

Indirect speech acts and Theory of Mind

The role of conventionalization and mind-reading abilities in understanding indirect speech acts

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Introduction

Some of the things we say do not describe a state of things, nor the action of doing something: they actually *perform that action*. For example, by saying, “Open the window, please”, I am performing an act: the *speech act* of requesting. Of course, there are many ways of performing the same speech act, and most of them would be *indirect*, like, for instance, “Could you open the window?”, i.e., a question about the interlocutor’s ability to open the window, or, even more indirect, “It is hot in here”, i.e., an assertion about the temperature in the room.

Indirect requests have been widely investigated through empirical studies testing the main theoretical accounts about their processing. Nevertheless, only a few studies have investigated the *cognitive functions* underlying indirect speech acts comprehension and their possible correlation with the level of indirectness of the speech act.

The pervasiveness of indirectness in human communication makes it imperative to try and understand how it works. Looking into the reasons why it does not, when it does not, makes it useful in terms of what it tells us about both the phenomenon and the populations at stake. Trying to understand to what extent the comprehension of the phenomenon is shaped by its features and driven by our cognitive abilities makes it interesting and worth digging into.

The aim of the present project is to address these points, with particular regard to *Theory of Mind*, through a series of studies on neurotypical adults, typically developing children and children with Autism Spectrum Disorder, in the framework of behavioral *Experimental Pragmatics*.

1 Background

1.1 Pragmatics

What is Pragmatics? Pragmatics is a subfield of Linguistics, that has its roots in Linguistics itself and in Philosophy of Language. It is often described as the study of language use as opposed to language structure, and it deals with the interaction between the linguistic meaning of an utterance and its context (Sperber & Wilson, 2005). In fact, Pragmatics studies the way context influences language and, crucially, the way language influences context.

Why are speech acts studied in Pragmatics? Speech acts (SAs), especially when indirect, need to be considered in context in order to understand the speaker’s meaning. The whole concept of SAs and the possibility to perform an act through an utterance (Austin, 1962) fits perfectly in the second area of interest mentioned above: that utterance actually influences the context in which it is uttered. Moreover, both the reasons behind the use of indirect ways to perform a SA and the possible issues with their comprehension are sociopragmatic in nature.

1.2 Experimental Pragmatics

What is *Experimental Pragmatics*? Experimental Pragmatics (ExPrag) is a relatively new field that emerged bringing Pragmatics and Cognitive Psychology together, whose aim is to experimentally investigate pragmatic phenomena through experiments (Noveck & Sperber, 2004).

What can experiments tell us about speech acts? ExPrag research can empirically test hypotheses formulated in Theoretical Pragmatics about speech acts comprehension and processing, as well as investigate the cognitive functions that make it possible (e.g., Theory of Mind, inhibition, and other executive functions). These two approaches, *from data to theory* (i.e., using experiments to test the plausibility of linguistic theories on the matter) and *from data to cognition* (i.e., using experimental data to investigate the cognitive functions underlying pragmatic processing), can and possibly need to be combined in order to have a comprehensive view of the phenomenon.

2 Research Questions

2.1 Indirect requests in Pragmatics

What are requests? According to the theory of SAs (Austin, 1962; Searle, 1969, 1979), a request is “a directive speech act which counts as an attempt to get H [i.e., the hearer] to do an act which S [i.e., the speaker] wants H to do, and which S believes that H is able to do; and which is not obvious that H will do in the normal course of events or of H’s own accord” (Searle, 1969, p. 66).

Indirectness characterizes human communication more than we are aware of: any verbal or non verbal communicative attempt “that conveys something more than or different from what it literally means” can be described as indirect (Brown & Levinson, 1987, p. 134). The option that is given here between “more than” and “different from” the literal meaning is quite crucial with regard to SAs, as the next section will point out.

How can requests be indirect? Searle drew the concept of indirect SAs (ISAs) into the wider framework of the relationship between the literal meaning of an utterance and the speaker’s meaning: according to Searle, the speakers uttering ISAs do mean what they say, but they also mean more, i.e., the speaker’s meaning would be “more than” the literal meaning (Searle, 1979).

In order to clarify this concept, it is useful to start where he started, from an example like the following:

- (1) “Can you get the pen?”

The utterance in (1) can be meant as a question about the interlocutor’s ability to get the pen, or as a request to pass it. In fact, it is a case of ISA as Searle defined it: one illocutionary act (in this case, a request) is performed indirectly through the performance of another (in this case, a question).

2.1.1 Indirect requests and conventionality

Does conventionality play a role? Conventionality is indeed a concept that is central to ISAs. The literal - lexically encoded - meaning of the utterance in (1), as already mentioned, would actually be that of a question; viceversa, a directive meaning is usually conveyed through imperatives. Nevertheless, the *conventional* meaning of (1) is that of a request, i.e., though directives would usually be conveyed through an imperative, they can also - conventionally - be performed through other forms, like, for instance, a question, and be interpreted as such, without those forms actually becoming idioms (Searle, 1979, p. 39–43).

