UNIVERSITÀ DEGLI STUDI DI CATANIA

INTERNATIONAL DOCTORATE IN NEUROSCIENCE
XXVI CYCLE

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Embodied Autism

An integrated approach through Psychology,
Pedagogy and Neuroscience

PhD THESIS

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ACADEMIC YEAR 2012-2013

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CHAPTER IV

The other face of autism

For an autistic child

To you in your world
Locked inside your self,
An island,
Isolated winds in your mind,
To you, locked inside beauty,
Inside anguish, inside joy,
You live Breathe Die
Emotions
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Your floor your world,
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Just you,
Your little expressive hands,
Like tiny birds,
Talking in flutters,
Your little angry snarls,
Repel a monstrous outside realm,
Your beloved treasures:
Buttons,
Diminutive faery animals,
Smooth wooden beads,
Dots of sunlight on your wall,
Humming your songs,
To calm your anxyous hands,
Safe,
Just you,
At one with rhythm,
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Only bits of those others,
Who come and go like currents of air,
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Your face a delicate empty mask,
To those who see only with eyes,
Those who don't understand,
Your world,
To me,
Watching you,
I see myself,
I sing songs for you,
Little one, to tell you,
You don't have to forsake your world to be free

(Jasmine Lee O'Neil)

INTRODUCTION

Over time a great number of theories, models and tenets have been proposed in order to search thoroughly autism, a fascinating and yet complex condition, which as a consequence, represents a *daunting challenge* for researchers[1]. This challenge becomes even more daunting when you wish to start moving from the meeting ground of Neuroscience, Psychology and Pedagogy. Recently the limits in this field of studies have been further put forward and we have also seen an increased communication among the aforesaid fields thanks to a change of paradigm in the cognitive sciences. This change of paradigm is leading us to a study of the ecological mind, that's to say of a mind being ontologically and mutually dependent from the body and the environment[2].

Of great importance is the discovery of the Mirror Neurons (MN) achieved by a team of researchers led by Giacomo Rizzolatti (University of Parma), which has gradually modified the traditional vision of the way the cognitive system works, favouring a point of view of the *embodiment* type. This theory ascribes a great value to body and to sensory-motor system, to the contrary to the classic interpretative model which considered human mind and thought just as a process of symbolic nature.

Research on cognition used to focus on abstract aspects of thought led by formal, not biological and independent from cultural elements, now this research has focused on mind as A. put in context B. decentralized C. turned towards action D. holistic E. deeply linked to biology tenets. This emerging perspective interpretation, usually known as *embodied cognition,* does not only query cognitive science centred on a cybernetic and reductionist background, but also presumes a cultural shift from a neutral mind to once *situated*. Knowledge and learning so get a strong perceptive motor

[1] Such assumptions have tried, sometimes without resolutive results and adopting 'pathologizing' interpretations, to identify its peculiar aspects.

[2] Cfr. Francesconi D., *Pedagogia e neuroscienze cognitive in dialogo. L'esempio dell'esperienza corporea,* in "Formazione e insegnamento", 1/2011.

connotation and they occur through multimodal channels, which involve all bodily aspects (such as doing, touching, looking and so on)[3]. Therefore the subject of my paper will be mind in its multifaceted dimensions known as "4 E": *embodied, embedded, extended*, *enacted*, that's to say mind embodied in the subject, deep rooted/ingrained in environment, dependent on social interactions, and being put into action[4]. Such paradigm acquires a very peculiar meaning when applied to autism, especially taking into account the latest perspectives opened up by Neuroscience. It has shown a grown interest in this field, reporting a quantity of experimental data, which opened up new perspectives on its clinical picture and its aetiopathogenesis, reversing completely the traditional tenets, centred mostly on emotional and affective aspects. For more than thirty years, because of a deficit in neurobiological and neurophysical tools, it was almost inevitably to turn to psychodynamic theories. They identified the *primum movens* as a result deriving from a distorted mother-child relationship of the symbiotic attachment partner: almost invariably the mother. Such interpretation was called into question when neurobiological and neurophysiological knowledge made it possible to substitute the psychodynamic way for a more effective way of analysing the basic aspects of autism.

After years of inactivity, progress of neuroscience is showing a new way. In fact, by analysing genetic/evolutive kinds of models that have been adopted in dealing with autism[5], it clearly emerges that these models have been long and in far reaching way influencing the very vision of this condition. A vision often partial and reductive, sometimes even specious, or in Bryan Jepson's words, fundamentally *blind*[6]. In the light of I've just written, what

[3] Cfr. Varela, F.J., Thompson, E., Rosch, E., *The Embodied Mind. Cognitive Science and Human Experience,* Cambridge, MIT Press, 1991.

[4] Cfr. Clark A., *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*, Oxford, Oxford University Press, 2008; Cf., Varela et al., *op. cit*., 1991.

[5] Models not always backed by evidence.

[6] Cfr. Jepson Bryan, *Autismo l'evoluzione di una malattia*, Associazione per la Ricerca in Europa sull'Autismo (*Association for European Research on Autism*) – AREA GCA, see at www.genitoricontroautismo.org.

should be established at the very outset is that we must consider autism and especially autistic individuals in their different parts: *embodied, embedded, extended, enacted*. Thus the embodied autism should be thought of/as an autism seen from *the inside*, that's looked upon from a relatively new perspective, a new dimension we are now aware of thanks to some high functioning autistic individuals (namely Temple Grandin and Donna Williams), who principally through autobiographical written stories have described its sensory-perceptive, cognitive, neural, motor characteristics.

All such aspects characterize it and make it a complete and utter *way of existing*. A different way of *existing in the world* that to non autistic people may seem weird and illogical, but if we consider it from an embodied perspective, it does have a coherence of its own. Therefore the subject matter of this story is the autistic individual embodied in a body, well-rooted (*embedded*) in his/her environment, dependent on social relationships and performing and being put into action who not only not only takes a different view of the world, but perceives, assimilates, introjectes it and develops it through sensory-perceptive peculiarities. Such peculiarities active the underlying cognitive and neural process and influence the general dynamic development. This paper in its first part will deal with the sensorial-perceptive processes as applied to the building of the world, and with some aspects of perception and communication in autistic individuals, which are different from those of neurotypical subjects. More specifically, I'll pursue a particular aspect of the sensorial-perceptive sphere relating to the eyesight. Eyesight which plays a fundamental role in the human being's cognitive process and about autistic subjects. This sense is a crucial means through which implications can be spotted in the processing of human face. In fact scientific literature is inclined to think that autistic subjects perceive and process human face in a peculiar way. Furthermore, this part of the body is regarded as a conveyor of many social signals. Noah J. Sasson maintains also that a closer and deeper examination of the abovementioned aspect might give an explanation about the origin and keeping of deficit in mutual

social relationships and in non verbal communication[7]. An atypical processing of human face, in Sasson's opinion, might act both as a cause and as an effect on many social deficits involving autism and it might also sheds light on some basic emotional distortion at the base of this illness.

All this reasons account for my decisions to focus in chapter two on behavioural and electrophysiological characters, which have been confirmed by specialized texts when it comes to processing of face by autistic individuals. Furthermore understanding the nature and modes through which autistic people process human face and the information mediated by it can help define an important criterion for an early autistic diagnosis. Given that human being's face perception is conveyed by a distributed neural system, where can be found multiple bilateral regions. I think it is useful in the third part of this paper to analyse thoroughly this matter, especially by lingering over some aspects such as the *Fusiform Face Area* (FFA), the *Superior Temporal Sulcus* (STS), and the Amygdala. Numerous studies have reported an atypical functioning also in this case. Such considerations become very important when we think about their far-reaching effects especially on educational and rehabilitative ground. The decision to interpret autism from an *embodied* point of view turns out to be valuable food for thought, a magnifier which let us discover something else: *the hidden face of the moon* and this being fully aware that from the point of view we usually consider the world, we would see very little or we would use one-sided and fossilized patterns. Such interpretation patterns, being shared by most people, can seem convincing and "objectively" valid, but they discourage so critical and self-critical judgment about asking things and wondering about things.

Coping with common places is nothing but learning how to observe the intellectual and unconscious simplifying processes we employ - reductionism, conventionality, our everyday idle working routine - on the contrary we should recognize the complexity, ambiguity, contradictoriness

[7] Cfr. Sasson J., *The Development of Face Processing in Autism*, in Journal of Autism and Developmental Disorders, vol. 36, No.3, april 2006.

and complementarity present in the indissoluble whole between body dimension and not corporeal part of a person. It is necessary to study autism "from its inside" to be able to get to the heart of our quest: the person has to be considered as a whole. In reference to the last field, pedagogic studies focused on autism still find it hard to offer accurate and well-structured insights. There are many valuable contributions, which recall, more or less specifically, theoretical and empirical inputs borrowed from medicine and psychology to such an extent that it is difficult to trace a remark, which can state to be the basis of this field. In the last decayed have increased very much specialist texts about autistic teenagers and children and about educational methods and aids especially provided for them. However when talking about autism in education and rehabilitative field there is a tendency towards an interpretation focusing on stimuli, associations, response, conditioning, behaviour alterations, adaptation, communication and this can lead to our "normative" interpretation, as if autism was only a technical fact linked to medicine. From this point of view such studies have relativised the concept "normality", because there is not a "right" way of perceiving the world but we should consider many different experiences and a plurality of "conceptions of the world". In short, it is necessary to present autism beyond its being a deficit.

The wished direction so is towards theoretical-empirical contributions in a cross-disciplinary way. Such way has to be based on pedagogic tenets to be able to obtain favourable effects on practical learning. Such contributions, however, must focus on the autistic subject because he/she is at the centre of the formative process, at the centre of his/her evolutive story. Such person is rooted in his/her environment (*embedded*) and interacts in it. Environment that, through the special ways it is experienced, de-stabilizes and dis-orientates the autistic person. Such environment can be seen as a limit, but also as a crucial means as educator-rehabilitator and therefore it might turn into an activator/multiplier of educational possibilities. My decision to write on autism implies therefore the need to find the central *telos* of educational

relation in the body and sensory experience. Such *telos* has to detect the most important formative moments in the various interactive modes of the autistic person with his/her environment. The educational project is always based on relation, a generative active and inter-active space, where it takes place a true and utter exchange of meanings, though they are not conventional and standard, but built through an educational relationship, which enable us to see, hear and listen in a better way even in *crossing the frontier.* The educational project to be provided in the case of a person suffering from autism, in the first place, must underline the importance of corporeity and it also has to stress attention on all the multi-sensory stimuli, which are sent to the subject by the environment, in a kind of reciprocal play[8] between interior and exterior and between structure and function. Starting from the elements just enunciated opens up new unexplored horizons towards not considered before issues. But we must be ready to bring the accepted norm into question, even to cross them in order to go exploring, though we do not know what the final destination is. There is an aspect of educational relationship that goes beyond the phenomenal appearance and it involves the intersubjective ability to transfer meanings from one person to another by using body as a medium. Body which is a pre-logical and pre-predicative dimension of our relational and understanding skills, and it enables us to project our face form towards the outer space. Body becomes, thus, the key feature of existence and it is the way through which we can learn how to recognize physical emotional signals. Furthermore, it is instrumental in representing, in practical terms, feelings brought about by emotions and in linking them to consistent. Such feelings can act as preparatory signs of an upcoming outburst of feelings. Body tells no lie. Body can brings about unease, pain, suffering but also satisfaction, pleasure, well-being. Body is the very peculiar meaning which is inside everyone's experience and it expresses its uniqueness. Here is a new consideration being thought about by pedagogy: it is undeniable that an

[8] Based on processes of selective stabilization

autistic subjects sense, existence in an environment and relationships to other people are based on his/her body, which is the tangible and evident manifestation of their *Living in the world.* Body that is the essence and the visible "container" of identity and of human vital space; body which cannot be simply reduced to diagnostic pictures or general categories, on the contrary it must be interpreted through a model of comprehensive education based on *consideration* for the subject. But all this can be achieved only if we agree to accept any difference potentially able to bear fruit. The educational and rehabilitative plan must be centred around considerations, which help us reveal an autistic person's path. Such path can be observed thanks to a continuous observation process.

An *embodied* perspective, involving formative processes and autistic patients, invites us not to consider body only a simple epistemic object, but it urges us on to put it in a specific environment and to make it subjective, giving thus the right value to existence by learning how to interpret the epiphenomenon. Inside the person the epiphenomenon lets us see the different cognitive Weltanschauungen and which enables us to acquire a deep pluralistic and negotiable knowledge. Though such mental mechanisms do not become visible if they are not consciously taken into consideration. We are so used to separating neutral, objective, scientific vision from an existential, subjective and pre-scientific one that we do not notice that such visions operate together in our lives by processing reality. The hoped-for direction, from a pedagogical point of view, should focus on this "revelation" and also on considerations which should be accompanied by a firm commitment that the treatment must cope with common places and it should also consider the existential conditions which mark its changes. Changes to be found also in treatment so to underline the role (and power) of the individual which, following Bateson, seem somewhat reduced, giving that it is not possible to talk about "his/her" mind not acting and interacting in contexts. We can add a brilliant sentence to what already expressed: "a map is not a territory", and so we get that it is necessary to

start from this act, this revelation to be able to explore new lands. The territory drawn on a map contains much more than the map can possibly show and such territory is alive, changing even to morphological alterations. Thus it is possible to draw parallels between map and territory by one hand, and educational and formative plans for an autistic person on the other, that is to say we should be aware of the great importance of our staring at the "person", with the firm intention of understanding him/her in all their possible complexity, but being conscious of the partiality and insufficient nature of our "staring", or our scarce possibility to make such interior complexity visible.

CHAPTER I

EMBODIED AUTISM

1.1 In the direction of an embodied perspective

As pointed out by Leo Kanner[9] and Hans Asperger[10] around the 1940's autism is characterized by: deficit in social adaption, isolated interests, linguistic and/or motor stereotypy and strong resistance to change.

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[9] The American psychiatrist Leo Kanner was born 13th June 1894 in a small town in present Ukraine. In 1913 he started attending the University in Berlin. 1924 he moved to the U.S.A. to work there as a medical assistant in a South Dakota hospital. 1930 he was chosen to establish the first infantile psychiatric provision at the Baltimoran *John Hopkins* Hospital. In 1933 he became associtaed Professor of Psychiatry.
In 1943 he wrote a detailed article entitled *Autistic Disturbance of Affective Contact* for the American magazine *The Nervous Child* (n. 3). This important piece of writing described the case of eleven children, whose symptoms were similar and were ascribed to a condition named by Kanner *autism of the first infancy.* This article spread immediately and became very popular with contemporary researchers. This article and the work by Hans Asperger have become landmarks in this field. Leo Kanner died in 1981 at 86 in Maryland.

[10] The Austrian paediatrician Hans Asperger was born in Vienna on 18th February 1906. 1931 he took a degree in medicine. 1932 he was named Director of the 'Curative Pedagogy' (Heilpädagogik) at the University Pediatric Clinic in Vienna. In October 1943 he delivered an essay entitled *Die autistichen Psychopathen im Kindesalter* to the German journal *Archiv für Psychiatrie und Nervenkrankheiten.* It was published in 1944 and it contained a systematic and scientific description of four children (Fritz, Harro, Ernst and Helmut). Unlike Kanner, the Austrian doctor used the word "autistical psychopathy" to refer to a certain infantile population, which shared symptoms like: isolation, stereotypies and resistance to changes. Hans Asperger highlighted three areas where the subjects observed by him differed from the group studied by his American colleague: language (fluent speech, whereas in Kanner's subjects it was absent and/or non communicative); motility (according to Asperger his subjects showed difficulties both in simple and in complex mobility, while Kanner maintained that his subjects were clumsy only in complex mobility; learning capacity (Aspenger called his subjects "abstract thinkers", whereas in Kanner's opinion the children performed better when learning something mechanically. Unlike Kanner, Aspenger in his description made references also to children's hypersensitivity and/or hyposensitivity to certain kinds of stimuli (olfactory, visual, auditory, tactile or gustatory). Asperger's syndrome is an autism spectrum disorder much more comprenhesive than the tenets of autism asserted by Kanner. The noun phrase *Asperger's Syndrome* was coined by the British psychiatrist Lorna Wing in 1981. It differs from autism as there is not a lack of delayed or retarded cognition and language: "la diagnosi della sindrome di Asperger tende a essere più tardiva di quella di autismo, e viene fatta nella tarda infanzia, adolescenza o addirittura in età adulta" (Frith U., *L'autismo. Spiegazione di un enigma,* Roma-Bari, Laterza, 2005).
Asperger, unlike Kanner, achieved little public recognition and kept in the background.
Thanks to Lorna Wing's publication *Asperger's Syndrome: A clinical account* in Psychol Med. (1981 Feb) there has been a renewed interest in Hans Asperger's vital scientific contribution. For further information on Asperger and his theoris cf. the said article and its

The worst symptom detected in autistical individuals by the two scholars is the fact that they, since birth, display difficulty in communicating with other people to such an extent that the social relations are severely impaired.

According to Leo Kanner autism should be caused by a congenital biological impossibility of relating to the outside world: "we must, then, assume that these children have come into the world with innate inability to form the usual, biologically provided affective contact with other people, just as other children come into the world with innate physical or intellectual handicaps"[11]. Hans Asperger agreed that the key aspect in autistic symptomatology is a difficulty in developing social abilities and affective relations: "vogliamo mostrare che l'anormalità fondamentale è un disturbo delle relazioni vive con il mondo circostante, un disturbo che spiega tutte le altre anomalie"[12]. So the autistic person would not follow the Aristotelian maxim: "Man is by nature a political animal". *"Anthropos zoon politikon"* and he/she would be prone to complete isolation and consequently to withdrawal. The very name *autism* stresses the point, deriving etymologically from Greek prefix *aut* (from *autos* "self" and Latin suffix *–ism* denoting a state or a quality). So the literally translation of *autism* is 'withdrawal' or 'egocentrism'[13]. Over the years the fact that autistic subjects are unable to communicate with others, will lead them to a dichotomy apparently impossible to be in agreement. On the one hand there's the autistic world, which is ruled by "weird" laws and is inaccessible, on the other hand the non autistic world ruled by rationality and logic and characterised by predictability and intelligibility. For a long time the image of an *Empty Fortress*[14] was associated with autism,

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Italian translation: *Bizzarri, isolati e intelligenti. Il primo approccio clinico e pedagogico ai bambini di Hans Asperger* (ed. Franco Nardocci),Trento, Erickson, 2003.

[11] Kanner L., *Autistic Disturbance of Affective Contact,* Nervous Child, 1943, p.250.

[12] Nardocci F. (a cura di) *Bizzarri, isolati e intelligenti. Il primo approccio clinico e pedagogico ai bambini di Hans Asperger*, Trento, Erickson, 2003, p.19.

[13] Cfr. Williams D., *Il mio e il loro autismo. Itinerario tra le ombre e i colori dell'ultima frontiera*, Roma, Armando, 2000.

[14] *The Empty Fortress. Infantile Autism and the Birth of the Self* by Bruno Bettelheim, published in 1967, is a well-known and controversial book on autism. The Austrian Jewish

spreading so a stereotype of an impenetrable and vacuous "no land" *(augè).* On the contrary the *non autistic world* thrives on the relative and flaunting conception of normality. And in the name of normality many mistakes are being made and many limits are hidden.

The specialised literature is instrumental as well, more or less voluntarily, in stressing the gap between these two worlds. In fact, some researchers have employed in their papers harsh expressions such as: children's moon[15], *The Ultimate* ***Stranger****: the autistic child, Un antropologo su* ***marte***, *Through the eyes of* ***Aliens****: A book about Autistic People*, ecc.[16]

The recurring use of words referring to remote places and to other dimensions (Moon, Mars, Aliens, Strangers) widens the gap between the two worlds. Such writings though sometimes reductive and biased, have been instrumental in bringing about fresh impetus and new food for thought. Moreover it has been possible to reformulate obsolete theories, starting from aforesaid writings and to put forward new ones about autism etiology.

