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# Augmentative and Alternative Communication

## Introduction and two case studies

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## INTRODUCTION

I would like to know the reader's thoughts and emotions if, for a while, he could be aware of what happens around him but not being able to speak or to use the communication channel used for his whole life: not able to tell his son that the wallet he's looking for is on the living room table, not able to thank his wife for all the time she spends with him, not able to greet his friends and discuss with them on the last world news. Maybe he could not speak at all, maybe he could just say "yes" with some intonation or maybe he could use a handful of different words. And that would be all he could say.

Also, I would like to know the reader's thoughts and emotions if, for a while, he was transported in a foreign country, where he could understand nothing at all, unable to communicate with anyone. He could resort to gestures, but what could he communicate through them? How much of his true communicative intentions could be conveyed through a simple and not organized gestural system?

I would like to inform the reader that this is not fiction, this is everyday's life of those who cannot communicate through oral language because of a stroke, a degenerative disease, or a developmental issue such as mental delay or autism. These cases are more frequent than any reader may think of.

How do these impaired people communicate? Sometimes, they resort to Alternative and Augmentative Communication (AAC) and gain the possibility to communicate again or to learn how to do it for the first time.

Alternative and Augmentative Communication was an argument briefly introduced during the Tactile Sign Language course, since prof. Checchetto wanted to give us an overview of all communication strategies and techniques used with deafblind population. This was the first contact I had with AAC. Should a linguist be interested in what happens when language is out of reach?

To look for an answer, I made a three months internship in Ferrara in a municipality office, to collaborate with prof. Francesco Ganzaroli who is an expert in AAC for both adults and children. The aim of my internship was to get closer to AAC

and see its application to complex cases. After a while, I realized how communication is important for people, whichever form it takes, and how versatile and powerful AAC demonstrated in offering impaired people the possibility of communication. I saw how communication could improve by using technology but also by using paper and pencil only. The quality of communication does not depend on how much money you spend on AAC supports, but how you use them and make the best of them. It looks almost incredible how AAC can be used in so many different settings and in so many different situations and pathologies.

In all cases I followed during those three months, the importance of communication for children and adults grew clearer and clearer. Communication has a huge part in human social life, and is part of being a person - a definite and complete person, with needs and wants and desires. A person with something to *say* and a modality to *say it*, which does not mean just *say through speech*, but *communicate it* to someone who is able to understand it.

Do I think a linguist should take interest in what happens if language is out of reach? Yes, I do think so. I think that a linguist should be aware of how many different communication systems human beings can use. In case oral language is impaired, a linguist should be able to suggest the better possible intervention to bypass the oral language lack in order to reach the most complete and effortless communication modality. AAC offers a range of modalities to access communication needless of all the cognitive or physical abilities necessary to access language.

The first chapter of my thesis focuses on the meaning of communication, why it is important for human beings, how it develops in children, and how it developed in our species.

The second chapter provides an insight of what AAC is and how it works, which devices or instruments it uses and how an AAC intervention is structured, from the initial assessment to instructional procedures.

The third chapter is about two cases I followed during my internship. I chose two children with different disabilities and different communication needs, who

went through two totally different paths: V. has a strong family support, while M. had to face an environment opposing AAC intervention until very recently.

Different situations and different interventions lead to my conclusions on AAC, which are closing the thesis.

To most of us, communication is so natural and effortless that we do not pay much attention to it. We take notes of its value only when we are in front of cases where oral language cannot be used, but still a way to communication has to be found, since all of us "*live and breathe words*"<sup>1</sup>.

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<sup>1</sup> Quote from Cassandra Clare, *Clockwork Prince (The Infernal Devices, book 2)*.

## CHAPTER ONE: AN OVERLOOK ON COMMUNICATION

*"We are stronger when we listen,  
and smarter when we share."*

*Rania Al-Abdullah*

### 1.1 What communication is

#### 1.1.1 A look on definitions

Communication is such a natural and effortless act we usually do not think about, and because of this it is difficult to define it.

Looking for some definitions of what communication is, it is possible to find what follows in the Oxford English Dictionary<sup>2</sup>:

- The imparting or exchanging of information by speaking, writing, or using some other medium:
- A letter or message containing information or news
- The successful conveying or sharing of ideas and feelings
- Social contact

The Collins Dictionary<sup>3</sup> defines communication as:

- the act or an instance of communicating; the imparting or exchange of information, ideas, or feelings
- something communicated, such as a message, letter, or telephone call

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<sup>2</sup> website <http://www.oxforddictionaries.com/definition/english/communication?q=communication>, last access 22/06, 11:30

<sup>3</sup> website <http://www.collinsdictionary.com/dictionary/english/communication>, last access 22/06, 11:30

- (usually plural; sometimes functioning as singular) the study of ways in which human beings communicate, including speech, gesture, telecommunication systems, publishing and broadcasting media, etc

Considering the verb “to communicate” in the Oxford English Dictionary<sup>4</sup>, we can also find:

- Share or exchange information, news, or ideas
- Impart or pass on (information, news, or ideas)
- Convey or transmit (an emotion or feeling) in a nonverbal way
- Succeed in conveying one’s ideas or in evoking understanding in others
- (Of two people) be able to share and understand each other’s thoughts and feelings
- Pass on (an infectious disease) to another person or animal
- Transmit (heat or motion)

The origin of this word is Latin, and it comes from the union of *cum* = “with”, and *munio* = “bound”. *Communicatio* means communication, but also participation; *communico* does not only mean communicate, but has as its first meaning the idea of sharing. In its very origin, communication is thought to be a process of sharing with others, which has to involve at least two people, both for a kind of natural attitude and for duty<sup>5</sup>. In all the above definitions, communication involves an exchange of information from one subject to another.

Trying to sum up all the important features of these definitions, it is possible to say that communication:

- is made by at least two persons participating in an exchange, and attempting to share information;

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<sup>4</sup> website <http://www.oxforddictionaries.com/definition/english/communicate?q=communicate>, last access 22/06, 11:30

<sup>5</sup> all information about the Latin words involved come from the Latin-Italian dictionary *Georges Calonghi* (2002).

- is a cognitive process because it involves mental processing in taking part to a communicative exchange specially, elaborating the received message and transmitting a new one;
- is an action, a complex activity bound to participants' cultural background and their personal identity.

We can now look at a different definition of communication, coming from biology:

*“Communication comprises all physical and behavioural characteristics that influence other's behaviour, regardless of the intentionality of the signaler”.*  
(Tomasello, 2008: chapter two, p. 13)

This definition is really interesting, especially if applied to animals and adds something to our definition of communication by saying that it is not always voluntary, at least among animals.

Examples of animal communication are apes' vocalization, the colours of their skin or plumage, physical behaviours such as showing teeth or wagging tails; anyway, non-human communication never reached the complexity and the flexibility in use belonging to human communication. Human communication is the outcome of thousand years of evolution and adaptation to the environment: to survive, humans gathered in communities in which collaboration and teaching became increasingly important. Humans developed an infrastructure made of both physical and psychological structures to support communication, to make it effortless and economic to use. More precisely, what made the difference was culture, which allowed a more symbolic level of communication to talk of reality and comprehend each other. There are also some biological factors which allowed culture's appearance in human species, such as bipedalism and standing up, which differentiated legs and arms and let hands free from walking. The brain became bigger because it had more space, and standing up helped modifying the vocal

apparatus. The larynx descended in the throat, and this allowed more control on vocalizations and their differentiation.

This delicate process had such a brilliant outcome that communication is pervasive to all aspects of our life. Communication has become the main way to achieve social closeness and be part of a group, which might be a small group as family is but also a group as big as society. Because of these intrinsic social value and function communication can be considered as a human right and should be safeguarded for all individuals, even when physical or mental disabilities occur.

### **1.1.2 Not only speech: the three levels of communication**

Communication studies describe communication as a process which can be divided into three levels, as Anolli (2012)<sup>6</sup> explains: verbal, paraverbal, and non verbal communication.

Verbal level is made of words, in both speech and writing. It is made of words, which are chosen by the speaker, by the logical construction of the sentence and by the use of some words instead of others.

Paraverbal level, called also paralanguage, is the way in which things are said: the tone of voice, voice velocity, voice colour/timbre and its volume in speech, which are represented in written language by punctuation. It is not conscious, but we use it every day with others.

Non verbal communication is made of gestures, postures, facial expressions and so on. All these aspects together make what we call “communication”; this is how an apparently plain, instinctive and effortless process becomes a complex web which connects different human behaviors and apparatuses.

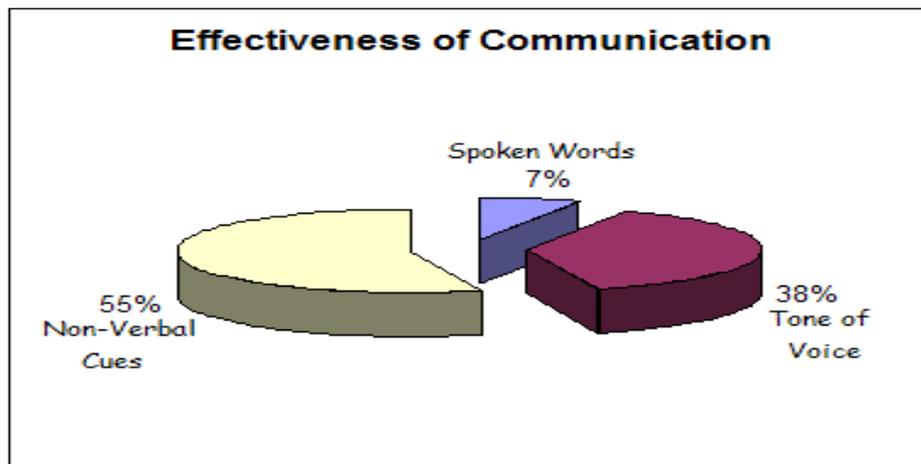
These levels do not have the same impression on the receiver. Mehrabian<sup>7</sup> (1967) says that paraverbal and nonverbal aspects are much more important in communication than the verbal ones, because they are basic for message

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<sup>6</sup> Luigi Maria Tarcisio Anolli (1945 – 2012) was an important Italian scholar and a professor of psychology at Milano Bicocca University in Milan.

<sup>7</sup> Albert Mehrabian (1939) is a famous American psychologist, known especially for his studies on nonverbal communication.

comprehension. He represented the percentage of influence of each level in this chart<sup>8</sup>:



It is possible to see how the nonverbal level of communication is fundamental to message comprehension; to explain this status which might look weird, we can suggest to think to the use of irony and sarcasm, in which the actual meaning of words is totally twisted by speaker's intended meaning, which is made explicit by paraverbal and nonverbal communication.

While the verbal level of communication is intended as speech, and so it is still called verbal communication, there is also another communication channel called nonverbal communication. It consists of paraverbal and nonverbal level of communication and can be defined as a transmission of contents and a sharing of meaning which is made by excluding the use of words; it is made of an heterogeneous system of phenomena and processes ranging from voice, facial mimicry and gestures to gaze direction, proxemics, haptics, kinesics and chronemics.

There is a strong correlation between verbal and nonverbal communication; they have common origins, but then they had different evolutionary processes. There are three basic differences between them:

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<sup>8</sup> image from <http://www.virtualspeechcoach.com/wp-content/uploads/2014/04/mehrabian-pie1.gif>

1. verbal language has a digital dimension, because it has or does not have features characterizing its components. Nonverbal language has an analogue dimension because its variation is proportional to the variation of its intended meaning. An example can be the emotion of joy and happiness, which emphasizes gestures by making them bigger and broader/wider;
2. verbal language has a denotative value, because it expresses information and knowledge with precision and accuracy. Nonverbal language has a connotative function, which means it is less controlled and has to do with the way concepts are expressed;
3. verbal language is characterized by arbitrary features, since the connection between “signifiant” and “signifié” is conventional. Nonverbal communication features always have some clear connection between “signifiant” and “signifié”.

Nonverbal communication channels consists in five different systems: vocal system, kinesics, haptics, proxemics, and chronemic systems (Anolli 2012: chapter five, p. 155).

Vocal system does not consist in words alone, but in voice as well. Voice means rhythm, intonation and volume. Voice tone is generated by the tension of vocal chords, and its variation during speech is called intonation. The intensity of voice is made of volume and intonation stress, while rhythm<sup>9</sup> depends on how much time is needed to express a sentence, how fast it is spoken and breaks as well. Silence has an important role as a communication strategy, although depending on culture. It might be a signal to stop communication, if matched with looking away and directing the head in a different direction. In other cultures, as in Asiatic one, silence is a sign of trust, harmony and understanding (Anolli 2012: chapter five, p. 163).

Kinesics studies head and facial movements along with eye movements. Facial mimicry is a main centre of attention for humans, because it has a great importance

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<sup>9</sup> This is a psychological definition of rhythm, which differs from the linguistic definition of rhythm. Marina Nespoulet, an important linguist, define rhythm as the alternation of prominent (stressed) and non-prominent (unstressed) syllables.

to interpret others' feelings. Studies about facial mimicry started with Darwin<sup>10</sup>, who said that facial expressions are universal and innate because of natural selection: they evolved from animals who used them as a form of communication, and then became evolutionarily significant for human survival. Ekman<sup>11</sup> (1978), a century after Darwin, developed the Facial Action Coding System, which is a system to describe and analyze every facial expression. Ekman said that facial expressions can show only basic emotions, and are divided in two categories: true expressions, which are involuntary and natural, and false expressions, which are voluntary and intentional and made to adjust to a social situation. Gaze is another important element in kinesics: eye contact is the basic condition to start an interpersonal relation, and is needed to send and receive information and feedback from partners. In addition, eye contact is also a way to settle conversational turns. Other movements are part of kinesics: body movements, or gestures, are divided into categories such as iconic and lexical gestures, pantomime, emblems, deictical gestures and motor acts. All kind of gestures and body movements are part of a cultural system that makes them significant for all members of that group, and sometimes they are even able to cross cultural groups to become almost universal gestures. Examples might be the conventional gestures of yes and no, which are expressed with a nod and a shake of the head in some cultures but are reversed in others, or a gesture such as rocking/cradling a baby can be used to indicate a baby.

Haptics is the study of communication through touch. Touch is an important sense for humans and one of their basic needs, because it conveys information about objects, but it is also a component of nonverbal communication in interpersonal relationships, and vital in conveying physical intimacy. Usually physical contact is ruled by culture, which can permit it or avoid it.

Proxemics studies the use and organization of space in interpersonal relationships. It determines the space between individuals while they interact and describe four types of distance: intimate distance is used for close encounters like

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<sup>10</sup> Charles Darwin (1809-1882) was an English naturalist and geologist. His most famous theory is the theory of evolution by natural selection.

<sup>11</sup> Paul Ekman (1934) is an American psychologist who dedicates most of his studies to facial expressions and emotions.

embracing, touching, or whispering and makes it possible to smell the partner. Personal distance is for interactions with close friends and family members, with a close contact that allows to touch the partner. Social distance is for interactions among acquaintances, where there is no physical contact. Public distance is for public speaking, when voice is louder and gesturing is emphasized. Culture rules the use of space, allowing more or less proximity to partners.

Chronemics is the study of the use of time in nonverbal communication, how it is perceived and how it is used to organize activities. In communication, time is important to regulate turns; if two people have the same perception of time, their turns will easily fit. The perception of time is influenced by culture as well.

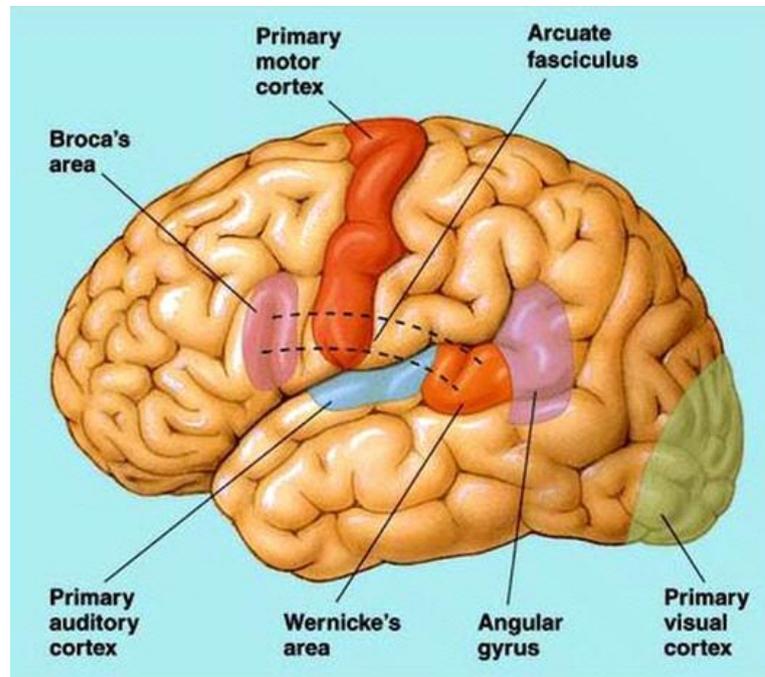
Now, it should be easier to see how nonverbal communication has an essential role in conveying meanings together with verbal communication and words. Nonverbal communication is not suitable to transmit concepts and abstract ideas, and is not fit to describe qualitative aspects of objects and events; this happens because nonverbal communication, although highly conventionalized, has a limited abstraction degree. It is important because it holds the relational component of communication and consequently it is necessary to generate, develop and maintain interactions. Verbal and nonverbal communication have to convey the same meaning at the same time, being interdependent and synchronic in order to generate a coherent and effective message; if coherence is not achieved, for voluntary or involuntary reasons, the message would be ineffective and may cause dis-communication, or a form of distorted communication.

## **1.2 Communication: biological infrastructure**

Language had a long development in human beings and deeply affected their biological dimension.

In order to gain a better control on vocal expression, the vocal tract had to change, develop and become the powerful and flexible vocal apparatus we have today. But that was not the only change, and probably not even the most significant one.

Human brain specialized in language, reserving to it large parts of itself; the two main areas specialized in language are Broca's area (Brodmann area 44-45) and Wernicke's area (Brodmann area 22), linked by the arcuate fasciculus which transmits information between them<sup>12</sup>.



This whole system is located in the temporal lobe of the left hemisphere. Broca's area is close to the inferior frontal gyrus of the brain and monitors all syntactic processes. Wernicke's area is located in the posterior section of the superior temporal gyrus and is involved in all semantic processes. These areas are active in both comprehension and production of speech.

In the Broca area, a particular kind of neurons is supposed to exist, called mirror neurons<sup>13</sup>. Mirror neurons fire both when an animal acts or observes the same action performed by another; these neurons have been observed in primate species, such as humans and monkeys. Their location is quite similar: in monkeys they are located in the inferior frontal gyrus and in the inferior parietal lobule, while in humans they are located in the premotor cortex, supplementary motor area,

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<sup>12</sup> Image from <http://www.acbrown.com/neuro/Lectures/Lang/Figs/NrLang13.jpg>

<sup>13</sup> Mirror neurons were discovered by Rizzolatti at the University of Parma in 1980s and 1990s. A subsequent study by Ferrari (ANNO) linked them to language because of their presence in Broca's area and their respond to mouth and facial movements.

primary somatosensory cortex and inferior parietal cortex. Their function is still unclear, but they are supposed to be the physiological basis for perception and action coupling, which means understanding other's actions and learning new skills by imitations. They are also supposed to be involved in language abilities, since cytoarchitectonic homologies between monkey premotor area and Broca's area in humans have been found (Rizzolatti and Craighero, 2004). Assuming that language developed in a gestural modality first, as asserted by Tomasello (2008) and Corballis (2003)<sup>14</sup>, the mirror neuron system might have been the key mechanism for an action-understanding and imitation-learning, and for the simulation of other's behaviour. This might explain the ability of children to vocally mirror non-words and to acquire the new word pronunciations, which can also occur without comprehension, as in speech shadowing and echolalia. Probably mirror neurons have no role in syntax.

A system which controls comprehension and production and which is able to learn by imitation would be of no use without memory. Memory may be stored in the ribonucleic acid (RNA) which is quite similar to DNA, his major cousin (Gardiner 2008: chapter 11, pg. 189). Memory is involved in both learning, during which it creates neural circuits by breaking down the gaps between cells, and remembering, which consists in the reactivation of particular circuits between cells. These cell assemblies are created in the cerebral cortex.

If the impulse does not cross the synapse often enough to connects cells, the process is named short-term memory, because it does not create a cell assembly which would guarantee a better stability of the impulse. In long-term memory, the impulse is able to create a cell assembly, which means a better stability of the stored information. Short-term memory is transformed into long-term memory by the hippocampus, located in the lower brain and which replays each cell assembly to stamp it during the early stage, in which the connection is still vulnerable to extinction (Gardiner 2008: chapter 11, pg. 190-191).

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<sup>14</sup> Michael Corballis (1936) is a psychologist and professor at the Department of Psychology in New Zealand. He is interested in cognitive neuroscience, including the evolution of language. In his book *From Hand to Mouth: The Origins of Language* (2003) Corballis suggests that language developed from a gestural system.

There are other different kinds of memory, dedicated to different processes. Remembering actions is a function assigned to procedural memory, which involves the putamen, a structure of the lower brain. Semantic memory have the task of remembering information. A particular kind of memory is the episodic memory, involved in storing all personal memories which includes the person himself, is controlled by the amygdala, located in the lower brain as well. Episodic memory is localized in a particular area within the cerebral cortex. The amygdala consolidates various inputs from all kind of receptors into a single episode, and triggering any one of those elements resurrects the whole episode (Gardiner 2008: chapter 11, pg. 191-192).

Much of the memory foundations are set in the lower brain, because it is the primitive layer of the brain we share with all mammals. The link between memory and speech built up because otherwise speech would be useless if not combined with memory; this connection let first humans benefit from their own experience and from the experience of others. Maybe this merging of memory and speech was a big improvement in our species, and explains also why speech centre and memory centre are close in human brain (Gardiner 2008: chapter 11, pg. 192).

### **1.3 Communication: psychological infrastructure**

Although communication is not a unique human feature, human communication reached the most refined and complex form – speech. Human communication is a cooperative enterprise based on joint attention, shared experience and common cultural knowledge; these three characteristics are also called (Tomasello 2008: chapter 1, pg 5) common conceptual ground as a whole, and it is a key dimension to all human communication, which has also an important component of prosocial motivation. It operates within the frame of mutually assumed common conceptual ground and of mutually assumed cooperative communicative motives. Shared intentionality plays a central role in human communication; it is necessary for humans to engage in collaborative activities, which is a human feature.

The infrastructure of human communication is made by human skills and the motivation of shared intentionality. It also follows natural tendencies, for example pointing is based on the natural tendency to follow the gaze direction of others, while pantomiming exploits the natural tendency to interpret the actions of others intentionally (Tomasello 2008: chapter one, pg. 6)

### **1.3.1 Apes' intentional communication**

As Tomasello (2008. Ch. 2) explains, great apes produce both vocal displays and gestural signals, but there are huge differences between these two modalities. Vocal displays are unlearned, genetically fixed and involuntary, and they could not learn any other forms of vocalization; there are no conditions to postulate an evolution of human language from apes vocalization.

Conversely, apes' gestural signals share with human communication the intentionality and the flexibility of use. There are two main categories of gestures, which are intention-movements and attention-getters. Intention-movements are phylogenetically ritualized and are not bidirectional communicative devices, while attention-getters are very interesting gestures, because they are probably unique to primates or even to great apes. The communicator knows that the recipient must see his gesture to react appropriately, and this shows the existence of a social intention (since the communicator wants the recipient to do something) and a referential intention, which are also split up between them. This is the closest thing ever found to human referential communication.

There is also a sensitivity to the recipient's attentional state, because the communicator knows the recipient has to be visually oriented towards him, showing that apes are able to determine what others do or do not see. If raised in captivity, they might also learn to indicate, but just with humans and just imperatively, meaning that they want something or they want something done for themselves. They do not even understand informative pointing, but they are able to understand that others have goals they try to reach, so they do understand intentionality of others and know that others have perceptions, sometimes

different from their own. Great apes can also understand the interrelation between goals and perceptions.

### **1.3.2 Human cooperative communication**

Human communication and linguistic code rest on a nonlinguistic infrastructure of intentional understanding and common conceptual ground, which are the basis for some forms of mental attunement leading to natural gestures such as pointing and pantomiming. There are two types of gestures: deictical and iconic gestures.

Deictical gestures originate from ape attention-getters and direct the recipient's attention to something present in the immediate perceptual environment, while iconic gestures come from ape intention-movements and direct recipient's imagination to something which is not present by behaviorally simulating it (Tomasello 2008: chapter three, pg. 61).

Deictical gestures evolved in pointing, in which there is a split between the referential intention and the social intention, meaning what I am pointing to and why I am pointing to it. In human infants, pointing comes before language (Tomasello 2008: chapter three, pg. 66).

Iconic gestures consist in enacting an action with hands or body to represent the referent. Since gestures are considered by Tomasello as forerunners of verbal language, their communicative strength has to rest totally on their visual dimension and on the human tendency to understand intentional actions. As pointing does, iconic gestures can be understood even without verbal language, and because of this they are considered culturally universal and depending on skills involving imitation, simulation or symbolization, while their comprehension involves an understanding of the intention to communicate. They come before language, but usually after pointing.

According to Tomasello (2008: Ch. 3), these gestures are effective because of the cooperation model of human communication, which is based on processes of shared intentionality as behavioral phenomena, both intentional and social. This

means that people see others as candidates for cooperative agency and triggers the use of skills for creating joint intentionality and attention, and at the same time requests the social motivation for helping and sharing.

The cognitive skills involved are connected to the creation of common ground, also called joint attentional frame (Tomasello 2008: chapter three, pg. 73), which is what each participant sees as relevant and knows that the other sees as relevant as well; this is necessary for the recipient to determine the communicator's referential intention and his social intention. There are three main typologies of common ground, depending on what it is based on.

Common ground can be based on perceptual environment or on shared experiences from the past, or can be created by top-down processes or bottom-up processes<sup>15</sup>. Common ground provided by top-down processes is especially solid and therefore salient. Common ground can be also based on common cultural knowledge (implicit common ground) or on things overtly acknowledged between communicators (Tomasello 2008: chapter three, pg. 78-79).

There is a complementary relationship between the overt communication act and common ground, because the more is shared (the more solid the common ground is), the less needs to be overtly expressed in the communicative act itself.

Besides common ground, social motivations for helping and sharing are needed as well to manage a communicative act. Having social motivations means to interact cooperatively for a joint goal, which is to get the message across from the communicator to the recipient. Humans have three main reasons to communicate: requesting help and information, informing by offering help or information, and sharing emotions and attitudes to create more common ground with the other.

Human communication is intentional; this intentionality is known as the Gricean<sup>16</sup> communicative intention, which also explains the mental assumption of

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<sup>15</sup> In top-down processes the first thing to be focused is the goal, and then all the procedures which will lead to it. In bottom-up processes, on the contrary, the first focus are the procedures and then the final aim.

<sup>16</sup> Herbert Paul Grice (1913-1988) was a famous English philosopher of language who contributed to communication studies with his theory. His theory of implicature (1961), the Cooperative principle and the Maxims of Conversation are considered central to human language.

helpfulness and the cooperative reasoning. The intentional layer is necessary to motivate someone to make the inferences required to identify the communicator's referent and social intention; the violation of the social norms of helpfulness and cooperation is unacceptable, because participants must reason cooperatively.

