this confrontation, a child starts to understand that others also have mental states, and their states can be different from the child's, because other people can literally have a different perspective. The experience of selfhood arises at the moment when the distinction my perception (my experience) vs. the perceptions (the experiences) of others is understood. The mechanism of CP underlying SK allows the distinction me-others to be made explicit, by using a sign as a tool for the semiotic mediation of mental states.

The coupling of the biologically and socially embedded development of metacognition is crucial for the theory of metacognition as a kind of cognitive gadget, presented by Heyes (2016, 2020). Heyes, on the one hand, does not ignore the biological (internal) factors influencing the formation of SK in its initial stadium, but on the other hand she also considers non-neural elements coming from the social environment of the subject to be crucial factors. The biological basis of the formation of SK is the connection between stimulus and motoric formed in the observation by children of their own movement. So a pathway between the motor representation of one's own movements and the sensory representation of this movement is built during self-observation in associative system learning (Heyes, 2016). Developing such a pathway enables the child to imitate the behavior of others. And imitation, also considered by Heyes as a cultural artefact (or cognitive gadget), is highly important in the child's early communication with its mother. Studies on the development of intersubjectivity in prelinguistic communication have shown that six-month-old children have a whole repertoire of behaviors in establishing contact with their parents, from smiles, through chatting and pointing, to gradual dissatisfaction and finally crying (Cohn & Tronick 1983; Moore et al., 2001). This early stage in communication makes it possible to build the first interpersonal relation and to recognize the me-other distinction. At the later stage of communication, when a child already possesses language, dialogue with others becomes a part of the child's own beliefs, i.e., it starts to be internalized (Cf. Vygotsky, 1987; Fernyhough, 2008).

SK thus develops with language acquisition and first social interactions such as playing, which is consistent with the thesis that metacognition evolved culturally (Heyes, 2016; Heyes et al., 2020). Such cultural evolution can be understood as a process of adaptation and selection adjusted to the social environment. Metacognition would then be a result of interaction by the use of language. CP assumes thus that the development of communication skills goes hand in hand with the development of cognitive abilities. In every act of communication, the self-others coupling is reinforced. The me-other tension is a natural factor influencing the creation of the autonomous self-knowing subject.

Until this point, we have formulated our thesis about CP in Vygotsky's terms, that is, by distinguishing elementary and higher psychological functions. This requires a commentary. First of all, our goal is not a return to Vygotsky's psychology nor to express in his theory the modern interdisciplinary approach to cognition. Rather, it is to go beyond his theory that is rooted in the psychology of the 1930s, in the sense of capturing his main ideas within the framework of current cognitive science. That way, the main emphasis is put on the mechanisms of creation and the transformation of cognitive abilities.

We distinguish three models of such mechanisms: 1. pre-linguistic; 2. linguistic and 3. cultural evolutionary:

1. The pre-linguistic model refers to Tomasello's Model, where the starting point is within pre-sign social mechanisms (the skills and motivations of shared intentionality) that also create and transform cognitive abilities.
2. The linguistic model refers to Vygotsky's Model, where focusing on different social and communication mechanisms of creation and the transformation of cognitive abilities reveals in particular how socio-sign mechanisms create and transform cognitive abilities.
3. The cultural evolutionary model refers to Heyes' Model, expressed in the language of the cognitive science idea of cultural evolutionary psychology, that unveils the mechanisms of "cognitive gadgets" – "distinctively human cognitive mechanisms" (Heyes, 2018).

What they have in common is that they are:

- a) models for the formation of cognitive abilities,
- b) intended to be models for the formation of specifically and uniquely human cognitive abilities,



c) consistent with the order of explanation *first between, then within* postulated here,

d) framed in terms of the social mechanisms of mind transformation.

Secondly, although the division between elementary and higher cognitive abilities is not popular in today’s cognitive psychology, the divisions that are proposed have similar intuitions to this fundamental distinction (Evans, 2008). One of these theories, through which one can explain our thesis that CP reveals mechanisms of the transformation of the mind, especially in the case of social and language mechanisms of developing higher forms of cognition, is the “Dual-Process Theory”, where the intricacies of underlying mechanisms of cognition remain a debated subject in contemporary discourse. Currently, cognitive systems explained by “Dual-Process Theory” are composed of two subsystems that work in tandem to facilitate metacognitive functions (Evans, 2008; Evans & Stanovich, 2013; Kahneman, 2011).

Table 1. Clusters of attributes associated with dual systems of thinking  
(Table from: Evans, 2008, p. 257).

