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Emotions in Learning Towards Coherent Intelligence: The Review of Studies on Social Behavior in Infants with Visual Impairment

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ABSTRACT

The two opposing opinions of biological universalism and cultural relativism advance a cohort of emotion theories. This review observes studies on social behavior in children with congenital Visual Impairment (VI), contrasting their outcomes with non-disabled infants. The article concludes that emotional exchange promotes categorization of social reality in newborns in order to acquire the initial phenomena, and then first words. Mental collaboration between infants and caregivers occurs through non-perceptual social interaction, at least in part, which helps infants with VI successfully pass their first language exercises. Non-perceptual social interaction originated before the five perceptual senses and was one of the first steps in the evolutionary development of perception. Each stage of embryonic development (then the fetus and child) provides the appropriate modality of social interaction corresponding to this stage. Human embryos are able to maintain interaction of the same modality as social insects. This modality of communication does not disappear with the further development of the organism at the next stages of the developmental hierarchy, but is replaced and goes into the background. An explanation for this mental collaboration has been proposed by the theory of coherent intelligence within the existing laws of physics.

Keywords

Social emotional skills, Interpersonal synchrony, Socialization, Coherent Intelligence, Non-perceptual social interaction, Emotions in learning.

Introduction

Social interaction is one of the central challenges of the mind-matter problem, its study requires the involvement of different domains of knowledge: from social sciences (which investigate the mind from different points of view) to physics, since all living beings and their interaction are subjects to the laws of physics. Obviously, laws of physics and mathematical models should become the basis of any theory of knowledge also in Social Sciences. From the standpoint of Newton physics, there are four possible domains of perceptual social interaction [1]. However, this approach from perceptual interaction under Newton's laws does not provide a complete explanation of objective reality, so social interaction should also be studied from other perspectives, also from viewpoint of quantum mechanics, since this knowledge domain complements the understanding of objective reality from the point of view of the world of elementary particles [1]. Social interaction can be defined as the interaction between individuals that leads to changes in the participants' mental states. This is why the viewpoint from microcosm on social interaction is also important, because modern knowledge about consciousness is being developed through the study of the interaction of neurons, whose dimensions are close to subjects of quantum mechanics. Recent studies already found that objects with the dimension of 15 micrometers (a nucleus of neurons can range from 3 to 18 micrometers in diameter, a neuron can vary from 4 to 100 micrometers) obey some laws of the quantum world, such as the phenomenon of quantum entanglement [1-3]. Therefore, all possible (from the viewpoint of physics) connections of neurons during an engagement of two or more participants in a social encounter should be the focus when studying social interaction.

Newborns participate in society from the first minutes of life, their cognitive development occurs in interaction with other people in meaningful context as well as in meaningless one, since any social interaction changes the mental states of participants regardless

of the meanings of the action that each participant individually implied or did not imply in it [4]. It is widely accepted that this mutual influence is also noticeable in the emotional expression and contagion, which occur at the very beginning and contribute to the categorization of social reality in infants, in order to then acquire first phenomena and then first words. Acquisition of knowledge is mainly based on discovery of new key relationships between cause and effect within prior knowledge, and/or on the opening links between elements of existing knowledge and new information domain [4]. Therefore question of how people acquire emotional skills is a question of acquiring knowledge about initial social phenomena.

Two opposing viewpoints – biological universalism and cultural relativism – advance a cohort of theories of social behavior, discussing the origin of initial social knowledge in newborns. The review by Danilov sustained the opinion of cultural relativism that expression of emotion is a sociological construct, by analyzing studies of fetal social behavior [5]. It discussed the existing data on the genetic determination of brain development, the hypothesis of an innate mechanism of social behavior was questioned: genes shape brain development from the outset, but they do not manage social behavior; genes influence the development of particular composition of psychological traits, but genes cannot impose on an individual how to apply them to a certain social event [5]. Followers of the cultural impact on the acquisition of initial knowledge promote several hypotheses, the main of which are two: (i) the theory of general sensitivities and expectations [6] and (ii) the theory of ostensive cues [7]. Danilov and Mihailova opposed these theories, highlighting their inconsistency with modern knowledge of young children's communication skills [4]. The lack of communication of infants with the surrounding social reality does not allow them to acquire the first social knowledge at the stage of their mental development: the perceptual sensitivities and expectations [6], and/or ostensive cues [7] are not able alone to fill infants' personal reality with a sufficient number of phenomena in order to start categorization [4]. They also conclude: Certainly, young infants should begin language categorization even before they initiate to develop their communication – which occurs only from the age of 12 months – since they need to already understand social reality with a minimum set of its phenomena before any communication. Thus, some mental collaboration between young infants and their social environment should accompany the mental development of infants, helping them to acquire the meanings of the initial phenomena of social reality [4]. The recent review of studies on fetal social behavior also sustains the above view, suggesting that fetal social behavior arises from and is directed by mental collaboration with the mother [5]. One possible explanation for this mental collaboration based on the existing laws of physics was proposed by I. Val. Danilov: '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' (p. 109) [8].