The conventionalization of a form as an indirect mean to convey a specific meaning tends to affect its indirectness, as the first ExPrag investigations on the matter have shown (see the next section).

How indirect can requests be? Four main levels of (in)directness have been found in the literature on ISAs (Blum-Kulka, 1987; Ruytenbeek et al., 2017):

1. direct requests (DRs): “Open the window”;
2. conventionally indirect requests (CIRs): “Can you open the window?”
3. non-conventionally indirect requests (NCIRs): “Is it possible to open the window?”
4. highly indirect requests (HIRs): “It is very hot in here”.

The central prediction stemming from this scale is that “the more ‘indirect’ the mode of realization, the higher will be the interpretative demands on the hearer” (Blum-Kulka, 1987, p. 133).

Traditionally, higher interpretative demands, i.e., higher needs of inferential processing, are thought to be reflected in higher cognitive costs (Gibbs, 2002, for a review). This assumption has been shown to be true by some experimental studies on ISAs (Clark & Lucy, 1975; Clark, 1979; Ruytenbeek et al., 2017), though the picture on ISAs processing is yet to be completely defined, as section 2.2. will show in more detail.

- Imperatives like 1. (DRs) represent the prototypical, direct form.
- *Can you...?* forms like the one in 2. (CIRs) have been considered conventionalized forms to convey an IR meaning ever since SAs emerged as a research topic (Morgan, 1978; Gibbs, 1983). They are immediately perceived as directive by means of a “convention of form” that indirect SAs can take (Clark, 1979, p. 433), so common that they could be defined idiomatic.
The reasons why they are not actual *idioms* are that they admit a literal response, and that they can be translated word for word in another language while maintaining the same indirect illocutionary force (Searle, 1979, p. 39-43).
- Cases like 3. (NCIRs) are forms that, even though they do not follow the “convention of form” that has just been mentioned, are also conventional in a certain sense: *Is it possible to...?* forms can in fact be traced back to a “convention of means” (Clark, 1979, p. 433): said convention states that speakers can request their conversational partners to do something by asking about their ability to do it.
This convention specifies a semantic mean through which the indirect request can be performed, and *Is it possible to...?* forms reflect that semantic mean just like *Can you...?* forms.
These forms are nevertheless less conventionalized as requests and are therefore defined non conventional IRs anyway.
- Assertions like 4. (HIRs) are obviously non conventional IRs as well, and they can also be defined as hints, or highly indirect requests (HIRs).
They cannot be considered conventional neither under the “convention of form” nor under the “convention of means”. Their form does not serve as an appropriate cue to the speech act of requesting (it could easily be interpreted as an assertion only), and needs *inferential processes* to be comprehended on the basis of extra-form information.

2.2 Indirect requests in Experimental Pragmatics

What has already been done? ISAs, especially IRs, have been one of the first topics (Noveck & Sperber, 2004, p. 10) to be investigated through behavioral studies (Clark & Lucy, 1975; Clark, 1979; Gibbs, 1979, 1981, 1983), though for several years this early interest in the matter seemed to be ceased.

A few more recent studies address the topic both through reaction time studies and eye-movement experiments (Ruytenbeek et al., 2017; Deliens et al., 2018), and even neuroscientific methods like EEG (Coulson & Lovett, 2010) and fMRI (Van Ackeren et al., 2012).

2.2.1 Indirect requests processing

The difference in terms of experimental design between the early and the recent studies on the topic makes it difficult to combine them in a comprehensive picture of the different phases of IRs processing. Nevertheless, three main results can be drawn from the literature so far.

1. People sometimes do process the literal meaning of an IR and answer to that as well, typically with a *yes*, before complying with the request (Abbeduto et al., 1989; Clark, 1979; Munro, 1979), e.g.:

- (2)
 - a. “Can you tell me the time?”
 - b. “Yes, it is six o’ clock.”

2. If the context supports a directive interpretation, there is no difference in terms of processing of IRs and their literal counterparts, given a context supporting the literal interpretation (Gibbs, 1979, 1983), e.g.:

- (3)
 - a. [Literal Meaning]
Rod was talking with his psychiatrist. He was having lots of problems in establishing relationships.
“Everyone I meet I seem to alienate,” Rod said.
“I just turn very hostile for no reason,” he continued. The shrink said:
“Can’t you be friendly?” [i.e., “Are you unable to act friendly?”]
 - b. [IR Meaning]
Mrs. Norman was watching her kids play in the backyard. One of the neighbor’s children had come over to play. But Mrs. Norman’s kids refused to share their toys. This upset Mrs. Norman. She angrily walked outside and said to one of her children:
“Can’t you be friendly?” [i.e., “Be friendly!”]