Recursivity is another feature of human communication shared by common ground, communicative intention and motivation; all the structure of human communication is characterized by recursivity, which is required for norms of cooperation and mutually expected by everyone. This process is called recursive mind-reading or intention-reading (Tomasello 2008: chapter three, pg. 94)

Communicative conventions are based on common intentions and on the recipient's search for relevance; these basis are the same for both gestural and linguistic modalities, meaning that they piggyback on the same infrastructure (Tomasello 2008: chapter three, pg. 101).

Arbitrary conventions are possible only if all individuals have skills of cultural learning, and if the sign has bidirectionality, meaning a shared form of the communicative device which enables both production and comprehension of these devices. This property relies, again, on the recursivity of human language and communicative infrastructure.

## **1.4 Communication: ontogenetic and phylogenetic development**

### **1.4.1 Ontogenetic development**

As Tomasello (2008: Ch. 4) argues, there are some similarities between the ontogenetic and the phylogenetic development of communication. The first communicative device used by children is pointing, which starts to be used around their first birthday. It is not known how pointing is learned, and even if it is learned or if it just comes naturally, although this second option looks more suitable. Infant pointing is very similar to adult pointing even in its underlying social intentions, since it is possible to distinguish between declaratives as expressive and as informative. The possible classes of social intentions are three, as for adults:

sharing, informing and requesting, all of them involving the cooperative motives of helping and sharing.

Early in development children understand that their requests work not by forcing others into actions but by informing others of their desires and waiting for them to cooperate with it.

Children also learn to refer to absent entities by pointing, attempting to orient the attention of the other person to some absent entities they have in mind. This means that children as communicators have the intention to direct the recipient's attention to a particular referent, which has to be identified through common ground and will help to make the needed relevance inferences to comprehend the overall social intention. In that moment, common ground plays a critical role, because children use it with an adult who is pointing to something to interpret both his referential intention and social intention.

One-year-old children are able to understand the Gricean communicative intention, that is the mutual expectation of helpfulness. They also have both the goal of their social intention and the goal of communicating successfully: for example, if a child asks a toy to an adult, who does not understand his request but by chance gives the child the desired toy, the child will still try to make his request more comprehensible in order to reach an effective communication.

Their understanding of all this is not fully adult-like, because it probably awaits more mature skills to develop completely; the process reaches its full development around three or four years, when they come to understand that the other person ought to engage communicatively and ought to help as requested.

Children are able to point as a gesture at three months, but they cannot do it with communicative intention until one year (Tomasello 2008: chapter four, pg. 136); twelve months are the early age at which infants possess the two prerequisites of understanding other's goal and of knowledge or information. They also need a social-cognitive and social-motivational infrastructure to start pointing communicatively, because they need to begin directing the attention of others to things for a reason.

All these changes mean that, at a some point before their first birthday, something triggers a development in different sets of social and cognitive abilities. This something is called the nine-month revolution (Tomasello 2008: chapter four, pg. 139), and is a new suite of social behaviours based on the ability to understand others as intentional and rational agents like the self, and on the ability to participate with others in interactions involving joint goals, intentions and attentions (which means be engaged in shared intentionality). By nine months, children understand that others have goals, but they still lack the ability to create common ground, and by twelve months they understand also that they actively choose means for pursuing goals, and children can understand why they choose them. By the same age, children know that others see things and they choose to attend intentionally to some subset of the things they perceive.; they are also developing shared intentionality and so the ability of creating common ground, which starts to emerge when they participate in triadic joint attentional engagement (child, adult, object). It takes some more months, up to fifteen months of age, to understand what other knows or knows not; at that age they are able to determine what we see together not in a joint attentional frame and what we saw together in the past. By the same age they are also able to construct shared goals and intentions with other.

Before the nine-month revolution, children do not point communicatively because they do not understand others as rational agent and they have not begun constructing joint attentional frames and common ground; the skill of shared intentionality is critical to support human communication, because it is its most basic feature. If a child does not develop shared intentionality, than he will be able to point intentionally but not cooperatively, as children with autism do: they are able to point for requests, but not for sharing or informing.

During the second year of life a new type of gestures appears, called pantomiming, which consists in iconic gestures (Tomasello 2008: chapter four, pg. 146). This nondeictic gestures are learned from adults by imitation, and usually are conventionalized gestures. It is worth noticing that these gestures are acquired at

the same time children start to acquire linguistic conventions, because they lay on the same social-cognitive infrastructure. Pantomiming requests skills of imitation, simulation and symbolic representation, but also the ability to enact an action outside its usual context and the understanding of the Gricean communicative intention. To comprehend iconic gestures, the infrastructure used to interpret pointing and the symbolic mapping are required.

With respect to pointing, iconic gestures are less used because pointing is a more natural and much simpler means of communication; in addition to that, iconic gestures compete with language in a way that pointing does not. During the second year, pointing increases in frequency while iconic gestures decline. This happens because adults pay more attention to speech than gestures, and because pointing is integrated into the language learning process.

Bruner (1983) exposes the social-pragmatic theory of language acquisition. Around their first birthday children start to learn conventions both for gestural and for linguistic expression, which is normal and expected because they lay on the same shared intentionality frame.

To achieve common ground for language, children have two possible ways: the collaborative interaction with other mature speakers of language, or a bottom-up procedure for word learning in joint attentional frames. This means, for example, that an adult invites the child to share his attentional focus and the child has to determine what the adult thinks to be salient for him. After the first period in which the child acquires words from his mother in a joint attentional frame, he becomes more flexible in acquiring words and consequently the visual attention is always less important.

The earliest referential language arises around fourteen-eighteen months of age, usually after a period of gesturing which supports the setting up of the shared intentionality infrastructure of language.

### **1.4.2 Phylogenetic development**

Tomasello (2008: Ch. 5) also considers the phylogenetic development of communication and tries to explain why it was favorable for human evolution. It is very likely that human communication initially arose in the context of mutualistic collaborative activities, and only after a long period its use was extended even outside collaborative activities.

Processes of indirect reciprocity, in which individuals care for their reputation as good helpers are necessary to account for human's tendency to simply inform others helpfully. This tendency brings to processes of social identification, affiliation and conformity, increasing common ground among persons and creating a sense of social belonging, so that each person feels to be part of an homogeneous group, which will become a cultural group. These processes of social identification are necessary to account for social norms in communication. In this context, arbitrary communicative conventions of vocal language have arisen by building on action-based gestures already meaningful.

Human collaborative activity and cooperative communication rest on recursive intention-reading and the tendency to offer help and information. While human children seem to collaborate just for the sake of collaborating, apes do not collaborate. Infants understand joint activities with the goal and complementary roles all in a single representational format, which enables them to reverse roles as needed; apes are not able to consider everything in a single format, so they have just single actions and are not suited for role reversal. This is why collaboration within apes is not frequent and limited to single actions in which they have an immediate reward.

Human collaboration is the basis for culture. People belongs to a cultural group to share labours and goals, and cultural practices and institutions rests on a collective implicit agreement that things should be so, so it is a collective agreement on social norms.

Human cooperative coordination depends on recursively understood common ground, because creating a joint goal involves mental coordination: if we both agree

to collaborate in order to achieve a common goal, then we can engage in collaborative activities. Children begin collaborate with others at the same time they begin communicating cooperatively; this means that cooperative communication and collaborative activities ground on the same shared intentionality infrastructure, with a basic motivation of helping others by providing them with the needed information.

Since there are three motives of human cooperative communication, there are also three basis processes by which cooperation evolves: mutualism, which consists in the granting of requests and in helping by informing, reciprocity and indirect reciprocity, which is the help offering outside of mutualistic contexts, and cultural group selection, which consists in sharing emotions and attitudes to increase common ground and group membership.

Hare and Tomasello (2005: ch. 3, p. 193) provide a model for the move in the direction of human collaboration and cooperative communication. The first step probably consisted in becoming more tolerant in feeding contexts, and then the ability to create joint goal and attention was selected; since mutualistic collaboration is the common conceptual ground necessary for cooperative communication, it is possible to assume that this was an obligatory step. Joint attention started top-down in collaborative activities with joint goals, and within this context the tendencies of requesting and offering help and information might arise as a way of facilitating joint goals. At the very beginning, the first device to request help might have been pointing, but as mutualistic collaboration increased and human helping one another spread outside the immediate context of time and place, pointing was no more effective. People started to help by informing and teaching, which implies the need of displacing things in space and time; since pointing rests on common ground, it is not possible to use it in teaching.

Iconic gestures still rest on common ground, but there are more information in the gesture itself; using them requires the development of skills of imitation and pretense, and of the understanding of the Gricean communicative intention, which means understanding the iconic gesture as voluntary and informative.

The Gricean communicative intention emerged in this helpful context, in which individualistic imperatives became cooperative imperatives. During this step, two related phenomena appeared: the need to express gratitude and politeness to have a reputation benefit. Politeness consists in not ordering, but requesting things and letting others volunteer for helping. In a group of individuals capable of recursive mind-reading and concerned with reputation, mutual expectation of helpfulness could easily arise.

Imitation is a very important feature in learning and teaching. Humans learn from others in a much more detailed fashion with respect to apes, and the fact of having this action-based approach is the result of human's need to learn imitatively from others. Imitation became an important social function, which was also implied in cultivating affiliation and liking. This had two important consequences for cooperative communication: the desire to cultivate affiliation became the desire to share emotions and attitudes with them, so that sharing built up group identity. To achieve this sharing, an active effort to expand common ground was needed and expressive-declaratives appeared. The other consequence is the fact that the establishment of norms for helpfulness in communication created also a pressure on individuals to conform to them. This implies again the Gricean communicative intention, since everyone knows together that helpfulness and cooperation are expected and, being concerned with reputation, everyone is forced to conform to norms. Gricean communicative intention also makes the communication act totally overt, because norms cannot be avoided.

All this process of development from imperative pointing to Gricean communicative intention is uniquely human.

Human communication is so powerful and effective thanks to its psychological infrastructure, which was already present in species-unique forms of gesturing such as pointing and pantomiming. Language was built and is still built upon this infrastructure and relies totally upon it.

After the creation of social norms and shared culture and common ground, the use of arbitrary signs became possible, triggering a process of

conventionalization. Communicative conventions are based on two features: we all do something in that way because everyone does it in that way and this way is totally arbitrary, because we might have done it differently. This is why it is quite straight supposing that linguistic communication in vocal modality, which is the most arbitrary form of conventional communication, has evolved from or overlapped with a more natural and meaningful gestural communication.

## **1.5 Communication theories**

Each approach developed a different theory of communication, based on different views of the human being. Behaviourism and humanism can be seen as thesis and antithesis, while interactionism might be defined as their synthesis. All these approaches are still mechanistic models, and this is why there was the need to shift the focus from physics to biology, starting to consider the human being as an organism rather than a mechanism. This focus shift brought us new models and approaches, starting to consider the function of language instead of the structure for language. These new models are further exposed and analyzed.

### **1.5.1 Behaviourism**

Behaviourism might be summarized in its two main assumption: *the person has only extrinsic needs* and *the person is conditioned from the outside in* (Gardiner 2008: Ch. 2, p. 14). To explain the first statement, we can say that a person has needs which lead to approach things that are good for him or avoid bad ones for him. The process by which an organism maintains itself in its optimal state is called homeostasis. In this process, the nervous system works as a mediator between the internal and the external environment. To explain the second statement, we can say that to a stimulus correspond an unconditioned or conditioned reflex; many studies had been done on how this link between stimulus and reflex is acquired. Whichever the reason is, behaviourism defines behaviour as a stream of responses, in which an habit is a chain of conditioned reflexes.

In this context, Claude Shannon<sup>17</sup> and Warren Weaver<sup>18</sup> (1949) developed the Transportation Theory of Communication, also known as mathematical approach: the information is transmitted by a source to a destination over a channel. The information received is not always the information transmitted, because of noise issues (some information which the source did not transmit) or because of equivocation (information which are not received by the destination). To measure the success of communication acts, the percentage of transmitted information was used. The amount of information transmitted by the source is measured as a function of the amount of uncertainty at the destination.

Then they added some more elements to this theory. To achieve a good transmission, human language provides contexts in which certain information is more likely than others; this strategy is called redundancy and explains why we are able to understand one another even though some of the information transmitted by the source is not received at the destination. The filter helps the receiver to determine which aspects are really important to the decodification and comprehension and selects them. In order to be sure that message transmission is successfully achieved, feedback is introduced between partners; it can be a positive feedback if the message is effectively received, otherwise it will be negative feedback, signalling the failure of the process.

This description of communication also shows some limitations, because it does not consider some basic aspects of communication itself, as elaboration and sharing of meanings, intentionality and the variety of communication systems; it also ignores psychological problems and the subjectivity of the individuals involved in the communicative exchange.

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<sup>17</sup> Claude Elwood Shannon (1916-2001) was an American mathematician and engineer who developed the mathematical approach to communication.

<sup>18</sup> Warren Weaver (1894-1978) was an American scientist and mathematician who is considered to be one of the father of automatic translation.

### 1.5.2 Humanism

Humanism opposed to behaviourism, and to summarize it in two sentences, we might say that *the person has only intrinsic needs* and that *the person grows from the inside out* (Gardiner 2008: p. 34).

The nervous system is the only system which can know the environment in order to perform three broad functions, which are stimulated from organic needs: biological, sociological and psychological function. The person is conceived of as the overlap of three spheres - each of them concerned with a different kind of needs. Biological needs refer to the ecosphere, which deals with the survival of the individual. Sociosphere involves sociological needs, and is concerned with the survival of the species and with the instinct of cooperation. Technosphere is the only sphere not concerned with survival, but is the one that makes us competent in our environment. Organism has a need for stimulation, and therefore explores and manipulates its environment looking for novel stimuli; through exploration and manipulation the unfamiliar becomes familiar, which is very important to know the environment and learn how to deal with it. As the threat to survival decreased, human beings need to know environment simply in order to know it: in this way a psychological need becomes end in itself, gaining functional autonomy and permitting the shift from extrinsic to intrinsic motivation. By having intrinsic needs, the person grows from the inside out in a society, which could be a synergetic or an antagonistic one; if synergetic, what is good for society is also good for the person itself, because there is a correspondence between society and person. Behaviourism postulate an antagonistic society, in which humans create contractual relationship based on their own advantage. Humanism thinks of a synergetic society, in which humans create intimate relationships based on mutual advantage. Humanism considers the destination actively involved in the communication process. McLuhan<sup>19</sup> and Nevitt<sup>20</sup> (1974) claim that the information is transformed at

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<sup>19</sup> Herbert Marshall McLuhan (1911-1980), was a Canadian philosopher of communication theory. His work is viewed as one of the cornerstones of the study of media theory.

<sup>20</sup> Henry James Barrington Nevitt (1908-1995), was a professional engineer, international consultant, theorist, and linguist. He was interested in the phenomenon of modern communications. His interest

the destination. Humanism considers not just the input information, but stored information as well. Much of this stored information is acquired as a conception gift, and is innate.

### **1.5.3 Interactionism**

Interactionism could be considered the synthesis of the behaviouristic thesis and the humanistic antithesis.

The need for stimulation and consistency was originally crucial for survival, but then became functionally autonomous; these needs were meant to an end before becoming ends in themselves. The person grows both from the inside-out and from the outside-in, but interactionism puts an emphasis on intrinsic motivation as a primary process.

Language is not an instrumental conditioning. Chomsky believed that acquiring language is an innate capacity for humans, because our species has a LAD (Language Acquisition Device) built in nervous system which triggers language acquisition. This means that language is an inside-out process, based on the unfolding of the genetic potential, but it also needs an outside-in process to keep the process going. This outside-in process is called LASS (Language Acquisition Supporting System). Language acquisition is considered as an imprinting in which a gap is left to be filled in by the language community.

Interactionists then consider input and output information to help the active exploration and manipulation of the environment in order to understand it, even through feedback information received by it; the relationship between input information and stored information is orchestrated by the environment through feedback information.

To sum up: interactionism claims that behaviour is a series of operations to remove a discrepancy between the present state and the desired state, in a mechanism based on feedback loop.

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in the theoretical aspects of mass media and communications resulted in a professional association and personal friendship with Professor Marshall McLuhan.

Going back to other parts of humanism and behaviourism, free-will and determinism are still in contrast, but both good for interactionism, which adds a third factor, choice. The gradual growth of an organism is a gradual emancipation from genes and environment. This is not the only discrepancy between behaviourism and humanism, but also the opposition between intrinsic and extrinsic worth. Interactionism resolves the opposition by saying that people possess them both, and by considering themselves to have it or not to have it they show different attitudes. The last main difference is about relationship: while humanism considers people having intimate relationship, behaviourism says that people have contractual relationship. Interactionism describes human beings as having a pro-social behaviour, which leads them to have intimate relationships.

Interactionism developed the Transaction Theory, which includes input, stored and feedback information since the person is interactive in the environment and uses feedback information to compare input and stored information. Human behaviour is determined by what is happening around us in the environment.

All this process is called the TOTE unit, in which TOTE is the acronym for the four main phases of the process (Gardiner 2008: chapter four, p. 63)

- test: compare input information against stored information of a desired future state, to see if a discrepancy exists;
- operate: operating according to a plan to reduce discrepancy;
- test: again, checking the correspondence between the present and the target state (if there is no correspondence, then operate again);
- exit: exit from the plan when information corresponds.

Hence, human behaviour is governed by plans which reduce the discrepancy between input and stored information, described as an image of a desired state.

Comparing the previously mentioned three different theories and putting them in chronological order it is clearly visible how the focus shifted from the communicator to both communicator and recipient. Behaviourism considers just

the communicator role as active, while the following theories consider the recipient as active as the communicator.

This is very important with reference to communication as a cooperative enterprise, in which all people involved are actively joining the communication act, and this is one of the main points in AAC. In AAC, the active interaction is a key feature, consisting in the acceptance and adjustment to the communicative requirements of the AAC user.

#### **1.5.4 Semiotic approach**

Semiotics studies the production, transmission and interpretation of signs in social life. Saussure<sup>21</sup> (1916) defines the sign as the union of a form of the sign (the signifier) and its meaning (the signified); in oral languages, the signifier is a vocal image and the signified is a mental representation. The sign can be considered as an equivalence between vocal images and mental representations as long as this link is stable.

Peirce<sup>22</sup> (1931-1935) says that the sign (A) is linked to (B) in correspondence with (C); here the sign is intended as something which refers to something out of its meaning and form, something external as in the pointing gesture. The concept of inference is now very important, since the sign becomes a clue for reaching a consequence.

Jakobson<sup>23</sup> (1963) reworked the model proposed by Shannon and Weaver (1949) and proposed six new communication functions, each of them corresponding to one of the elements considered in the mathematical approach (e.g. transmitter, receiver, message, the code used, contact, and context). Communication functions are:

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<sup>21</sup> Ferdinand de Saussure (1857-1913) was a Swiss linguist and semiologist. He is considered one of the fathers of modern linguistics and semiotics, thanks to his work *Cours de linguistique générale* (1916) [Course in General Linguistics]

<sup>22</sup> Charles Sanders Peirce (1839-1914) was an American mathematician, philosopher, semiologist, logician, scientist and academic. He is considered the father of pragmatism and of modern semiotics.

<sup>23</sup> Roman Jakobson (1896-1982) was a Russian linguistic and semiologist.

- Expressive function: relates to the addresser (sender) and adds information about the addresser's internal state without changing the meaning of the whole sentence.
- Phatic function: language for the sake of interaction, which can be observed in greetings and casual discussions, but especially provides the keys to open, maintain, verify or close the communication channel.
- Metalinguistic function: the use of language to discuss or describe itself.
- Referential function: corresponds to the factor of context and describes a situation, object or mental state.
- Poetic function: focuses on "the message for its own sake", on the code itself, and how it is used.
- Conative function: engages the receiver directly and is best illustrated by vocatives and imperatives.

Every communicative act contains all communication factors but not all its functions.

### **1.5.5 Sociological approach**

The sociological approach deals with socio-cultural implications involved in a communicative exchange with a stress on the subject's social perspective.

Goffman (1959)<sup>24</sup> studied the conditions of social organization which are needed to let the information circulate, in order to verify how the social dimension influences the organization of the communicative act and how it can control communication order. Organization in communicative acts seems to be based on rules on the opening (greetings), on the theme of interest and the closure, but there are rules regulating also the use of voice, space and the regulation of turns. These rules are influenced by the context (frame) and by personal culture. Goffman says

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<sup>24</sup> Erving Goffman (1922-1982) was a Canadian sociologist who was interested in communication sociology.

that communication expects participants to have shared system and is ruled by the strategies chosen by the participants during the communication act itself.

Goffman also brings the concept of dramaturgy into sociology by saying that everyday life may be compared to theatre, since it is characterized by a number of phenomena such as etiquette and save face.

A different school of thought is the postmodern sociology which defines communication and information as a commodity, but also as a way/tool to improve reflexivity. Reflexivity is the ability of discussing and compare our own point of view and ideas with others, and possibly even change them.

### **1.5.6 Pragmatic approach**

Pragmatics is interested in the concrete act of communicating, intended as a dynamic process and the correlation between text and context.

Austin<sup>25</sup> (1962) proposed the theory of linguistic acts, in which he described the linguistic act as composed of three actions during the communicative process:

- locutionary act, which is the performance of an utterance;
- illocutionary act, which is the aim of the speaker;
- perlocutionary act, which is the actual effect of speech on the receiver.

Illocutionary acts are classified in five categories: assertives, directives, commissives, expressives and declarations. To highlight how an utterance may have a meaning and a strength going beyond its literal meaning, linguistic acts are divided into direct speech acts and indirect speech acts. The difference between them is that in direct speech acts there is correspondence between the literal meaning of the utterance and the meaning intended by the speaker, while in indirect speech acts there is no correspondence. This mismatch is achieved using non verbal devices such as voice tone and rhythm.

Part of pragmatics is also the Gricean communicative intention and the cooperation principle (1967).

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<sup>25</sup> John Langshaw Austin (1911-1960) was an English philosopher and linguist who was interested in language philosophy and in studying linguistic analysis. He is remembered primarily for his theory of speech acts published in the book *How to do things with words*.

The cooperation principle is made of four maxims, which have to be respected in order to achieve a successful communication:

- maxim of quality, which requires to share only true and reliable information;
- maxim of quantity, which asks to give only the requested information;
- maxim of relation, which asks for relevance;
- maxim of manner, which requests to be as clear as possible, brief and orderly.

In every speech act the receiver understands more than the sender says. In order to explain how this happens, Grice explains that participants to the communication act use implicatures, which is what is suggested in an utterance even though it is neither expressed nor strictly implied. There are conversational, scalar and conventional implicatures, all of them made to help the receiver to fully understand the message.

### **1.5.7 Psychological approach**

Communication is an important part of human life, because it is the medium for the expression of one's identity from a personal and a social point of view.

Bateson<sup>26</sup> (1972) explained the subtle difference between "being in communication" and "getting into communication": individuals transmit information, but also are in communication meaning that they can discuss their own identity. There are two levels of communication: communication level, dedicated to information exchange, and metacommunication level, used to discuss about communication itself and offers information on how to interpret the message expressed in communication level.

To construct interpersonal relations, Bateson proposed two relational models: a symmetrical relationship based on parity between participants, and a complementary relationship, based on different relation between participants. One of them has a dominant position on the other, which has a subdued role.

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<sup>26</sup> Gregory Bateson (1904-1980) was an English anthropologist, psychologist and sociologist.

What is central in this approach is the psychological and social dimension of communication, which enables individuals to keep in touch with each other and share positive feelings as well as labours.

### **1.6 Summary**

In this first chapter, my aim was to focus on how communication works and give some information about its development in normal conditions. I wanted to underline and highlight how communication is inborn and intrinsic in humans, and how it affects all dimension of our life - from biology to psychology.

Focusing on the psychological and sociological sphere of communication we can understand why Alternative and Augmentative Communication (AAC) is so important and should be more used.

We have seen that pointing and pantomiming have a good communicative result, but still they lack the power of a full-blown language, oral or signed. It is not possible to use them for teach a child mathematics or reading, and they are not appropriate for an adult who suffers from aphasia after a stroke. With pointing and pantomiming a child would not be able to say to his mother that he is happy because of something happened at school, and would never be able to recognize and name his own feelings, which is an important step for development. Pointing and pantomiming are still not fitting for a man who is not able to articulate words after a cranial trauma and was perfectly able to speak before; it does not fit both for society and for his own feelings and self-esteem.

AAC can open communicative channels when it seems there is no way to interact. ACC can break down the wall of silence to bring in the fresh air of communication in a wide array of situations and potentially with everyone.

## CHAPTER TWO: AUGMENTATIVE AND ALTERNATIVE COMMUNICATION

*"A different language is a different vision of life."*

*Federico Fellini*

### 2.1 What is Augmentative and Alternative Communication

To define Augmentative and Alternative Communication (AAC) I use the definition given by Beukelman and Mirenda in their book<sup>1</sup>:

*The American Speech-Language-Hearing Association (ASHA) Special Interest Division 12: Augmentative and Alternative Communication (AAC) defines AAC as follows:*

*Augmentative and alternative communication (AAC) refers to an area of research, clinical, and educational practice. AAC involves attempts to study and when necessary compensate for temporary or permanent impairments, activity limitations, and participation restrictions of individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication. (2005, p.1)*

ISAAC (founded in 1983) is the International Society for Augmentative and Alternative Communication, which is involved in the diffusion and improvement of AAC. AAC was born, as an organized form of communication, at the beginning of the Seventies in Toronto, Canada, at the Crippled Children's Centre as a communication modality for intelligent children with quadriplegia or anarthria. In Italy AAC started to spread in the Eighties.

There are many terms which need for a wider explanation, starting from the difference between augmentative and alternative. Augmentative communication is an information transmitted through non-verbal language which strengthen an

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<sup>1</sup> Beukelman, Mirenda (2013), pg. 4

information transmitted through speech; an oral word combined with a manual sign or a gesture is an example of augmentative communication. Alternative communication is based on the use of different modalities since oral speech is not available; an example might be represented by communication through eye-gaze, or the use of a system of gestures which are conventional between the person with complex communicative needs and his caregivers and family.

Other terms which need a further explanation are rehabilitation and habilitation. Rehabilitation is a common word which means regaining an ability temporarily lost because of some circumstances; in AAC rehabilitation refers to intervention strategies and technologies helping someone with an acquired disability to regain his ability. Habilitation instead refers to intervention strategies and technologies that help someone to develop a capability for the first time. This difference does not exist in Italian language, where *riabilitazione* (rehabilitation) is used for both meanings, whether the individual with complex communication needs (CCN) is an adult who is taking a rehabilitation through an AAC intervention or a child who is learning to communicate for the first time through AAC. The adult is taking a rehabilitation (*riabilitazione*) since he was able to communicate before his impairment, through oral speech, and now is learning to do it again, but with a different modality. The child is really taking an habilitation (which should be called *abilitazione*) intervention, because he has never been able to communicate and now is learning to do it through AAC.

