Linguistic and extralinguistic communication in deaf children

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Abstract

We present a study on the linguistic and extralinguistic pragmatic abilities of deaf children. Following the tenets of Cognitive Pragmatics theory, which provides a framework for explaining differences in difficulty as regards various pragmatic phenomena, we investigate the ability to comprehend direct, indirect, deceitful, and ironic communication acts performed through linguistic and extralinguistic means. Our main prediction is that there is a gradation of difficulty in comprehending these communicative phenomena, in deaf children as well as in hearing children. This prediction is grounded on the assumptions that the construction of the meaning of a communication act is independent of both the communicative means (i.e. linguistic or extralinguistic) and the input modalities (i.e. oral or visual). Rather (as supported by previous studies on hearing children), the gradation of difficulty is determined by mental representations of different complexity and inferential chains of different loads. Our aim was to validate the predictions on (46) deaf children aged 2–4 years and 4;6–7 years. The results confirm our expectations.

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1. Introduction

A series of studies suggest that the pragmatic competence of deaf children with hearing parents, in contrast to their linguistic competence, is poorer when compared with hearing children. Day (1986) and Pien (1985), for example, reported on limitations in the strategies employed by deaf children in order to enter a conversation. Lederberg and Everhart (2000) found that the communicative skills of deaf children born to hearing parents and hearing children improve similarly along some dimensions, such as the amount they communicate, their
increasing responsiveness to their mothers’ focus of attention, or their initiating a higher proportion of dyadic conversations. However, they found some important differences in pragmatic function. Deaf children were less skilled at maintaining topics and the pragmatic function of their communication was more likely to be unclear compared to hearing children.

Furthermore, Jeanes et al. (2000) investigated the ability of two groups of profoundly deaf students born to hearing parents, one group using oral and the other using signed communication, to employ a series of pragmatic skills required for effective face-to-face interaction; for example, the ability of listeners to request clarification, the ability of speakers to respond to requests, and the strategies speakers use at times of communication breakdown. They found that profoundly deaf students had difficulty consistently using appropriate, productive pragmatic behaviors in their face-to-face dyadic interactions.

These studies indicated some differences between deaf and hearing children’s pragmatic abilities in language production. However, in our view they have three main limits. First, we do not think it is appropriate to compare the pragmatic abilities of deaf children by observing them while interacting with their hearing mothers (see e.g. Day, 1986; Lederberg and Everhart, 2000). This procedure might penalize them in that, in evaluating their performance, it takes the verbal language as a benchmark. Second, some studies evaluate deaf children’s pragmatic abilities from the point of view of individuals who speak a verbal language. In particular, such studies focus on the quantity of specific and non-specific requests for clarifications made by hearing and deaf children (see Jeanes et al., 2000). They do not analyze the appropriateness of the responses in terms of their effectiveness. It is entirely possible that the most effective responses to requests for clarifications in deaf children’s interactions differ from those in hearing children’s interactions. Thus, these studies may have measured deaf children’s pragmatic preferences rather than their pragmatic abilities.

A further limit of these studies is that they compare the pragmatic abilities of deaf children with those of hearing children only as regards the linguistic means. However, in the hearing population, linguistic and extralinguistic pragmatic abilities are mediated by verbal and visual input modalities, respectively; in the deaf population, instead, both linguistic and extralinguistic pragmatics are mediated by visual input modalities. If one assumes, as we do, that pragmatic competence can be expressed through different means (i.e. linguistic and extralinguistic), and can exploit different modalities (i.e. oral and visual), it is not entirely correct to conclude, on the basis of the studies above, that deaf children have poorer pragmatic skills than the control groups of hearing children have. To draw a conclusion like this, one also ought to compare the extralinguistic pragmatic abilities of the two groups, that exploit the visual modality in both groups. Within our framework, there is reason to believe that the pragmatic competence of deaf children, when properly investigated, parallels that of hearing children. In particular, we expect the emergence of pragmatic abilities in deaf children to parallel the emergence of pragmatic abilities in hearing children.

The present study is concerned with the pragmatic abilities of both deaf and hearing children. Some of our previous studies investigated both linguistic and extralinguistic pragmatics in hearing children: they all support the existence of a single pragmatic competence that can be expressed either through the linguistic or the extralinguistic means of communication. In particular, when we compared linguistic and extralinguistic pragmatic abilities in hearing children we detected the same trend in the degree of difficulty of comprehension between different pragmatic phenomena for both (see e.g. Bucciarelli et al., 2003). Thus, for example, an irony expressed either through the linguistic or the extralinguistic means, is always harder to comprehend than a direct, non-ironic, communication act either expressed through the linguistic or the extralinguistic means, respectively.
In the present study we expect to find the same pattern of results as for the hearing population, namely the same gradation of difficulty among pragmatic acts of different sorts. Indeed, our aim is to identify those aspects of the development of pragmatic abilities that are independent of the input modalities: these aspects should be common to the two populations of children when comparing extralinguistic pragmatics, which in both groups is expressed through the visual modality. However, we also aim to identify the aspects of the development of pragmatic abilities that are dependent on the input modalities: these aspects should emerge from a comparison of the two populations on linguistic pragmatics, which in hearing children is expressed through the oral modality and in deaf children is expressed through the visual modality. Solving these issues is relevant in that it allows us not to succumb to a bias, namely interpreting something that is a peculiarity of deaf children’s communicative development as a problem in the emergence of pragmatic competence.

2. The emergence of pragmatic competence in deaf children: the role of the visual input modality

The deaf population is not a homogeneous category: in particular, deaf children may be born either to deaf or to hearing parents, and there are many different sign languages. As regards deaf children born to deaf parents and deaf children born to hearing parents, their early experience with linguistic and extralinguistic communication follows very different patterns. Deaf children with deaf parents are exposed to a natural sign language at birth and they are socialized into deaf culture: for them, deafness is the norm rather than the exception (Padden and Humphries, 1988). However, a mean percentage of 90 deaf children are born to hearing parents, and our study focuses on this majority of deaf children. In the final discussion, we consider the possible implications of our results for deaf children born to deaf parents.