This intriguing hypothesis of non-perceptual social interaction must be studied from different perspectives in order to complement scientific knowledge on the ontogenesis of social interaction. If the manifestation of the phenomenon is found in various cases of social interaction (which differ in the biological species and age of social creatures, in the environment and situation), this could mean that the theory is consistent with objective reality, and then many phenomena from the social behavior of animals with a nervous system will find their explanation. In this case, the knowledge of social interaction will be added by an understanding another modality of social collaboration that could complement the theory of evolution. This could also explain many gaps in the modern knowledge, for example, on understanding how single animals became social beings, the origin of emotions, and how humans created language. Because from the perspective of the hypothesis of Coherent Intelligence, non-perceptual social interaction predated the five perceptual senses and was one of the first steps in the evolutionary development of perception. Therefore, understanding the physical process of transferring information between individuals is the goal of this research, and given the above statements, it requires approaching to social interaction from all possible domains of physics, including quantum mechanics.

Method

In terms of this approach, recent studies have already investigated social behavior of fetuses [5], categorization of social reality in 3- to 4-months-old infants [4], and social behavior among young children [9]. The current study attempts to explore this topic by observing cases of social behavior among infants with the most possible reduction in the impact of perceptual interaction on individuals: in children with congenital VI. This review observes studies on social behavior in congenital VI children, contrasting their outcomes with non-disabled infants. The criterion for inclusion in the study was the age of infants in the pre-linguistic stage, articles have been chosen as they studied the cognition development in infants with VI without other disabilities. The search of articles was completed, basing on relevance to the subject field, through 3 works on language development in children with VI: the book of Pereira and Conti-Ramsden [10]; systematic review by Mosca, Kritzinger, Van der Linden [11]; and critical review by Vervloed, van den Broek, van Eijden [12]. Other articles relevant to the topic of the current research were also observed.

Results

How infants with VI acquire initial social knowledge

In the last hundred years numerous studies have focused on the social behavior among young children with VI [13-28]. Several systematical, theoretical and critical reviews collected these data [11,12,29-31]. The book "Language Development and Social Interaction in Blind Children" by Pereira & Conti-Ramsden10 also made a great contribution in understanding of cognitive development of children with VI.

It is widely argued that social behavior – language and emotional expression – in infants with congenital VI does not delay from their sight peers at the first year of life. Infants with VI are able to associate first words at the period of neurological development

which is not significantly different with their non-disabled peers, 'regarding the age of the first 50 words there seems to be no delay in blind children compared to sighted children[10]'. At this stage their social mimicry is also not far behind: 'there was no decrease in the facial expressiveness of the blind children in the period of development considered [25]. A stasis or regression in development occurs between the ages of 16 and 27 months [29]. 'The period between the second and third year of life seems to be a vulnerable period for children with blindness. Out of 25 longitudinal studies, 8 (32%) reported regression in both development and behaviour, and the DS studies indicate DS in 30% of the children with blindness [12]'. That is, among children with VI, the first stages of their mental development follow the same trajectory as in unimpaired children, and then 70% of them successfully pass to another stages.

