

# Interdisciplinary Review on 6 Concepts Relevant to Non-Perceptual Social Interaction

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**Abstract**

Phenomenon from everyday life that is routine and mundane for all of us, if it exists, then it should be visible from and can manifest itself through different studies. Thus, the observation of various studies from different social sciences has been chosen to find evidence of unconscious mental collaboration between individuals. The review aims to substantiate the assumption of nonperceptual social interaction by analyzing the results of studies on 6 known concepts: Theory of Mind (ToM), Visuospatial Perspective taking (VSP), Implicit memory, Unconscious thinking, Interpersonal perception, and Socialization. The review introduces the new concept of nonperceptual social interaction, proposing one of its explanations based on the existing laws of physics – the theory of Coherent Intelligence.

**Keywords:** Implicit memory, Unconscious thinking, Interpersonal perception, Socialization, Coherent Intelligence, Non-perceptual Social Interaction

**Introduction**

The constitution of objective reality, which is the only one for all of us instead of many personal realities, formation of values and social reality with common beliefs and norms are fundamental issues which lead studies from many sciences to pay more attention to the unconscious part of social interaction because it appears from the very beginning of everyone’s life and permeates all social structures and configurations during the whole life. In addition to communication (conscious and/or unconscious mutual exchange of symbols with reciprocal intended meanings), social interaction consists of a priming-sensitivity exchange of stimuli that have not yet become signs with reciprocal assumed meanings (Table 1). The latter can become communication in the future, when individuals fill them

with mutually intended meanings, constantly changing their signals in response to the history of direct interaction and in response to the history of social relations between individuals. Priming-sensitivity exchange also includes both conscious and unconscious stimuli. That is, priming-sensitivity exchange can be both anticipation and/or preparation for communication, and its accompaniment. From the perspectives of Sociology, Developmental psychology and Social psychology, social interaction is a set of stable and unchanging tools of mutual exchange that people use to design rules, institutions and systems within which they seek to live, or, on the other hand, convey the impact of society on the person. The review pays attention to an unconscious priming-sensitivity exchange that is part of perceptual unconscious interaction, it passes through different unconscious stimuli, basing on tacit knowledge, emotion, ‘unsaid’, and subliminal perception. This pre-communication exchange has been manifested since the first living beings interacted and created their common social reality.

**Table 1: Social interaction, its structure**

Social Interaction				
Perceptual social interaction				Non-perceptual social interaction
Perceptual conscious interaction		Perceptual unconscious interaction		
Verbal and Non-verbal Communication	Conscious Priming-Sensitivity Exchange	Unconscious Non-verbal Communication	Unconscious Priming-Sensitivity Exchange	

Unconscious non-verbal communication (a part of perceptual unconscious interaction) occurs in facial expressions, gestures, pupil mimicry, eye-gaze, blushing and tone of voice, which relies on an unconscious signaling system controlled by Autonomic Nervous System (ANS). This perceptual unconscious interaction participates mainly in emotional contagion, influencing the assessment of the behavior of others and themselves in a group, also in the sense of their truth or falsity [1]. Argyl suggested that the primary function of nonverbal communication is to develop and consolidate interpersonal relationships, while verbal communication is used to convey meaning about events. Communication is mutual exchange of symbols with reciprocal intended meanings. It is still unknown how important emotional

contagion and behavioral assessment are for exchanging symbols and giving them reciprocal intended meanings. But important that both, emotional contagion and behavioral assessment together mean and/or imply some mutual exchange before them, because (a) accepting the emotions of others implies an equal feeling of emotional states and their senses by both sides of this exchange and (b) behavioral assessment also requires a prior convention on the principals of assessment, such as the meaning of “truth or false”, the meaning of “bad”, etc., with which it is possible to correlate the actual state. That is, any communication and perceptual unconscious interaction, both probably can occur on the basis of some prior unconscious interaction. Emotional and behavioral trainings throughout life can help accept reciprocal meanings of emotional states and behavioral assessments. They can also help to imbue all phenomena of reality with mutual meanings. But is such an unconscious exchange so adequate and lasting that young children can learn the meanings of symbols, such as tone of voice and body language, to then adopt beliefs and unspoken social rules, as well as necessary social skills, such as language. Thus, at the very beginning of their lives, children must learn so many difficult things through so poor unconscious signs. Recent research argued that nonverbal communication and decoding skills improve between the ages of 4 and 8 [2]. Carpenter