As regards the use of linguistic pragmatics for studying the visual input modality, one should realize that there are many sign languages, just as there are many oral languages. Studies in the literature are mainly concerned with American Sign Language (A.S.L.), whereas in the present study we deal with Italian Sign Language (I.S.L.). Sign languages exhibit grammatical structure at all linguistic levels, including phonology, morphology, and syntax. Deaf children who acquire A.S.L. as a native language from their deaf parents go through the same stages at the same ages as hearing children acquiring an oral language. Thus, for instance, manual babbling develops into first signs, just as vocal babbling develops into first words. Further, Goodwyn and Acredolo (1993) find that advances in cognitive abilities such as memory, categorization, and symbolization underlie both hearing and deaf children’s ability to produce their first words.

A series of studies investigate whether children learning sign languages develop signs at an earlier age than is typically expected for vocal words; the general finding is that deaf children produce their first recognizable signs slightly earlier in development, compared to hearing children producing their first recognizable words (see e.g. Bonvillian and Folven, 1993; Goodwyn and Acredolo, 1993; Meier and Newport, 1990). The data also indicate that the small difference in onset time is reliable, thus supporting the notion that the gestural modality is, in fact, easier to execute. In particular, sign production requires less fine motor control than word production (Goldin-Meadow, 2003). However, the use of signs in referential contexts (i.e. to name or indicate objects and actions in signed words) does not appear in deaf children until approximately at 12 months, precisely the age at which hearing children produce their first recognizable words in referential contexts (Petitto, 1988). As Goldin-Meadow (2003) concludes, although it may be easier to produce signs than words, it is not easier to use those signs...
symbolically. This important step in the language-learning process is taken at the same developmental moment, whether the child is learning a signed or oral language.

All these results suggest that there are constraints on the organization of all natural languages that operate independently of the modality through which language is acquired, being it oral or visual. At the same time, the modality of transmission clearly impacts other aspects of language acquisition and processing. For example, morphological and lexical information is most often conveyed concurrently in signed languages, reflecting the capacity of the visual system to process different information simultaneously.

Our analysis of the emergence of pragmatic competence focuses both on linguistic and extralinguistic means of communication, where by extralinguistic means we mean gestures. Gestures can be defined as movements of the arms and hands in a spatial region reserved for symbolic expression, typically in front of the torso (McNeill, 1998). Some (conventional) gestures are interpretable in the absence of speech, as e.g. the okay sign. Conventional gestures have form and meaning established by the conventions of specific communities; certain pictograms are an example. In contrast to words, which can be broken down into components, conventional gestures exist as unanalyzed wholes. Non-conventional gestures coincide with the specific linguistic segments to which they are linked in meaning. They are not interpretable in the absence of speech, are individual and spontaneous, are outside of any special social code that regulates them, and show cross-cultural similarities (see McNeill and Levy, 1982 for a distinction).

From the developmental point of view, gestures by deaf children are initially used as extralinguistic communication; subsequently, some of the gestures acquire a grammatical structure and become a linguistic means of communication. Although deaf children from different cultures create different lexicons (e.g. in American culture, gestures are almost always used to make requests, but the same is not true in Chinese culture), they create similar syntaxes. Thus, for example, both deaf American children and deaf Chinese children combine gestures in sentences structured in language-like ways (Goldin-Meadow and Mylander, 1998), and these are preconditions for gestures becoming language. For hearing children, the relationship between extralinguistic and linguistic communication is different, in that gestures remain an extralinguistic means of communication. However, when comparing the timing of the emergence of extralinguistic pragmatic competence in the two populations of children, we might expect to detect fewer differences than in the emergence of their linguistic communication.

Sign language is a perfect example of gestures becoming signs (see Bonvillian and Folven, 1993). In sign languages the manual modality takes on the full burden of communication. For this reason, and in contrast with the global synthetic form that gestures assume when used with speech (so-called co-speech gestures), global representation is abandoned. In sign languages segmented representation probably arises because when there is no speech, the gesture must “do it all” (see Goldin-Meadow, 2003). In addition to their function as co-speech gestures, iconic gestures are relevant to the finding that gestures become language in deaf children, and for this reason we deal with these gestures briefly, although they are not included in our experiment.

Iconic gestures specify the identity of their referents through iconicity: their form captures an aspect of its referent. They can be of two sorts: conventional or non-conventional. Some conventional iconic gestures are also defined as pictograms: such symbols are recognized within the hearing culture as standing for a given meaning. Conventional iconic gestures are often used by deaf children as “words” within their gesture system; in contrast, there are truly iconic gestures, which are not conventional. These gestures constitute 3/4 of the iconic gestures genuinely produced by deaf children. As compared to those produced by hearing children,
however, iconic non-conventional gestures produced by deaf children tend to be less transparent in their meaning than would be desirable. Thus, for example, a deaf child may pat his head with a flat palm to represent a crown, despite the fact that crowns do not sit flat on the head. Deaf children produce a wide variety of iconic gestures and tend to have a stable store of them that adhere to standards of form; this leads us to conclude that deaf children do not create each gesture anew every time they use it. Again, all this considered, Goldin-Meadow (2003) claims that sign language is a perfect example of gestures becoming signs.

More evidence to support this claim is presented in a study by Goldin-Meadow et al. (1996). They compare speech acts and gestures in production tasks in adult individuals without specific deficits and they find that when communication is based on gestures only, without the aid of speech, this modality assumes all the constraints characteristic of linguistic expression. In other words, gestures acquire grammatical form and regular syntactic rules. Deaf children use gestures to communicate, and they seem to be responsible for introducing a language-like structure into their gestures. In speech situations, however, gestures do not acquire a grammar as complex as that used by individuals who mainly use the linguistic means of expression. In such cases, gestures cannot be considered symbolic signs (see Volterra and Erting, 1990). Theoretical and functional transitions from spontaneous gestures to lexicalized signs have been investigated by McNeill (1993), who is interested in considering the relationship between gestures and sign languages.