Numerous articles highlight a discrepancy between communicational ability of congenitally VI infants and their achievements in the first language acquisition, contrasting their overcome with non-disabled peers. They emphasize several obstacles to the neurodevelopment of infants that must be caused by a lack of visual input: (i) the deficit of ability to receive expressive reactions, difficulties in integration and interpretation of input from the other sensory organs [32]; (ii) the shortage in fine motor and locomotor competence that require visual-motor coordination [32]; (iii) the limited opportunity to experience control over their environment, the limited experience of control developmentally impairs infants' ability to intentionally apply their behavior in the interaction that follows to complexity in a development of emotional bonding [32]; (iv) the lack of opportunities to learn to share meanings of external objects with other person [33]; (v) personality and self-concept shortage. These 5 obstacles should shape the delay of neurodevelopment and neurobiological process in infants with congenital VI, despite this, they somehow improve language and social mimicry together with peers. Blindness affects congenitally blind children development in different ways, language development being one of the areas less affected by the lack of vision [34]. The absence of vision does not in itself preclude the establishment of a rich communicative system [21,22]. The reorganization of the cortical visual system during infancy to compensate of reduced visual input [35] in blind children cannot explain such a success in acquiring first knowledge as this reorganization is already the overcome of long-term learning, sustained by brain plasticity, due to the fact that the reorganization of the cortical visual system happens after continuous reciprocal interaction as its result, but not before this interaction. That is, the reorganization of the cortical visual system requires initial knowledge of social reality in order to know how to develop the brain adequately to both social reality and existing perceptual inputs. So, the modern discussion on this topic raises the problem of how infants with VI acquire initial social knowledge.

Discussion

As noted above, innate essence of social knowledge is problematic. There are at least 2 reasons why: (i) no trait is 100% heritable, heritability is caused by many genes of small effect. The association of genes-traits-behavior does not have a cause-and-effect relationship between genes and behavior directly: even a strong association is not a proof of causation [5]; (ii) there are no findings or even ideas about a genetic mechanism that could control and maintain the development of certain innate patterns of social behavior. There is no theory of the genetic mechanism that could link a particular mental state of individuals to a certain social reality, affecting the behavior of individuals depending on a specific set of meanings of a concrete social reality [5].

Theories within the framework of cultural relativism, such as Waxman and Leddon's [6] theory of perceptual sensitivities and expectations, and/or the theory of natural pedagogy (ostensive cues) by Csibra and Gergely [7] are also not suitable for describing the case of infants with VI, since visual input is a core factor in their explanation of the acquisition of first social knowledge.

There are 2 arguments of non-perceptual social interaction between infants with VI and their caregivers that promote their cognitive development.

Infants recognize social phenomena unconsciously

A few intriguing findings from studies of social behavior among infants can probably bring closer to understanding this statement.

Finding 1: Children with VI use the same words as their sighted peers and attribute a similar meanings to them [34]. The similar social context of infants create similarity of their vocabulary; the comparison of the results obtained with blind children and with sighted children from the same area and language community points to similarity between them [10].

Finding 2: Congenitally Blind children are able to learn the meaning of certain words without direct sensory experience, such as words "look" and "see" [10].

Finding 3: The blind children do use gestures as an accompaniment to speech, in the absence of visual experience with gesture. Moreover, these children use gestures to express the same kind of information as sighted children, and their gestures take the same form as those of the sighted children. The research found that blind children used gestures at a comparable rate when talking to sighted or blind dyads - visual expression is not essential for gesture development [10].

Finding 4: Recognition of social signs occurs in the subject even when the triggering stimuli cannot be consciously perceived due to their placement within the unseen field of cortical blindness. Recent research by Tamietto et al. [36] tested subjects with unilateral destruction of the visual cortex and ensuing phenomenal blindness on invisible stimuli. They received emotional stimuli alternately within the intact and blind field of their vision separately. The outcome was measured by a comparison of consciously seen and ‘‘unseen’’ pictures of facial mimicry or bodily gestures. The study showed fast and high emotional expression in cases when images were invisible to subjects. That is, emotional contagion occurs even when the triggering stimulus cannot be consciously perceived due to cortical blindness. Furthermore, different emotional stimuli induced highly similar emotional expressions [36].

The above findings show that children are able assimilate social phenomena even if the stimuli are not presented in their actual social reality (Finding 2), and even if the stimuli cannot be perceived perceptively through the senses (Finding 3). Moreover, people are able to recognize social phenomena unconsciously, subjects successfully do this even if they are not aware of the existence of stimuli and these stimuli cannot be consciously perceived by them (Finding 4). It is possible to suggest some training that can provide in the subjects the skills mentioned in Findings 1 - 3, but it is unlikely that such skills can appear on their own. The interaction with the same essence as interconnection between subjects and their social surrounding that sustained their mutual comprehension in Findings 1 - 3, and helped subjects to acquire new meanings in Findings 2 - 4, can also help infants with VI assimilate initial social knowledge. It is generally argued that interaction with mother (caregiver) contributes to infants development. Julie Rattraya and M. Suzanne Zeedyk [37] argued that their results are evidence that visually impaired dyads engage in sophisticated communicative exchanges prior to infants' acquisition of language. So, there is a reason to pay more attention to the modality of this interaction.