et al., shown the ability to recognize markedness (gesture during speech) is learned in the early stages of development, somewhere between three and four years of age, but these gestures is not recognized by two-year-olds children [3]. Boone and Cunningham argued that 4-year-olds (not younger) could only correctly identify sadness at a rate that was better than random, by studying at what age children begin to recognize emotional meaning (anger, fear, happiness, and sadness) in expressive body movements [4]. But other studies also show the socialization of already human embryos, that is, can human embryos already somehow understand certain meanings, such as “I”, “we “ and “others”? Existent knowledge can help us a little in answering the above questions, as well as such practical questions about social behavior as: (a) why in socialization, a group accepts one person rather than another; (b) how the group instills commitment in a new member; (c) how people are able to understand others’ mental states; (d) how synchronized people can improve their collective performance and learning; – these and many other questions attract review to pay attention to perceptual unconscious interaction. The aim of the review is to introduce the new concept of unconscious priming-sensitivity exchange by analyzing findings through studies on 6 well-known concepts.

**Table 2. Overview of studies selected for the review**

No	Concept	Authors	Year	Type of study	Experimental paradigm	Number of studies in review / subjects in research	Ages
1	Socialization	Arabin et al.	1996	Research	Type and duration of fetuses’ movements towards each other	25 fetuses’ twins	8–17 weeks
2	Socialization	Castiello et al.	2010	Research	Kinematic Analysis of fetuses’ movements	5 fetuses’ twins	12–18 weeks
3	Socialization	Zoia et al.	2006	Research	Kinematic Analysis of fetuses’ movements	8 fetuses	14–18–22 weeks
4	ToM	Powell et al.	2017	Replication research of Knudsen & Liszkowski, 2012	A person’s social cognitive ability to attribute false beliefs to others	16+16 children	24–27 months and 3 years
5	ToM	Powell et al.	2017	Replication research of Buttellmann et al., 2009	A person’s social cognitive ability influenced by the experimenter’s beliefs	94 children	17–20 months
6	iToM	Schneider et al.	2014	Research	Registration of eye movements tracked to measure a person’s social cognitive ability to attribute false beliefs to others	104 adults	M=19.6 years
7	Interpersonal perception	Cirelli et al.	2014	Research	Group cohesion and social cooperation in synchronous performance between adults and infants in contrast to asynchronous one	30 infants	14 months
8	Interpersonal perception	Miles et al.	2009a	Research	Group cohesion and social cooperation under in- phase and anti-phase interpersonal synchrony	66 adults	18–36 years

9	Interpersonal perception	Miles et al.	2009b	Research	Recall of self and other-relevant information under in-phase or anti-phase interpersonal coordination	36 adults	Undergraduate students
10	Interpersonal perception	Thompson and Trevathan	2007	Replication research of Isabella & Belsky, 1991	Learning was tested using a two-monitor standard preferential looking procedure	63 infants	3 months
11	Interpersonal perception	Trainor and Cirelli	2015	Review	Group cohesion and social cooperation in synchronous performance between adults and infants in contrast to asynchronous one	A series of studies	14 months
12	VSP–Visuospatial Perspective taking	Freundlieb et al.	2017	Research, Experiment 3	An impact on cognitive processes of how objects look from another’s viewpoint	32	M=21.94 years
13	Implicit memory	Vohringer et al.	2017	Research	An assessment of implicit memory via a priming task	134 children	From 3 months to 3 years

## Method

In this interdisciplinary review findings relevant to the concept of unconscious social interaction were investigated by extracting it from 4 concepts which were explored by different researches under particular conditions suited also to observe results of unconscious collaboration in and between groups, they are: Theory of Mind (ToM), Visuospatial Perspective taking (VSP), Interpersonal perception, and Socialization. This extract from the well-known concepts became possible due to a selection of studies within the following limits:

1. Focus on group collaboration. The authors believe that unconscious processes cannot be felt by the subjects and unconscious interaction can be explained better and clearer in case of the group result.
2. The crucial factor of the study selection was reduced cultural influence, which was realized by choosing research of fetuses and infants. The review made a focus on studies of fetuses and young infants because of their obvious purity of intention and less experienced mind. In such a way, the experimenters minimized the influence of cultural experiences of participants, their bias and habits on the results of the review, such as: (a) prior experience – experimenters could not be sure that a subject had already known the object before, but did not pay attention to his or her explicit knowledge about it, (b) inattention or mistake – experimenters could not be sure whether the subject consciously memorized the object instead of not paying attention to it during the experiment, (c) participants’ expectations – it is possible that participants of the experiment wished to satisfy the experimenters’ expectations on the performance, and (d) experimenters’ impact – an experimenter could influence the performance.
3. Absence or minimal amount of communication between participants. Only studies without communication between the participants of the experiments or with some communication, which could not help participants to achieve results, were selected for the review.
4. The possibility to contrast the collective results with the individual results under the same conditions of research. Only studies, which fit this criterion, were selected for the inclusion in the review.

The phenomenon from everyday life that is routine and mundane for all of us, if it exists, then it should be visible from and can be

manifested through different studies. Thus, various studies from different social sciences have been observed in the review. In total, based on above mention criteria, 12 articles were selected for the inclusion in this review (Table 2). Then the above analysis was combined with the results of studies on the 2 concepts: Implicit memory, Unconscious thinking. Thus, 1 articles on these 2 concepts was also included. The findings from Behavioral genetics and Associative Sequence Learning were also observed to avoid the possible assumption that the aforementioned collaboration of embryos and human infants may have some innate mechanism that integrates representations of others with representations of the self.

## Review of the studies based on the concept of Socialization

An acceleration of fetus twins’ physical and neurological maturity in respect of single embryos in the 14–18 weeks period supports a supposition of an influence of social interaction on thinking and raises another question of how they can distinguish each other from the environment without the meanings of the “I”, “We” and “Another” [5]. Furthermore, other-directed actions of twins are predominant over self-directed actions, given that fetuses start to socialize before their eyelids can finally open, and eyes are about as fully formed when he or she Hits the 26th week.

For example, it was found that from the 11th week onwards, different patterns of inter-twin contact such as head-to-head, head to arm and arm to head contact are observed. It is, however, between the 15<sup>th</sup> and 22<sup>nd</sup> week that intra-pair contact becomes a constant and increasing feature of all twin pregnancies [6]. Performance of movements towards the co-twin is not accidental: already starting from the 14th week of gestation twin fetuses execute movements specifically aimed at the co-twin [4].

The findings force researchers to predate the emergence of social behavior: when the context enables it, as in the case of twin fetuses, other-directed actions are not only possible, but predominant over self-directed actions [5]. In twins a differential kinematic pattern for movements performed towards the eye region and movements performed towards the mouth were already evident at the 14th week of gestation. At 14 as well as at 18 weeks, movement duration was longer and deceleration time was more prolonged for movements towards the eye compared to movements towards the mouth,

consistently with available evidence on acceleration of physical and neurological maturity in multiple pregnancies [5]. However, in case of single embryos in the 14–18 weeks period the results of the kinematic analyses for hand to mouth and hand to eye movements indicated that up to the gestational age of 18 weeks there was no evidence of coordinated kinematic patterns. Reaching was inaccurate and showed poor control of the hand trajectory with characteristic jerky and zigzag movements. However, by 22 weeks individual fetus reaching become straighter and more directly aimed towards the target [7].

## Discussion

Socialization is too complex process to be described only by human rational intentions and conscious communication. In fact, why do we need to be socialized, and do the group consensus on common values, unspoken norms, rules and beliefs appear only in a rational and conscious way? Newborns come into the world wired to interact socially. The fetus has been showing signs of socialization from 14 weeks, given that there is no society around the embryo that can consciously convey to him or her the meanings of socialization and its purpose [4].