A series of neuropsychological studies on A.S.L. also suggest that some cerebral regions process language independently of the input modality. Neville et al. (1998) employ the MRI technique to compare hearing and deaf individuals as they read English sentences and view A.S.L. sentences. They find that, when native signers view A.S.L. sentences, robust activation is observed within the classical language areas of the left hemisphere, as observed when native speakers of English read English sentences. Although there is a strong bias for these regions to process language independently of the modality of the language, native signers, but not native speakers, display robust and extensive activation within the right hemisphere. These results are consistent with the idea that early acquisition of A.S.L. leads to an increased role of right-hemisphere structures in language processing. This may occur in response to the important role of visual spatial information in processing A.S.L. Further, neuropsychological studies suggest that differences in linguistic input modalities result in differences in the functioning of the neurocognitive system and, in turn, result in different time periods in the emergence of communicative competence (Neville and Bavelier, 2001).

This brief review of the studies on deaf and hearing children reveals both similarities and differences in the two populations. A possibility consistent with both psychological and neuropsychological data is that the differences result from the different input modalities involved in the linguistic communication of the two groups: linguistic communication in deaf children exploits visual input modalities, whereas linguistic communication in hearing children exploits oral input modalities.

The present study is concerned with pragmatic abilities in deaf and hearing children, and we believe that also in this case, a proper comparison would need to take extralinguistic pragmatic abilities into account along with linguistic pragmatic abilities. Extralinguistic pragmatic abilities, in both groups of children, exploit visual input modalities. An extralinguistic analysis might shed light on a pragmatic core of pragmatic competence, which is common to deaf and hearing children, as it is not affected by the communicative input modalities. Unfortunately, the studies outlined briefly in section 1 investigate pragmatic abilities in hearing and deaf children exclusively through the linguistic channel. We now introduce Cognitive Pragmatics, which is our
framework for explaining and predicting the emergence of linguistic and extralinguistic pragmatic competence in both hearing and deaf children.

3. The cognitive pragmatics framework

A theory that accounts for the emergence of pragmatic abilities in hearing children is Cognitive Pragmatics, which offers a unified account of different pragmatic phenomena, expressed either through the linguistic or the extralinguistic means (Airenti et al., 1993a,b). The theory, which is developed within the framework of the Speech Act theory (e.g. Austin, 1962; Searle, 1969; Grice, 1989), assigns an important role to a specific sort of knowledge shared by the participants in the dialogue, namely the behavior game.

In order to reconstruct the meaning intended by an actor, Cognitive Pragmatics claims that a partner has to recognize the behavior game in which the communication act constitutes a move. Behavior games can be thought of as action plans, i.e. trees of intentions whose leaves are specified either as terminal, precisely defined actions, or as higher-level intentions to be worked out according to the context (Pollack, 1990). In addition, a behavior game specifies the typical situation in which it can be played. The meaning of a communicative action (either linguistic, extralinguistic, or, more often, a mix of the two) is fully understood only when it is clear what move of the behavior game it realizes. The context within which an utterance is proffered constitutes the validity conditions of the behavior game bid by the speaker. Conversational cooperation requires that speaker and hearer share the knowledge of the behavior game in play. In the same way, we can say that a communication act is understood from the perspective of a third person when the observer is able to define the behavior game played by the participants.

Thus, the level of difficulty in comprehending an act depends upon the complexity of the inferences necessary to link the communication act to a move of the game. Within the framework provided by Cognitive Pragmatics theory, Bucciarelli et al. (2003) offer a more articulated description of the factors determining the level of difficulty in comprehending different pragmatic phenomena by an observer of the communicative interaction. We list such factors in Fig. 1.

3.1. Complexity of mental representations

Two factors may determine the complexity of the mental representations involved in comprehending a pragmatic phenomenon.

3.1.1. Conflicting representations

Here, representations involve a difference between what is communicated and what is privately entertained by the actor. In the case of no conflict, we are dealing with standard communication; in the case of conflict, we are dealing with non-standard communication.

Directs, conventional indirects and non-conventional indirects involve an actor whose beliefs and communicative purposes are in line with what he or she says; therefore they are all examples of standard communication. In case of direct and indirect communicative acts, the intended meaning is consistent with the meaning expressed by the actor. In terms of mental representations, the partner/observer can refer the communication act to the actor’s game without taking into account conflicting mental representations. This is not the case for non-standard communication acts, such as deceits and ironies, where the mental representations involved are more complex. Consider the following examples from our experiment.
In a classroom, children are doing math exercises. One child (A) is holding a book to hide the comic strips inside. The teacher (B) comes over, with a look of suspicion.

Linguistic/I.S.L.: B: “Are you doing the exercises?”
A: “Yes, I am”

Two children A and B are playing with Lego. Together they are building a fairly high tower. B knocks the tower over.


The communicative acts in [1] and [2] are a deceit and an irony, respectively. In both cases the actor’s expression act conflicts with her private belief. The actor says $p$ while believing $\neg p$. To comprehend both kinds of pragmatic phenomena it is necessary to detect that what has been said conflicts with the actor’s private belief. For this reason both deceit and irony can be considered examples of non-standard communication. It follows that (as predicted) standard phenomena are easier to deal with than non-standard phenomena. However, detecting this conflict is still not enough to differentiate irony from deceit (see below).

3.1.2. Representations where shared beliefs are exploited

Deceit and irony share a common feature: in order to detect them, it is necessary to detect a conflict between what is expressed and what is privately entertained by the actor. In case of
deceit, the observer recognizes the difference between the mental states that are expressed and those that are privately entertained by the actor. Irony comprehension involves the detection of a further conflict, namely the conflict between the belief expressed by the actor and the belief shared with the partner. The contemporary activation of the representations of an actor’s utterances ($p$), one of which is in conflict with the actor’s private belief ($\neg p$), the other with the belief shared with the partner ($\neg p$), makes ironic statements difficult to entertain for a child. It follows that, as long as we are concerned with simple pragmatic phenomena (as defined below), ironies should be harder to deal with than deceptions.