Van Ackeren et al. (2012) proved that the same holds for HIRs, though the context in that study was visual (e.g., “It is very hot in here”, presented right after the picture of a desert [Literal Meaning: i.e., “The temperature is high”], or a closed window [IR Meaning, i.e., “Open the window!”]).

3. If the context is not manipulated, *Can you...?* forms are processed just like DRs, while NCIRs seem to be more difficult to process (Clark & Lucy, 1975; Ruytenbeek et al., 2017).

Did these previous studies address all of the levels of indirectness? While the first studies on the topic focused on conventional IRs (Abbeduto et al., 1989; Gibbs, 1981, 1983; Munro, 1979), the most recent studies have a variety of experimental designs taking various levels of indirectness and various levels of manipulation of the context into account. For instance, it has been found through corpora analysis that *Can you...?* forms require a directive interpretation

more often (71% of the instances) than *Is it possible to...?* forms (16% only), at least in French (Ruytenbeek et al., 2017, p. 50). For this reason, the most recent studies on IRs processing (Ruytenbeek et al., 2017; Deliens et al., 2018) focus on these two forms.

Coulson & Lovett (2010) and Van Ackeren et al. (2012), instead, consider only HIRs in supportive vs non supportive contexts. No study to date has taken into account both non conventional IRs like *Is it possible to...?* forms and HIRs: this is an issue that Experiments 2 and 3 will take care of.

2.2.2 Indirect requests and development

What about IRs comprehension in development? The developmental story of IRs comprehension dates back to the 1970s as well, but the first research findings were anecdotal and fragmentary (Papafragou, 2000). The few studies on the topic seem to show an above chance understanding of a variety of conventional indirect forms for the SA of requesting such as *Can you...?*, *May you...?*, *Would you...?*, and *Why don't you...?* forms, as early as 2;6 years (Reeder, 1980; Shatz, 1978), and a developmental pattern of acquisition of different forms of IRs between the age of 4 and the age of 7, with a significant gap between the 6 and 7 year olders (Carrell, 1981).

These studies are quite difficult to compare with one another, as they all make use of different methodologies (paraphrase choice, cooperative play, act out task, respectively) and they look at IRs from a syntactical complexity point of view, without taking conventionality into account, nor testing any HIR. Moreover, none of these studies took any measure of cognitive functioning. Experiment 1 and 2 of the present project will take care of these aspect.

Do we know anything about atypical development? A clear picture on the exact pragmatic impairments in children diagnosed with High Functioning Autism (HFA) and ASD in general is still lacking. However, there is evidence suggesting that they have difficulties in understanding indirectness (due to a ToM impairment), and in understanding the purpose of using IRs (MacKay & Shaw, 2004).

Counterevidence is also available. In fact, a few recent studies (Kissine et al., 2012, 2015) tested IRs comprehension in ASD and TD children and found that ASD children can comply with IRs at an above chance level. In one study, HFAs performed even better than the TD participants Kissine et al. (2015). Importantly, however, this study collected no neuropsychological measure and tested children in two very different age-ranges (HFAs: 7-to-12 years old; TDs: 2;7-to-3;6 years old). These two factors may bias the results from Kissine et al. (2015). Overall, in fact, the existing experimental literature is still lacking a comprehensive picture of IRs understanding in both typical and atypical development.

This need for further investigations, along with the issues that have just been raised with regard to the experimental design of the study by Kissine et al. (2015), have inspired Experiment 1 of the present project.

2.3 Two types of Pragmatics

Are all pragmatic tasks created equal? Several accounts in theoretical pragmatics support a distinction between different pragmatic processes types. Arguably the most appropriate and cautious way to look at it, though, would be to draw a distinction between *Linguistic Pragmatics* and *Social Pragmatics*, following Andrés-Roqueta & Katsos (2017), who provide a comprehensive report of the other views as well.

According to them, a line could be drawn between *Linguistic Pragmatics*, used for pragmatic tasks relying on structural language and semantics only, along with a general competence with pragmatic norms, such as, for instance, scalar implicatures, informativeness in general, metaphors

that are not novel, and *Social Pragmatics*, for pragmatic tasks where complex inferential abilities and ToM skills are needed, such as novel metaphors and irony.