The above-mentioned facts raise the question of interaction between fetus twins. It can be assumed that heritability sets their need for socialization, but there is still the question of how to explain the perception of the embryos of each other [5]. Castiello argued that (i) when the context enables it, as in the case of twin fetuses, other-directed actions are predominant over self-directed actions, and (ii) an acceleration of fetus twins' physical and neurological maturity in respect of single embryos in the 14–18 weeks period [5]. These facts make it possible to assume that either embryos can distinguish each other from the environment with an understanding of the meanings of "I" and "other", or there is some non-perceptual and unconscious mental interaction between them. There are several arguments to support that this interaction cannot be attributed to simple action-reaction behaviors:

(a) Science knows a little about ability of 14th week's embryos to perceive environment. But it is possible to assume that this is a difficult task for fetuses taking into account that they start to socialize before then their eyelids can finally open, and eyes are about as fully formed when he or she hits the 26th week. In the 14-week period, their personal reality seems like a homogeneous environment, the embryos are connected to the mother as a single organism. That is, the fact of their other-directed actions supports an assumption that fetuses somehow can understand their environment.

(b) Above noted that in a case of twin's embryos there is the acceleration of physical and neurological maturity (in the period between 14th and 26th weeks) in respect to singletons, this happens due to the fact of their interaction. Even if it is possible to suppose any fetus's perception of each other (which is still a big problem for this period of pregnancy), embryos need to also distinguish other fetus from the mother's body, which is not a simple problem. And as it happens, this shows that his or her body and the body of another embryo as well as mother's body are different subjects for embryo. Then another thought in support of the above, since this cooperation can improve neurological activity of fetuses, it can probably mean that its parties fill the interaction with meanings, otherwise what other explanation can this unbelievable and unexplained collaboration have as this interaction develops neurological maturity of embryos. That is, what is the content of this interaction that it stimulates the growth

of the nervous system of embryos compared to the development of a single fetus, which also moves, but alone without a pair? If above arguments are correct, then there is thus no other explanation for fetal interaction as a mental interaction, even if it is unconscious. Their interaction is independent of both perceptual conscious and perceptual unconscious interaction, hence some non-perceptual and mental interaction between embryos can also be assumed.

## Review of the studies based on the concepts of social metalizing and ToM

The results of experiments with 18-month-old children show their adherence to social norms such as mutual assistance, as well as respect for others and/or self-esteem, expressed in intervention of stating the truth only if necessary, that is, children are already participating in the community [8]. For example, Powell et al, conducted exact or conceptual replications of several experimental paradigms that have been claimed to provide evidence for understanding of others' beliefs in infants and toddlers. In two paradigms, they found evidence consistent with the original reports. Both paradigms measured infants and toddlers' interactive helping behaviors. Two- and three-years-old children tried to communicate with an experimenter about relocation of her object more frequently when she had not observed the transfer, replicating Knudsen and Liszkowski [8]. Powell et al. also replicated Buttelmann and colleagues finding that 18-months-old infants helped an experimenter with a false belief by unlocking the actual location of her desired object, not the empty box she misguidedly tried to open. The interpretation of the latter finding as evidence of infants' sensitivity to another's perceptual history is tempered [8].

In the other study, researchers examined aspects relating to automatic processing: the extent to which the operation of implicit ToM is controllable and how it is influenced by behavioral intentions. This was implemented by assessing how task instructions affect eye-movement patterns in a Sally–Anne false-belief task. One group of subjects was given no task instructions (No Instructions), another overtly judged the location of a ball a protagonist interacted with (Ball Tracking) and a third indicated the location consistent with the actor's belief about the ball's location (Belief Tracking). Despite different task goals, all groups' eye-movement patterns were consistent with belief analysis, and the No Instructions and Ball Tracking groups reported no explicit mentalizing when debriefed. These findings represent definitive evidence that humans implicitly track the belief states of others in an uncontrollable and unintentional manner [9].

