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Social-cognitive and pragmatic aspects of language acquisition from a developmental perspective

Doctoral (PhD) dissertation

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1. Introduction - The psycholinguistics of non-compositionality

Psycholinguistics, or the psychology of language is concerned with discovering the psychological processes by which humans acquire and use language. Conventionally, the field focuses on four major topics: language processing, perception, production and acquisition (Gleason and Ratner 1998), and represents a cognitive, mentalistic approach, in that it aims to describe the interaction of language and the mind in human communication.

Studies of comprehension investigate how people understand spoken or written language. This is a broad area of investigation that involves the careful combination of comprehension processes at many levels, including investigation of how speech signal are interpreted by listeners (i.e. speech perception), the construction of the meaning of words and phrases (lexical access), grammatical structure analysis to obtain longer units of meaning (sentence processing), and how meaning is constructed beyond the word level – that is, the cognitive background mechanisms of how discourse, texts and conversations are understood (pragmatics, indirectness, discourse organization).

Psycholinguistics therefore investigates both the production and perception of literal, and non-literal, figurative language use. Concerns specifically relevant to figurative language use and the cognitive strategies of their processing may be fruitfully investigated in the developmental dimension by looking at the acquisition of pragmatic competence, hence the ability to understand and productively use non-compositional constructions and to abide by the norms of everyday discourse. The social-cognitive dimension in the developmental study of pragmatic competence as addressed by the present study may shed light on the developmental milestones that contribute to our human-specific ability to produce and understand figurative constructions and to take part in the dynamic interactive process of everyday discourse with ease.

1.1. The development of psycholinguistic inquiry – from rags to riches

The ’cognitive revolution’ in linguistics designates the 10-20 year period beginning in the 1950-ies, when the Behaviorist paradigm floundered and gave way to new approaches about human psychology and the mind. This new perspective, initiated by Noam Chomsky finally considered intangible, conceptual phenomena as relevant elements of psycholinguistic inquiry, and relied on new, revolutionary insights including the use of the computational

metaphor of mind, and the idea that language consists of a mental grammar which is a set of unconscious rules. Cognitive linguistics thus sees language more or less as the mirror of the mind, a product of human intelligence, "created anew in each individual by operations that lie beyond the reach of will or consciousness" (Chomsky 1975).

Many of the problems investigated by current psycholinguistics have long been of enduring interest to philosophers, linguists, and other thinkers of related disciplines, such as anthropology, computer science, biology, and neurology. Despite such deep historical roots, the field of psycholinguistics is relatively young. Some researchers date its birth to the early 1950-ies, when psychology and linguistics converged as a result of linguistic questions emerging in experimental psychology. From the 1930-ies through the 1950-ies the dominant paradigm in psychology was behaviorism, advocating principles that emphasized serial patterning in behavior, and seeing language as a manifestation of general learning mechanisms based on diverse types of conditioning methods and stimulus-response chains. Learning theories proved to be insufficient in accounting for characteristic features of language acquisition (like word coinage, the goal-oriented and not mechanical imitation of children (Pléh-Felhősi-Schnell 2004), and for the processing of phrases endowed with implicit content, incorporating discontinuous elements, among others.

Finally, a new transformational framework emerged that guided much of linguistic theory intensively for the next two decades, in which language was seen as a central component of human cognition, and where the mental operations of producing and understanding utterances were in the focus of attention. This cognitive linguistic approach brought linguistics and psychology closer in that they managed to unify the two fields' main interests. As Miller put it (1990, 321.): "Linguists and psychologists talk about different things…Grammarians are more interested in what could be said than in what people actually say, which irritates psychologists, and psychologists insist on supplementing intuition with objective evidence, which irritates linguists". During the 1970-ies, psychologists also discovered interactions among the various levels of linguistic analysis and the importance of the situational context in language processing, and therefore began to investigate comprehension from a holistic approach, incorporating various factors of linguistic, mental and social dimensions.

Concentrating on the mental organization of discourse allowed the elaboration of cognitive models of language processing, production and perception, and resulted in the formation of a new paradigm which considered language as a medium of mental representations. This new approach delegated language from the observation of the physical,

behavioral output over to the investigation of conceptual dimensions, and new theories on the cognitive traits of language paved the way for psycholinguistic research on idiomaticity. For long, psycholinguistics focused on literal language use, investigating primarily literal meanings, although most cognitive linguists acknowledge that our everyday language is metaphorical by nature (Lakoff and Johnson 1980, Lakoff 1987. Lakoff and Johnson (1980) elaborated their Conceptual Metaphor Theory which states that human thinking and cognition itself is metaphorical, and the human mind resorts to concrete meanings whenever it has to handle non-compositional structures, which eventually result in the formation of ICMs (idealized cognitive models), that is, in conceptual (not linguistic) metaphors, which give us an analogy we rely on when deciphering intended meaning. Of course these cognitive metaphors (e.g. ANGER is HEAT) have linguistic realizations (*He was fuming*), but the theory's novelty lies in the introduction of such conceptual metaphors that are believed to exist in the human mind, assisting meaning construction. This view became one of the most pervasive and most dominant theories in cognitive semantics, providing fruitful grounds for research in language and thought issues later on.

Despite the unanimous consent of researchers on the metaphorical nature of human thinking and language use, idiomaticity has been practically left out from the focus of attention in semantic and linguistic research for long, and until recently, psycholinguistic inquiry focused primarily on literal language use, trying to map the mental processes responsible for word meaning (semantics), sentence processing (syntax), and its corollaries. Later on, the birth of pragmatics and the simultaneous interaction of different dimensions of language use allowed a holistic approach, in which participants, social purposes, and context also play crucial roles in meaning construction (see more of this in chapter 8). Therefore, the understanding of figurative language (such as metaphors, idioms, indirect utterances, jokes and other forms of humor, even irony) requires the simultaneous integration of different factors, which in turn ensures the successful deciphering of intended meaning. The cognitive pragmatic model proposed in the present study aims to make up for some shortcomings of models on the cognitive mechanisms we rely on in human discourse rich in inferential processes and non-compositional, indirect utterances.

1.2. Models of lexical access

A number of models have been created to mirror our retrieval of word- and phrase meanings from our mental lexicon. The four prevailing models are *Serial search models*, which rely on modular processing, that is, on two phases of interpretation. This hypothesis is represented by serial models that aim to explain metaphor and idiom comprehension (e.g. Standard Pragmatic Model (Gibbs 1994), Searle (1979b), and with Bobrow-Bell (1973). This serial approach, however, was not born our in present day psycholinguistic experiments: the two phases would require twice as much time and effort as literal interpretation. Findings demonstrate that non-literal (indirect, figurative or humorous) interpretation does not require more time or effort (Gibbs and Gonzales 1985, Gibbs, Nayak and Cutting 1989) (see more of this in chapter 1.6).

Therefore, *Parallel access models* have been drawn up, which hypothesize the simultaneous activation of literal and figurative meanings (Swinney and Cutler 1979). Such interactive models include connectionist approaches (Christiansen *et al*. 1999), which create artificial neural-networks to model human cognition and language use, in which representations are activation-patterns (Pléh 1998, 2013). Those opposing such interactive models argue that the simultaneous activation of so many factors would require considerable effort from the side of the interpreter and thus processing in the case of non-compositional constructions would be rather slow. However, psycholinguistic experiments demonstrate the opposite, namely, that understanding non-literal constructions is not slower, and not more difficult than that of literal phrases (Gibbs 1994, Gibbs, Nayak and Cutting 1989), and this is because alternative meanings are not automatically and thus unnecessarily activated, but are only prepared for retrieval, and we efficiently choose among competing meanings that are simultaneously present. These models thus hypothesize a mental component of interpretation that enables the person to interpret the intended meaning of non-compositional constructions with ease, without extra time and effort (Gibbs 1994). The following experimental paradigm aims to identify this mental component (hereinafter referred to as mentalization or theory of mind), and give experimental evidence of its presence in the different aspects of pragmatic meaning construction that goes beyond the level of syntactically based semantic interpretation.

1.3. Mentalization and pragmatic competence

1.3.1. Background

The problem of idiomatic language processing and acquisition is an issue of great concern in today's psycholinguistics (Sperber and Wilson 1986, Baron-Cohen and Tager-Flusberg 1993, Gibbs 1994, Tomasello 1999, Norbury 2005). The increased interest surrounding the topic is due to its importance in both thinking and speaking. Research centering on non-literal language use and understanding tries to give answers to a number of debates in cognitive neuroscience and cognitive linguistics, trying to identify the processes and mechanisms we rely on when take part in a conversation, engage in everyday discourse, and think and speak in general, abilities so common we take them for granted.

Embedding the present research into a pragmatic background, a cognitive psychological theory is proposed in explaining the processing of non-compositional constructions. After outlining the major models of metaphor processing, their shortcomings and efficiencies are discussed and through a synopsis of the changing conceptualization of metaphors and idioms the traditional and the cognitive linguistic views are confronted. The first chapter aims to answer two questions in the focus of attention in today's cognitive psychological and linguistic research on idiomaticity: first, the processing of idioms and metaphorical expressions, second, their acquisition and the mastering of pragmatic competence. As for the interpretation of non-literal constructions, my research demonstrates that figurative language understanding is based on similar, but not the same processes as literal language use (hence the equivalence of time in processing), which is in harmony with Gibbs' experimental results and their implications (Gibbs 1994) and with Sperber and Wilson's tenet of cognitive pragmatics (1986). An important, however, in itself probably not sufficient factor in figurative language use is *theory of mind*, which is also a prerequisite for pragmatic competence, that is, for the mastering of the ability to flexibly handle and interpret non-literal, indirect expressions so common in everyday conversations.

1.3.2. Tradition vs. innovation

The traditional view of figurative language (Aristotle 1996, Kövecses 1986, 2002) sees metaphor and non-literal expressions as representing an extraordinary, distorted way of putting thoughts, which could be expressed in a conventional, i.e. literal manner. Later on –

the traditional view states – such figurative expressions have become conventional in language use, and thus, they do not really count as metaphorical. As opposed to these traditional convictions, the cognitive view sees metaphor as an integral part of our everyday language, which is not a distorted, complicated way of expressing ourselves, but one facilitating interpretation, often allowing us to convey thoughts which cannot be expressed literally, or could only be circumscribed in a lengthy manner.

Another important aspect of the traditional view is that it sees metaphors as elements strictly belonging to language. They are considered linguistic expressions, pertaining to the domain of poetics and verbal games. The innovative, cognitive view represented by Lakoff and Johnson (1980) falsifies these views, and states that metaphor is an element of thought. They thus delegate non-literal expressions to a cognitive dimension, breaking away from the domain of linguistics per se, investigating metaphor as an element of our conceptual system.

1.4. Current theories on metaphor understanding

Metaphor, like all other forms of figurative language, has been usually explained as a secondary linguistic process taking place on literal language. However, this explanation does not fit well with recent findings in psycholinguistic and cognitive studies (Glucksberg and Keysar 1990, Burt 1992, Gibbs 1994), claiming that metaphors may be defined as non-literal expressions, characterizing one thing in terms of another, juxtaposing concepts from separate domains of experience on the basis of a conceptual analogy (ANGER IS HEAT) (Gentner and Bowdle 2001).

Along with the Lakoff and Johnson view (1980), Gibbs (1992, 1994) claims that long-term memory is structurally organized by prototypes extended by metaphoric and metonymic principles called conceptual metaphors or conceptual mappings. A conceptual metaphor, such as LOVE IS A JOURNEY, is constituted by conceptual mappings between the two domains that make up the metaphor, the target- (abstract e.g. *anger*) and the source (concrete, e.g. *heat*) domain. In the appropriate context, most conventional metaphoric expressions, such as *we are at a crossroads* or *our marriage is on the rocks* access these conceptual metaphors from our long-term memory.

Most researchers in current psycholinguistic experiments on figurative meaning believe that the processes involved in comprehending metaphorical language are much the same as those used for literal language. The basic question in metaphor processing, namely,

what makes the listener/reader create the figurative meaning – i.e., a metaphorical category - instead of using the literal meaning of the vehicle (Gentner-Bowdle 2001) is still unclear. The mentalistic model proposed in this study, highlighting the role of mentalization tries to go behind the scenes and map the cognitive background mechanisms of non-compositional, pragmatic processing.

1.4.1. The conceptual metaphor theory

The cognitive turn in metaphor research brought by Lakoff and Johnson's book *Metaphors we Live by* (1980), created the first paths of convergence of linguistics to psychology in the cognitive investigation of idiomaticity, and thus laid down the foundations of conceptual analysis of linguistic phenomena.

As opposed to the mentioned traditional theories presuming that idioms, such as *flip one's lid, blow one's top*, are isolated, conventionalized expressions and non-compositional, arbitrary constructions whose meaning cannot be predicted from the meaning of their constituent parts (Kövecses 1986, 2002, Lakoff 1987), cognitive semantics sees them as conceptual analogy-based cognitive models, consisting of two domains: a source and a target domain. Their primary function, as conceived by cognitive linguistics, is to help understand one concept in terms of another, by means of correspondences[1] between the elements of the two domains. The source domain is a more concrete entity (such as HOT FLUID) that we rely on to interpret a more abstract concept, the target domain (ANGER). This correspondence between the source domain and the target domain is called a conceptual metaphor.

The mappings between the two entities determine what conceptual metaphor is behind the conceptualization of a given concept, in our case, anger. These domains however, tend to overlap, creating fuzzy categories for the entailments[2].

There have been studies investigating what role our metaphorical thinking plays in figurative language understanding (Gibbs 1994). Gibbs examined the role of conceptual metaphors in immediate idiom comprehension to see if people always access conceptual metaphors each time they encounter and interpret an idiom. The findings indicate that people

[1] We establish such entailments for ANGER IS PRESSURE IN A CONTAINER conceptual metaphor in the following way: pressure is anger; body is a container for anger; cause/intensity of pressure is cause/intensity of anger; control over pressure is control over anger; explosion of container is outburst of anger, etc. (Kövecses 2002).

[2] Since the general metaphor BODY IS A CONTAINER FOR ANGER includes other minor metaphors, an expression belonging to the domain ANGER IS A HOT FLUID IN A CONTAINER entails that it also belongs to the BODY IS A CONTAINER FOR ANGER metaphor. The same way, since heat and fire are inseparable, expressions in one domain (e.g. heat) often belong to the other domain (fire) as well.

do access conceptual metaphors when understanding idioms, but significantly less so when processing literal paraphrases of idioms. Furthermore, people access the appropriate conceptual metaphors, such as ANGER IS HEAT when processing idioms belonging to that conceptual domain (be steaming, be fuming), but not when they read idioms (e.g. *jump down one's throat*) motivated by different conceptual metaphors (ANGER IS ANIMAL BEHAVIOR). These findings provide evidence on the central role our metaphorical mind plays in figurative language understanding, supporting the conceptual metaphor view representing a cognitive approach (Lakoff and Johnson 1980, Gibbs 1992, 1994).

Grady-Oakley-Coulson (1999) point out the limitations of conceptual metaphor theory, claiming that the novel, inferential nature of metaphor stemming from the emergent feature of the blending of different input spaces in the conceptual blending theory (see 1.6.5.) cannot be captured explicitly within the conceptual metaphor theory based on a mere bilateral (source-target) correspondence and projection.

1.5. The typology of idioms

Idioms (*be boiling, be fuming*) are non-literal expressions based on metaphors (Gibbs 1994), where the overall, intended meaning of the phrase does not result from the summarized (literal) meanings of its individual components. Traditional views of idiomaticity held that such phrases are non-compositional, and that their figurative meanings are directly accessed from the mental lexicon. Gibbs (1994) classifies idiomatic phrases on the basis of the following two aspects:

From the morphological aspect he distinguishes decomposable and non-decomposable idioms. The decomposable group entails those idioms where the semantic interpretation of the elements contributes to their holistic, idiomatic meaning to a great extent (*lay down the law, the back of the chair, the neck of the bottle*, etc.).

The opposite is true for non-decomposable idioms: their figurative meanings cannot be derived from the sum of the meanings of its individual components, but they encode a fairly independent figurative meaning (*shoot the breeze, hit the sack*).

According to the aspect of conventionality we distinguish conventional idioms that are frequently used in everyday conversation (*be exploding, lose one's head*), as opposed to non-

conventional phrases: the ones that are not familiar, for they are relatively rarely used[3] (*steal one's thunder, be water in the sand*). And then we have the so-called dead-metaphors, which designate those expressions that further undergo a process of conventionalization, in which their metaphorical meaning becomes quite stable and fixed, either losing their early creative potential (anything referred to as *dog* means "bad", "of no use"), or losing their metaphorical nature – we have no other literal way of expressing them (*leg's table, mouth of the river*, etc). The two distinctions can, of course, overlap, and we can talk about idioms that are decomposable, as well as conventional, (*play with fire*), non-decomposable conventional (*blow one's trumpet*), etc.

1.6. Psycholinguistic models of metaphor processing

There have been attempts to create a model of non-compositional meaning construction, which can account for the speed, ease and versatility in human thinking and communication that is characteristic of everyday discourse involving indirect, idiomatic expressions (Cooper 1999). In the following part of the thesis I am going to delineate the major models of metaphorical interpretation, demonstrating how they at some point lose focus in the abundance of human communication, integrating myriads of social-cognitive and linguistic factors. As we'll see, the models often explain some salient features of pragmatic, i.e. holistic interpretation, but fail to consider other aspects present in another dimension of decoding (e.g. not the in the linguistic but in the social domain). Eventually a model incorporating all the mentioned factors of interpretation will be drawn up, showing how mentalization is reasonably believed to be a core component in non-compositional meaning construction and thus in the acquisition of pragmatic competence.

1.6.1. Idiom-list hypothesis (Bobrow and Bell 1973)

Bobrow and Bell's model, similarly to Searle's (1979b) theory of figurative interpretation, suggests that people comprehend non-literal expressions (*kick the bucket, spill the beans*) by first processing the phrase's literal meaning, and when seeing that the literal meaning does not fit the context at hand, then, and only then do they directly retrieve the phrase's idiomatic

[3] Obviously there can be individual differences in what one considers a rare or a familiar idiom, however, we do have generally conventional ones that are no doubt frequently used – and thus their interpretation is facilitated by their familiarity.

meaning from the special phrasal lexicon "reserved" for frozen figurative expressions (Figure 1).

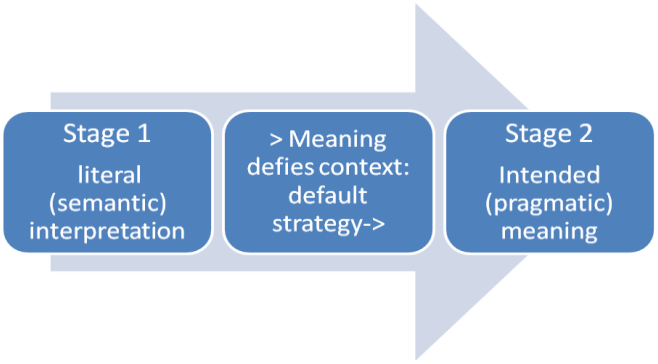


Figure 1.

Idiom list hypothesis (Bobrow-Bell 1973)

This implies that people should have more difficulty understanding figurative speech, and that the interpretation of idiomatic expressions should take twice as long as that of literal ones. Burt (1992), Gibbs and Gonzales (1985), Gibbs, Nayak and Cutting (1989) and Glucksberg and Keysar (1990) falsified these convictions in experiments where people's task was to judge the meaningfulness of word phrases. Measuring participants' reaction times they demonstrated, that in a context supporting the idiomatic meaning, idiomatic expressions took significantly less time to verify than literal phrases. The bias participants had to interpret the expressions idiomatically right away before recognizing their intended literal meaning, stems from the priming effect the contexts convey in these cases, and from the poetic structure of our mind (Lakoff and Johnson 1980, Gibbs 1986, Pléh and Thuma 2001).

It is also referred to as the metaphor interference effect, since the metaphorical meaning was instantly noticed by participants, and interfered with their ability to classify it simply as false. More recently, the interference effect has been used to trace the mechanisms by which metaphor is comprehended. Wolff and Gentner (2000) showed that the interference effect is equally strong for reversed metaphors *(some jails are jobs*) as for forward metaphors (*some jobs are jails*). This suggests that metaphor processing begins with a symmetric alignment, as in the structure-mapping model, rather than by a directional projection from the concrete (vehicle) to the abstract (topic) domain.

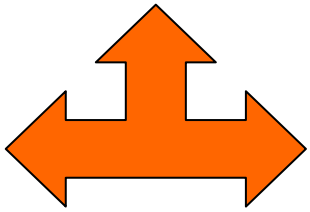
1.6.2. Lexical representation hypothesis (Swinney–Cutler 1979)

Swinney and Cutler suggest that idioms are stored as long expressions in the mental lexicon. Both the literal and the figurative meanings may be simultaneously activated when we select the intended (idiomatic) meaning fitting the given context (Figure 2) out of the competing meanings. The model known as the lexical representation hypothesis states that idioms are stored and retrieved from our mental lexicon in the same manner as any other word or lexical ambiguity.

Idioms are stored as long expressions in the mental lexicon:

We choose the appropriate

3. **INTENDED MEANING** (contextual help)



Both 1. **LITERAL** and 2. **FIGURATIVE**

meanings are activated

Figure 2.

Lexical representation hypothesis (Swinney-Cutler 1979)

This model is attractive because it does not hypothesize a special idiomatic processing mode and a default strategy, which would be time consuming. Idioms here are understood as if they were single words, not through a decompositional analysis requiring more stages. However the revolutionary finding (Burt (1992), Gibbs and Gonzales (1985), Gibbs, Nayak and Cutting (1989) and Glucksberg and Keysar (1990), that it takes the same or less time to process figurative expressions than processing their literal meanings, does not necessarily mean that both meanings are activated simultaneously to the same extent. Furthermore, the model does not identify the mechanisms that help us decide among the competing meanings it hypothesizes.