What implications does this distinction have? This distinction is particularly crucial for young TD children and children with ASD, and it is important for IRs as well. Kissine et al. (2015) and Deliens et al. (2018), for instance, recall this distinction and draw the hypothesis that the pragmatic profile of ASD implies what they call an *Egocentric Pragmatics*: HFAs have recently proved to succeed in some pragmatic tasks like scalar implicatures and informativeness (Chevallier et al., 2010; Pijnacker et al., 2009) and metaphors (Norbury, 2005), but struggle with irony (Happé, 1993): this might suggest that HFAs can only perform well in the pragmatic tasks comprised in the *Linguistic Pragmatics* realm, i.e., requiring morphosyntactic abilities and lexical knowledge only. Nevertheless, as according to Kissine et al. (2015) and Deliens et al. (2018) HFAs seem to also be able to comply with IRs, which arguably need more than morphosyntactic skills to be comprehended, they propose that HFAs have an *egocentric* approach to Pragmatics and that they can only perform well in those pragmatic tasks that do not require any perspective shifting, and IRs would fall into this category. They also attribute to cognitive flexibility and planning abilities the seemingly preserved comprehension and compliance to ISAs, but their studies did not include any ToM measure. Whether or not IRs as a whole can be included in one of the two types of Pragmatics, and whether or not ToM has a crucial role in this distinction, will be two of the questions addressed by the present project.

2.4 Indirect requests and Theory of Mind

Has any study on IRs comprehension ever measured ToM skills? The already mentioned studies on ASD (Kissine et al., 2015; Deliens et al., 2018) have enriched the picture on IRs comprehension by taking into account some cognitive functions that might have a role in IRs comprehension, such as inhibition, flexibility, and working memory.

Only a few studies investigating IRs comprehension have taken ToM into account. They were conducted on other pathological populations, namely right-hemisphere lesion patients (Champagne-Lavau & Joannette, 2009), Alzheimer patients (Cuerva et al., 2001) and traumatic brain injury patients (Muller et al., 2010). These studies seem to suggest ToM might have an important role in the comprehension of the phenomenon.

Nevertheless, no study to date has ever addressed the potential role of ToM in IRs comprehension in TD children, nor in ASD, even though the debate on pragmatic deficits in ASD and their relationship with ToM skills has been lively and well fed since the 90s, with particular regard to metaphor and irony processing (Andrés-Roqueta & Katsos, 2017, for a review).

Moreover, ToM is a complex cognitive function, which is now broadly considered as partitioned into two components, namely cognitive ToM, concerned with cognitive beliefs and mindreading in its proper sense, and affective ToM, concerned with emotion recognition and empathy (Dennis et al., 2013; Turner & Felisberti, 2017). Both components might prove to be playing a role in IRs comprehension, as studies on other populations seem to suggest.

2.5 Predictions: what we do not know and what we can expect

What is missing in the literature? From the overview provided in the previous sections two main elements seem to be missing:

- studies looking at the different levels of indirectness within the same experimental setting;
- studies on the cognitive functions underlying ISAs comprehension, measuring them instead of assuming their involvement, particularly with regard to ToM.

These two elements must be taken into account as (i) substantial part of ISAs as a multifaceted phenomenon possibly belonging to both types of Pragmatics as outlined earlier, depending on the level of indirectness, (ii) source of a more informed view of when and why ISAs are comprehended, and (iii) if combined, potential keys to some fundamental questions on the nature of Pragmatics itself: if it was actually the case that ISAs understanding relies on different pragmatic processes depending on the level of indirectness of the ISA (i), then two types of pragmatic processing would exist, one of them being based on linguistic factors rather than (or, at least, more than) ToM skills.

This would be particularly interesting from a theoretical point of view, as Pragmatics has traditionally be seen as the ability to infer the communicative intentions of the speaker and therefore substantially overlapping with ToM. A a vastly followed account, in fact, actually sees Pragmatics as a specific submodule of ToM for pragmatic interpretation (Sperber & Wilson, 2012) and evidence on IRs of the kind we have hypothesized here would cast doubt on this view.

What do we expect with regard to the levels of indirectness? Given the scale presented in section 2.1.1., along with the results from previous studies on typical and atypical development (illustrated in section 2.2.2.) and about IRs processing (as seen in section 2.2.1.), some predictions could be drawn:

1. a developmental pattern of acquisition might be present for conventionalized vs. non conventionalized forms: the main prediction would be to observe that DRs and CIRs are acquired around the same (very early) age, followed by NCIRs and HIRs;
2. neurotypical adults might interpret NCIRs and HIRs as non directives more than they do with DRs and CIRs; differences in terms of processing times are also expected.

Do we have any predictions on ToM's role in IRs comprehension? Taking into account the distinction between the two types of pragmatics (presented in section 2.3.), and the few studies on IRs measuring ToM (listed in section 2.4.), two main predictions can intersect with those on the levels of indirectness:

1. both cognitive and affective ToM might play a role in IRs comprehension;
2. IRs might fall into two different types of pragmatics depending on conventionality levels: CIRs might need lexical competence only, while ToM might be necessary for NCIRs and HIRs to be complied with;
3. atypical development might show higher difficulties in comprehension for those forms requiring ToM abilities, i.e., NCIRs and HIRs.