This partially was the situation of the 1960's and 1970's. These decades mark a watershed between the older psychodynamic conception – led by Bruno Bettelheim as its most extreme exponent – and the newer organicistic fromulation, which semeed definitely to exonerate parents from the terrible charge that they had been responsible for their own children's disorder.

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psychoanalyst Bettelheim long time spread the harmful and misleading theory that autism is brought about by a poor relationship with ones parents, especially with the mother. Bettelheim borrowed the expression "mother refrigerator", coined the years before by Kanner and put a major emphasis on it. He would have us believe that autism is a defence mechanism used by the child, who perceives his mother's wish to limit him. For a long period of time Bettelheim's unsound theory influenced scholars, who, in their turn made it known. These remarks against children's parents were not only very misleading but also totally inaccurate as it was shown by scientific evidence. The biography *The Creation of Dr. B., A Biography of Bruno Bettelheim,* (Simon & Schuster, 1997) by Richard Pollack tore Bettelheim and his theory to shreds. For further references see the above–mentioned book.

[15] This expression is used in literature to refer to autistic children.

[16] Cfr. Delacato C.H., *The Ultimate Stranger: the autistic child,* Arena Pr, 1984; Cfr. Sacks O., *Un antropologo su marte. Sette racconti paradossali*, Milano, Adelphi edizioni, 1995; Cfr. O'Neill J.L., *Through the Eyes of Aliens: A Book About Autistic People,* Jessica Kingsley Pub, 1998.

The American psychologist Bernard Rimland dealt a death blow to "The Empty Fortress" by Bettelheim. Rimland was father of an autistic child called Mark. In 1964 Rimland published his first and most famous work: *Infantile Autism: The Sindrome and its implications for a Neural Theory of Behavior,* where he argued strongly that autism is a biologically based illness and he also suggested that sensory-perceptive abnormalities might be intrinsic parts of it. Following what had already been proposed by Rimland, Carl H. Delacato in 1974 developed a sensory dysfunction theory, which held that autistic individuals would not be psychotics, but brain-damaged subjects suffering from a serious sensorial disturbance. Delacato was one of the first to come up with the theory that hyper- and hyposensitivity experienced by autistic children caused all autistic behaviours, especially their great difficulty in communicating and forming relationships with other people and their stereotypy. Delacato's insights over the years have been corroborated by the great autistic writers Temple Grandin e Donna Williams. Bernard Rimland and Carl H. Delacato helped thus to shed new light on a world that had been earlier nebulous and impenetrable[17].

In the 70's and in the 80's a great emphasis was placed on the cognitive development and this, together with progress made in neurosciences, has led to the current and popular firm belief that autism is biologically or neurologically based and that it is a disorder of brain and mind development[18].

Autism has been traditionally labelled as a condition characterised by a minimum relationship to external stimuli and reality, by a limited ability to communicate and by imagination disorder[19]. But continuous and meticulous post-cognitive research has shown that besides the three above-mentioned

[17] In 1967, that's to say when Bruno Bettelheim published *The Empty Fortress* and three years after Bernard Rimland's work, Clara Clairborne Park brought out a book entitled *The Siege: The first eight years of an autistic child.* Park was a teacher and her book was one of the first and best biographies on autism. It dealt with her autistic daughter: Jessica Park.

[18] Cfr. Frith U., *op. cit.*

[19] These are considered as compensative finalistic reactions, brought about by one or more fundamental disturbances.

bad aspects we can detect many other facets. As it has been stated, autism is a multifaceted world and this will urge new research, whose scientific contributions, once they are cleared, will act as *bridges between the two worlds*[20]. Nevertheless in order to lay the foundations of these ideal buildings, we need the basic and invaluable help from high functioning autistic subjects. A case in point are Temple Grandin and Donna Williams, who through their autobiographies, diffused a rich harvest of information on the multiple shades of their perceptive and emotional inner life. And they made this in a lively, detailed and vigorous way. These original readings of the autistic world from "its inside" have assisted me to deconstruct some conventional beliefs about autistic subjects. This process began several years ago through some important jobs, process which brought about the controversial question: *what is like to be autistic?*

Such question forms the basis of this paper and will make it easier to solve some thorny issues. *What is like to be autistic?*, has may be detected by careful readers, recalls a well known article by Thomas Nagel: "*What is like to be a bat?*". It was written for *The Philosophical Review* (4 October 1974), and dealt with the impossibility of living directly and of experimenting in the first person what a bat feels. He was sceptical about the mere possibility of conjuring up what it thinks: "Non serve cercare di immaginare di avere sulle braccia un'ampia membrana che ci consente di svolazzare qua e là all'alba e al tramonto per acchiappare insetti con la bocca; di avere una vista molto debole e di percepire il mondo circostante mediante un sistema di segnali sonori ad alta frequenza riflessi dalle cose; e di passare la giornata appesi per i piedi, a testa in giù, in una soffitta. Se anche riesco a immaginarmi tutto ciò (e non mi è molto facile), ne ricavo solo che cosa proverei io a comportarmi come un pipistrello. Ma non è questo il problema: io voglio sapere che cosa prova un pipistrello a essere un pipistrello. Ma se cerco di figurarmelo, mi trovo ingabbiato entro le risorse della mia mente, e

[20] Cfr. Bogdashina O., *Le percezioni sensoriali nell'autismo e nella sindrome di Asperger*, Crema, uovo nero edizioni, 2011.

queste risorse non sono all'altezza dell'impresa"[21]. Similarly, if we apply such method to autism, we will realized that being an autistic person is quite different from conjuring it up and so a non-autistic person cannot possibly get directly that kind of subjective experience. Unlike Thomas Nagel, I think that the aforesaid method might be an "ideal" basis for investigating and studying in depth some aspects, especially those linked to the sensory-perceptive system and to communication, which can be referred to as the best means to know ourselves and the world around us.

[21] Nagel T., *What Is It Like to Be a Bat?,* "The Philosophical Review", october 1974.

1.2 Sensory-perception and *building* of the world in the autistic syndrome

...Therefore our conviction that our perceptions
are accurate and trustworthy is just an illusion.
We re-create, inside our brain,
the outside world where we live.
Eric Kandel

It is undeniable that sensory experiences play a crucial role in letting any sentient creature feel what has written Eric Kandel; that's to say the possibility of *re-creating* the outside world where we live in our brain. In fact all we know comes from our senses. But this knowledge has an intrinsic representative nature because our senses feel the objects in a different way than they really are[22]. It follows that any sensory or mental perception and/or cognitive action does not reproduce exactly objects, but form a representation of them. After such preliminary remarks we come directly and inevitably to a series of gnoseological issues: "è il mondo la causa primaria e la mia esperienza ne è la conseguenza o è la mia esperienza a essere causa primaria e il mondo la conseguenza?"[23].

In order to achieve what I've intended to show in this paper, I make a point of trying to find an answer to Von Foerster's question. Hans Von Foerster was an Austrian American physicist and cybernetician who pointed out that since objects and events are not primary experiences, it is our experiences the primary cause and the world is a consequence[24].

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[22] Cfr. Calisi A., *La conoscenza come costruzione della realtà, http://www.ildiogene.it/EncyPages/Opere/CalisiAConoscenza&Costruzione.pdf.*
[23] Foerster H.V., *Attraverso gli occhi dell'altro*, Milano, Guerini e Associati, 1996, p.34.
[24] Here the author is following also the Swiss epistemologist Jean Piaget, who argued that objects in the world are perceived through our activity in it.

Von Foerster borrowed from the Irish philosopher Berkeley *"esse est percipi"*, and he maintained that *all being in existence* is produced only by our sensible perception. Being aware that Von Foerster's position on knowledge can lead to solipsism, I'll try – in his wake – to turn my attention to the sensory-perceptive system in an attempt to make it and its nature clearer. More specifically, I'll concentrate on sensory-perceptive system's effects on cognitive processes, and on the *building* of the world. In this paper I'll adopt a constructivist approach to knowledge. I've taken such approach being aware that any reality is, in its strict sense, a construction of a person's mind: "l'immagine che ogni uomo ha del mondo è e sempre rimane una costruzione della sua mente, e non si può provare che abbia alcuna altra esistenza"[25].

Human beings in order to perceive the outside world need special sensory organs and neural channels. Eyesight, hearing, touch, taste and smell bring us into contact with the outside world, they were called *doors of perceptions*[26] by Huxley. A large number of external stimuli passes through these doors. These stimuli first are changed into chemical/electric nervous signals and then they are processed by the brain. Although human beings share the same sensory hardware and live in the same world, autistic persons perceived in a surprisingly different way. The sensory-perceptive field, in relation to autism, was studied for the first time during the 60's and 70's of the 20th century, when Bernard Rimland in 1964 and Carl H.Delacato in 1974 examined fully this syndrome. The Italian-born American pedagogist and psychologist Delacato, born in 1927 in Pennsylvania, while studying some autistic children noticed that their behaviour and attitude were almost identical with that of blind, deaf or brain-damaged children. Such evidence made Delacato think that autistic subjects are brain-damaged individuals suffering from serious sensory disorders. He put forward the theory of *sensory dysfunction,* which asserted that autism is a neurological based

[25] Cfr. Schrodinger E., *What Is Life? the Physical Aspect of the Living Cell,* Mind and Matter, Cambridge at the University Press, 1967.

[26] Cfr. Huxley A., *Le porte della percezione. Paradiso e inferno*, Milano, Mondadori, 2002.

disorder and it is attributable to a damaged or not-working properly sensory channel. Indeed, in order to have a good neurological organization our brain should be able to perceive things in a coherent and reliable way, otherwise the neurological organization will not work properly. Thus, if the sensory channels have been impaired, an autistic subject can not possibly receive outside perception in a complete and trustworthy way. Usual autistic symptoms are body rocking, stereotyped language and movements, bites, objects handling and so on. Delecato thinks that these signs are used by autistic people to "normalize" their sensory channels. In the efforts to do this their attention is diverted from the real world. Thus it prevents them from living a normal life. The American researcher was of the opinion that eyesight, hearing, touch, taste and smell can be impaired in three ways:

- Hyper: the sensory channels are too receptive, so too many stimuli reach the brain, which can not process them.
- Hypo: sensory channels are not open enough and as a consequence too little stimulation can reach the brain.
- White noise: sensory channels produce their own stimulation because of a malfunction. This simulation interferes with stimulations going to the brain and so the message form the outside world is altered, or at work, it is completely drowned out by the noise of the system. As a consequence of I've written before, autistic subjects can not lead a normal life.

A case point is when the hearing sensory channel does not work properly: in the "hyper" situation the autistic person might refuse a contact by showing his/her annoyance if embraced. Following Rimland's and Delacato's theories, numerous uncommon sensory experiences have been observed in

autistic people. However, as stated by Goldstein[27], these unusual sensory experiences have been neglected or superficially studied. So far sensory atypical characters, although they play an important role together with social and communicative deficits, are in the major diagnostic classifications early considered as associated symptoms. New horizons have opened up in this field thanks to Bernard Rimmel and C. Delacato, whose works, over the years, have been confirmed by several psychological studies and, above all, by autistic subjects[28] autobiographies. Several studies[29], surveyed by O'Neill[30], proved that 70%-80% of autistic patients have sensory disturbances. Research and various reports have noted that all five senses and kynesthetic and proprioceptive sensibility are involved. In addition to hyper – and hyposensibility to ambient stimuli, Crispiani[31] quotes the following characteristics:

- A search for a specific sensory selfstimulation.
- Perceptive distortions; for example depth might be perceived in a wrong way or still things might be perceived as moving.
- Perceptive overload: when an autistic person is in a place too crowded, or too full of hearing or visual stimuli, he/she might react angrily or violently because of his/her uneasiness and irritation.

[27] Cfr. Goldstein H., *Commentary: Interventions to facilitate auditory, visual and motor integration: "Show me the data",* Journal of Autism and Developmental Disorders, 30, 2000, pp.423-425.
[28] Especially high-functioning autistic persons.
[29] Cfr. Ornitz E.M., Guthrie D., Farley A.J., *The early development of autistic children*, in Journal of Autism and Childhood Schizophrenia 7, 1977, 207-209; Cfr., degli stessi autori, *The early symptoms of childhood autism*, in G.Serban (a cura di) *Cognitive Deficits in the Development of Mental Illness*, New York; Cfr., Volkmar F.R., Cohen D.J. e Paul R., *An evalutation of DSM-III criteria for infantile autism*, in Journal of American Academy of Child Psychiatry 25, 1986, pp. 190-197.
[30] Cfr. O'Neill M., *Sensory-perceptual abnormalities in autism*, in Psychological Perspectives in Autism "Conference Proceedings", 1995, pp.55-61.
[31] Cfr. Crispiani P., *Lavorare con l'autismo. Dalla diagnosi ai trattamenti*, Bergamo, Edizioni Junior, 2002.

Therefore it's very important to take this fact into consideration when planning homes for autistic subjects.

- Difficulty in processing information coming from several channels at the same time.
- "Multichannel perception": this means that the perception of a sound can also brings about the vision of colours or the smell of something.
- Stimuli overselectivity: autistic persons tend to focus on things evoking specific functional reactions or pay particular attention to uncommon aspects or insignificant details of a stimuli, overlooking the global view and the context.
- High skills at visual spatial discrimination: autistic subjects have a tendency to focus on details. This enables them to show their spatial perceptive skills. In fact, they have very good memory for positions, forms and can distinguish images, forms ecc.

The above listed characteristics form an uncommon perceptive world, where the subject has difficulty in giving sensations a coherent meaning, in organizing and then changing them into concepts. In the light of evidence, is it possible that, as maintened by some scholars[32], the true and deep cause of autism lies in the perceptive channel? Furthermore, to be fully understood is this disorder in the first place a perceptive deficit? If things are not like this, what is then the real role played by sensory-perceptive experience in this syndrome? The inescapable conclusion is that we should try to give answers to these unavoidable questions by studying the issue in depth and by taking into due considerations autobiographies written by high functioning autistic people.

[32] Cfr. Vand Dalen J.G.T., *Autism from within: looking through the eyes of a middly afflicted autistic person*, link 17, 1995, pp.11-16; Cfr. Hatch-Rasmussen C., *Sensory integration,* www.legacy.autism.com,1995; Cfr., Williams Donna, *Il mio e il loro autismo. Itinerario tra le ombre e i colori dell'ultima frontiera*, Roma, Armando editore, 1998.

1.3 Temple Grandin

To autistic persons, autism is a way of existing.
It is pervasive, it embellishes any experience, sensation, perception, emotion:
in a nutshell all life.
(Sinclair, 1993)

Temple Grandin's attitude lent a fresh perspective to the subject. In 1986 she published *Emergence: labeled autistic*, which was hailed by specialists as an unprecedented book. As a matter of fact, it was the first time that somebody tried to describe the autistic condition "from the inside". This had been inconceivable for no less than four decades because medicine had been denying the existence of this inner world or at least the possibility of penetrating it. Temple Grandin was born in 1947 in Boston and in 1950 she was diagnosed as being autistic. After a natural science PhD, she's now an associated teacher at the University of Colorado. Her name started to be familiar to common readers owing to *Un Antropologo su Marte* by the English neurologist Oliver Sacks. After reading her autobiography he doubted that the book might had been written by an autistic subject. Indeed he was highly dubious about the fact that a person suffering from autism might have issued out such an introspective and retrospective account of this syndrome. However, after reading other papers written by her and after he knew her personally, he changed his mind. The works by Grandin have been instrumental in collecting new and original data, which have had far-reaching benefits for subsequent research. All her publications make it clear that autistic persons not only have an interior-inner world, but also it is full of emotions, sensations, perceptions, languages that – still being atypical features – have a true coherence of its own. Coherence, for example, that in

Temple Grandin is characterised by the fact that she – unlike most people – *thinks in images* and not through linguistic bases. This enables her to have excellent visual-spatial skills and also outstanding associative and mnemonic abilities: "il mio schema di pensiero inizia sempre dallo specifico per passare al generale con modalità associative e non sequenziali"[33].

Thanks her keen visual skills, which *oblige* Grandin to focus on details, she has developed a great empathy with animals, especially cattle, and this enable her to put forth a fascinating theory, where she linked animal's behaviour and some autistic peculiarities: "le persone autistiche sono più vicine agli animali di quanto non lo siano gli esseri umani normali"[34].

Grandin herself in her *Thinking in pictures,* whose original title should have been "*A cow's eye view*", argues that in order to realize what's the point of view of a cow it is not sufficient to see as a cow does, but it's crucially important that we feel like one: "quando mi immagino al posto di una mucca, devo essere realmente quell'animale e non una persona travestita da mucca. Uso le mie abilità di pensiero visivo per simulare cosa vedrebbe e sentirebbe un animale in una determinata situazione…devo anche immaginare come sia percepire il mondo attraverso il sistema sensoriale di una mucca"[35]. Now it has become possible to refer back to the first part of this paper and we are appoaching the chance to give an answer to the question already asked: *what is like to be autistic*? A possible interpretation comes from Temple Grandin, who, being an autistic subject, can see from the inside the sensorial and perceptive sphere of animals. In her opinion there are many sensory-perceptive analogies between animals and autistic people, and those analogies distinguish also autistic persons from non-autistic ones. One of the most important similarity is the way of looking at the real world: the autistic people pay attention to detail, non autistic individuals, in Grandin's words: "confondono quegli stessi dettagli nel loro

[33] Grandin T., *Pensare in immagini e altre testimonianze della mia vita di autistica*, Trento, edizioni Erickson, 2001, p.37.
[34] Grandin T., *La macchina degli abbracci*, Milano, Adelphi edizioni, 2007, p. 76.
[35] Grandin T., *Pensare in immagini,* p. 156, 2001.

concetto generale di mondo"[36]. Human beings, according to her, "non vedono consapevolmente alcun oggetto a meno che non gli stiano prestando un'attenzione diretta e concentrata", while the autistic persons and the animals should not concentrate on something to see it, since this happens independently from the activation of an intentional process. Thinking in pictures takes a person to experience the world as it is, so any new particular is noticed and can become a source of anxiety. It is a well-known fact that the autistic persons don't like changes in their environment or habits and are fond of their routine. If a single detail is changed and the same goes for animal Grandin says, the whole (Gestalt) is no more familiar and can thus give rise to stress, fear and frustration. She hypothesizes that autistic persons and also animals, unlike normal people, are not subjected to inattentional blindness, in other words the failure to notice an unexpected stimulus that is in ones field of vision when paying ones attention to something else. It should be caused by the activity of the frontal lobes: "la ragione per cui le persone normali hanno tanta difficoltà a vedere i dettagli è che sono intralciate dai lobi frontali, posti alla sommità del cervello"[37] and they, in Grandin's opinion, in autistic subjects would not work as they might. Grandin's theory has been backed up by Mario Lambiase, who in his *Autismo e lobi frontali* suggests that the frontal cortex might be involved in originating autism: "una causa x danneggerebbe, in uno o più particolari momenti della costruzione dell'embrione, la struttura anatomica del cervello, alterandone il programma di formazione. A motivo di ciò si determinerebbe, nei momenti critici dello sviluppo, un difettoso assemblamento anatomo-funzionale delle parti cerebrali colpite, nel cui snodo principale vi sarebbero i lobi frontali"[38].