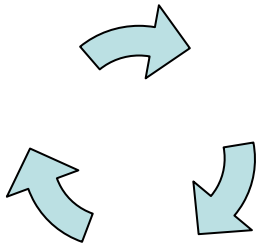
Some evidence against this model is provided by contextual tasks based on stories with final sentences (*He swallowed the bitter pill*) having either literal (*took his medicine*) or idiomatic (*endured the inconvenience*) interpretations (Gibbs 1986). In this study participants' task was to judge whether the sentence presented to them (which was either the 1. literal, 2. the idiomatic interpretation of the target sentence, 3. unrelated or 4. an anomalous sentence)

was a meaningful English sentence. The results suggest that participants were not subsequently faster in responding to the literal targets than they were to make the same judgments for unrelated targets, thus it seems doubtful that both the literal and the figurative meanings would be activated simultaneously. Burt (1992) and Mueller and Gibbs (1987) have demonstrated that simultaneous activation is possible in the cases of isolated idiomatic expressions, that is, when there is no, or only a short context, which does not create an effect of idiomatic priming; and in contexts simultaneously supporting both literal and idiomatic meanings.

1.6.3. Direct access hypothesis (Gibbs 1984)

Gibbs (1984, 1986, 1994) formulated this hypothesis on the basis of his findings listed above as counter-arguments to the mentioned models. He suggests that idiomatic expressions are interpreted just as easily as literal ones, thus no special phase or extra time and effort is required. Idioms are accessed directly in our mental lexicon, and it often takes not more, but rather less time to interpret figurative expressions than literal ones (Fig. 3.). People therefore automatically compute the intended, non-literal meanings, due to the poetic structure of the human mind, in other words, because, in line with Lakoff-Johnson (1980), we inherently think metaphorically and metaphors are indeed our vehicles of thought.

Figurative meaning retrieved directly from the lexicon.



Familiar idioms are understood
more rapidly than similar literal constructions

Figurative interpretation does not take any longer than that of conventional expressions.

Figure 3.

Direct access hypothesis (Gibbs 1984)

However, metaphors, idioms, and pragmatic phenomena may differ in several aspects, and a sufficient model should account for all aspects of idiom processing. Conventional, familiar idioms have been found to be interpreted faster than less familiar phrases (Schweigert 1991, Blasko and Connine 1993, Varga et al. 2014). Some idioms are predominantly figurative (*spill the beans*), whereas others (*have one's name on something, take one's medicine*) have both literal and figurative uses that are practically equal in frequency. Difficulty in understanding idioms depends on the given phrase's familiarity or conventionality, thus, this factor influences and facilitates figurative interpretation to a great extent. The more frequent the idiom is, the less time it takes to interpret it. However this factor is not controlled for in the model.

1.6.4. Composition model (Tabossi - Zardon 1993)

The composition model states that idioms are interpreted as sentences, i.e., through decomposition, resulting in a holistic interpretation of the phrase (Fig. 4.). Thus idiomatic phrases and expressions are compositional, where the individual parts are functions of the intended, figurative meaning. Therefore, this model states, that a semantic analysis based on the grammatical structure of the phrase yields the idiomatic meaning of the expression at hand.

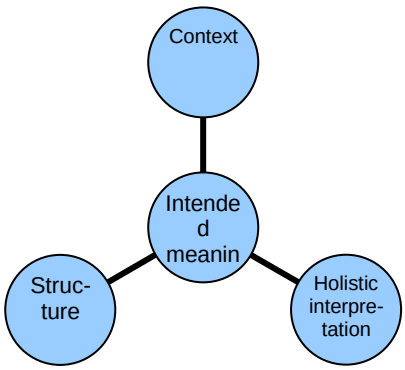


Figure 4.
Composition model (Tabossi-Zardon 1993)

Tabossi and Zardon give an explanation that applies only to the interpretation of decomposable idioms, whose semantic analysis contributes to their idiomatic meanings to a great extent (*feet of the mountain, the leg of the table, etc*). The model, however, does not give

a valid explanation to the processing of non-decompositional expressions (*kick the bucket, fly off the handle*).

1.6.5. Conceptual blending model (Fauconnier and Turner 1998)

Coulson and Oakley created a theory of online meaning construction, also known as conceptual blending (Fauconnier and Turner 1998, Coulson and Oakley 2000). The theory represents a connectionist approach, delineating a domain-general framework theory, functioning as an explanatory model for linguistic and nonlinguistic blends as well. Blending theory describes different phases of a creative construction of meaning, which happens through the integration of dynamic cognitive models. The conceptual integration outlined by blending theory combines different conceptual spaces (input spaces, generic space, blended space), and has an *emergent structure* of its own – thus having a pragmatic reality (Fig. 5.).

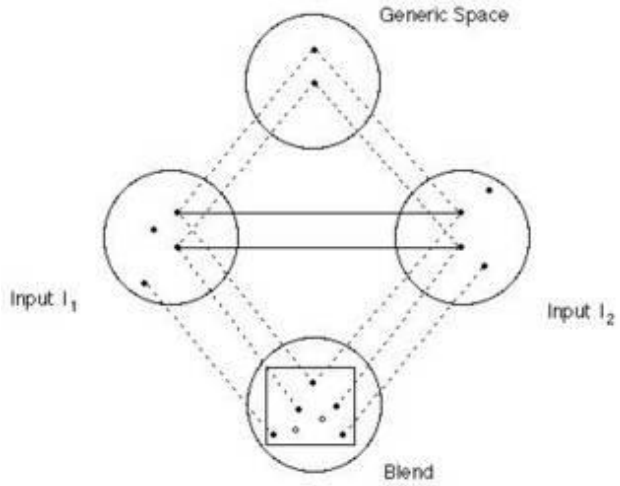


Figure 5.
Blending model of metaphor (Coulson-Oakley 1998)

Due to its domain general, unspecific nature, it is applicable in different fields, such as anthropology, sociology, motion-detection, vision, and not exclusively to linguistics. This is largely in harmony with current views in cognitive pragmatics (Sperber-Wilson 1986, 2002), in that inferential meaning construction is not strictly and exclusively a linguistic process. This generality of the theory is just as much a disadvantage, as it is an advantage: it assures versatility and flexibility (and thus applicability in different disciplines), however, its weakness stems from the lack of specificity for linguistic, in our case, idiomatic expressions.

As a general framework theory of meaning construction, it may be relevant concerning the processing of idioms, because the different cognitive stages of blending include the generation of inferences, and thus of mental representations, through the integration of different mental spaces. Veale and O'Donoghue (2000) claim that it solves three problems rooted in the comprehension of metaphors and idioms: relevance (i.e. what concepts are relevant to the analogy or metaphor at hand), structural analysis (what the relationship is between the relevant concepts invoked in the analogy), and recruitment (what type of mappings, entailments need to be activated to construct a coherent representation).

As for metaphor processing and understanding, Grady, Oakley and Coulson (1999) compared the conceptual metaphor theory (CMT) (Lakoff and Johnson 1980) and the theory of conceptual blending (BT) (Fauconnier and Turner 1998). The authors claim that the conceptual metaphor theory addresses recurring patterns in figurative language, while blending theory focuses on the particulars of individual cases. Therefore, since they address different aspects of metaphoric conceptualization, the two approaches are complementary: the bilateral CMT mappings are inputs to and constraints on the dynamic conceptual networks posited within BT (Grady *et al*. 1999). The latter contributes to the inferences residing in new emergent structures with novel conceptualizations not ensured by the conceptual metaphor theory alone. Also, BT may give a better explanatory framework for non-conventional metaphor processing as well.

Conceptual blending theory, however, leaves a number of questions unanswered. It does not explain how our mind actually constructs different mental spaces, in-between representations that get integrated and blended, producing their own emergent structures and final holistic, blended representations; how and why conventional associations arise, and how cross-domain mappings are structured (Steen and Gibbs 1999, Grady *et al*. 1999). As Gibbs (2000) rightly claims, it is not a single theory to be either confirmed or falsified. Its generality hinders its explanatory force, since it does not aim to explain specific processes in their integrity – in our case the interpretation of non-compositional, idiomatic phenomena. Thus, it is, in its present form, not a viable model for pragmatic meaning construction and idiomatic language use, however, its claims are undoubtedly valid, forming the main pillars of holistic processing. The mentalistic model drawn up below and argued for experimentally aims to clarify such unanswered questions, and fill in existing gaps in the mentalistic paradigm of pragmatic meaning construction in general, and of metaphor research in particular.

1.7. Attempt to create a viable model

As we have seen, the above mentioned major models of metaphor interpretation and of idiom processing currently prevailing in cognitive psychology are of no sufficient explanatory value, and thus cannot identify and explain the operation of the representational mechanisms that are in the background of non-literal language use. Models are often biased, focusing on one- or the other aspect of interpretation, giving answers only to decompositional (Tabossi and Zardon 1993), or to conventional idioms (Gibbs 1984). Modeling mental – interpretative processes from strictly one aspect (be it morphological [decomposability] or statistical [conventionality]) cannot provide a valid model nor for metaphor processing, neither for figurative language use.

The models all call for the need to look for mental processes in explaining non-literal interpretation.

We have seen in Bobrow and Bell's (1973) and in Searle's model (1979b) from the Standard Pragmatic Model's traditional approach, who claimed that figurative language use is a secondary stage of interpretation, therefore, it requires more time and effort from the part of the reader / listener, who deciphers non-literal meaning. This, however, has been falsified by the findings of current psycholinguistic experiments (Gibbs 1982, 1983, 1994, Gibbs and Gonzales 1985, Gibbs, Nayak and Cutting 1989, Burt 1992). Measuring reaction times it was found that people do not always interpret the literal meanings of indirect or non-literal expressions during comprehension, in fact, in a context supporting the idiomatic meaning people were much faster to select the intended (figurative) target (*lose one's head*) than the literal one (*lose one's key*) (Glucksberg and Keysar 1990).

The conventionality of idioms (Swinney and Cutler 1979) further complicates results, because people's familiarity with one or the other idiom can greatly facilitate interpretation, which might have influenced their results. Therefore, a sufficient model thus needs to control for the role of conventionality in idiom processing (Varga et al. 2014).

1.7.1. Problems of definition

The above mentioned experiments demonstrated that it takes not more, but rather less time for participants to interpret non-literal expressions than literal ones, and apparently it does not

require extra time and effort. These findings prompted researchers to formulate the following two claims concerning figurative interpretation and language use (Gibbs 1994, p. 109):

1. Comprehension does not take place in three distinct stages. Figurative interpretation does not follow after an obligatory literal misanalysis.

2. Identical mental processes drive the comprehension of both literal and figurative utterances.

The first claim, by now, is widely accepted among researchers (Gibbs 1982, 1983, 1994, Gibbs and Gonzales 1985, Gibbs, Nayak and Cutting 1989, Burt 1992). They argue that figurative language is thus not deviant, and it does not require more time or special cognitive processes to be understood.

On the basis of this conviction we could claim that the second statement necessarily follows from the first one, however, not necessarily. Although this finding is supported by Lakoff and Johnson's widely accepted view of metaphors being an integral part of our conceptual system and of the poetic nature of our mind facilitating and even requiring figurative thinking, still, equivalence of processing times gives no assurance that the same mental processes are involved in literal and in figurative language comprehension. Something needs to account for the twist in processing, without unnecessary time-consuming stages and extra effort hindering the interpretation process.

1.7.2. The mentalistic model

All these findings call for a cognitive factor that drives intuitive interpretation in discourse settings, be it idiomatic, non-compositional or indirect utterance we have to handle. This view yields a mentalistic model as the one outlined and backed up experimentally in the present study, which accepts the fact that figurative language is *different from*, but *not more difficult than* literal language use, integrating social-cognitive components of interpretation, intention-based mindreading and efficient inferential activity (Fig. 6.). This model is based on the cognitive cornerstone of interpretation named *theory of mind*, our mentalizing ability, which allows us to recognize others' intentions, and hence it apparently bridges the gap in the explanatory paradigms of nearly-sufficient models of interpretation.

A widely held assumption in today's pragmatics and in contemporary cognitive science is that recognizing speaker's intention is of crucial importance in non-literal language use, be it discourse setting or idiomatic expression Sperber-Wilson 1986, Happé 1993). Grice (1957, 1975) in his cooperative principle established four maxims of conversation, three of which can be integrated into the fourth one: relevance (Sperber and Wilson 1986). Relevance functions as the major guideline in our interpretative processes, and it thus plays a key role in idiomatic language comprehension as well.

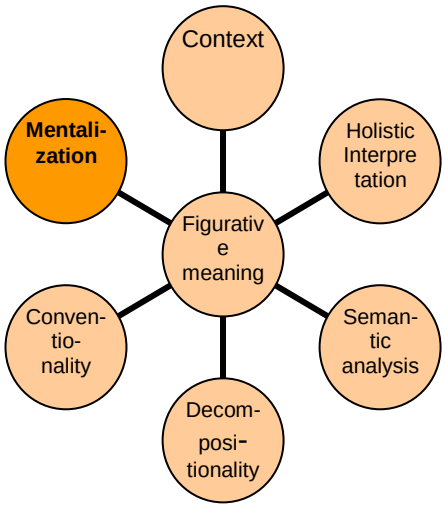


Figure 6.

The mentalistic model, building on mentalization

Grice (1975) rightly claimed that in a conversation most of the information is implied, rather than asserted. To be able to decipher such implicit pieces of information, we rely on the guideline of relevance: what may be relevant from the speaker's point of view, supposing that they stay cooperative (not violating the maxims of the cooperative principle). To discover the relevant path in the conversation, we need to rely on our mentalizing, mind-reading ability, so-called intentionality, which allows us to recognize speaker's intention, and thus the intended referent of the expression heard. This strategy allows us to decipher the intended meaning of the utterance at hand.

1.8. Discussion: Social-cognitive skills – the cornerstone interpretation

By now in cognitive approaches it is a widely accepted fact that interpretation is based on intentional reading, and meanings are constructed primarily on intentional ground. Most researchers of cognitive development (Perner and Lang 1993, Tager-Flusberg 1993, Leslie 1987, Csibra and Gergely 1998) invariably agree that to explain our own and others' behavior, to interpret others' actions and intentions, we rely on a complex of social skills and information, which allows us to denote mental states and intentions to others and to ourselves. The mind reading ability rooted in theory of mind (ToM) is a basic term in cognitive psychology to explain cognitive processes, such as learning, language acquisition, social behavior, etc (Kiss 2005). Since it is so much part of our cognition, it is a basic mental component of cognitive functions. In the mentalistic model proposed in the present study, it plays a central role, as this it is a basic cognitive skill driving both the semantic and the pragmatic aspects of language acquisition that may account for the ease and the equal reaction times in current psycholinguistic findings. The key role of ToM also ensures a paradigm in which differences in figurative language use do not necessarily mean more effort, difficulties and the need for additional default strategies.

In the mentalizing model the addressee deciphers intended meaning relying on their social-cognitive skills and mindreading ability, or theory of mind, which plays important roles in language acquisition, having an especially important function in word learning (Tomasello 1995, 1999, 2003), in the resolution of the problem of reference described by Quine (1951) that is, in narrowing down meaning. Furthermore, it is of crucial importance in holistic language use in discourse, since it assures the baby's emerging communicative skills in the so-called proto-conversations. Our social-cognitive skills are, therefore, where our ToM (theory of mind), a mentalization-based mind-reading ability stems from, constituting a basic component of social interaction per se, of which language is a crucial component and vehicle.

2. The development of social cognition

The time of the emergence of our basic social-cognitive skill of interpreting others' actions and intentions is debated in developmental psychology. Some scholars believe it is entirely (Pinker 1994, Fodor 1983, Meltzoff and Gopnik 1993 a,b) or in part (Trevarthen 1979, 1993, Leslie 1987) an innate human specific skill, whereas some say the acquisition is largely based

on natural pedagogy and an innate propensity of human infants to pay attention to caregiver's pedagogical stance, and it starts with an inference and understanding of goals around 12-15 months of age (Csibra-Gergely 1998, Csibra 2010, Gergely-Csibra 2013). Tomasello (1999), one of the major researchers of primate and infant cognition holds that it is at around 9-12 months of age that human infants begin to engage in a set of new actions and behaviors, and that interaction with the environment is a driving force in infants' social-cognitive development.

The acquisition of this skill of intentionality constitutes a kind of revolution in that infants begin to understand the social world surrounding them. At around 9 months children engage in a so-called joint attentional behavior that seems to indicate the emerging understanding of others as intentional agents, just like the self whose relations to the outside world may be followed, shared and directed (Tomasello 1999). Intentional agents are seen as beings with feelings and purposes who make conscious decisions so as to achieve certain goals. The appearance of joint attention denotes the turn in cognitive development when children for the first time begin to follow adults' gaze, share the focus with the adult (i.e. look where the adult is looking), and thus to engage with them in social interaction. This milestone is an important event in infants' understanding of their own and therefore others' intentional actions, besides, it is crucial in word learning as well.

In preverbal stages of development a driving force of mentalization is based on a kind of simulation (Kiss 2005), when children engage in sensory-motor actions (e.g. imitation), and achieve the previously seen goal with the same means (Pléh-Felhősi-Schnell 2004). Then in the phase of experimentation in the following few months of life (Piaget-Inhelder 1962, Baron-Cohen 1995) children try to achieve goals with their own means, which shows that they have managed to understand the causal relation between the purpose and the goal. This brings them closer to identifying others' actions as conscious acts, in which intentions drive behavior. This in turn will contribute to their successful deciphering of intended meaning in instances of pragmatic interpretation.

2.1. Metarepresentation and theory of mind – the seeds of relevance

Further on, cultural learning further enhances this process and engages the child in social interactions, which leads to the acquisition of linguistic and communicative competence. To achieve this, infants must understand the communicative goal of what has been said, that is,

they must decipher what the speaker means. The acquisition of this ability, namely, theory of mind is, therefore, the basic instinctive skill enabling further social-cognitive and linguistic development, paving the way to the acquisition of pragmatic competence. Theory of mind is therefore, essential in mastering a cooperative stance: in supposing that the speaker is a rational, intentional agent, whose action is conscious and goal-oriented. Therefore the human instinct of attributing intentions to others is of key importance in the interpretative theory of naïve psychology. We employ this complex of social deciphering skills to explain, understand and predict others' behavior. This brings us to the recognition of the importance of rational stance and relevance in interpretation, which functions as a crucial guideline in deciphering intended meaning, and thus, in figurative language comprehension (Gergely-Csibra 1997, 2013, Csibra 2010, Sperber-Wilson 1986).

At this point there is still a long way to go before infants will understand false beliefs, because that requires not only representation (symbolic interpretation of the events or entities observed) but also metarepresentation: a representation of representations (Sperber 2000). A first level *representation* is the personal mapping of the world around us (drawings, language, another way of representing, i.e. materializing, capturing the entities and stimuli of the world) (Peter knows…, Peter thinks…., Peter is…, Peter wants…). *Metarepresentation* is a second-level, dual representation, because it is a belief, conviction, thought, knowledge about a representation (Peter believes that Kate knows / doesn't know that…..) which eventually can turn out to be a *false belief* (Perner 1991, Baron-Cohen - Tager-Flusberg (eds.) 1993). In other words, children have to arrive at a stage when they are able to culturally mediate their understanding of the world through the beliefs, convictions, knowledge, opinion, and intentions of other persons. Therefore it is reasonable to suppose that intentionality, and thus theory of mind is a central component in the development of pragmatic competence, as we will see from the false belief tasks further on in the study. The precursors (that is, preceding developmental phases) of a fully fledged mentalization are thus the following (Tomasello 1999, Fig. 7):

– Engaging in joint attentional scenes which sets up a social-cognitive ground for acts of symbolic (i.e. involving our representation of things, concepts and events), including linguistic communication.
– Understanding others as intentional agents
– Eventually building up the theory of mind, essential in the understanding of not just intentions but of communicative intentions, in the separation of goals and means in actions

and behavior, enabling the listener to infer the relevance of the adult's utterance to the goals it entails.

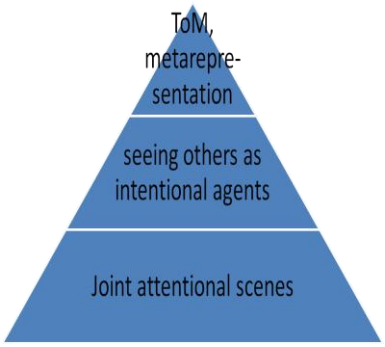


Fig.7.

Continuum of mentalization in development (Tomasello 1999)

The understanding of mental representations of the self and others, that is, the mental states children learn to represent and thus understand are usually referred to BDI states after their main representatives: Beliefs, Desires and Intentions (Kiss 2005, Alberti 2011). These stages of mentalization build upon one another; therefore, it is reasonable to hypothesize a continuum (Legerstee 1991). In this view, a more detailed picture of the continuum of the development of ToM incorporating the main stages described by leading scholars is captured by Figure 8.

The ability to share focus (engage in *joint attention*) with the caregiver (Tomasello 1999, Baron-Cohen 1989), then *follow their gaze* (Scaife-Bruner 1975, Leekam et al. 1997) is crucial in basic interactions and in word acquisition, in narrowing reference. Just before the first year of life children also develop an ability of reading from reactions of others and evaluate situations in view of these reactions. This is known as *social reference*, when in an event children first look at their caregivers, and react to the event based on the caregiver's reactions, mirroring adults' responses (Campos-Sternberg 1981, Feinman-Lewis 1983). This is closely linked to secondary intersubjectivity, a context where beyond the binary setting of mother-infant scenarios (primary intersubjectivity), children become able to use this binary framework in reference to a third entity, creating triadic situations. Social referencing reveals the relationship between secondary intersubjectivity and communication, in that infants use their caregiver's mental state in reference to the situation experienced.