System 1	System 2
Cluster 1 (Consciousness)	
Unconscious (preconscious)	Conscious
Implicit	Explicit
Automatic	Controlled
Low effort	High effort
Rapid	Slow
High capacity	Low capacity
Default process	Inhibitory
Holistic, perceptual	Analytic, reflective
Cluster 2 (Evolution)	
Evolutionarily old	Evolutionarily recent
Evolutionary rationality	Individual rationality
Shared with animals	Uniquely human
Nonverbal	Linked to language
Modular cognition	Fluid intelligence
Cluster 3 (Functional characteristics)	
Associative	Rule based
Domain specific	Domain general
Contextualized	Abstract
Pragmatic	Logical
Parallel	Sequential
Stereotypical	Egalitarian

Cluster 4 (Individual differences)	
Universal	Heritable
Independent of general intelligence	Linked to general intelligence
Independent of working memory	Limited by working memory capacity

System 1 uses fast, involuntary, unconscious responses and simple heuristics to achieve output, while System 2 employs mostly conscious processes which are analytical, employ reasoning and most importantly, allow us to override the output of the first system. Still, the case remains open if such so-called stepping in utilizes mindreading or not. Our thesis considers features that characterize elementary and higher psychological functions as corresponding to the specifics of System 1 and System 2 respectively (see Table 2).<sup>6,7</sup>

Table 2. The distinction between Vygotsky's conception of cognitive capacities (left column (Wertsch,1985)) and dual process theory (right column) approach that underlies the functional resemblance of these two viewpoints.

Elementary Psychological Functions	System 1
Governed by external stimuli	First-order signals are encapsulated within the perception-action loop
Lack of conscious realization of mental processes	Operates autonomously and does not require working memory
Individual origin of components of cognition	Operates implicitly and is for the control of processes within one agent

<sup>6</sup> In this case we do not rely on the details of dual systems theory; rather, we would like to postulate that such an approach is in line with our position and translates well to such a model. Furthermore, we want to emphasize the crucial role of social interactions in the creation of – the processes of social co-construction (Tomasello, 2019; Carpendale et al., 2016) – psychological functions, and in turn, metacognition.

<sup>7</sup> They differ in the assortment of traits that distinguish one class of processes from others. For instance, Kahneman (2011) characterizes S1 in a spirit similar to Vygotsky: “System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control” (Kahneman, 2011, p. 22). As an example of the functioning of S1, he gives different types of lingual utterances as automatic activities: i.e., The answer to “ $2 + 2 = ?$ ”. The defining trait of Vygotsky's higher psychological functions is “the assumption that mental activity is mediated by culturally derived sign systems” (Ferryhough, 2008, p. 227). Despite that, researchers would agree that higher psychological functions and System 2 are “in charge of self-control” (Kahneman, 2011, p. 28).

Higher Psychological Functions	System 2
Availability of self-regulation due to volitional control	(Explicit metacognition) used by processes of cognitive control
Social and cultural origins	Cultural selection as part of the origin
Conscious realization of mental processes	Involves conscious states like feeling or fluency

Then, Shea et al. (2014) and Heyes et al. (2020) concentrate on the structure and functioning of this two-system array. Shea et al. (2014) take into account the “Dual System Framework” in order to explain metacognition and claim System 2 functions for suprapersonal cognitive control. Heyes et al. (2020) provide argumentation for the cultural origins of at least some aspects of metacognition, pointing to cultural learning as a factor in the development of metacognition.

In our opinion, the transformative impact of social interactions is a crucial cause of the refinement and development of System 2 functionality and overarching metacognitive capacities. On one hand, there are some abilities (particularly these specifically human, such as SK), which would not develop without linguistic interactions (System 2), but on the other hand, not all manifestations or types of metacognition originate from social linguistic practices (namely those from System 1).

### Summary

In this paper we proposed an extended understanding of CP, while characterizing both its content and tasks. In the case of content, we introduced the notion of transformation as a class of pre-linguistic (including shared intentionality) and linguistic cognitive abilities and processes. If they take part in the structuration of social interaction, then they also lead to the transformation of basic mental functions into higher psychological functions. The extension of the task of CP required adding an explanatory function, and so we proposed a mechanism-based explanation as an execution of the said function. On the basis of Vygotsky’s, Tomasello’s and Heyes’ conception we proposed to “turn over” of the order of explanations (*first between, then within* principle) of higher psychological functions, which takes social interactions formed through transformative abilities as a starting point. By combining these two extensions we arrive at an account of CP that is meant

to be a description of a domain where empirical and theoretical hypotheses concerning the mechanisms of transformation are formulated, and how cognitive capacities turn into higher psychological functions. We made an attempt to show how this transformation works on the example of self-knowledge as this kind of metacognition, which is based on social interaction. This can be understood as a proposal of an interdisciplinary research paradigm concerning inquiry on the social mechanisms of transformation of mind and cognition.

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To emphasize the individual work put into this paper: DŻ 50% – general conception of the paper, preparation of the chapters: Extended understanding of Cognitive Pragmatics, Mechanistic explanations in CP, explanation of the dual system: ideas: social mechanisms of mind transformation, transformational conception of the sign, the interpersonal level of explanation, summary; APŻ 30% – preparation of the chapter Metacognition explained in terms of CP, introduction to pragmatics, summary; AF 20% – explanation of the dual system, query, text and tables edition, English proofreading, summary.

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