3.2. Inferential load

The inferential load necessary to correctly refer the actor’s communication act to the behavior game the actor is playing is a further factor determining the difficulty in comprehending different pragmatic phenomena. In other words, different inferential loads are involved in comprehending different pragmatic phenomena. The necessity to build a long chain of inferences is what discriminates between complex and simple communication acts. Complex acts require a more complex chain of inferences to be referred to the actor’s game. In standard communication, direct and conventional indirect acts are considered “simple acts” whereas non-conventional indirect acts are considered “complex acts”.

Searle (1975) defines direct speech acts as those where a speaker utters a sentence and means exactly and literally what he or she is saying, as in:

[3] Where is the train station?

Indirect speech acts, instead, are those where comprehension requires the realization that an illocutionary act is (indirectly) being performed via the execution of a different, literal illocutionary act:

[4] a. Can you please tell me where the train station is?  
   b. Do you mind telling me where the train station is?  
   c. Have you ever taken a train from here?

Conventional indirect speech acts are those in which the meaning has been stabilized by use (4a, 4b). Non-conventional indirect speech acts are those in which the primary illocutionary force is derived through some inferential steps (i.e. 4c). Within the perspective offered by the Cognitive Pragmatics theory, there is no essential difference between a direct speech act and a conventional indirect speech act: both are simple acts, immediately linking the move to the game. A difference is instead predicted between conventional indirect speech acts (simple indircts) and non-conventional indirect speech acts (complex indircts). Conventional indirect acts are conventionally associated with a behavior game. Thus, they make direct reference to the game at play. Non-conventional indirects, instead, involve actors whose belief and communicative purposes are not immediately in line with what is said; the partner has to construct a chain of inferences in order to refer the actor’s move to the behavior game in question. For this reason, conventional indirect speech acts should be easier to understand than non-conventional ones.

Also in non-standard communication, the inferential load is what explains the difference in difficulty between simple and complex deceptions and between simple and complex ironies. As Bucciarelli et al. (2003) point out, the inferential process that characterizes complex
communication acts with respect to simple communication acts is triggered by the violation of expectations on behalf of the partner. Different sorts of violations initiate different inferential paths. Complex acts can be considered a form of non-literal language. In dealing with non-literality, the cues utilized by the partner or the observer in deriving the actor’s intended meaning are the expectations that are being violated in apparent contradiction to the principle of cooperation.

One of the reasons why the distinction between simple and complex acts is important is that an investigation into the difference in the level of difficulty in comprehending different pragmatic phenomena, e.g. deceit versus irony, must only take into account acts which are comparable in terms of inferential load. In our experiment, we only investigated different pragmatic phenomena of the simple sort (with the exception of complex indirects). In this way, we were able to control the differences in difficulty due to the length of the inferential chain, while focusing on the difficulties that were due to the need to detect one or more conflicts between representations.

The assumptions of Cognitive Pragmatics hold for communication acts expressed through linguistic and extralinguistic means. Communicative gestures – just like speech acts – only find their meaning within the context provided by the behavior game played by the participants in the communicative exchange. Note that in the literature, only Bucciarelli et al. (2003) have applied the classical distinction between direct and indirect communication acts to extralinguistic communication acts. In their view, while one may distinguish between direct and indirect gestures, the same is not true for direct and simple indirect gestures, as both have a certain degree of conventionality. Thus, for example, a person pointing to a bottle may intend to ask for the bottle, but such a gesture does not allow to distinguish between linguistic expressions such as “Give me the salt” and “Would you give me the salt?”. In their study, nevertheless, these authors stress the close correspondence of a communication act of the linguistic protocol with the respective one in the extralinguistic protocol by using the label “simple indirects” for gestures as well.

Bucciarelli and colleagues investigated the ability to comprehend direct, indirect, deceitful, and ironic communication acts, whether expressed through speech acts or communicative gestures. In accordance with the assumptions illustrated above, they predict that there is a gradation of difficulty in comprehension: simple standard acts are easier than simple deceits, which again are easier than simple ironies. They also predict that, within standard communication, simple acts are easier to comprehend than complex acts. Furthermore, they validate their predictions through an experiment on 160 hearing children in the following age groups: 2;6–3 years, 3;6–4 years, 4;6–5;6 years, and 6–7 years. The global results confirm the predicted gradations of difficulty, both for the different sorts of speech acts and for the communicative gestures.

In the literature, no studies have systematically investigated the pragmatic abilities of deaf children using both linguistic and extralinguistic means. In particular, none of the studies investigate the ability of deaf children to comprehend different pragmatic phenomena expressed through both linguistic and extralinguistic means. We carried out an experiment to compensate for this deficit, inasmuch as our experiment parallels the one done by Bucciarelli et al. (2003).

4. An experiment

Our study investigates deaf children’s ability to comprehend direct, indirect, deceitful, and ironic communication acts either expressed through Italian Sign Language or communicative gestures.

Regarding a within-group comparison, we expect to find that, for both hearing and deaf children and for both linguistic and extralinguistic phenomena:
Standard communication is easier to comprehend than non-standard communication.
Within standard communication, simple acts are easier than complex acts.

Also, regarding the comparison between linguistic and extralinguistic phenomena, for both hearing and deaf children: trends in difficulty should appear constant within both the linguistic and extralinguistic protocols, whereas performance with a single pragmatic phenomenon might differ in the two protocols.

Regarding a between-group comparison:

- We expect to find that, in dealing with linguistic as well as extralinguistic pragmatic phenomena, hearing and deaf children perform comparably. This expectation holds in particular when comparing extralinguistic and linguistic pragmatics in deaf children with extralinguistic pragmatics in hearing children, in that all three exploit the visual input modality.

4.1. Materials

We used 12 videotaped stories where the characters are involved in everyday communicative interactions. In particular, each story is concerned with one of the pragmatic phenomena investigated, three in each of the following categories: directs, simple deceits, simple ironies, and complex indirects. Each story lasts more or less 30 s.