3 Timeline, methods and experimental design

3.1 Timeline

The timeline of the present project can be seen in Figure 1, and the following sections will describe the conducted and planned experiments in details.

Experiment 1, as described in the following section, has been presented as a poster (Mazzaggio et al., 2019) both at the XPRAG.de conference in Edinburgh (June 19-21, 2019) and at the XPRAG.it conference in Cagliari (September 19-20, 2019), and I am currently writing the paper, as shown in Figure 1.

The expected submission date for each paper is to be intended at the end of each “Writing Paper” period.

PHASES	2018		2019						2020						2021										
	n	d	j	f	m	a	m	j	j	a	s	o	n	d	j	f	m	a	m	j	j	a	s	o	n
1st YEAR																									
Literature Review																									
Experiment 1																									
Short Term Programs																									
Writing Paper 1																									
2nd YEAR																									
Experiment 2																									
Eye-Tracking Training																									
Experiment 3																									
Visiting Period																									
3rd YEAR																									
Writing Paper 2																									
Writing Paper 3																									
Writing Thesis																									

Figure 1: Timeline for the present project.

The Eye-Tracking Training in January-March 2020 will be under the supervision of Francesca Foppolo in Milan Bicocca. The Visiting Period planned for the end of the 2nd year will most probably take place in Cambridge, under the supervision of Napoleon Katsos, who has worked on the two types of pragmatics distinction mentioned earlier (Andrés-Roqueta & Katsos, 2017).

3.2 Experiment 1

The first experiment of the present project has been a pilot study focusing on HIRs in typical and atypical development. As HIRs are understudied in development, the experiment included two different kinds of HIRs, where one would need higher inferential abilities to be understood.

3.2.1 Research Questions

1. Does children comprehension of requests vary depending on the level of indirectness of the request (i.e., DRs, HIRs, even more indirect HIRs), with DRs being easier to comprehend than HIRs?
2. Is there a difference in comprehension between (TDs vs. HFAs) groups with one group being facilitated over the other?
3. Is there a developmental path in IRs comprehension (TDs vs. younger TDs), with younger TDs having more difficulties than older TDs?
4. Does ToM play a role in IRs comprehension, or are language abilities enough (i.e., will ToM skills be able to predict IRs comprehension)?

3.2.2 Predictions

1. If the earliest studies on IRs in adults (Clark & Lucy, 1975; Clark, 1979) and typical development (Shatz, 1978; Carrell, 1981) have shown that IRs are generally more difficult to understand than DRs, then it is plausible that both TDs and HFAs will have more difficulties understanding IRs (HIRs in particular) than DRs (i.e., effect of condition).
2. If, as shown by previous studies, HFAs have difficulties in understanding the use of ISAs in general (MacKay & Shaw, 2004), but show no real problems with CIRs (Paul & Cohen, 1985), a difference between TDs and HFAs will probably be observable in those cases (HIRs) that need higher inferential abilities (i.e., effect of Group and probable interaction of Group X Condition).

3. If the only study on IRs comprehension in development targeting different age ranges (Carrell, 1981) is confirmed, the younger TD group should have more difficulties in complying with IRs in general, particularly with those requiring higher inferential abilities.
4. If HIRs belong to the Social Pragmatics type of pragmatic tasks (Andrés-Roqueta & Katsos, 2017), ToM might play a role for their comprehension, though language abilities will certainly be needed, confirming previous studies on other non literal phenomena (Norbury, 2005, for metaphor). This would mean that both linguistic and ToM skills should be able to predict children’s comprehension of HIRs, with children with higher linguistic and ToM skills having better understanding of HIRs.

3.2.3 Method

Participants The participants were 59 Italian children, 14 HFA children [MA = 10,6; SD = 1.17], 26 age-matched TD children [MA = 11.03; SD = 0.61], and 19 younger TD children [MA = 5.35; SD = 0.48], recruited through an ASD support center and two schools.

Experimental Design The experiment had a 3x3 latin square within-subjects design. Requests were presented as DRs, HIRs, and more indirect HIRs (HIR2).

Task Participants were asked to help the experimenter recreate a drawing of a farm (see Figure 2): the experimenter would request their help through either DRs (e.g., *What colour is the grass?*), HIRs (e.g., *I don’t remember the colour of the grass*) or even more indirect HIRs (e.g., *The colour of the grass is hard to remember*).



Figure 2: IRs task for Experiment 1.

Other measures Both language and ToM skills of the children participating in the study were tested through standardized tests, namely the BVL (Batteria per la Valutazione del Linguaggio) for their morphosyntactic and lexical skills (Marini et al., 2015) and two false belief tasks from The Theory of Mind Task Battery for their first and second order ToM skills (Hutchins & Prelock, 2014).