The visual input is not preferred

According to the phylogenetic hypothesis, all living organisms share a common ancestry. Ancient genes had been conserved through millions of years of evolution to create dissimilar structures for similar functions, demonstrating deep homology between structures once thought to be purely analogous [38,39]. While ontogenesis does not generally recapitulate phylogenesis in any direct sense, both biological evolution and the stages in the child's cognitive development follow much the same progression of evolutionary stages as that suggested in the archaeological record [40].

Evolutionary developmental mechanisms also include interactions between individuals of the same species, individuals of different species, and species and their biotic and/or abiotic environment. Such interactions link ecological communities. Importantly, there is little to distinguish the causality that underlies these interactions from that which underlies inductive interactions within embryos [41]. Certainly, the perceptual inputs of creatures adequate to their nervous system and vice versa – this statement correct for all animals. That is, social beings develop and evolve in accordance with both social reality and existing inputs, and modalities of social interaction are related to the nervous system and existing inputs. This can also mean that each stage of embryonic development (then the fetus and child) provides the appropriate modality of social interaction corresponding to this stage. Parallels in some stages of human embryo development with other animals, such as insects, suggest similarities in the inputs and modalities of social interaction of these creatures at these stages. The author believes that human embryos are able to maintain interaction of the same modality as social insects, which demonstrate greater collaboration without perceptual interaction [1]. This modality of communication does not disappear with the further development of the organism at the next stages of the developmental hierarchy, but is replaced and goes into the background. Each new stage of development requires involvement and advancement of the perceptual inputs, in order to maintain a new stage of social interaction.

As noted above, between the ages of 16 and 27 months, many children with VI meet with difficulties in the development [29]. 'Delayed or atypical developmental trajectories can put children who are blind under stress at the age of 18 months. At this age, when sighted children start crawling and walking, and start to explore the world at greater distances from their parents, the child with blindness still has a strong need to be close to his parents for comfort, security and help' (p.15) [12]. The visual input becomes important for this new stage and the absence of this input could lead to delays of mental development, which is manifested in regression in language acquisition. On the contrary, in previous stages of their development, newborns with VI successfully developed, following the same trajectory as sighted children. They successfully assimilated the initial meanings of social reality, despite the lack of visual input. This suggests that newborns use various inputs, and the visual input is not preferred at that stage, since its absence does not change much in their development.

Conclusion

Emotional exchange promotes categorization of social reality in newborns in order to acquire the initial phenomena, and then first words. The author believes that mental collaboration between infants and caregivers occurs through nonperceptual social interaction, at least in part, which helps infants with VI successfully pass their first language exercises.

This hypothesis is sustained by a number of arguments:
(i) infants with VI at the first year of their development cannot communicate with caregivers so effectively, that this may help infants acquire initial social phenomena for associating first 50 words in the same period as children without disabilities. There is no evidence of any communication even in sighted infants at this stage of their mental development. There is no support from genetics and physics that some innate knowledge on a particular social reality can be passed between generations through any genetic mechanism and/or with the help of any information exchange, that can help children with VI behave socially appropriately;
(ii) infants are able assimilate social phenomena even if the stimuli are not presented in their actual social reality, and even if the stimuli cannot be perceived perceptively through the senses. Moreover, people are able to recognize social phenomena unconsciously, subjects successfully do this even if they are not aware of the existence of stimuli and these stimuli cannot be consciously perceived by them;
(iii) newborns use the various inputs for stimuli, and the visual input is not preferred, since its absence does not change much in their development.

Infants learn emotional patterns from their social surrounding. Each stage of embryonic development (then the fetus and child) provides the appropriate modality of social interaction corresponding to this stage. Parallels in some stages of human embryo development with other animals, such as insects, suggest similarities in the

inputs and modalities of social interaction of these creatures at these stages. The author believes that human embryos are able to maintain interaction of the same modality as social insects, which demonstrate greater collaboration without perceptual interaction [1]. This modality of communication does not disappear with the further development of the organism at the next stages of the hierarchy of development, but is replaced and goes into the background. Non-perceptual social interaction originated before the five perceptual senses and was one of the first steps in the evolutionary development of perception. An explanation for this mental collaboration has been proposed by the theory of coherent intelligence within the existing laws of physics [8].

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