These person with complex communication needs (CCN) need adaptive assistance because their gestural, spoken and/or written communication is inadequate to meet their communication needs for a temporary or a permanent time. There are many congenital causes for communication disorders, including severe intellectual disabilities, cerebral palsy, autism and developmental apraxia of speech, but there are acquired conditions as well, for example amyotrophic lateral sclerosis, multiple sclerosis, traumatic brain injuries, and stroke, which might resulted in a permanent brain damage.

The ultimate goal of an AAC intervention is *“to enable individuals to efficiently and effectively engage in a variety of interactions and participate in activities of their choice”*<sup>2</sup>.

In order to be able to use AAC there are some prerequisites, as Gava<sup>3</sup> explains in her book. First, a symbolization ability is necessary. It is the ability which enables human mind to create an internal representation of knowledge. These representations have to be recognized in the lexical contents of an alternative code's icons. Second, the presence of a yes/no modality is important, which means that the binary answer has to be used properly in the right context. Third, communicative intentionality is fundamental as well: communicating through AAC requires an effort and being motivated to do so is of great importance.

As it is widely explained in the previous chapter, communication has more than one purpose in human life and behaviour, and all these purposes have to be included in all AAC forms to claim that AAC permits persons with CCN to express themselves. Expressing needs and wants and regulate other's behaviour is probably the purpose that looks more obvious in complex contexts. The content of the message is important, usually predictable, with a critical accuracy and rate of message production; for example, someone saying that his oxygen mask is not working or that he wants to be turned on his side. Another important function is sharing information; for example a person talking with a health care provider or instructing a new caregiver on how to organize his daily routine. Here the content of the message as well as accuracy and rate of message production are important, but in this case it is composed of novel words and sentences about a variety of topics. Other very important functions in human communication are social closeness and social etiquette: both of them might be fulfilled by AAC. Social closeness has the goal of establishing, maintaining and developing social engagement; in this case the

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<sup>2</sup> Beukelman, Mirenda (2013), pg 8.

<sup>3</sup> Maria Luisa Gava (1939) is an Italian psychologist who was also one of the first to start using AAC in Italy.

content is less important than the interaction itself, since what really matters is the connection and the feeling of intimacy achieved through the interaction. Social etiquette on the other hand is formed of brief and highly predictable social conventions, such as greetings. Another important function is conducting internal dialogue in order to organize daily plans but also to record personal reflections.

The role of a competent communicator requires the following abilities:

- portray a positive self-image to the communication partners
- show interest in others and draw them into interactions
- actively participate and take turns in a symmetrical fashion
- be responsive to partners
- put partners at ease with the AAC system.

A good AAC intervention involves the identification of critical skills for communicative competence and some instruction to support the possible highest level of communicative competence.

AAC is not the only answer, since instruments are effective only if the person handling them use them with competence. Competence is a key word in AAC, with particular reference to communicative competence, which is made of four components: linguistic, operational, social and strategic competence.

Linguistic competence consists in *“receptive and expressive language skills of one's native language(s). It also involves knowledge of the linguistic code unique to one's AAC system [...]”*<sup>4</sup>. For persons who present acquired disabilities, this process has already been done before, and only the skills specific to AAC have to be learned. People with congenital disabilities have to learn all of these skills, both receptive and expressive skills of their native language and the skills specific to their AAC system.

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4 Beukelman, Mirenda (2013), pg 11.

Social competence refers to engagement in communication interactions and how to keep them alive and going smoothly. This competence requires knowledge of sociolinguistic and sociorelational aspects of communication. Sociolinguistic skills include the abilities to start, maintain and terminate conversations, manage conversational turns properly, communicate a variety of functions such as requesting or rejecting and engage in a variety of coherent and cohesive interactions. Sociorelational skills include a positive self-image, the interest in other people and in communicating with them, the ability to participate actively in conversation, responsiveness to partners and the ability to put them at ease with the AAC.

Strategic competence involves the compensatory strategies to deal with functional limitations of AAC and limitations associated with it. Every AAC system, although flexible, impose some interactive limitations; mainly, the low speaking rate, the interaction with people unfamiliar with AAC and the possibility of communication breakdowns. For these reasons, it is important to teach some strategies for communication breakdowns as well. In order to make those who rely on AAC competent communicators, it is essential to teach them how to put others at ease with the AAC system and also some strategies to compensate for the slow speaking rate. Coaching who relies on AAC to make them competent is always more important.

## **2.2 The basics of AAC intervention: vocabulary, assessment and evaluation.**

### **2.2.1 Formulation, storage, retrieval of words and messages**

Message selection in natural speech is so automatic that it is difficult to select vocabulary items in advance of the act of speaking; choosing items for who rely on AAC would be a quite problematic task. In addition to it, difference in age, gender, social role and medical conditions exert a strong influence on those who rely on

AAC, as they do on natural speakers. There are lot of other aspects influencing their vocabulary which should be thought of: the environment (or environments) in which they live or the type of disability or medical condition, for example, influence the vocabulary employed to interact with family, caregivers and/or medical staff or education personnel. Their interests shape their vocabulary as well, as do their differing life experiences.

Presently, electronic AAC systems have an almost limitless capacity for message storage, and they support both word-based strategies (writing letter by letter) and phrase-based strategies in the same monitor. There are many debates on the best message managing, with someone supporting word-based strategies because of their generative flexibility and someone supporting phrase-based strategies which improve communication rate and timing. Both point of view are right, and both strategies should be used with respect to the context: for example, a man who rely on AAC might prepare some sentences word by word before a meeting, to have complex and novel messages ready to be spoken out by the AAC device. The most important feature of these two message management strategies is that individuals who rely on AAC can choose the one they prefer with respect to the communication situation they are involved in.

Most conversations have a predictable structure, such as greetings which changes from culture to culture and have a high variability depending on situation and persons involved. It is important for those who rely on AAC to have available and be able to choose the right greeting in the right context as social norms prescribe, and it is also advisable they have a range of different messages to choose among, based on their age, gender and on the familiarity with the communication partner.

Small talk is another type of highly predictable conversation which is made for initiating and maintaining interactions, not for genuine information exchanges. Small talk is usually used for engagement and disengagement messages when interacting

on social settings, and often they are used to introduce the information exchange. As it is possible to grasp from this description, small talk is very important for those who rely on AAC because it is the first step towards communicative engagement with others, and also because it can be used with a variety of partners since it has no particular reference to specific shared information.

Procedural descriptions are rich in details, sequential, and require a timely and efficient communication. These descriptions are important for who has complex medical or care needs to instruct their caregivers or medical staff how to do something.

Content-specific conversations are what is commonly defined as conversation, meaning an information exchange. To be engaged in this kind of conversation, individuals need to be able to formulate novel and unique messages.

Wrap-up remarks are those formulas used to end a conversation and which then leads to farewell statements.

Basing on the ability to spell and read, there are three types of AAC users:

- preliterate individual, who have not yet developed reading and writing skills and so rely on symbol or code sets. Their vocabulary is made of two categories of words, one for essential messages and one for developing language skills. The first one highly depends on their communicative needs, and it is usually organized by contexts. The second category of words are words which the individual does not know yet, but are included to encourage language and vocabulary growth through direct exposure, which is more natural and more efficient. Also it is important to include words and messages that encourage them to use various language structures and combinations. Developmental vocabulary includes words from all semantic categories (substantive words, generic verbs, specific verbs, affirmation and negation words, adjectives);

- nonliterate individuals are unable to spell well enough to use a letter-by-letter system and to read and write and normally are not expected to regain or

develop these skills. Their messages are always chosen from a functional perspective and represented by symbolic sets. It is very important to verify that their vocabulary is age and gender appropriated and that it includes some developmental vocabulary as well. New messages can be added when needed or in relation to a new environment or interest. In the peculiar case of nonliterate AAC users the goal is to expand the number of concepts about which the individual is able to communicate;

- literate individuals are able to read and spell, and can formulate their messages on a letter-by-letter or word-by-word system and can retrieve and manage stored messages. Three types of messages should be prepared for quick retrieval: timing enhancement, message acceleration and fatigue reduction. Timing enhancement are messages which should have a quick deliver to the partner in order to be appropriate, or they may be ineffective if not communicated in time; an example might be a request of help. Message acceleration is given by words or messages frequently occurring and/or quite lengthy, which could be managed through encoding strategies to spare keystrokes and speed up the rate of message production. It is important that the selection of a fatigue reduction vocabulary items is easily accessible when individuals are tired, in order to prevent them from spelling the whole message.

The selection of items which are going to be part of the AAC user's vocabulary cannot be casual, and has to select some appropriate sources. This selection is made in three steps, and the first consists in finding a core vocabulary composed of words and messages commonly used and frequently occurring. The sources can be some word lists provided by other individuals relying on AAC, who are already competent in the use of AAC system from an operational and social point of view. Some uses pattern of the specific individuals that can be provided by family and friends, which are the most efficient vocabulary sources, but also taking into account the performance of a natural speaker in a similar context would help to provide a rich core vocabulary.

The fringe vocabulary is a “*vocabulary words and messages that are specific or unique to the individual*”<sup>5</sup> and includes names and preferred expressions, also referred to special interests of the people who rely on AAC. All these expressions should be recommended by informants who are very close to the AAC user, and the more informants are consulted, the richer the vocabulary would be. At the very beginning of the intervention using a communication diary or a checklist to record all the needed vocabulary would help to enrich it, adding new words when they come into use.

### **2.2.2 The use of symbols**

There are so many symbols and signals other than speech surrounding us and familiar to us that we take them for granted, but since the majority of us is able to speak we do not see how powerful and versatile they are. The majority of them can be successfully employed in AAC communication.

First of all, a symbol is “something that stands for or represents something else”<sup>6</sup>. The relation between the symbol and the referent is called iconicity; if this relation is manifest, than the symbol is a transparent symbol. If the relation is not guessable, than we have an opaque symbol. There is also the possibility that the relation between symbol and referent is not immediately obvious, but becomes clear once the meaning is explained, which is the case of the translucent symbol.

Symbols for AAC might be divided in two categories, based on the request of help to produce them: if an aid is needed (such a device, for example), the symbol is aided. An aided symbol can be, for example, a PCS symbol indicated on a device, or a real object such a cup, standing for the action of drinking. If there is no need for help and no request for an external device, the symbol is unaided. An unaided

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5 Beukelman, Mirenda (2013), pg 33

6 Beukelman, Mirenda (2013), pg 38; from Vanderheiden&Yoder (1985), pg 15.

symbol can be a manual sign or a vocalization. Some symbol sets can include both aided and unaided symbols, and are called combined symbol sets.

There are many factors influencing the understanding of symbols. The ability to understand the meanings of specific referents helps in recognizing abstract symbols, for example, and from a certain stage developmental age helps as well, around two years of age. The degree of iconicity affects symbol learning, as does general experience with pictures and the reinforcement value of a referent. Comprehending symbols which refer to concrete objects is usually not a problem, while learning abstract concepts through symbols is more complex. Still, there are some factors which might improve the ability to identify the meaning of such symbols: concreteness, familiarity, context (familiar activities in context), wholeness, colour, focus (emphasizing relevant characteristics via size or position).

Unaided symbols include many nonverbal behaviours, of which gestures and vocalization are the most communicative forms.

Gestures are not only signs, but also other kinds of gestures. Emblems are gestures which condense a whole sentence or an idea, such as "come here" expressed through the movement of a hand. Usually emblems are shared between members of the same culture. Illustrators are nonverbal behaviours which go with speech and illustrate what is being said for many different reasons, such as emphasizing it, depicting a referent or a spatial relationship, illustrating the pacing of an event, or some gestures may even substitute a word or a phrase (when asking "where is my...?" and miming the action of writing). Affect displays show emotional states. They usually differ from emblems because they are more subtle and less intentional. Regulators are nonverbal behaviours used to regulate conversations, and are culturally bound. Adaptors are behaviours that are not usually involved in communication. Self-adaptors refer to manipulation of one's own body in acts such as holding or scratching, while object adaptors are manipulations of objects and alter adaptors refers to contact with others.

Vocalizations might occur even in people who do not speak, and have a communicative nature as well. They can be voluntary or involuntary, and if voluntary may be interpreted by people who are familiar with the individual as a communicative act. Manual sign approaches are good alternatives to speech-only approaches. Combining speech and signs amplifies the meaning while slowing presentation rate, and makes answering simpler because only a physical answer is expected. Providing physical guidance is simpler, as it is simpler to teach new vocabularies, considering also the fact that stimulus processing is facilitated in the use of visual mode. The only possible problem in using signs is the intelligibility limitations with untrained community members; this problem might be solved by using multimodal system.

Aided symbols require an external device or support to be used. Tangible symbols can be discriminated through touch, which makes them helpful with visual or dual sensory impairments or severe cognitive disabilities. Real objects can be associated with their referents, such as miniature objects, which are more difficult to recognize because of their different size and sometimes also texture. Partial objects might be used in the same way. It is also possible to select tangible symbols with different shapes and textures and arbitrary associate them with a referent; for example, a soft small ball might become the symbol for a favourite snack.

Among aided symbols there are also pictorial symbols, which are probably the most famous AAC system. The simplest and more immediate set is made of photographs, which are often used with people with intellectual disabilities. Picture Communication Symbols (PCS) is the most widely line-drawing system for communication used in the world, thanks to its transparency. A similar system is the Widgit Symbols, although it is a little more abstract and less transparent. Pictograms are white-on-black picto-images, designed to enhance figure-ground discrimination. Blissymbols is a fascinating symbolic system which was developed to be a language for international communication, consisting in approximately one hundred basic symbols which can be combined between themselves. It is totally abstract, and

because of this does not fit for severe cognitive impairments. Orthography and orthographic symbols are used as well in the form of single letters, words, syllables to create sentences. Braille is a famous tactile symbol system for reading and writing, used by blind people, and it can be written with a one-to-one correspondence between letters and Braille cells (alphabetical or uncontracted Braille), or some special symbols can be used to encode entire words or part of them (contracted Braille). Fingerspelling, typical of sign languages, can be used as well to spell words.

Makaton vocabulary is the most known combined symbol system, which offer a multimodal approach by combining speech, manual signs and graphic symbols. It is organized in eight stages of growing complexity and consists in approximately 450 concepts.

### **2.2.3 Displays and access**

Using a symbol system in an AAC intervention implies that who relies on AAC system has to be able to select the wanted symbol from a small set of possibilities. The presentation of all messages or symbols available at one time is called selection set, and it might rely on the visual, auditory or tactile dimension. There are many different types of selection set displays:

- fixed displays in which symbols are fixed in a determined position, and are used in low-tech communication boards. Usually there are a number of fixed displays in order to contain all the needed vocabulary items;



These are examples of fixed displays. The first one is made of paper and can be hung on the wall, or in case the AAC user is on wheelchair the display can be fixed on a board to be kept on his knees or on any other support. The second one is a device which has small buttons underneath each picture; by pressing the picture, the device gives a vocal output of the picture. Since the link between image and vocal output is fixed, the picture board cannot be changed. In case the pictures changes, also the vocal output has to be rearranged.

- dynamic displays are computer screen displays that after a selection input change automatically the selection set on the screen to a new set of symbols;
- hybrid displays, which are electronic fixed displays with a dynamic component (usually an indicator light informing the user of the selection). This works also as a memory aid. Displays containing alphabet letters and a word prediction system can be seen as hybrid displays as well, since the alphabetical part is fixed but the word prediction changes at every keystroke;
- visual scene displays (VSD) is a virtual environment or a photograph depicting a situation, and messages as the names of objects or people can be accessed from the picture itself.



An example of VSD.

These different characteristics have to be taken into account when preparing an AAC intervention, and related to the motor, cognitive, language and sensory abilities and constrains of the AAC user.

The number of items in the selection set is really important, because it determines the number of messages, symbols or commands the individual requires or can decide on. The more symbols are available on the set, the more messages the AAC user can express.

Size is another important issue, which concerns both individual item size and overall display size. They are determined by visual and motor capabilities of the individual, so that the individual item is big enough to be easily visible and at the same time big enough to allow accurate selection; at the same time, the disposition of items has to be easy to reach and visible in all its parts. Spacing and arrangement of items are closely connected to size because they have to consider the same variables of motor and visual capabilities. For individuals who use only the right hand, for example, reaching the left side of a big display with accuracy might be difficult; it is possible to arrange the size of the items by making them bigger and surrounded by a large empty space in the side in which the individual has less motor control.

Hand is not the only possibility for the selection of items. In some cases, head can be the only body part which has a fine motor control. A headstick is used to select the items from a vertical items display, although they are less used today because of the increased availability of head- and eye-tracking strategies.



Two examples of headsticks for different functions: one is used to point on a communication board, the other to use a keyboard.

The orientation of the display relative to the floor is important as well and depending on the individual motor control, postural and visual capabilities. In the case of a direct selection display, in which the individual has to point to items, it is even more critical than in the case of scanning, in which only one or two switches have to be reached and activated.

This leads to different selection techniques. A selection technique is the way that an AAC user employs to select or identify an item from the selection set. There are two main approaches: direct selection and scanning.

Direct selection is used when the individual choose an item directly from the display; finger pointing or touching are the most common selection methods, but pointing may be achieved also with optical pointers, light pointers, head or eye trackers. Pointing gaze is also an effective way to indicate choices. There is a big difference among all these options. Physical contact is required by selection through touch, for example in communication boards or in technological devices such as

iPads or tablet computers, in which pressure is not required. On the contrary, physical pressure or depression is important in other devices such as standard or adapted keyboards or touch pads. Switches for AAC also works with pressure. It is important during the initial assessment to find out which body part can generate a pressure sufficiently controllable so that the selection is accurate. Pointing requires no contact; eye pointing, tracking, or gazing select item by looking to it for a time long enough for the communication partner to identify the gaze direction and confirm it. Using direct selection with individuals who experience limited control capabilities might be problematic, but there are also some alternative activation strategies which can be employed. Timed activation, for example, requires to sustain the contact after the identification for a determined period of time to confirm the selection; the length of timed activation can be adjusted to the individual's needs.

Scanning is used when an individual is unable to choose items directly from the selection set, usually because of a lack of motor control. The facilitator or the electronic device scans through all options, and when the desired item is presented, the person who relies on AAC indicates it in some way. Scanning is no more widely used because new technologies based on eye or gaze tracking are more economic to use for those who rely on AAC.

Feedback is very important in AAC, both in the case of electronic devices or in the case of facilitators. It helps the individual who relies on AAC to know that an item has been selected, and provides him some information about it. The first one is called activation feedback and is important for who is using the technology; for example, a selected symbol or picture can be highlighted with a specific light or coloured borders. The second one is called message feedback and although not essential it might be useful for communicative partners as well; it can be, for example, the selected symbols' sequence shown on a message window or a word echo provided by the device.

Usually AAC intervention focuses on message output, which is the information the AAC user provides to the partner. Synthetic speech, print, gestures, manual

signs, pictures and symbols in communication boards: all this is used as a way to give a message to communication partners. But sometimes some individuals require also a message input in AAC to correctly receive information from others and comprehend them easily. This is particularly true for people with autism spectrum disorders. Usually message input is provided through the same AAC modality used for message output.

#### **2.2.4 Assessment**

The assessment process is the first part of every AAC intervention, as it necessary to identifying existing communicative forms, verifying their function and analyzing the communicative demands of the environment. In addition, an assessment of behavioural state and partner skills is helpful in shaping correctly an effective intervention. These assessment have three main purposes: evaluating the communicative potential of existing behaviours (even problem behaviour, which might have a communicative function), deciding on which intervention pathways to take, and prioritizing communication skills for instruction. Partner involvement is essential, because they usually have information about the individual's existing repertoire and might recognize some potential communicative acts, which are any existing behaviours within the person's repertoire that might now (or in the future) become a form of communication. Potential communicative acts can be a voluntary form of communication or not. Sigafos<sup>7</sup> defines them as prelinguistic or potential communicative acts "*because they make no inferences about the communicative function or intentionality of the behaviours*"<sup>8</sup>. It is very important being carefully in this part of the assessment: it is of vital importance not to assign communicative intention too hastily and distinguish if they belong to the perlocutionary stage of communication (which means the act is unintentional, but has some potentiality to

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<sup>7</sup> Jeff Sigafos is a New Zealand professor of educational psychology.

<sup>8</sup> Sigafos, Arthur-Kelly, Butterfield, Foreman (2006), pg 24.

become communicative), or to the illocutionary stage (which is informal but intentional). The difference between perlocutionary and illocutionary stage is a matter of intentionality.

At this stage, in which communicative intentionality is still unclear, communication is made by subtle, informal and hard-to-interpret behaviour. The importance to direct intervention to more symbolic forms is highlighted by three potential problems of prelinguistic behaviours: they may be difficult for partners to recognize, sometimes are inappropriate and not age-appropriate, affecting greatly the quality of life.

Anyway, potential communicative acts are still very important. First, they can provide the start to develop a more symbolic communicative form by working on them, and second, they show that communicative intentionality is present.

But how can prelinguistic behaviours become proper and effective communication acts? This transition is possible when others interpret and react to them as if they were intentional forms of communication, creating a link between the act and the achievement of a result. This is why is really important to identify possible communicative behaviours before starting the whole process, and specify what communicative function they can have.

Sigafoos, Woodyatt, Keen et al. (2000)<sup>9</sup> developed the Inventory of Potential Communicative Acts (IPCA), which "*focuses on the range of communicative forms and functions that have been observed in individuals with developmental and physical disabilities*"<sup>10</sup>. To assess behaviour, a checklist was developed as well; it is called Behaviour Indication Assessment Scale (BIAS).

The IPCA covers ten communicative functions:

- social convention (greetings, small talk)
- attention to self (getting attention)

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<sup>9</sup> Sigafoos, Arthur-Kelly, Butterfield, Foreman (2006), pg 28.

<sup>10</sup> Sigafoos, Arthur-Kelly, Butterfield, Foreman (2006), pg 28.

- reject or protest
- request an object
- request an action (also assistance with a task)
- request information
- comment
- choice making
- answer
- imitation

There are questions about specific communication skills, so that nothing is left aside or forgotten, and usually the context in which behaviours occur has to be described as well.

The next stage of the assessment is a direct observation of the individual to check the results. Knowing the context in which a particular behaviour should occur, it is helpful to recreate this context to observe if it occur consistently. The results of both observation and the IPCA can be transferred onto the Scoring Grid, which gives a visual feedback of how the communicative behaviour of an individual works. Empty cells show gaps in the person's communication repertoire, which should be filled as soon as possible.

Direct verification is also useful to determine if the potential communicative acts are intentional or not; this difference is important because determines the intervention pathways that will be pursued. To determine if the behaviour is intentional and so represents a form of communication and, in this case, what function serves, it is possible to expose the individual to a number of verification trials designed to evoke a specific communicative act. The verification assessment verifies the probability with which potential communicative acts are evoked by the occasion for communication.

Once the critical points for intervention are clear, it is important to establish instructional priorities. The environment establishes communicative demands; for this reason the environment in which the individual lives has to be examined, as well

as the activities that occur frequently, in order to find out the specific communication skills the environment requires. To organize the assessment in an organic way, it can be organized around the domains of:

- domestic;
- vocational or educational;
- recreational-leisure;
- community living.

Each of these environments is associated with specific activities and includes some subenvironments; for example, the domestic environment contains the kitchen, the bathroom, the living room. Then, once the activities are outlined, the skills requested to complete the activities have to be identified, and in many cases requested skills are necessary communication skills. During the observation, the partner observes at which point the person can get on with his own abilities, and consequently at which point the breakdown or difficulty occurs.

Another important aspect that should be assessed is the individual's level of alertness or behavioural state, because it greatly influences "*the extent to which the person will be responsive to social interaction and communication intervention*"<sup>11</sup>. The behaviour influences the level of alertness and the person's involvement with partners and environment; it is important to engage the individual who relies on AAC when more responsive, or otherwise communication breakdowns are likely to occur, or the individual can also refuse to communicate because he is too tired.

Working on the AAC user is not the only direction of intervention; partners need to be educated as well. They have to be highly responsive to the individual, and some strategies can be taught to help them to be more responsive in a more appropriate modality.

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<sup>11</sup> Sigafos, Arthur-Kelly, Butterfield, Foreman (2006), pg 45.

### 2.2.5 Intervention Pathways

Intervention pathways seek a modality to teach the person the communication skills that will be needed in order to participate to a range of environments and activities. An intervention pathway is "*the process of teaching the individual more symbolic forms of communication*"<sup>12</sup>, which can also be seen as a developmental progression from the beginning stage (perlocutionary, illocutionary) to a more advanced (locutionary) stage of communication development. This can happen if the partner uses empirically validated instructional procedures in a frame that considers also the communicative potential of existing behaviours, the context in which communication is expected to occur and partners expectations and skills. An act is considered to have communicative potential when it is within physical capabilities of the individual and occur, or might occur, during social interaction in the rules of social acceptability. The choice of the intervention pathway to follow is made for each communicative act, because each of them can have a different communicative potential; it is not unlikely that an individual has different behaviours representing different stages of development, and so he will benefit from a multiple intervention pathways.

The interpretive pathway is suitable to emphasize consistent interpretation of existing behaviours as forms of communication; this means that interpreting an act, probably involuntary, as if it was voluntary, and responding consistently to it as if it was a request, it will become a consistent form of communication. The seek for consistency is important also for acts which have been described as communicative from partners but not observed during the verification assessment. Interpretive pathway increase the frequency of these acts but also helps to bring the act under stimulus control, which means that it makes the act more likely to occur under the right conditions. There are many reasons to explain the inconsistency of a communication act: the first is the fact that maybe the behaviour is not a

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<sup>12</sup> Sigafos, Arthur-Kelly, Butterfield, Foreman (2006), pg 49.

communicative form. A lack of motivation may make a communicative act inconsistent as well; to enhance motivation, the environment can be rearranged to create the need for communication, and the partner has to provide opportunities for communication when there is a strong motivation to communicate. Another possibility to explain inconsistency of communicative acts is the fact that opportunities are created at times when the individual is in a behavioural state not conducive for responding. Inconsistency is frequent in newly emerging behaviours, and it is important for partners to respond consistently in this stage to facilitate the transition from the perlocutionary to the illocutionary stage. Basic principles operating in this pathway are, from the developmental perspective, related to partner overinterpretation and responsivity (since the partner interprets the acts as specific communicative functions and respond to them appropriately); from the operant psychology, contingent reinforcement is employed, since the partner's responses works as reinforcement. If after a period of time the behaviour does not increase consistency, it is likely that its function may have been misinterpreted. When a significant increase has been obtained, the act can be shifted to the Enhancement Pathway or not, depending on the form of the behaviour which has been increased, the demand of the environment and the aim of the intervention for the individual. For example, a waving of the hand to greet someone, when prompted to occur consistently, can stop his process here. The focus of Interpretive Pathway is to facilitate the transition between a perlocutionary to an illocutionary stage of communication development.