The understanding of others as *intentional agents* initiates somewhere around the first year of age, heavily building on a natural pedagogical stance of infants (Csibra 2010,

Gergely-Csibra 2013), enabling them to come to understand goals and thus acquire a sense of intentionality and agency (Gergely, Watson, 1996, Csibra-Gergely 1998).

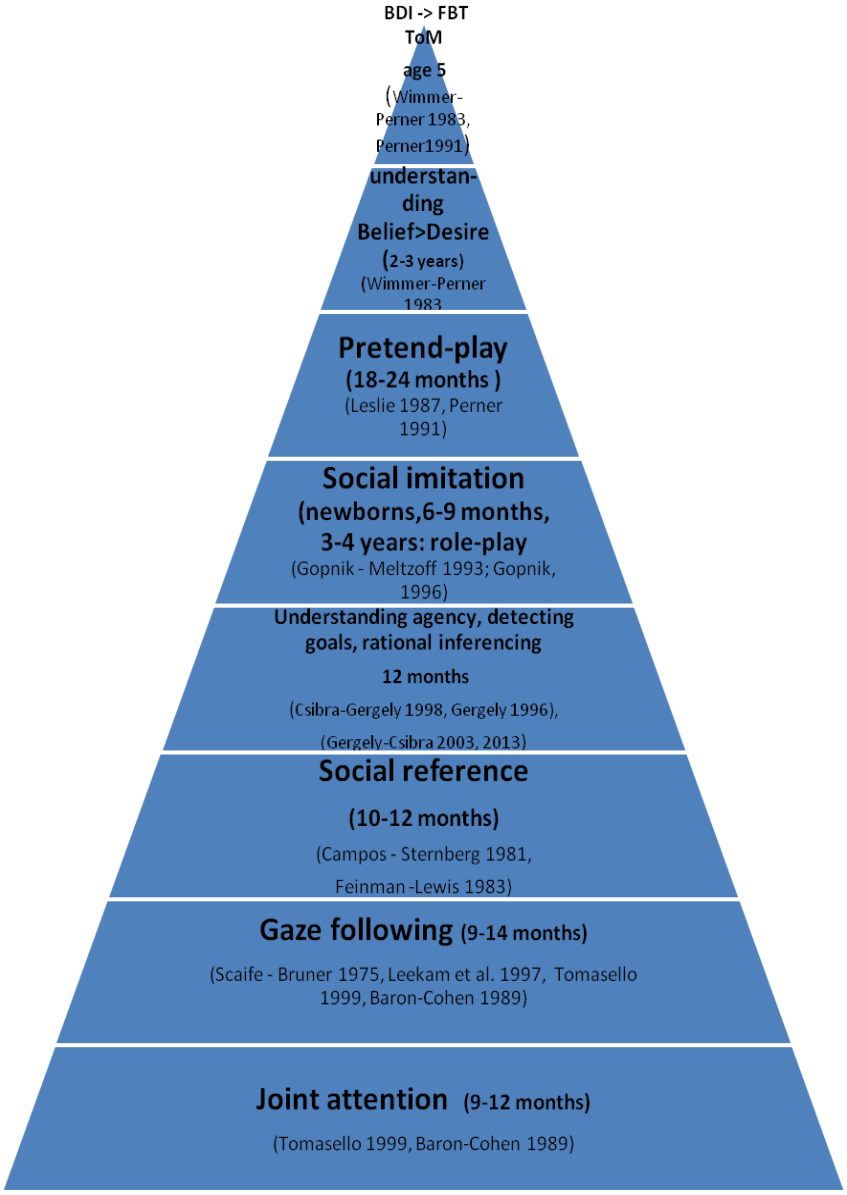


Figure 8.

The detailed continuum of the development of mentalization

Social imitation is present in social cognitive development almost all throughout the trajectory: infants engage in this when smiling back to caregivers, simple forms of imitation and social reference also represent social imitation at 6-9 months of age, and later around age 3-4 subtle forms of role-play are higher-level manifestations of this phenomenon.

Children around 2-3 are known to have a *desire-belief psychology* (Wellmann 1990, Kiss 2005). At this stage, as they become able to see others as intentional agents, having goals, feelings, thoughts, desires and gradually master a sense of intentions. They become

able to conceptualize that others have desires that may differ from their own, and eventually, above age 4, around age 5, that others may have beliefs that may be different from theirs. Surpassing this stage they eventually come to understand that such beliefs may actually be false, and thus they acquire the ability to recognize *false belief* (Wimmer-Perner 1983, Perner 1991). This stage is generally considered to be a fully-fledged mentalizing competence, or theory of mind, often measured with the classical test based on false belief (FBT), capitalizing on unseen displacement (see 3.2.1 and Figure 10. below).

In sum, a number of studies (Perner 1991, Csibra-Gergely 1998, Tomasello 1995, 1999) have demonstrated that the emergence of theory of mind is not a clearly identifiable leap in cognitive development, but it has several stages, supposedly building on an innate inclination to pay attention to social signals known as pedagogical stance (Gergely-Csibra 2013), manifested later, during the first few months of life in the form of its precursors, then developing further between 2-5 years of age. The major social cognitive revolution, when the child's interpreting abilities become close to that of an adult's in that it can be measured with verbal tasks, target holistic interpretation and involve the ability to recognize false-beliefs, is believed to take place in preschool years, around ages 4-5, until then these communicative abilities are not in place. For this reason the empirical study delineated in the present investigation also targets this age group.

2.2. Theories concerning the development of mentalization

Currently a number of theories address the nature of theory of mind development in an ontogenetic perspective. The main representatives of these approaches are listed below.

2.2.1. Modularity theories

Modularity theories (Fodor 1983, Leslie 1987, Leslie et al. 2004, Baron-Cohen 1995) postulate that ToM development is driven by innate neural mechanisms dedicated to mental state reasoning. They claim that experience's main role lies in that it may be important in triggering this mechanism, but it cannot revise the mechanism's basic nature in itself. Leslie and colleagues have proposed the most elaborated modularity theory of ToM, which, however, represents a relatively strong form of modularity, therefore, accounts stipulating less

stringent criteria have also been proposed (Coltheart 1999). The central claims by the strong modular view is that an innate ToM module (ToMM) is working by the second year of life, and that later age-related improvements in ToM performance in childhood are driven by an inhibitory selection process that becomes increasingly able to handle the executive demands of ToM tasks (Mahy-Moses-Pfeifer 2014).

2.2.2. Simulation theories

Simulation theories primarily emphasize shared neural representations (Gordon 1992, Harris 1992, 2000) and suggest that children (and adults) rely upon direct access to their own psychological states in order to make mental state attributions. A number of studies have investigated the problem of privileged access in children (Kiss-Jakab 2014) as it has been debated if access to one's own mental states have priority and thus is easier than the access to others'. In reasoning about the minds of others, children project into others' "shoes" and then read off what they would experience in the relevant situation (Mahy-Moses-Pfeifer 2014), thus evoke a framework based on a change of perspectives and experience. Simulation theories give an elaborated account of the extended developmental trajectory of ToM reasoning from the early understanding of false beliefs to later success on more challenging ToM tasks that require more complex simulation, and are also consistent with work demonstrating relations between children's ToM and imaginative ability, which is believed to be in the background of such simulation-based inferentially grounded heuristics.

2.2.3. Executive accounts

Executive accounts emphasize the role of inhibition (Russell 1997, Carlson-Moses 2001, Carlson-Moses-Claxton 2004) and postulate that children's difficulties in reasoning about mental states stem at least in part from challenges in inhibiting one's own perspective in order to generate a different one, and/or in holding the relevant perspectives in working memory. These accounts posit that developments in executive functioning contribute markedly to age related changes in ToM during the preschool years, and even beyond. At least two possible views might arise in terms of the role of executive functioning in ToM reasoning. One strong stance might be that executive functioning is sufficient for ToM, meaning that executive

functioning can support ToM reasoning in the absence of additional processes. A second, weaker stance might be that executive functioning is not sufficient for ToM (that is, it relies on other processes as well) but that it is nonetheless necessary for ToM. This weaker stance itself takes two forms according to which executive functioning is necessary for either the expression of ToM concepts in online task performance or for the emergence or acquisition of ToM concepts themselves (Mahy-Moses-Pfeifer 2014).

2.2.4. The theory-theory account

The theory-theory account advocates the importance of conceptual change in development, hence a continuum and gradual unfolding of cognitive abilities (Gopnik-Meltzoff 1993, Gopnik-Wellmann 1994, Gopnik 1996). It posits that knowledge about the mind resides in domain-specific theory-like structures and that radical conceptual changes drive the development of children's naive mental state understanding. In this view children have naïve implicit theories about their own and others' mental states. Its basic concepts are heavily based on theories in the philosophy of science, emphasizing folk-psychological heuristics in mindreading mechanisms. Such theories can be confronted with learning mechanisms based on empirical generalizations such as schemes or scripts, in that the theories are abstract, given that they refer to mental states not necessarily manifested in behavior (Kiss 2005). The theories hypothesize logical and reasonable relations between the abstract entities, which in children's mindreading context yields a practical heuristics of inferences and conclusions. The main goals of such theories are explanation, prediction and interpretation (*ibid*.).

In this view, therefore, children collect evidence about the relation between mental states and action, much as scientists do when collecting data to inform theory (Gopnik 1996, Mahy-Moses-Pfeifer 2014). To the extent that such evidence is inconsistent with children's current theory of mind, conceptual change will take place. Thus, relatively abstract theorizing about data absorbed from the social world forms a system of mental concepts, which suggests that the child and their experiences play an active role in concept formation. In other words, the theories are not experienced, but rather, constructed.

Children thus progress from simpler to more complex forms of knowledge concerning mental state concepts, in the framework of a continuum, relying on their experience. The main tenet in this theoretical stance is that conceptual change in response to experience drives the development of ToM, which, however, is fairly challenging to assess and prove in neuro-

psychological terms, because it is not entirely clear how conceptual change is reflected in the brain (Mahy-Moses-Pfeifer 2014). Therefore, neural investigations that may contribute to the resolution of the debate on how efficient such theories are, may result to be very important in a parallel examination of developmental and neural issues in this matter.

2.2.5. Progressive modularization

The theory of progressive modularization is primarily an opposition to Fodor's modular views defying the downplayed importance of the environment and experience in development, given that the environment, in the innatist paradigm only plays a role in the unfolding of innate mechanisms, as these views emphasize maturation, rather that conceptual change-based development. Karmiloff-Smith (1996) questions ready-made innate modules and argues for the importance of development, building a novel theory of progressive modularization. The main idea in this is that modules are not the starting point, but rather, the end-point of development. She accepts domain-specific predispositions, thus retaining an innatist modularist view, but advocates a progressive development that gives ground to experience and environmental influences in the maturation process. In this view she blends Fodor's innatist views (1983) and Piaget's constructivist views (1970) and draws up a theory that accepts both domain-specific and domain-general mechanisms in development (Kiss 2005). This gives ground to a whole new concept called representational rewriting building on several representational stages in development.

2.2.6. Social-constructivist theories

An approach present in ToM research emphasizes social-constructivist views stemming from Vigotsky's and Wittgenstein's works, pointing out the importance of social factors in development and the role of language. They underline correlations between language skills and success on false-belief tasks believed to indicate theory of mind skills (Astington-Jenkins 1999). They also emphasize social factors such as family circumstances, amount of child-directed speech involving mental terms and believe that these have an effect on successful mentalization. They see language as a medium of cultural transmission, facilitating mentalization and its development.

Astington discusses Vigotskyan approaches in cognitive development, putting social factors in the foreground, adapting these social constructions to the development of theory of mind, whereas Montgomery (1997) calls Wittgenstein's private language argument to life, applying it in a framework of mentalization, arguing that introspection is unreliable, that following rules is not possible in a strictly private context. This, in his view, defies simulation theories (Kiss 2005), and supports views that mental states (just like emotions) are social constructs.

2.3. Some theories on the cognitive mechanisms required for the passing of the False Belief task

Kiss and Jakab (2014) delineate the currently prevailing major theories in today's cognitive developmental psychology on the cognitive mechanisms that enable children to pass the false belief tasks. This test is a classic measure (Wimmer-Perner 1983) in developmental psychology to see if a child has the ability to mentalize, i.e. to think with another person's head and denote intentions thoughts and beliefs to another person and the self. The scenario the task is based on involves an unseen displacement, where a protagonist puts a desired object (i.e. Maxi puts his chocolate) in location A, then leaves the scene. Then his mother comes in and places the box of chocolate in the drawer. At this point the child is asked: 'Where will Maxi look for the box of chocolate?'. In general three-year-olds fail the test because the mostly answer that Maxi will look for it in location B, since they cannot take the fact into consideration that Maxi actually missed the event of relocation. Older children, above age four tend to answer correctly and say that Maxi will look for it in locaton A, since that is the place he left it. These older children are therefore, able to represent the mental states, thoughts and beliefs of the protagonist, and this ability enables them to answer correctly. The validity and relieability of the False Belif test (FBT) has been largely debated as a widespread methodological measure of theory of mind, though it has been an extremely fruitful source of research in the last few decades.

The authors (Kiss-Jakab 2014) draw up nearly twenty explanations as tasks analyses to explain success on the test. The most important views that are relevant in terms of the present research are listed below.

In line with the theories in section 2.2., here too, we find the major representatives of ToM development theories in the explanatory frameworks provided by the task analysis. Leslie's (1987) innatist view claims that there is a ToM module in all children, which manifests itself in pretend play at 18-24 months of age (e.g. in situations when a child uses a

banana as a telephone), which mirrors their ability to engage in symbolic action, handling the 'as-if" stance efficiently. This module however is insufficient at the age of three, hence children of this age fail the test, whereas in older children an additional 'selection processor' is in place which completes the module and thus enables them to pass the test successfully. A similarly innatist view of Fodor states that a basic innate mindreading apparatus is present in the modular mind, available for three year-olds (who actually tend to fail the FBT), and these children are subject to performance limitations in terms of some cognitive heuristics.

In Perner's (1991) view children need a metarepresentational ability to pass the test. In line with Fodor's view on the representational nature of mental states, this view states that when the child forms a belief (a representation) about someone else's belief (representation), they construct a metarepresentation. For the successful completion of the FBT, beyond this, the child needs to be able to distinguish the reference- (e.g. that the object in question is in location B) and the sense of the mental representation (it's in location A). In other words, the child needs to understand that the proposition that the chocolate is in location A (original place) may be seen as true for the protagonist but false for the observer. Those who understand this distinction pass the test, those who have not mastered it yet, fail.

An explanatory framework largely relevant in terms of the present research series is that of Apperly (2011), who argues that the core mechanism in passing the FBT task is perspective taking. This ability is emphasized a number of times in pragmatic meaning construction where the cooperative stance central in the Gricean framework and the ability to infer the speaker's intention in order to decipher the intended meaning of the phrase is crucial, in ironic, as well as in humorous, metaphorical and indirect utterances triggering inferential mechanisms. In this view, the child has to overcome their egocentric bias and understand that the protagonist did not see the act of relocation, thus their view is different from ours, hence, in view of their knowledge, the protagonist will look for the object in the original place where they left it.

Gopnik and Wellmann (1994) emphasize that naïve theories of others' mind change in conceptual development. They claim that to pass the FBT a child needs to master the concept of belief. When they do, they understand the conflict of the two worlds of representations and can manage these efficiently, thus answer correctly.

Some further theories emphasize one or the other aspect of the cognitive mechanisms crucial in the efficient functioning of our mentalizing ability, such as the key role of executive functions, or they see the FBT as a narrative which requires pragmatic meaning construction and the smooth handling of cohesive devices in a framework of coherent structures. Some

argue that the understanding of conditionals is central in gaining a mentalizing ability in that these structures open up separate worlds, thus representations. DeVilliers-Pyers (997) suggest that the acquisition of syntax, namely, the understanding of complement-taking predicates is crucial in being able to construct metarepresentations (e.g. "She promised to bring bananas but she brought only oranges" or "She thought it was a bug in his hair but it was only a leaf").

A correlation between passing the FBT and understanding counterfactual statements (e.g. "If Peter had brought his keys, we would have been able to enter the hall") has been observed, where parallelism is based on that these statements present a situation similar to the unseen displacement task. Some believe that participation in conversations is necessary to develop a concept of belief which gives green light to the ability to mentalize and think with others' heads, while others claim that simulation is the core mechanisms in mindreading, when one acts as if they were in the other person's shoes, i.e. use one's own mind introspectively to predict the other's behavior. Self-observation is also seen as crucial in such predictions and thus in passing the FBT.

Fónagy and Target (1997) argue that there is a strong correlation between the security of attachment and the age when children can pass the FBT: securely attached children pass it earlier than their insecure peers. Astington (1996) provides a social-constructivist view and claims that the concept of false belief emerges first in an interpersonal setting, and becomes interiorized later. Metamemory and the key role of the understanding the notion of intentions is also emphasized in current theories of cognitive development, while a novel theory of epistemic vigilance (Mascaro-Sperber 2009) employing a pragmatist's view suggest that children have to give up their trust that helped them in their early communication (e.g. in achieving a cooperative stance), and they eventually learn to take into account the possibility that some pieces of information may be misleading, as in the case of lies and errors.

Finally, some view the FBT as a normative task in that three year-olds interpret the question as where the protagomsit 'should' look (instead of 'will' look). This explains why three year-olds fail the test, whereas older children who appreciate the precise meaning of the sentence, pass.

2.4. The development of non-compositional comprehension

Langacker states that language is a form of cognition, a cognition packaged for purposes of interpersonal communication (Langacker 1987). Taking part in a conversation thus requires

thinking for speaking (Tomasello 1999), because effective human symbolic communication requires some unique forms of conceptualization. Speakers often create figurative analogies when the resources of their linguistic inventory are insufficient to express themselves so as to reflect their point of view. Therefore such linguistic constructions can be conceptualized as mental categories, or cognitive symbols.

It is by now widely accepted in cognitive and functional linguistics that metaphors permeate even the most ordinary uses of natural language (e.g. Lakoff 1987, Johnson 1987, Gibbs 1994). Parents regularly try to educate children telling them to *toe the line* or to *put that out of your mind*, or *don't lose your head* etc. Comprehending these figurative ways of expression helps children acquire the ability of drawing analogies between the familiar concrete domains and the more abstract domains of social and mental life they are learning about (Tomasello 1999). As for the further development of idiomatic language use and pragmatic competence, having acquired a number of initial metaphorical constructions children gradually become able to construct broad and individual expressions, leading to productivity. Because of the complex relational mappings of metaphors it is, at first, difficult to understand and to decipher idioms, unless context has a facilitating effect. The comprehension of idiomatic language requires the construing of aspects of reality in metaphorical, analogically based ways (Lakoff 1987, Tomasello 1999), for which we apparently rely on theory of mind.

To support the above proposed model of pragmatic meaning construction, the following sections delineate an empirical study testing the main allegations of the model on theory of mind being a central component of figurative interpretation.

3. The development of metaphor comprehension – A case for experimental pragmatics I.

3.1. Objective

Idiomatic language use requires pragmatic competence, that is, it requires the participants to be able to comprehend and use non-transparent, opaque constructions, by inferring the intended meaning holistically, in a figurative framework, through mentalization. In other words, apparently a key element in this process is theory of mind. In light of all this, the basic tenet of the present investigation is that children without mature ToM skills (just as children with autism, Tomasello argues (Surian-Baron-Cohen-Van-der Lely 1996, 1989), will have

more difficulty in comprehending metaphors and idiomatic language, than their mates with mentalization skills.

The Simile task employed in the study served a control function, given that similes (e.g. *Kate is <u>like</u> an angel*") are analogies made explicit, therefore, a literal interpretation suffices in their case. In the case of metaphors the analogy is implicit („*The dancer was a swan*"), and the intended meaning needs to be deciphered with different strategies: through changing perspectives and mentalizing. In other words, the ability to predict the speaker's mental state and intentions (ToM) is believed to enable the listener to decode intended, metaphorical meaning of the sentence.

3.1.2 Hypothesis

Children not capable of mentalization do well in the simile task, since it requires only literal interpretation of an explicit statement, but will not be successful in the metaphor task. Those with ToM (i.e. passing False Belief Test) do significantly well in the metaphor task measuring pragmatic competence, since they rely on their mentalizing ability in deciphering intended meaning, through the inferring of the intentions of the speaker.

3.2. Method

The sample consisted of 45 preschoolers, between the ages 3-6, 19 boys and 26 girls, of a mean age of 5;1 years (ranging from 3;7 to 7;3). Since there was no correlation between the factors of gender and performance, the interference of these factors is not analyzed. Four children were excluded because they did not meet the terms for valid and reliable testing. Therefore, a total of 41 preschoolers were tested. The experiment was conducted in a local kindergarten, in Budai Nagy Antal Óvoda, in Pécs, building on two basic tasks (see App. section 1.):

1. Theory of mind assessment with unseen displacement false belief task (based on Wimmer-Perner 1983) in the form of a puppet play (see Fig.9.)

2. Linguistic tasks on pragmatic competence measuring metaphor comprehension based on a questionnaire consisting of two simile tasks and two metaphor tasks (relying on Happé 1993 and Gibbs 1994, see tables 1,2 and App.).

Figure 9.

The false belief test (FBT) with puppets

The experiment was recorded in a quiet room in the preschool, with each child individually. First children underwent a test of mentalization, based on the unseen displacement task measuring the ability to recognize false belief (Wimmer-Perner 1983), in the form of a puppet play the trained experimenters performed to the children. On the basis of the results in this ToM tasks the sample was divided into two groups, yielding ToM group and NoToM group in the evaluation of the results. The performance of these two groups was then compared in view of their scores on the linguistic test measuring metaphor processing skills using SPSS program of statistical analysis. Children were all taken as being in the normal IQ range since their admission to kindergarten can be seen as sort of rule of thumb for this cognitive trait, thus their preschooler status was taken as an indicator of average normal IQ.