The videotaped stories are identical in the three protocols. However, the critical act in the linguistic protocol is expressed either through speech (Italian) or Italian Sign Language; in the extralinguistic protocol it is expressed through communicative gestures (see Appendix A). In both protocols, each story involves just one communication act, namely the one we investigated. Each story involves two or three different characters chosen so as to be easily distinguished by very young children. An example of one of the stories involving a simple act is the following:

[5] A child (A) is walking with her mother (B) along the road. In the linguistic protocol the child says/signs: “Mom, pick me up”. In the extralinguistic protocol the child tugs on her mother’s dress and holds her arms up.

For each story, a photograph of the last frame is presented to the participants (see Fig. 2).

In each picture, a balloon above the actor’s head has to be filled in by choosing one among four randomly introduced photographs, of which only one represents the character’s real intention. Thus, of the four alternative response-pictures only one response is correct, the other three are wrong. In the case of non-standard communication acts and complex communication acts, one of the erroneous alternatives is intended to be misleading, corresponding to a misinterpretation of the actor’s communicative intention. In particular, for the deceitful communicative acts, the misleading alternative corresponds to the event that the actor did not want to occur, whereas for the ironic acts, the misleading alternative corresponds to the literal meaning of the communicative act or, as in the case of complex indirects (which always represented declined requests), to having understood the act as an acceptance of the request. The two remaining choices were clear mistakes, having nothing to do with the story. We did not provide misleading alternatives for standard communication acts (directs), as in these cases, the illocutionary force (being expressed in the surface act) does not admit of a misleading interpretation. For example, in the case of the task in [5], in one of the balloons the mother picks up the child (real intention), in another the mother washes the child’s hands, in another the mother looks at a pine branch, in another the child picks up a teddy bear (see Fig. 3).
As we said above, in deaf children some gestures become signs. Thus, in order to construct our I.S.L. and extralinguistic protocols, an official hearing I.S.L.—Italian Language Translator, born to deaf parents, verified that all the gestures in the I.S.L. protocol were indeed proper I.S.L. signs, and that all the gestures in the extralinguistic protocols were not. The translator also verified that each communication act investigated in the two protocols had the meaning intended by us, the experimenters. In particular, she assigned one of the following interpretations to each communication act: the actor is sincere, the actor is deceiving, or the actor is ironic. The same procedure was adopted for the (Italian) linguistic protocol; here, three independent judges, all hearing adults, and all native speakers of Italian, independently evaluated each communication act as sincere, deceitful, or ironic. The results of these evaluations all confirmed our classifications of the communication acts in the three protocols.

4.2. Procedures

The deaf participants and the hearing participants in the control group were recruited in their daycare centers, kindergartens, and primary schools. In particular, deaf participants were traced with the help of the ENS (Italian Board of the Deaf). The (three) experimenters frequented the daycare centers and schools of the experimental subjects for a couple of days, in order to get acquainted with the children. The experiment was carried out in a quiet room, one child at a time. For the control group the experimenter was alone together with the child; for the deaf group, the experimenter was together with the child and an I.S.L. interpreter. The children were told that they were going to play a game. In the pre-test, the experimenter introduces a picture of Mickey Mouse with a balloon above his head and says: “Mickey Mouse invites Minnie to go to the beach”. Then the experimenter shows four alternative pictures of which only one represents Mickey Mouse’s communicative intention (i.e. Mickey Mouse and Minnie on the beach) and says to the child: “Complete the balloon with Mickey
Mouse’s thoughts”. All the children passed this pre-test and went on to the real experiment, which runs as follows.

The experimenter shows the participants the video-taped stories one by one, several times if the child so desires, and with no time limits. At the end of each story, a photograph of the last frame of the story is presented to the child. As in the pre-test, the picture has a balloon to fill in with the actor’s thoughts, i.e. the communicative intention. The pictures representing the actor’s four possible communicative intentions are shown immediately after each story and the experimenter asks: “What is the character thinking? Choose the right one”. Before showing the children each of the videotaped stories, the experimenter shows them the respective pictures to make sure that they understand what the photographs represent. At the end of the experiment, the child receives a reward (chocolate and cookies). The scenes were presented in two different random orders, balanced according to age groups and gender of the participants. No tasks involving the same communicative acts occurred on consecutive runs. All the experimental sessions were audio-recorded (average time 20 min).
4.3. Participants

Participants in the experiment are 46 deaf children and a control group of 46 hearing children. They attend day-care centers, kindergartens and primary schools in northern Italy. The deaf children belong to two age groups: 2–4 years (18 children, mean age: 3;3 years, 7 males, 11 females) and 4;6–7 years (28 children, mean age: 6 years, 17 males, 11 females). Of the 2–4 year-olds, 8 were assigned to the linguistic protocol and 10 to the extralinguistic protocol. Of the 4;6–7 year-olds, 15 were assigned to the linguistic protocol and 13 to the extralinguistic protocol. All the deaf children are profoundly deaf with a hearing loss of over 90 decibels (their loss of hearing is congenital or neonatal), which is neither primarily nor secondarily correlated with other intellectual or physical impairments. All the deaf children are “signing deaf”, and they almost exclusively use Italian Sign Language (I.S.L.) as a communicative means. None of the children have deaf parents, although some of their parents sign in I.S.L. Because the aim of our research is to investigate the different levels of difficulty in comprehending different pragmatic phenomena expressed within a particular modality, linguistic or extralinguistic, and because of the practical difficulties encountered in recruiting deaf children, we proceeded as follows: those deaf children whose parents sign and thus can be assumed to be more familiar with Italian Sign Language, were presented with the linguistic protocol, whereas those deaf children who not had been exposed to sign language early in their development were presented with the extralinguistic protocol. (Actually, we know from the literature that these two populations of deaf children vary in the degree of relevant early communicative experiences). The hearing children of the control group were also divided in two age groups: 2–4 years (mean age: 3;3 years, 8 males, 10 females) and 4;6–7 years (mean age: 6 years, 18 males, 10 females). Of the 2–4 year-olds, 8 were assigned to the linguistic protocol and 10 to the extralinguistic protocol. Of the 4;6–7 year-olds, 14 were assigned to the linguistic protocol and 14 to the extralinguistic protocol. Each child in the control group was selected for being entirely comparable with a child in the experimental group for age, gender, and years of school attendance.