Also the research carried on by the American neuropsychologist Elkhonon Goldberg seems to be in line with Temple Grandin's insights. In fact, in his

[36] Grandin T., *La macchina degli abbracci*, 2007, p. 45.
[37] Ivi, p.70.
[38] Lambiase M., *Autismo e lobi frontali. Alla ricerca delle basi anatomiche di un enigma*, Gussago (BS), Vannini editrice, 2004, p.24.

book entitled *The executive brain. Frontal lobes and the civilized mind* he points out that the frontal lobes represent the hub connections are received from the whole of our body. According this neuropsychologist any damage to a part of the brain would entail an alteration of the input to the frontal lobes and as a consequence of this the output as well would be altered. The frontal lobes so giving that they had not received a proper input, can not give correct output independently they are not structurally impaired. This leads Grandin to write: "In attesa di saperne di più, io parto dal presupposto che uno dei problemi dell'autismo non stia tanto nei lobi frontali, quanto nell'input anormale che essi ricevono"[39].

She has underlined that among sensory peculiarities one of the most important in autism is the sensation experienced when being touched. The simulation brought about by a pressure on the body, though often longed for, bothers people suffering from this syndrome: "da sempre, fin da quando posso ricordare, ho odiato essere abbracciata. Volevo provare la sensazione positiva di essere abbracciata, ma era semplicemente troppo *opprimente.* Era come un'enorme ondata di stimolazioni che sommergeva tutto e io reagivo come un animale selvatico"[40].

In her book Grandin emphasized that many autistic children look for a stimulation deriving from a pressure providing that it is not unexpected. This because, according to Grandin, the nervous system has not got enough time to process the sensation. Once again this American researcher sees a parallelism between autistic human being and animals. The cows, in fact once channelled through the passage which blocks them before vaccination, relax when they are pressed by the lateral panels. Temple Grandin has been suffering from continous fear and anxiety together with panic attacks. During one of these attacks she got into the passage used for blocking animals. At first she was scared to death, then she says: "mi irrigidii e cercai di sottrarmi alla pressione, ma non potevo uscire perché avevo la testa

[39] Grandin T., *La macchina degli abbracci*, 2007 , p. 75.
[40] Grandin T., *Pensare in immagini*, 2001, p. 69.

bloccata. Dopo cinque secondi avvertii un'ondata di rilassamento…dopo circa un'ora mi sentii molto tranquilla e serena…questa fu la prima volta che mi sentii veramente a mio agio nella mia pelle"[41].

A key issue in her accurate book is the autistic people's lust for pressure. But the kind of pressure to receive, must be actively longed for and it must not be imposed on these patients. This can be obtained, as described by many high functioning autistical people's biographies, by for example wearing belts or shoes very tightly, or applying a pressure on some parts of the body. Touch is used by many autistic children, who don't speak, to explore the ambient and to know things around. Donna Williams used it to perceive even her own body: "Donna Williams descrive la percezione frammentaria che aveva del suo corpo, tale per cui era in grado di percepire solo una parte alla volta …Donna si dava ritmicamente dei colpetti, e a volte schiaffi, per capire dove fossero i suoi confini corporei"[42]. Temple Grandin shows us a complex image of autism in its relation to sensory-perceptive aspects. Thus the seemingly weird behaviour is just a means used by autistic to balance ambient stimuli that have been received and processed in an atypical way. Accordingly, avoiding physical contact, urging for a pressure on ones body through uncommon ways, showing anxiety, stress and/or attempts to flee would be a re-action to the outside world, which in meaningless to autistic persons. The real life of somebody suffering from this disorder so might be a continuous groping for the right answers, the right reference points, in Grandin's words, would be like feeling as an *antropologist on Mars.* I think that anybody who deals with autism after reading Temple Grandin's works, should approach it employing a new paradigm. A new paradigm that must analyse not only like it used just the syndrome but also the relationship between the autistic person (embodied in a body, deep rooted into an ambient, where he/she acts through specific sensory-perceptive cognitive ways), and the non autistic world. More food

[41] Grandin T., *Pensare in immagini*, p. 70.
[42] Ivi, p.73.

for thought has been given us by Donna Williams, a well-known high functioning autistic woman.

1.4 Donna Williams

As a child my sensitivity channels did not work properly and
my reaction to light, sound and contact not only was meaningless
but also excessive.
I could not understand the world; not only this, I could not even bear it.
Donna Williams

Donna Williams was born in 1963 in Melbourne and as an adult she was diagnosed being autistic. Today she is a well-liked writer, singer-songwriter and scriptwriter. In Donna Williams'life, music and art were factors which led to her self-knowledge. She herself did not know to have such great gifts. Thanks her numerous books[43] we got the chance to observe her many-sided inner universe. Donna Williams since her childhood has had a considerable difficulty in processing external stimuli. To quote her own words: "ho sperimentato il mio autismo come un cesto, con molti puzzles diversi, tutti mescolati tra loro e a ciascuno manca qualche pezzo, ma c'è qualche pezzo in più che non appartiene a nessuno di quei puzzles. Il primo dilemma per me fu individuare quali pezzi appartenessero ai vari puzzles; da lì dovetti ricavare quali pezzi mancassero e quali non avrebbero dovuto essere affatto nel mio cesto"[44] .

[43] Cfr. Williams D., *The Jumbled Jigsaw: An Insider's Approach to the Treatment of Autistic Spectrum Fruit Salads*, Jessica Kingsley, 2008; Cfr. Williams D., *Exposure Anxiety, The Invisible Cage*. *An Exploration of Self-Protection Responses in the Autism Spectrum and Beyond*, Jessica Kingsley, 2008; Cfr. Williams D., *Autism and Sensing: The Unlost Instinct,* Jessica Kingsley Pub, 1998; Cfr. Williams D., Autism: *An Inside Out Approach*, Jessica Kingsley Pub, 1996; Cfr. Williams D., *Everyday Heaven: Journeys Beyond the Stereotypes of Autism,* Jessica Kingsley Pub, 2004; Cfr. Williams D., *Like Colour to the Blind: Soul Searching and Soul Finding,* Jessica Kingsley Pub, 1998; Cfr. Williams D., *Nessuno in nessun luogo. La straordinaria autobiografia di una ragazza autistica*, Roma, Armando editore, 2002; Cfr., Williams D., *Qualcuno in qualche luogo,* Roma, Armando editore, 2005; Cfr., Williams D., *Il mio e il loro autismo. Itinerario tra le ombre e i colori dell'ultima frontiera*, Roma, Armando editore, 1998.

[44] Williams D., *Il mio e il loro autismo. Itinerario tra le ombre e i colori dell'ultima frontiera*, Roma, Armando editore, 1998, p.9.

In such environment Donna is obliged *to make use of a body, a face and a voice, which were perceptively not linked to her*. So she had to learn how to behave, interact and come up to other people's "absurd" expectation. She was kept prisoner and obsessed by her drives, habits and sensory-perceptive world, which often overwhelmed her. Williams in her teens started thinking she was an alien incapable of any emotions. She was informed that she is autistic at 25. She experienced sensory hyper sensibility and difficulty in integrating the systems, which made her perceive the world as a meaningless and aimless environment. Those faults made her body, voice, motion and emotions oppressive, alienated[45]: parts drown away form her. This writer describes in her books what had been helpful, but she avoids labelling autism, which - she states - cannot be the find:"ecco perché, per me, non esiste una singola cosa chiamata autismo"[46].

The most significant features in her autobiographies are issues about control, tollerance and connective disorders. According to Williams the issues about control (constriction, obsession and state of serious anxienty) concern the ability *to answer* the world and/or oneself intentionally; the issue about tollerance (sensorial hyposensitivity, emotional hyposensitivity) concernes the ability *to bear* the world and /or oneself, while the connective disorders (difficulty in paying close attention what is been said or done, perceptive and systems integration trouble, cerebral hemispheres, defective connection) concern the ability *to understand* the world and/or oneself[47]. These three questions, in Donna Williams' opinion, can lead to the three fundamental issues that concern autism: difficulty in responding to other people, speech disorder, strange/weird behaviour. According to her the above-mentioned questions are all the utmost importance to those studying this syndrome. To quote her words:"Se aveste un cammello che trovasse difficile camminare sotto il peso di tutte le balle di paglia che porta sulla groppa, il modo migliore per rendergli più facile il cammino sarebbe il

[45] Cfr. Williams D. *Il mio e il loro autismo*, op. cit.
[46] Ivi, p. 13.
[47] Ivi, pp.30-31.

toglierne quante più possibile. Gestire il problema significa addestrare il cammello a camminare o a sembrare di camminare portando la paglia. Curare significa togliere la paglia dalla groppa del cammello"[48].

To approach properly autism she asserts that first it is necessary to improve processing and to reduce sensorial overload, so to help autistic people to establish mechanically the connections that should have been present normally. Donna Williams describes two sorts of connective disorders in the processing of information: the belated and the very fast connection. The author focuses on the belated once which can be classified as: processing of information that pass through sensory channels, monitoring of ones expression (emotion, body language, actions, facial expressions and so on), provinding access to words or to body connections. Processing, monitoring and access to information should occur in Donna Williams and other autistic people through a single channel ("mono"), while most people might be able to process information in a proper and continuous way through several sensory channels (multichannel) at the same time. To be able to work through many channels might, among other things, enable non-autistic persons not only to process the literal meaning of what has happened but also to have access almost simultaneously to information, thoughts, past experiences, which help the subject to act in a reasonable and conscious way. Unlike "multi-channelled" people: "mentre accedono alle connessioni con ciò che vogliono esprimere, le persone "mono" possono avere poca o nessuna capacità di elaborare simultaneamente la risposta di chi ascolta o di chi guarda e così non sapere affatto se sono anche soltanto comprensibili per gli altri o se gli altri sono interessati a quanto essi dicono"[49]. The fallout from this situation inevitably affects communication and social interaction, which turn into a discontinuous and unreliable experience. The impossibility of maintaining continuous and simultaneous processing, access and monitoring might then imply that there is an incapacity to take

[48] Williams D., *Il mio e io loro autismo*, p. 87.
[49] Ivi, p.97.

contemporaneously "self" and "other" (issue self/other) into consideration. According to Donna Williams this impossibility is the cognitive trouble which form the basis of most of autistic subjects' problems (especially about their social and communicative disorders); hence, following Donna Williams' theory, the necessity of employing a method such as the *multisensorial integration*, whose aim is to help persons use eyesight, hearing, touch, smell, taste and proprioception all together. As stated before by Williams, autism is characterised not only by a connection disorder, but also by tollerance and control. Sensory hypersensitivity and emotional hyposensitivity (and/or exposure anxiety) are related to connection disorder. Very interesting is her account about sensory hypersensitivity that – in her case – started both independently from the information overload and as its direct consequence[50]. Following this last interpretation, the information overload might be broad about by connection troubles and it should be related to data hypersaturation. So a poor information processing system, she points out, raises the visual, tactile, hearing and so on sensory sensitivity. This situation should turn ambient stimuli into painful, sometimes unbearable sensations. A case in point is tactile hypersensitivity: "l'essere toccata può diventare terribile come l'essere scossa", while if an auditory perception intensifies "i suoni normalmente non udibili si possono sentire come fossero normali e poiché stanno già entrando troppe informazioni perché il cervello stia al passo con le sue connessioni, la percezione di questi suoni aggiuntivi può renderli decisamente insopportabili"[51]; visual hypersensitivity (such as various kinds of bright lights) can be also experienced as physically *uncomfortable and excruciating.* Williams'suggestions therefore can help autistic patients to handle both the sentence and causes of "hypersaturation" through professionals. An example of this is the use of coloured lenses in order to face visual-perceptive troubles. As described by Olga Bogdashina in fact: "il

[50] Because of allergic reactions, toxicity and metabolic disorder.
[51] Williams D., *Il mio e il loro autismo*, op. cit., p.189.

sovraccarico sensoriale causato da luci forti, lampade fluorescenti, colori e motivi fa reagire il corpo come se fosse sotto attacco o bombardato, dando luogo a cambiamenti biochimici negativi che possono avere per effetto sintomi fisici come mal di testa, ansia, attacchi di panico o aggressività"[52] and consequently autistic subjects to relieve stress caused by such sensory overload might employ defensive visual acts: looking somewhere else, looking at something for a short time, keeping one's finger in front of the eyes, ecc. The techniques known as IRLEN[53] and "color-imitor"[54] use both coloured filters or lenses to filter well-defined light frequencies and this in order to reduce the overload of visual stimuli and to help brain process information in a more correct way. According to Donna Williams this should have a favourable effect on the other systems: "poiché l'elaborazione visiva rappresenta circa il 70% di tutto il processo di informazione, se questa è sovraccarica le conseguenze sugli altri sistemi possono essere gravissime. Quando viene tolto il carico dal processo visivo, può diminuire in modo significativo anche quello sugli altri sistemi"[55]. The successful use of coloured lenses after the changes in autistic people's visual perception has opened up new perspectives on the research about perceptive disorders brought about by sensitivity to light. Donna Williams suggestes that those who try to reduce the information overload should follow some tips: speaking slowly and calmly, reducing as much as possible movements, intonation patterns, face expressions. Moreover physical contact should be avoided and just when strictly necessary it should be slow and predictable so not cause anxiety, frustration and confusion.

[52] Bogdashina O., *op. cit,* p. ,2011

[53] It is a method that was developed over the 1980's by the American psychologist Helen Irlen. It is instrumental in diagnosing perception disorder and in providing the relative treatment by using coloured sheets and/or filtering lenses. The lenses used as glasses should have a specific colour because everyone is sensible to a specific colour.

[54] It is a technique used by some ophthalmologists based mainly on problems occurring when somebody is reading a sheet and also on a coloured light reflecting on a sheet so to be able to decide what is the best kind of lenses to use.

[55] Williams D., *Il mio e il loro autismo,* p.65.

Another way to stop hypersaturation, from bringing about hypersensitivity, is granting autistic subjects spells (from 5 min. to 1 min.) of time free from stimulation. These intervals are useful for helping autistic persons to bear stress and information overload. The "from inside" interpretation Donna Williams has put the stress on some crucial perceptive disorders common in people suffering from autism: agnosia[56]. This word and the relative concept were developed by Lissauer in 1890 and "descrive un disturbo della capacità di identificare immagini, non riconducibile a un difetto elementare di sensibilità, a deficit della vigilanza o della capacità di esplorare l'ambiente. Un disturbo agnosico riguarda in generale una sola modalità sensoriale (visiva, uditiva o tattile)"[57]. Donna Williams since 199, when it was published her first book, has reported on a wide range of sensory-perceptive experiences and has wondered why the recognition of agnosia in the autistic patients has been so belated and difficult. She has suffered from double, auditory and tactile agnosia. Such disorder, though is does not wholly overlap with autism. This inability, as she reports in her *Jumbled Jigsaw*, is one of the most important aspect of this syndrome. Williams describes the impossibility of recognizing the faces of familiar people (prosopagnosia), the inability to tell where she's being touched and what she feels when she is touched (tactile agnosia), the serious speech problems (very common in people suffering from agnosia). The aforesaid difficulties have been experienced by Jenny, a child whose story is narrated by Williams in her *Il mio e il loro autismo. Itinerario tra le ombre e i colori dell'ultima frontiera*. Jenny shows strange behaviour and communicative and social interaction deficits because of perceptive disorders. Although she sees people as a whole, she can process them visually just bit by bit and this means that "Jenny definisce persone, luoghi e cose da questi pezzetti e può

[56] Coined in German from Greek *agnosia*: *a* 'without' and *gnosis* 'knowledge'.
[57] Vallar P., Pagano C., (a cura di), *Manuale di neuropsicologia*, Bologna, il Mulino, 2007, p. 245.

improvvisamente scoprire che cose, un tempo familiari, sono invece notevolmente sconosciute se piccole componenti vengono cambiate"[58].

In view of this, people's faces, body language and expressions are perceived by the little girl as senseless and even frightening to such an extend that this experience turns into a dull moment or into something to be avoided. Besides suffering from prosopagnosia, Jenny has tactile disorder and difficulty in perceiving her own voice. The impossibility of receiving meaningful and complete messages in a continuative way through eyes, ears and touch pushes her into playing with her own sensations: "si spinge in dentro gli occhi, accende e spegne la luce, gioca col controllo del volume della T.V. e con la sua mancanza di percezione della profondità, muovendo le cose ripetitivamente vicino e lontano dal suo viso"[59]. Therefore bizarre behaviour in autistic subjects might be interpreted as an adaptation of a world experienced as senseless and meaningless. In the light of what I have written, it has clearly emerged that the sensory-perceptive world of an autistic person plays an important role when it inter-acts with the surrounding environment. An environment that brings about unease, anxiety and frustration because of the sensory-perceptive channels in the autistic patients. Channels, as mentioned before, are unable to show the person suffering from autism any intrinsic coherence. The "from the inside" vision, described also by Temple Grandin's and Donna Williams' reports, makes us think about two basic points: a. what's like to be an *antropologist on Mars*? That's to say how an autistic human being feels in social interactions. b. this inside view should encourages to rethink on the whole our methods of treating this disability. These methods can't disregard anymore a careful and thorough sensory-perceptive analysis of the autistic individual.

[58] Williams D., *Il mio e il loro autismo*, p.45.
[59] *Ibidem.*

1.5 Olga Bogdashina

There are two ways of looking at things:
the non autistic and the autistic way.
(Bovee)

An Anglo-Russian MA and Phd Olga Bogdashina has given prestige to research on the role of sensory-perceptive disorders in autism. In 2003 it was issued the Italian edition of her *Le percezioni sensoriali nell'autismo e nella sindrome di Asperger*. Bogdashina's book, though not the first work on such questions, has broken new ground in this field. In particular, merit closer inspection her valuable insights into strange behaviour sensory-perceptive disorders relationship. "Inside view of autism" and "autistic individuals' first person accounts" are the leitmotivs running through her publication: "I racconti personali di individui autistici rivelano che uno dei principali problemi è la loro percezione anomala, e molti autori autistici considerano l'autismo soprattutto come una condizione relativa al trattamento degli stimoli sensoriali"[60].

What should be established at the very outset is that: "Attualmente, non essendo noti test medici che rivelino l'autismo, la diagnosi si basa sulla presenza dei comportamenti specifici, in particolare deficit nelle interazioni sociali, nella comunicazione e nell'immaginazione, conosciuti come la triade deficitaria. Tuttavia, tali comportamenti sono visti come un insieme di reazioni compensative finalizzate, causate da uno o più deficit fondamentali, e non possono essere considerati come caratteristiche primarie. Queste caratteristiche comportamentali, seppure molto utili per la diagnosi, non ci dicono molto sul perché le persone autistiche le manifestano e su come facciano esperienza del mondo. É per questo che non è di alcuna utilità cercare di eliminare questi comportamenti senza identificare le cause

[60] Bogdashina O., *op.cit*., p.31.

sottostanti, a prescindere da quanto queste "reazioni bizzarre" interferiscano con l'insegnamento o con il trattamento dei bambini autistici"[61].

Bogdashina claims that the numerous research carried on about this issues have a weak point because they focused only on the above-mentioned malfunctioning triad. As a consequence, they have made the mistake of dealing with autism symptoms[62] and not with its causes. Bogdashina declares that such symptoms are secondary to a malfunction involving brain activity and its structure. All the evidence from her book makes it clear that she has the firm intention of describing and analysing thoroughly the *kinds of sensory experiences* of autistic individuals so to be able to realize how they experience and act in the world. According to Bogdashina, so the ability to understand completely and to be aware of the aforesaid aspect is crucially important to provide educational and rehabilitative aids to autistic individuals. Yet autistic persons, as noted by Bogdashina[63], are often unaware that they perceive the world in a different way. This dissimilar perception springs from their native sensory-perceptive process and from the fact that they are unable to realize that non autistic people (99% of human beings) display a quite different sensory-perceptive mode. Morris argues that autistic subjects interact atypically with their environment and the response is unexpected because their communication system and their perceptive system are different from the normal developing individuals' systems. Morris has adopted the acronym SPAT (*Senses, Perception,*

[61] Ivi, p.24.