3.3. Tasks

3.3.1. Theory of mind task

The ToM task was based on Fable Belief recognition in unseen displacement condition with Maxi as the protagonist was originally drawn up by Wimmer-Perner (1983), which was in fact further adapted to test mindreading skills of children with Autism spectrum disorder by Baron-Cohen et al. (1985), as Fig. 10. illustrates. The main idea in both measures is the false belief recognition of the protagonist in a context of unseen displacement.

The test in our investigation also capitalized on this framework, but made use of puppets and relied on a plot of two bears, and their jar of honey: Brown bear is getting ready to eat the honey for breakfast, but goes to wash their hands, so he leaves the jar in a basket and leaves. White bear, who was in the background, appears on stage and places the jar into a box, to save it for later, then leaves. At this point the child is asked the ToM question,

together with a Reality control question and a Memory control question to ensure answers truly mirror ToM skills, and are not hindered by memory or other linguistic processing issues. Only those answers counted as right that were correct in all three (ToM, reality control and memory control question) conditions.

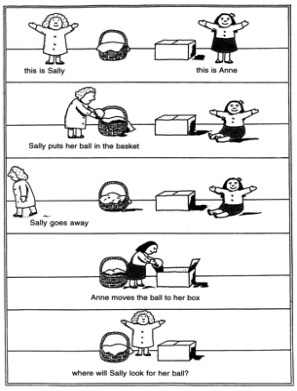


Figure 10.

Sally-Anne test (Baron-Cohen et al. 1985, based on Wimmer-Perner 1983)

ToM question: When Brown Bear comes back, where will he look for the honey?
Memory question: Where did the Brown Bear put the honey in the beginning?
Reality question: Where is the honey now?

3.3.2. Linguistic tasks: Simile vs. Metaphor condition

The simile condition served as a control task, since it requires only literal interpretation of target phrases from the part of children. According to Sperber and Wilson's relevance theory (1986), similes are comparisons (metaphors) made explicit by the word "as" or "like" and thus can be interpreted decompositionally, through a semantic analysis. "Sally is like an angel" is syntactically not different from saying "Sally is like her mother" (Happé 1993).

The successful completion of the metaphor task, however, requires some understanding of intentions, since metaphors are implicit, and therefore, mentalization skills, so as to decipher intended meaning. In a metaphor, the propositional form of the utterance is a flexible interpretation of the speaker's thought. Since literal interpretation is not sufficient, children need to decipher the relevant, intended meaning, for which they need to, at least in part, rely on their social-cognitive skills, namely, ToM.

In the idiomaticity trial we compared performance in tasks with (a) Similes and (b) Metaphors (see tables 1 and 2 for samples and appendix for entire test). In both tasks we had a short (i) (decontextualized) multiple-choice condition and testing production with more emphasis, and

(ii) (contextualized): story-based condition where the ending line served as the target sentence, in which the simile or metaphor had to be explained by the child, testing perception abilities more intensely. The aim of these two conditions was to get genuine results that incorporate both perception and production skills of the subjects.

In the decontextualized condition based on tasks of Happé (1993), children had to select the right answer in a multiple choice test that was read out to them. In the contextual condition building on tasks in Gibbs (1994) children listened to a short story, the last sentence of which was idiomatic. Subjects had to answer questions about the target sentence. In this part of the study the contextual effects are not analyzed in detail (see section 6.5.4.). The aim of the decontextualized and contextualized conditions in this part of the investigation was to get a valid and reliable picture of both the production and the perception aspect of idiom processing, in other words, that the responses integrated would include both aspects and therefore mirror the true nature of the ability. The conditions can be evaluated separately, and since the effect of the context on the success of interpretation is an important question in psycholinguistic inquiry, this aspect is taken under scrutiny in a later phase of the evaluation of the results of the study (see 6.5.4.)

The correct answer was the figurative meaning supported by the context. Children could earn 1 point with each correct answer; and each trial consisted of 5 tasks. Therefore the maximum score was 20.

Decontextualized condition – Simile trial	**Contextual condition – Simile trial**
Multiple choice test 1) The dog was so wet. It was like… (*a walking puddle*)…….. 2) Carol glared at Nicola. She was so cross. Her eyes were like…… (*daggers*)…… 3) The night sky was so clear. The stars were like…… (*diamonds*)……. 4) Simon just couldn't make Lucy understand. She was like…… (*a brick wall*)……. 5) Caroline was so embarrassed. Her face was like…… (*beetroot*)……	Johnny's grandpa was a very nice old man. He loved his family, and always took little Johnny fishing to the lake and helped him catch fish for dinner. Johnny always ran ahead, he was so happy to go, but grandpa could not be jumping with joy, but he walked very slowly because he was **old *as* the hills.** *Q: What was Johnny's grandpa like? Why couldn't he run? Why is he like the hills?*

Choose one item from the following list to complete each sentence: *a brick wall* *dresses* *daggers* *a beetroot* *a walking puddle* *diamonds*	

Table 1.
Simile tasks

Decontextualized condition – Metaphor trial 1) The dancer was so graceful. She really was…… (*a swan*)…… 2) Father was very very angry. He really was……(*a volcano*)…….. 3) Michael was so cold. His nose really was……(*an icicle*)…… 4) John was very clever and tricky. He really was……(*a fox*)…….. 5) Ann always felt safe with Tom. He really was.…(*a safe harbor*)……... Choose one item from the following list to complete each sentence: *an icicle* *a fox* *a safe harbor* *a hat* *a swan* *a volcano*	**Contextualized condition – Metaphor trial** 1. Johnny is helping his mother make a cake. She leaves him to add the eggs to the flour and sugar. But silly Johnny doesn't break the eggs first – he just puts them into a bowl, shells and all! What a silly thing to do! When mother comes back and sees what Johnny has done, she says: "Your head is **made out of wood**!" *Q: What does Johnny's mother mean? Does she mean Johnny is clever or silly?*

Table 2.
Metaphor tasks

3.4. Results

3.4.1. False belief test

Statistical analysis was done with SPSS, using ANOVA. 16 children passed the test, forming the ToM group, while 25 children failed the test, becoming members of the No ToM group (mean age: 4;8). The mean age of children in the ToM group was 5;6, suggesting that the ability a mature mentalization is in place between the ages 4 and 5.

3.4.2. Simile condition

In the simile condition ($F_{(1,43)}=0,5$, $p_{simile}>0,05$) the two group's performance was not significantly different. Those without mentalization skills did just as well in the task requiring literal interpretation, as their mates from the ToM group (see Fig. 11).

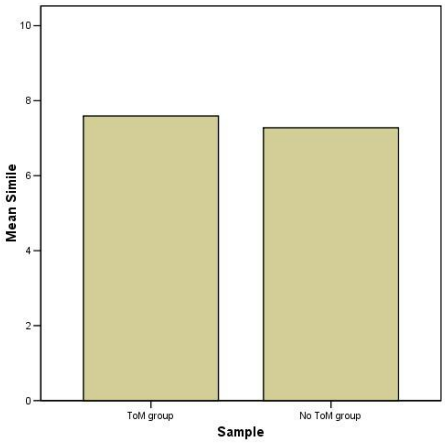


Figure 11.

Simile interpretation in view of mentalizing skills

3.4.3. Metaphor condition

In the task requiring figurative interpretation and thus the deciphering of intended meaning, those with mentalization skills did significantly better than those without ToM ($F_{(1,43)}=134$, $p_{metaphor}<0,01$). There was no interaction between the simile and the metaphor conditions (see Fig.12).

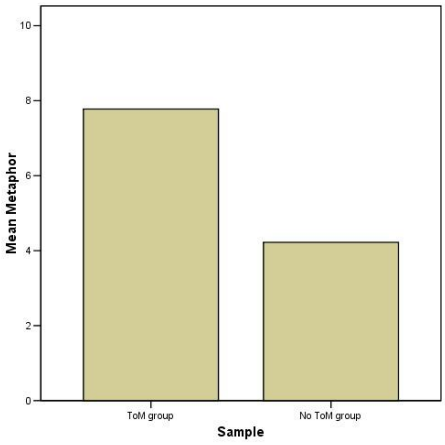


Figure 12.

Metaphor interpretation in view of mentalizing skills

3.4.4. Discussion

Children without mentalization skills do just as well in tasks measuring literal interpretation as their mates with more mature social-cognitive skills. Children with ToM, relying on their mentalizing skills and thus intention reading abilities succeed in deciphering intended meaning, and are significantly more successful in understanding and using metaphors. The findings suggest that theory of mind ability correlates with and in fact is a central component of a productive pragmatic competence.

The results of the above study confirmed the prediction that the acquisition of theory of mind is an important factor in figurative language use and comprehension, and in general, in drawing inferences in everyday communication. The deciphering strategies based on mindreading and metarepresentation proposed by the mentalizing model are highly consistent with developmental psychological findings concerning children's social cognitive and communicative development (Baron-Cohen 1989, Csibra and Gergely 1998, Tomasello 1999, Gopnik-Meltzoff-Kuhl 2000, Sperber 2000, Hamvas 2001). Acquiring the mentalizing ability and relying on social cognitive skills rooted in ToM enable preschoolers to take someone else's perspective, hence decipher their goals, beliefs and eventually false beliefs, which largely contribute to the decoding of the intended, figurative meaning of non-compositional utterances requiring holistic, pragmatic meaning construction. Mentalization, therefore, is confirmed to play a central role in becoming competent participants in conversations, where the smooth handling of non-literal expressions and discourse organization norms is a crucial. The results confirm that pragmatic competence emerges between years 4-5, in line with developmental literature, which however state that it emerges around age 4 (Perner and Lang

1993, Tomasello 1999), giving green light to further cognitive, social and communicative development. The above results suggest that it is in place, at least in verbal, false belief tests around age 5, rather than four, given that the mean age in the ToM group was 5;6, which however, on the basis of the continuum of mentalization surely has its roots in less fully-fledged forms of ToM around age 4.

Relevance theory (Sperber-Wilson 1986) relates the degree of metarepresentational ability to the degree of communicative ability and thus to pragmatic competence in a specific way: practically identifying the two. In view of this, theory of mind is seen as the basis of holistic and idiomatic language processing skills. ToM in itself, however, may not be a sufficient factor in figurative language use. Recent studies hypothesize that other cognitive and linguistic factors may also contribute to figurative language comprehension (Norbury 2005, Bucciarelli-Colle-Bara 2003, Musolino-Lidz 2006, Eskritt – Whalen – Lee 2008, Varga et al. 2014), suggesting that some general cognitive skills may enhance inferential processing by providing compensatory strategies and working memory span may also complete and thus improve mentalization based performance in complex cases of pragmatic meaning construction.

Some studies have found that analogical alignment and semantic, compositional processing is also predictive of metaphor understanding: Norbury (2005) claims that first-order theory of mind abilities do not ensure metaphor comprehension, instead, semantic ability (broad enough semantic representations) is a stronger predictor of performance in idiomatic language use. Another study (Babarczy - Szamarasz 2006) investigated whether the crucial factor in metaphor comprehension is theory of mind (Sperber - Wilson 1986, Happé 1993, Sperber 2000), or rather, as Gentner suggests (Wolff and Gentner 2000, Gentner - Bowdle 2001), analogical (or symmetric) alignment. Their subjects were patients with Williams syndrome, whose social-cognitive skills are believed to be atypical, hence impaired, in that they are hyper-social beings, while their perceptual-cognitive skills are intact (Tager-Flusberg and Sullivan 2000). Their findings indicate that ToM skills do not necessarily correlate with metaphor processing skills. The performance of subjects with WS on metaphor tasks was better than expected, but their mentalization skills were far behind those of the control group.

Both of these two counter-examples are, however, studies investigating subjects with cognitive or language impairments, whereas the mentalizing model aims to answer questions concerning the idiomatic language use of typically developing populations. The above mentioned factors for sure constitute the basis of compensatory strategies, since they, by

default, have to rely on existing general cognitive skills to compensate for the lacking ToM competence, but this does not necessarily falsify the above findings in neurologically normal typically developing populations who rely on their existing ToM skill in efficient pragmatic interpretation. Therefore, the claims against the prevailing importance of theory of mind in pragmatic competence, which, otherwise is supported by a large number of studies (Sullivan 1994, Surian-Baron-Cohen-Van der Lely 1996, Noveck 2001, Bucciarelli-Colle-Bara 2003, Eskritt-Whalen-Lee 2008) and the emphasized role of broad semantic representations found in atypical patterns of development do not themselves defy the findings in normally developing typical populations, however, certainly raise important questions which are subject for future research. It is important to note that, as Karmiloff-Smith (Karmiloff-Smith – Karmiloff 2002) points out that we shall not generalize concerning the functioning and development of a healthy mind based on evidence from atypical cases. Patients with Williams syndrome (WS) (Tager-Flusberg and Sullivan 2000, Babarczy-Szamarasz 2006, Lukács-Kas 2014), Autism Spectrum Disorder (ASD) (Győri et al. 2002, Győri 2014) and Specific Language Impairment (SLI) (Karmiloff-Smith – Karmiloff 2002, Ryder – Leinonen – Shulz 2008, Lukács-Kas-Pléh 2014) and even in schizophrenia (Varga et al. 2014) seem to fall back on compensatory strategies that function as compensating strategy to make up for the lack of mentalizing skill, and these findings do not defy the hypothesized key role of ToM in healthy pragmatic development. Further research is needed to fully map the typical and the atypical patterns of pragmatic development.

3.5. Conclusions – The validity of the mentalizing model

Gibbs himself states in the third chapter of his book entitled Poetics of mind (1994):

"My claim that figurative language understanding does not require special mental processes still leaves many important questions unanswered. Exactly how does common ground (the shared beliefs and knowledge held by speakers and listeners in context) constrain figurative language interpretation? (Gibbs 1994, 119)"

The mind-reading strategy rooted in theory of mind apparently bridges the gap in Gibb's theory: the intention-reading ability enables the hearer to decipher the intentions of the speaker, hence ensures that the idiomatic phrase at hand will be interpreted in the intended, figurative meaning, through mentalization.

Gibbs suggests (*ibid*.) that "we need to try to identify processes that seem special to different types of figurative language and demonstrate that they play important roles for all types of language, and therefore, are not special after all" (p. 114-115).

As pointed out above, the mentalizing model accepts that figurative language is *different from* (i.e. special), but *not more difficult* than literal language use (not special, after all). The model builds on cognitive interpreting strategy of theory of mind, which, as it is well known, is also present in early word learning in the building of the lexicon: it helps anchor referents in the early stages of language acquisition, through joint attention and shared focus between baby and caregiver. Hence, literal interpretation and pragmatic, figurative interpretations in fact share some basic elements, and after all, incorporate the same cognitive mechanism: mentalization.

All in all, findings suggest that ToM contributes to finding the intended referent in both literal and figurative language to a great extent. Therefore, the mentalistic model seems most consistent with the available psycholinguistic evidence showing that metaphor understanding does not require a special mental process that would not be present in first language acquisition (Perner and Lang 1993, Gibbs 1994, Csibra - Gergely 1998, Tomasello 1999, Sperber 2000). It provides fruitful ground for research on remaining questions in today's cognitive linguistics targeting models of interpretation (Bobrow and Bell 1973, Swinney and Cutler 1979, Gibbs 1984, Tabossi and Zardon 1993), and contributes to the creation of viable model in harmony with current mentalistic theories like conceptual metaphor theory (Lakoff-Johnson 1980) and blending theory (Fauconnier-Turner 1998), by yielding valid and reliable predictions about idiomatic language acquisition, and generating new methods and strategies in the investigation of human language and cognition.

The above model and investigation confirms that theory of mind is crucial in inferential activity, hence in figurative and non-compositional, holistic meaning construction. It is reasonable to believe then, that it plays a similarly important role in other aspects of pragmatic competence, like the understanding of the types of humor, often based on ambiguity, exploiting the clash of competing meanings. To support this, the following chapter will delineate the role of mentalization in humor processing, humor's relation to metaphor, and eventually to the entire trajectory of pragmatic competence.

4. The development of humor comprehension in view of mentalization

The present chapter investigates the pragmatic competence of the same preschooler sample as before, from a cognitive and developmental aspect. It aims to map the cognitive background mechanisms that are responsible for the complex and smooth handling of non-literal language use in general, and of metaphorical meaning construction, along with humor understanding in particular. In order to investigate if higher-level mentalization skills are necessary for higher-order pragmatic competence like humor and irony processing, this part of the study relies on both first- and second-order theory of mind tests, and an adapted version of a non-verbal (or semi-verbal) mentalization test named Eyes test in which the response is based on visual stimuli and inferences made on the basis of the emotions present in human eyes. The results of an empirical investigation support the crucial role of mentalization, a symbolic, representational competence that allows for flexible interpreting strategies and versatile meaning construction in everyday, often humorous and thoroughly indirect discourse, where, however, mentalization seems to suffice for metaphor understanding but not be sufficient in itself in the case of humor processing, which is highly embedded in a socially grounded cultural background, where social constructions also seem to influence the successful interpretation, beyond ToM abilities.

4.1. Humor and cognition

Humor is a human-specific behavioral phenomenon, present in our thinking, language use and actions, a result of the interaction of several psychological and social functions. It penetrates human cognition, everyday social communication and organization. Humor therefore, represents an interdisciplinary issue, being in the center of attention of cognitive sciences, among them psychology, linguistics, sociology, folklore and ethnography.

Complex as it is, it is difficult to define (Séra 1983, Bergen 2003, Martin 2007). In developmental psychology it is debated when exactly humor understanding emerges, whether humor competence can be defined as forming one particular milestone or having several components, whether it should be defined as an active or as a passive competence or both, and if production plays a central role in humor at all.

Up to present, psycholinguistic research has mostly focused on pre-fabricated jokes. The relationship of cognitive development and humor was mainly investigated through classical jokes ending with a punch-line. Few studies focused on the cognitive prerequisites

and strategies of spontaneous humor present in our everyday interactions and social settings. Similarly, most psycholinguistic studies have tried to map the mental mechanisms that account for humorous language use and understanding (Bergen- Binsted 2004). As it has long been hypothesized, findings confirm, that humor requires cognitive strategies (Schopenhauer 1819, Séra 1983, Attardo 1994, 1997, Giora 2001). The central mechanism in all cognitive approaches is that humor is based on something unexpected, something *incongruent*. Our expectations, as cognitive psychology has revealed, are rooted in our cognitive schemes, which themselves are representations stored in our long-term memory. Accordingly, in the present empirical research we hypothesize cognitive prerequisites that give ground to mental flexibility and wit in humor.

4.2. Cognitive, developmental and linguistic issues in humor research

Humor is a versatile phenomenon – it is in the center of attention of cognitive psychology, concerned with perception, language use and mental operations, memory, problem solving, creativity, play and emotions; developmental research asking what cognitive milestones enable productive humor competence and perception, at what age; and of **co**gnitive pragmatics focusing on the social goals fulfilled by humor, non-literal language use, discourse organization and social cooperation in interaction.

Humor, therefore, represents a cognitive linguistic issue, since decoding the intended meaning is crucial in its smooth handling and coordination. It is not based on a simple bipolar coding-decoding paradigm as has long been hypothesized by traditional views in linguistics and communication studies (Jakobson 1960). Research in cognitive approaches has demonstrated that social and contextual factors are crucial in the dynamic meaning construction of everyday discourse. All these cognitive and interpersonal strategies eventually boil down to pragmatic competence, designating a cooperative ability between speaker and hearer in monitoring each others' messages, attitude and intentions, decoding invisible meaning. The successful deciphering of intended meaning is based on this cooperative attitude of partners. The recognition of the intentions of the speaker is of key importance in decoding intended meaning, where the cognitive ability of changing one's perspectives enables the partners to take each others' communicative and intentional stance. This is the main idea of non-literal interpretation and of the cognitive mechanisms we argue for in the

present investigation, based on our metaphor processing results in the previous chapter and on the findings of the experimental studies described (Schnell 2005, 2006, 2007, 2012).

In social (especially informal, humorous) communication, we rely on our social-cognitive skills, change perspectives to see the other's point, that is, we mentalize: interpret the utterances by making use of relevance-based conclusions and hence successfully arrive at the intended, non-literal meaning. Laughter and humor are all social-communicative strategies employed in human communication, which enhance interpersonal proximity, and have emotional, psychological and social-cognitive advantages. In humor research it is also important to keep in mind the culture-specific nature of punch lines, which makes humor understanding even more difficult than other forms of non-literal speech, where the deciphering of parallel mappings and analogical alignment often suffices for successful interpretation. Victor Raskin's influential writing on the Semantic Mechanisms of Humor (1985) induced a change in linguistic paradigms and thus a novel cognitive approach emerged in humor research.

4.3. Incongruity and our central expectations

A number of theories have been drawn up by philosophers, linguists, and different thinkers concerned with humor production and interpretation. The central motive in all these different theories is, however the same: something unexpected, incongruent is observed. Kant (1790/1987) and Spencer (1860) called this phenomenon *relief*, Schopenhauer (1995) named it *incongruity*, Coulson (2001) uses the term *conflict*, while Giora refers to *optimal innovation* (2001, 2002), where the most salient meaning may be modified to become optimal, for which relevance serves the most important guideline when we make efforts in interpretation. Humor understanding, rooted in the deciphering of non-compositional, intended meaning subject to social and situational contextual constraints therefore, constitutes a cognitive pragmatic issue. Today's linguistic research seems to converge with psychological and philosophical research trends in this mentalistic direction. This tendency and argumentation is in harmony with the ReALIS approach and the hypothesized mental operations in the theory aiming to explain the decoding of a variety of possible meanings in a matrix of several interpreters and the several worlds of these interpreters, where each meaning reflects a participant's mental stance (Alberti 2011). All in all, cognitive strategies are employed in the dissolution of incongruity

and in achieving relief (Attardo 1997, 2001a,b, Norrick 1993, 2003, Graesser et al. 1989), also known as inferential mechanisms triggered by an implicature, a form of incongruity.