The Enhancement Pathway develops additional forms that can be produced at the same time of existing behaviours to enhance or complement them, in order to make them more effective and more recognizable communicational signals. If they are more recognizable, it is also more likely that partners will interpret them correctly and respond consistently, which will be a strong reinforcement for the AAC user. Usually, existing acts are enhanced by pairing them with more conventional and easy-to-interpret forms. Basic principles of Enhancement Pathways are the

concepts of behaviour indication, reinforcement and response synthesis. Their occurrence should indicate that the person is motivated to communicate and is likely to be reinforced by partner's response. The focus is on prompting an additional response; after the new response is prompted in a short period of time, the partner will respond accordingly. It is important to keep in mind that the two behaviours have to be produced and emerge as a single unit. The partner has to wait until they occur together before responding. It is not a problem if the new form occurs by itself, but it might be a problem if the old form is not followed or is not prompted with the new one, or a long period of time separates the old form and the new form. A behaviour can stop his development at this stage or continue to the Replacement Pathway, usually depending on the effectiveness and the social appropriateness of the new form. For example, a child can look at an object to mean that he wants it, but this communication act can be easily misunderstood. Enhancement Pathways have the aim of making the act more consistent, and the child can be taught to alternate the gaze between the wanted object and the communication partner. Once the child learned to do that, the communicative act is more noticeable and has an appropriate form and has reached the aim of the Enhancement Pathway. These enhanced forms can also be taught as a strategy to employ when communication breakdowns occur, to be used as repair strategies.

Replacement Pathway substitutes old forms of communication with new ones, which have to be functionally equivalent. This pathway is used for consistently occurring acts serving a specific communication function, but some factors make replacement more desirable than enhancement. For example, it may be ineffective with unfamiliar partners and its form or topography can make it socially stigmatizing; in addition, some acts may be unacceptable, such as tantrums to request things. The new symbolic form of communication has to be acceptable, easy to interpret and having the same communicative purpose. The basic principles of Replacement Pathway are functional equivalence, which means that the new and the old form of communication share the same meaning, and response efficiency:

the new behaviour must be more efficient than the old one, leading to more consistent and immediate reinforcement. It is also important to make sure that the new communication act is within physical abilities and easy to produce for the AAC user.

These three intervention pathways are helpful to facilitate the transition to a more symbolic form of communication. What is important to keep in mind is the fact that it is the behaviour which enters a pathway, but not the individual, who might receive intervention within more than one pathway at the same time.

### **2.2.6 Instructional Procedures to teach skills, behaviours, maintenance and generalization**

During intervention, empirically validated instructional procedures have to be used in order to enhance, strengthen and replace the potential communicative behaviours of AAC users. The importance of using procedures firmly grounding in basic principles of learning and development in the context of AAC, especially in developmental disabilities, is fundamental. Although the three types of intervention roughly correspond to the three intervention pathways, there is no direct correspondence among them. The same procedure may be effective within more than one pathway.

In the Interpretive Pathway the aim is to strengthen existing behaviours which have some communicative potential, following the basic principles of reinforcement and partner responsivity. In this stage, the focus is on interpreting the act and responding to it as if it was a form of communication, so that the transition from perlocutionary to illocutionary stage is smoother. Problems in this transition may inhibit the development of functional symbolic communication; it is very important to facilitate it with the correct strategies. The basic principles of all approaches are: following the AAC user's lead, using prompts to elicitate the behaviour, create opportunities and needs for communication exchanges, and developing turn-taking routines. Approaches which particularly fit Interpretive Pathway are:

- contingent responding: is the feedback provided by the partner every time the individual with CCN engages in communication acts. It is important to increase the rate and the communicative potential of the act, and it can work with the principle of structured overinterpretation of potential communication acts. The act, by obtaining a reinforcing consequence, is learned by the individual as an effective way of engaging and interacting with partners. The reinforcement can have different specific natures: it can be a nonlinguistic contingent response, such as following the individual's attention, or can be a linguistic contingent response if it involves verbally commenting or acknowledging an individual's behaviour. Verbal acknowledging what the individual was trying to communicate is also called linguistic mapping. The most critical feature in using contingent responding is the immediate reinforcement, which has to occur quickly;

- referencing: the partner can use this procedure to direct the AAC user's attention to an object, a partner or to establish joint attention. It teaches the individual that an effective communication act is one which makes clear the object of interest to the partner during the interaction. It requests to develop also the ability to direct partner's attention;

- wait and signal: the partner pauses during a routine activity and waits, looking expectantly for a response to the individual with CCN. This principle of waiting for a response is also called expectant delay, and it is useful to create opportunity and need for communication if correctly used. The partner has to wait a time long enough so that the individual with CCN is motivated to communicate. This pause should be of at least five seconds, but can last more, even 30 seconds, in order to build motivation but also to give enough time to the individual to complete a communicative act. The wait and signal procedure is also helpful in developing turn taking naturally during conversational exchanges.

The aim of the Enhancement Pathway is to make existing behaviour more effective with partners by adding to them a new form with the same communicative function. It is assumed that existing behaviours are already in the illocutionary stage,

therefore they are intentional but still less than optimal in terms of representing effective forms of communication. There are two approaches which can be successfully used in this pathway:

- response chaining: is an integrate and ordered sequence of responses. It teaches to the individual to produce the existing communicative act and, immediately after, the second response as if they were a unity. To achieve this goal, the two behaviour have to occur simultaneously or very closely together. It is also important to be sure of reinforcing the behaviour only when the two acts occur together: it is advisable to withhold reinforcement until the new responses occur;

- shaping: also known as the method of successive approximation, is a process involving both reinforcement and extinction which can be applied to various dimensions of the potentially communicative act. For example, a gesture can be effective, but the topography might be problematic: in this case, shaping can be applied to topography and the gesture can be reinforced when occurring in another place. This approach can be employed to develop more conventional responses and can be used also as a strategy to replace forms (Replacement Pathway).

The Replacement Pathway shoots for the development of a more symbolic system of communication, which can be effective with a range of partners. Functional communication training is the principal approach within this path and has the goal of facilitating the transition from illocutionary to locutionary stage of communication development. The principles underlying this approach are related to functional equivalence and response efficiency. Two acts have to share the same communicative function to be functionally equivalent, while the new behaviour has to be easier and more effective with respect to the old one to be more response efficient. The symbolic form must be more efficient than the old one, and easier to produce, or at least not requesting much effort. Being more efficient, it will be reinforced by the more immediate and consistent reinforcement by partners.

One problem frequently discussed is the lack of maintenance and generalization for individuals with CCN. Maintenance and generalization are very

connected: generalization is the extent to which a behaviour occurs across different sets of partners and environments not presented during instruction. Maintenance can be thought of as a generalization across time. There are a number of empirically validated procedures that can be implemented by partners to promote maintenance and generalization:

- introducing natural reinforcement contingencies: teaching communication strategies that will work effectively with a range of partners in a range of settings will lead to reinforcement in natural environment;

- training sufficient exemplars: using a number and a variety of stimuli in training will help generalization;

- use common stimuli: using training materials and settings which are likely to occur in everyday life will ensure both maintenance and generalization;

- use loose training: vary the discriminative stimuli and prompts used in training so that the individual learn to respond to only one specific type of stimulus and prompt;

- provide intermittent reinforce: intermittent reinforce makes the new behaviour more resistant in natural environment, where reinforcement is unlikely to occur every time.

These strategies should be used during initial instructional phases to strengthen, enhance or replace potential communication acts.

It is also very important to create opportunities for communication in natural settings, and these procedures may be successfully employed:

- missing item format: by withholding one or more items necessary for the activity, the individual with CNN is forced to ask for them;

- blocked response or interruption strategy: blocking a person from completing or continuing an activity and requesting the individual to produce a communicational request before enabling him or her to continue;

- incomplete presentation: giving some material to start an activity, but not all of them so that the individual with CCN has to request them;

- delayed assistance: is helpful to teach individuals how to request help;
- wrong item format: providing a wrong object after a request creates the opportunity to teach them how to reject the wrong item and request for the correct one.

## **2.3 Augmentative and Alternative Communication for Developmental Disabilities**

### **2.3.1 An outline of Developmental Disabilities: pathologies and issues**

Disabilities are considered developmental disabilities if they occur before birth, during birth or are acquired early in life and significantly affect one or more aspects of development. Since they appear so early in development, this means that issues are already present when children start to acquire communication and language skills for the first time, a process that is usually made through AAC. AAC is used routinely with those who experience developmental disabilities, such as cerebral palsy, intellectual disability, autism spectrum disorder, deaf-blindness and childhood apraxia of speech.

Cerebral palsy is described as *“a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to nonprogressive disturbances that occurred in the developing fetal or infant brain”*<sup>13</sup>. Cerebral palsy is, then, the early lesion or malformation of developing brain tissue, often resulting from prematurity or problems during intrauterine development. A white matter damage can occur also during birth or immediately after. Still, there is an high percentage of unidentified cause.

Cerebral palsy results in difficulty with motor skills depending on the location of the brain lesion. Spastic cerebral palsy results in hypertonia, which is an increased muscle tone, and can manifest as a diplegia, if legs are more affected than arms,

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<sup>13</sup> Definition given in 2007 by the Executive Committee for the Definition of Cerebral Palsy, which is an international group of scientists and researchers, and reported by Beukelman&Mirenda (2013), pg. 203.

hemiplegia if there is one side of the body more affected than the other (left arm and leg, for example), or quadriplegia, which is the most severe form impairing all four limbs, the trunk and oral-motor structures. Spastic cerebral palsy is the most common condition. Another condition is dyskinetic cerebral palsy, provoking involuntary movements as changing patterns of muscular tone across the day. It is divided in two subtypes: the first, dystonic cerebral palsy, is characterized by a rigid posturing of the neck and trunk, while the second, athetoid cerebral palsy, involves abrupt, involuntary movements of the limbs which make difficult regulating movement and maintaining posture. The last type of cerebral palsy is the ataxic form, which associates with increased or decreased muscle tone and causes problems with balance and positioning the trunks and limbs in space. There is also the possibility of mixed cerebral palsy, when more than one type of motor pattern is involved.

Usual issues associated with cerebral palsy are: articulation disorders, impaired speech intelligibility, language delays and/or disorders. It is important to underline how much an impaired motor ability influences language development: the opportunities to practice language are restricted by the difficulty in speech but also the cognitive aspect of language is impaired because of the lack of object manipulating experiences. The presence of dysarthria depends on the degree of motor impairment. More than that, intellectual disabilities, hearing impairment and learned helplessness are often present. Other associated conditions frequent in people with cerebral palsy are intellectual disabilities and visual problems.

The intervention for such complex cases requires a team of professionals from a number of disciplines. The first step of the assessment is finding good positioning and seating adaptations in order to ensure optimum stability and the movement efficiency necessary to access a communication system. Another important step is to verify visual acuity and possible visual-perceptual problems, which will affect decisions on the AAC system to use. The presence of perceptual impairments, which may affect the process of learning oral language (e.g. hearing impairment), should

be verified during the assessment. It is critically important in cerebral palsy to prepare an AAC intervention with a so called “balanced approach”, which means that the intervention should be balanced with motor development training, speech therapy and academic instruction, designed to meet immediate need and with an eye to the future. Since these individuals usually live to adulthood, it is very important to start with a early programming of their future, to provide them all the needed skills. Long-term planning is not optional, and should start with AAC devices which can accommodate a wide range of activities. A balanced approach applies a multimodal communication systems involving natural modes of communication such as speech, gestures and facial expressions although impaired by motor issues.

Intellectual disability is characterized by *“significant limitations both in intellectual functioning and adaptive behaviour as expressed in conceptual, social and practical skills. This disability originates before the age of 18.”* This definition is given by the American Association on Intellectual and Developmental Disabilities (AAIDD)<sup>14</sup>. An emphasis is put on how supports have an important impact on their abilities; intellectual disabilities are of central interest for who is involved in AAC projects, because children with intellectual disabilities constitutes a large, if not the largest, proportion of school-age individuals who requires AAC supports, in different countries around the world (State of Florida, Pennsylvania, New Zealand, Israel)<sup>15</sup>.

Opportunity barriers are a great issues affecting this population. The use of AAC can exist only in inclusive, natural opportunities in schools, families and community environments; in these situations, the use of AAC will affect the vocabulary development as well as a whole set of social and communicative skills which are really needed to face functional, everyday communication in situations that are both motivating and life enhancing. Problem behaviours are common in

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14 Definition found in Beukelman, Mirenda (2013), pg. 208.

15 All research are reported in Beukelman, Mirenda (2013), pg. 209

individuals with intellectual disabilities, because sometimes are the only communication channel. In order to prevent them, teaching functional communicational skills as an alternative is central; once they learn that these communication skills are just effective as, if not even more efficient than problem behaviours, they will not use them again. It is important to keep in mind that often speech is not the first mode of communication in this population. As a solution for problem behaviour, some input strategies such as maps, visual schedules and rule scripts can be associated with output strategies as choice making, to enhance both comprehension of the world and their ability to express desires and feelings. Intellectual disabilities is a definition which, like a box, contains a wide range of syndromes and conditions that results in cognitive impairment, but not limited to it. AAC intervention, then, depends on the disability involved and can be applied across the range of specific syndromes and conditions; different strategies and techniques are chosen on a case by case basis.

The term autism spectrum disorder (ASD) is an umbrella term that encompasses a large range of social-communication impairments, and which requires an intervention focused on educational and relational features from an early age. The high variation in the autism spectrum makes difficult to delineate a unique intervention format for individuals, but some support is needed in the area of social communication in all cases; most people with ASD have receptive and/or expressive language impairments, which directly affect social and communication interventions. Early intervention is important, and should be started as soon as a diagnosis is seriously considered, without waiting for it to be confirmed. Intervention should focus on the use of evidence-based instructional techniques in six main areas: functional and spontaneous communication using verbal and/or AAC modalities, develop appropriate social skills with parents and peers, develop play skills with peers, establish various goals for cognitive development with a particular attention to generalization, a positive behavioural support for problematic behaviour and functional academic skills. For children with ASD the pragmatic

aspect of communication is critically important because it is the more impaired; it is also important to support the development of spontaneous communication as a dynamic, interpersonal process. This support has to be introduced in the context of naturally occurring routines, with an attention in building social base for communication. The use of an AAC device with voice output is usually recommended because it works as an attention-getter and as a kind of social bridge to communicative partners. In addition to this, it can also reduce communication breakdowns because it is possible to program them with whole messages instead of, or in addition to, single words and phrases.

Deaf-blindness is a dual sensory impairment which affects both vision and hearing loss to various degrees; the result is an impaired ability of acquiring information via the auditory and visual channels. The legal definition of deaf-blindness is *“a visual acuity of 20/200 or less with a moderate to profound hearing loss (a loss of 60-90 dB or greater)”*<sup>16</sup>. Deaf-blindness can be congenital, if the onset of both impairments is between birth and the age of two (e.g. intrauterine infections, chromosomal abnormalities like CHARGE syndrome, congenital brain damage), or acquired, when the onset of both impairments occur later in life (e.g. genetical disorders like Usher syndrome, aging, acquired brain injury, early childhood infections). Most congenitally deaf-blind individuals remains at a prelinguistic stage of communication development; but AAC intervention offers a wide range of options. The first step is considering the timing and severity of both visual and hearing losses. In the cases of acquired deaf-blindness, usually are able to communicate via speech or speech reading with techniques like tactile fingerspelling, tactile sign language, Tadoma Method<sup>17</sup> and electronical aid such as the Screen Braille Communicator. In the case of congenital deaf-blindness, the

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<sup>16</sup> Definition given by Ladd, 2003; found in Beukelman, Mirenda (2013), pg. 215.

<sup>17</sup> **Tadoma** is a communication method in which the deafblind person places his thumb on the speaker's lips and his fingers along the jawline in order to feel the movements of both lips and throat.

situation is usually more complicated: some signs, gestures or behaviours can be used, as well as tangible symbols. Communication boards can be used as well, especially with line-drawing symbols, or with some textured symbols. The use of different textures can be useful even with switches, by applying the texture on the switch which, when activated, can speak out a message. Usually different techniques are employed, to achieve a multimodal communication which can work with supports or as unaided communication. Facilitators with deaf-blind individuals should have a deep training on deaf-blindness to know how to facilitate access to environment information, help the development of receptive and expressive communication skills and developing a trusting, interactive relationship to promote a social and emotional well-being. Deaf-blind individuals need systematic instruction even for basic functions and have a particular need for developing multimodal modes of communication to overcome the limitation imposed by their dual sensory impairments. Instructional procedures most commonly used consist in: presenting a discriminative stimulus, prompting communicative behaviour, fading prompts and then providing reinforcement for correct responses. Target skills which have to be taught as soon as possible are choice making, requesting and recruiting attention. Too often there is no attention for social conversational skills, which are left aside; skills as greeting others, responding to greetings, asking and answering questions should be taught as well.

Childhood apraxia of speech (CAS) is a congenital, neurological speech sound disorder *“in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits”*<sup>18</sup>. There are no clear consensus about the criteria for diagnosis, because the causes are still unknown; it looks like CAS is a result of a known or unidentified neurological impairment. CAS is connected with motor speech behaviour, which results in prosody, language, metalinguistic and phonemic abnormalities. There is a consensus on the validity of

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18 Definition given by the American Speech-Language-Hearing Association (ASHA) in 2007; found in Beukelman, Mirenda (2013), pg 218.

three clinical markers for CAS: inconsistent errors on consonant and vowels in repeated productions of syllables or words, lengthened and disrupted coarticulatory transitions between sounds and syllables, and inappropriate prosody, especially in the realization of lexical or phrasal stress<sup>19</sup>. Usually, the primary treatment focuses on speech therapy in order to improve it as much as possible, while AAC is a secondary intervention used to support natural speech development in early stages. CAS is often associated with language delay because of children's inability to practice language in their first years; AAC provides an alternative way of discovering language, practicing and play with it as typically developing children do. Speech is rarely comprehensible, and children with CAS tend to produce one-word utterances, which are not an effective communication. AAC can be employed in aided or unaided techniques, and especially aided ones which are comprehensible to everyone (e.g. PCS, VOCAs, Ipad with dedicated programs). It is important to evaluate vocabulary and portability constraints to choose the adequate device and provide the individual with something which is at the same time easy to carry and use and can manage an adequate vocabulary. AAC displays have to facilitate both language development and social competence. For those children who have an appropriate age and are literate, an alphabet supplementation can be employed: a child can speak and point the first letter of every words, which can help partners to guess the whole word. Symbol displays work in the same way, with the individual pointing to symbols in conjunction with speech. These are ways to repair to the frequent communication breakdowns occurring in conversation, which are due to the unintelligibility of words and phrases. Unaided techniques such as body language, signs and gestures can be used as well. For individual with CAS literacy is, usually, a difficult goal to achieve because it relies on phonological skills which are impaired. Handwriting abilities are often impaired, since fine motor planning is not good. To help them, texts can be provided with adequate symbols, or a voice output

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19 The three clinical markers are described in ASHA, 2007; found in Beukelman, Mirenda (2013), pg. 219.

can be used, which will also assist them with correct speech production; the use of digital speech output is suggested to practice natural speech.

### **2.3.2 Beginner communicators: how to create communication and participation**

A beginner communicator is an individual who has one or more of these characteristics:

- relies primarily on nonsymbolic modes of communication. These behaviours may be unintentional or intentional;
- is learning to use aided or unaided symbols for communicative functions;
- uses nonelectronic AAC systems for communication.

Age is not important for beginner communicators, because they can be children acquiring language for the first time but also adults who are now recovering from a brain injury; what is important is the fact that they are learning or relearning basic communication skills.

It is important to be aware that norm-referenced assessment tools cannot measure accurately the abilities of most individual relying on AAC when they are very young. It is also of critical importance to built on children's abilities and not focusing on their impairments, and always operate under the assumption that all children can gain significant skills. While conducting intervention with children should be remembered the fact that no long-term outcome prediction should be done, while it is essential to include strategies for supporting the development of natural speech and of literacy skills; it is essential also to increase communication opportunities and teach communication and social interaction skills which are necessary for a positive outcome.

Intervention should start very early, in the first few years which are usually spent at home; this means that family members are taught how to provide the correct input and how to support children. As they grow older, they start to attend to nursery schools usually including typically developing children and some children with CCN, possibly with a well-trained staff member for AAC (but, unfortunately, this

happens rarely). A similar setting is preferable because it creates more opportunities for integration and for a natural communication. To create communication opportunities it is important to increase participation in natural context among peers, during everyday routines, and to make them motivating, familiar and valued by the child and who surrounds him. Routines are an important source for communication opportunities, because routines are situation very familiar to the child, and their steps must be organized always in the same order to help the child to remember them. Plays can be occasions as well, even if it is very important to remember that play must remain playful and not become a work. An accurate selection of toys and materials should focus on the possibility to create interaction among peers. Toys have also to be easy to carry and manipulate, which is an essential feature for children with motor impairments because the quality of early conversation is related to the child's ability to manipulate objects. The aim of intervention is a full inclusion in social and educational activities, and for this many strategies have to be developed also in different areas such as information sharing and social abilities (social closeness, social etiquette).

Routines are the best way to create explicit opportunities for communication in a natural environment. There are many simple strategies which can be employed: withholding a needed object so that he has to request it, inserting the use of symbols in activities, interrupting a relished activity to create the occasion for protesting. It is important that all these strategies (and many others) are incorporated during all the day and in all activities and contexts, to help generalization.

It is of main importance to prepare both long-term and short-term plannings, so that the acquisition of needed abilities can start as soon as possible with an eye on the individual's future.

Probably some words should be spent on who is a facilitator: a facilitator is “*[...] an individual who assumes [...] responsibility for supporting the communication*”

*of individuals with CCN*<sup>20</sup>. The first important step is to teach them to identify nonsymbolic communication signals and how to respond to them, in order to make the person with CCN to understand that his behaviour has an impact on others and also helps preventing problem behaviours, which often have a communicative function. These goals are achieved through contingent responding. At the very beginning, distinguish intentional from unintentional behaviours can be very difficult, but there are some indicators of intentionality, such as alternating gaze, body orientation and the behaviour when the facilitator respond, or does not respond, to the signal. Usually these spontaneous signals are used to get attention, accept and reject, and if they are not present some strategies to develop these behaviours should be included. Initially to teach attention-seeking signals is important to respond to all socially acceptable behaviours that can be intentional, then facilitators can limit the responses only to the most desirable and frequent behaviour alone. Some simple technology can enhance the salience of these behaviours if they are too subtle, for example a call buzzer which can be activated by a switch. The problem is that often attention-getting signals are unacceptable behaviours; through intervention with prompting and fading it is possible to shift these form to some gestures which are socially acceptable and functionally equivalent.

Once all signals are part of the person's repertoire, facilitators have to provide him with structured opportunities to practice attention-getting, acceptance and rejection signals in natural activities; routines can provide these opportunities.

Routines can also be used to play with children, especially in the form of interactive routines for moving or dancing and singing together. The facilitator pauses and waits for signals from the child before continuing the activity.

The main problem of many signals or gestures or vocalizations is the fact that they are idiosyncratic, and therefore comprehensible only to a few facilitators; those

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20 Definition given in Beukelman, Mirenda (2013), pg 239

who are less familiar with the child might encounter communication breakdowns. Gesture dictionaries can avoid them, by providing the unfamiliar facilitator with a description and meaning of the behaviour and suggestions on how to react to it.

Once getting attention, rejecting and accepting are acquired abilities, it is possible to add other basic skills such as following symbol schedule and engaging in social routines. Because the symbolic techniques require joint attention, some techniques can be used to establish it and make it develop. For typically developing children, joint attention emerges gradually between 9 months and 15 months, and makes them able to check partner's attentional focus, then to respond to pointing and as a last step to direct partner's attention themselves. While introducing symbols, it is important to facilitate joint attention and reducing its demand by manipulating the disposition of symbols during interactions and hold them in front of the child, aligned with his eye gaze.

Symbols can be used to prepare a visual schedule for children with many different purposes at the same time:

- introduces the idea that one thing (the symbol) can represent another (the referent);
- provides an overview of the activities of the day and of what comes next;
- facilitates the transitions from one activity to another.

Symbols can be real objects, tangible symbols, drawings or words, and the format should be age appropriated. It can be a daily appointment book or a wall display with real objects on it.

Another possibility for beginners communicators who are starting to participate to activities with peers is represented by talking switch devices. They are composed by recorded messages which are reproduced when a switch is activated; the main advantage of this device is that a single symbol can represent a whole message, for example a part of a song which is usually sung in the morning during greetings, or a request at a restaurant or in a shop.

### **2.3.3 Focus on language: challenges and instructional approaches.**

What makes communication competence is, ultimately, the ability to use language interactively, which is what has to be taught to individuals with CCN.

All natural languages, including sign languages, are composed of five domains: phonology, semantics, syntax, morphology and pragmatics.

Phonology is related to abilities such as spell, write and read, and often is not of primary importance for people with CCN whose goal is to achieve the ability of expression even without speech.

Semantics is related to the understanding of words and how they relate to one another, and it is difficult to acquire because people with CCN have an input made of speech but an output language made of symbols; this means that they have to learn the meaning of both word and symbol, which results in an asymmetry between input and output modality and creates a number in instructional and learning challenges. For example, adults tend to talk less to children with CCN, depriving them of the possibility to acquire vocabularies. Children with CCN also do not select the lexicon they use, which is prepared for the AAC displays from others; there might be a non correspondence between the internal lexicon and the external one. Since they rarely have symbol feedback they tend to overextend words, and if they have a correction it is usually only in verbal modality, without pointing to the right symbol. Another big difference might be the different organization of semantic and conceptual features of spoken language and symbols; there can be more or less convergence in the organization in a system that in others. An interesting question is how do children with CCN learn the symbol-referent relationship. Typically developing children between 12 and 15 months acquire vocabulary words much more rapidly than usual, because of a phenomenon called “fast-mapping”, which appears to work even with children with CCN<sup>21</sup>, permitting the fast acquisition of symbols.

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21 Researches by Drager et al. (2006), Ronski et al. (2010) and others; found in Beukelman, Mirenda (2013) pg. 257.

Syntax is due to the rules for putting words in sentences. People with CCN have peculiar syntactic characteristics: they use mainly one- or two-word messages in both elicited and spontaneous production and show a limited use of complex structures (such as questions, negatives, commands and auxiliary verbs). People with CCN use also different word orders from spoken language, and tend to omit some words, especially verbs and articles, even when they are available on the display. This feature has been reported both from Italian and American sources<sup>22</sup>: expressive productions of children with developmental disabilities are not organized morphosyntactically and show no order. There is a huge use of multimodal combinations, word overextensions, metalinguistic strategies to compensate for a lack of symbols. To explain the difficulty with syntactic patterns, some hypothesis look to the modality of communication (modality-specific hypothesis), and suggest that the asymmetry between what they hear and how they communicate is the cause of the unusual graphic symbols sentences; probably both display-related and language practice-related factors contribute to the different patterns used by people with CCN.

Morphology is the set of rules for building and changing words. Researches<sup>23</sup> demonstrated that people with CCN have many difficulties with receptive and expressive morphology. Beukelman and Mirenda<sup>24</sup> found that four possible explanations are possible to explain why people with CCN experiences problems with morphology:

- symbols needed to indicate the same function of morphemes (e.g. plural, past tense) are not available on displays, so they are unable to practice them;
- morphemes omission can be also a strategy to prefer efficiency over accuracy, in order to enhance the speed of communication;

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<sup>22</sup> Reported both from Beukelman and Mirenda (2013) and Gava (2013).

<sup>23</sup> Idem, pg 258.

<sup>24</sup> Ibidem.