3.2.4 Outcomes

The analyses conducted on the two older groups (TDs and HFAs) with binomial logistic regression models had the following outcomes.

1. Children’s accuracy significantly differed depending on the condition only ($p < .0001$): they performed significantly worse with HIRs than with DRs (DRs vs. HIRs: $p < .005$; DRs vs. more indirect HIRs: $p < .0001$).
2. No group differences were found, possibly because the HFAs sample was too narrow. Nevertheless, it can be seen by looking at the descriptive statistics that a difference exists indeed: while TDs data showed a clear pattern of declining accuracy depending on the level of indirectness (DRs: 100%, SD: 0; HIRs: 83%, SD: 0.36; more indirect HIRs 73%, SD: 0.44), HFAs seemed not to perceive the manipulation (DRs: 76%, SD: 0.42; HIRs: 68%, SD: 0.46; more indirect HIRs: 78%, SD: 0.41).
3. The hypothesis on the younger TD group still needs to be tested as the data from their sample are yet to be analysed.

4. Children’s performance in the language (BVL) and ToM tests significantly predicted their accuracy in the IRs task (positive correlation between accuracy and the BVL scores: $p < .05$; $\beta = 4.78$; and between accuracy and ToM tests: 1st order ToM: $p < .05$; $\beta = 1.59$; 2nd order ToM: $p < .05$; $\beta = 2.71$). Interestingly, accuracy in the more indirect HIR condition negatively correlated with both children’s BVL scores ($p < .05$; $\beta = -0.16$); and children’s scores in the 2nd order ToM test ($p < .05$, $\beta = -3.04$), i.e., participants with better morphosyntactic and ToM abilities still performed lower with more indirect HIRs than DRs and HIRs.

Three main results can be drawn from the results of these analyses. In line with previous studies on adults (Clark & Lucy, 1975; Clark, 1979) and what can be hypothesized on the basis of the few studies on IRs comprehension in children (Shatz, 1978; Carrell, 1981), (i) both TDs and HFAs exhibit more difficulties understanding HIRs than DRs (i.e., there is an effect of condition).

Both ToM and morphosyntactic abilities seem to predict IRs comprehension (ii): children with better morphosyntactic and ToM skills also exhibited a better understanding of IRs (i.e., positive correlations have been observed between accuracy in the IRs and the BVL and ToM test scores), suggesting that the better the linguistic and ToM abilities the better children’s understanding of IRs.

However, (iii) this general pattern appears to be influenced by the indirectness of the request. In fact, participants with better morphosyntactic and 1st-order ToM abilities still performed lower with more indirect HIRs requests than DRs and HIRs (i.e, negative correlations have been observed between accuracy in the more indirect HIRs condition and the BVL and ToM-1st test scores). Similarly, the better 2nd-order ToM the better IRs understanding, but still this was more the case with DRs than HIRs (i.e., negative correlations have been observed between accuracy in the two HIRs conditions and the ToM-2nd test scores).

Overall, these results seem to show that both linguistic and ToM skills likely enhance children’s IRs understanding, but the level of indirectness of the request might involve these functions to different extents.

The fact that we observed no significant accuracy differences between TDs and HFAs is probably due to the sample of HFA participants being too narrow to make any appreciable difference emerge.

3.3 Experiment 2

The second experiment of the project will still consider HIRs in development, but will take NCIRs into account as well.

3.3.1 Research Questions

1. Does children comprehension vary depending on the level of conventionalization (CIRs vs. NCIRs vs. HIRs), with CRs being easier to comprehend than NCIRs and NCIRs being easier to understand than HIRs?
2. Is there a developmental path in IRs comprehension (i.e., group differences), with younger children having more difficulties than older children?
3. Does ToM play a role in IRs comprehension, or are language abilities enough (i.e., will ToM skills be able to predict IRs comprehension)?

3.3.2 Predictions

1. If previous studies on CIRs in adults (Clark & Lucy, 1975; Ruytenbeek et al., 2017) and typical development (Carrell, 1981) have shown that NCIRs and HIRs are generally

more difficult to understand than CIRs, then it is plausible that children will have more difficulties understanding HIRs than CIRs and NCIRs (i.e., effect of condition). However, this effect is expected to be more significant for HIRs than NCIRs, as conventionalization is probably more relevant for adults.