4.4. Results

Table 1 illustrates the percentages of correct performances by hearing children in the linguistic and extralinguistic protocols.

Table 2 illustrates the percentages of correct performances by deaf children in the linguistic and extralinguistic protocols.

Regarding the within-groups comparison, we expected to find that, for both hearing and deaf children and for both linguistic and extralinguistic phenomena:

- Standard communication (simple acts) is easier to comprehend than non-standard communication

Table 1
Percentages of correct performances by hearing children in the linguistic and extralinguistic protocols

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<th>Standard acts</th>
<th>Non-standard acts</th>
<th>Standard acts</th>
<th>Global performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simple</td>
<td>Deceit</td>
<td>Irony</td>
<td>Complex</td>
</tr>
<tr>
<td>Linguistic</td>
<td>89</td>
<td>65</td>
<td>67</td>
<td>45</td>
</tr>
<tr>
<td>(N = 22)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extralinguistic</td>
<td>87</td>
<td>56</td>
<td>64</td>
<td>44</td>
</tr>
<tr>
<td>(N = 24)</td>
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</table>
Figs. 4 and 5 illustrate the percentages of correct performances by 2–4-year-old and 4;6–7-year-old deaf children in the linguistic and extralinguistic protocols, respectively.

Results for deaf children in the linguistic protocol reveal that the prediction is confirmed over all children (90% versus 55%, in the standard and non-standard protocols, respectively: Wilcoxon test: tied \( z = 3.8 \), tied \( p = .0001 \)) and when considering 4;6–7 year-olds separately (Wilcoxon test: tied \( z = 3.3 \), tied \( p = .0007 \)) but not for the 2–4 year-olds (Wilcoxon test: tied \( z = 1.8 \), tied \( p = .058 \)).

Results for deaf children in the extralinguistic protocol reveal that the prediction is confirmed over all children (87% versus 59%, in the standard and non-standard protocols, respectively:
Wilcoxon test: tied $z = 3.89$, tied $p < .0001$) and when considering 2–4 year-olds (Wilcoxon test: tied $z = 2.2$, tied $p < .03$) and 4;6–7 year-olds (Wilcoxon test: tied $z = 3.3$, tied $p = .0007$) separately.

Figs. 6 and 7 illustrate the percentages of correct performances by 2–4-year-old and 4;6–7-year-old hearing children in the linguistic and extralinguistic protocols, respectively.

Results for hearing children in the linguistic protocol reveal that the prediction is confirmed over all children (89% versus 66%, in the standard and non-standard protocols, respectively: Wilcoxon test: tied $z = 3.7$, tied $p = .0002$) and when considering 4;6–7 year-olds separately (Wilcoxon test: tied $z = 3.3$, tied $p = .0008$), but not for the 2–4 year-olds (Wilcoxon test: tied $z = 1.8$, tied $p = .065$).

Results for hearing children in the extralinguistic protocol reveal that the prediction is confirmed over all children (87% versus 60%, in the standard and non-standard protocols, respectively: Wilcoxon test: tied $z = 3.89$, tied $p < .0001$) and when considering 2–4 year-olds (Wilcoxon test: tied $z = 2.5$, tied $p < .02$) and 4;6–7 year-olds (Wilcoxon test: tied $z = 2.9$, tied $p < .004$) separately.

A more detailed analysis, comparing deceit and irony, did not reveal any difference in the level of difficulty in comprehending these. In particular, regarding deaf children in both the linguistic and the extralinguistic protocols, the results show that the degree of difficulty involved in comprehending deceits and ironies is the same over all children and when considering the age
groups separately (Wilcoxon test: tied $z$ ranging from $-1.9$ to $-0.25$, and tied $p$ ranging from $0.06$ to $<0.8005$). Regarding hearing children, the same result holds in the linguistic and extralinguistic protocols: the results reveal that the degree of difficulty involved in comprehending deceits and ironies is the same over all children and when considering the age groups separately (Wilcoxon test: tied $z$ ranging from $-1.63$ to $-0.04$, tied $p$ ranging from $0.1025$ to $0.9706$).

As to the differences between linguistic and extralinguistic phenomena, the results for deaf children reveal that the degree of difficulty in comprehending simple standard acts and complex standard acts is the same in the two pragmatic protocols. This result holds over all children and when considering the single age groups separately (Mann–Whitney test: $z$ value ranging from $0.04$ to $0.85$, $p$ value ranging from $0.96$ to $0.39$). As far as non-standard acts are concerned, the results reveal that comprehending both deceits and ironies involves the same degree of difficulty in the two pragmatic protocols. This result holds over all children and when considering the single age groups separately (Mann–Whitney test: $z$ value ranging from $1.90$ to $-26$, $p$ value ranging from $0.79$ to $0.06$). Similarly, the results for hearing children reveal that the degree of difficulty involved in comprehending simple standard acts and complex standard acts is the same in the two pragmatic protocols. This result holds over all children and when considering the single age groups separately (Mann–Whitney test: $z$ value ranging from $0.08$ to $0.8$, $p$ value ranging from $0.92$ to $0.42$). As far as non-standard acts are concerned, the results reveal that comprehending deceits and ironies involves the same degree of difficulty in the two pragmatic protocols. Again, this result holds over all children and when considering the single age groups separately (Mann–Whitney test: $z$ value ranging from $1.16$ to $-0.22$, $p$ value ranging from $0.22$ to $0.82$). Hence, the prediction:

- Within standard communication: simple acts are easier to comprehend than complex acts.