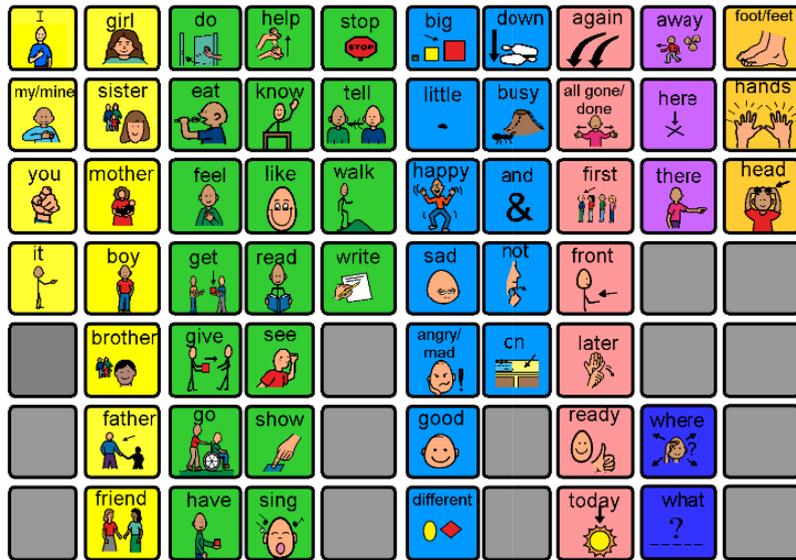
- individuals with CCN are not taught how to apply morphological rules;
- since their output is influenced by the AAC modality, often the modality itself precludes the need for the use of morphemes.

The most important aspect for AAC users is related to the pragmatic of language. Pragmatics studies the communicative functions of language and the rules to use it for social purposes. Individual with CCN tend to limit their communicative functions to responses and requests with a simple form, producing utterances as long as they need to get a message across. In conversations with naturally speaking partners they have a passive and respondent role; this is not a symptom of pragmatics difficulties, but just a function of conversational asymmetry and of an unbalanced conversational power.

Children who rely on AAC are often given their first symbol set when they are very young. Someone could wonder if there is any symbol set which can help language development more than others; the answer is that there is little empirical evidence on such matter. While using AAC symbols, their organization becomes crucial to make communication efficient and effective. Organizational strategies fall into two main categories: grid displays or visual scene displays. On visual scene displays (VSD) events, people and objects and all symbols which can be useful in that context are shown all together in the same scene, while on grid displays all symbols are organized in a grid pattern according to an organizational scheme. One of the most famous pattern is called the Fitzgerald key<sup>25</sup>, which is the most used semantic-syntactic display strategy; symbols are organized from left to right into categories such as nouns, verbs, modifiers, what, where, with frequently used cluster of symbols prepared on the top or on the bottom of the display.

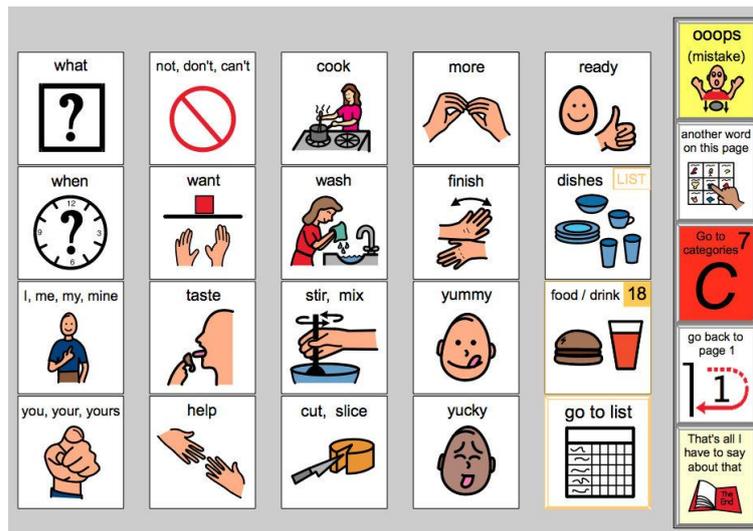
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25 McDonald, Schultz, 1973. Found in Beukelman, Mirenda (2013), pg 262.



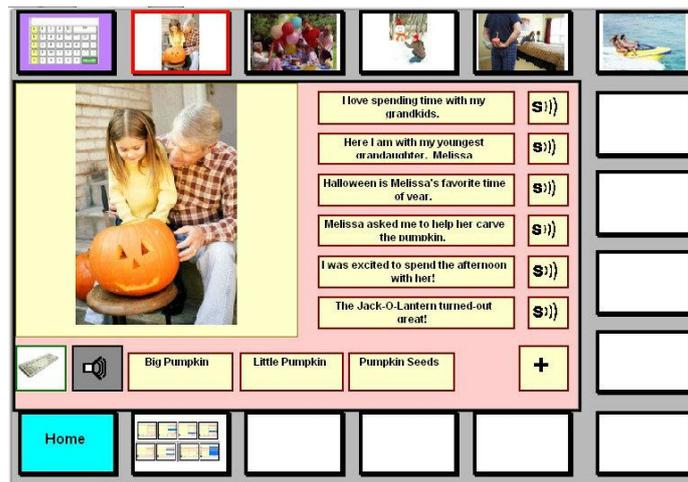
An example of a Fitzgerald key disposition. Categories are highlighted also through a different background colour, which is a good strategy in absence of visual problems.

The Fitzgerald key is not the only acknowledged strategy for symbol displays. Taxonomic grid displays, for examples, are organized into superordinate categories, but are not useful until 6 or 7 years of age. The most popular grid display strategy consists in organizing vocabulary according to event schemes, routines and activities. Each display has the vocabulary items specific to an activity or a routine, typically organized in syntactic categories. Since they are easy to construct and prepare, making new words available when needed, activity displays are a vehicle for participation and inclusion while promoting language development and a more complex expressive output. The Pragmatic Organization Dynamic Display (PODD) combines diverse kinds of strategies to support communication for different functions. The main goal of all PODD is an efficient and effective communication; it contains some words and phrases which can be used to express messages on the ongoing activity, or which can be easily interpreted by communication partners. In addition, PODD contain various navigational strategies, pragmatic starters to take turn, symbols for conversational repair. Vocabulary items should be repeated more than once in multiple locations, to be always able to produce sentences with ease.



This is a PODD about meals and cooking. It is possible to see some navigation strategies: the list of food and drinks is at page 18, number inserted in the symbol of food and drink. There is the yellow symbol to inform of a misunderstanding, the symbol for closing conversation about a topic, the symbols to link to specific pages such as the pages with categories and page one.

In visual scene displays are presented the symbols associated with a specific activity in a schematic organization. VSDs depict the environmental and interactional context of an event that is personally relevant for the individual with CCN. If the VSD is on a speech generating device, an associated message can be spoken out when some spots are activated on the display. Children learn to use VSDs quite rapidly, and once they learn to use them they take more conversational turns. VSDs are also appropriate to support fluent speech in adult aphasia. Another possibility which stays between grid displays and VSDs is the hybrid display, made of a central VSD and a grid layouts which reports some additional conventional symbols outside of the VSD.



This is a Visual Scene Display. The activity is presented in the central picture, while specific symbols are presented in the outer frame. Some suggestions for conversation topic are presented in the right part of the screen, which can be spoken out by touching or clicking on them.

Symbols can correspond to a word, a phrase or a whole sentence. The size of message units affects language development, but there are no researches on this topic to date. Then, to decide which length is appropriate for an individual, the decision looks to the individual's abilities and needs. For example, longer message units speed up the conversation and require fewer cognitive and/or linguistic resources, which makes them good for individuals who fatigue easily, are minimally motivated to communicate, have low language abilities or are just learning how to use AAC. But longer message units impede also communication accuracy and flexibility. Short message units are indeed more flexible, and can enhance language development because of the control the individual has on symbols. It is possible to correct structures and enhance them. As in many aspects of AAC, there is not a "right" approach. Probably the best solution is a compromise made of full sentences ready to be used and an short units to give free expression when there is no particular need for speed.

Instructional approaches to teach how to use symbols effectively teach at the same time the ability to learn their meaning, which is receptive language, and how to produce them in communication, which is expressive language. Some approaches treat them as separate and independent entities, whereas others prefer a holistic perspective.

Explicit instruction and incidental teaching are two opposite procedures to teach language and communication skills, but they are also often combined. Explicit instruction consists in small teaching units, called trials, made of stimulus – prompts – correct response – reinforcement. Trials are repeated over time and prompts are faded gradually. Prompts can have different forms, among which the most used is facilitator modeling (e.g., a facilitator produces a manual sign to prompt the individual to repeat it). Other prompts are the expectant facial expression, gestures, pointing, verbal cues, physical prompts. Another kind of strategy can provide instructional feedback contingent on message construction. A recast of the learner's message using a more correct and complete form will work.

Incidental teaching is often combined with explicit instruction, because it helps in generalizing abilities and to use them in the context of everyday routines. The facilitator arranges the environment to create communication opportunities and provides instructions by gestures, modeling, verbal cues and, if necessary, even physical prompts to elicit the target behaviour. Then, the facilitator responds in a functionally related manner to the behaviour.

Conversational coaching is a strategy employed for teaching the usage of speech generating devices with AAC displays in conversational interaction. During the interaction, a facilitator provides gestural, physical, direct or indirect verbal prompts to teach the basic conversational skills of commenting, asking questions focused on partner, answering questions and taking nonobligatory turns, which are turns used to indicate interest usually represented by head nods, vocalizations, smiles. Prompts are faded as quickly as possible; usually this strategy shows quick

results, and can be taught to family members or peers who are then able to provide instructions during natural social routines.

Strategy instruction model is used to teach a wide range of skills, and consists in eight steps:

- define the specific goal;
- explain the skill to the individual with CCN and why it is important;
- demonstrate the use of the skill, or have the individual observe someone else using it;
- think with the person a situation in which this skill can be applied;
- set up situations to use and practice the skill, during both natural interactions and role playing. It is important to use different setting and to start with less demanding situations, then as the individual gains more competence, some more demanding situations can be introduced;
- provide guided practice in natural occasion and in role playing. Offer an opportunity to use the skill spontaneously at the beginning, and prompt only if required;
- evaluate progress regularly, and keep practicing until the person uses the skill spontaneously in 80% of opportunities;
- conducts some trials in novel settings to evaluate the generalized effects.

Language modeling techniques are based on the idea that by observing how symbols are used by facilitators, the individual with CCN can learn that they can be recombined generatively. As the natural speaker learn speech , even in these settings explicit instruction is reduced.

In aided language stimulation (ALgS) “a facilitator highlights symbols on the user's communication display as he or she interacts and communicates verbally with the user”<sup>26</sup>. The symbol display is accessible to both partners and contains key vocabulary. ALgS developed a number of instructional techniques for the facilitator

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<sup>26</sup> From Goossens' et al. (1992), pg 101. From Beukelman, Mirenda (2013), pg 273

to indicate symbols while talking, which are designed to attract children's attention (e.g. use of dolls). The main feature of this technique is that both partners use speech and provide a symbol input during activities. With this technique, children learn to recognize more symbols, produce more complex messages and take more turns during group activities.

Similar to ALgS is the System for Augmenting Language (SAL), which employs also the use of a speech generating device with simpler instructional techniques. Communication partners learn to activate symbols to augment their speech input.

Aided Language Modeling (ALM) combines speech and words, and is quite useful during highly motivated interactive play or story reading activities; while pointing to a symbol, the partner also says the related words.

#### **2.3.4 Supporting linguistic and social competence**

The development of communicative competence relies on knowledge, judgement and skills in four operational domains: operational (consisting in using skills to make the AAC system work), linguistic (knowing how to generate messages on their system), social skills (which permit the use of linguistic competence in natural contexts and situation) and strategic skills (which help in using the best strategy to achieve the best result in that given context). For most communicative interactions, only two blocks are really necessary: linguistic and social domains.

Linguistic block, as explained before, is composed of different domains which request some attention, such as semantic, syntactic and morphological domains; they have to be supported and developed more or less explicitly.

In order to support semantic development, there are two primary approaches used to teach language comprehension and symbol-referent relationship.

The explicit instructional approach is based on the principles of stimulus control and on the premise that symbol-referent learning is a match-to-sample task. At the beginning, it is achieved with identical object and symbols (e.g. the same cup as object and symbol); then the learner is taught to match objects and symbols

which differs in some way (e.g. a red cup with the symbol of a blue cup). To help the learner some additional explicit instructional techniques can be combined with this approach, but faded as soon as he is able to produce them without prompting. This approach can be used also in natural communicative interactions, which can offer the contexts for some highly motivated choice such as a preferred snack; every choice-making routine or picture book reading activities can be used to provide explicit symbol-referent instruction. Language modeling is another approach to semantic development based on typical development and on how new words are acquired. The facilitator points to symbols while speaking in the context of a motivating and interactive activity and, at the same time, provides opportunities for the learner to use symbols during the activity. There are no studies to compare the efficiency of language modeling and explicit instruction, but as always it seems that the best results are achieved by a combination of both of them.

Early syntax is often neglected at the beginning of the intervention, although syntax requests focused instruction to develop. In this case the utility of instructional strategies is documented; the most used are the strategy instruction, language modeling and some elements of incidental teaching. Strategy instruction is used to teach both comprehension and production of grammar constructs, and consists in explaining the target grammatical rule, learning to recognize correct and incorrect forms and then some practice is provided. Language modeling is useful to provide support for the use of multisymbol utterances; since it has various approaches, all of them can be employed (e.g. SAL, ALgS, Aided Language Modeling) and complemented with some incidental teaching techniques.

It is important also to enhance and teach the comprehension and use of morphemes, especially for those which alters meanings in important ways. Since morphemes are usually omitted by those who rely on AAC, it is not surprising that they have difficulties in understanding them when used by others. Aided language modeling appears to improve use of morphemes, possibly used with some explicit instructional procedures in order to learn to discriminate and recognize when each

of the morphemes is required (e.g. learning to discriminate -s as a plural marker and -'s as a possessive marker, and when they are used).

Supporting pragmatic language development is another essential feature of an AAC intervention. The most basic functional skills are choice making and requesting, which are taught as soon as possible, and then strategies for supporting conversational and other types of interaction are taught.

To make a request, an individual has to be aware of what is a preference, and so before choosing between two objects, he must be able to accept or refuse them when presented one at a time. The development of preferences and the knowledge of how to communicate them in an appropriate way through nonsymbolic means is the necessary first step for choice making. Choice making is the selection of an item from a set of options, and it is not always self-initiated or occurring in communicative interaction. On the other hand, requesting always involves communicative interaction between two people. The formats used for both choice making and request should be selected on the skills in the person's repertoire. At the beginning, choices are elicited, and consequently initiated by others; it is important that elicited choices are presented frequently in meaningful opportunities, embedded in high-interest and fun activities, so that they can learn that through choice they can control their environment. From the beginning of the intervention, age-appropriated options should be presented; if it is not possible because current interests and capabilities are not age-appropriated, they should be used anyway to arise interest. The next step will consist in exposing the individual to a variety of age-appropriated interests and options. Initial choice arrays should be made of two options, and other options can be added gradually as the individual learns to visually scan and select. There are several options for teaching initial choice making: two preferred options can be provided, for example, or a preferred and a nonpreferred one, or even one preferred option and a distractor. Since the choice between two preferred options is the most natural choice format, probably it should also be the most used. Sometimes the concept of choice is not clear to the

individual with CCN and has to be taught through the use of object, which is the most straight and empirical way to teach them that, basically, what they point or reach to is what they get. Occasions for choices should be presented as often as possible, each day and in all environments and activities. To teach how to make choice, the facilitator can use prompts such as verbal cues, gestures, models and/or physical assistance, or the comprehension check procedure; both approaches can be used, what is critical in teaching choice-making is always providing the natural consequences following a selection, even if they are not what the individual wanted, so that they will learn to weight their choices more carefully. It is an error providing a corrective feedback, because the child with CCN will learn that it is not important to pay attention to choice, and it is not correct also checking for correctness by providing a second opportunity, which will probably confuse the learner.

Once the skills for choice-making are developed, it is possible to start teaching requesting.

Self-initiated requests are important because are connected both to communication and the reduction of problem behaviour. To teach generalized requesting, usually is used a combination of explicit instruction and incidental teaching, and consists in using a single symbol to initiate a request and then make a choice between two or more offered options. Since in order to make a request it is also necessary to gain partner's attention, instructional steps for making requests involve also teaching the use of attention-getting signals. Usually, at first the rate of self-initiated requests is quite low, highlighting the need for a strategy that encourages spontaneity. This goal has been achieved with the Picture Exchange Communication System (PECS), which does not request any particular attention-getting behaviour as a prerequisite, but teaches just to exchange symbols for desired items. Once that basic requesting with a single symbol are mastered, the facilitator can construct simple sentences by employing descriptive symbols related to colours, size, numbers and other features.

General case instruction is useful to teach functional living skills and communication skills<sup>27</sup>; it involves *“the analysis of a relevant stimulus and response classes associated with particular tasks or situation and teaching individuals both when to respond and when not to respond under a variety of conditions<sup>28</sup>”*. This technique usually results in a more spontaneous use and generalization of communication skills.

Communicative rejecting have to be taught to individuals with CCN as well, since rejecting often is expressed through problem behaviours. The reject can be an escape, which is a request to terminate an ongoing event, or an avoidance, which means evade and event not yet occurred. The first step is teaching a generalized rejecting, which can be a simple no expressed through gestures or other modalities and can be used in a variety of situations. The main problem of generalized rejecting is that it is not easy to understand what or why the person is rejecting. In order to teach generalized rejecting, Sigafos identified a six steps procedure<sup>29</sup>. First, the team identifies some nonpreferred items or events and then considers the appropriateness of current rejecting behaviours. If they are not socially acceptable or inefficient, a selection of socially acceptable rejections is identified. From the fourth step, opportunities for rejecting are created in a range of contexts in everyday routine; prompts are provided to teach and elicit the new rejecting behaviour, and as reinforcement (and last step) the nonpreferred activity is terminated, or the nonpreferred item is removed immediately. It is of crucially importance that, once a rejecting behaviour is learnt, it is always respected. Only later other skills such longer delays between the rejection and the removal of the item can be taught; another important step is giving instruction when escape or avoidance are not possible, because specific activities must be done. In this case, the use of a visual

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27 Beukelman, Mirenda (2013), pg 295

28 Chadsey-Rusch et al., 1993; found in Beukelman, Mirenda (2013), pg, 295

29 Sigafos et al. (2004); found in Beukelman, Mirenda (2013), pg, 297

schedule which highlights the non-negotiability of some activities can be useful, and it is possible to focus the individual's attention to upcoming preferred activities.

Teaching to answer yes and no questions is quite complex. Yes and no answers are a different form of rejecting which can be employed in a wide range of linguistically diverse contexts, so wide that generalization is very difficult. Usually yes and no are used only for rejecting and requesting objects, without being used to answer others types of questions. Probably a structured instruction on yes and no generalization may help in employing them in other contexts also, but before starting a structured instruction, a consideration on the individual's cognitive abilities is necessary: a generalization of such abstract concepts requires a good cognitive support.

Individuals with CCN need access to AAC techniques that support social interaction, and need to be taught social interaction skills. Introducing themselves when meeting someone new is an ability positively evaluated by others and can also make interaction smoother. Introduction consists in three components, in Beukelman and Mirenda's analysis<sup>30</sup>: some basic information about the person and of his disability, information about the person's mean of communication, and some advices to facilitate the interaction. Then, the topic for the conversation can be established. A visual support can be useful for children's interaction with peers, and can also consists in simple cards to initiate play activities. Since everyone has an interest in something or an hobby, the individual's interest can be appropriately displayed to stimulate interaction. Remnants can work in the same way, and teaches also the use of symbols for a past event. Reaching a compromise for portability, remnants can be used as interests as a topic for conversation and questions. For example, some remnants can be collected in a book, called conversation book, and every object can be accompanied by a caption describing the event and suggesting some questions. They are useful for who has poor speech articulation, because once

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30 In Beukelman, Mirenda (2013), pg 299.

the topic is clear it is easier for partners to guess parts of the individual's speech that are difficult to understand. Another technique to support interaction involves the use of two identical boards, one used by the person with CCN and the other used by the partner. The facilitator helps both of them with explicit instructional procedures, coaching the individual using AAC how to initiate, maintain turn and ask or answer questions. This dual display format decreases communication breakdowns, as explained by Beukelman and Mirenda<sup>31</sup>, because it promotes natural turn taking and helps the person with CCN both in comprehension and in production, since both of them are expressed through symbols. Asking questions to the partner is an ability that most of the people with CCN has to learn by explicit teaching; specific instructions on how to ask the partner about his feelings and thoughts are required and should be introduced when conversational skills are developing. A form of a partner-focused question is the response-recode strategy (R-R), which consists in responding to a question and asking a related question in return (e.g., *My favourite coffee drink is cappuccino; what's yours?*<sup>32</sup>). An ability which is positively perceived by communication partners is the ability to take nonobligatory turns and comments on the conversational topic. Nonobligatory turns are made of interjections mainly and are not demanding for people relying on AAC, but are very important for social feedback and should be taught with this goal in mind. Regulatory phrases are important as well, since they manage aspects of interactions related to the operation of the AAC systems and are made of directions for positioning, give some information about the effective use of the AAC system, obtaining conversational turns or signalling the need to repair to a communication breakdown. The skill of repairing communication breakdown is very important for those who rely on ACC system; it is used when a partner requests clarifications, does not respond or responds inappropriately, which means that he probably did not understand the

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31 In Beukelman, Mirenda (2013), pg 303.

32 Example taken ibidem.

previous message. There are two types of repair strategies: the first consists in repetition, but is also the less effective especially when the problem is poor intelligibility of speech, while the second is modification. Modification is divided in addition, reduction and substitution, which are all strategies that modify the message in order to make it simpler or clearer to understand. Conversational repair techniques should be taught as soon as possible, since often problem behaviours appear to repair communication breakdowns. Halle et al.<sup>33</sup> offered some suggestion on how to teach these skills; basically two or more forms have to be selected to be taught, paying attention to social acceptability and transparency, so that everyone can understand them.

## **2.4 Acquired disabilities**

### **2.4.1 Acquired physical conditions: an overview**

There are (unfortunately) many ways to acquire a linguistic disability as a consequence of degenerative diseases or traumatic injuries. In next pages I am going to describe the most common pathologies causing linguistic and communicative disabilities.

Amyotrophic Lateral Sclerosis (ALS) is a progressive degenerative disease with unknown aetiology, which involves motor neurons of the brain and the spinal cord. As some researches show<sup>34</sup>, the 80% to 95% of people with ALS are unable to speak in their last part of their life, they require AAC supports. Usually these supports rely on ocular movements, because extraocular muscles are unaffected, and so ocular movement is voluntary and unaffected. Dysarthria (a motor speech disorder) is a quite common result of weakness and spasticity of muscles. Depending on the ALS type, dysarthria occurs more or less early in the disease process: in bulbar

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33 Halle et al. (2004); found in Beukelman, Mirenda (2013), pg 306

34 Saunders, Walsh, Smith (1981) and Ball, Beukelman, Pattee (2003). Found in Beukelman, Mirenda (2013), pg 380.

(brainstem) ALS dysarthria occurs early and all functions, from speech to swallowing functions, deteriorate rapidly. In spinal ALS, people may retain normal or mildly dysarthric speech for a long period of time. During the last part of life nearly all the people with ALS, regardless of the type of the disease, experience severe communication disorders, sometimes involving also cognitive changes: it seems that 40% to 50% of people with ALS experience some degree of dementia by the time of their death<sup>35</sup>, although it is usually not overt dementia. Aphasia is occasionally associated with ALS. Ball, Beukelman and Bardach (2007) described a three-phase intervention model which is typically employed in ALS. The Early Phase consists in monitoring, preparing and supporting and goes from the initial diagnosis to a referral for an AAC assessment; in this phase natural speech is still functional and has to be monitored on a systematic schedule in order to control the progressive reduction in speaking rate, which is really important because precedes the reduction in intelligibility. It is important to organize the AAC assessment before the reduction in intelligibility, which is usually a dramatic and fast decrease<sup>36</sup>. Once the AAC assessment is completed, it is possible to start selecting options and purchasing them. In the Early Phase the individual has to be assisted also with some strategies that will preserve the communication effectiveness of natural speech as long as possible. It is important as well to educate the individual and his family on AAC decisions and prepare them to take AAC-related decisions when the time comes. The Middle Phase is composed of assessment, recommendation and implementation and lasts from the referral for AAC assessment to the selection and purchase of AAC strategies and the completion of initial instruction. The selection is determined by the physical abilities and the personal lifestyle preferences of the individual with ALS, considering the possibility of an home environment or the

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35 Lomen-Hoerth et al. (2003), Yorkston et al. (2012); found in Beukelman, Mirenda (2013), pg 381.

36 The main studies are Ball, Beukelman and Pattee (2002) and Ball, Beukelman and Bardach (2007), found in Beukelman, Mirenda (2013), pg 382.

desire to stay active in the community as long as possible. These decisions about patterns of participation affect communication needs as well as AAC strategies (someone who wants to stay active in the community needs an AAC device that is self-contained, compact and portable, for example). It is important to develop consensus on the profile of the individual's communication needs and participation, so that it is simpler to identify communication needs and assign to them a level of importance; usually the most valued and frequent are regulating other's behaviour and social closeness. In this phase some prediction on the natural course of abilities could be done. A bulbar ALS will result in no speech but the person will have still a good motor control, while spinal ALS will impair motor control first, leaving speech intact for a longer time. In this phase is also important to work on the acceptance of AAC intervention and to develop operational competence for both the person who relies on AAC and his facilitators. The Late Phase consists in adapting and accommodating the AAC strategies from the initial AAC intervention until the individual's death in order to provide effective communication as long as possible.

Multiple sclerosis is the most common neurological condition for degenerative diseases of young and middle-age population. It is an inflammatory disease of unknown cause in which the insulating covers of nerve cells in the brain and spinal cord are damaged, and consequent lesions are scattered in the central nervous system with different location and provoking different symptom patterns; AAC intervention, therefore, has to cope with very different situation from person to person. Dysarthria is frequent but not a universal characteristic of this disease, so there is a relatively small number of individuals with multiple sclerosis who require AAC because of severe speech impairments. In these rare cases during an Early Phase intervention there are usually more vision problems that require support; visual problems are quite frequent in multiple sclerosis and appear early. If an AAC support is needed, tremor, which is characteristic of this disease, can interfere with access. When speech is intelligible, an alphabet supplementation that helps identifying the first letter of every word might be the right solution. During the Late

Phase speech is no longer functional and the individual has to rely totally on AAC, but the use of an AAC support can be difficult because of vision problems, spasticity, ataxia, or tremor. These physical problems may be go with cognitive impairment, which is often documented in this population (Rao, 1995; Yorkston et al., 2012)<sup>37</sup>.

Parkinson's disease is *“a syndrome composed of a cluster of motor symptoms that include tremor at rest, rigidity, paucity (i.e. reduction in movement), and impaired postural reflexes.”*<sup>38</sup> It causes a fluctuation in motor responses and often involuntary movements; dysarthria is common but speech disorders are not uniform. Usually speech becomes more and more difficult to understand, so intervention focuses first on supporting natural speech to make it more effective; it is also common for individuals with Parkinson's disease to experiment reduced loudness level, which can be helped through portable vocal amplifiers. Those who are unable to communicate through speech have to rely on AAC strategies. Usually they are older adults with problems of reduced range, speed and control of movements. There are two constraints associated with people with Parkinson's disease: the first one is that they usually have some residual speech and, though not effective, they still want to use it without AAC, and the second constrain is that they are usually old, and have spouses and friends of the same age group, probably experiencing some hearing limitations.