## Discussion

Humans are able to track others' mental states efficiently and without being conscious of doing so using their implicit ToM system. Recent research in cognitive science proposes two ToM systems that contribute to formation of objective reality: one acts implicitly/unconsciously from the very beginning of life (iToM), and the other, explicit ToM that appears later, is controlled by consciousness [9]. The important conclusion for the current study from the experiments on infants is that at the age of the 18th month they already understand what a community expects from them and they respond to other members on what surrounding people anticipate. They share with the community its beliefs and norms even in the absence of communication on this topic with other members. Questions still remain: (a) how symbols of communication can become reciprocal intended meanings before communication; (b) how communication can infuse the message with confidence, that the message is truth, as research also show that young child can distinguish false. That is,



how young child accepts beliefs and unspoken rules of community without verbal communication through such poor information exchange as unconscious nonverbal communication. Perfectly, that so young infants can express consciously their thoughts, but incredibly, that they understand and accept (which is more important for the current review) some society beliefs and norms without any learning program of these values through known communication, taking into account that before the experiments infants had already known and accepted them. After all, the above (see also the introduction) shows the difficulty to explain the socialization of children with the help of known perceptual unconscious interaction. This fact supports the above assumption that there may be another part of unconscious social interaction, not only one perceptual unconscious interaction, through which children are capable of social interaction without any communication from an early age.

### **Review of the studies based on the concepts of Interpersonal perception and Visuospatial Perspective taking (VSP)**

The findings from the studies on the concepts of Interpersonal perception and VSP make it possible to assume that unconscious social interaction contributes to objective reality formation in the collective from the childhood and can help to introduce information into implicit memory domain. For example, the experiments with 14-months-old infants show that interpersonal synchrony acts as a cue to direct prosocial behavior toward individuals rather than as a prime for generalized prosocial behavior. Infants were significantly more likely to help an experimenter following Synchronous versus asynchronous movement with this person. Furthermore, this manipulation did not affect infant's behavior towards a neutral stranger who was not involved in any movement experience. This indicates that synchronous bouncing acts as a social cue for directing pro-sociality. Musical behaviors such as dancing, singing and music production, which require the ability to entrain to a rhythmic beat, encourage high levels of interpersonal coordination. Such coordination has been associated with increased group cohesion and social bonding between group members. These results have implications for how musical engagement and rhythmic synchrony affect social Behavior in very early development [10].

By 14 months of age, infants who are bounced in synchrony with an adult subsequently show more altruistic behavior toward that adult in the form of handing back objects "accidentally" dropped by the adult compared to infants who are bounced asynchronously with the adult. Furthermore, increased helpfulness is directed at the synchronized bounce partner, but not at a neutral stranger. Interestingly, however, helpfulness does generalize to a "friend" of the synchronized bounce partner. In sum, synchronous movement between infants and adults has a powerful effect on infants' expression of directed prosocial behavior [11, 12]. Research of Thompson and Trevathan on 3-months-old infants investigated their learning, which was operationalized as a significant preference in looking times at objects, and short-term memory, which was operationalized as a significant difference in looking times toward the object associated/not-associated with mother's voice. Experiments showed that synchronization between infant and his or her mother, operationalized as an emotional support from the mother could help her infant to improve learning, contrary to asynchronous mother's behavior, which decreases infant's learning.

Later experiments with adults supported a finding that social connections founded on stable interpersonal synchrony appear

to shape memory function in a manner similar to that of more longstanding relationships. While participants in less stable anti-phase condition demonstrated the typical memory advantage for self-related compared to other-related information, this effect was eliminated when participant and confederate movements displayed in-phase coordination. In two experiments, participants rated the degree of rapport manifest by a simulated pair of walkers exhibiting various configurations of synchronized strides. The results revealed that the highest levels of rapport were associated with the most stable forms of interpersonal coordination (i.e., in-phase and anti-phase synchrony), regardless of whether coordination between the walkers was conveyed via the presentation of visual or auditory cues. These findings underscore the importance of interpersonal coordination to core aspects of social perception [13, 14].

The study showed that spontaneous VSP taking occurs in mental space where another person's perspective matters for mental activities rather than physical actions. Importantly, the effect disappeared if the other's visual access to the objects was impeded by opaque goggles, but face of confederate was still in the field of view of the participant. This demonstrates that human adults show spontaneous sensitivity to others' VSP in the context of mental activities, such as joint reading [15].