2. If the only study on IRs comprehension in development targeting different age ranges (Carrell, 1981) is confirmed, a developmental path will probably prove to be present, with HIRs being comprehended easily by the 5-6 year-old group and less by the other two groups, while CIRs and possibly NCIRs are expected to be comprehended by all groups, as they require lower inferential abilities (and, possibly, linguistic abilities only).
3. If HIRs belong to the Social Pragmatics type of pragmatic tasks (Andrés-Roqueta & Katsos, 2017) ToM might play a role for their comprehension, though language abilities will certainly be needed, confirming previous studies on other non literal phenomena (Norbury, 2005, for metaphor). This would mean that both linguistic and ToM skills should be able to predict children’s comprehension of HIRs, with children with higher linguistic and ToM skills having better understanding of HIRs.

3.3.3 Methods

Participants The participants will be 60 TD Italian children, divided in three groups: 3-4 year olders (20), 4-5 year olders (20), and 5-6 year olders (20), recruited in a school.

Experimental Design The experiment will have a 3x3 latin square within-subjects design. Requests will be presented as CIRs, NCIRs, and HIRs.

Task The task will be an act-out task. Six “memory” cards will be presented on a magnetic board and the child will be instructed to remove any card that is presented twice – if and only if the experimenter asks the child to. The instructions will present the manipulated variable (e.g., CIR: *Can you remove two cats?*; NCIR: *Is it possible to remove two cats?*; HIR: *There’s too many cards here.*). Removing the cards will be considered as a directive interpretation.

Other measures: Both language and ToM skills of the children participating in the study will be tested through standardized tests, namely the BVL for their morphosyntactic and lexical skills (Marini et al., 2015) and two false belief tasks from The Theory of Mind Task Battery for their first and second order ToM skills (Hutchins & Prelock, 2014), along with an affective ToM tests, possibly the Reading the Mind in the Eyes test (Vellante et al., 2013) and selected stories from the Strange Stories test (Mazzola V. & Camaioni L, 2002). A measure for inhibition and working memory will also be taken to ensure comparability with the existing literature (Kissine et al., 2015; Deliens et al., 2018).



Figure 3: IRs task for Experiment 2.

3.4 Experiment 3

The third experiment of the project will still take CIRs, NCIRs, and HIRs into account, but will investigate them in adulthood through reaction times and eye-tracking methodologies.

3.4.1 Research Questions

1. Does participants' compliance vary depending on the level of conventionalization (CIRs vs. NCIRs vs. HIRs), with CIRs being easier to comprehend than NCIRs and NCIRs being easier to understand than HIRs?
2. Does conventionalization affect the processing costs of IRs, with CIRs being faster to comprehend than NCIRs and NCIRs being faster to comprehend than HIRs?
3. Does ToM play a role in IRs comprehension (i.e., will ToM skills be able to predict IRs, and particularly HIRs, comprehension)?

3.4.2 Predictions

1. If the recent studies on CIRs and NCIRs in adults (Ruytenbeek et al., 2017; Deliens et al., 2018) have shown that NCIRs are less frequently interpreted as IRs than CIRs, then it is plausible that NCIRs and HIRs will be interpreted as non directives more than CIRs (i.e., effect of condition). We also expect NCIRs to be interpreted as directives more than HIRs, as adults should be sensitive to the level of conventionalization.
2. If HIRs do not share with CIRs the convention of means (Clark, 1979) that make CIRs and NCIRs perceived as directives, then it is plausible that they will take longer to be processed, because of the higher inferential load. NCIRs would be expected to take longer than CIRs, as they are not conventionalized, but less than HIRs, as NCIRs do not share with CIRs the convention of form, but they do share the convention of means, as defined in section 2.1.1. and stated by Clark (1979).
3. If HIRs belong to the Social Pragmatics type of pragmatic tasks (Andrés-Roqueta & Katsos, 2017) ToM might play a role in the directive interpretation of IRs. This would mean that ToM skills should be able to predict participants' directive interpretation and IRs processing effort, with adults with higher ToM skills giving more directive interpretations of NCIRs and HIRs than adults with lower ToM skills, and complying with them in a shorter time.

3.4.3 Methods

Participants The participants will be neurotypical Italian adults (university students). The number of participants will be between 25 and 40 adults, following previous studies on the same topic with comparable methodology (Ruytenbeek et al., 2017; Deliens et al., 2018).

Experimental Design The experiment will have a 3x3 latin square within-subjects design. Requests will be presented as CIRs, NCIRs, and HIRs.