[62] Theo Peeters points out that professionals often cure autism by treating the symptoms, but he thinks that they are just the tip of the iceberg. If they treat just symptoms such, as behaviour, stereotypies and aggressiveness, the most important part (the bases) are overlooked. Cfr. Theo Peeters: *Autismo infantile, orientamenti teorici e prativa educativa*. Ed it. a cura di Paola Visconti, Phoenix editrice, Roma, 1998. In this connection I would like to quote Donna Williams' words: "quando si cerca di trattare persone, liberandole dall'apparenza dei sintomi, non ci si aspetta tanto che queste persone diventino normali, quanto che imparino ad agire da normali (…) Lo sradicamento dei sintomi può essere spesso un sollievo per i genitori, i professionisti e gli assistenti e per gli autistici stessi (…) allo stesso tempo questo approccio è simile alla ricerca di curare l'epilessia insegnando alla gente a comportarsi normalmente durante un attacco".

[63] She quoted from Morris B., *New light and insight, on an old matter*, Autism99 Internet Conference Papers, www.autism99. Org.

Abilities and Thinking Systems) to refer to such systems. Although autistic and non autistic individuals live in the same world, the latter are conditioned by SPATS, whose functioning is peculiar to such an extent that they can not react normally to sensory stimuli. To improve autistic patients' living conditions, in Morris' opinion, would it be necessary to take SPATS into due consideration when making the diagnosis. This technique, he says, makes it possible to acquire further data useful for an integrative progress. Olga Bogdashina's focus on autistic subjects' *sensory needs* moves into line with priorities and aims, which are meant to provide social and speech competence. Such competence though cannot be achieved if peculiar autistic sensory-perceptive nature is neglected Bogdashina's publications is centred on first person accounts by high functioning autistic writers and on specific data, which support her insights. Thanks to reseach on sensory deprivation and on auditory and/or visual defects[64] it has been possible to detect similarities to autistic behaviour: "per esempio, comportamenti come dondolarsi e sbattere la testa ritmicamente, far roteare oggetti o tastare il perimetro di un luogo (in particolare di spazi vasti) e la necessità di toccare tutto in una camera prima di fermarsi e sedersi sono tipiche sia dei bambini autistici, sia di quelli con disturbo visivo"[65].

Furthermore Fay and Schuler have pointed out that some peculiar aspect of autism (such as echolalia and pronominal inversion) are shared also by children suffering from visual deficit. Bogdashina mentions H. Cass' *Visual impairments and autism. What we know about causation and early identification*. In this book this scientist suggests that both most blind children and autistic children suffer from the same basic disturbance. Bogdashina referring to such theory raises a very interesting question: "i bambini autistici sono in qualche modo "ciechi", ovvero la loro percezione è

[64] Cfr. Cass H., *Visual impairments and autism. What we know about causation and early identification*, Autism and Visual Impairment Conference, Sensory Seires 5, 1996, pp. 2-24; Cfr. Gense M.H. e Gense D.J., *Identifying autism in children with blindness and visual impairment*, Review 26, 1994, pp.56-62.
[65] Bogdashina O., *op.cit*, p.30.

distorta?"[66]. She has drawn an analogy between autism and blindness as tactile/smell/taste/hearing and visual disorders can be considered as a kind of blindness to reality. The many and detailed first person stories by high functioning autistic persons collected by Bogdashina in her book, wuold seem to bear out her claims. These accounts draw our intention to abnormal perceptive skills and make us think about autism as a condition to be linked to the treatment of sensory stimuli. As I have already pointed out, autistic individuals, through their unusual sensory perception of the world, can be influenced by hyper-or-hyposensitivity or have difficulty in processing stimuli and so different is their Weltanschauung. As a consequence the normal links between things and events are experienced by autistic people as frightening, oppressive and bewildering. The role played by sensory-perceptive universe in autism led her to pose some very useful and meaningful questions: "possiamo allora essere sicuri di muoverci nello stesso mondo percettivo/sociale/ecc. se le nostre ricostruzioni di esso sono così diverse? Siamo sicuri che vediamo, udiamo, sentiamo, ecc. esattamente le stesse cose? Come possiamo sapere che soltanto la nostra "versione percettiva" del mondo sia corretta e che la loro sia sbagliata?"[67] .

Howewer, what she asks is more of food for thought than real questions. Bogdashina, in other words, invites all experts in autism to give careful consideration to the importance of autistic sensory-perceptive profiling. Accordingly, the Russian author goes into some peculiar autistic aspects. A case in point is autistic individuals'tendency to "perceive things in a literal way", that is to say they can see the bare essentials of the world. In short, the brain of an autistic human being does not need to go through interpretation and understanding. As already illustrated by Temple Grandin, autistic subjects don't need to concentrate intentionally on things: they can pay attention to detail and would not suffer from *inattentional blindness*. Another peculiarity of people suffering from autism is their impossibility of

[66] Ivi, p.31.
[67] Ivi, p.51.

distinguishing between crucial and minor information (Gestalt Theory of perception). Paying attention to every single detail, without filtering or selecting information, can bring about an incapacity to make distinction between important and trifling stimuli. This aspect, in Bogdashina's view, accounts for strong and weak points in autistic perception: "da un lato, essi sembrano percepire informazioni più accurate e in maggiore quantità; dall'altro, tale quantità di informazioni non selezionate non può essere trattata in modo simultaneo, e ne può derivare un sovraccarico di informazioni"[68] .

The autistical individuals thus would perceive the whole scene together with every detail as a single unity (Gestalt Theory of perception), but this might turn out to be unbearable when information must be processed as "holistic situations". The perception of Gestalt though seems not only to affect vision but also other sensory channels. For example, autistic subjects have considerable difficulty in concentrating on a single auditory stimulus, such as a voice, when it arrives together with all other surrounding noises. Their incapacity to filter only background noise, makes them filter also the voice they are attempting to listen to. In *Le percezioni sensoriali nell'autismo e nella sindrome di Asperger* Olga Bogdashina analyses the apparently most recurring sensory experience in autism.

In this part of my paper, leaving aside the already discussed hypersensitivity and hyposensitivity, I will focus my attention on some sensory peculiarities which affect autism:

- Inconsistency of perception (oscillation between hyper- and hyposensitivity)
- Fragmentary perception
- Synaesthesia

[68] Ivi, p.55.

- **Inconsistency of perception**

Bogdashina finds the inconsistency of sensory autistic perception disconcerting. This assumption has been backed by numerous autobiographical accounts quoted in her book. It might exist a kind of oscillation between hyper- and hyposensitivity to such an extent that being under one or under the other of these conditions (hyper- and hyposensitivity) imply a different response. In fact an autistic person can appear to be deaf to certain stimuli, or on the contrary, he/she can react to it in a way that make one conjure up a kind of very painful response. Bogdashina's and high functioning autistic subjects' assumption has been confirmed by the scientific contribution by Ornitz E.M. and Ritvo E.R. entitled *Perceptual inconsistency in early infantile autism*. Their authors assert that autism should be influenced by an oscillation between over-excitation and under-excitation, which makes it impossible to process sensory imputs in a proper way, thus creating an unstable perceptive experience. Ornitz himself in his *Autism at the interface between sensory and information processing* claims that the modulation sensory disorder imply all sensory channels and it can be seen both as hyper- or hyporeactivity and as self-stimulation. He has put forth a theory which supposes that social interaction failure, communication and speech disorders, bizarre behaviour are brought about by a sensory imput atypicality. J.G.T.VanDalen is a high functioning autistic man and has written one of the most meaningful autobiographical accounts, which has been mentioned by Bogdashina in her paragraph centred on perceptive inconsistency.

J.G.T.VanDalen states that autism can be considered a complete and utter perceptive disorder. He also claims that between two oscillations he is able to come instantly to a sort of condition, where his perception becomes *normal*, and this autistic condition, where his fears, anxiety and his usual concentrating on things fade away making so space for normal relational

feelings. In VanDalen's opinion autism has varying degrees of change and it can even reach a level where the disorder is absent.

- **Fragmentary perception**

As already mentioned by Bogdashina about Gestalt Theory of perception, autistic people when they have to process more information simultaneously cannot reduce the whole image to meaningful units. These persons tend to analyse details, which at various times attract their attention. This tendency to perceive parts rather than the whole, known as stimulus overselectivity, induces them to use only a minor part of the available information and to interact with parts of objects or human beings as if they were complete entities.

Overselectivity has been described also by Hilde De Clercq[69], a linguist and mother of an autistic boy: Thomas. She describes some situations, when her son has shown a cognitive approach based on details rather than on general context. Thomas, for example, does not recognize his father, sitting in a bathtub, just because he had shaved some days earlier or his mother because she had put a new dress on or changed earrings. Thus selecting and keeping in mind some details can cause great difficulty in recognizing objects and/or persons in the case any detail is changed. In people suffering from autism a small change can amount to a total change. Jim Sinclair, a high functioning autistic man, writes about his overselectivity: "ho scoperto nel corso degli anni che il mio modo di percepire le cose differisce da quello dei comuni mortali. Ad esempio, quando mi trovo di fronte a un martello, inizialmente non sono assolutamente di fronte a un martello, vedo soltanto un insieme di pezzi che non hanno alcun rapporto fra di loro. Posso notare un pezzo di

[69] Cfr. De Clercq H., *Il labirinto dei dettagli. Iperselettività cognitiva nell'autismo*, Trento, Centro studi Erickson, 2006; Cfr. *L'autismo da dentro. Una guida pratica*, Trento, Centro studi Erickson, 2001; Cfr. Peeters Theo; Valenti Antonella; De Clercq Hilde, *Autismo. Orientamenti teorici e pratica educativa. Un approccio etico,* Crema, Uovo nero edizioni, 2012.

ferro e nelle vicinanze, per pura coincidenza, una barra di legno; dopodichè rimango colpito dalla coincidenza , e questo sfocia nella percezione di un martello. Infine la funzione del martello mi viene in mente quando realizzo che questa struttura percettiva che si è presentata nella mia mente può essere utilizzata per lavori di falegnameria"[70].

Several theories have been proposed to account for overselectivity: some symptoms (incapacity to get to the heart of information, difficulty in discovering a general principle from particular instances, exaggerated focusing on fragments of life) favour the theory of central coherence. This theory[71], also called CC, suggests that a normal cognitive system is naturally able to achieve an inner coherence, to whom are addressed the greatest possible number of stimuli, and the said system can also identify common elements in the various circumstances, on the contrary such skills might not be present in autistic subjects. In short, people suffering from this disorder maybe do not possess this sort of *innate coherence* and consequently they maybe see the world as a lacking unity entity. As reported by Bogdashina, the fragmentary perception can turn social interaction into a vexed problem: "in una condizione di percezione frammentaria la persona ha grosse difficoltà a interagire con altre persone, sia perché queste appaiono consistere di molti parti sconnesse, sia perché i movimenti di questi pezzi di persone sono imprevedibili…Di conseguenza, l'immagine mentale risultante di una "raccolta di pezzi" è spesso insignificante e spesso spaventosa. La frammentazione complica l'interpretazione delle espressioni facciali e del linguaggio corporeo e dunque ostacola o addirittura blocca lo sviluppo della comunicazione non verbale"[72].

Avoiding people and/or never looking at them, showing persistent repetition of an act, resistance to change and anxiety in unknown places might be

[70] Cfr. Peethers T., *Conoscere l'autismo*, associazione un futuro per l'autismo, www.autismo.net, p.9-10.
[71] Cfr. Frith U., *Autism: Explaining the Enigma*, Oxford, Basil Blackwell, 1989, trad.it. *L'autismo. Spiegazione di un enigma*, Bari, Laterza, 2009; Cfr., Happè F., *Autism: An introduction to Psychological Theory*, London, UCL press, 1994.
[72] Cfr. Bogdashina O., *op.cit*., p. 77.

interpreted as means employed by autistic individuals in trying to avoid unpleasant feelings, that had been brought about by the fragmentary perception[73].

- **Synaesthesia**

A condition which is frequently occurring in autism is synaesthesia. It was reported for the first time by the Victorian scientist Francis Galton, who noticed that some people, on the whole complete and utter normal individuals, when hearing music could see in their mind a certain colour. Galton, thus, named this simultaneous perception *synaesthesia* (from *syn* "together" and *aesthesia* from Greek *aesthesis* "sensation"). Synaesthesia is a physical involuntary experience occurring when the production of a sense impression relating to one sense by stimulation of another sense. This phenomenon was a long-time curiosity until some scholars, for instance Vilayanur S. Ramachandran[74], started studying it and they judged it a serious neurological condition. Following the results obtained by the Indian neurologist and his team, it is possible to state that synaesthesia[75] is brought about by a cross activation of areas associated to colours (area v4) and of areas associated to visual representation of numbers. The occurrence of a grapheme activates the part of brain involved in processing graphemes and this simultaneously activates the part involved in colour-processing, also if no stimulation had been previously given. In 1993 D. Maurer presented *Neonatal synaesthesia: implication for the processing of speech and faces,* where he maintains that all newborn babies experience sensory and undifferentiated inputs till 4-6 months old. He also claims that synaesthesia in adulthood might result from a defective modulation in the perceptive system. His theory seems in line with Ramachandran's discoveries, who

[73] Such perception seems to affect all sensory modes.
[74] Cfr. Ramachandran V.S., *Che cosa sappiamo della mente*, Milano, Arnoldo mondadori editore, 2004.
[75] Whose most common form is called *grapheme-colour* synaesthesia.

asserts that synaesthesia[76] is caused by a gene or by a series of genes: "forse tutti noi nasciamo con un eccesso di connessioni neurali. Nel feto molte connessioni ridondanti vengono "potate" per produrre l'architettura modulare caratteristica del cervello adulto e io sono convinto che nei sinestetici il gene della "potatura" sia difettoso e provochi un'attivazione incrociata di aree distinte del cervello"[77] . Although in synaesthesia can be found thirty different senses combinations, only two senses are mostly involved in an unidirectional way (eyesight, for instance, can be experienced as it were touch, on the contrary touch does not bring about visual perceptions). Synaesthetic subjects do not usually complain about their condition because they consider it their normal way to perceive the world. Synaesthetes can usually remember things better than most people are able to, and they also have a tendency towards order, accuracy and symmetry. Such elements recall some peculiar tendency of autistic individuals, namely resistance to change, fixation with tidiness and routine; echolalia and an outstanding memory for details. In autobiographical accounts drawn up by high functioning autistic subjects there are various reports of synaesthetic perception. A case in point is Jim Sinclair, who writes about *colour of voices* and *tactility of music* or to quote O'Neil:"è possibile…non soltanto veder i colori, ma quasi sentirne anche l'odore" and Willey: "rifiutavo le parole che avevano un brutto aspetto, perché troppo sbilenche, troppo ingombranti o troppo insolite nella fonetica"[78].

This kind of perception can cause high bewitching for some sensory stimuli. Such enchantment can reach a climax with a state of "resonance" where: "si può sentire la superficie, la consistenza e la densità di un materiale senza osservarlo con occhi fisici o toccarlo con mani fisiche o gustarlo con una lingua fisica o picchiettarlo per sentire come suon, cioè lo

[76] It is mostly present in the same family and is more common in females than in males (ratio 6:1), it is also recurrent in left-handers.
[77] Ramachandran V.S., *op. cit*., p 70.
[78] Bogdashina O., *op cit*, p. 134.

si può sentire con sensi non fisici" [79]. Olga Bogdashina's papers are instrumental in keeping a keen interest in autistic sensory perception, a quite neglected aspect in the approach to the matter under discussion. The Russian writer has diffused a rich harvest of information and food for thought, useful for providing positive contributions to autistic syndrome's treatment. Bogdashina often stresses that every autistic individuals has his/her own way to acquire, perceive and process stimuli and information which affect their senses and make them experience the world as an incoherent, illogical and meaningless universe. Therefore Bogdashina writes that: "quale che sia l'approccio educativo messo in pratica, gli interventi sensoriali sono essenziali perché il bambino ne benefici…Spesso più che il trattamento e il numero di ore che lavorate con il vostro bambino conta in <che mondo percettivo> siete, cioè se siete in uno stesso mondo percettivo o in due diversi"[80]. Thus understanding how an autistic person perceives the world can let specialists create the best treatments this syndrome. Furthermore observing, studying and investigating the sensory-perceptive profiling of autistic subjects not only can explain some bizarre behaviours but can also teach people, who approach autistic individuals, to be sympathetic and understanding. To round off this section I will quote a very meaningful passage from Olga Bogdashina: "Come ultima cosa, non meno importante, spero che questa ricostruzione del mondo sensoriale dell'autismo darà ai lettori una qualche idea del modo in cui le persone autistiche percepiscono il mondo e farà comprendere ai non-autistici che il modo in cui vedono l'ambiente non è necessariamente l'unico modo di vederlo"[81] . Olga Bogdashina's contributions have made us think carefully and seriously about this illness, yet they might be confusing for us. In fact, besides some large sensory-perceptive categories, where she deals with common features of autism, she has written also about an infinite series of sensorial profiling of autistic individuals, characterized by endless

[79] Ivi, p. 102.
[80] Ivi, p. 182.
[81] Ivi, p. 195.

perceptive, cognitive, neural shades. The complexity of such profiling work is confirmed by first persons accounts written by high functioning autistic individuals, who, from an embodied point of view, have described a different way of *existing in the world,* which is different from neurotypical subjects. From such inner point of view, it clearly emerges that autistic persons face a lot of problems in the social interactions in a world, for them, chaotic and illogic, which brings about anxiety, unease, frustration. Thus withdrawing into the autistic universe is one of the few means to be able to protect themselves against an upsetting flow of information, stimulation, feelings, which they are usually unable to handle. In order to avoid the danger of being at a loss when approaching such a complex issue, I will confine myself to study thoroughly only one sensory channel: eyesight.

In the next chapter, after having illustrated the reason why I have chosen eyesight as my main focus, I will try to analyse some thorny questions, especially about the vision (perceiving entity) and human face (perceived entity). Such decision is based on a serious of scientific research[82] which have pointed out that autistic people process faces in a different way from neurotypical individuals.

[82] Cfr. Pierce K., Miller R.A., Ambrose J., Allen G., & Courchesne E., *Face processing occurs outside the fusiform face area in autism: Evidence from functional MRI*, Brain, 124, 2059-2073; Cfr. Schultz R.T., Gauthier I., Klin A., Fulbright R., Anderson A., Volkmar F., Skudlarski P., Lacadie C., Cohen D.J., & Gore J.C., *Abnormal ventral temporal cortical activity during face discrimination among individuals with Autism and Asperger Syndrome*, Archives of General Psychiatry, 57, 1-23; sono alcune delle numerose pubblicazioni che evidenziano atipicità nel processamento del volto umano da parte di soggetti autistici.

CHAPTER II
HUMAN FACE PROCESSING

2.1 Eyesight and autism

In this chapter I will pursue the question of eyesight, as it being the best sense when it comes to acquire information from the external world. Since old times the supremacy of eyesight from gnoseological perspective has been unquestioned in all western cultural world. A very interesting reference to the importance of eyesight is in Aristotle's "Metaphysics": "Per natura, tutti gli uomini desiderano conoscere. Prova di ciò è il piacere causato dalle sensazioni, poiché anche fuori da ogni utilità, noi le gradiamo per esse stesse e, soprattutto, le sensazioni visive. Infatti, non solo per agire, ma anche quando non proponiamo nessuna azione, preferiamo la vista a tutto il resto. La causa di questo è che la vista è, di tutti i nostri sensi, quella che ci fa acquisire più conoscenze e che ci fa scoprire maggiormente le differenze"[83]. A close bond between *eyesight* and *knowledge* was probably shared also by ancient populations, which in fact symbolized knowledge through the image of an eye. Eye that should not be thought of here as a physical structure containing light-sensitive cells associated with nerve fibres, so that light entering it is converted to nervous impulses that reach the brain. Rather we should consider it like a connection place between the Ego and Other, subject and object, inside and outside, singular and plural[84], perception and action.