### **Discussion**

Interpersonal perception is stimulated by high levels of interpersonal coordination, causing increased group cohesion and social bonding between group members [12]. Due to the facts that (1) 'synchronization' between a child and his or her mother can help the child improve learning as opposed to the mother's asynchronous behavior, (2) given others-related information becomes more confident in case of 'synchronization', new information turns solid knowledge, given others-related information increases in respect of self-related one when participant and confederate are synchronized, and (3) concerning that implicit memory impacts confidence in a statement as "an increase of implicit memory improves individuals' performance on tasks and fills their solutions with confidence"—probably all these facts together mean that unconscious social interaction, which is stimulated by rhythmic synchrony between participants, can help to introduce information into implicit memory domain [13-17]. Moreover, unconscious social interaction can change individual perception of reality, as it is possible to assume from recent research on VSP: "Participants took longer to categorize words that were upside down for the confederate, suggesting that they adopted the confederate's VSP without being prompted to do so" [15]. Perceptual unconscious interaction controlled by ANS cannot become the only one explanation of this process as it has insignificant and non-relevant impact on the informational exchange. Probably some nonperceptual cooperation of individuals can complement this process.

### **Review of the studies based on the concepts of Unconscious thinking and implicit memory**

Based on the results of the existing studies it can be suggested that implicit memory and unconscious thinking have become conventional already. Recent research on infants can probably declare with greater confidence that implicit memory is present from early age onwards. A total of 134 children were followed longitudinally from 3 months to 3 years of life assessing different age appropriate measures of implicit memory. Results from structural equation modeling give further evidence that implicit memory is stable from 9 months of life onwards, with earlier performance predicting later performance. Second, it was found that implicit

memory is present from early age onwards, and no age-related improvements are found from 3 months onwards [18].

The possible evidence of unconscious stage of thinking presents in the results of measuring of internally generated reactivation of single neurons in human medial frontal cortex. The neurons show progressive recruitment over 1500 MS before tastes report making the decision [19].

## Discussion

The authors believe that unconscious social interaction and unconscious thinking are related, taking together the above-mentioned findings and assumptions from other concepts of the review (from chapters 1-3), and due to the opinion that ‘implicit memory is present from early on’, as well as another one that the capacity for behavioral imitation, and the properties of the mirror neuron system, are constructed in the course of development through associative learning [18, 20]. Putting all these arguments together, it can also be assumed that people in society are unconsciously connected all their lives and such cooperation affects cognition, and the unconscious domain of thinking participates in this unconscious social exchange. Hence, one can also assume the idea of a collaboration of minds, without any communication during group performances.

## Review of the studies on Behavioral Genetics and Associative Sequence Learning

Brain systems are constructed during the completely human life (or animal life), reflecting also in a development of mirror system, as in the effect of implicit collaboration with others, which is nonperceptual and unconscious. Unconscious social interaction impacts twin fetuses and infants’ behavior also in case without communication, as well as without known perception. Hence, taken together findings from above-mentioned studies and analysis of below-noted results it is possible to conclude that unconscious social interaction occurs through two ways: perceptual unconscious interaction and non-perceptual social interaction. And the last one contributes to a person’s lifelong learning from birth.

Recent research on Associative Sequence Learning (ASL) of infants contest the assumption that humans are more skilled to imitate others than animals, because of a special, inborn ‘intermodal matching’ mechanism that integrates representations of others with representations of the self. Researchers argued that “the mechanisms which make imitation possible, by aligning representations of self with representations of others, have been tweaked by cultural evolution, not built from scratch by genetic evolution” [21].

Recent research in genetics also support the above-noted assumptions, both genetics and environment contribute substantially to individual differences in psychological traits. Psychological traits impact behavior of individual but they are one of many other factors, which guide person to make a decision also concerning his or her freewill. In summary, genetic characteristics of individuals cannot be sufficient and single factor as for similar behavior in some cases and surprisingly different in others. Heritability is caused by many genes of small effect and most environmental effects are not shared by children growing up in the same family [22].