4.3.1. The psycholinguistics of non-compositional interpretation

On the basis of the first chapter, describing the models of figurative interpretation, the role of compositionality, familiarity and cognitive strategies in successful meaning construction, the basic tenet of the present investigation is that non-literal meaning construction is based on at least three levels: syntactic dimensions (parsing, bottom-up processing (Gergely-Pléh 1995), pragmatic dimension (top-down dimension), and the social-cognitive frame where references get anchored by means of the cognitive guideline of relevance, through effortless inferences, in harmony with Grice's CP (1957, 1975) and Sperber and Wilson's views (1986). As outlined above, our social-cognitive skills are rooted in our ability to change perspectives, giving ground to mentalizing, where one forms a theory of the other's mind, intentions, goals, feelings, and decodes the utterance by integrating their point of view, taking into consideration not only linguistic, but also the social and situational factors of the immediate and broad context.

4.4. Humor and pragmatics

As argued above, humor constitutes a pragmatic issue, since-it is often verbal, hence triggers strategies of discourse organization. Social and situational context largely determine interpretational outcome (aggressive humor is often seen as insult humor or irony – (for definitional problems on this topic see chapter 7). Implicit meaning evokes interpreting strategies and inference. In fact, Sperber and Wilson argue for an optimal relevance in interpretation, serving as a guideline in the myriads of factors to consider in non-compositional meaning construction. Therefore, pragmatic decoding is not argued to be a plain synthesis of holistic, chaotic mass of impressions and inputs from linguistic, social, cognitive domains, but an optimal relevance determines the rule of thumb in inferencing. Similarly, Giora 2001 emphasizes that jokes and humorous instances often capitalize on the activation of the "least relevant" meaning. Jokes are stories ending with a punch-line, so it's easy to see how discourse coherence matters in interpretation. Going further, inference helps in the dissolution of incongruity, creating imagination based cognitive strategies that also

contribute to the decoding of meanings. Bergen and Binstead actually refer back to Chomsky's linguistic creativity (stating that language is such that an unlimited number of constructions (i.e. utterances) may be created out of a limited set of components, i.e. words) and emphasize a need for "full creativity" (Bergen, Binsted 2004) in pragmatic competence in general and in humor processing in particular, meaning, that cognitive, mental strategies are required in order to decipher implicatures. This, they claim, is far more creative and more complex than Chomsky's linguistic creativity which refers to the recursive, combinatoric nature of language. The role of cognitive strategies in pragmatic meaning construction is therefore, backed up from several directions, making humor a relevant problem in cognitive pragmatic and developmental research.

4.5. Humor and play – a developmental perspective

In evolutional terms, humor is rooted in playful behavior and social play, having ab-ovo social-cognitive implications, and as such, it shall be investigated and explained in a social context (Martin 2007). Developmental psychology tries to map if humor and its understanding is determined by the broad frames of playful social attitude, or rather by 'humor as play' interpreted in a narrow sense after Wittgenstein's idea of language games and motivation to follow rules (Wittgenstein 1965). Séra (1983) claims that the sense of humor, difficult to define and broad as it is, has to be separated from the sheer ability to laugh. Sports, ball games serve as a perfect metaphor of humor as social play, where beyond the descriptive rules of the game/humorous interaction the prescriptive rules constitute important prerequisites of a game and of humor too. In humor, participants' expectations and intended meanings are crucial in interpretation based on a common ground.

It is now widely accepted, therefore, that humor, in evolutionary terms, is rooted in playful behavior (Tisljár-Bereczkei 2005). To make things more complicated, just like humor, play is also difficult to define. It is activity oriented, autotelic, spontaneous, (Berlyne 1969), more a mental state than an activity (Apter 1982 claims, it is a 'state of mind'). In both humor and play the "as-if" stance is crucial concerning its relationship to reality, and the two (playfulness and sense of humor) seems to emerge at the same time in cognitive development, around the age of 4-6 months. Leslie (1987) refers to *pretend play* stemming from the as-if stance, emerging at around at 18 months which is of central importance in mentalizing and symbolic operation. Both humor and play assume a pleasant environment, without tension. As

for developmental stages, Barnett (1990) and Bergen (2002a,b) state that children with a sense of humor are more playful, and vice-versa: playful children tend to get involved in humorous situations more readily, which is in harmony with McGhee and Lloyd's (1982) views that sense of humor correlates with an inclination for social play.

Still, humor and play are also markedly different. They differ in terms of cognitive strategies for the dissolution of incongruity. As Martin (2007) states, if a child puts on their mother's clothes, puts on lipstick and high-heel shoes, then the child engages in play. But if they put the suit on backwards, put the shoes on their hands and make a clown's face with lipstick, it is more than that: it is humor. Beyond a playful attitude, humor involves a mental twist, something unexpected, incongruent, where the intentional mental twist yielding incongruity needs to be resolved. It is crucial that such resolution is conscious and there is access to the mental content – otherwise one only laughs at the joke but does not get it.

4.6. The development of humor comprehension

Developmental psychologists have demonstrated that humor is not a milestone, not a sudden abrupt change in cognitive functions (Martin 2007), but that incongruity is present all throughout our ontological development in different forms and varieties (peek-a-boo games, making faces with parents, unexpected playful actions (caregiver unexpectedly starts chewing on a pacifier…). In line with this, Zigler et al. (1966) observed that the child engages in humorous settings at a level congruent with their mental abilities. They call this phenomenon the principle of Cognitive Congruency, stating, that the child's humor always aligns to their actual cognitive abilities: they find situations the most humorous, which are in harmony with the complexity of their actual cognitive schemes. In other words, the child enjoys the level and type of humor which suits the complexity of their cognitive stage most.

Apparently, just like mentalization, humor too, is not an all-or-nothing ability. Instead, its development follows a continuum (Fig. 13.): at 4-6- months they enjoy peek-a-boo games, at 12-18 months making faces, hiding and finding objects, and after the age of three, verbalization opens up new dimensions in humor production and perception, gradually extending to the mastering of jokes and verbal humor, and eventually to reasoning abilities on instances of incongruity.

Figure 13.

Continuum of humor development

This is in harmony with current findings in cognitive development on the recognition of communicative intentions by infants (Southgate et al. 2010, Csibra 2010), which show that seventeen month-old babies demonstrate pragmatic abilities for resolving the referential ambiguity of non-verbal communicative gestures, and for inferring the intended meaning even of communicative utterances. Such early abilities are explained by a natural pedagogy (Gergely – Csibra 2013), by the intentional stance of infants who expect a message from each social interaction, and have inclination to decipher (and are prepared to detect) meanings from social settings. Csibra (2010) makes three proposals concerning the development of receptive communication of infants, namely that the presence of communicative intentions can be recognized in others' behavior before the actual content of these intentions is accessed or inferred; that such recognition takes place through the decoding of specific ostensive signals; where decoding enables infants to detect the communicative intentions of others.

As for the development of 'real' humor competence, Wolfenstein (1954), McGhee (1979), Pien and Rothbart (1980) state that it presents itself around the age of 2. It is believed to grow out of pretend-play (Leslie 1987) appearing around the age of 18 months. Since Piaget (1970) many believe that play is closely linked to symbolic activities like drawing, language use, or the labeling of objects. Wolfenstein (1954) claims such symbolic abilities

appearing between the sensory-motor stage the pre-operational stage pose a cognitive prerequisite to humor competence, since the child needs to be able to represent others' thoughts and change perspectives in order to decipher the intended (humorous) meaning of the given utterance. Bergen (2003) argues for a gradual separation of humor and play, when after acquiring representational competence, the child becomes able to distinguish humor from other types of play.

McGhee (1979) argues that at the pre-operational stage incongruity is humorous itself; also, Pien and Rothbart (1980) claim that at this age no resolution is necessary for the humorous effect. At the concrete operational stage resolution becomes more important (McGhee 1979), since it involves higher-level mental processes, requiring problem solving, associations, etc. Verbal humor of course gets refined and gradually more explicit with the development of verbal abilities, where metalinguistic competence allows the child to judge what is humorous in the given construction and why. At this age children coordinate discourse smoothly, and are successful in interpreting puns based on metalinguistic cues (ambiguity, word-games, phonetic punch lines), riddles, story-based jokes and more complex instances of linguistic ambiguities (Wolfenstein 1954, Piaget 1970, McGhee 1979, Bergen 2003).

4.6.1. Humor and Theory of Mind (ToM) - neuropsychiatric evidence

Humor, being such a versatile phenomenon, is studied widely not only at the linguistic level, but also at the conceptual level: by identifying cognitive strategies that contribute to conflict resolution and trigger the humorous effect during interpretation. ToM deficit has been demonstrated in several neuropsychiatric disorders (autism, schizophrenia, bipolar disorder) (Frith – Corcoran 1996, Frith-Frith 2007, Baron-Cohen 1989, Varga, et al. 2010, 2013a,b, 2014, Varga et al. in press), where difficulty in mentalizing apparently goes hand in hand with a deficit in pragmatic competence and problems in understanding non-literal utterances (idioms, politeness, indirectness, also humor). Mentalization research today mostly focuses on the correlation of humor and ToM deficit in schizophrenia (Frith-Corcoran 1996, Polimeni and Reiss 2006, Varga et al. 2010), in autism and Down syndrome (Baron-Cohen 1989, St. James-Tager-Flusberg 1994), in alcoholism (Uekermann et al. 2006), and in patients with right hemisphere lesions (Winner et al. 1998, Paradis 1998). Neuropsychiatric disorders thus provide indirect evidence that ToM and mentalizing abilities correlate with pragmatic

competence in general, and with humor processing difficulties in particular (Attardo 1997, 2000, 2002, Giora 2002, Varga et al. in press).

5. The False Belief Test (FBT) as verbal performance limitation

As described in section 2.1. in detail, ToM, stemming from our complex social-cognitive ability, enables us to read others' intentions and predict their mental state and behavior. It is believed to follow a continuum as have a number of components in development, building on one another, with a number of precursors (Fig 7, 8). As it has been noted by many (Baron-Cohen 1989, 1995, 2003, Baron-Cohen - Tager-Flusberg 1993, Happé 1993), children with autism are characterized by a social-cognitive and ToM deficit, due to which they demonstrate difficulty in engaging in social interaction, predicting and interpreting others' mental states, deciphering their intentions and intended meanings.

It is debated among scientists whether children demonstrate ToM and mentalizing skills at the age of 4-5, or earlier, since the tests used in developmental psychology require verbalized answers, therefore, children's results may reflect a verbal performance limitation: until they master verbal skills, they cannot properly respond and therefore they may not pass the test for reasons that concern their verbal, and not social-cognitive skills. In this view the verbal false belief test does not test real ToM skills, only one aspect of people's understanding of the minds of others, since due to its verbal nature it constitutes a performance limitation which distorts the results. Onishi and Baillargeon (2005) and Surian et al. (2007) proposed that children are actually able to read others' minds at 15, and 13 months of age, and some even suggest that a basic mindreading mechanism is present in human infants as young as 7 months old (Kovács-Téglás-Endress 2010). In their study (Kovács-Téglás-Endress 2010) the mere presence of a social agent was enough to trigger online belief computations, which suggests that such basic mindreading mechanisms are innate, thus automatic and spontaneous.

In fact the efficiency, validity and reliability of the classical False Belief Test (FBT) is an issue fairly debated. In their article Bloom and German (2000) present two reasons against the FBT as an omnivalent test of theory of mind skills. Their major claims are that passing the FBT requires abilities other than theory of mind, since it requires skills to follow and understand lengthy chains of linguistic structures (i.e. sentences that consitute a short narrative), remember the location of the object placed somewhere and then relocated, or decipher precise meanings in the questions (where the protagonist will look vs. should look).

Although one can control for these factors with control questions (as in our study), but in this view, verbal performance limitation may reasonably be seen as a factor that distorts the results. The authors also argue for the reverse of the above claim against FBTs, namely, that there is more to theory of mind than passing the FBT: some precursors are present in younger children and may even be innate (Gergely-Csibra 1997, 2003, Kovács-Téglás-Endress 2010), that are full-right components and even rudimentary forms of a fully fledged theory of mind which are, however, not mirrored by FBTs. This results in that failure on the FBT is not necessarily informative about the child's conceptual abilities (Bloom-German 2000, 29). Although the authors acknowledge that this task has motivated some of the most exciting research in cognitive development, they emphasize that it should be considered in its proper context: as a measure on how children cope with multiple representations and primarily with children in the verbal stages.

5.1 ToM tests in developmental psychology

We distinguish first order ToM tests, which measure the ability to predict what the other person thinks ("*Where Sally thinks the doll is*"). The classical test for this is the Sally-Anne test above (Fig. 10). Beyond this, second order ToM tests are designed to measure the ability to argue about a second person's mental state (desire, belief, intention ("*Where Sally thinks Mary will look for the doll*"). In other words, the child needs to think with two people's head. Classical tests measuring this ability are rather complex stories known as the Ice-cream van story (Perner-Wimmer 1985), and the Birthday puppy paradigm (Sullivan et al. 1994). These two tests are, however, fairly complex linguistically, they are not ideally adapted to preschoolers' verbal skills and thus may generate effects of verbal performance limitation in that age group. For this reason in the secondary ToM task in the study applied in order to investigate higher levels of mentalization and its relation to higher order pragmatic competence as humor and irony, we relied on Baron-Cohen's (1995) secondary ToM version of the classical first-order Sally-Anne ToM tests (Wimmer-Perner 1983), in which the question refers to Anne's belief about Sally's intention: *Where does Anne think that Sally thinks the ball is*? This shortened second-order ToM test measures the same ability without lengthy structures to keep track of, and as such, seemed more suitable for this age group of children.

The third test on social cognition was the Eyes-test based on Baron-Cohen – Wheelwright – Jolliffe (1997) which entails two components: a cognitive strategy in which we differentiate our mental states from others, plus an emotional judgment on how that other person may feel, based on their look, which we predict by reading emotions from the eyes. This is a more complex, wider perspective on others' mental states and intentions, where one simulates their emotions, judge their mental state and predict their behavior accordingly. In our empirical study the adapted version of the original eyes test is however is adapted to the preschooler age group, as it contains small stories with different protagonists from a family, centering around one main character (puppy), where children have to judge the emotions of the people from their eyes. The present investigation aims to contribute to the answering of debates surrounding verbal performance limitation and its effect on the age when children pass FBTs, and thus makes use of the Eyes test based on the ability of reading emotions from the eyes.

5.2. ToM and linguistic abilities – debated causal relationship

It is debated if linguistic abilities and mentalizing skills are independent of each other or the two are interconnected and involve shared routes of ontological development. Nativists believe the two are independent – language is not necessarily needed for proper ToM development. Therefore, if measured with non-verbal tests, we actually get results that younger children already mentalize and can judge their own and others' intentions fairly soon, since ToM is an innate module of ours, which may actually be composed of more than one mechanism (ToMM) (Sperber 2000, Sperber-Wilson 2002).

The other approach denies both the modular and the innate, domain specific nature of ToM, and claims that ToM has no special role in language development. ToM is seen as a domain general cognitive ability, and language is only needed for the implementation of such cognitive processes (Gopnik-Wellmann 1994, Perner 2000). Some claim that if any relationship is found between ToM and language, it is due to the verbality of ToM tasks (Chandler-Fritz-Hala 1989, Győri et al. 2007).

The third approach states that ToM and language are interconnected, that their relationship is causal and crucial (Perner et al. 2005, Slade - Ruffmann 2005, De Villiers 2007). The representatives of this approach, however, have different views on some aspects of this relationship, and they make different claims on the direction of the relationship, centering on debates on which ability develops first, and whether there is a specific language

that plays a special role in ToM development, or language in general has a fundamental role. Our study taps into this line of research, and we claim that non-literal language use is a special field in language which mirrors cognitive interpretative processes, and which is perfectly adapted to the study of the relationship between language and ToM, because in non-literal interpretation the listener needs to change perspectives and thus predict the intentions of the speaker, which enables them to decode the intended meaning. Apart from idiomaticity, sentential complements have received a lot of attention in research in this field (De Villiers – Pyers 1997, De Villiers 2007, Hahn 2009).

The greatest criticism on the verbal testing of ToM abilities was articulated by Astington and Jenkins (1999) who claim that any relationship between ToM and linguistic abilities is due to the verbal nature of ToM testing. To clarify counterarguments of this kind the present study includes a non-verbal (NV) humor task within the linguistic tasks, and a NV ToM test (the readapted Eyes test). With the NV tasks the present investigation aims to clarify if the NV ToM test is predictive in the linguistic tasks, if it can be passed by children at an earlier age, hence it supports the hindering effect of verbalization on performance in preschool years.

It's important to note that there is currently no omnivalent ToM test that would reliably mirror the complexity of the multifaceted and extremely complex cognitive ability of mentalization. A number of ToM tests exist, apart from unseen displacement (e.g. the 'Smarties box test' or the 'Appearance-reality task' measuring access to the mental states and false beliefs of the self). A meta-analysis of existing ToM tests has demonstrated, however, that each test is endowed with the same predictive force, so each one is predictive in itself, with the same efficiency and reliability (Wellmann et al. 2001). It is also debated whether ToM is a single, unified entity (Happé 1993, Perner 1991), or has a number of levels (Dennett 1991, Sperber-Wilson 2002).

An important question concerns which form of language can mirror ToM competence authentically. As mentioned above, the present investigation builds on the conviction that figurative language is a domain of language through which mental, cognitive interpretative processes employed in interpersonal context and discourse settings can be studied efficiently. To separate such pragmatic, idiomatic domains and semantic abilities, the study makes use of control tasks in the irony condition, where the stories were based on events caused by physical actions and there was no agent and mental component to the physical causal events described, thus the need for interpersonally based mentalization is minimized, if not excluded.

6. The development of humor comprehension- A case for experimental pragmatics II.

6.1. Objectives

The present empirical investigation is a continuation of the research on idiomaticity and pragmatic competence in healthy preschool children (see section 3). The basic tenet of the present study is unchanged: ToM is hypothesized to be a prerequisite of smooth coordination of discourse and productive non-literal language use. The study targets the preschooler age group in which the ability to change perspectives, represent symbols and recognize false belief emerges.

To test effects of performance limitation, a non verbal ToM test was drawn up (Schnell 2012, Schnell-Varga 2012), adapted to preschoolers' competence, and was made less abstract than the original (Baron-Cohen – Wheelwright – Joliffe 1997), where normal adults and adults with high functioning autism were asked to identify the mental states based on pictures of eyes. This original form of methodology would in itself represent a performance limitation in the study of preschoolers, for that reason a re-structured and re-adapted version is used (Schnell 2012, Schnell-Varga 2012).

The study aimed to test the relationship between a verbal (V) and a non-verbal (NV) ToM test and linguistic abilities. We investigated whether the NV ToM test is a valid predictor in pragmatic tasks equally to the verbal (V) ToM test (Schnell 2007, 2010). If we find no correlation between NV ToM results and performance in verbal tasks measuring pragmatic competence, it proves that any relationship between language and ToM is due to the verbality of the tasks.

The second phase of the study also aims to compare humor and irony processing (see section 7), and clarify if humor and irony results are any different in view of mentalization skills. In other words, can results support the view in humor research that irony is a form, thus sub-category of humor, on the basis of processing issues, in cognitive terms, or, is metaphor, irony and humor rather markedly distinct categories, as the linguistic approach suggests from a formal-analytic and rhetorical view (Nemesi 1999).

6.2. Hypothesis

The study investigates the cognitive background and prerequisites of pragmatic competence in the course of development. It aims to clarify if children who pass the False Belief test as a

measure of their ToM skills, process non-literal expressions, namely metaphor, humor and irony more successfully than those who do not yet have a fully-fledged ToM. We compare the two group's (ToM group and No-ToM group) performance in verbal tasks of pragmatic competence focusing on humor and irony processing (section 7), eventually comparing metaphor understanding, humor and eventually irony comprehension in view of the mentalizing skills. With the non- verbal dimensions the procedure aims to clarify if the NV ToM test is predictive in the linguistic tasks, if it can be passed by children at an earlier age, hence if it supports the hindering effect of verbalization on performance in preschool years.

6.3. Method

The subjects and the methodology in the verbal FBT was the same as described in chapter 3, section 3.2, but added a second order ToM question was added to the test (Baron-Cohen 1995), to investigate of second-order mentalization is necessary for more cognitively complex forms of non-compositionality like humor and irony, as hypothesized by Happé (1993) and Sperber-Wilson 1986, Wilson 2009), given that the two are often seen as belonging to the same category (irony being a form of aggressive humor (Martin 2007).

Subjects were read out verbal jokes, in all three conditions: riddles, one-liners and contextual jokes with punch-line. Each condition consisted of 5 jokes; hence they could earn a total of 15 points in the verbal condition, and an additional 5 in the non verbal visual test, altogether a maximum of 20 points in the humor condition.

The subjects were asked if they found the humorous stimuli funny, and why. Some explanation was needed in order to see they understood the humor, not only laugh (Séra 1983).

6.3.1. Novelties in the methodology

The study intends to make up for cavities in current trends in humor and cognitive pragmatic research and employs a novel approach in the following aspects: (i) not many studies focused on the distinction of humor and irony, however, the two are rather seen as overlapping categories in humor research, whereas in linguistics they are seen as markedly distinct (Nemesi 1999, Attardo 2001b). (ii) Not many studies centered on spontaneous humor in everyday interaction. The present framework looks at different types of humor, not only pre-fabricated jokes but short instances of humorous utterances, like one-liners and riddles,

together with spontaneous forms of humor like non verbal, visual humor. (iii) The testing materials include both verbal (V) and non verbal (NV) ToM and humor tests to check if NV skills correlate with verbal skills, or only verbal ToM scores do; and to see if verbal performance limitation may induce false correlations in ToM scores and verbal skills. The empirical study is a continuation of the one outlined in section 3, targeting the relationship between ToM and idiomaticity, where the difference in the two groups' performance in the metaphor condition is due to their results in the ToM task, i.e. their social-cognitive competence.