[83] Cfr. Reale G. (a cura di) Aristotele, *Metafisica*, Bompiani, 2000.

[84] Not only because eyesight is the means through which a relationship can be established, but because it is the synthesis of a plural, two eyes, which brings about a singular point of view. A vision that comes from an active and subjective process and this results in the creation of the surrounding world, whose reality is not directly accessible but can achieved only through mental rappresentation.

Eye not only looks and registers passively, it is also active because it involves the act of seeing and a subsequent action and goes from one thing to another activating a creative power of its own: "la visione attiva un gioco reciproco dove il reale è non solo visto, ma anche illuminato, influenzato e introiettato"[85].

The eye is always ready to observe, state and analyse objects and details from the external world, it is instrumental in knowing and recognizing entities. Vision and eyes, therefore, seen as a medium and conveyers of external knowledge. Knowledge of details, that can attract or reject attention. In the autistic condition eyes experience conflicting and opposing moments and on one hand they can stare for a very long time small details as witnessed by Temple Grandin: "stavo seduta per ore sulla spiaggia a osservare la sabbia scivolarmi tra le dita. Esaminavo ogni singolo granello di sabbia mentre mi passava sulle mani. Ogni granello era diverso e io ero come uno scienziato che studiava i granelli sotto la lente del microscopio. Mentre ne analizzavo la forma e i contorni, andavo in una trance che mi tagliava fuori dalle immagini e dai suoni che mi circondavano"[86], on the other hand they try to avoid any suddenly stimulus because they perceive it as a danger "quando qualcuno mi guardava dritto negli occhi lo percepivo come un attacco"[87]. The autistic eyes look at things in a very fascinating way, and this can be experienced especially by people who live with autistic individuals and who also detect in them a feeling of *presence/absence.* A presence more apt to be perceived when they look in an enchanted way at objects, on the contrary an absence that we can realize especially when they poorly try to process essential stimuli for everyone: social stimulation acts and emotional stimuli transmitted especially through human face. The human face thought of as a conveyer of a lot of information, words,

[85] Gianolla M.C., *La potenzialità dello sguardo come veicolo di rapporti di potere*, http://mondoailati.unical.it/files/dottorato/docs/DOTTORANDI/Giannolla.pdf

[86] Grandin T., *Pensare in immagini e altre testimonianze della mia vita di autistica*, Trento, edizioni Erickson, 2001, p.50.

[87] Bogdashina O., *Le percezioni sensoriali nell'autismo e nella sindrome di Asperger*, Crema, uovo nero edizioni, 2011, p.95.

expression; such outstanding conveyer is perceived and processed by autistic subjects through ways that have been described as atypical by many research. Very important is thus studying thoroughly and understanding how autistic people perceive and process human face because as Noah J. Sasson maintains also that a closer and deeper examination of the abovementioned aspect might give an explanation about the origin and keeping of deficit in mutual social relationships and in non verbal communication [88]. An atypical processing of human face, in Sasson's opinion, might act both as a cause and as an effect on many social deficits involving autism and it might also sheds light on some basic emotional distortion at the base of this illness. Furthermore understanding the nature and modes through which autistic people process human face and the information mediated by it can help define an important criterion for an early autistic diagnosis.

2.2 Peculiarities of human face elaboration in autism

Newborn babies normal developing show from their first days of life a tendency to follow biologically based movements[89]. This kind of skill is kept to a high degree in species[90] and it is considered to be of crucial importance both for filial attachment and for detecting possible predators. Neural correlates involving perception of biological motion are linked to brain areas involved in processing basical social signals such as facial expression and direction of look[91]. A special attention for biological

[88] Cfr. Sasson J., *The Development of Face Processing in Autism*, in *Journal of Autism and Developmental Disorders*, vol. 36, No.3, April 2006.
[89] Cfr. Simion F, Regolin L, Bulf H. *A predisposition for biological motion in the newborn baby*. Proc Natl Acad Sci USA, 105(2):809–13, [PubMed: 18174333], 2008.
[90] Cfr. Regolin L, Tommasi L, Vallortigara G. *Visual perception of biological motion in newly hatched chicks as revealed by an imprinting procedure*. Anim Cognit,3:53–60, 2000.
[91] Cfr. Pelphrey KA, Morris JP, Michelich CR, Allison T, McCarthy G. *Functional anatomy of biologicalmotion perception in posterior temporal cortex: an fMRI study of eye, mouth and hand movements*, Cerebr Cortex, 15 (12):1866–76, 2005.

movement can be interpreted as a precursor of ability to guess what are other people's intentions[92]. Towards the tendency to follow people's motion, normal developing newborn babies show a clear preference for human voice and are especially attracted more by their mother's voice than by strangers' voice. When 4 days old newborn babies can distinguish face looking at them and a face looking elsewhere[93]. At about 3 months old they can focus their eyes on other's people's eyes rather than on other parts of face, and they tend also to concentrate more on faces than on other parts of the body[94]. The situation is quite different where it comes to autistic children according to many experts[95]. Analyzing home videos is a good way to trace the first symptoms of autism before the illness is diagnosed. These videos are so important because they are unaffected by the passing or by memory shortcomings from parents[96]. Obscure symptoms, in fact, can appear during the first year of life, but they can be forgotten, neglected or sometimes even denied by parents because of anxiety, poor memory or ignorance of baby's normal development stages. The first studies which focused retrospectively on home videos reported that normal developing children can recognize autistic ones through their interaction and attachment, sensory-motor intelligence, orientation towards stimuli, way at looking at other people. Furthermore in one year old babies suffering from autism have been observed no interest in social relationship, rare socializing smiles and proper facial expressions, hypotonicity and instable attention[97].

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[92] Cfr. Frith CD, Frith U. *Interacting minds: a biological basis*. Science, 286(5445):1692–1695[PubMed: 10576727], 1999.

[93] Cfr. Farroni T, Csibra G, Simion F, Johnson MH. *Eye contact detection in humans from birth*. Proc Natl Acad Sci U S A, 99(14):9602-9605, 2002.

[94] Cfr. Haith MM, Bergman T, Moore MJ. *Eye contact and face scanning in early infancy*. Science, 198(4319):853-855, 1977.

[95] Cfr. Carter AS, Davis NO, Klin A, Volkmar FR. *Social development in autism*, in Volkmar FR, Paul R, Klin A, Cohen D, eds. Handbook of Autism and Pervasive Developmental Disorders. 3rd ed. New York, NY: John Wiley & Sons; 312-334, 2005.

[96] Cfr. Maestro S., Muratori F., Cavallaro M.C., Pei F., Stern D., Golse B., Palacio-Espasa F., *Attentional Skills During the First 6 Month of Age in Autism Spectrum Disorder,* J. AM. ACAD. Child adolesc. Psychiatry, 41:10, October, 2002.

[97] Cfr. Adrien JL, Lenoir P, Martineau J et al., *Blind ratings of early symptoms of autism based upon family home movies*. J Am Acad Child Adolesc Psychiatry 33, 1993, 617–625.

The most important symptoms helpful for an early detection are to be seen so in the autistic atypical social relationship, involving poor social contacts; inability to answer when they are called by name; poor eyesight contact and impossibility to play games where they have to imitate something or make vocalizations[98].

Already in Kanner's and Asperger's works we can find the first reports about the visible differences in human face processing. According to Leo Kanner autistic people from their births are basically and biologically incapable of having normal emotional relationships with other human beings[99]. This circumstance should cause all abnormalities that can be detected in autism. Many of the first signs of malfunctions in these patients (eyesight contact, shared attention, response to emotional stimuli and recognition of faces) involve their skills to process information conveyed by face. Therefore it is possible that the atypical way to process faces plays a crucial role in brain system malfunction, which are the underlying causes of social autism deficit. Furthermore the neural system, which convey the face process become active very soon and thus this kind of atypical processing might be the earliest signs of an autistic brain[100].

The first research on atypical processing human face process was carried on by T. Langdell in 1978[101]. He reports that two age groups (9-14 years old) of normal and autistic were tested for their ability to recognize the faces of peers in pictures from isolated facial features and inverted photographs. The normal subjects found the upper regions of the face most helpful for identification, whereas the younger autistic children found the lower features more helpful. The older autistic children showed no specific

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[98] Cfr. Landa RJ, Holman KC, Garrett-Mayer E. *Social and communication development in toddlers with early and later diagnosis of autism spectrum disorders*, Arch Gen Psychiatry, 64(7):853-864, 2007.

[99] This aspect was considered fundamental also by H. Asperger.

[100] Cfr. Dawson G., Webb S.J., McPartland J., *Understanding the Nature of Face Processing Impairment in Autism: Insights From Behavioral and Electrophysiological Studies,* Developmental Neuropsychology, 27(3), 2005, 403–424.

[101] Cfr. Langdell T., *Recognition of faces: An approach to the study of autism*, Journal of Child Psychology and Psychiatry, 19, 255-268, 1978.

reliance on any one area, but were found to have error scores as low as those of the younger autistic children on the recognition of lower parts and error scores as low as the; controls on recognizing upper portions. The results are discussed and are found to favour a hypothesis in which the autistic child's familiarity with the mouth and/or eye areas is related to a cognitive deficit which affects the processing of both verbal and non-verbal interpersonal communication. In another study Hobson, Ousten e Lee[102] have shown that autistic subjects, comparing to normal groups, to be able to acquire certainty about identity and to recognize feelings, look more at the mouth and meaningfully less the eyes area. Both pieces of research point out that autistic individuals focus their attention on the area of the mouth if they have to observe and process a face. Such theory has been also backed by many eye-tracking[103] reports, which confirm the high functioning autistic people's tendency to explore the areas which are not central, neglecting eyes, nose and mouth, they also declare that autistic subjects employ atypical means to look at social interactions situations[104]. In such circumstances, in fact, high functioning autistic patients when tested showed little interest about the eyes of the persons in the aforementioned situations and more attention on mouths, other parts of body and object. More recent research has shown that fifteen month old autistic babies, if compared to same age normal developing children, display very similar results[105]. Autistic individuals employ an uncoordinated visual ways and seems that they do not have a better memory for faces than for things. All evidence lets

[102] Cfr. Hobson R.P., Ouston J., & Lee, *What's in a face? The case of autism*. British Journal of Psychology, 79, 441-453, 1988 (a).
[103] Cfr. Pelphrey K.A., Sasson N.J., Reznick J.S., Paul G., Goldman B.D., & Piven J., *Visual scanning of faces in autism, Journal of Autism and Developmental Disorders*, 32, 249-261, 2002.
[104] Cfr. Klin A., Jones W., Schultz R., Volkmar F., & Cohen D., *Visual fixation patterns during viewing of naturalistic social situations as predictors of social competence in individuals with autism*, Archives of General Psychiatry, 59, 809-816, 2002; Cfr. Kevin A. Pelphrey, Noah J. Sasson, J. Steven Reznick, Gregory Paul, Barbara D. Goldman, and Joseph Piven, *Visual Scanning of Faces in Autism*, Journal of Autism and Developmental Disorders, Vol. 32, No. 4, August 2002.
[105] Cfr. Klin A, Jones W. *Altered face scanning and impaired recognition of biological motion in a 15-month-old infant with autism*, Dev Sci, 11(1):40-46, 2008.

us think that for them a human face is not a special stimulus at all. Still other researchers have noted that groups of autistic persons have poorer skills at recognizing faces rather than peer groups. The tests adopted are of two kinds: discriminating tests [106] and recognizing ones [107]. Various stories borrowed from autobiographical accounts drafted by high functioning autistic individuals back further these assumptions: "Temple Grandin, ad esempio, si trovava spesso in situazioni imbarazzanti dal momento che non ricordava i volti delle persone se non le aveva già viste molte volte o se non avevano caratteristiche del volto fortemente distintive, come una grande barba, occhiali spessi o uno strano taglio di capelli"[108]. Specialized studies have also described the autistic children's tendency to perform likewise in tests centred on the recognition of faces and of objects, and in some cases it has been observed that objects were even better recognized. These data maybe can be interpreted by thinking that autistic subjects are both incapable of processing faces in a holistic way and they tend to focus their attention on details rather than on global parts[109]. To make this codification and representation process even more atypical is the scarce tendency of autistic persons to show *an inversion effect* for faces. Normal adults show a considerably less precise recognition of faces when stimuli are upside-down oriented, the same does not seem to occur when it comes to recognize objects because these are very little influenced by orientation. Many research have shown that face inversion effect is not perceived in the same way by autistic individuals and if autistic subjects are tested to recognize upside-down pictures, they will perform better than normal people. This

[106] Cfr. Tantam, D., Monoghan, L., Nicholson, H., & Stirling, J. *Autistic children's ability to interpret faces: A research note*. Journal of Child Psychology and Psychiatry, 30, 1989, 623–630.
[107] Cfr. Boucher, J.,&Lewis,V. *Unfamiliar face recognition in relatively able autistic child*ren. Journal of Child Psychology and Psychiatry, 33, 1992, 843–859; Cfr. Boucher, J., Lewis, V., & Collis, G. *Familiar face and voice matching and recognition in childrenwith autism*. Journal of Child Psychology and Psychiatry, 39, 1998, 171–181.
[108] Bogdashina O., *Le percezioni sensoriali nell'autismo e nella sindrome di Asperger*, uovo nero edizioni, 2011, p. 137.
[109] Cfr. Happe, F., Autism: *Cognitive deficit or cognitive style?* Trends in Cognitive Science, 3, 1999, 216–222.

might suggests that autistic patients, differently from non autistic ones, process things and faces in a similar way. In the light of what just stated it is necessary to analyse closer inversion effects and the possible reasons of its scarcity in the autism syndrome.

2.3 Inversion effect

As already stated, though it is possible to recognize faces since birth, a good skill at this ability can be acquired after several years. Human beings recognize faces through various means: by recognizing face features and features configuration; they are also able to recognize faces as complete units (in a holistic way). Recognizing faces through the features relation works better when faces are not upside-down oriented. The first researcher who showed such dissociation was carried on by Peter Thompson[110], who using two photos of former English Prime Minister Margareth Thatcher obtained a grotesque result by altering one of the two pictures. He changed it to such an extent that the eyes and mouth are vertically flipped. If it is shown upside-down, it seems not to have been altered but once it is shown in upright position it clearly displays alterations to mouth and eyes:

[110] Cfr. Thompson, P., *Margaret Thatcher: A new illusion*. Perception, 9(4), 1980, pp. 483–484.

Picture (A): Disgregation of the face configuration processing, due to its upside-down position, do not let us notice clearly that are present some alterations. If faces are restored to their normal position the face on the left seems weird.

Many research carried on normal adults and teenagers the *inversion effect* has been defined as the difference performance registered between upright pictures and inverted ones[111]. Various experiments where it was detected the difference in face inversion effect and inversion effect involving other stimuli have shown that faces are quite affected by inversion[112].

Yin[113] pointed out that normal adults process faces, unlike objects, are first processed in a holistic way. Such assumption has been backed by another research[114]. This faces are perceived and processed not only through their individual parts but also through a general way, where spatial relations between details acquire an additional meaning and value. Inversion impairs this processing form and so the upside-down forces are perceived and processed through a medium apt to analyse details bit by bit as it usually happens with things. Studies have demonstrated that older the normal person is, higher is their tendency to inversion effect. The precision in

[111] Cfr. Farah M.J., Tanaka J.W., & Drain H.M., *What causes the face inversion effect?* Journal of Experimental Psychology: Human perception and performance, 21, 1995, pp.628-634.
[112] Cfr. Dallett K., Wilcox S.G., & D'Andrea L., *Picture memory experiments*, Journal of Experimental Psychology, 76, 1968, pp.312-320.
[113]Cfr. Yin R.K., *Looking at upside-down faces*, Journal of Experimental Psychology, 81, 1969, pp. 141-145.
[114] Cfr. Diamond R., & Carey S., *Why faces are and are not special: an effect of expertise*, Journal of Experimental Child Psychology, 41, 1986, pp.1-22.

recognizing upside-down faces decreases both in teenagers and in adults when the picture is not upright but the performance of children in the same situation is better. Most authorities think that young children depend exceedingly on a strategy which works bit by bit when it is necessary to codify and remember faces, while older children (from 10 on) and adults depend more on facial configurations. Such assumptions were also confirmed by Carey e Diamond[115], who observed an early tendency in children to process faces following their features, but around 10 years old they tend to adopt a holistic approach. In autism, unlike what's happenin non autistic human beings, it seems that the inversion effect does not exist. This seems due to two things: A. autistic people are not capable to process faces using the same means as non autistic individuals do B. autistic subjects do not usually employ configuration strategy when processing a face. Given that upside-down, faces break up processing face configurations but it does not affect details, the absence of inversion effects in autistic subjects indicates that there is an indifference to information about faces configurations. The fact that autistic children and normal ones do not show face inversion effect and that only autistic adults are not affected by inversion effect seems to be caused by a sort of incompetence in recognizing faces and in treating them as stimuli.

In contrast, objects continue to be categorized in a featural manner by adults[116]. Since young children show a distinct preference for featural categorization of both faces and non-facial stimuli, Schwarzer concludes that over time, older age and experience with faces encourage children to categorize faces in a more holistic manner. Whether this transition from featural to holistic categorization of faces fails to occur in autism has not been explicitly tested, although indirect evidence (i.e., the lack of an

[115] Cfr. Carey, S., & Diamond, R., *From piecemeal to configurational representation of faces.Science*, 195, 1977, 312–314; Carey, S., &Diamond,R. *Are faces perceived as configurations more by adults than by children?,* Visual Cognition, 1, 1994, 253–274.

[116] Cfr. Ward, T. B., *Analytic and holistic modes of categorization in category learning*. In B. E. Shepp, & S. Ballesteros (Eds.), Object perception: Structure and process. (pp. 287–419), 1997, Hills dale, NJ: Erlbaum.

inversion effect) suggests that individuals with autism may maintain a featural approach in adulthood. Weeks and Hobson [117] supports this conclusion by demonstrating that children and young adults with autism, aged 8–22, tend to sort a series of facial photographs according to the hats they are wearing, while controls matched on chronological age and verbal ability sort the same photographs in a more holistic manner (i.e., by the expressions being displayed). Also, as mentioned previously, featural processing is implied by studies demonstrating a disproportionate emphasis on the mouth region for identity and affect recognition. All in all these elements highlight both evident alteration in face information processing and a possible malfunctioning of the system involved in recognizing faces in autism.

2.4 Electrophysiological evidence

In this chapter I will deal with electrophysiological evidence about face processing in autism. Electrophysiological evidence's studies give important information about the neural bases of atypical face processing in autism and they provide the optimum conditions when testing non high functioning children because it is not necessary for them to answer questions. More specifically electroencephalogram (EEG) tests the electrical activity in the brain and event correlates potentials (ERPs) which involves average in electric signals in relation to a certain event. Both EEG and ERPs are non-invasive methods which are by means of electrodes placed for some time on the scalp can show fundamental data also in handicapped subjects who can not talk, answer or make movements or to older patients. All this becomes in analyzing and understanding early working phases and

[117] Cfr. Weeks, S. J., & Hobson, R. P. *The salience of facial expression for autistic children*. Journal of Child Psychology and Psychiatry and Allied Disciplines, 1987, 28, pp. 137–152.

development of children's brain. Various ERP research have been carried on newborn babies' and children's face processing and furthermore it has been found on ERP element (N170) sensitive to faces. Such studies have also demonstrated that ERP elements mirror several processing phases and that they include both early attention phases and perceptive factors and the subsequent show waves that are thought to reflect cognitive updating and memory[118].