The recent review on 37 experiments on neonatal imitation of 18 gestures suggested that neonates do not imitate a range of actions. Only three gestures – lateral head movement, facial expressions of emotion,

and tongue protrusion – have yielded more positive than negative findings. Even the tongue protrusion effect lacks the specificity that defines an imitative response. Close examination of the experimental procedures indicates that the head movement effect is likely to be due to perceptual tethering, and that the facial expression effect, when present, may be an artifact associated with the method used to score infant behavior. To imitate perceptually opaque actions requires a neurocognitive mechanism that relates the seen and unfelt to the felt and unseen. It has been widely believed for some 30 years that the human capacity to solve the correspondence problem, and thereby to imitate, depends on a complex, innate cognitive mechanism. If infants are able to imitate within hours or days of entering the world, their imitative capacity could not be based on learning; if they can imitate a range of behaviors, the innate endowment must be something more complex than a couple of reflexes [23].

## Discussion

Recent studies contest the assumption that human infants have inborn ‘intermodal matching’ mechanism that integrates representations of others with representations of the self. Infants’ behavior cannot be only described by some innate capacity to act in a certain way, that environment also fosters human reactions. Interaction between twin fetuses as well as social actions of infants – which were revealed in above-mentioned findings from recent research on the concepts of implicit Theory of Mind, Visuospatial Perspective taking, Implicit memory, Unconscious thinking, Interpersonal perception, and Socialization – cannot only occur and be described by genetics and/or some innate cognitive mechanism, and/or active intermodal matching model (AIM).

## Conclusions

The article proposes one explanation for different inexplicable facts of collaboration between individuals without any perceptual interaction between them, by studying concepts of Theory of Mind, Visuospatial Perspective taking, Interpersonal perception, and Socialization. Taking them together with the results of studies of implicit memory and Behavioral genetics, the authors can assume the following 4 findings about unconscious social interaction:

1. Either twin fetuses can understand the meanings of ‘I’ and ‘other’ etc., or their interaction is non-perceptual and unconscious.
2. Infants are born socialized also in the absence of communication with other members. Their socialization cannot only be explain by known perceptual social interaction.
3. Unconscious social interaction can help to introduce information into implicit memory domain, and contribute to objective reality formation from the childhood.
4. Implicit memory and unconscious thinking impact on and are influenced by unconscious social interaction, that is, the unconscious domain of thinking participates in this unconscious social exchange.

These 4 findings taken together make it possible to assume non-perceptual mental interaction between human beings, that is, unconscious social interaction occurs through two ways: perceptual unconscious interaction and non-perceptual social interaction The last one happens without any verbal and non-verbal communication and, probably, do not engage five basic human senses. Future research in neuroscience can also contribute to study non-perceptual social interaction as the review of Redcay and Schilbach has already shown a support on the standpoints above, by indicating new insights into the workings of the social brain in interaction [24]. Their research

demonstrated simultaneous engagement and interactions among nodes of supposedly distinct networks (that is, the mentalizing, mirror neuron and reward networks). Researchers proposed that social interaction forms an integrated social interaction network. Their findings are converging on a set of brain regions across distinct networks that play key roles and interact closely in order to support social behavior in ecologically valid contexts. This can help to understand how social behavior is realized at an interpersonal level and how this is supported by inter-brain neural Activity [24]. The review introduces the new concept of non-perceptual social interaction, and proposes long-term study on it that can contribute to the improvement of the curriculum. Authors stay on the standpoint that non-perceptual social interaction permeates all social textures and configurations, people are unconsciously connected all their lives and such cooperation affects cognition. One of the explanations of non-perceptual social interaction basing on the existing laws of physics – Coherent Intelligence (CI) – was introduced by Igor Val. Danilov, and the results of the experiments on CI were published by Igor Val. Danilov in the Paper ‘Unconscious Social Interaction: Coherent Intelligence [25]. Second edition complemented’: ‘Coherent Intelligence is an effect of unconscious collaboration provided by interconnection of many brains united by entanglement state of their neurons – the phenomenon of quantum entanglement of particles – which is stimulated by common emotional arousal. This connection of entangled neurons may unite neural chains of different cerebrums and maintain their coherent mental process.’ This theory supposes that the phenomenon emerges from collaboration of many individuals if they solve an important problem for them at the same time within the framework of single emotional stimulation [25].

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