The scope of investigation is extended and include a second-order ToM test to see if higher-order mentalization is necessary for higher-order figurative language use, and incorporated both verbal and non verbal ToM test, as well as humor and irony (see section 7) tasks. The NV mentalization test used is a re-structured, novel version of Baron-Cohen – Wheelwright – Joliffe (1997) designed for adults, adapted and created observing the needs of the preschool age group.

6.4. Tasks

6.4.1. Verbal First- and Second-order ToM tests

First the verbal ToM test of first and second order (see Fig. 9, 10.) were recorded, using a puppet play described in section 3 already, based on a recognition of false belief, stemming from an unseen displacement (Wimmer, Perner 1983) incorporating a second-order ToM question as well (Baron-Cohen 1995). After the puppet play in which the brown bear puts his honey on the table, the white bear displaces it into the box nearby, the child is asked 3 questions: a first-order ToM question: "Where will the brown bear look for the honey?"; a Memory question: "Where did the brown bear put the honey at the beginning?"; and a Reality question: "Where is the honey now?" (to check if the child understands to situation and their answer is not due to their limited memory performance). The second-order ToM question requested subjects to answer "Where does the white bear think the brown bear will look for the honey". Only those answers were accepted that included the right answer for all main ToM and control questions.

6.4.2. Non verbal test of mentalization – Eyes test

The eyes test is in reality a semi-verbal mentalization test (DeVilliers 2007), in that it does involve linguistic stimuli, but only in the presentation phase. In the response phase children do not have to rely on their linguistic and syntactic abilities to come up with the answer, that is, their correct response is not dependent on the precise processing of the lengthy syntactic structure of the basic story and the additional complex question. Instead, they get simple stories, which align in complexity and difficulty to the rest of the linguistic stimuli (see App.), where the protagonist experiences an event that evokes a certain feeling and thus mental state in them. Then, after listening to the story, they subjects are asked to identify which eyes suit the protagonist's mental state best:

Sadness - Peter
Peter and Dorothy got a puppy for Christmas. They walked the puppy each afternoon, and even slept with their dog, they loved it so much. One morning when Peter woke up, the dog was not in the room. It disappeared….. – It may have got lost! – Peter thought.
How did Peter feel? Which picture shows his eyes?

The Eyes test aimed to measure the social-cognitive competence of children in both the cognitive and the affective modality. The test contained pictures of eyes reflecting the six basic emotions in line with Ekman's theory: 1. sadness, 2. joy, 3. surprise, 4. anger, 5. disgust, 6. fear. (Fig. 14). (Ortony, Turner 1990).

Fig. 14.
Based on Ekman's theory of basic emotions:
Sadness, Joy, Surprise, Anger, Disgust, Fear (Ortony – Turner 1990).

In the test condition each story was followed by three eyes to choose from. Each story featured one family member as the protagonist, i.e. either Peter, or Dorothy, Mother of Father, therefore, they eyes were carefully matched to these traits of the characters and the selection of eyes to choose from also considered the age and gender of the protagonist, ensuring that children would not choose on the basis of some default strategy, i.e. on the basis of the gender or age of the protagonist in question. In other words, when it was Dorothy whose feelings and mental state had to be guessed, the pictures subjects had to choose from were carefully selected to involve young females' or girls' eyes, and vice versa, if males were the targeted protagonists, to avoid interference of the results.

6.4.3. Linguistic tasks

In the study testing idiomaticity and its relations to mentalization skills (section 3) was extended to evaluate the performance in the metaphor, humor and irony (see section 7) conditions. The Humor trial consisted of four sub-trials, three of them of linguistic (see Table 3[4]), and one of non-verbal nature (see Fig. 15).

1. One-liners:	**2. Riddles**	**3. Jokes**
Jean (chamberer) and his Landlord: Landlord: Jean, could you plug in the cow, please? Jean: Why, Sir? Landlord: Because I want to drink boiled milk.	- Why didn't the skeleton cross the road? – It didn't have the guts………	A guy is sitting at home when he hears a knock at the door. He opens the door and sees a snail on the porch. He picks up the snail and throws it as far as he can. Three years later, there is a knock on the door. He opens it and sees the same snail. The snail says, "*What the hell was that all about*?"

Table 3.
Verbal tasks of the Humor condition

4

For reasons of translation techniques the exact humor test is attached in the appendix in Hungarian as well, and samples are provided in English, that reflect the cognitive and linguistic complexity of the jokes used in the testing. Jokes are so embedded in cultural background that they often cannot be translated exactly, only equivalents can be given to mirror the material. For the original test see the Hungarian version at the end of the Appendix.

Two decontextualized joke conditions

(a) “Jean” jokes or one-liners are short, therefore are taken as a type of decontextualized forms of humor, based on ambiguity, the resolution of which can give insight into the metalinguistic competence that emerges at this age, believed to play a role in the deciphering of ambiguity (Gleason-Ratner 1998);

(b) Riddles served as another short condition for decontextualized stimuli where interpretation is not backed up by contextual cues, and humor is presented in the form of questions;

(c) The visual humor test consisted of pictures where interpretation does not depend on linguistic stimuli or syntactic processing; therefore we can exclude verbal performance limitation (Fig. 15.).

Fig. 15.

Visual Humor test samples

Incongruity in jokes, either of verbal or of non-verbal nature, has an intended meaning. In figure 15. in the second picture the snail tries to get away *for a reason*. Those children who successfully decipher the intention behind this behavior get the joke, those who fail to do so, don’t see it as funny. The intended incongruity is the surplus which differentiates play (snail on a scooter) from humor (with the intention of sneaking away).

(d) Contextual jokes condition was based on story-form jokes ending with a punch line, where the child had to explain why the joke is funny. Here we forecasted that due to contextual cues jokes will be easier to handle for children than decontextualized one-liners where there is no contextual constraint to help narrow down the range of possible meanings.

6.5. Results

6.5.1. ToM tests

The results of the 1st and 2nd order and V-ToM test almost completely overlapped: out of the entire sample only one child did not pass the 2nd order ToM test. That is, who can think with the Brown Bear's head, (first order ToM) and change perspectives, can also think with the White Bear's head and predict what it thinks of the Brown Bear's intentions. For this reason in the summarized chart of results the two V-ToM tests overlap.

The area under the ROC curve (see Fig. 16.) defined a considerable 'area under the curve' (AUC) as it deviated from the main diagonal also referred to as 'the line of no information', thus confirming the high diagnostic accuracy of the test. Age proved to be predictive in passing the ToM test, i.e. age definitely influences success in ToM task. One month increases chances of success in ToM tasks with 23%.

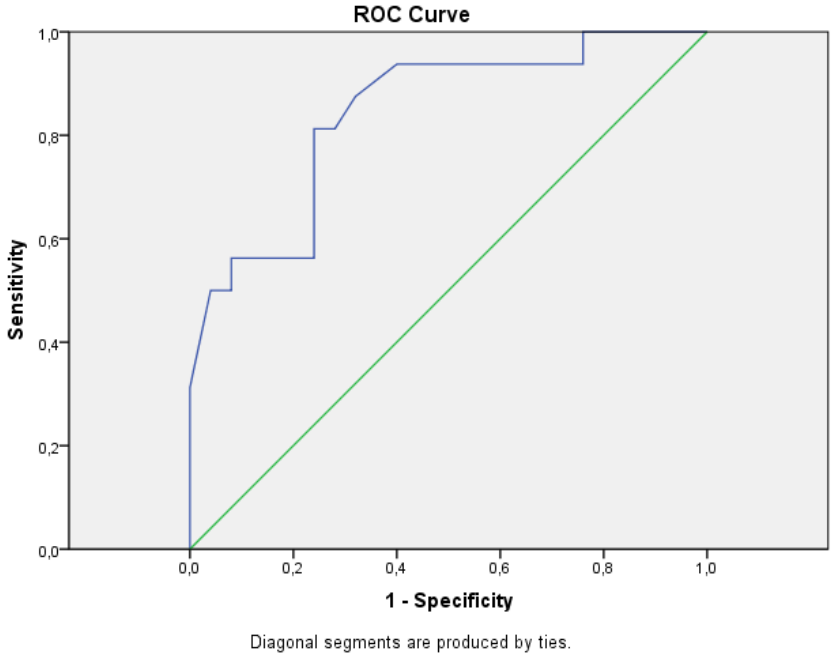


Fig. 16.

Area under RoC curve showing the diagnostic accuracy of the test

Our findings thus suggest a unified, (though versatile) ToM (Happé 1993), rather than a multi-layered complex of skills consisting of more mechanisms (Sperber-Wilson 2002).

6.5.2. Eyes test

The novel Eyes test did not yield any further groups, its function was mainly to see if (i) it is easier to pass for preschoolers, i.e. children can pass this at an earlier age, which would mean that it is a version of mentalization tests that is not subject to verbal performance limitation, (if children pass it significantly earlier), and (ii) if it is predictive in verbal tasks of pragmatic competence as well. The eyes test was found to be predictive on the basis of correlations and values in the statistical analysis.

The results show that children pass the NV ToM (Eyes) test at a mean age of 5; that is, about 4 months earlier than they pass the verbal test. This supports the fact that the verbal nature of the task entails a tendentious verbal performance limitation. They pass the verbal ToM test at 64,5 months, in average (this is in harmony with previous findings (Perner 2001, Perner-Lang 1993, Kiss 2005).

There is no significant correlation between the NV ToM test (Eyes test) and the NV Humor task (see Appendix), which may suggest that the verbal ToM test is more predictive in pragmatic (verbal) tasks than the Eyes test..

The V-ToM test proved to be more predictive in verbal tasks of pragmatic competence than the NV Eyes test. However the Eyes test results are in line with mean scores of pragmatic task results (see graphs 22, 23, 24 revealing eyes test results in relation to the rest of the scores) confirming that the Eyes test functions as a valid and predictive measure.

6.5.2.1. Validity of the Eyes Test

Statistical analysis has shown that both the verbal and the non-verbal mentalization test results are valid up to a 100%.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
tom1num * EyesT/6	41	100,0%	0	0,0%	41	100,0%

6.5.2.2. Reliability of the Eyes test

Somers'd measure in the statistical analysis has shown that there is a significant difference in the performance of the two groups in terms of Eyes test results Somers's d T=4,503; p< . 001 suggesting that the ToM group is significantly better in the Eyes test, which confirms its predictive value and efficiency. Children were able to pass the Eyes test 4 months earlier than the verbal ToM test, and yet the ToM group is significantly better in it, which means that it is possible to use this as reliable valid and predictive measure in children's mentalization skills, as it can ensure an earlier detection of mentalization skills, due to its semi-verbal nature.

Directional Measures

			Value	Asymp. Error[a]	Std.
Ordinal by Ordinal	Somers' d	Symmetric	,471	,100	
		tom1num Dependent	,385	,085	
		EyesT/6 Dependent	,605	,127	
Nominal by Interval	Eta	tom1num Dependent	,570		
		EyesT/6 Dependent	,510		

Directional Measures

			Approx. T	Approx. Sig.[a]
Ordinal by Ordinal	Somers' d	Symmetric	4,503	,000
		tom1num Dependent	4,503	,000
		EyesT/6 Dependent	4,503	,000
Nominal by Interval	Eta	tom1num Dependent		
		EyesT/6 Dependent		

6.5.3. Idiomaticity

In the simile condition both the ToM and the NoToM group did almost equally well; while in the metaphor condition children in the ToM group did significantly better than those in the NoToM group (see Fig. 17**.)** (Upper line: ToM group, Lower line: NoToM group, in all charts). This replicated the results of the previous study targeting only Simile vs. Metaphor

processing in section 3 (Fig. 18) which confirms the validity and reliability of the method and the findings.

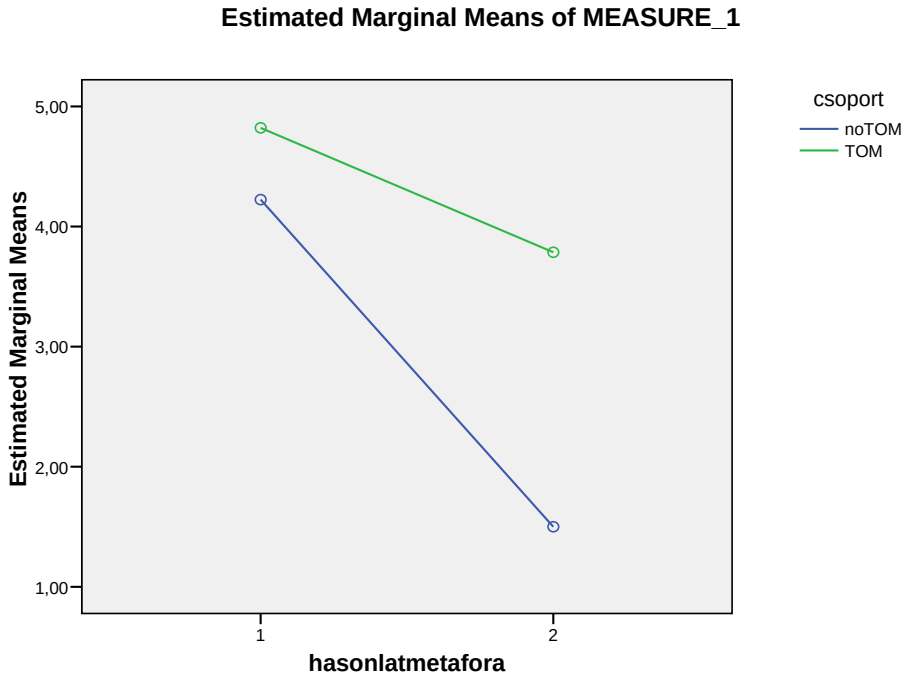


Fig. 17.

Idiomatic and pragmatic skills in line with ToM competence

1.: Simile condition 2.: Metaphor condition

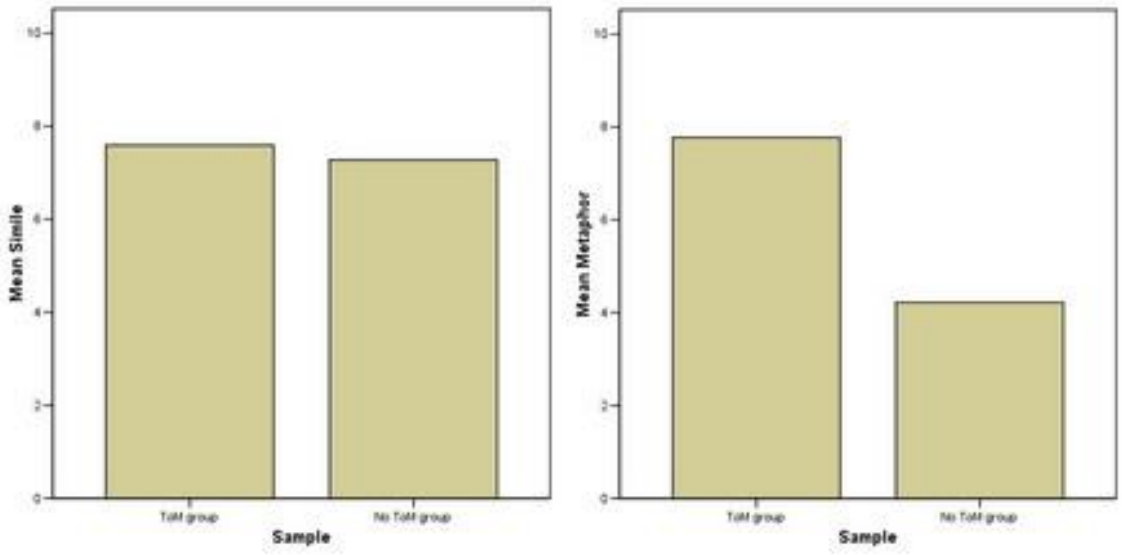


Fig. 18.

Simile and Metaphor comprehension in view of ToM skills (from section3)

(i) The statistical analysis entailed a single-sample ANOVA variance analysis with SPSS. We found a difference independent of groups in the simile/metaphor tasks [F(1,41)=173,59, p<0,05] – meaning, there is a difference in the processing of simile and metaphor.

(ii) Furthermore, there is a significant interaction between groups and the simile/metaphor tasks; F (1,41)=35,006; p< 0,05. In the simile condition the NoToM group did just as well as the ToM group, but the ToM group was significantly more successful in resolving metaphor tasks.

(iii) We found a difference between groups, independent of simile/metaphor or contextualized/decontextualized conditions: F(1,41)=55,113, p<0,05; meaning, the two groups used different mental strategies when resolving the tasks.

6.5.4. Contextual effects in the metaphor condition

The decontextualized condition measured production, while the story condition focused on perception skills. We found no significant difference between the two conditions (Ctx/Dectx), meaning, that production and perception actually correlate, and thus measuring one or the other shall suffice and is predictive in terms of judging competence. Figure 19. shows contextual effects in idiomatic processing.

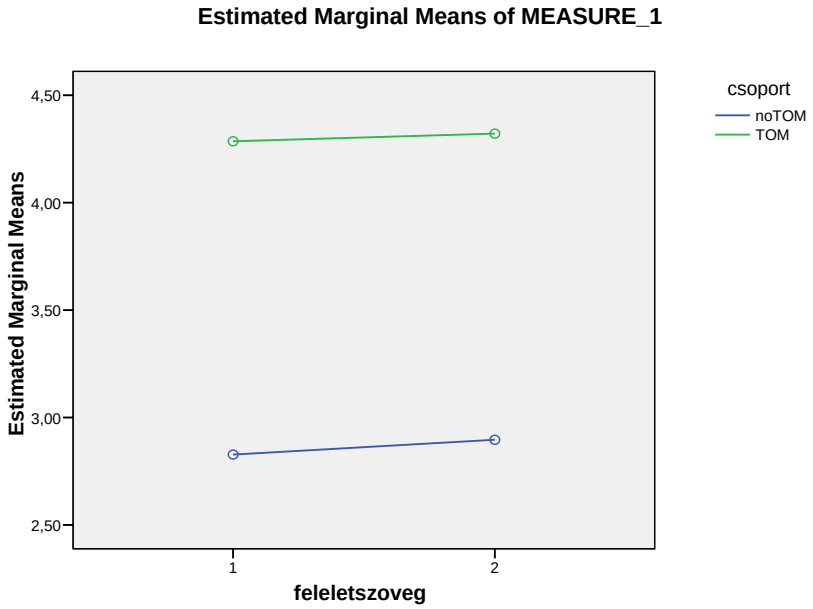


Fig. 19.

Contextual effects in idiomatic processing in view of mentalization

(1) Decontextualized (multiple choice) / (2) Contextual (stories metaphor / simile ending)

There is no significant difference between decontextualized and contextualized stimulus processing, only a slight advantage on the side of longer, contextual input. In other words, the contextual conditions were slightly more successful in both groups, which in the case of the metaphor tasks confirm the facilitating effect of the context in interpretation. The contextual cues apparently help in the resolution of implicatures and in the selection of the intended meaning out of competing alternatives F(1,41)= 0,228 n.s. All in all, contextual cues and situational constraints apparently do facilitate interpretation, but they do not make a significant difference in results.

6.5.5. Humor results

We found that there is no significant difference between Dctx/NV/Ctx humors, that is, the differences in performance are not due to the difference in the type of humor trials. F=(2,82)= 0,416; non signif.

But there is a trend for interaction. Figure 20 shows the performance of the two groups in the three categories of humor, namely in One-liners (1), Non verbal (2) and Contextual jokes (3); F(2,82)=2,744; p<0,1.

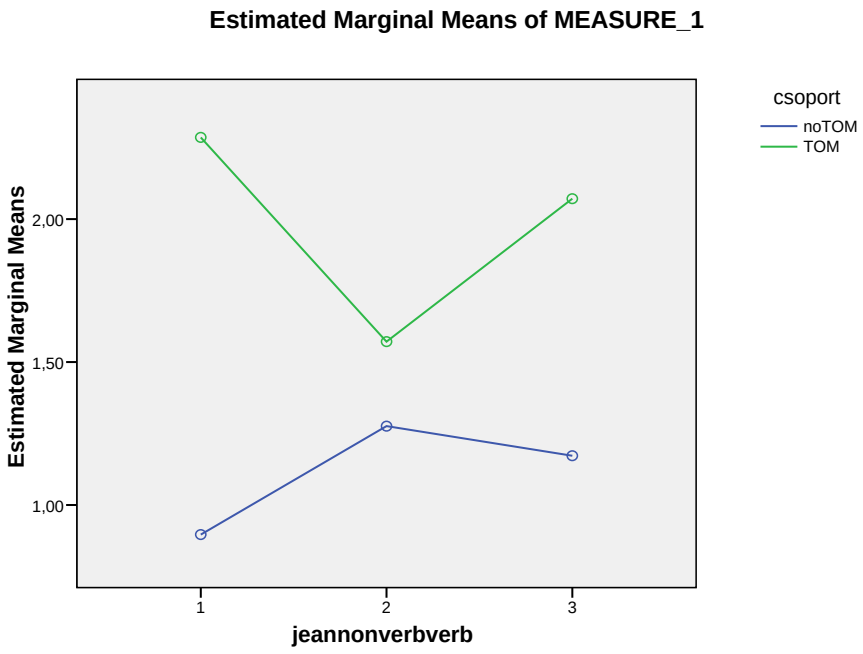


Fig. 20.

(1) Decontextualized (2) Non-Verbal and (3) Contextualized humor comprehension skills in view of mentalization

The ToM group performed better in the verbal tasks than in the non-verbal picture test. This finding supports previous views in literature, in line with the Cognitive Congruence principle (Zigler et al. 1966), that children enjoy the type of humor in which the cognitive complexity is in harmony with the children's actual cognitive abilities. Thus, those who have mastered verbal skills enjoy verbal humor more, and in the verbal modality humor had a greater effect.