Faces recall a separate cerebral electric activity plan. Several researches have detected and reported an ERP element , to be found on the back temporal lobe, which becomes active mostly when faces are shown and which is stronger in the right hemisphere and weaker in the left one. It has been recorded that N170 is faster when faces and eyes are involved rather than when it comes to upside-down faces or to different nature stimuli.

Latency is affected by disgregations in early processing phases but it is not altered by facial intimacy or by recognizing processes. Facial inversion and the partial breaking up of faces impair both latency and by the extent of the element, such inversion effects are specific to faces[119]. Movement of face, eyes and mouth influence the size of N170.

In the first research[120] carried on about N170 in teenagers and in autistic adults it has been recorded a pattern alteration about N170. The high functioning autistic subjects, if compared to normal development individuals on the same cognitive level, show slower N170 latency about faces rather than faces external parts and do not show face inversion effect. Moreover the speed of face processing mediated by latency in N170, has seemed to be correlated with proficiency on a facial test. The same study

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[118]Cfr. Dawson G., Webb S.J., McPartland J., *Understanding the nature of face processing impairment in autism: Insights from behavioral and electrophysiological studies*, Developmental Neuropsychology, 27 (3), 2005, pp.403-424.

[119] Cfr. Rebai M., Poiroux S., Bernard C., & Lalonde R., *Event-related potentials for category-specific information during passive viewing of faces and objects*, International Journal of Neuroscience, 106, 2001, pp. 209-226.

[120] Cfr. Mc Partland J., Dawson G., Webb S., Panagiotides H., & Carver L., *Event-related brain potentials reveal anomalies in temporal processing of faces in autism spectrum disorder*, Journal of Child Psychology and Psychiatry, 45, 2004, pp.1235-1245.

suggests that the first phase of facial structural codification is impaired in autistic and it is characterized by a slower information processing. Furthermore in relation to N170 through cranial topography, it has been observed that in many autistic people there is not the usual specialization for faces in the right hemisphere.

In normal developing people N170 goes through a long time of development. Some experimented studies[121] have identified a precursor of N170 which is to be found in adults and in persons from 4 to 15. Similarly of N170 in adults, this element seems bigger about eyes and faces show in the normal orientation and it can be affected by inversion.

It is clearly slower than N170 in adults, it can go up to about 270msec in 4-5 years old children and it does not come up with size and latency of adults tell there are late teens. Some scientists have called this element the precursor of N170 (pr N170) and have studied it in both sutistic and non autistic 3-6 years old children. 3-4 years normally developing children, unlike adults, showed no size difference between faces and objects and showed also faster responses (shorter latency of prN170) towards face than towards objects. By contrast autistic children have shown about things larger prN170 than normal developing children and have also shown shorter prN170 of latency for objects than for faces. Webb, Bernier, et al. In a research where were tested six young children both normal developing and autistic ones, have recorded the highest negative N170 pattern towards faces than towards things. Normal developing children have continued displaying faster responses towards faces than towards object, but autistic children haven't shown no differences in their ERP latency between faces and objects. Such data might suggest then that autism in the first place is associated to the incapacity to take advantage of speed, which is in normal developing people, when it comes to process faces.

[121] Cfr. Taylor M., Edmonds G., Mc Carthy G., Allison T., *Eyes first! Eye processing develops before face processing in children*, NeuroReport, 12, 2001, pp.1671-1676; Cfr. Taylor M., McCarthy G., Saliba E., Degiovanni E., *ERP evidence of developmental changes in processing of faces*, Clinical Neurophysiology, 110, 1999, pp.910-915.

Despite several studies, N170 neural substrates are still under debate. Some scientists claim that such element reflects the identification of eyes because N170 displays a larger size and a shorter latency in response to eyes. Other scholars state that N170 mirrors the holy processing phase of the whole face likewise the structural codification phases that had been postulated by Bruce and Young about face processing. Electrophysiological evidence does not limit itself to finding N170 factor. The activation of EEG in the gamma area (30hz to 80hz) has been said that it might mirror neural processes involved in holistic processing or perception of a whole or Gestalt.

More specifically gamma activation is thought to be the key factor through which brain organizes stimuli. In fact gamma activity increases in the visual cortex during perception of consistency oriented objects and movements. Increased levels in gamma activity have been detected also in the frontal region during tasks which ask for selective top-down features, increased levels of attention processing of upright faces, emotional based scenes. It has been verified that autistic individuals display an abnormal gamma frequency when processing upright and upside-down faces.

In normal developing individuals the upright faces recall a large growth in gamma activation rather than to upside-down faces. On the contrary, autistic individuals display a gamma activation similar to upright faces and upside-down ones. The decrease of gamma activation in response to upright faces in the autistic group shows a reduced perceptive binding rather than the group of normal developing individuals. It is also consistent where there is a malfunctioning in the human face holistic/configuration processing.

CHAPTER III

THE DISTRIBUTED HUMAN NEURAL SYSTEM FOR FACE PERCEPTION

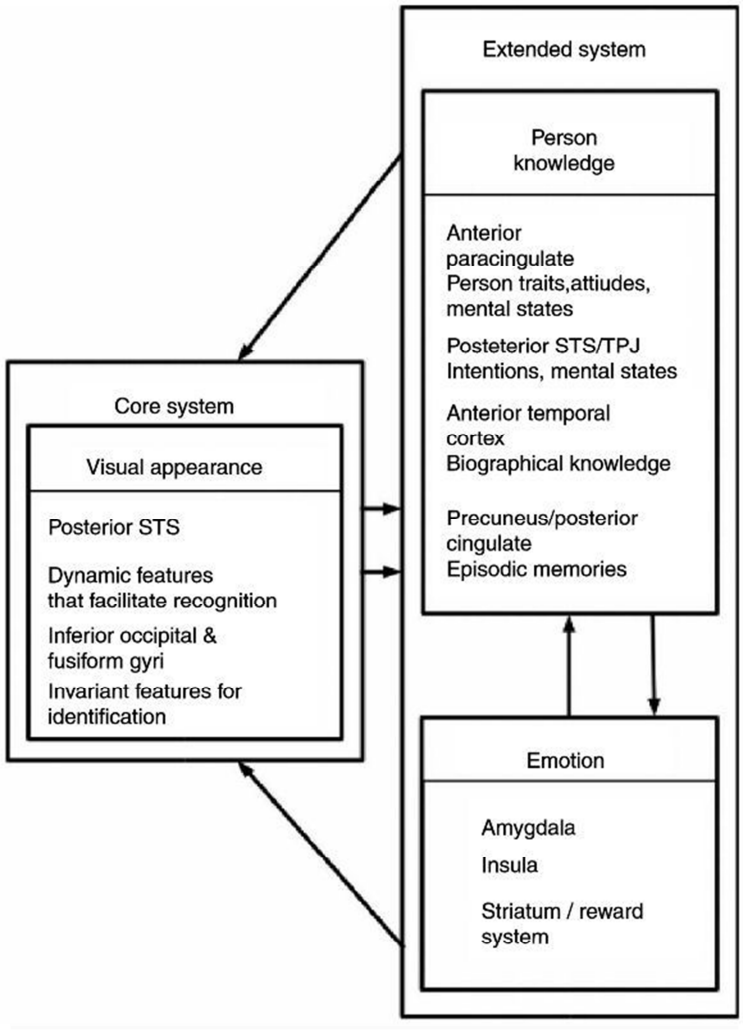
3.1 The core system and the extended system

Several studies have shown that face perception in humans is mediated by a distributed neural system that consists of multiple, bilateral regions.

The existence of a specialized neural system for face perception in the human brain was suggested first by the observation of patients with focal brain damage who had a selectively impaired ability to recognize familiar faces, but a relatively unimpaired ability to recognize other objects. This syndrome is called prosopagnosia [122]. Prosopagnosia is associated with lesions in ventral occipitotemporal cortex that are usually bilateral, although a few well-documented cases have been reported following right unilateral lesions. Based on functional imaging research, Gobbini and Haxby [123] proposed a face recognition model which ties functional units to certain brain regions. They distinguish between a core and an extended system:

[122] Cfr. Hecaen H., Angelergues R., *Agnosia for faces (prosopagnosia)*, arch. Neurol 7, pp.24-32, 1962; Cfr., McNeil J., Warrington E., *Prosopagnosia: a face-specific disorder*, Quart J.Exp. Psychol 46A 1-10, 1993.

[123] Cfr. Gobbini, M. I., & Haxby, J. V. *Neural systems for recognition of familiar faces*. Neuropsychologia, 45(1), pp.32–41, 2007.



Model of face processing by Gobbini and Baxby (2007).

The core of the human neural system for face perception consists of three bilateral regions in occipitotemporal visual extrastriate cortex. These regions comprises the occipital face area (OFA) in the inferior occipital lobe, the Fusiform Face Area (FFA) in the middle fusiform gyrus, and the face area in the dorsal superior temporal sulcus (STS). In several fMRI studies, these areas showed an enhanced activation for faces as compared with other visual objects. These regions are presumed to perform the visual analysis of faces and appear to participate differentially in different types of face

perception. The region in the lateral fusiform gyrus appears to be involved more in the representation of identity whereas the region in the Superior Temporal Sulcus appears to be involved more in the representation of changeable aspects of faces and to process dynamic facial information (expression, eye gaze, and facial speech)[124]. The core system encodes the visual appearance of familiar faces while the extended system provides the person's information and the emotional response. Additional regions in other parts of the brain also participate in face perception insofar as they are recruited to process the significance of information gleaned from the face (for example, lip-reading elicits activity in regions that are associated with auditory processing of speech sounds). Although these additional regions are parts of neural systems involved in other cognitive functions, such as auditory verbal comprehension, emotion processing, and spatial attention, they facilitate the accurate recognition of speech-related mouth movements, expression and eye gaze direction when acting in concert with the core face perception system.

The existence of multiple regions that participate in face perception is corroborated, also, by studies of evoked potentials recorded with electrodes placed on the cortical surface in patients undergoing brain surgery for the treatment of epilepsy[125]. In the light of what I have just written it is useful to try to study in depth the nature and the role played in the autistic face processing by Fusiform Gyrus, Fusiform Face Area, Amygdala and Superior Temporal Sulcus.

[124] Cfr. Haxby J.V., Hoffman E.A., Gobbini M.I., *The distributed human neural system for face perception*, Trends in Cognitive Sciences, vol. 4, No. 6, 2000.

[125] Haxby J.V., Hoffman E.A., Gobbini M.I., *The distributed human neural system for face perception*, op. cit., p. 225, 2000.

3.2 A look inside: Fusiform Gyrus (FG), Fusiform Face Area (FFA) and Amygdala

Accompanying their deficits in face perception, persons with autism and related disorders show hypoactivation of the Fusiform Face Area "FFA" in fMRI studies of face perception[126]. In neuroimaging studies of typically developing individuals, no class of visual stimuli has been shown to activate the lateral aspect of the middle fusiform gyrus (FG), an occipito-temporal visual cortical area, more than the human face, and it has come to be known as the FFA[127]. Face-selectivity is often taken as evidence for a neural module specific for face processing[128]. The FFA roughly corresponds with the location of brain injury in some persons who have a face recognition defect known as prosopagnosia. It is not known whether hypoactivation to faces in the FG of persons with autism is the result of a defect in the cortex or whether the underlying cortex is normal and an FFA fails to develop for some other reason. Amygdala dysfunction is thought to be an important component of the neuropathology of autism[129].

Perhaps the best evidence for this comes from postmortem studies which demonstrate that the neurons of the amygdala in persons with autism are smaller and more densely packed than normal and have stunted neuronal

[126] Cfr. Critchley, H. D., Daly, E. M., Bullmore, E. T., Williams, S. C., Van Amelsvoort, T., Robertson, D. M., et al., *The functional neuroanatomy of social behaviour: Changes in cerebral blood flow when people with autistic disorder process facial expressions*. Brain,123, 2203-2212, 2000; Cfr. Pierce, K., Muller, R. A., Ambrose, J., Allen, G., & Courchesne, E., *Face processing occurs outside the fusiform 'face area' in autism: Evidence from functional MRI*. Brain,124, 2059–2073, 2001; Wang, A. T., Dapretto, M., Hariri, A. R., Sigman, M., & Bookheimer, S. Y. (2004). *Neural correlates of facial affect processing in children and adolescents with autism spectrum disorder*. Journal of the American Academy of Child & Adolescent Psychiatry, 43, 481–

[127] Cfr. Haxby, J. V., Ungerleider, L. G., Clark, V. P., Schouten, J. L., Hoffman,E. A., & Martin, A. *The effect of face inversion on activity in the human neural systems for face and object perception*. Neuron, 22, 189–199, 1999.

[128] Cfr. Farah, M. J., Rabinowitz, C., Quinn, G. E., & Liu, G. T. *Early commitment of neural substrates for face recognition*. Cognitive Neu-ropsychology,17, 117–123, 2000.

[129] Cfr. Bachevalier, J., *Medial temporal lobe structures and autism: A review of clinical and experimental findings*. Neuropsychologia, 32, 627–648, 1994; Cfr. Baron-Cohen, S., Ring, H. A., Wheelwright, S., Bullmore, E. T., Brammer, M. J., Simmons, A., et al. *Social intelligence in the normal and autistic brain: An fMRI study*. European Journal of Neuroscience, 11, 1891–1898, 1999.

arborization[130]. Three published fMRI studies on the amygdala in autism seem to demonstrate the functional consequence of these pathological findings. Each has shown hypoactivation of the left amygdala during perceptual judgment tasks involving the face and/or facial expressions[131]. These findings appear to be related to known deficits in emotion perception among persons with autism and other pervasive developmental disorders. Whether amygdala dysfunction in persons with autism extends to objects of a non-social nature has not been investigated. It is has been argued that because of developmental abnormalities in the acquisition of social cognition, persons with autism fail to find salience in social stimuli and instead find salience in physical stimuli such as objects[132].

While social motivations and cognition fail, a person with autism may grow to value objects or other socially irrelevant aspects of the environment instead of interaction with other people. Accordingly, some persons with autism develop a special interest for objects of a restricted domain such as coins, stamps, etc. It has been suggested that the FG and amygdala of individuals with autism might respond to their special interests despite a lack of activation to faces. Some fMRI studies suggest that categorical specialization in ventral temporal cortex is related to our experience with faces and the use of a subordinate level of categorization, i.e., individuation[133]. Indeed, the lack of a normal configural processing strategy for faces in persons with autism suggests that they are face novices and this lack of face expertise underlies observed neurofunctional abnormalities in

[130] Cfr. Kemper, T. L., & Bauman, M., *Neuropathology of infantile autism*. Journal of Neuropathology and Experimental Neurology, 57, 645–652, 1998.

[131] Cfr. Baron-Cohen, S., Ring, H. A., Wheelwright, S., Bullmore, E. T., Brammer, M. J., Simmons, A., et al., *Social intelligence in the normal and autistic brain*: An fMRI study. European Journal of Neuroscience, 11 , 1891–1898, 1999.

[132] Cfr. Klin, A., Jones, W., Schultz, R., & Volkmar, F., *The enactive mind, or from actions to cognition: Lessons from autism*. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, 358, 345–360, 2003.

[133] Cfr. Gauthier, I., Anderson, A. W., Tarr, M. J., Skudlarski, P., & Gore, J.C., *Levels of categorization in visual recognition studied using functional magnetic resonance imaging*. Current Biology, 7, 645–651, 1997.

the FFA. Several neuroimaging studies [134] suggest that the brains of individuals with autism process faces in a fashion more typically found in object processing. This research indicates that the fusiform gyrus (FG), a brain region found to activate maximally to human faces in typical populations exhibits reduced activation in persons with autism in response to the viewing of unfamiliar faces. Activation patterns for object stimuli, however, appear normal. Interestingly, while viewing faces, individuals with autism were found to demonstrate greater activation in an atypical cortical location usually involved in object processing, suggesting that the perceptual processing of faces in autism is more like the perceptual processing of objects in persons free from social disability.

Two predominant theories for the etiology of this abnormality have been proposed [135]. One, there exists a genetically determined cortical system specialized for face processing [136] and the existence of autism somehow disrupts the formation of this system. And two, the development of a face processing system is heavily dependent on experience. Reduced social interest in autism would impair normal levels of engagement with faces and lead to the development of face processing abnormalities. Evidence for an inborn specialized system for face processing, as emphasized by the first theory, comes from several sources. First, typically developing neonates prefer face-like stimuli to other visual patterns of similar complexity [137] and are capable of recognizing individual faces [138]. Second, a recent study

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[134] Cfr. Pierce, K., Muller, R. A., Ambrose, J., Allen, G., & Courchesne, E., *Face processing occurs outside the fusiform 'face area' in autism: Evidence from functional MRI*. Brain, 124, 2059–2073, 2001; Cfr. Schultz, R. T., Gauthier, I., Klin, A., Fulbright, R. K., Anderson, A.W., Volkmar, F., et al., *Abnormal ventral temporal cortical activity during face discriminations among individuals with autism and Asperger syndrome*. Archives of General Psychiatry, 37, 331–340, 2000.

[135] Cfr. Pierce, K., & Courchesne, E., *Exploring the neurofunctional organization of face processing in autism*. Archives of General Psychiatry, 57, 331–340, 2000.

[136] Cfr. Farah, M. J., Wilson, K. D., Drain, M., & Tanaka, J. N., *What is 'special' about face perception?* Psychological Review, 105, 482–498, 1998.

[137] Cfr. Goren, C. C., Sarty, M., & Wu, P. Y., *Visual following and pattern discrimination of face-like stimuli by newborn infants*. Pediatrics, 56, 544–549, 1975.