Results for deaf children in both the linguistic and the extralinguistic protocols reveal that the prediction is confirmed over all children and when considering the age groups separately (Wilcoxon test: tied $z$ ranging from $2.1$ to $3.9$, tied $p$ ranging from $<0.04$ to $<0.001$). Furthermore, results for hearing children in the linguistic and extralinguistic protocols reveal that the prediction is confirmed over all children and when considering the age groups separately (Wilcoxon test: tied $z$ ranging from $3.6$ to $2.04$, tied $p$ value ranging from $0.0002$ to $<0.05$).

Regarding the between-group comparison, we expect to find that:

- In dealing with linguistic phenomena as well as in dealing with extralinguistic phenomena, hearing and deaf children perform comparably.

Results for the linguistic protocol reveal that globally the hearing children’s performance (65% of correct responses) does not differ from the global performance by deaf children (59% of correct responses: Mann–Whitney: $z = 1.7$, $p = 0.08$). The same result holds if we consider 2–4 year-olds (Mann–Whitney test: $z$ value = $-0.03$, $p = 0.97$) and 4;6–7 year-olds (Mann–Whitney test: $z = 1.8$, $p = 0.06$). Still considering performance with the linguistic protocol, the two groups of children do not differ if we separately consider simple standard acts, complex standard acts, deceits, and ironies. In particular, this result holds if we consider all children as well as each single age group (Mann–Whitney test: $z$ value ranging from $-1.294$ to $0.00$, $p$ value ranging from $0.2$ to $>0.9$).

Results for the extralinguistic protocol reveal that the global performance by hearing children (62% of correct responses) does not differ from the global performance by deaf children (72% of correct responses: Mann–Whitney: $z = 0.09$, $p = 0.92$). The same result holds if we consider 2–4
year-olds (Mann–Whitney test: $z$ value = .17, $p$ = .85) and 4;6–7 year-olds (Mann–Whitney test: $z$ = .04, $p$ = .96). Still considering performance with the extralinguistic protocol, the two groups of children do not perform differently for simple standard acts, complex standard acts, deceits, and ironies, considered separately. In particular, this result holds if we consider all children as well as each separate age group (Mann–Whitney test: $z$ value ranging from −.67 to .00, $p$ value ranging from .50 to >.9).

Finally, for the purpose of exploration, we analyzed differences in performance due to age. Results for deaf children reveal no improvement in performance with age in any of the pragmatic tasks, either linguistic or extralinguistic (Mann–Whitney test: $z$ value ranging from 1.86 to 1.73, $p$ value ranging from .06 to .08). Likewise, results for hearing children reveal no improvement in performance with age in any of the pragmatic tasks, either linguistic or extralinguistic (Mann–Whitney test: $z$ value ranging from .34 to 1.69, $p$ value ranging from .73 to .089). An exception are deceitful acts in the extralinguistic protocol (Mann–Whitney test: $z$ = 2.04, $p$ = .04).

5. Discussion and conclusions

The aim of the present study has been a systematic investigation of the linguistic and extralinguistic pragmatic abilities of deaf children. We follow the assumptions of Cognitive Pragmatics regarding the mental representations and processes involved in comprehending different pragmatic phenomena. According to the theory, these factors affect the emergence of pragmatic competence independently of either the communicative means or the communicative input modalities. Thus, a study regarding the emergence of pragmatic competence in deaf children is an interesting litmus test for this prediction. The results of our experiment confirm all the expectations, with a couple of exceptions.

First, 2-year-old deaf and hearing children perform equally with standard and non-standard linguistic phenomena. The results for these two groups of children are in the predicted direction, although the difference in performance is not statistically significant. A possible reason is that there were few subjects in these groups (18 children) as compared with those in the groups aged 4;6–7 years (28 children).

A second unexpected result is that irony comprehension is no more difficult than deceit comprehension. Plausibly, the gestures used for ironic communicative acts in our protocols have a certain degree of conventionality, in particular when they are conventionally associated with a standard meaning. This may prevent an ironic interpretation by young children. An example of irony from our protocol is pressing one’s cheek with a finger (which is the Italian version of patting one’s stomach, that means ‘good’) to mean in the specific context ‘not good’.

From a developmental point of view, the differences found in performance due to age reveal no improvements in performance for deaf and hearing children in any of the linguistic pragmatic phenomena investigated. Standard communication acts are as easy to comprehend for 2–4 year-olds as for 4;6–7 year-olds, and non-standard communication acts are as difficult to comprehend for 4;6–7 year-olds as for 2–4 year-olds. The same result holds if we consider performance by deaf and hearing children with the extralinguistic pragmatic phenomena. An exception are deceitful communication acts expressed through extralinguistic means, which hearing children from 4;6 onward comprehend better than do 2–4 year-olds. A possible explanation for this pattern of results is that for young hearing children, visual cues to deceits are harder to detect than are linguistic cues; they are also harder to detect than for deaf children of comparable age, whose communicative input modality is the visual one. With increase in age, the ability of hearing children to detect visual cues to deceits should also increase.
Except for the ability to comprehend extralinguistic deceits, the global results of our study suggest strong similarities in the emergence of pragmatic competence in deaf and hearing children. Note here that we focused our study on comprehension of communicative interactions, in that the participants were asked to observe and interpret the interaction of two agents. This procedure allowed us to make a direct comparison between different pragmatic phenomena and to keep some performance variables related to the child and his/her specific communicative partner constant.

Our experimental results contrast with the results in the literature according to which deaf children have poorer pragmatic skills than hearing children. In particular, we found that the emergence of pragmatic abilities in deaf children parallels the emergence of pragmatic abilities in hearing children. This result holds even when we compare, from a linguistic pragmatic point of view, deaf and hearing children exploiting different input modalities in the two groups: visual in deaf children and oral in hearing children. Overall, our results reveal that a variety of pragmatic phenomena are equally difficult for hearing and deaf children, irrespective of whether they use (oral or signed) language or extralinguistic means. These results are consistent with the assumptions of Cognitive Pragmatics that the mental representations and inferential processes involved in communication are not affected by the nature of the communicative channel, be it vocal, signed, or gestural. Still, different channels may affect the emergence of pragmatic competence differently.