Strokes may interrupt the circulation which serves the lower brainstem; if this happens, usually the stroke causes severe dysarthria or even anarthria, since the brainstem controls all nerves controlling the muscles of face, mouth and larynx, as explained by Beukelman and Mirenda<sup>39</sup>. In this situation, most of them have to rely on AAC for all the rest of their lives, while a small group recovers and is able to use speech effectively. Since they are aware of the world around them, they need to be

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37 Researches found in Beukelman, Mirenda (2013), pg 391.

38 Definition from Beukelman, Mirenda (2013), pg 394.

39 Idem, pg 398.

able to exchange information and achieve social closeness and thus they have extensive communication needs. In the early phase of intervention it is important to develop a functional yes/no response and later it is possible to introduce some low-tech techniques like eye-linking, eye-gaze or partner-assisted scanning strategies; as soon as possible a formal AAC assessment will help to identify the best strategies for the individual.

#### **2.4.2 Severe Aphasia and Apraxia of Speech in details: intervention strategies.**

Aphasia is “*an impairment of the ability to interpret and formulate language resulting from brain injury*”<sup>40</sup>. Usually the injury is cerebrovascular accident located in the left hemisphere of the brain, but it can result also from accidents, tumors, meningitis or epilepsy. Communication requires several neurological steps in a precise sequence which can be interrupted at any point by the injury: when comprehending what others say, when creating an idea, when retrieving words, creating the structure of the sentence or even when executing the movements to speak. All the people before the onset of aphasia communicate naturally through speech, and after it up to 40% will experiment chronic and severe language impairments<sup>41</sup>. In aphasia AAC supports can serve many different functions, from enhancing comprehension, providing an alternative mean of expression, and serving as a word or phrase bank to serving as a communication tool or as a technique to participate in activities. In all these cases, AAC should involve multimodal strategies relying on residual speech and gestures, and when necessary on others supports. Garrett and Beukelman (1992; 1998) developed a classification system to aid in planning intervention for individuals with aphasia: the first big difference is between individuals who can learn to communicate independently with AAC supports and those who can use AAC in a partner-supported contexts.

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40 Definition from idem, pg 405.

41 Data from Collins (1986), Helm-Estabrooks (1984), Kurland et al. (2004), Martin et al. (2009); found in idem, pg 406.

Partner-dependent AAC communicators with aphasia always require the help of their communication partner or of a facilitator, but there are different levels of dependence. Emerging AAC communicators experience profound cognitive and linguistic disorders across all modalities of communication, being in a situation usually called global aphasia which deeply impairs comprehension as well as production. They have extreme difficulties in speaking, using symbols and responding, often also because of apraxia of speech can occur; since communicating is so hard for them, they seldom do it purposefully. Sometimes they have troubles in associating photographs and their referents. In this phase is important to focus on developing fundamental communication skills: turn taking, choice-making with objects or photographs, referential skills and clear signals for agreement and rejection, which are the nonlinguistic form for yes and no. Contextual choice AAC communicators have more abilities than emerging AAC communicators, but still they lack the linguistic ability to start or add something to a conversation; on the contrary, they can participate in topical communications if the partner provides them some pictorial or written choices and, since comprehension may be impaired, augmented input technique can be employed as well. All these strategies have to be embedded in conversations about familiar topics, so that the main focus can be the expressive language, with particular attention to reference by pointing what they are talking about, understanding graphic symbols, make choices and beginning to ask questions by pointing or with exaggerated intonation. Facilitators will offer augmented input: they can write key-word choices so that the individual with aphasia can point to the preferred options, but the choices can also be represented by pictures, maps or in the form of rating scale in which the individual can point a value. To avoid communication breakdowns, it is advisable to teach to communication partners to supplement speech by gesturing, writing key words and drawing if necessary, in order to present an augmented input. Transitional AAC communicators still need the support of a partner, although they have the ability to use external symbols and some strategies to support communication. They can have

a fluent or nonfluent aphasia and usually have communication notebooks or a speech-generating devices with messages set for common situations, but they need cues from the partner to use an external strategy to supplement their speech. The goal for intervention is to teach them to initiate AAC-supported conversation with as little cuing as possible. For example, it is possible to teach them to introduce themselves using a prepared card or a message on a SGD; after that, they can learn to set the topic for a conversation by presenting a remnant or a picture from a notebook or a SGD. Visual scenes are of particular interest, since they organize narrative information, comments and questions in the same page, permitting an extended interaction between partners. They can be low-tech printouts or high-tech digital pages on a communication device; it is not important, because their main feature is that they help engaging reciprocal interactions by providing semantics organizational support. AAC strategies can have a role in speech restoration and, at the same time, compensate for its loss.

As it is said before, there are also individuals who are able to converse independently although they have a severe aphasia; they are independent AAC communicators with a good comprehension and share ideas intentionally, using a variety of strategies and modality they naturally selected, without help. They can use both natural (gestures, speech, residual writing) and augmented communication strategies, which rely on some external objects such as pictures, SGDs or alphabet cards. Independent AAC communicators usually have anomic aphasia, a moderate Broca's aphasia, conduction or transcortical motor aphasia. Since they are able to easily retrieve messages previously stored in their AAC systems, they can use SGDs and need no prompting, at least in familiar situations. On the other hand, they seldom participate actively in discussion about unusual topic in which they had to generate novel information, because their AAC skills are not sufficient to participate efficiently and independently in free-form conversations. In order to help them, an inventory of topics and messages can be prepared and stored in their AAC devices, which they can use in some structure practice during role plays. Generative AAC

communicators are individuals who are able to write or speak and convey some novel information in their communication; their main problem is that their skills are too fragmented for an effective communication such as a discourse. Usually they are suffering from apraxia of speech, agrammatism, spelling and word retrieval errors, but have an independent lifestyle and can actively participate in conversations in a set of environments. Intervention consists in identifying participation patterns, clarifying communication needs and find out some topics of interest, and then in teaching to manage a variety of AAC techniques. Sometimes can happen that generative AAC communicators do not use their AAC devices; this can be due to various issues: inadequate vocabulary, inadequate training on the device use, lack of acceptance of AAC by partners and by the individual himself.

Specific-need AAC communicators do not wish or do not actually need AAC as a primary communication method, because they can rely on speech and gestures, but in some situations which needs specificity, clarity, or a particular efficiency they might need an AAC support. Intervention is limited to these contexts, and it is important an accurate analysis of requirements and capabilities; since the use of these supports will be quite limited, some low-tech devices can be employed such as communication cards containing a set of messages needed. Even though the use will be limited to some situations, it is important to provide an adequate training in use with role playing.

The assessment of people with aphasia is not limited to speech, but embraces all cognitive and linguistic competences with an eye also to sensory, motor, representational and communicative competencies. It is important to evaluate with a systematic method communication needs and participation contexts prior to select AAC intervention. Some multiple assessment tasks are employed to examine the performances of the individual with aphasia and identify which category of communicator fits him; it is also possible to prepare a checklist of present and emerging competencies, and if the majority of them belongs to a single category of communicator it is likely that the person belongs to that category (for example

transitional AAC communicators). Monitoring the abilities might help to see if skills in the next category are emerging, so that the goal of intervention can be a development towards independent AAC communication. For the assessment a modified PACE (Promoting Aphasics' Communicative Effectiveness) is used to elicit a communication exchange. It consists in choosing an action picture and the aphasic has to ask some questions about it, which he cannot see. This procedure helps to assess the overall success of communication and the effectiveness of the methods employed by the individual with aphasia, including residual speech. Clinicians have to assess also expressive and receptive linguistic skills in a conversational context, with and without AAC support, and with and without partner supported strategies such as written choice conversation, augmented input, cued question asking, photographs or visual scene referencing, and tagged yes/no responses. The Multimodal Communication Screening Task for Persons with Aphasia (MCST-A)<sup>42</sup> is an assessment which permits to reveal how the individual with aphasia responds to situational questions. The assessment helps distinguishing who require partner support from generative AAC communicators.

During the assessment it is possible to evaluate the access to stored messages on a SGD with a role play, considering time constraints, information specificity, length and complexity of the needed response. Other important features to consider are predictability of the answer, communicative function expressed, familiarity with the partner and the context and personal relevance of the information. Some trials can be conducted with different devices, until the appropriate size, the arrangement of message squares and the number of message per page are found out, considering motor impairment if present. To test generative AAC systems in which the individual uses combinations of two or three symbols, the procedure is quite similar, but in this case the abilities required are both for retrieve, formulate and initiate messages combined with the abilities to repair communication breakdowns through natural

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42 Created by Garrett & Lasker 2004, revised by Garrett & Lasker 2006. Found in Beukelman, Mirenda (2013), pg. 436

modalities with aided or unaided strategies (gestures or some messages on the device).

The assessment for an individual with aphasia is not only related to linguistic abilities. A language test is usually done before the AAC assessment and can contribute to the selection of AAC strategies; there are different aphasia batteries which can measure the extent of the receptive and expressive language impairment such as the Western Aphasia Battery – Revised<sup>43</sup>, the short form of the Boston Diagnostic Aphasia Exam – Revised<sup>44</sup>, or the Boston Assessment of Severe Aphasia<sup>45</sup>. Since nonfluent aphasia brings difficulties with syntactic encoding, it is important to remember that AAC strategies have to simplify combinations. Cognitive abilities have to be tested as well, especially attention, memory, reasoning and representational skills, since they can affect language. The awareness of their own communicative abilities should be also observed, as the initiative and the tenacity they have in conveying messages despite communication breakdowns.

Prior to the AAC intervention it is advisable to assess interests, topics and autobiographical information from family members and friends in order to prepare an adequate vocabulary and try to find out which will be the individual's need, that is the environment and the activities in which he will participate. It is useful to prepare a list of challenging situations, which will be also meaningful opportunities for communication such as physical needs. Then, the individual himself will be able to sort topics in preferred and nonpreferred categories, adding things he feels as important and identifying most important ones.

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43 Kertesz (1982, 2006); found in Beukelman, Mirenda (2013), pg 439.

44 Goodglass & Kaplan (1983); Goodglass, Kaplan & Barresi (2000); found in ibidem.

45 Helm-Estabrooks, Ramsberger, Morgan & Nicholas (1989); found in ibidem.

### **2.4.3 Traumatic brain injuries**

Until twenty years ago AAC intervention in case of traumatic brain injuries were delayed to wait the stabilization of the patient; the result was that the individual who suffered for a traumatic brain injury (TBI) was unable to communicate properly for long periods. Today AAC systems are designed to meet short-term communication needs, and can change over time, while all efforts to recover speech are continued. The causes of TBI are varied, but the most common are falls and traffic crashes. Usually communication disorders associated with TBI are the result of an impairment in 3 areas: cognitive impairments, damages to specific language processing areas of the brain or damages to motor control networks of the brain (dysarthria). Predicting the path for natural speech recovery is difficult and would be inappropriate, since dramatic changes can happen during recovery: some individuals recover completely, some of them can be able to produce a number of intelligible words but not completely functional speech, and others might have severe dysarthria and have to rely on AAC systems to augment speech intelligibility. If speech is marginally intelligible, the semantic context or topic may help to discriminate the words; a list of frequent topics can help to establish the topic at the beginning or to resolve communication breakdowns. Another strategy to augment the intelligibility of speech is alphabet supplementation, which consists in identifying the first letter of each word on an alphabet board; it also helps because it slows the speech rate.

To describe the recovery of people with TBI, the Rancho Levels of cognitive Functioning Scale<sup>46</sup> is usually used; it describes eight levels, from the total lack of responses to purposeful and appropriate behaviour.

During the Early Stage of recovery (Rancho Levels of Cognitive Functioning I, II, III) it is almost impossible to assess any capability, because the individual appears like sleeping or is not able to stay awake and pay attention for long periods.

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46 Hagen (1984). See Beukelman, Mirenda (2013), pg. 463 and following pages.

Observation may help in identifying changes and, as the person is more alert and more responsive, although for short period of time, a differentiation between objects and people can be a positive sign, since it is a precursor of yes/no response. The goal is to increase the consistency of responses when they appear and to shape them into meaningful communication. An assessment on visual capabilities is important to understand if a limited number of bright-coloured and exaggerated symbols can be presented for choices.

In the Middle Stage of recovery (Rancho Levels of Cognitive Functioning IV, V) responses to stimuli are more consistent but attention and memory are still impaired; if there are no specific language impairments or motor control impairments, the individual begins to speak functionally. It is now possible to identify and assess residual capabilities; after the assessment of motor control capability, memory, attention, and contingent visual-perceptual or visual acuity disturbances have to be tested. The most common goals in this phase are the compensation for attention and memory impairments, and the support to communication in case of language or motor control problems. In this phase it is important to reduce the complexity of the device and the number of messages. Context-specific activity displays are often employed, since they are simple to use and have a limited number of messages available.

In the Late Stage (Rancho Levels of Cognitive Functioning VI, VII, VIII) those who are still unable to speak have severe specific language or motor control disorders. The Participation Model can be used for assessment and intervention planning can be introduced. Communication needs, capabilities and constraints that have to be considered during AAC intervention have to be identified. Usually individuals in this stage are oriented in space and time and are able to show goal-directed and appropriate behaviour, but they still can exhibit difficulties in learning new information because of some residual cognitive impairments. At this point, they have many interaction needs, from wants and needs to social closeness, sharing of information and active participation in social routines. Usually a direct selection of

AAC techniques is used, with some trials with various devices and symbols. The majority of adults can use systems with alphabetical symbols, including letters, words and sentences.

## **2.5 Unsuccessful outcomes**

There are many issues which can compromise the outcome of an AAC intervention. They include *“the individual's or family's continued desire to work on speech alone, difficulty with acceptance of AAC alternatives, adherence to a medical model of treatment versus a participation model in available intervention centres, discontinuation of treatment, inappropriate match of system features to the communicator's capabilities, limited availability of personalized messages, lack of practice in contextual situations, lack of available communication partners for partner-supported communicators, a limited support network to assist in message development for generative AAC communicators, and/or a lack of communication opportunities because needs are met and anticipated by others.”*<sup>47</sup> In addition to all these issues, it is important that the AAC system has a dynamic content; all changes in the individual's life must be reflected in the AAC system.

Here in Italy above mentioned problems have a particular importance, since they are all mingled together. The first problem is a scarce proposal of AAC intervention, because the medical model of treatment is still widespread and very strong while AAC is seen as a last resort for complex cases, where speech did not appear or recover after a long medical intervention. Since AAC is not common, it is easy to find schools, medical or rehabilitation centres lacking well-trained staff, which slows the intervention and can compromise it because of an insufficient theoretical background or experience in handling such cases. The lack of a trained staff reflects on the quality of the intervention as well: the vocabulary will be inadequate, the training on how to use AAC strategies will be insufficient and

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47 Garrett & Kimelman (2000), Purdy & Dietz (2010), Scherer, Sax, Vanbiervliet, Cushman & Scherer (2005); found in Beukelman, Mirenda (2013), pg 443.

confused or ineffective, and the effort to use AAC strategies or devices will be too high for the individual with CCN to be worthwhile. A successful intervention embraces the individual and his family and environment, requesting a careful cooperation of all parts involved towards a shared goal. A successful intervention starts with a complete information on AAC to the individual with CCN and his family and goes on with a trained team which first identifies communicative needs and then structures an adequate intervention pathway, choosing the appropriate strategies to employ. Once the individual with CCN is able to communicate, the intervention reaches its first but not ultimate goal; as the individual with CCN gains new abilities, new interests, new environments, AAC devices and vocabulary have to be revised. A successful intervention, indeed, lasts his whole life.

### CHAPTER THREE - AAC IN USE: TWO CASE STUDIES.

*"We think because we have words, not the other way around.  
The more words we have, the better able we are to think conceptually."*

*Madeleine L'Engle*

During my internship in Ferrara, consisting in a collaboration with professor Francesco Ganzaroli, I had the opportunity to see many different cases, all of them interesting for outcomes and strategies adopted for rehabilitation or, in some cases, abilitation. I decided to focus on two of them, both concerning children who were in the care of SMRIA<sup>1</sup> in Ferrara in the period from March to June 2014, although their path had already begun: the case of V., a child with moderate autism and specific impairment in oral language comprehension, and the case of M., a child with cerebral palsy.

Both cases involve developmental disabilities and are examples of alternative or better, augmentative communication. The children are both preliterate individuals because they have not reading or writing skills and rely on symbol sets. They use unaided (such as gestures) as well as aided (such PCS on a device) symbols with a direct selection technique achieved through touch or pointing in V.'s case or through eye pointing in M.'s case. Since they are learning how to use aided and unaided symbols and the basic communication skills, they are considered beginner communicators, so they have to learn how to communicate and how to do it in their specific modality. Since they are children, it is very important to focus on their abilities first, and only afterwards on their impairments, because they can develop skills easier than adults, so that their situations might evolve and change considerably over time.

The two cases have some points of contacts and many big differences. Both have the same starting point: though for different reasons, neither V. nor M. can

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<sup>1</sup> Salute Mentale Riabilitazione Infanzia e Adolescenza (Mental Health Rehabilitation for Childhood and Adolescence) is a public centre which integrates neurologists, physiotherapists, speech therapists, psychologists and educators in the same structure, which provides care for complex situations completely.

talk. In V.'s case, it is known for sure that she also lacks comprehension abilities, in M.'s case it is suspected that he has not great comprehension abilities. However, the cases developed in opposite directions. In V.'s case, school, family and therapists cooperate in order to teach her the use of her communication device, and finally make her a competent AAC user. In M.'s case, to the contrary, the family does not approve the AAC intervention and school lacks interest in taking a definite position on it.

Before presenting the cases, I would like to focus on how the service organization works in Ferrara. My internship took place in the CSC<sup>2</sup>, which is a service depending on the municipality; its consulting is requested by schools or medical staff to find AAC solutions for people with CCN. The aim of the internship was to work together with professor Francesco Ganzaroli, an Assistive Technology expert who works for the municipality and cooperate with schools, ASL<sup>3</sup> and organizations caring for people with CCN. In the specific case of a child with disabilities, the ASL section in charge of him is called SMRIA. When it takes on responsibility of a child, it starts a procedure which involves all the parts of the service, from the medical part (such as speech therapy or physiotherapy) to the everyday environment (such as school and family). Professor Ganzaroli is always consulted when AAC is involved, both for the device's selection and for the organization of the intervention. Once the team of specialists is formed, the assessment and the intervention modalities are shared by all team members.

I shall present as first the case of V., and then the case of M..

### **3.1 V.: autism and specific impairment in language comprehension. A successful AAC intervention.**

#### **3.1.1 A short introduction on autism**

Autism is classified as a disorder of the central nervous system function, and being considered a neurodevelopmental disorder, it is included in the pervasive

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<sup>2</sup> *Centro Servizi e Consulenze*, Services and Consulting Centre.

<sup>3</sup> Azienda Sanitaria Locale, Local Health Company.

developmental disorders' group. Autism causes disorders in a variety of areas such as the acquisition of cognitive, linguistic, motor and social abilities. In 75% of studied cases, autism is associated with mental retardation and strikes three areas of crucial importance in children's development: interaction with others, communication and behaviour.

In the DSM-IV (1996-2000)<sup>4</sup>, the following are indicated as diagnostic criteria:

1) impaired quality of social interaction (for a diagnosis at least two features have to be identified):

- a) impaired usage of nonverbal behaviour such as eye contact, facial mimicry, postures to regulate social interaction;
- b) inability to develop relationships with peers;
- c) absence of emotions or goals sharing;
- d) absence of social or emotive reciprocity;

2) impaired quality of social communication (for a diagnosis at least one feature has to be identified):

- a) delay or total absence of spoken language, without the development of a compensatory modality such as gestures or facial mimicry;
- b) when language is present, no ability in starting or sustaining conversations;
- c) stereotyped and repetitive language, or eccentric language
- d) absence of simulation plays, and of social imitation plays.

3) restricted, repetitive and stereotypical behaviour, interests and activities (for a diagnosis at least one feature have to be identified):

- a) totally absorption in one or more restricted interests, abnormal for intensity or focalization;
- b) strict submission to useless habits or specific rituals;

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<sup>4</sup> Diagnostic and Statistical Manual of Mental Disorders (DSM) is published by the American Psychiatric Association and offers a common language and standard criteria for the classification of mental disorders.

- c) repetitive motor behaviour, also used for self-stimulation;
- d) abnormal interest for one specific part of an object, such as the wheels of a toy car.

Autism is difficult to recognize because of its high variability and the complex array of symptoms, whose intensity might vary. For this reason, Wing<sup>5</sup> called *autistic spectrum* the whole continuum from the lightest form of symptoms to those forms in which autism is more evident and more acute.

Autism appears before the age of three years, but some signals are present even before 18 months of age although extremely complex to recognize and point out with ease. Usually a prompt diagnosis is reached at two years of age.

One feature that makes autism more recognizable and causes alarm is language impairment, both in verbal and non-verbal modalities. Communication, to be more precise, is not totally absent but deviant; often there are no expressive or receptive language forms because the pragmatic function of language is absent. The pragmatic function of language is to enable the child to understand the value of communication, which is interacting with others socially and being able to modify the world around him through language.

Receptive communication is usually more limited than expressive one. Being a cognitive process, to explain the problematic language reception the *Weak Central Coherence Theory*<sup>6</sup> is used. According to this theory, it is assumed that the natural tendency of the cognitive system is to process stimuli in a global process, which considers them within their context and complements information in order to reach a meaning more complex than the one actually intended. Autism causes a weaker tendency to central coherence (the global information processing and combining), which does not enable people with autism to combine information efficiently to

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<sup>5</sup> Lorna Wing (1928 – 2014) was an English psychiatrist and a pioneer in the field of childhood developmental disorders who advanced understanding of autism worldwide. She introduced the term Asperger Syndrome and was involved in founding the National Autistic Society in the UK.

<sup>6</sup> Uta Frith (1941) is an English developmental psychologist who has pioneered much of the current research in autism. There is currently no consensus about the validity of the Weak Central Coherence Theory (1989, 2002) which she first proposed.

reach a uniform meaning; details tend always to be more important than global meaning.

The Theory of Mind<sup>7</sup> is also used to explain the difficulties in receptive communication. The Theory of Mind is what permits human beings to attribute one another thoughts, emotions and intentions which can be not overtly expressed; consequently, through the Theory of Mind a person is able to predict others' behaviours. If children with autism do not develop it, they have bigger and more evident deficits in social behaviour and in pragmatic communication abilities.

Any kind of symbol is totally unintelligible to children with autism; this is also the reason why they are not able to develop and participate in symbolic playing, since they cannot understand it.

Roughly the half of children with autism develop a more or less proper spoken language. Differently from children with mental delay or deafness, they do not compensate for the lack of language with gestures or other behaviours. Even when language is present and proper, often children are not able to use it to engage in conversations, resorting to some forms easily recognizable such as: echolalia, a non-creative use of language, pronominal inversion, literal understanding, idiosyncratic language, poor (if any) flexibility in the use of words<sup>8</sup>. In the use of language children with autism usually do not make errors because they mainly rely on echolalia, while typical developing children apply grammatical rules to words occurring in errors.

Children with autism, then, can be divided in two categories: roughly half of them is verbal and usually has a higher level of functioning. The other half is composed of non-verbal children, who do not develop language and since they are not naturally able to compensate for it through other modalities, they have to be taught to use a different system of communication. Comprehension has often to be

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<sup>7</sup> The Theory of Mind (ToM) had a so complex development that it is not possible to attribute its creation to a single person. The first to introduce it in the studies about autism were Simon Baron-Cohen, Alan M. Leslie and Uta Frith in a research published in 1985, suggesting that children with autism do not develop a ToM.

<sup>8</sup> Children with autism create a univocal correspondence between one word and one meaning, so that they are not able to understand other meanings of the same word.

supported in both groups, even in verbal one; a better comprehension usually results in a more efficient expressive language.

### **3.1.2 The case of V.: anamnesis, assessment and first intervention.**

V. is born on February 2008 after a normally progressed pregnancy and a regular birth. Her family is composed by her mother, father and a older sister, born in 2006. At nineteen months, V. started nursery school, showing no problems at mother detachment, but since she did not answer when someone called her name, an audiological examination was conducted issuing in no hearing impairment.

At two years of age, on pediatrician's suggestion, the family turned to a child neuropsychiatrist, pointing out the absent language development, inadequate listening abilities, difficult eye contact and abnormal autonomy showed by V. It was particularly noticeable that V. did not compensate for the absence of language through gestures, onomatopoeic language, or facial mimicry. No pointing gestures were observed, and V. tended to engage in repetitive play, using objects in a non-functional way.

During the assessment V. showed attention to environment, but she did not explore it. She was interested in very few toys used in a repetitive way and favouring toys which were rewarding a motor aspect, such as aligning, piling or rotating. Interaction, sharing and exchange were not intentional and limited to occasions in which V. needed help or on explicit requests, and even in those situations she did not alternate the gaze between the other person and the object, did not point, did not use any facial mimicry or any functional behaviour to get attention (usually she just screamed). Shared attention was very limited and also eye contact was inadequate for strength and length. In relation with others, she appeared passive and accepted meddling in her activities, but it was impossible to build an exchange based on turns. V. never involved in symbolic plays and her imitative ability was quite limited, because it happened only sometimes and with routine activities that have others as objects, since she was not able to reproduce them on herself. Verbal production was limited to vocalizations and a kind of

intonation which imitated others' intonation. There were no attempts to compensate for the lack of verbal expression through gestures, and generally communication intentionality was quite poor. Cognitive level could not be tested, but an important cognitive delay seemed unlikely. No motor, visual or verbal stereotypy was assessed.

Because of her poor social interaction, stereotyped and repetitive play and her communication deficit a diagnosis of Generalized Developmental Disorder was established.

In May 2010, V. was assessed through the CARS<sup>9</sup>, with a result of 34 points which describes a mild to moderate autism.

In September 2010, at the age of thirty months, V. took up an educational path with Maurizia Borini, a speech therapist of the SMRIA centre who administered a PEP-3<sup>10</sup>. The test highlighted a consistent deficit in both expressive and receptive language and in imitation skills. Feeling the communication deficit as a priority, the educational path consisted in enhancing comprehension through a daily schedule constructed with images and photographs and in giving her a communication book. Since V. had no problems in recognizing symbols, the passage from photographs to images and then symbols was quite rapid. To stimulate her poor communicative intentionality, toys were widely employed and the modality used were the gesture "give to"<sup>11</sup> or the PECS<sup>12</sup>. V. was taught to ask for toys with the gesture "give to", if the toys were in the speech therapist's hands, or to choose the picture of the desired toy and give it to the speech therapist as a request.