[138] Cfr. Johnson, M. S., Dziurawic, H., Ellis, M., & Morton, J., *Newborns' preferential tracking of face-like stimuli and its subsequent decline*. Cognition, 40, 1–19, 1991.

indicates that the FG is activated during face processing early in life. Tzourio-Mazoyer et al.[139] presented photographs of women's faces to 2-month-old infants and, using positron emission tomography (PET), found that their brain activation patterns were similar to those of adults, including activation in an anatomical location approximating the adult FG. Although such a finding does not confirm the existence of an inborn specialized brain region for face processing - it can be argued that 2 months is enough time for the beginnings of this system to emerge - it does suggest that the neural system underlying face processing in adulthood may be active, in whatever nascent capacity, early in infancy. This explanation would posit that inborn neurostructual differences in the brain of an individual with autism fail to differentiate the face as a ''special'' class of visual stimulus. The existence of such an impairment would prevent an individual with autism from attributing preferential significance to the human face over other visual stimuli in the environment, a process that would invariably impede normative social development. The second theory argues that the special status given to the human face for typical populations is not an inborn trait, but rather a product of experiential expertise and regular exposure to human faces. Researchers who endorse this hypothesis argue that the FG activates not only in response to human faces, but also in response to any stimulus that is expertly processed by a particular individual. For example, Gauthier and her colleagues have demonstrated that experts of non-face categories such as birds and cars exhibit greater FG activation than do non-expert controls, and that training participants to become an expert in a novel class of objects (a collection of original creatures she has deemed ''greebles'') leads to increased activation in the fusiform gyrus[140]. From this perspective, individuals with autism may not process faces as ''special'' because they

[139] Cfr. Tzourio-Mazoyer, N., De Schonen, S., Crivello, F., Reutter, B., Aujard, Y., & Mazoyer, B., *Neural correlates of woman face processing by 2-month-old infants*. NeuroImage, 15, 2002, pp.454–461

[140] Cfr. Gauthier, I., Tarr, M. J., Anderson, A. W., Skudlarski, P., & Gore, J. C., *Activation of the middle fusiform ''face area'' increases with expertise in recognizing novel objects*. Nature Neuroscience, 2, , 1999, pp. 568–573

spend reduced amounts of time engaged in face perception from birth, and as a result, never develop a visual expertise for faces. As Pierce and Courchesne[141] have pointed out, the origin of the irregular brain activation pattern seen in autism in response to faces may illuminate another controversial question within the face processing literature—is the FG a modular brain region specialized for the processing faces or is it an experience-driven neural substrate devoted to any well-developed visual expertise? If the FG is not exclusively selective for faces but rather more flexibly underlies the expert processing of any visual stimulus, then individuals with autism should demonstrate activation in the FG within a particular category of expertise. Because a common characteristic of autism is the presence of an intense and narrow focus on a particular area of interest, this question could be addressed without significant difficulty. The presence of FG activation in such individuals while viewing stimuli within their area of expertise would suggest that the neural system associated with face processing in typical populations is not functionally impaired in autism, but rather that faces are not processed at expert levels for these individuals. Explanations for this discovery would likely involve developmental evidence for reduced attention to faces, differential processing styles, or abnormal learning mechanisms. As noted by Pierce and Courchesne, this question could further be addressed in the context of Gauthier's ''greeble'' task. If individuals with autism trained to be experts in the processing of greebles demonstrate an increase in FG activation in the same manner that typical populations exhibit, this would also lend support to the conclusion that this neural region is not functionally abnormal in individuals with autism, but rather minimally activated during face processing because of an insufficient expertise for faces. Conversely, if the FG remains dormant even after extensive training with greebles, this would support the contention that this brain area is functionally impaired in individuals with autism. A similar

[141] Cfr. Pierce, K., & Courchesne, E., *Exploring the neurofunctional organization of face processing in autism*, op cit.

paradigm could be implemented using faces. If individuals with autism can be trained to process faces at expert levels, and subsequently demonstrate more normative levels of activation in the FG, it could be concluded that a lack of expertise and not localized neural impairment is responsible for the minimal activation patterns found for this region in response to faces. Additionally, although admittedly speculative at this point, it is conceivable that individual differences in face processing performance may in part be explained by quantitative differences in neurological activation. Discovering the degree to which FG abnormality in individuals with autism correlates with performance on face processing tasks, and perhaps more broadly, with the level of impairment experienced in the social world, would help elucidate the neural underpinnings of impaired social cognitive functioning in autism. Future investigations are needed in order to determine the level of plasticity in the face processing system, both in normal individuals and individuals with autism, in order to guide intervention efforts. Also, an abnormal neurological profile for face processing by individuals with autism ultimately may provide an early indication of the possible presence of the disorder. Motivated by the need to develop a reliable early measure for the detection of the disorder, Dawson et al.[142] introduced an effective method for discriminating 3- to 4-year-old children with autism from both typically developing individuals and those with developmental delay. Using high density ERP, these authors demonstrate that in contrast to both typically developing children and children with developmental delay, children with autism do not exhibit differential brain activation patterns for faces as compared to objects. This finding compliments behavioral studies demonstrating that children with autism process faces abnormally and provides the first compelling neural evidence that a face processing impairment exists early in life for these individuals. Another important

[142] Cfr. Dawson, G., Carver, L., Meltzoff, A. N., Pagagiotides, H., McPartland, J., & Webb, S. J., *Neural correlates of faces and object recognition in young children with autism spectrum disorder, developmental delay and typical development*. Child Development, 73,, 2002, pp. 700–717.

study about the role of the Fusiform Gyre in face processing has been carried on by Grelotti et alii[143]. These researchers have investigated the activity in the cerebral areas involving Fusiform Gyre and Amygdala in an autistic boy (DD, for "DigiDestined"). He showed a special interest about some characters, known as Digimon, borrowed from a Japanese cartoon. The researchers have employed images representing Digimon because they are very important for him. Their aim was to test the Fusiform Gyre and Amygdala activity. The autistic patient has detected Digimon faster than familiar faces and objects, though he detected the familiar faces slower than the other objects. This research has also used behavioural studies and fuctional magnetic resonance (FMRI) of familiar and unfamiliar faces, everyday's objects and Digiamon. During the first experiment (images E1) were tested the autistic subject crazy on Digimon (DD) and another autistic 17years old boy who didn't care about Digimon. On a translucid screen were projected black and white images of unfamiliar faces (cut at the height of hair), Digimon and other kinds of objects. Pictures were projected one by the other on a black screen for 3.9 seconds, with 0.3 seconds interstimulation interval. Every picture was put together with an object of the same class or subclass. The boys were told to say if two pictures were the same or not, and to answer by pressing a push-botton panel.

A possible bewildering factor when interpreting E1 data results was the boy's familiarity with the Digimon and their faces, so, to be able to detect if the familiarity with characters was directly linked to Digimon's face or to his knowledge of such characters, this boy was asked to perform another test (E2). In this experiment, as originally planned, the comparison was between complete Digimon, Digimon having black strips hiding their faces, several human faces and some objects[144]:

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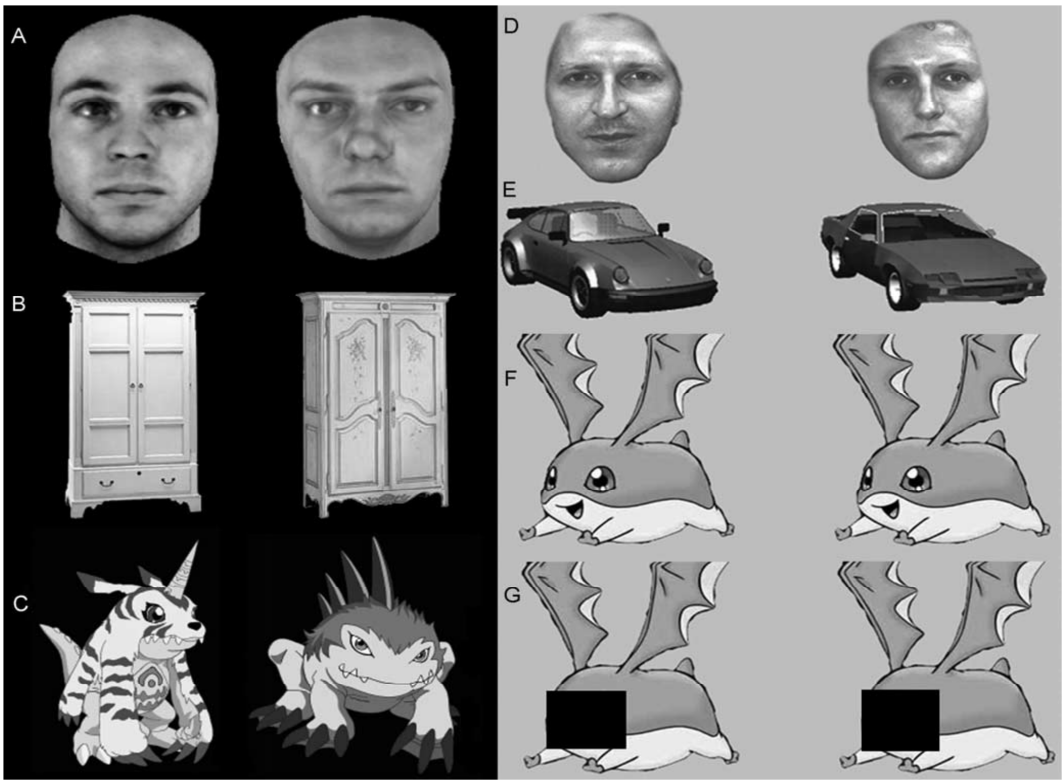
[143] Cfr. Grelotti DJ, Klin AJ, Gauthier I, Skudlarski P, Cohen DJ, Gore JC, Volkmar FR, Schultz RT., *fMRI activation of the fusiform gyrus and amygdala to cartoon characters but not to faces in a boy with autism*. Neuropsychologia, 43(3):373-85, 2005.

[144] Grelotti DJ, Klin AJ, Gauthier I, Skudlarski P, Cohen DJ, Gore JC, Volkmar FR, Schultz RT., *fMRI activation of the fusiform gyrus and amygdala to cartoon characters but not to faces in a boy with autism*, op. cit., p.376.



The results of the study by Grelotti et alii demonstrate that there is a larger activation of the Fusiform Gyre in the autistic boy towards Digimon rather than familiar and unfamiliar faces and the objects. In addition they conclude that Fusiform Gyre activation in the autistic boy and his missed cortical specialization for faces are in line with different time intervals when the boy was observing or thinking about people and Digimon.

What are the implications of these findings for understanding the nature and origin of the FFA? One possibility is that DD's "face module" is damaged and dysfunctional and that nearby cortex can nonetheless support the individuation of non-face objects like Digimon. Indeed, the fact that some individuals with acquired prosopagnosia are reported to have relearned objects but not faces[145] would be consistent with this account. In addition, a unique individual with visual object agnosia was reported to have face

[145] Cfr. McNeil, J. E., & Warrington, E. K., *Prosopagnosia: A face-specific disorder*. The Quarterly Journal of Experimental Psychology, 46A(1), 1–10, 1993.

recognition preserved[146], suggesting that areas of the cortex can subserve a discrete function and can be selectively damaged, without impacting the function of adjacent areas. DD could be an example of a person with autism who has a dysfunctional face module but an otherwise intact FG cortex that responds to objects that have a special meaning to him. A second explanation for the observed face and Digimon dissociation in DD emphasizes the perceptual processes that underlie face processing and expert non-face object processing. Although some studies[147] have reported individual patients whose face processing deficits are disproportionately more impaired than their within category object discrimination or configural processing[148] face recognition deficits in persons with prosopagnosia are often accompanied by marked difficulty in discriminating between visually similar objects and sensitivity to an object's level of categorization. Additionally, objects of expertise are found to recruit the FFA, suggesting that specialization for faces in the FFA is an example of a more general phenomenon related to experience, individuation, and configural processing. Accordingly, a lack of experience with faces may underlie the face processing deficit in persons with autism and hypoactivation of the FFA in neuroimaging studies of face perception. Within this framework, DD's activation to Digimon is conceived as the equivalent of the FFA for faces, a result of his acquisition of Digimon expertise.

[146] Cfr. Moscovitch, M., Winocur, G., & Behrmann, M., *What is special about face recognition? Nineteen experiments on a person with visual object agnosia and dyslexia but normal face recognition*. Journal of Cognitive Neuroscience, 9, 555–604, 1997.
[147] Cfr. Farah, M. J., Levinson, K. L., & Klein, K. L. (1995). *Face perception and within category discrimination in prosopagnosia*. Neuropsychologia, 33, 661–674.
[148] Cfr. Duchaine, B. C., *Developmental prosopagnosia with normal configural processing*. Neuroreport, 11, 79–83, 2000.

3.3 Amygdala

The amygdala, which is located in the anterior medial section of the temporal lobe, is an important bilateral gray matter structure composed of several distinct nuclei. An extensive body of animal research has established that it plays a central role in fear-related processes and several other aspects of emotion, as well as interactions of emotional processes with cognitive processing. The amygdala often is given a central role in theories of social perception and cognition[149].

The amygdala has attracted great interest among autism researchers and those interested in the social brain. Initial interest stemmed from consistent findings of stunted neuronal arborization within this structure as seen in a series of postmortem cases[150]. Across cases, neurons of the amygdala appeared too small and too densely packed because of the limited development of the dendritic tree. In addition, there are now three published FMRI studies on the amygdala in autism; each has shown the amygdala to be hypoactive during a face perceptual task[151]. There are also findings from structural neuroimaging studies of differences in the size of the amygdala in autism[152], and differences in neural communication between the amygdala and the rest of the brain. The initial finding that bilateral lesions to the human amygdala impair recognition of emotion from facial expressions was quickly followed up with functional imaging using PET and has since then

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[149] Cfr. Adolphs, R., Tranel, D., Damasio, A.R., *The human amygdala in social judgment*. Nature 393 (6684), 470–474, 1998; Cfr., Baron-Cohen, S., Ring, H.A., Bullmore, E.T., Wheelwright, S., Ashwina, C., Williams, S.C.R., 2000. *The amygdala theory of autism*. Neurosci. Biobehav. Rev. 24, 355–364.

[150] Cfr. Bauman, M.L., Kemper, T.L., 1994. *Neuroanatomic observations of the brain in autism*. In: Bauman, M.L., Kemper, T.L. (Eds.), The Neurobiology of Autism. Johns Hopkins University Press, Baltimore, pp. 119–145.

[151] Cfr. Baron-Cohen, S., Ring, H.A., Wheelwright, S., Bullmore, E.T., Brammer, M.J., Simmons, A., Williams, S.C., 1999. *Social intelligence in the normal and autistic brain: an fMRI study*. Eur. J. Neurosci. 11, 1891–1898.

[152] Cfr. Abell F, Krams M, Ashburner J, Passingham R, Friston K, Frackowiak R, Happe F, Frith C, Frith U., *The neuroanatomy of autism: a voxel-based whole brain analysis of structural scans*. NeuroReport 10:1647–1651, 1999; Cfr., Aylward EH, Minshew NJ, Goldstein G, Honeycutt NA, Augustine AM, Yates KO, Barta PE, Pearlson GD., *MRI volumes of amygdala and hippocampus in non-mentally retarded autistic adolescents and adults*. Neurology 53:2145–2150, 1999.

spawned a veritable industry of fMRI studies investigating responses to faces and other social stimuli. Whereas the fusiform gyrus is important for the perception of facial identity, the amygdala has been shown to play a critical role in the early stage processing of facial expression[153]. The amygdala is a fast responding structure that quickly reacts to emotionally potent stimuli, signaling other brain areas as to the salience of an event[154]. The amygdala plays a critical role in emotional arousal, assigning significance to environmental stimuli and mediating the formation of visual-reward associations, i.e., ''emotional learning''[155].

It is reliably engaged during judgments of personality characteristics from pictures of the face or part of the face. Activation of the amygdala appears to be automatic and stimulus driven, as it can be engaged by images of facial expressions out of conscious awareness[156]. Most studies of the human amygdala's role in face recognition have focused on recognition of so-called basic emotional expressions: happiness, surprise, fear, anger, disgust, and sadness, which can be reliably signaled by the face and for which there exist extensively normed and commonly used sets of stimuli. The human amygdala is activated when subjects perceive certain basic facial emotions[157], and amygdala damage impairs recognition of basic emotions[158]. However, the amygdala's role appears to extend to more complex social judgments as well: Subjects with bilateral amygdala damage are impaired in judging the trustworthiness or approachability of other

[153] Cfr. Breiter, H.C., Etcoff, N.L., Whalen, P.J., Kennedy, W.A., Rauch, S.L., Buckner, R.L., Strauss, M.M., Hyman, S.E., Rosen, B.R., *Response and habituation of human amygdala during visual processing of facial expression*. Neuron 17, 875–887, 1996.
[154] Cfr. LeDoux, J.E., *The Emotional Brain*. Simon and Shuster, New York, 1996.
[155] Cfr. Anderson, A.K., Phelps, E.A., *Lesions of the human amygdala impair enhanced perception of emotionally salient events*. Nature 411, 305–309, 2001.
[156] Cfr. Pasley, B.N., Mayes, L.C., Schultz, R.T., *Subcortical discrimination of unperceived objects during binocular rivalry*. Neuron 42, 163–172, 2004.
[157] Cfr. Blair, R. J. R., Morris, J. S., Frith, C. D., Perrett, D. I., & Dolan, R. J., *Dissociable neural responses to facial expressions of sadness and anger*. Brain, 122, 883–893, 1999.
[158] Cfr. Anderson, A. K., Spencer, D. D., Fulbright, R. K., & Phelps, E. A., *Contribution of the anteromedial temporal lobes to the evaluation of facial emotion*. Neuropsychology, 14, 526–536, 2000.

people from their faces[159], and amygdala activation in normal subjects correlates with untrustworthiness judgments[160], as well as other social judgments such as aspects of racial stereotyping. Baron-Cohen, Wheelwright, and Jolliffe[161] explored the recognition of complex mental and emotional states, including social emotions, from the face. Their findings were threefold:

(1) Such complex mental states are recognized disproportionately by information from the region of the eyes in the face.

(2) When making judgments about such states from images of the eye region of the face, normal subjects activated the amygdala in functional imaging studies.

(3) This amygdala activation was not found in subjects diagnosed with autism, who are impaired in their ability to recognize complex mental states from the eyes. A correlation between amygdala activation and FFA has been described for emotion perception in healthy subjects and in ASD subjects. The left amygdala has been associated with the processing of negative expression, whereas the right amygdala seems to be more involved with face processing in general, regardless of emotional valence[162].

These findings, together with many others, have suggested that the severe impairments in everyday social behavior exhibited by people with autism may be attributable in part to dysfunction in circuits including the amygdala[163].

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[159] Cfr. Adolphs, R., Tranel, D., & Damasio, A. R., *The human amygdala in social judgment*. Nature, 393, 470–474, 1998.

[160] Cfr. Winston, J. S., Strange, B. A., O'Doherty, J., & Dolan, R. J., *Automatic and intentional brain responses during evaluation of trustworthiness of faces*. Nature Neuroscience, 5, 277–283, 2002.

[161] Cfr. Baron-Cohen, S.,Wheelwright, S., &Jolliffe,T., *Is there area ''language of the eyes''? Evidence from normal adults and adults with autism or Asperger syndrome*. Visual Cognition, 4, 311 – 332, 1997.

[162] Hadjikhani N., Joseph R.M., Snyder J., Tager-Flusberg H., *Abnormal Activation of the Social Brain During Face Perception in Autism*, Human Brain Mapping 28:441–449, P.446, 2007.

[163] Cfr. Baron-Cohen S, Ring HA, Bullmore ET, Wheelwright S, Ashwin C, Williams SC., *The amygdala theory of autism*. Neurosci Biobehav Rev 24:355–364, 2000.

3.4 Superior Temporal Sulcus (STS)

At the end of the 20th century, if we had asked most neuroscientists about the 'social brain' they would have immediately identified the frontal lobe and limbic system, and more specifically structures such as the orbitofrontal cortex, the amygdala and the striatum. These structures are indeed deeply involved in mood, motivation and decision processing. More recently, researchers have also focused on another aspect of the social brain, which can broadly be called 'social perception', in which it is now clear that the superior temporal sulcus (STS) is a major player. Social perception refers to the initial stages of evaluating the social communicative intentions of others by analysis of eye-gaze direction, facial expressions, body movements, and other types of biological motion[164].

Therefore, Brothers et al.[165] proposed that the amygdala, the orbitofrontal cortex (OFC), inferotemporal face-responsive regions and the STS represent areas primarily involved in the processing of socially relevant information.

Based on recent brain-imaging results obtained for ASD[166], abnormalities in the STS are strongly implicated in ASD. Therefore, anatomical and functional anomalies in the STS during early brain development could constitute the first step in the cascade of abnormal neural phenomena underlying ASD. In a seminal review about the role of the STS in social perception, Allison et al. stated that it is plausible that there are STS anomalies in autism, although they also pointed out that there were 'no studies specifically implicating the STS region in autism. Five years later, new brain-imaging techniques enabled Dakin and Frith to suggest that 'abnormalities in the STS may provide a neural basis for the range of motion processing deficits observed in ASD, including biological motion

[164] Cfr. Allison, T., Puce, A. and McCarthy, G., *Social per- ception from visual cues, role of the STS region*. Trends in Cognitive Sciences, 4, 267-278, 2000.
[165] Cfr. Brothers, L., Ring, B. and Kling, A., *Response of neurons in the macaque amygdala to complex social stimuli*. Behavioural Brain Research, 41, 199-213, 1990.
[166] Cfr. Allison, T., Puce, A. and McCarthy, G., *Social perception from visual cues, role of the STS region*. Trends in Cognitive Sciences, 4, 267-278, 2000.

perception[167]. They went on to say that, 'such an explanation may also provide a link between perceptual abnormalities and specific deficits in social cognition associated with autism'. Importantly, the greatest response within the STS is seen to dynamically changing, social stimuli, although a response is also seen to static biologically relevant stimuli, such as faces, or stimuli with implied motion. Further, perception of this motion, or implied motion, recruits a large response from cells within the STS only if the visual actions follow a specific sequence. Thus, while speech and social perception appear to be separate behavioral domains, they both share a common function of first parsing sequences of input into units and second interpreting meaning from those units in the STS. Social stimuli which elicit activation within the STS fit broadly into the category of biological motion, or the ''visual perception of a biological entity engaged in a recognizable activity''[168]. The perception of biological motion engages a broad network of brain regions including superior temporal areas, and visual regions within both ventral (object) and dorsal (motion) regions[169].