6.5.6. Non-verbal results

The NoToM group performed better in the non-verbal task than in verbal counterparts, even if intended, humorous meaning was supported by the context (in the joke condition) (Fig. 20).

At first sight it is fairly interesting that the NoToM group did better in the non-verbal (NV) task than in the verbal tasks, and that the ToM group did considerably better in verbal humor tasks, while it was the least successful in the NV task. We would think that once acquired, ToM suffices for NV interpretation as well. But apparently when the child reaches the verbal stage, verbalized humor takes the lead, and NV modality lags behind. A number of hypotheses exist that may explain this finding. Séra (1983) suggests that the child begins to explore humor in verbal jokes after the acquisition of verbal skills. Cognitive Congruency (Zigler et al. (1966) may also account for the interesting curve in Fig. 20, that for children who have mastered verbal skills, verbal humor proves to be of optimal complexity and triggers greater pleasure during resolution.

6.5.7. Contextual effects in the humor condition

Fig. 20. also reflects contextual effects in humor processing: the ToM group was more successful in short, decontextualized humor (Jean-jokes or One-liners) than in the contextualized humor task (i.e. jokes ending with a punch line). It may be because longer context may burden processing in humorous utterances where cognitive effort is greater than in semantic processing, because the resolution of incongruity requires an interactive dynamic meaning construction; while short verbalized input, being more congruent in cognitive terms, triggers a more optimal effect.

Independent of tasks we did find a difference between the ToM and the NoToM group: $F(1,41)=7,612$, $p<0,01$; meaning, the ToM group and the NoToM group rely on

different cognitive strategies. This proves that the ToM group makes use of a different mental strategy and relies on mentalization.

6.5.8. Idiomaticity vs. Humor results

We aimed to compare whether idiomatic language (i.e. metaphor) is easier or more difficult than the resolution of humor-generated implicatures. We continued tracing contextual effects in interpretation in this part of the study as well. In the Ctx/Dectx conditions were carefully designed to be of the same syntactic and semantic complexity; their length and difficulty was standardized. To exclude verbal performance limitation, we also used a picture test to measure children's humor skills. $F(2,82)= 222,29$, $p< 0,01$, Interaction: $F(2,82)=22,97$, $p<0,01$.

Figure 21 and 22 show the results in the Simile, the Metaphor and the Humor condition, suggesting that idiomaticity was remarkably easier than humor comprehension for preschool
children.

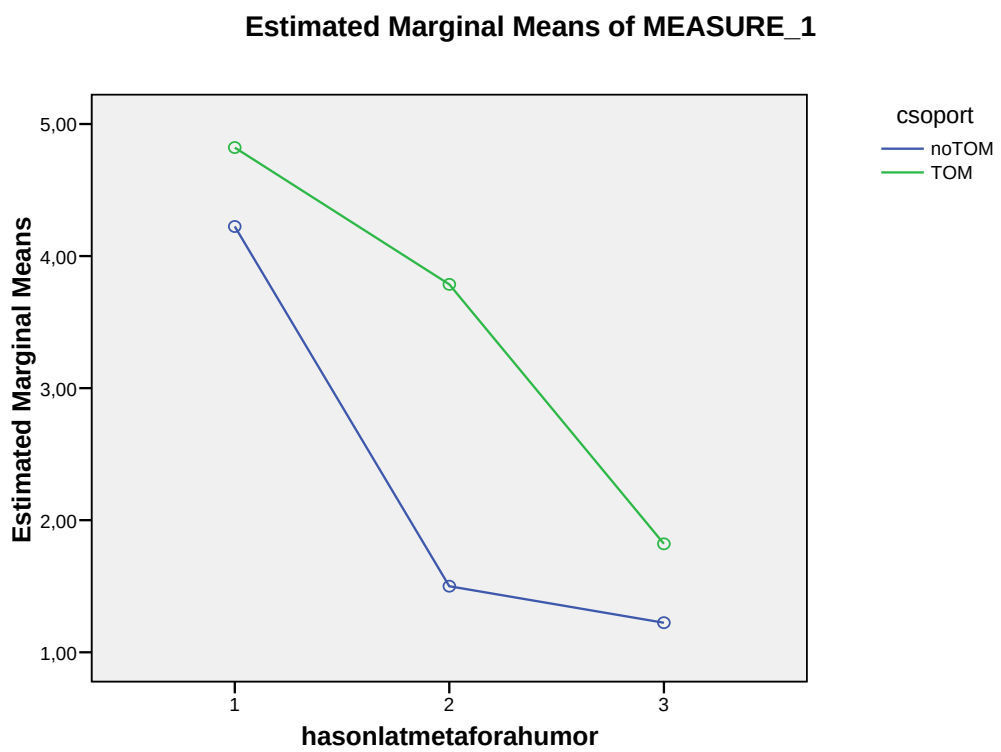


Fig. 21.

1. Simile / 2. Metaphor / 3. Humor processing

in relation to ToM skills

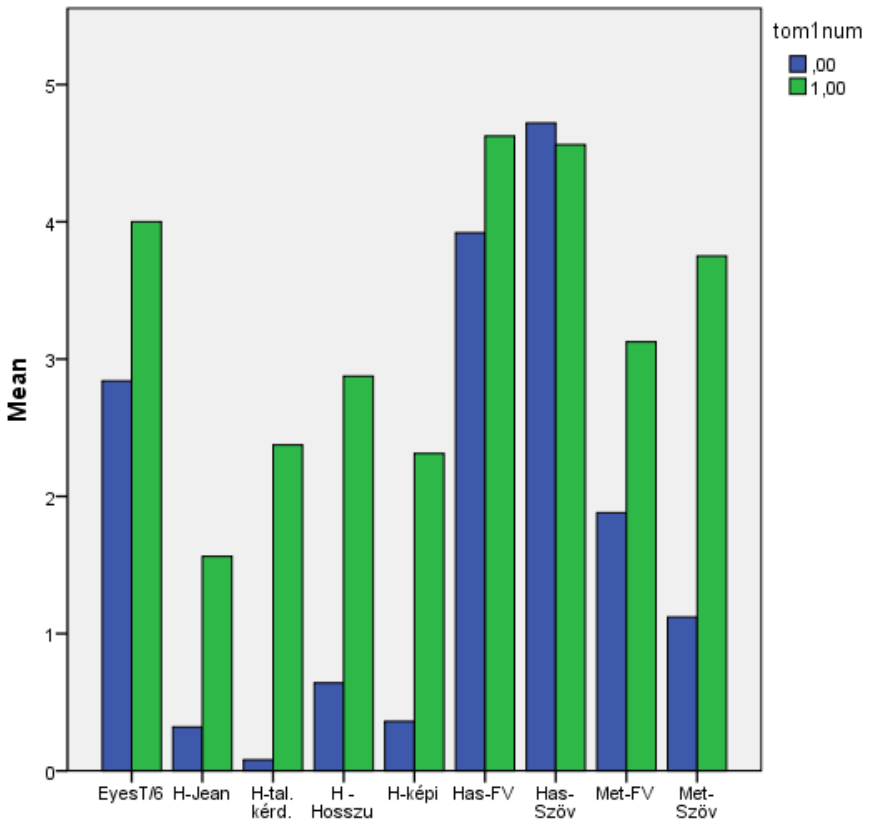


Fig 22.

Relationship of [V-ToM skills] and [NV-ToM, Idiomaticity (Simile/Metaphor) and Humor]

1 – Eyes Test; 2 – H - One-liners, 3 – H-Riddles, 4 – H-Jokes, 5 - H-visual, 6 - Similes (Dctx), 7 – Simile (Ctx), 8 – Metaphor (Dctx), 9 – Metaphor (Ctx).

00: NoToM group (blue, left side) 01: ToM group (green, right side)

This may be due to the fact that humor involves a social, cultural background knowledge and experience, and in general such knowledge is necessary for the correct interpretation of the punch line. Often the social-constructions that serve as the background of the incongruity, or cultural particularities, that one acquires with age and with social integration, are not yet available and accessible for children of this age.

All in all, the results suggest that ToM did facilitate the comprehension of humor; however, it does not suffice for equal success in the case of Humor and Idiomaticity, sufficing in the latter case, while being important but in itself insufficient in the former.

ToM, therefore seems to be enough for a successful interpretation of metaphors. As the chart shows, the NoToM group did well in the Simile task but did poorly in the Metaphor task, while the ToM group was significantly more successful in the Metaphor task than in the Humor tasks. Secondary ToM did not make the Humor results any better, however, most of the kids passed the test. This suggests that ToM is not a multi-level ability, and Humor competence cannot fully be explained on a mental basis – it also involves social, cultural implications.

The results back up this hypothesis, and as the graph shows, the NoToM group was not successful in the metaphor, nor in the humor task, while the ToM group was significantly more successful in both. This suggests that ToM does make a difference: it is needed for Humor processing, but not enough, since social constructions and cultural framework all contribute to intended meaning construction in the case of humor. All in all, the findings support our initial hypothesis, that mentalizing skills are essential in deciphering intended meaning.

That the ToM group was more successful in the metaphor task than in the humor task may be due to the fact that humor is more complex, since it is often culturally and socially embedded, and not only mental strategies but some background knowledge is needed for smooth interpretation, which is often determined by social constructions. To do this, one has to reach a certain age, to acquire knowledge about social status, cultural background, history and stereotypes. These factors are not mental factors, but crucially depend on social experience and come with age, and mental abilities can not entirely and fully substitute such socially construed experience and knowledge. For this reason humor proves to be a more complex phenomenon within the trajectory of pragmatic development, and therefore one of the most complex of all aspects of pragmatic competence, that needs to mature in school years further on, and be explained in a culturally embedded framework (Pexman et al. 2005). Further research is needed to clearly map the intricacies of the development of humor beyond the stage represented in the continuums in the present investigation (Fig. 26 or 30).

6.5.9. Conclusions of humor vs. idiomaticity results

The findings indicate that mentalization is a crucial component in successful processing of non-compositional constructions, sufficing for metaphors, but being important but not in itself sufficient in the case of humor. The relationship of ToM and pragmatic competence is seen to

be established on the following grounds: the results reveal that the NoToM group is not as successful in idiom comprehension as the ToM group. This shows that ToM, our mentalizing skill contributes to successful comprehension of non-compositional, idiomatic constructions, since it enables the listener to decipher the intended (idiomatic) meaning of the utterance (Sperber-Wilson 1986, Perner 1991, Sperber 2000).

The ToM group however, is not equally successful in idiom and humor comprehension. Idiomaticity seems to be less difficult, which may suggest that for humor possibly social, cultural factors are necessary that emerge later in development (Gibbs 1994, Pexman et al. 2005, Martin 2007). It seems, first-order ToM suffices for idiomatic comprehension, while for humor a socially mature mind needed which is flexible in the realm of cultural and social constructions. The more difficult nature of humor comprehension within pragmatic competence is supported by neuropsychiatric studies (Varga et al. in press) demonstrating that patients with schizophrenia demonstrate a deficit not only in mentalization but also in humor processing, whereas they are found to be somewhat more successful in metaphor and irony comprehension (Varga et al 2013a, 2014).

The Eyes test was not designed to separate the sample into further groups of ToM competence, rather, it was included to see if the non-verbal variety can be predictive and passed earlier, ensuring the avoidance of performance limitation. The results seem to back up the expectations. The Eyes test however, maintains the possibility of a wide range of further investigation in several aspects. Future methodologies building on the Eyes test can give us even more insight into the interaction of non-verbal mentalizing skills and non-verbal inferential processes, and give us a clearer picture of the level of measured pragmatic competence and its associations to performance limitation.

McGhee (1979) argues that a fully fledged humor competence emerges at the age of 7, when the child can coordinate several meaning simultaneously, and select the intended meaning from competing alternatives. At this age children become able to carry out a number of mental operations, to remember them, represent them at a conceptual level, and operate with symbols. This is in harmony with Piaget's cognitive scheme (1970), where this period is marked by the transition between the pre-operational stage and the stage of concrete operations, when the child can handle the different outcomes of a number of inputs, evaluate and coordinate different outcomes at a representational level. In this competence the ability to change perspectives is crucial in both Piaget's theory (who emphasizes the egocentric world of preschool children without this competence), and the results of the present investigation also suggest the ToM enables the child to see the other's point of view, predict their mental

state and intentions, and thus decipher intended meaning (Sperber-Wilson 1986, Schnell 2007, 2012).

In the child's cognitive development this phase is followed by further, more refined stages, where they reach the stage of formal operations around their teenage years. In this period, their thinking is not determined by sensory input based on experience, but rather, on logical principles. At this age children can recognize logical inconsistencies and prefer jokes based on such incongruity (Martin 2007). As we can see, there is a multi-stage development, and ToM itself seems to be composed of several factors (Abu-Akel – Shamay-Tsoory 2011). During cognitive development gradually more refined structures emerge, which enable the child to resolve playful incongruities in language and experience. This is in line with the Theory-theory of the development of mentalization (Gopnik-Wellmann 1994, Meltzoff – Gopnik 1993 a,b) advocating a continuum of conceptual changes in development, which is apparently the theory most supported by the findings of the present investigation, in line with the tenet of neurolinguistic studies investigating the validity of these theories on a neural basis (Abu-Akel – Shamay-Tsoory 2011, Mahy-Moses-Pfeifer 2014).

This preschool period is characterized by egocentric and magical thinking, where sensory input predominates experience, resulting in the so-called pre-logical thinking (Piaget 1970). In this stage children cannot differentiate reality from fiction (Vajda 1999, p 118). The simultaneous coordination of several views and aspects is a very complex task which requires cognitive effort. It entails the ability to change perspectives and predict others' mental states, desires, beliefs and thoughts. By the age of around 7 (beginning of school years) magical thinking decreases (Mérei 1989), and rational thinking takes over the place of imagination (as this manifests itself in drawing as well). Symbolic operations also get more refined in all modalities (drawing, language use, and thinking). When the child becomes able to consider multiple factors, views and selects among different outcomes of the same input, they become able to handle incongruity in jokes as well, where resolution is rooted in the same cognitive processes: deciphering speaker's intentions.

It is important to note however, that the predominant nature of magical thinking is apparently contradictory to the theory-theory account's view on a trajectory of conceptual changes and the series of changes of naïve theories of mind in cognitive development. Therefore, the magical thinking period is not seen as deterministic in the present explanatory framework, but rather, it is seen as a window-period within which conceptual changes may take place, given that magical thinking itself encompasses several years, during which children obviously develop in cognitive terms. Several features of children's thinking have

been identified which are temporarily present but children grow out of within the magical thinking period of preschool ages, such as syncretism or transduction. These, however, represent phases of tranisiton, since they are not permanent but pass as children become more competent in several domains of their cognition. Therefore, the magical thinking dominant in preschool years is not seen as one excluding the possibility of conceptual changes as a means of cognitive development. The fact that magical thinking predominates gives certain characteristic features of preschoolers' mental life, but does not mean that there are no cognitive and conceptual changes and development in this period, and that it would be deterministic in conceptual terms.

In sum, the fact that magical thinking is a main feature of preschool years and that, as we believe, is dominant in this period, does not defy its convergence with the theory theory account of ToM development, as we believe conceptual changes take place even within the magical thiking period encompassing several years in preschool years.

7. Humor irony and social cognition: The development of irony comprehension - A case for experimental pragmatics III.

This chapter gives an insight into the cognitive and developmental background of pragmatic development, targeting the unfolding of irony processing. It maps the relationship of ToM and irony comprehension, determines if mentalization plays a significant role in the successful interpretation of irony in the case of normally developing preschool children. The results are also integrated in the wider framework of pragmatic development in order to see the relative position of irony in relation to metaphor and humor on the developmental trajectory.

The findings indicate that mentalization plays a crucial role in pragmatic abilities in general, and in irony processing in particular. Conclusions are drawn on why linguistic and cognitive approaches treat irony and humor differently. The experimental findings eventually synthesize the results on this issue, suggesting that the two forms two require fairly distinct cognitive strategies, therefore, constitute different categories of processing.

7.1. Background: Humor vs. irony

According to classical rhetoric, metaphor and irony are tropes in which the literal meaning is replaced by a related figurative meaning: in metaphor, this is a related simile or comparison,

while in irony, it is the contrary or contradictory of the literal meaning (Wilson 2013). Humor concerns social issues, since it serves social goals: we use aggressive humor (in humor research labeled as 'irony') in social settings to demonstrate social power and humiliate the self or others. Wittgenstein (1965) saw language as a game, with rules to abide by, social purposes to serve, where one tries to manipulate other's behavior or mental states (i.e. thoughts, beliefs, feelings, convictions, desires, etc.). We also pointed out similarities and differences in juxtaposing humor and play developmentally and evolutionarily (Bereczkei 2003, Martin 2007) above.

There are a number of definitional problems present in humor research and in linguistic approaches to irony. While in linguistics the two are treated as markedly distinct (Attardo 1994, 2000, 2001b, Giora 2001, 2002), humor research tends to downplay the differences in the two and treat irony as a sub-category of humor, namely**,** aggressive humor serving special interpersonal purposes (Séra 1983, Tisljár-Bereczkei 2005, Gibbs-Gregory-Colston 2014). Problems with this approach is, that humor is (of course), not always ironic. Naturally the two may overlap, but we have to distinguish the cultural and the linguistically ironic meaning. Irony is one rhetoric figure of speech whose meaning can be distinguished only pragmatically, and not semantically. Only the pragmatic (context dependent) meaning corresponds to the intended (ironic) meaning, the literal (semantic) meaning is misleading ("You are a great friend!" meaning: "You are not a great friend").

Stylistically, in social-psychology**,** in terms of interpersonal goals and functions, irony is seen as belonging to humorous utterances, however, they trigger different responses: humor triggers laughter, while for irony the adequate response is not laughter but self-deprecating irony. If one laughs at an ironic remark targeted at them, they admit being weak and lame; therefore, they respond with self-irony which allows them to come out of the humiliating situation as a winner, or at least as equal opponents. Irony, therefore, often seen as an aggressive subtype of humor, can be directed to the self or to others.

The boundaries of irony actually extend beyond humor in instances when something is so rude that it is not funny anymore. In this framework it is generally directed to others, not the self. Thus, the overlap is only partial. Gibbs (1994, Gibbs-Colston 2007) carried out a number of psycholinguistic experiments on irony , concluding that productive use and understanding is in place around ages 8-13, so it is acquired rather late within non-literal language acquisition. Metaphors, however, are acquired fairly early, compared to this, in preschool years, they find.

These tenets in literature suggest that irony processing may be more difficult, and they suppose, because it capitalizes on a second-oder ToM competence, since one needs to think with not only the other's head (Tom says: You are a great friend") but also detect the clashes of meaning in that the semantic being the sentence meaning is the opposite of the pragmatic, intended, i.e. speaker's meaning, in view of the other person's representations. In other words, successful interpretation lies in the ability to judge the speaker's desire about the hearer's belief (Winner-Leekam 1991). This entails the representation of another representation, and hence irony is seen as requiring second-order mentalization skills (Happé 1993).

7.1.1. Objective and hypotheses

This chapter investigates the development of irony comprehension and its cognitive prerequisites, if ToM is necessary for the successful processing of irony, as claimed my many (Sperber-Wilson 1986, Happé 1993, Wilson 2012, Varga et al, 2013a, 2014). The empirical study below targets irony processing of normal, typically developing preschoolers, and view their performance in linguistic tasks measuring irony understanding in view of their mentalization skills (NoToM vs. ToM group). The study aims to reveal if irony is more difficult than metaphor, if it requires second-order ToM abilities which represent higher level mentalizing skills, and determine the relative place of irony in the trajectory of pragmatic development in relation to metaphor and humor. In other words, on the basis of the findings, conclusions will be drawn on irony's relation to both metaphor and humor, thus contributing to the clarification of long-standing debates in both topics.

7.2. Method

Subjects, procedure, method are the same as described above in previous sections. Testing wad done in the same manner as in the phase measuring metaphor and humor competence. Children underwent several verbal irony tasks measuring different aspects of their pragmatic abilities. Linguistic stimuli were read out to them, and they answered verbally. To avoid default answers and priming effect of these, the questions alternated yes/no answers as correct. In other words, one question was formulated in a declarative, positive aspect, while the other in the negative, asking the opposite (see App.) Each trial consisted of 5 tasks,

similarly to the structure of the previous investigations on metaphor and humor. In the quantitative study they got 1 point for each correct answer. The maximum score was 15.

7.3. Tasks

The Irony trial consisted of three sub-trials: Irony condition, Irony with linguistic help condition, and Control condition (Table 4). In the irony condition a short scenario was read to the child (2-3 sentences) in which one of the protagonists makes an ironic remark relating to the other's behavior. At the end of the scenarios a question relating to the ironic content of the story had to be answered.

In the Linguistic help condition the speaker's mental state was made explicit ("angrily said…"); therefore it was expected to be easier for children, since no implicit mental contents had to be deciphered through lengthy inferential chains.

In the Control condition the stories were based on physical events, thus did not involve interpersonal settings, thus, as expected, did not require genuine interpersonal mindreading, only semantic interpretation (hence its control function). All three trials were designed to be of the same length and of the same syntactic and semantic difficulty.

1. Irony condition	**2. Irony with linguistic help**	**3. Control condition**
Peter and Kate go to a dance party. Peter asks Kate for a dance, but he constantly steps on her toes. Kate says to him: **You dance very well, my dear!** *Question: What does Kate mean by this? Does she think Peter does not dance well*?	Mary asks John to help her do the washing. John accidentally leaves a red shirt among the white clothes, so all the clothes come out pink! Mary *disappointedly* says: **These clothes are really bright white!** *Question: Does Mary think the clothes are bright white?*	There is an apple tree and a plum tree in the garden. A strong wind comes and it blows so hard, all the fruits en up on the ground, none stays on the trees. *Question*: *Does any fruit stay on the fruit trees after the stor*m?