Between 2011 and 2012 V. had an intensive work with the speech therapist and at the end of this first treatment, a new assessment was done. All areas showed

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<sup>9</sup> The Childhood Autism Rating Scale (CARS) is a behavior rating scale intended to help diagnose autism. It was developed by Eric Schopler, Robert J. Reichler, and Barbara Rothen Renner. The childhood-autism rating scale was designed to help differentiate children with autism from those with other developmental delays, such as intellectual disability. The first version of the CARS was published in 1989.

<sup>10</sup> The third edition of the Psychoeducational Profile (published in 2004) allows to assess skills and behaviors of children with Autism and communicative disabilities from 6 months to 7 years.

<sup>11</sup> This gesture is made with the hand's palm upward and pointing from the actors to the action object.

<sup>12</sup> PECS, Picture Exchange Communication System; see chapter two, pg. 50.

a good improvement including receptive language, while expressive language was still absent. It was clearly necessary to help comprehension through visual supports such as images and gestures and at that stage it was important to promote communication and requests through the exchange of symbols with the goal of pointing to symbols in a communication book. The speech therapist aimed at gradually fade the visual support to comprehension, but V. showed unexpected problems in processing oral requests. As a matter of fact, V. looked to be unable to comprehend any kind of oral communication. Deeper analysis were conducted in 2013, in order to find out the cause of the comprehension impairment: the cognitive evoked potentials were assessed through the mismatch negativity (MMN)<sup>13</sup>, in order to verify the automatic processing of auditory stimuli out of V.'s attentional focus. Results clearly showed that V. did not understand language because she had no oral language automatic processing, which created a specific impairment in oral language comprehension. V. heard perfectly all sounds, including oral language, but her brain did not decode it. Since this impairment might reduce or even disappear over time, it is important to keep on stimulating V. through oral language, and also to enhance comprehension through visual support because it is the only effective communicative modality for both expressive and receptive language. As electronic communicator, an iPad was used with an AAC program called *Parla con 1 click*<sup>14</sup>, which had some communication tables with photographs and PCS and a voice output. The goal of the AAC intervention was to enable V. to make more complex requests by constructing sentences. V. was trained during speech therapy sessions on how to construct nuclear sentences (subject-verb-complement)<sup>15</sup>; after some initial difficulties, V. developed a good competence in forming sentences. The AAC device was used both by V. to communicate with

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<sup>13</sup> The mismatch negativity (MMN) is a component of the event-related potential (ERP) to an odd stimulus in a sequence of stimuli. It arises from electrical activity in the brain and is elicited regardless of whether the subject is paying attention to the sequence. It is measured with an electroencephalography (EEG) in the case of auditory stimulus.

<sup>14</sup> *Parla con un click* is an Ipad application designed, developed and hosted by Tookty® LLC, available for IOS and Windows. Imported in Italy in 2009.

<sup>15</sup> These nuclear sentences are formed by subject, verb and object, always in this precise order. The object can be a direct object or an indirect object.

others and by others (parents, teachers, classmates) to communicate with her; it was of essential importance to enable V. to express what she wanted and to understand what was happening around her, in order to avoid social isolation.

### **3.1.3 My first meeting with V.: observation, behaviour and abilities.**

I met V. during her speech therapy sessions many times during my internship. The team in charge of her is now composed by a child neuropsychiatrist, a speech therapist, an educator and an expert in assistive technology. I would like to point out that the speech therapist, Mrs Maurizia Borini, has a deep knowledge of AAC and a wide experience in autism. V. is now six years old, and perfectly able to use her AAC device (iPad with the AAC communication app TapSpeak<sup>16</sup>) for requests. Still, she uses it mainly to ask things. What is really striking in meeting V. is the total absence of language; I never heard her say a word, but she is always producing sounds, like a quiet humming, with a variety of intonations. She changes the sounds while doing activities such as puzzles on her iPad, and when a piece slips into the right place she produces sounds with an exclamatory intonation. It looks like she uses these sounds as a personal gratification. She often puts her hand on her mouth while humming, as wishing to feel her lips and the air emissions; she often does it with her mother, staring at her mother's lips moving and moving her own lips trying to reproduce the mechanical movement of articulation. I never heard her reproducing sounds while doing this, she just moves her lips. In those moments she looks really interested in grabbing all aspects of articulation. Before the diagnosis of specific impairment in oral language comprehension, the speech therapist trained her to reproduce the correct position of articulators for all sounds as a play, in order to improve her imitation abilities. V. is also able to write her name on the keyboard and recognize it in a list of names, because all computer games she uses during her speech therapy sessions request the user name. She does not understand it as a succession of letters (or sounds in speech) but has an holistic perception of the word as an image, which she remembers and is able to reproduce on the keyboard.

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<sup>16</sup> *TapSpeak Choice* in an Ipad application for IOS developed by Ted Conley © 2010-2011, LLC



requires more attention. V. is quite competent in this activity, and usually makes very few mistakes. Her main mistakes are due to her impatience and consist in choosing a symbol which is similar to the correct one. For example, if in the picture she has to describe that there is a boy with brown hair, and among the subject symbols, there are both a boy with blonde hair and a father/man with brown hair, she might choose the father symbol due to its close resemblance to the boy in the picture instead of the blonde boy symbol. As the speech therapist points to the wrong symbol, she is usually able to check and correct it. Being quite impatient, she tends to choose the subject first, then the object and as last part the action, but she puts them in the right order in the bottom line without hesitation.

V. knows very well the environment and were to find things she wants. The speech therapist has an iPad of her own, and sometimes she proposes V. some plays on it. At the beginning of almost every session, V. tries to find out the iPad to start playing, and remembers perfectly all the places where she already found the device, which proves that she has good memory indeed. Knowing the environment, V. needs little cues to find out what they are going to do; if the speech therapist points to the table, she sits and waits, if the therapist points to the computer, V. goes to the chair in front of it and sits there. She knows where to hang her coat and where her favourite toys are placed. As previously mentioned, she prefers toys with a relevant motor aspect, with no symbolization or fiction. She does not like toys making sounds.

On the iPad, usually she likes to play puzzles, but it is a lonely activity. When the speech therapist tries to play games with alternate turns, V. shows signals of irritation and either refuses to play and looks for a toy or she tries to grab the iPad from the therapist's hands to take it back. This second reaction is not frequent now, while it was during the first period. She gets nervous when someone tries to integrate in her play, even when the aim is giving her some help with the play and on how it works. The refuse of others' intervention has for V. negative outcomes as it happened with some computer games she used first during the therapy and then also at home as extra exercise. At home, she refused help and learned to play with a

trial and error method. For example, V. likes a play in which she has to recognize objects and click on them when a character names them (e.g. "look for the red bird and click on it!"). Since she is not able to decode the oral naming of the object, a set of card with all the named object was prepared and the trainer shows her the image of the object she has to recognize. If she is left alone during the exercise or refuses help, she is forced to click objects in a random order until she accidentally finds the right one. After a few time V. refuses help, a new issue arises since that computer game is no longer usable as an activity, but only as entertainment.

#### **3.1.4 The construction of new communication boards on the AAC device.**

When I first met V., she used the AAC program TapSpeak and had communication boards based on three different environments: home, school and medical office. Probably they were functional at the very beginning, when V. had a poor vocabulary and many objects were available in only one environment. Symbols were all mingled together with no order, but V. was perfectly able to find them quickly even when she had to switch to different environments in the same sentence. The problem arose when someone had to tell her something, and trying to find out symbols was almost impossible. The AAC communicator has to be easy to use even for those who use it for the first time, in order to be a facilitation and not an obstacle to inclusion. I thought of V.'s schoolmates: one of them might want to ask V. something, but I wondered if he would keep looking for symbols until he found them among three different folders (although they are at school and the right symbol is supposed to be there, it was possible that it was not) and a chaotic mass of symbols. I thought that he would probably give up.

A radical change in organization was urgent, and I was asked by the speech therapist to try to think of a different organization and make a plan of it to be revised by the whole team. Knowing that V. was able to create symbol sequences using the order of a nuclear sentence, I decided that it was worth trying an organization based on the creation of symbol sentences. This rigid sequence is not suggested for the linguistic development of a child, since we use different kind of

structures when talking, but in this specific situation, at least one structure was better than no structure at all.

First, I tried to figure out what V. most needs on her communicator. I knew that she used it essentially for requests, so the structure she would use is "*Io voglio...*" ("I want..."). After *voglio* (want), a verb, a noun or even a person can be added; I thought of preparing these three last categories but then I quit the idea immediately, as it looked too complicated to me. The structural change in organization was already challenging, and the introduction of such categorization could result too difficult and probably demotivating for a child with autism, who has a problematic relationship with changes. It was very important that V. felt motivated to use her communicator and that she uses it at each single need all time. A change she could not understand, approve or simply accept could lead her to refuse the use of the communicator. I decided to create two folders after *Io voglio*, one for actions and one for people. In the action folder there are verbs such as *giocare, mangiare, andare, leggere, giocare al computer*<sup>17</sup>. All these verbs need a further complement, which might be a direct object as in the case of *mangiare*<sup>18</sup>, or an indirect object in the case of *giocare*<sup>19</sup>. In order to keep the folder as neat as possible, I set every symbol in order to open another window with all options V. uses, so that they were easy to find and their use more intuitive. Other symbols can be added any time with a easy procedure, straightly in the folder. The possibility of adding photographs instead of symbols is also available and easy as adding a PCS symbol; when adding a new button to a board, it is possible to set on it a number of options including the image that will appear. It is possible to choose between PCS, other symbolic system installed by the AAC user, or photos and images available in the iPad. Every symbol is combined with the Italian word written in capital letters; the decision to add words to symbols is due to V.'s visual memory. It is not unlikely that, in the future, she might recognize some words she frequently uses as they

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<sup>17</sup> The verbs are: play, eat, go to, read, play computer game.

<sup>18</sup> The Italian verb *mangiare*, as the English one, requires a direct object (eat an apple; *mangiare una mela*).

<sup>19</sup> The Italian verb *giocare*, as the English one, requires an indirect object (play with a toy; *giocare con un giocattolo*).

were images: the picture becomes a word. In addition to that, there is the possibility that her specific impairment in language comprehension disappears at a certain time of her life.

Here are some examples of folder organization and windows:

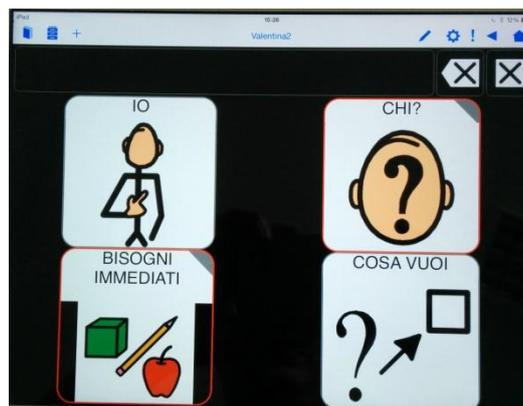


Fig.1 - This is the first page of the AAC board. By tapping on a button, a new page opens. The only button which does not open a new page is the one with the question *cosa vuoi?* (what do you want?), which is used to prompt a request. On the top of the screen the message window is fixed and shows all selected symbols. By tapping on the message window the entire message is spoken out. Tapping on *Io* (I), the symbol appears in the message window to construct the sentence. This will not happen for the other two buttons, because they are only folders needed to organize symbols and the true subject of the sentence is included in them.

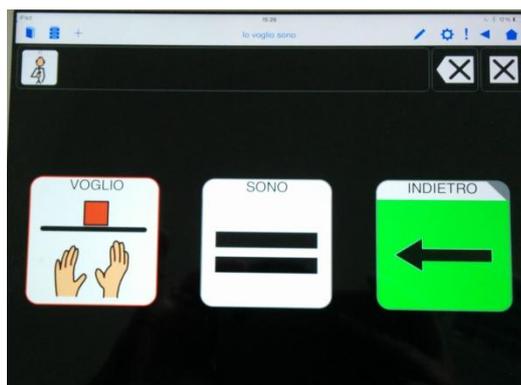


Fig. 2 - The symbol *io* (I) is visible on the message window on the top of the screen. When tapped, the symbol opens this page with the choice between *voglio* (want) and *sono* (am). The first is used to express needs and requests, the second to express feelings and conditions such as tired. The navigation button *indietro* (back) is green in all pages to help its recognizing.

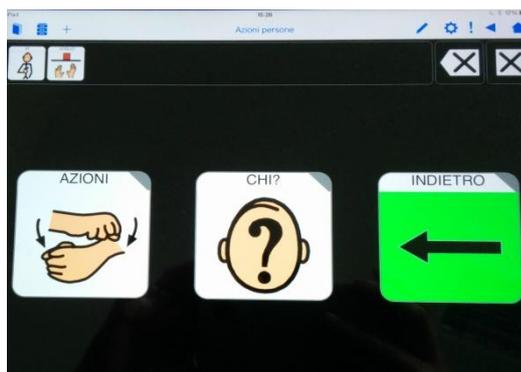


Fig. 3 - The button *voglio* (want) leads to a page with two folders: one for actions and one for people. The decision to separate the two options was forced because of the large number of items needed. These buttons are folders, so they do not appear in the message window when tapped on. The structure is the same as the one in the previous page, in order to help memorization of buttons and make the structure more predictable.





Fig. 6 - This is the page which appears when tapping on *chi?* on the first page and also on the *chi?* as object in fig. 3. All people are represented by their photograph and their name. In addition to these buttons, there are some useful buttons to talk to V., and the button *sono*, which leads to a page with feelings. It is not much used by V. today, but it is important to include something new that might stimulate her.



Fig. 7 - This is the page for fast communication. I thought of it as a page in which all more used buttons are collected, and this explains why it looks so empty now. At the moment there are few symbols connected with behaviour, such as *non urlare* (stop screaming), *aiuto* (help), *seduta* (sit down) or *finito* (done).

The new communication boards were presented at home by V.'s mother, contrary to the speech therapist's request of not showing the new boards until V. was trained during a therapy session. Anyway, V. was able to learn to use them quickly, learning the new organization fast and showing a great competence in their use in a little time. The new boards' structure was not a problem for V.; she was already able to create sentences with symbols, and I think that the boards' structure helped her by presenting the symbols in the correct sequence. There are, of course, some exceptions: time and interrogative markers are not always presented in the right order.

The request of not presenting to V. the new board outside of the therapy session was due to the risk of trial and error learning; if V. learned an incorrect boards' use, the chances to correct it were very low. A structured session of intensive use of the new boards was strongly suggested.

Today many new symbols have been added, especially photographs of objects or symbols needed to enhance comprehension and, possibly, expand vocabulary. It is important that even if V. does not use them actively, they are however available so that when she will learn their use through training or observation, she can use them spontaneously.

I would define V.'s intervention successful, because V.'s behaviour has improved. She has less frequent problem behaviour and is more manageable because she can express what she needs or wants and can understand what is happening or will happen around her thanks to her AAC device. Her cognitive abilities are improving, since she is developing or improving new abilities and skills. Still, her communicative intent is low, due to autism; she uses her device when needed (but not so often at home, which is an aspect that has to improve). Other people use her device successfully to communicate with her, so inclusion in class is improving.

### 3.1.5 Final considerations on V. case

Since a consistent cognitive delay is unlikely, the only obstacle to language acquisition or learning is the specific impairment in language comprehension. It looks to be an impairment connected to oral language comprehension, as V. is able to understand ideas expressed through symbols. Due to autism, her communicative intentionality is limited to needs and requests, but her ability to use symbols instead of photographs or pictures demonstrates an high level of abstraction. From the observations I made during speech therapy sessions and from what the therapist told me, I can say that V.'s memory looks age-appropriated. We do not know if her cognitive abilities are developed enough to allow her to learn a full-fledged language.

At this point, her good memory, visual, imitation and attention abilities, fine motor skills, besides the fact that she is able to learn communication through symbol combination, leads me to suggest an attempt to expose her to a full-blown language as soon as possible. Since exposing her to vocal language has been proved to be fruitless, the alternative could be the exposure to LIS<sup>20</sup>, which is a full-fledged language that will allow V. to develop the same linguistic competence as a spoken language. Offering her the chance of being exposed to language is crucial for her cognitive and linguistic development. She is now 6 years old, that means she is still in time to learn a language which will be her first language (L1), although the time for exposure is not unlimited.

As Guasti explains in her book<sup>21</sup>, the critical period is a phase in life span during which the individual develops some particular skills with a higher sensitivity and an optimal outcome. Lennenberg<sup>22</sup> proposed that critical period exists for language as well as for other abilities such as vision, and it is supposed to guarantee and optimal acquisition of the individual's first language. The hypothesis was supported by studies on linguistic recovery both in children and adults, which show how children have a better recovery after brain damages. In addition to brain

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<sup>20</sup> LIS: *Lingua dei Segni Italiana*, Italian Sign Language.

<sup>21</sup> Guasti Maria Teresa (2007), *L'acquisizione del Linguaggio. Un'introduzione*, pg. 46 and following.

<sup>22</sup> Lennenberg E.H. (1967), *Biological Foundations of Language*, Wiley and Sons, NY; from Guasti M.T., (2007).

damage recoveries, also cases of compromised L1 acquisition seem to suggest the existence of a critical period: the most famous cases are Genie<sup>23</sup>, who was exposed to language at 13 years of age, and Chelsea<sup>24</sup>, who as a child was diagnosed with mental delay, and at the age of 31 years was discovered as only deaf. In both cases they were not able to develop a proper language. On the contrary, Isabelle<sup>25</sup>, who suffered from social deprivation from the first year until 6 years of age, was then able to catch up with her peers, from a linguistic perspective, in one year only. These cases are emblematic, but there are many studies conducted on deaf population which point out that the sooner the deaf child is exposed to sign language, the faster and more properly the linguistic system develops. The critical period seems to span from birth to adolescence, with optimal recovery outcomes. Obviously, the nearer to adolescence, the worse the process works: performances lower as it gets closer to adolescence. Since linguistic development is fully working and still acquiring complex structures, such as passive sentences, in typically developing children at the age of six-seven years, V. is still in time to be exposed to Italian Sign Language. Unfortunately, there are not many studies on how sign language helps the development of oral language in children with autism. Cristina Cavaliere describes in her graduation paper<sup>26</sup> three cases of children with autism exposed to signed language. They proved that the use of signs had been a good support to communication and, when possible, to oral language. Tincani (ANNO)<sup>27</sup> describes two children with autism whose oral production was improved by the use

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<sup>23</sup> Curtiss S. (1977), *Genie: A Psycholinguistic Study of a Moder-day "Wild Child"*. Academic Press, NY, in Guasti (2007) pg. 47.

<sup>24</sup> Curtiss S. (1989), *The case of Chelsea: A new test case of the critical period for language acquisition*. Unpublished manuscript, University of California, LA. In Guasti (2007), pg. 47.

<sup>25</sup> Davis K. (1947), *Final note on a case of extreme social isolation*, American Journal of Sociology, 52, ppg. 432-437. In Guasti (2007), pg. 47.

<sup>26</sup> Cavaliere (2010) *I segni: ponte verso l'acquisizione linguistica e la comunicazione in bambini con autismo*, pg. 56 and following.

<sup>27</sup> Matt Tincani, Ph.D., BCBA-D, is an associate professor in the special education and applied behavior analysis programs at Temple University. He is interested in topics related to positive behavior support and effective instructional strategies, with a focus on students with disabilities who display problem behaviors.

of signs: in fact, vocalizations were more frequent after the manual production of the correspondent signs<sup>28</sup>.

The exposure to sign language could be of particular importance if the specific impairment in language comprehension might reduce in the future. Besides all the above, signs are an unaided modality of alternative communication; if V. learns some signs, she will be able to communicate even if her Ipad is not available at that moment. The competence in managing an unaided modality of communication could be very important in order to be independent of all electronic devices and have a last resort useful in every situation. Even the production of a single sign is advisable and would be of great importance.

Some objections have been raised at the above thesis by her family and the speech therapist. It is true that LIS is unknown to most common people, and that the use of her AAC device is simpler and easier to understand for everyone; but the aim of exposing V. to LIS is to give her the opportunity of acquiring a full-blown language. Another possible advantage of the LIS exposure is the learning of single signs which might substitute the iPad use in some contexts. In this possible scenario, the main point is that V. has the linguistic basis to learn another language, if her specific impairment reduces in the future.

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<sup>28</sup> Tincani, M. (2004), *Comparing the Picture Exchange Communication System and Sign Language Training for Children With Autism*. In Cavaliere (2010), pg 37 and following.

## 3.2 M.: cerebral palsy and a difficult AAC-family relationship

### 3.2.1 A focus on cerebral palsy

Cerebral palsy had been reported for the first time in 1861 by Little<sup>29</sup> under the name of "cerebral paresis". Many attempts have been done over the years in order to define it due to its different manifestations. In 1964 Bax<sup>30</sup> defined it *as a disorder of movement and posture due to a defect or lesion of the immature brain*<sup>31</sup>; this definition is still used successfully, especially with three criteria of exclusion to isolate cerebral palsy from other diseases and cerebral issues. Bax excluded *disorders of posture and movements which are:*

- *of short duration*
- *due to progressive diseases*
- *due solely to mental deficiency*

Bax's definition focuses on motor aspects and stressed the specific consequences of early as opposed to late and acquired brain damage. In 1992 Mutch and colleagues changed the definition given by Bax in order to account for the high heterogeneity of cerebral palsy; they used the term cerebral palsy as *an umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stage of development*<sup>32</sup>. In April 2006, the Executive Committee<sup>33</sup> proposed

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<sup>29</sup> William John Little (1810–1894) was an English surgeon who is credited with the first medical identification of spastic diplegia, which he observed in the 1860s amongst children. Little was one of the first to bridge the gap between neurology and orthopaedics, and his important work continues to impact both of these fields, including the continually-increasing cooperation between orthopaedic surgeons and neurosurgeons in today's management of spastic cerebral palsy and similar neuromuscular disabilities. Also, Little founded the Royal Orthopaedic Hospital of London.

<sup>30</sup> Martin Bax has been a paediatrician for over 40 years. He was one of the pioneers of community paediatrics and brought a scholarly approach to the subject, being also very active in research. He was chairperson of the European Academy for Childhood Disability (EACD). His most important research are about Cerebral Palsy and about Autism and Epilepsy.

<sup>31</sup> Bax MCO, (1964), Terminology and classification of cerebral palsy. *Dev Med Child Neurol* 6: 295-307; found in *A report: the definition and classification of cerebral palsy. April 2006.*

<sup>32</sup> Mutch LW et al., (1992), Cerebral palsy epidemiology: we are we now and where are we going? *Dev Med Child Neurol* 34: 547-555; found in *A report: the definition and classification of cerebral palsy. April 2006.*

and approved a new definition for cerebral palsy which considers and highlights motor disorders, but recognizes that they are often accompanied by other developmental disorders.

*"Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy, and by secondary musculoskeletal problems."*<sup>34</sup>

Motor disorder is the main factor to be emphasized, but it is not the only one because many other developmental disorders often go with cerebral palsy. The fact underlines that a correct approach to cerebral palsy needs to be multidimensional and with a multidisciplinary setting.

Cerebral palsy is classified considering the following components:

- 1) Motor abnormalities: nature and typology of the motor disorder, functional motor abnormalities.
- 2) accompanying impairments
- 3) anatomical and neuro-imaging findings: anatomic distribution (parts of the body affected by cerebral palsy), neuro-imaging findings.
- 4) causation and timing of the disease.

What is of main interest is the point of accompanying impairments. They can interfere with daily life and can produce even greater activity limitation than the motor impairment itself. These accompanying impairments might be: seizure disorders, hearing and visual impairments, cognitive and attentional deficits, emotional and behavioural issues, later-developing musculoskeletal problems. All these impairments have to be classified as present or absent, and if present the extent to which they interfere with the ability to function or to participate in

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<sup>33</sup> On July 2004 an International Workshop was held in the USA and sponsored by many association interested in cerebral palsy. The task was to revisit and update the definition and classification of cerebral palsy.

<sup>34</sup> Rosenbaum P., Paneth N., Levinton A., Goldstein M., Bax M. (2006), *A report: the definition and classification of cerebral palsy. April 2006.*

desired activities have to be reported. The presence or absence of epilepsy, IQ, hearing and vision have to be assessed as well.

### **3.2.2 Anamnesis and evaluation**

M. is born on 2002 and is now 11 years old. He is affected by a cerebral palsy triggered by perinatal factors. Because of his cerebral palsy<sup>35</sup> he has no control on most of his body and is not able to produce any voluntary sound. Facial expressions are almost absent, but M. is able to smile with some effort: when he does it, it means a great happiness. The head is in control only when lifted with a dedicated neck brace, which lifts up the chin so that the head is not lowered. M. cannot move his legs and has a limited control on arm movement, especially on the right arm and hand. This limited control was used to develop a natural yes/no system, which unfortunately is not totally reliable because of its slowness and sometimes its unclarity. Considering the great effort it requires, it is not surprising that M. gets tired easily and that his answers are more and more confused. The yes answer consists in lifting up a little the right arm, or in cases of great emphasis both arms, while the no answer consists in leaving the arm laid on the wheelchair armrest and waving the fingers. This system works great when M. is not tired and wants to communicate, but when he is tired, he often signals the yes answer by lifting just the hand, moving the wrist instead of the shoulder. In this way, the positive or negative answers can be confused; sometimes his answer starts with one of the two gestures and then changes, probably because movement control is difficult. Matters are further complicated by the comprehension issue: we do not know how much he understands of what is said to him. His educator reported me an episode which happened some months ago: the educator wanted him to look at his own face on a mirror, but sitting on a wheelchair the mirror was too high to reflect M.'s face. The educator asked him if he could see his face and M. raised the arm, which is the signal for a positive answer, but it was impossible for M. to see his own face in the mirror. There can be many different explanations for this episode: M. might not

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<sup>35</sup> For further information on cerebral palsy see chapter two, p. 27 and following.

understand the educator's question, even if repeated twice or three times, because of a momentary distraction or M. might not understand the question because he is not totally able to understand it. This situation questions M.'s comprehension abilities and how much he really understands of what is said to him. M. might also have answered with a positive answer due to other motivation such as the fact that the mirror was too high to reflect his face and he did not want, or did not know how to explain it to the educator.

Examinations on M. are quite difficult to conduct because of the lack of communication; the only reliable exams are those which do not need a direct patient intervention. We have no way to test his cognitive level, his comprehension abilities, as well as the sight, which is essential to program an AAC intervention. On the other side, we know for sure that his hearing is normal, because when he hears a sound he immediately tries to identify its source. As for the cognitive and linguistic aspects, there are almost no way of testing them. He always tries to interact by smiling and using as often as possible the yes/no answering modality, and he looks like using them properly most of the time. This feature lets us suppose that at least in a partial and incomplete way, he understands what is said to him. No clues are present on how partial is his comprehension, but it is important to remember how much language development and motor ability are connected at an early stage of development; it is not unlikely that the lack of object manipulating experiences can impair the cognitive aspect of language, since the cause effect relationship cannot be properly established.

### **3.2.3 AAC intervention on M.**

The team in charge of M. is composed of a child neuropsychiatrist, a physiotherapist, an educator and an expert in assistive technology working to find out an alternative modality of communication. M. has no control on his facial mimicry, which cannot be used as a discriminating factor. Since he has no voluntary movements except a little control on the right arm (and sometimes on the left one,

to lift it with the right one), the only possible access to communication is and was represented by gaze, with the big question on his visual skills.