The STS receives inputs on both form and motion and integrates these to identify a moving form and to extract social significance from this form. This function is seen in a diverse number of biological motion tasks ranging from eye gaze perception to perception of a social, moving form from point-light displays. While motion, or implied motion, must be present to activate the STS, the degree and location of activation appears to vary by degree of complexity, type of motion, and biological relevance. Specifically, like in the language domain, a hierarchy of STS activation is seen with the greatest degree of activation to dynamic, complex, and socially meaningful stimuli (e.g. emotional facial expressions) and the lowest to non-meaningful, non-

[167] Cfr. Frith, C.D. and Frith, U., *Interacting minds—A biological basis*. Science, 286, 1692-1695, 1999.

[168] Cfr. Pelphrey, K.A., Morris, J.P., *Brain mechanisms for interpreting the actions of others from biological-motion cues*. Current Directions in Psychological Science 15, 136–140, 2006.

[169] Cfr. Vaina, L.M., Solomon, J., Chowdhury, S., Sinha, P., Belliveau, J.W., *Functional neuroanatomy of biological motion perception in humans*. Proceedings of the National Academy of Sciences 98, 11656–11661, 2001.

social motion (i.e. random motion), with no activation seen to static, non-socially relevant stimuli. These stimuli will be reviewed in turn below. Facial expressions are a complex form of biological motion in which a number of facial muscles change over time in a specific sequence to convey a particular emotion. It has been proposed that the role of the STS in face perception is to process changeable aspects of faces perception of eye gaze, expression, and lip movement[170]. A separate region, the fusiform gyrus (FG) is involved in invariant aspects of faces perception of unique identity, highlighting the dissociation between recognizing who a person is and what a person is trying to communicate. One type of biological motion involving the face is a change in eye gaze direction. This powerful social cue can convey an enormous range of social and communicative signals including boredom, envy, disgust, fear, interest in another object, or sharing of interest in that object, for example. When subjects were asked to selectively attend to eye gaze direction, more activity was seen in the left STS and intraparietal sulcus (IPS) than when they were asked to attend to person identity; however when attending to identity versus gaze, greater activation was seen in right lateral FG and inferior occipital gyrus (IOG)[171]. Furthermore, viewing an averted as opposed to direct gaze activates STS and IOG to a greater extent. A series of experiments with a brain-damaged patient who had a lesion of the right superior temporal gyrus (STG) revealed a selective deficit in using eyes as a cue to shift attention[172], suggesting this region is critical to perceiving eye gaze shifts as meaningful.

The above studies reveal that the role of the STS in face processing is in identifying the changeable aspects of faces, such as eye gaze, head

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[170] Cfr. Haxby, J.V., Hoffman, E.A., Gobbini, M.I., *Human neural systems for face recognition and social communication*. Biological Psychiatry 51, 59–67, 2002

[171] Cfr. Hoffan, E.A., Haxby, J.V., *Distinct representations of eye gaze and identity in the distributed human neural system for face perception*. Nature Neuroscience 3, 80–84, 2000.

[172] Cfr. Akiyama, T., Kato, M., Muramatsu, T., Saito, F., Nakachi, R., Kashima, H., *A deficit in discriminating gaze direction in a case with right superior temporal gyrus lesion*. Neuropsychologia 44, 161–170, 2006a; Cfr. Akiyama, T., Kato, M., Muramatsu, T., Saito, F., Umeda, S., Kashima, H., *Gaze but not arrows: a dissociative impairment after right superior temporal gyrus damage*. Neuropsychologia 44, 1804–1810, 2006b.

orientation, lip-reading, and facial expressions (particularly when conveying an emotion). Each of these ‘‘changeable aspects’’ convey social communicative significance through specific, sequenced movements.

In addition to recognizing human activity, an important component of STS function is the ability to extract meaning from that activity. Greater activation in the STS is seen when the subject infers a goal or intention of the other person as compared to simple perception of biological motion.

In fact, studies of biological motion perception often imply goals or intentions of an observer. A shift in eye gaze, for example, is a movement that conveys social meaning but it also can elicit conjecture on what the person who is doing the gaze shift is thinking. This function may explain why STS activation appears in studies of theory of mind (TOM) perception, or having an understanding of the goals, intentions, or beliefs of another person[173]. A large body of neuroanatomical and neurofunctional evidence suggests the temporal lobes, and particularly the STS/STG, are abnormal in autism. Rapid brain growth is seen in autism between birth to 6–14 months of age[174]. This rapid rate of brain growth continues into early childhood, after which time brain size is not significantly different from normal.

Evidence suggests this rapid growth occurs in an anterior to posterior gradient with frontal and temporal lobes most affected. Specifically, MRI volumetric studies reveal significant enlargement of gray matter in the frontal and temporal lobes in 2–4-year-old children with autism as compared to controls[175]. A voxel-based morphometry study found decreased concentrations of gray matter in autism localized bilaterally to the superior temporal sulci. Analysis of cortical sulcal maps in autistic children revealed bilateral anterior and superior shifting of the superior frontal sulci and right

[173] Cfr. Frith, U., Frith, C.D., *Development and neurophysiology of mentalizing*. Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences 358, 459–473, 2003.

[174] Cfr. Courchesne, E., Carper, R., Akshoomoff, N., *Evidence of brain overgrowth in the first year of life in autism*. Journal of the American Medical Association 290, 337–344, 2003.

[175] Cfr. Carper, R.A., Moses, P., Tigue, Z.D., Courchesne, E., *Cerebral lobes in autism: early hyperplasia and abnormal age effects*. Neuro- image 16, 1038–1051, 2002.

anterior shifting of the STS, sylvian fissure, and left inferior frontal sulcus. The authors interpret anterior shifting of sulci as indicating delayed or incomplete sulcal development based on developmental sulcal mapping studies of typical children. Furthermore, cortical thickness has been shown to be reduced in a number of brain regions in autism and this reduction correlates significantly with autism symptoms in the STS and inferior frontal gyrus in addition to a number of parietal regions (inferior parietal lobule, supramarginal gyrus, and superior parietal lobule) and one occipital region (IOG). Reduced cortical thickness suggests either early primary neural abnormalities in these regions or secondary abnormalities resulting from aberrant cortical connectivity. Temporal lobe abnormalities have also been found in post-mortem studies. Four of the six autism brains that Bailey et al. [176] examined contained temporal lobe abnormalities. These abnormalities include mild widening of temporal sulci in one case (Case 1), abnormal temporal laminar patterns in two cases (Cases 1 and 4), thickening of the STG in two cases (Cases 2 and 4), and scattered mature neurons within white matter in the STG in one case (Case 5). Neuronal integrity, as measured by levels of NAA recorded during MRS Spectroscopy, is impaired in the lateral temporal regions in one study [177] . The primate anatomical literature has shown that the STS has rich projections to the frontal lobes[178] and the cerebellum[179]; areas which have been consistently implicated as abnormal or impaired in autism. Finally, a study of cerebral bloodflow during sedation in children with autism revealed hypoperfusion

[176] Cfr. Bailey A, Luthert P, Dean A, Harding B, Janota I, Montgomery M, et al. *A clinicopathological study of autism*. Brain, 121:889–905, 1998.
[177] Cfr. Hisaoka, S., Harada, M., Nishitani, H., Mori, K., *Regional magnetic resonance spectroscopy of the brain in autistic individuals*. Neuroradiology 43, 496–498, 2001.
[178] Cfr. Seltzer, B., Pandya, D.N., *Frontal lobe connections of the superior temporal sulcus in the rhesus monkey*. Journal of Compartive Neurology 281, 97–113, 1989.
[179] Cfr. Schmahmann, J.D., Pandya, D.N., *Projections to the basis pontis from the superior temporal sulcus and superior temporal region in the rhesus monkey*. Journal of Comparative Neurology 308, 224–248, 1991.

of bilateral STG/STS[180] and in fact this hypoperfusion in the left STG/S correlated with degree of autism severity[181].

Thus, the above evidence suggests that dysfunction of the temporal lobes may play a significant role in the development of autism

[180] Cfr. Ohnishi, T., Matsuda, H., Hashimoto, T., Kunihiro, T., Nishikawa, M., Uema, T., et al., *Abnormal regional cerebral blood flow in childhood autism*. Brain 123, 1838–1844, 2000.

[181] Cfr. Gendry Meresse, I., Zilbovicius, M., Boddaert, N., Robel, L., Philippe, A., Sfaello, I., et al., *Autism severity and temporal lobe functional abnormalities*. Annals of Neurology 58, 466–469, 2005.

CHAPTER IV

THE OTHER FACE OF AUTISM

4.1The *existence* of the autistic subject in the world. Favourable effects

The decision to interpret autism from an *embodied* point of view turns out to be valuable food for thought, a magnifier which let us discover something else: *the hidden face of the moon* and this being fully aware that from the point of view we usually consider the world, we would see very little or we would use one-sided and fossilized patterns. Such interpretation patterns, being shared by most people, can seem convincing and "objectively" valid, but they discourage so critical and self-critical judgment about asking things and wondering about things.

Thus, starting from the meeting ground of different fields, such as neuroscience, psychology and pedagogy presupposes the skill/commitment to go through the various fields, in a continuous "going farther" and "going back" so to make them flexible , distensible , interconnecting. Cognitive sciences'new paradigm has helped dilate, make flexible and interconnect the borders. Such paradigm has substituted gradually the traditional vision about cognitive process for an *embodiment* kind of structure, which theorizes that cognition is linked to body and to sensory motor system. This new perspective theorizes that knowledge has essentially a motor-perceptive connotation. It works thanks to multi-modal channels , which involve all body features. The past experiences play a significant role and it is also the main aspect of the cognitive process. Consequently, there is a shift from a neutral condition to a one situated in its various dimensions: *embodied, embedded, extendend, enacted.* Mind, which is embodied in the subjects, rooted in the environment , depending on social relationships and being put into action. Thus, moving from this approach, the thought should not be considered only as a reduplication and adaptation to reality, but also a

discover and building of it through sense attributions and construsctions. These depend very much on the interaction with reality. Knowledge and experience are mutually generative. My decision, so, to write about *embodied* autism involves the consideration of this kind of paradigm. It traces its central *topos* in the body and sensory experience and identifies the significant phases of the discovering and building of real world through different interaction modes of the autistic person with the environment. Autistic subject *embodied* in a body, deep rooted in the environment, depending on social relationships, and acting/being put into action in his/her environment, dependent on social relationships and performing and being put into action who not only not only takes a different view of the world, but perceives, assimilates, introjectes it and develops it through sensory-perceptive peculiarities. Such peculiarities active the underlying cognitive and neural process and influence the general dynamic development. This paper in its first part will deal with the sensorial-perceptive processes as applied to the building of the world. Thanks to the works by specialists, for instance Bernard Rimmel and C.H. Delacato, to the autobiographies written by high functioning autistic people such as Temple Grandi and Donna Williams and thanks also Olga Bogdashina's work, today it is possible to have some different interpretations of the causes and about the acceptance of some apparently bizarre behaviours. Observing and analyzing sensory-perceptive autistic profile bring about favourable effects in the educational and rehabilitative field, because they can help reduce sympthoms, and make it troubling. Every kinds of methods should take in great consideration the type and degree of sensory problem that affect autistic subjects, given that this influences very much the quality of their relationships with people and environment. Environment that, through the special ways it is experienced, de-stabilizes and dis-orientates the autistic person. Such environment can be seen as a limit, but also as a crucial means as educator-rehabilitator and therefore it might turn into an activator/multiplier of educational possibilities. My decision to write on autism implies therefore the need to

find the central *telos* of educational relation in the body and sensory experience. Such *telos* has to detect the most important formative moments in the various interactive modes of the autistic person with his/her environment. The educational project is always based on relation, a generative active and inter-active space, where it takes place a true and utter exchange of meanings, though they are not conventional and standard, but built through an educational relationship, which enable us to see, hear and listen in a better way even in *crossing the frontier.* The educational project to be provided in the case of a person suffering from autism, in the first place, must underline the importance of corporeity and it also has to stress attention on all the multi-sensory stimuli, which are sent to the subject by the environment, in a kind of reciprocal play[182] between interior and exterior and between structure and function. Starting from the elements just enunciated opens up new unexplored horizons towards not considered before issues. But we must be ready to bring the accepted norm into question, even to cross them in order to go exploring, though we do not know what the final destination is. There is an aspect of educational relationship that goes beyond the phenomenal appearance and it involves the intersubjective ability to transfer meanings from one person to another by using body as a medium. Body which is a pre-logical and pre-predicative dimension of our relational and understanding skills, and it enables us to project our face form towards the outer space. Body becomes, thus, the key feature of existence and it is the way through which we can learn how to recognize physical emotional signals. Furthermore, it is instrumental in representing, in practical terms, feelings brought about by emotions and in linking them to consistent. Such feelings can act as preparatory signs of an upcoming outburst of feelings. Body tells no lie. Body can brings about unease, pain, suffering but also satisfaction, pleasure, well-being. Body is the very peculiar meaning which is inside everyone's experience and it expresses its uniqueness. Here is a new consideration being thought about

[182] Based on processes of selective stabilization

by pedagogy: it is undeniable that an autistic subjects sense, existence in an environment and relationships to other people are based on his/her body, which is the tangible and evident manifestation of their *Living in the world.* Body that is the essence and the visible "container" of identity and of human vital space; body which cannot be simply reduced to diagnostic pictures or general categories, on the contrary it must be interpreted through a model of comprehensive education based on *consideration* for the subject. But all this can be achieved only if we agree to accept any difference potentially able to bear fruit. The educational and rehabilitative plan must be centred around considerations, which help us reveal an autistic person's path. Such path can be observed thanks to a continuous observation process. An *embodied* perspective, involving formative processes and autistic patients, invites us not to consider body only a simple epistemic object, but it urges us on to put it in a specific environment and to make it subjective, giving thus the right value to existence by learning how to interpret the epiphenomenon. Inside the person the epiphenomenon lets us see the different cognitive Weltanschauungen and which enables us to acquire a deep pluralistic and negotiable knowledge. Though such mental mechanisms do not become visible if they are not consciously taken into consideration. We are so used to separating neutral, objective, scientific vision from an existential, subjective and pre-scientific one that we do not notice that such visions operate together in our lives by processing reality. The hoped-for direction, from a pedagogical point of view, should focus on this "revelation" and also on considerations which should be accompanied by a firm commitment that the treatment must cope with common places and it should also consider the existential conditions which mark its changes. Changes to be found also in treatment so to underline the role (and power) of the individual which, following Bateson, seem somewhat reduced, giving that it is not possible to talk about "his/her" mind not acting and interacting in contexts. We can add a brilliant sentence to what already expressed: "a map is not a territory", and so we get that it is necessary to start from this act, this revelation to be able

to explore new lands. The territory drawn on a map contains much more than the map can possibly show and such territory is alive, changing even to morphological alterations. Thus it is possible to draw parallels between map and territory by one hand, and educational and formative plans for an autistic person on the other, that is to say we should be aware of the great importance of our staring at the "person", with the firm intention of understanding him/her in all their possible complexity, but being conscious of the partiality and insufficient nature of our "staring", or our scarce possibility to make such interior complexity visible.

4.2 The other side of the moon. Beyond the deficit. *Inside* the experiences

In the second and third chapters of this work I focus my attention on a specific neuroscientific field, which has its aim in trying to trace the atypical modalities of human faces perception and processing by autistic persons. This can spread the great complexity of autism. Such matter acquires a particular importance if we analyze and interpret it through an *embodied* perspective. As I have already mentioned, if studying autism involves the crucial idea of body and sensory experience in the relationship process, it will be necessary to deal with the face, which is a part of the human body that plays an outstanding role in social-emotional-communicative-relational life. Face to be interpreted as a primary source and a conveyer such outstanding conveyer is perceived and processed by autistic subjects through ways that have been described as atypical by many research. Neuroscientific studies about human face sensory-perceptive processes can make us understand that autistic individuals, in the same way as other people suffering from a neurological syndrome, see the same thing (face in this case) but in a different way. The scientific research on this field contribute to promote a relativization of the concept of "normality",

because they suggest us that there is not a "right" way to perceive the world but many different experiences and many "conceptions of the world", that we should consider and accept.

But starting from this evidence it is possible to make some new and interesting observations. Is it legitimate to find and establish a cause link between the principal deficits of the autistic spectrum , which are present in social interactions, in verbal and non verbal communication and the atypicalness found in the face processing? As already mentioned, human face is not a relevant stimulus for autistic babies when it comes to process faces in the first months of their life. How does it affect the building and the atypical development of social, emotional, communicative and relational skills? Many of the early signs of social malfunctioning in autistic patients patients (eyesight contact, shared attention, response to emotional stimuli and recognition of faces) involve their skills to process information conveyed by face. Therefore it is possible that the atypical way to process faces plays a crucial role in brain system malfunction, which are the underlying causes of social autism deficit. Furthermore the neural system, which convey the face process become active very soon and thus this kind of atypical processing might be the earliest signs of an autistic brain[183]. And, so, is the inborn incapacity[184] biologically determined to establish normal emotional contacts with people? How can we distinguish the inborn factor from the acquired one? Were autistic persons from their birth impaired by a malfunctioning of their structure involved in face processing or rather they do not develop it sufficiently because they receive insufficient stimuli from people's faces? As it is often decays the truth might stand halfway between the genetic based explanation and the environmental based one. This is the case with Nelson's theory[185], reported by Noah J. Sasson in the already cited

[183] Cfr. Dawson G., Webb S.J., McPartland J., *Understanding the Nature of Face Processing Impairment in Autism: Insights From Behavioral and Electrophysiological Studies,* Developmental Neuropsychology, 27(3), 2005, 403–424.

[184] Studied by great researchers as L. Kanner and H. Asperger.

[185] Cfr. Nelson, C. A.,*The development and neural basis of face recognition*. Infant and Child Development, 10, 3–18, 2001.

contribution. It postulates that human beings have a neural system which is naturally able to process faces, by it should acquire sufficient skills at face processing to get to a normal development level. What are then, the possible favourable effects on the educational field? The face is together and simultaneously a particular and general, specific and common, biological and cultural "place" and it necessary to start right from it through education and rehabilitative acts oriented towards a further appreciation of sensory, expressive, emotional, facial potentialities. If it is proper to start from this "actuality" to be able to observe face not only from a phenomenal perspective but especially from an ontological point of view as a unique and peculiar area. From such area it is possible to distinguish and intrinsic resonance and a vital dimension which become real between interiority and exteriority, emotion and corporeity: crucial factors of personal selfhood distinguishing signals of the subject, places of its characterization. We have to consider face as a subject/object o learning process as a bases for educational planning , if we want to be able to *look* at autism under a completely new light. Then it is necessary to change the environmental setting, going in the direction of a growing understanding of the autistic subjects' complexity of relational dynamics and being fully aware of their impact on educational and formative quality processing.

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