Our study is concerned with deaf children born to hearing parents, but (as we said in section 1) there is also a population of deaf children born to deaf parents. Some studies suggest that these children benefit from being introduced to a sign language from a very early age; and indeed, their language acquisition strongly parallels the acquisition of language in hearing children. The results of our study reveal a strong parallelism between the emergence of pragmatic competence in deaf children born to hearing parents and in hearing children. Future studies ought to investigate whether the same results hold for deaf children born to deaf parents.

We end with some considerations regarding two practical implications of our results. The first concerns the construction of proper instruments for assessing pragmatic abilities. As we know from the literature, there is a risk of underestimating the communicative abilities of deaf children, as when teachers rate the speech intelligibility and receptive communication abilities of deaf and profoundly deaf students (Hide and Power, 1996). Second, our results provide some suggestions concerning pragmatic rehabilitation. Since linguistic and extralinguistic channels take part in a similar way as regards the emergence of pragmatic competence, a rehabilitation program that also focuses on extralinguistic communication could enhance the effectiveness of communication and allow us to intervene at a very early stage.

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Appendix A

The following is a description of the videotaped stories used in our experiment and the balloons accompanying each of them. The balloons numbered ‘1’ are the choices considered
correct: the balloons numbered ‘2’, ‘3’, and ‘4’ are erroneous choices. Regarding complex indirects, deceits, and ironies, the erroneous alternative in ‘2’ is intended to be misleading.

**Simple acts**

- **Directs**
  - A child (A) is walking with her mother (B) along the road.  
    Linguistic/I.S.L.: A: “Mom, pick me up”  
    Extralinguistic: A tugs on B’s dress and holds her arms up  
    Balloons:  
    (1) B picks A up  
    (2) B washes A’s hands  
    (3) A is carrying a doll  
    (4) B looks at some plants

- A is sitting in front of her desk holding a telephone receiver, B comes in  
  Linguistic/I.S.L.: A: “Please, take a seat”  
  Extralinguistic: A points to a chair for B to sit down on  
  Balloons:  
  (1) A and B are sitting  
  (2) B is sitting on the floor  
  (3) A is combing her hair  
  (4) B is lying on a sofa

- A man (A) opens a car door for a woman (B)  
  Extralinguistic: A gestures with his arm for B to get into the car  
  Balloons:  
  (1) B gets into the car  
  (2) A gets into the car  
  (3) B plays with a doll  
  (4) A makes a phone call

**Simple deceits**

- In a classroom, children are doing math exercises. One child (A) is holding a book to hide the comic strips inside. The teacher (B) comes over, with a look of suspicion.  
  Linguistic/I.S.L.: B: “Are you doing the exercises?”  
  A: “Yes, I am”  
  Extralinguistic: A hides the comics under the desk and shows the teacher her book  
  Balloons:  
  (1) B pats A’s head with approval  
  (2) A is reprimanded  
  (3) A, C, and D are playing together  
  (4) A and C are reading a comic

- A and C are playing with some pillows. A knocks a vase over. A boy (B) hears the noise and comes in  
  Linguistic/I.S.L.: B: “Who did that?”  
  A: “He did”
Extralinguistic: B looks at them with a questioning look and A points to C

Balloons:
(1) B reprimands C
(2) B reprimands A
(3) A and C test their strength in an arm wrestle
(4) B reads a newspaper

• Two children are playing hide and seek. B counts and C goes to hide behind the door. A third child (A) helps C to hide. C asks A not to reveal his hiding place.

Linguistic/I.S.L.: B: “Where is C?”
        A: “Under the table”

Extralinguistic: B looks at them with a questioning expression and A points under the table.

Balloons:
(1) B looks under the table
(2) B looks behind the door
(3) A and C play together
(4) C is counting

Simple ironies

• Two children A and B are playing with Lego. Together they are building a fairly high tower. B knocks the tower over.

Extralinguistic: A claps

Balloons:
(1) A is sad
(2) A is happy
(3) B is drawing
(4) A and B are playing the piano

• Two girls (A and B) are sitting at a table. B has two candies; she is eating one of them. A asks if she can have the other one. B eats the second sweet and gives A the paper.

Linguistic/I.S.L.: A: “That’s nice!”
Extralinguistic: A strokes B on the back.

Balloons:
(1) A sticks her tongue out at B
(2) A kisses B
(3) A is cooking
(4) A and B are hanging out the laundry.

• Two boys are sitting in a park. B is eating a snack and A is reading a newspaper. The snack falls on the ground. B picks it up and goes on eating it.

Linguistic/I.S.L.: A: “Uhm, that’s good”
Extralinguistic: A presses his cheek with his finger (Italian version of patting one’s stomach)

Balloons:
(1) B throws the snack away
(2) B eats the snack
A drinks some water
A and B open a door.

Complex acts

- **Non-conventional indirects**

  - A child (B) is walking with his sister (A). They stop in front of a toy shop
    Linguistic/I.S.L.: B: “Would you get me that game?”
    A: “We don’t have any money”
    Extralinguistic: B points insistently at a game
    A shows him her empty purse
    *Balloons:*
    (1) A and B go away
    (2) B has the game in his hands
    (3) A ties B’s shoelaces
    (4) A gets a chocolate from the chocolate machine

  - A girl (A) is sitting at a table studying, whilst another girl (B) is hammering
    Extralinguistic: A calls B’s attention by pointing to her book
    *Balloons:*
    (1) B stops hammering
    (2) B hammers
    (3) A and B drink some tea
    (4) A is drawing

  - A girl (A) with a boy (B) are peeling potatoes. Another girl (C) comes in, holding a ball
    Linguistic/I.S.L.: C: “Will you come and play with me?”
    A: “He must help me”
    Extralinguistic: C shows B the ball, A stops B from getting up by holding his arm.
    *Balloons:*
    (1) B helps A
    (2) B and C play with the ball
    (3) A washes up
    (4) B plays the guitar

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