Task The task will be a computer-based task. Six "memory" cards will be presented and participants will be instructed to remove any card that is presented twice – if and only if the computer asks the participant to. The instructions will present the manipulated variable, just like in Experiment 2. Participants willing to answer the question or agree with the statement, will have to choose the default pointer (on the right in Figure 4), and that

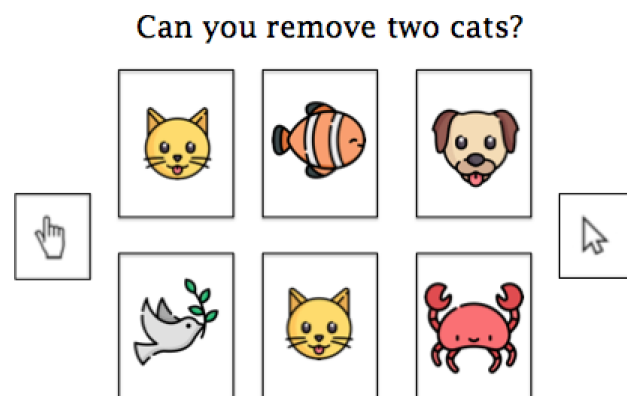


Figure 4: IRs task for Experiment 3.

will make the answering options (YES vs. NO)

available on the screen; any time they will want to comply with the request, they will have to choose the hand pointer (on the left in Figure 4), and that will make the cards' movement possible. Any click on the hand pointer will be considered as a directive interpretation. If possible, eye-tracking data will also be gathered to try and check whether a possible bias in the existing literature (Ruytenbeek et al., 2017; Deliens et al., 2018) actually played a role: a similar paradigm was used, but two (YES vs. NO) buttons were shown at the bottom of the screen, potentially biasing participants towards a non-directive interpretation.

Other measures: ToM skills and cognitive functioning of the participants in the study will be tested. ToM will be tested through the Strange Stories test (Mazzola V. & Camaioni L, 2002), along with an affective ToM tests, possibly the Reading the Mind in the Eyes test (Vellante et al., 2013). A measure for inhibition (the Stroop test) and working memory (Reverse/Digit Span) will also be taken to ensure comparability with the existing literature (Kissine et al., 2015; Deliens et al., 2018).

4 Outcomes

The present project aims at enhancing the knowledge about the role of conventionality in IRs comprehension and compliance both in development and adulthood. It also investigates the cognitive function(s) involved in IRs comprehension, with a particular focus on ToM.

What will it tell us on IRs comprehension? The outcomes of the project won't in any way be definitive, but will constitute a first map of the interactions between language skills, ToM skills, and conventionality in typical and atypical development, as well as a confirmation of the tendencies that have recently been sketched (Ruytenbeek et al., 2017; Deliens et al., 2018) with regard to the effect of conventionality on IRs processing in adulthood, ruling out the possible biases that these studies presented (i.e., buttons potentially biasing participants towards a non-directive interpretation shown at the bottom of the screen throughout the whole experiment).

What about development? With specific regard to typical and atypical development, the expected outcome for Experiment 1 and 2 would be to outline a developmental pattern of acquisition for conventionalized (DRs and CIRs) vs. non-conventionalized forms (NCIRs and HIRs), partially confirming the existing developmental literature while disproving the claims for acquisition of IRs before the age of 3 thanks to a more fine-grained and better balanced measure.

Will its outcomes with regard to ToM be relevant? By measuring ToM skills and having HFAs participating in the studies, it is possible that one of the outcomes of this project will be a confirmation of the existence of two types of pragmatics (as defined in section 2.3.), with IRs falling into the two different types depending on conventionality levels (i.e., CIRs needing lexical competence only, and therefore falling into the Linguistic Pragmatics category, and NCIRs and HIRs needing at least first order ToM skills to be complied with, therefore belonging to the Social Pragmatics category).

This confirmation, if further strengthened by other results in line with this distinction, might have serious theoretical implications with regard to (i) the characterization of HFAs pragmatic impairments and (ii) the status of Pragmatics. In case the pattern seen in Experiment 1 is confirmed, IRs comprehension might be partially preserved in HFA, provided that their linguistic and ToM skills are good enough: this would mean that (i) their pragmatic abilities are beyond the *Linguistic Pragmatics* realm, but are not *egocentric* per se, contrary to previous hypotheses (Kissine et al., 2015; Deliens et al., 2018); they might as well be modulated by their ToM skills - along with, as previously shown by Norbury (2005) with regard to metaphor comprehension, their linguistic skills. With regard to the nature of Pragmatics itself, if IRs comprehension

proved to be effectively relying on ToM to different extents depending on the level of indirectness, it would mean that (ii) two types of pragmatic processing would actually exist, one of them being based on linguistic factors rather than (or, at least, more than) ToM skills.

As mentioned earlier, traditionally, Pragmatics has been thought to coincide with the ability to infer the communicative intentions of the speaker, and should therefore be linked to, if not overlapping with, ToM; a vastly followed account actually sees Pragmatics as a specific submodule of ToM for pragmatic interpretation (Sperber & Wilson, 2012).

Providing evidence in favour of the existence of pragmatic phenomena that do not need ToM abilities to be understood might be a significant step towards a different view of Pragmatics as a whole, relying more on linguistic or ToM skills depending on the specific pragmatic phenomenon at stake.

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