In order to see if gaze might be the alternative solution to the absent language, some trials with an ETRAN<sup>36</sup> began. After a little time, M. showed to be competent in using it with an optimal outcome; he understood the meaning of PCS symbols, although he was stimulated also through language.

The main problem in M.'s path is the inconsistency of AAC intervention. His family refuses the use of AAC, and at school it is not used, while it should be used every day and become the main communication modality. Materials for ETRAN had been left at school many times, but they were not used and got lost. The use of ETRAN is not difficult; using three or four images at a time following gaze direction is not complicated and with little training it is possible adding more images. I tried myself the use of an alphabetic ETRAN (which means having 21 letters on a board, and not just three or four symbols) and I was able to understand most of the words spelled on it. For M. the use with three or four symbols was advisable at the beginning because he had to accustom to ETRAN: he had to learn to explore the communication board, learn to recognize the symbols and their meaning, and improve his attention span. The use of ETRAN, on the other way, demands to the communication partner to actively enjoy the use of AAC strategies and to get involved into it in first person. The communication partner has to learn with the AAC user how to track his gaze, has to misunderstand the message and experiment communicational breakdowns, in order to learn new strategies to prevent errors and repair communicational breakdowns. This experience requires to the communication partner a big effort, much work and expose themselves, which is a challenge that not everyone is ready to take.

Since M. proved to be competent in the use of ETRAN, it was decided to try to use an eye gaze device which uses the same strategy of ETRAN, consisting in pointing the gaze for a longer time to the symbol which has to be selected. After

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<sup>36</sup> The ETRAN is a communication board arranged in order to be used through gaze. It is made of a transparent material such as plexiglass, in order to follow the gaze direction, and has some symbols or words on it. They can be printed and so fixed, or secured through Velcro so that they can be changed easily.

some trials, M. was able to use the eye gaze device to play some cartoons. While V. combines symbols, M. uses one symbol to mean a whole sentence: for example, the symbol for cartoons has the vocal output *voglio guardare un video* (I want to see a video).

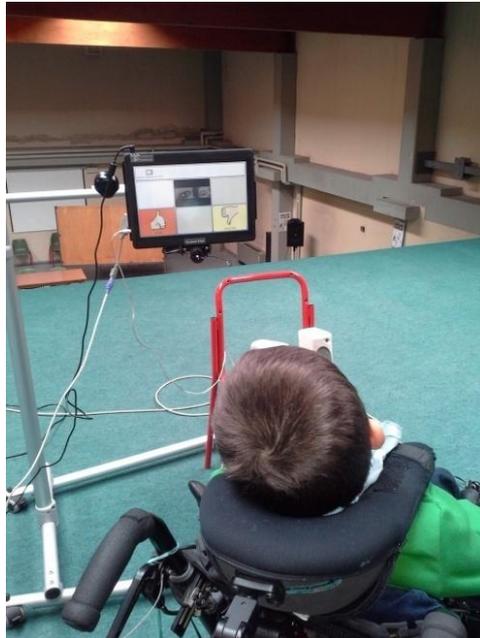


*M. watching some cartoons at school. It is possible to see here the neck brace which allows a better control on head movements.*

The main problems in the use of the eye gaze device are represented by the discontinuous use of it: divided attention, frequent lapses in concentration, easy tiredness. Before my internship, approximately ten meetings with the eye gaze device had already been done, and M. had improved his patience in using the device and shown more perseverance in trials and a higher tolerance to repeated trials.

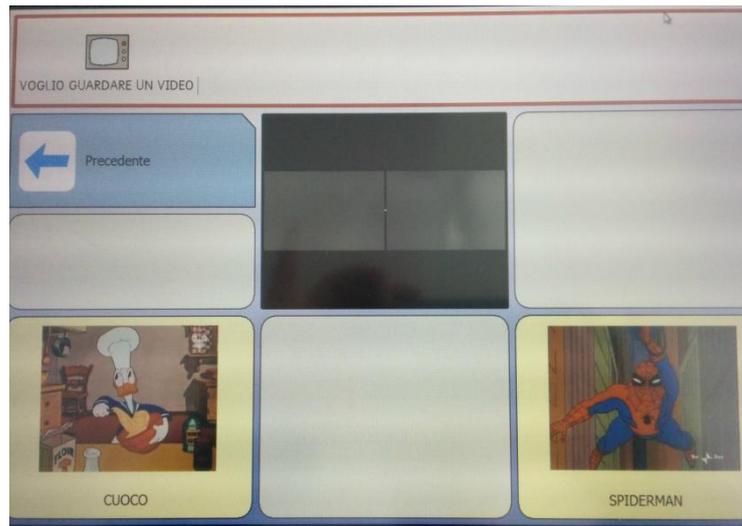
Before my internship, the aim was understanding if the eye gaze device could be employed successfully with M.; when my internship started, the decision of using it was already made. M. had to be prepared on using the device, the device had to be adapted to M. and his needs. He had to understand that the eye gaze device is not a toy but it can be used to communicate. Until that moment, M. used it only to watch cartoons; the meetings were very difficult because they were distant in time and sometime they were also disturbed by school staff members. The aim shifted to the necessity for M. to understand that he acts voluntarily on the device and this made some things happen; through the device M. is able to regulate other's behaviours, which was something new to him, something he had to understand.

The first step was a different organization of cartoons on the device screen. New cartoons were added and at the end of each of them, M. is forced to give a personal opinion by choosing between two buttons: *mi piace* (I like it) and *non mi piace* (I don't like it), in order to encourage conversation and be more independent, so that he does not need stimulus to express an opinion or thoughts later in time.



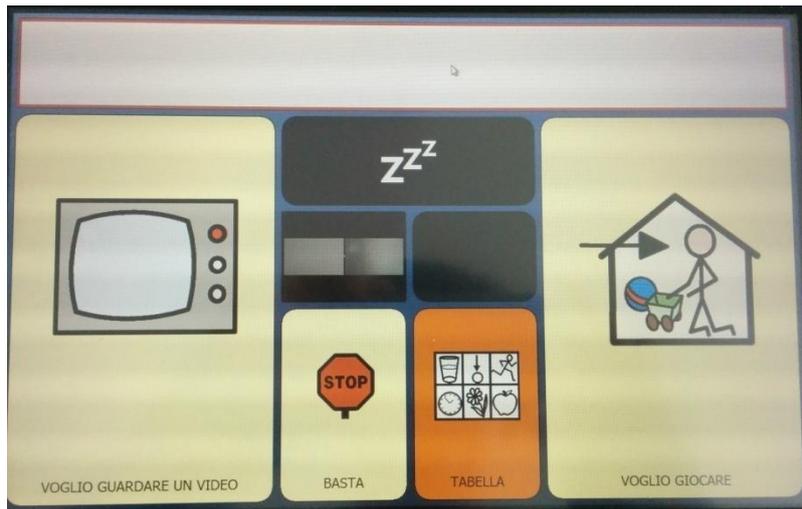
*M. chooses to say that he likes this cartoon. On the central square in the screen there's a space dedicated to the camera, which is quite useful to see if eye and camera are aligned or not. If not correctly hooked, the device would not work.*

Cartoons were presented two per page, plus the next button to go to next page, and their order was changed so that he did not find the usual cartoon in the usual position.



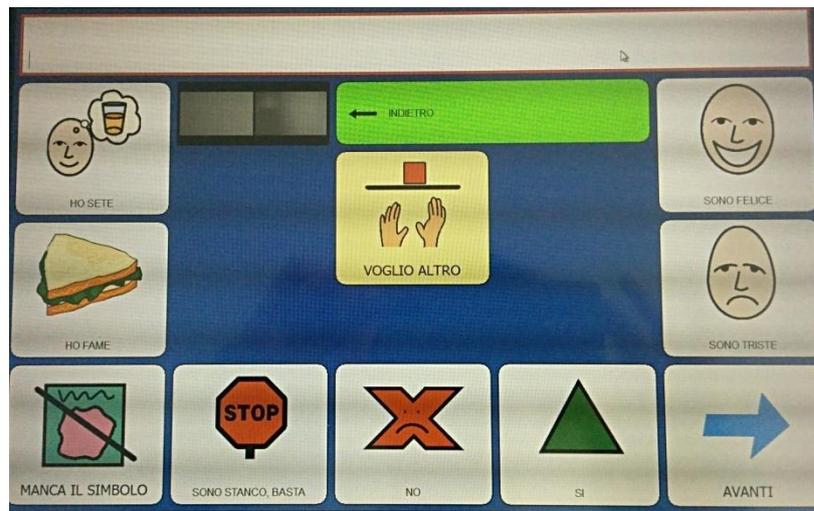
*One of the cartoon pages. See on the top of the screen the message window.*

Presenting only two cartoons per page, though M. could probably manage even three or four choices per page, was a strategy to make him understand the choosing process and, at the same time, the relationship between his gaze and the device. Helps and prompts in use were going to be faded as soon as possible, so that M. understood that it is him who operates on the AAC device, and what happens on its screen is his own choice. Unfortunately, the first time cartoons were ready M. was tired and not very attentive. During this train session, I had the impression that the timing for selection was too high. The timing for selection is the amount of time (seconds) for which the AAC user has to point to the button to select it. The higher it is, the more time the communicator has to focus on the button. This makes the process slower, but at the same times prevents unwanted selections. Observing M. facing a new board, I thought that he needed some more time just in the first use to take confidence with symbols' disposition, which can be achieved covering the camera with one hand and taking the hand off when M. is ready. Then, the selection timing can be reduced.



*The new home of M.'s device. The Zzz button on the higher part of the screen informs the user that the camera is not working at the moment.*

I prepared a small communication board using the pc program Clicker 5<sup>37</sup>, which was already installed in the eye gaze device and allows the creation of communication boards with PCS or other symbolic systems and/or alphabetical system. Every buttons can have a link to other pages, but for the first trial probably a simple and clear board was more advisable.



*M.'s communication board. It has only few symbols with the words corresponding to the vocal output written under the symbol.*

<sup>37</sup> Clicker 5 is a pc program developed by Crick Software , an English company, which has been translated into Italian. The English version of Clicker 6 is now available.

Only the basic symbols were included for this first communication board, symbols which were already known to M. from the ETRAN use, such as *manca il simbolo* (the symbol I need is lacking). This communication board is still founded on the use of yes/no questions and does not allow a big choice in expression, but it is important to keep in mind that the use of a communication board on the eye gaze device was new to M. and requested some practice.

During the session, M. explored it and then started to select again and again the symbol for thirst. It was not important if he was really thirsty or not, but it was perfect that he made spontaneously a request, in order to create the correct link between symbol and consequence in other's behaviour. The next step would have been to give him some water, but instead of water, or some juice, the school staff offered him some yogurt. Since M. is able to drink from a spoon, there were no reason to offer him yogurt instead of something to drink, and this was a huge mistake because it compromised the right connection between action and consequence: if M. had selected the drink symbol, he should have seen someone getting something to drink to offer him, otherwise he might perceive the use of the communication board as useless. Why does he have to strive to select a symbol to make a request if what he wants goes unheard? At this stage, it is important to create the conditions leading to communication, and the perception of the value of communication. It was not important if he really wanted something to drink (indeed, we thought that he probably made the selection without knowing what would have happened, out of curiosity), but it was important to create the correct link between action and consequence, as the interpretive pathway suggests in order to facilitate the transition from a casual and inconsistent behaviour to a voluntary one. At this moment, all communicative acts expressed through the communication board have to be overinterpreted and reacted to as if they were voluntary, so that M. can perceive them as effective ways of engaging in communication with partners and regulating their behaviour. And if M.'s behaviours are not voluntary? If he did not really want something to drink, but pointed to the symbol accidentally? He

should have learned that selecting that symbol he will receive something to drink. That day he did not really want it, but the day after he might really want some water and repeat that particular behaviour, again and again, making it a habit for drinking. The same process has to be repeated with all symbols; it is not known if he has the ability to generalize processes, so that he would spontaneously understand that by pointing to some symbols, he gets some precise things. If he does not have the ability to generalize, then it is possible to teach him how to make requests with all symbols.

Having partial and non precise information on his cognitive level, it is also difficult to make long-term planning without underestimate M.'s abilities. For sure, he will go on with the physical therapy to maintain arms mobility, and the work with the eye gaze device needs to become an everyday routine with precise aims ranging from the implementation of vocabulary to an exposure to oral language supported with symbols, to improve comprehension abilities. Probably, once M. will be able to use the device properly, it could be used to test his cognitive abilities adapting some tests to his communication modality.

At the present time, the main problem is the attitude of both school and family with respect to the AAC device and the whole AAC intervention.

### **3.2.4 Family and school: a difficult relationship with AAC intervention**

Both family and school have problematic attitudes to the AAC intervention for different reasons and with different degrees.

M.'s family is composed by him, mother and father. His mother is the one who takes most care of him and usually meets the team which follows M.'s case. She left the idea of a possible use of voice quite late, after repeated medical examinations conducted by the SMRIA team as well as by other highly specialized centres. M.'s mother looks to be more interested in using and developing the physical yes/no communication system instead of a eye gaze technique, such as the ETRAN or the eye gaze device. The yes/no physical answer should not be neglected, and it is good that M. keeps using it when possible; but he needs a possibility to express more,

and to express it more freely. She also affirms that M. is able to indicate, though slightly, by moving his hands. At home, his father sits M. on his lap, bends M.'s torso forward and stretches and holds up his upper arms, so that M. can move the hands to indicate one of two options by moving a little the right or the left hand. The fact is that this method can't be employed away from home, because that position is difficult to reproduce, requests some strength and especially a very close position, which I define as intimate. Of course, a stranger can't sit M. on his lap and ask to indicate things which someone else prepares in front of him; it is not a social acceptable solution, and it has to be remembered that the aim of an AAC intervention is to look for the most effortless and acceptable solution.

It was previously mentioned how important is the acceptance of the AAC intervention by both the person with CCN and his social environment, which for M. means family and school mainly. If the family does not support the AAC intervention and uses different communication strategies, the intervention planning calling for collaboration among all environments and individuals is not going to work. Perceiving the refusal of the family and the poor support from his family, M. is not going to make efforts on the eye gaze device's usage.

The lack of support by his family matches with the lack of interest at school. Although the AAC team asked the school to organise to be independent from their help and to ask for an eye gaze device in the structure to be used by M. every day, the school stays in a limbo made of indecision and postponing the matter. From the beginning of the school year, the AAC team proposed the school to send a form requesting the AAC device and taking responsibility for it. Since it is an expensive device, the school had to prepare a stash in which the device can stay over night or when the school is closed. This closet looks to be the biggest problem. At the end of May, the school still had an ambiguous behaviour towards the device: if the problem was the device safety, the answer should have arrived earlier with its motivations. In May, the school's answer was still on how to prepare the request, where they can find the documents to prepare it, whom they have to ask and similar questions. I agree that keeping a so expensive device is a great

responsibility. I also agree that it is difficult to go against the family's attitude to not encourage the use of the AAC device. What I feel as detrimental is the ambiguity and the lack of interest in the whole AAC intervention. The ETRAN is a simple piece of plexiglass and still it is never used, although it requires no stash.

Both the ETRAN and the eye gaze device require an engagement with M., a great effort to learn how to use them, to prepare them and periodically updating them by adding new symbols made of piece of paper or bunch of pixels. Giving him the possibility to express freely means that M. can say what he wants. It means recognising him as an individual with precise will and desires; this is not something which should be further postponed.

### **3.2.5 An unexpected success**

The family opposition and the school's lack of interest were ingredients for a failure, M. however showed interest in the AAC communication. He was always very cooperative with his own limitations connected with poor attentional focus and the tendency to fatigue easily, but he was also able to show a great tenacity and patience in learning how to use the device and waiting for it to be adapted to his needs. It was not an easy path, but he helped in it.

During the second half of May and June, there were no meetings because the AAC team was waiting for an official request from the school, which never arrived. Nevertheless, the team was discussing on a way to hook his family to the eye gaze project. As said before, one of the essential features of AAC intervention is organization; everyone has to go in the same direction in the agreed modalities. It was essential that his family support to intervention and acceptance of taking a role in it. The first step was to engage the family in the use of eye gaze device; at the end of July a meeting was organised in order to show M.'s mother the use of the eye gaze device. The aim of the meeting was showing her the possible use of the device as a diagnostic instrument, which can be used to assess visual acuity and more generally visual perception as a first step, and to show her how the device works. Since she never accepted the use of the eye gaze device, though she never openly

opposed to it, the acceptance of it as a diagnostic instrument was a significant step forward in the direction of considering it as a communication device.

During the meeting, M. started to use the communicator on his own will, and once he selected the cartoon button he tried to call his mother's attention, using his voice and moving on his wheelchair. He made it clear that he wanted his mother to sit with him and then chose a cartoon to watch together; after the cartoon, he selected the button with the message *basta sono stanco* (stop, I'm tired). The team asked him to confirm if he was really tired and wanted to stop, and he confirmed by raising the arms in his yes/no modality. He was visibly satisfied of what he had done, and his mother was positively impressed.

She is not yet ready to consider the eye gaze device as a communicator device, but she accepted to use it for a diagnostic purpose thanks to M.'s demonstration of great competence in use. The road to reach an everyday use of the device is still long, but from September on, M. will use the device regularly during some therapy sessions at the SMRIA.

### **3.2.6 Conclusion on M.'s case**

The case of M. is totally different from V.'s case: we have opposite physical situations, opposite access issues, opposite problems in communication intentionality; still, the huge difference between M.'s case and V.'s case is the cohesion among family, school and the specialized team which follows the child. In M.'s case, family, school and AAC team do not work in the same direction and with the same goal; the team tries to add a new communication modality which goes with the existent one and increases the possible answers and gives M. the possibility to make a precise request or display a precise mood. Considering communication alone, there are no possible ways to evolve the present situation except for the eye gaze. The only use on yes/no answers is constraining and, I think, frustrating; the communication partner has to guess every time what the person with CCN needs, and if the partner is off-topic the person with CCN has no way to tell him that he is wrong. There are no way to comment on things or events, no

possibilities to express an opinion or to make a direct request. Being able of saying just an uncertain yes or no is definitely constraining.

The possibility of using the eye gaze device as a diagnostic tool is a great opportunity to test M.'s visual abilities, which informally has always been considered good. But I think that, once M. has become competent in the device use, it is possible to take advantage of it and use it to test other abilities, such as cognitive ones. It would be of great interest, and it would be useful, to know how much M. understands of the world surrounding him. The team thinks his memory works well, because he is able to repeat the calibration<sup>38</sup> of the eye gaze device without instruction and because he seems to remember persons and events.

I suggest that the use of the eye gaze device might be useful also to test the linguistic development. A picture-matching task might work: the target sentence should be presented orally, and then M. could choose one of the alternatives, preferably among three or four options with one correct image. Given M.'s short attentional span and his tendency to fatigue easily, the test should be divided in at least three or four sessions of five trials each for the first times, and a first session should be dedicated to explain M. how the test works and what he has to do, checking if he correctly understood it. First, a test on vocabulary is essential: it is important to verify familiar items, and see how many words he knows because the correspondence word-PCS symbol might be unclear, or he might know the word but not be familiar with the symbol. Testing both the symbol vocabulary and the oral word vocabulary is important because, as explained in chapter two, there might not be an exact correspondence between the internal lexicon<sup>39</sup> and the lexicon available in communication boards. I think that the test should start testing simple sentences with a SVO<sup>40</sup> structure, and then some more complex structure can be assessed to have an overview of M.'s linguistic abilities. Once the overview is

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<sup>38</sup> The calibration is a short procedure which has to be done every time the device is moved and the individual with CCN starts to use it again; it is a procedure to hook the eye to the camera. If the calibration has optimal or good results, it means that the posture/device's positioning relation is good; otherwise, if results are unsatisfactory, probably the device has to be placed in a different position.

<sup>39</sup> The internal lexicon is the body of words known by an individual.

<sup>40</sup> SVO: Subject-Verb-Object. Italian language displays this as its basic words order.

complete, it could be possible to teach him some of the unknown structures by exposure and play. The organization of a possible test is a complex issue which requires a long preparation and a careful reflection, but it is a chance worth a try.

I think that M. has more potential than his environment believes. A test would assess his abilities, which I am sure would be many, and could be used in order to work on them and improve them. It is very important that a correct, organized and continuous intervention starts as soon as possible.

## CONCLUSIONS

It is now time to draw some conclusion of all I exposed concerning AAC and its use. First of all, a clarification is needed: is AAC a language? No, it is not. I think that the definition best suiting AAC is an access modality. It is an access modality to communication, which is the exchange of a message from an individual to another, in whatever form it might take; then, depending on the cognitive resources of the individual with CCN, this communication could be a full-blown language or not. As an example, an individual affected by ALS<sup>41</sup>, though not able to speak, understands perfectly oral language and is able to write in that language using, for example, an eye gaze device with an alphabetic board. On the other hand, an individual with autism such as V. uses symbols. Still, V. is able to use a symbolic sequence to express what she wants to say, and the order used in the sequence reflects the basic order of the Italian language.

Talking about symbols, I think it is important to clarify the relationship between signed languages and AAC: is a sign language an alternative communication? No, it is not, because it is a fully developed language which uses a different communication channel, namely the visual one. A sign language has its own prosody, grammar, vocabulary. However, signs are used in AAC as unaided symbols. The use of some signs does not mean using sign language. It is like an aphasic individual who is able to use only some words and does not understand oral language properly because he does not use grammar. In the case of the use of some signs, excluding the grammar proper of a sign language and considering signs as isolated vocalization can be considered as either alternative communication, when signs are used to replace words, or augmentative communication, when they are produced concurrently with words in order to make their meaning clearer because of cognitive problems or dysarthria. Signs can be used to enhance both production and comprehension, as illustrated in previous chapters. It is important to distinguish between signs and gestures: while signs are codified, gestures are conventional just for the persons surrounding the individual with CCN and have to be learned to

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<sup>41</sup> Amyotrophic lateral sclerosis; see chapter two.

communicate with him, and only with him, because another individual employing gestures as well will use a different gesture set to communicate.

Another question which may arise now is when to use AAC. I think the best answer is whenever there are communication problems, even if the final goal is using oral language after a training or rehabilitation period. It is important to guarantee to the individual the possibility of expression through the training period, otherwise he will not be able to communicate until the end of it. Thinking of an individual who suffers from a brain damage, the rehabilitation period might be quite long and results are often difficult to predict. Is it really psychologically and physically healthy for that person having no possibility of expression for a long period because the only strategy employed is to encourage him to use only oral language even if he is unable to use it? And especially, *is it really necessary to encourage the use of oral language* in such cases when alternative strategies are possible? Every person who used to talk before a car accident, a stroke, a disease always tend to use oral language again, because it is his natural communication modality. Only when oral language is not effective, AAC is used, as an alternative strategy or, if speech is at least partially comprehensible, as an augmentative strategy. In cases of developmental disabilities, speech has to be introduced and encouraged, but AAC does not compete with it because it uses different communication channels and strategies, but indeed, it can enhance the development and the use of oral speech. We should never forget that AAC is not an alternative to language, but only to its phonetic and verbal component. AAC is not an alternative to the neuropsychological process of language: it has to develop and it is expressed through a different modality only.

If comprehension of the world around people with CCN improves, if people around them understand their needs and opinions, if the individual with CCN experiments that communicative exchanges are effective and efficient through AAC, then he is motivated to communicate and request again, and the more he uses his own communication system, the more he becomes competent in use and is able to repair communicational breakdowns. The more the individual with CCN becomes

competent, the more he can say, and the more he is able to say, the more he wants to say. Through this process, the individual with CCN becomes a competent communicator who is able to give surrounding people a positive impression of himself as an independent and capable individual.

I think this is the most important characteristic of AAC: it allows people to communicate even in situations where it looks impossible. AAC allows people with CCN to share their life with others, which does not mean just physically, but from an emotional and social point of view, which is one of main human features and one of the main functions of human communication.

As I said in the first chapter, human beings have reached present global characteristics because of communication. Communication is our most natural touch even when we are apart, it is one of the most important social needs of humans. Through communication we grow up, we love, we care for each other, we live. Giving the chance to communicate to all of us is our higher proof of humanity, and as illustrated in second chapter there is a huge set of possibilities to enable individuals with CCN to communicate. Even in complex situations such as V.'s and M.'s cases, there is always a possibility to reach communication; its complexity and use will depend on the AAC user, but as illustrated in the third chapter these possibilities are always worth a try because their results can be brilliant. Ultimately, communication is not just the way to request help or something to eat, but is a request to be recognized and considered as human beings, it is the way we participate and shape our world.

## **BIBLIOGRAPHY**

**Anolli, L.** (2012) *Fondamenti di psicologia della comunicazione*, Bologna, Il Mulino.

**Beukelman, D., & Mirenda, P.** (2013) *Augmentative and alternative communication: Supporting children and adults with complex communication needs* (4th ed.). Baltimore, Paul H. Brookes.

**Cavaliere, C.** (2010) *I segni: ponte verso l'acquisizione linguistica e la comunicazione in bambini con autismo*. Graduation thesis, University of Venice.

**Cellarosi, G.** (2013) *Analisi di un disturbo del processamento automatico dell'informazione uditiva attraverso il caso clinico di una bambina autistica*. Graduation thesis, University of Ferrara.

**Corballis, M.** (2008) *Dalla mano alla bocca. Le origini del linguaggio*, Milano, Raffaello Cortina Editore.

**Gardiner, L.** (2008) *The Psychology of communication*. Victoria, Trafford Publishing.

**Gava, M. L.** (2013) *La comunicazione aumentativa alternativa tra pensiero e parola. Le possibilità di recupero comunicativo nell'ambito delle disabilità verbali e cognitive* (Seconda edizione, formato ebook). Milano, FrancoAngeli edizioni.

**Georges, K. E., Calonghi, F.** (2002) *Dizionario Enciclopedico della lingua latina* (Quarta edizione). Torino, Rosenberg&Sellier.

**Guasti, M.T.** (2007) *L'acquisizione del linguaggio. Un'introduzione*. Milano, Raffaello Cortina Editore.

**Nespor, M., Bafile, L. (2008) *I suoni del linguaggio*. Bologna, Il Mulino.**

**Rizzolatti, G., Craighero, L., (2004) *The mirror-neuron system*. Annual Review of Neuroscience, 27:169-92.**

**Rosenbaum P., Paneth N., Levinton A., Goldstein M., Bax M. (2006) *A report: the definition and classification of cerebral palsy. April 2006*. Washington, USA.**

**Scursatore, L., Capellino, R., (2013) *Critica del silenzio. Educazione al linguaggio gestuale nei deficit complessi della comunicazione*. Roma, Aracne Editrice.**

**Sigafoos, J., Arthur-Kelly M., Butterfield N. (2006) *Enhancing Everyday Communication for Children with Disabilities*. Baltimore, Brookes Publishing Co.**

**Tomasello, M. (2008) *The Origins of Human Communication*, Cambridge, Massachusetts, The MIT Press.**

**Warrick, A., (1998) *Comunicare senza parlare. Comunicazione Aumentativa e Alternativa nel Mondo*. Torino, Omega Edizioni.**

**Xaiz, C., & Micheli, E, (2001) *Gioco e interazione sociale nell'autismo. Cento idee per favorire lo sviluppo dell'intersoggettività*. Trento, Edizioni Erickson.**

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