Table 4.

Irony tasks

7.4. Results in the Irony conditions

Figure 23 shows the results of the two groups in the Irony (and in the Humor) conditions.

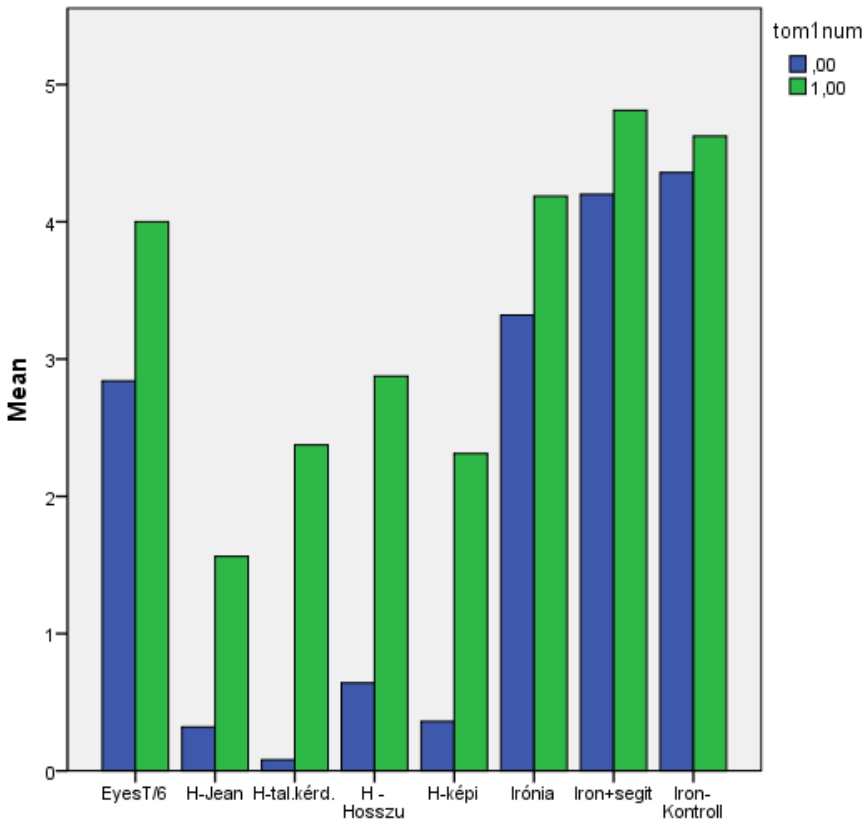


Fig.23.

Relationship of [V-ToM skills] and [NV-ToM, Humor and Irony competence]

1 – Eyes test, 2 – H-One-liners, 3 – H-Riddles, 4 – H-Jokes, 5 – H-Visual, 6 – Irony, 7 – Irony with lg. help, 8 – Control (Irony).

00: NoToM group (blue, left side); 01: ToM group (green, right side)

The Mann Whitney analysis of the mean ranks of two independent samples indicated that there was a significant difference in the performance of the NoToM and the ToM group in Irony tasks, i.e. the difference in results is due to their mentalization ability. U=115,5, p= .019, r= .36. The mean rank in the NoToM group is 17, in the ToM group it's 27,6, showing remarkable difference in performance, almost double efficiency in the ToM group.

In the irony with linguistic cue task U=150, p= .104, r= .25; there was no significant difference in the two group's performance (mean rank for the ToM group being 24, for the

NoToM group: 19), but this difference is visibly bigger than in the case of the control task. This suggests that the surface cue providing explicit information about the speaker's mental state indeed facilitated non-compositional meaning construction, and the NoToM group was more successful in interpreting this, explicitly put irony than the genuine irony. This confirms the role of mentalization in irony processing and in pragmatic competence, along with the facilitating effect of surface cues, and context in interpretation.

In the control condition requiring only semantic interpretation the analysis indicates that there is no significant difference in the results of the two groups, 20,44 being the mean rank in the NoToM group, whereas 21,88 in the ToM group. This shows that the difference in mean performance is very small, meaning, that the NoToM group, in short of a fully fledged mentalizing ability is equally successful in semantic tasks, as the ToM group, since in this trial no mentalization and thus no pragmatic meaning construction was needed, and semantic interpretation sufficed: U= 186, p= .664, r= .067.

In general humor is apparently more difficult for preschoolers than irony (Fig. 23), and metaphor (Fig. 22), see also Fig. 24 for relative difficulty. The relative placement of the different types of non-compositional constructions yields a developmental trajectory of pragmatic development: among the three targeted forms of non-compositionality, the easiest to handle is apparently irony, then comes metaphor, and eventually humor, for which a number of social and contextual situational, and cultural factors need to be considered in order to explain full productivity (Colston-Gibbs 2002, Pexman et al. 2005).

In the case of humor incongruity is probably not at the linguistic and conceptual level only but it is deeply embedded in a social, cultural, context. Therefore, such sociocultural incongruity needs to be deciphered, beyond the linguistic and cognitive levels. This may explain its observed level of difficulty in the trajectory of pragmatic development (Fig 24).

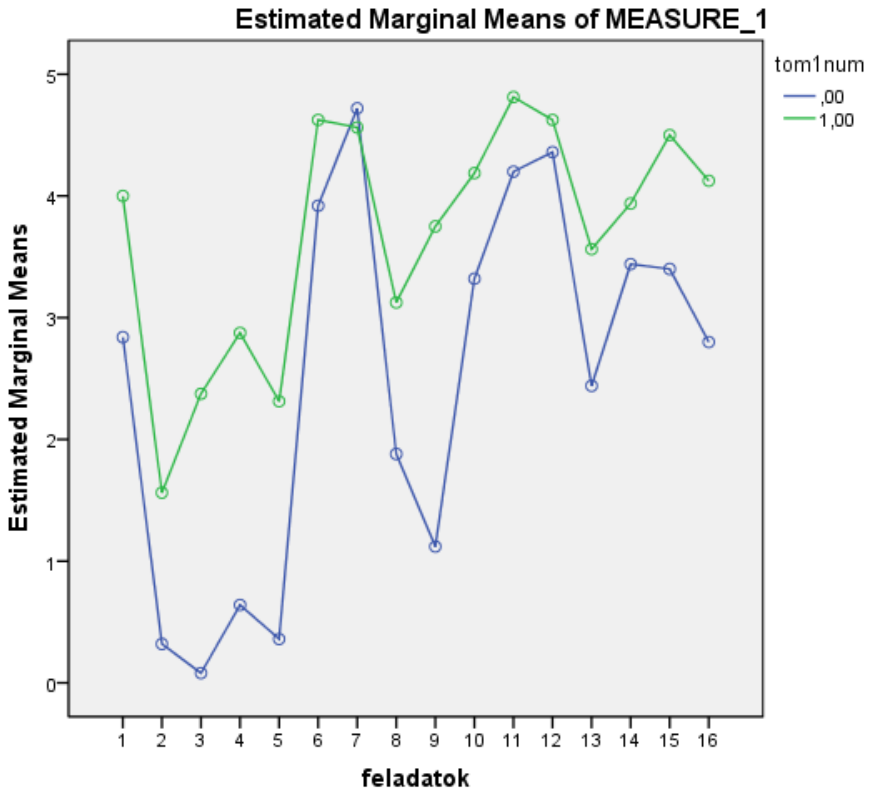


Figure 24.

Synopsis of results in one chart – Bird's eye view on pragmatic development

Lower line: NoToM group, Upper line: ToM group.

1 - Eyes test	**9. Contextual METAPHOR**
2. Decontextualized HUMOUR (One-liners)	**10. IRONY**
3. Decontextualized HUMOUR (Riddles)	**11. IRONY with linguistic help**
4. Contextual HUMOUR (jokes ending in punch line)	**12. CONTROL task in irony condition**
5. Non verbal HUMOUR (visual) (NV)	**13. MAXIM of Quantity**
6. Decontextualized SIMILE	**14. MAXIM of Quality**
7. Contextual SIMILE	**15. MAXIM of Relevance**
8. Decontextualized METAPHOR	**16. MAXIM of Manner**

7.4.1. Irony vs. Humor results

Fig. 23 shows irony vs. humor. Tendentious correlations were found between Contextual Humor tasks and irony results, F= 0,518, p< .001, which suggests that contextual cues are important factors in the comprehension of both, and that the mental strategies active in one also play a role in the other.

Irony and humor are treated as dichotomies in linguistics, whereas in humor research the two form rather fuzzy, blurry, overlapping categories. The present findings may clarify this issue, confirming that irony triggers different cognitive processes than humor processing. Children were successful in irony, but a lot less competent in the humor tasks (see Fig. 23, 24). This suggests the detachment of irony and humor, although as for social function, the two may serve similar or converging goals. All figures of speech, after all, tend to have similar functions: they help formulate abstract phenomena we cannot otherwise understand (Lakoff-Johnson 1980), conveying playfulness, poetic style, and wittiness in communication. As Gibbs-Gregory-Colston (2014) point out, finding the humor in irony is not the same as in simple jokes, and demands the examination of a complex host of contextual factors not always considered in linguistic theories of humor. Irony is not necessarily difficult (*ibid*), confirming the findings of the present study, that situational cues set the stage for a directly available, mentalization based inferential interpretation.

7.4.2. Irony vs. Metaphor

Statistical analysis with Mixed Way ANOVA indicates that there is a significant difference in Irony vs. Metaphor scores (see Fig 25): p<0,01; mean: 2,503, (F) 4,156=44,305, suggesting that irony is significantly easier than metaphor in both groups, which entails that different cognitive processes are responsible for the processing of the two forms of polysemy. Since even the NoToM group was more successful in the Irony than in the Metaphor condition, it is reasonable to suppose that irony processing entails some kind of a compensatory strategy and a different heuristics in interpretation: prosody, contextual and ostensive cues and other salient, distinctive features of irony, which trigger the compensatory strategy of ‘taking the opposite meaning’ heuristics.

It is important to note however, that in the irony condition the ToM group was significantly more successful than the NoToM group U= 115,5, p= .019, r= .36 (see 7.4.),

which entails that mentalization does play a significant role in the successful deciphering of irony. Figure (25) reflects the relative difficult of irony in relation to metaphor, giving an insight into the nature of the processing of the two forms of polysemy.

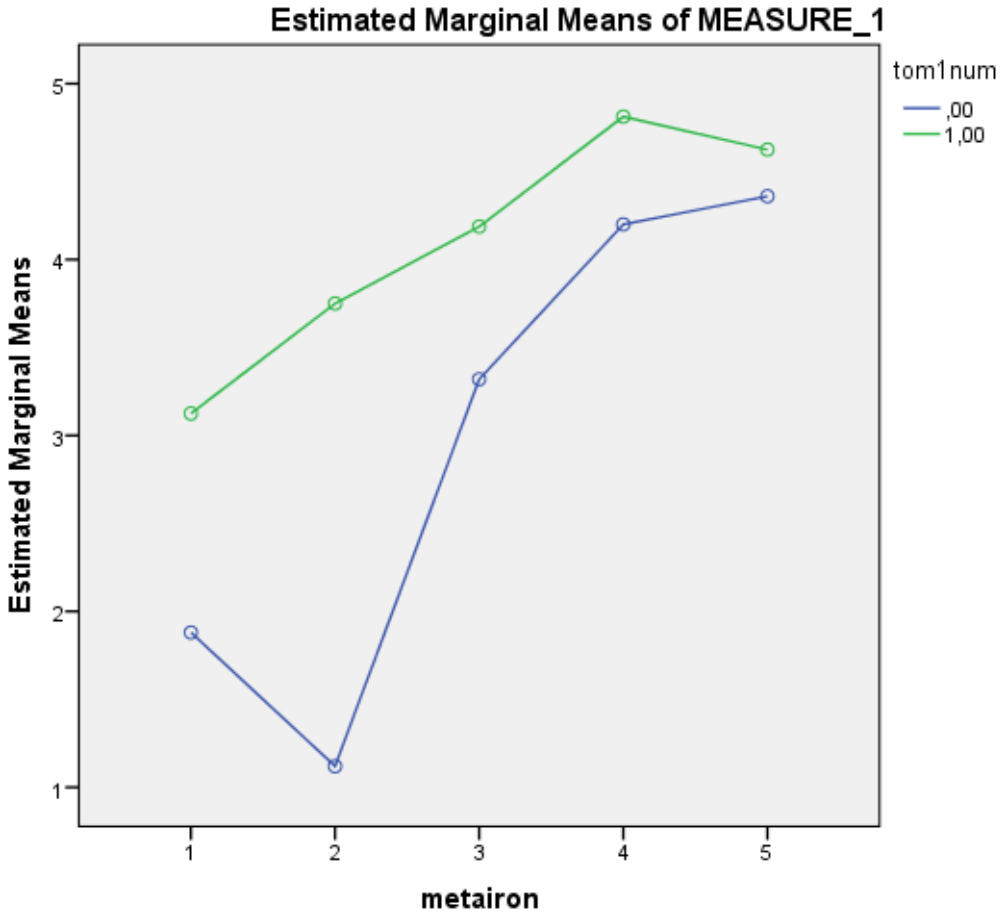


Fig. 25.

Metaphor vs. irony processing in view of mentalization

Lower line (00): NoToM, Upper line (1,00) ToM group

1- Decontx. Metaphor; 2- Context. Metaphor; 3- Irony, 4- Irony w. ling.help; 5- Control task (irony condition)

The inquiry if irony and metaphor are processed differently is not unprecedented. Several studies investigated the nature of metaphor and irony processing (Colston-Gibbs 2002). It is believed that the two are interpreted in a different manner, however, at the same time, sharing a common cognitive basis. It has been demonstrated that both entail the drawing of comparison but in a different manner: metaphor capitalizes on similarity, whereas irony on contrast. The drawing of comparisons is based on an inherent inferential ability of the human mind, i.e. mentalization, which the two share, but the direction of drawing such conclusions is

apparently different: convergence (similarity) in the case of metaphor, and divergence (contrast) in the case of irony. Divergence, i.e. contrast allows for a shortcut strategy: take the opposite meaning heuristics, which is a well-known phenomenon in cognitive pragmatic research (Happé 1993, Győri et al. 2002). Győri et al. (2002) have found that high functioning autistic individuals can in fact handle irony well, despite their mentalization deficit, since they rely on compensatory strategies based on the "take the opposite meaning" default tactic. This may explain why the NoToM group handles irony well, compared to their lower success rate in metaphor processing, where due to the complex nature of the potential and optimally relevant entailments involved, with emergent structures (Wilson 2009, 2013, Wilson-Carston 2006) and the emergent properties involved in conceptual mappings. These factors make metaphor processing a lot more complex, and therefore, cognitively more sophisticated inferential chains are needed for efficient metaphor understanding than in irony.

7.5. Contextual effects in the irony condition

The Irony with linguistic help condition provided surface cues, which can also be seen as being contextual cues. This factor significantly improved performance of subjects in the irony with linguistic help condition, compared to the implicit irony condition (see also Varga et al. 2013a). The facilitating effect of the linguistic surface cues confirms that context facilitates pragmatic processing and comprehension in general, since all children's performance was better in the linguistic help condition. Therefore the facilitating effect of context has been born out in all three (metaphor, humor and irony) conditions as well, confirming its central role in holistic interpretation.

7.6. Discussion

As expected, no significant difference was found between the performance of the two groups in two cases: in the 'Irony with linguistic help' and in the 'Control' condition.

In the Irony with linguistic help condition the implicit meaning was made explicit with the overt formulation of the speaker's mental state ("*angrily*" said) – therefore, a semantic interpretation sufficed for the correct decoding of the ironic remark. Due to the linguistic help (explicit formulation of the speaker's mental state) the meaning was not implicit any more, thus facilitating the inference of the intended meaning. The NoToM group and the ToM group

were equally successful in this trial, i.e. no significant difference was found in the performance of the two groups. The NoToM group was obviously successful in this because the linguistic surface cue facilitated pragmatic interpretation.

In the control condition (Fig. 23, 24): As expected, this trial proved to be equally easy for both groups, since in these cases no human agents participated and thus children did not have to mentalize about intentions and intended meanings. A pure semantic interpretation sufficed in this case.

Significant differences were found in the performance of the two groups in the irony task, confirming the key role of ToM in irony processing, given that the ToM group was significantly more successful in the irony task than the NoToM group (see 7.4.1.). ToM skills, therefore, correlate with success in irony comprehension. This suggests that mentalizing abilities do facilitate the interpretation of ironic utterances where the intended meaning is not the literal meaning but the opposite (see Fig. 23, 24, 25).

The NoToM group was fairly successful in the Irony task, compared to the rest of the pragmatic tasks: namely, metaphor and humor tasks. Surprisingly, the Irony condition was the easiest task measuring pragmatic skills. This suggest that children actually handle irony at an earlier age than previously demonstrated (Gibbs 1994), hypothesizing an irony processing skill at age 8-13 (Fig. 24, 25).

All in all, the findings suggest a continuum between literal and non literal language, in line with pragmatic literature (Sperber-Wilson 1986, Wilson 2012, Abu-Akel – Shamay-Tsoory 2011, Mahy-Moses-Pfeifer 2014). Literal meaning may sometimes be ambiguous, and therefore, the intended meaning is not always strictly the literal or the idiomatic one (Giora 1997, 2001, 2002). Our findings thus support Giora's views (1997, 2002) on the graded salience hypothesis. Literal and non-literal domains of speech, therefore, are not treated as a dichotomy in our research.

As for cognitive strategies, the interpretation definitely shows a continuum of cognitive effort needed in the different cases of non-compositionality. ToM abilities seem to make no significant difference in some domain (Similes, Irony with linguistic help, Control condition). The simile and the irony with linguistic help are two conditions where the implicature is made explicit, and therefore, literal interpretation suffices. These constitute the initial stages of the wide division line forming a continuum between literal and not literal domains.

ToM is needed and is sufficient in other cases: (e.g. Irony, Metaphor). Still, in some other cases ToM cannot, in itself, account for non-compositional interpretation: in cases of

Humor. Humor is apparently more difficult for children to process than metaphor (Fig. 22, 24), but surprisingly, irony was easier for children than metaphor (Fig. 24, 25). This contradicts previous findings in irony research (Gibbs 1994), which claim that irony is mastered around ages 8-13.

7.6.1. Some thoughts on the irony results

The early success in irony tasks may in part be explained by ostensive and behavioral cues proposed by Csibra (2010) and (Southgate – Chevallier - Csibra (2010), who claim that infants demonstrate pragmatic abilities in the resolution of the referential ambiguity of non-verbal gestures and of verbal utterances. Irony involves an ironic situation, where ambiguity is present in several modalities: in the characteristic tone of voice, in situational and contextual cues and in the social setting itself. Infants seem to have an inclination, an instinct to detect such cues that modify meaning. Csibra (2010) claims that infants recognize the presence of communicative intentions in others' behavior *before* the actual content of these intentions is accessed or inferred. Thus, they seem to rely on specific cues, the distinctive features of irony (Wilson 2009, 2013), among these ostensive signals, the decoding of which enables them to detect the communicative intentions of others. This attitude, rooted in the so-called pedagogical stance (Csibra-Gergely 2006, Csibra 2010, Gergely-Csibra 2013) ensures that infants and children rely on dedicated mechanisms that enable efficient social communication. Such strategies may account for the ease with which children handled irony, compared to other non-compositional constructions.

Metaphor and irony are known to involve different processes of comparison: similarity vs. contrast, respectively. This suggests that irony, since it is the exact and sheer opposite of what is said, may be interpreted with different heuristics, on the grounds of the "infer the opposite meaning" heuristics, where slight ironic intonation is enough to trigger such algorithm.

Irony is a complex phenomenon, with a number of definitions and forms that probably call for different methodologies in a valid and reliable context of investigation. Grice himself noted (Grice 1975) that in order to comprehend an ironic utterance, the hearer assigns a meaning opposite to the one literally expressed by the speaker. Some post- and neo-Gricean theories however assume that to comprehend irony it is necessary to build complex inferential chains (Sperber-Wilson, 1986; Wilson-Sperber 1992, Wilson 2009, 2013, Clark – Gerrig

1984, Morgan 1990, Kumon-Nakamura et al 1995), while cognitive views defy this (Gibbs-Gregory-Colston 2014). Considering the presently available experimental database on irony processing of preschoolers, it seems plausible to distinguish between simple and complex ironies (Wilson 2013), however, the classical theories of irony do not encompass both possibilities (Bucciarelli – Colle – Bara 2003, 211).

On the basis of Gibbs (2007, 339) Wilson (2013) gives a list of definitions and types of irony, in which some of them take irony in a very broad sense, covering even jocularity, sarcasm, hyperbole, rhetorical questions and understatements as well. The multifaceted nature of irony makes it extremely difficult to study in experimental settings where one needs to control for variables to get reliable and valid results. Leggitt and Gibbs (2000, 5-6) attempt to give a few operational definitions of the types of irony, to a situation when one member of a group wants to see a different movie than the others, but not being able to agree, he says *he'll leave them if they don't get his way*. In this setting the following forms of ironical utterances may emerge, in the matrix of irony types (Leggit-Gibbs 2000, 5.) (Table 5.):

Irony. ''The speaker's observation of a contradictory state of affairs, but not directly critical of the addressee.'' e.g.: „We always get along so well."
Sarcasm: ''A statement that clearly contradicts the knowable state of affairs, and is harshly critical toward the addressee.'' e.g.: „You are being so mature".
Hyperbole/ Overstatement: ''A description of the state of affairs in obviously exaggerated terms.'' e.g. „This is the end of the world".
Understatement: ''A description of a state of affairs as clearly less important than it appeared in context.'' e.g. „You are being a little silly".
Satire: ''A statement that appears to support the addressee, yet the speaker actually disagrees and mocks the addressee.'' e.g. „You will want to see a cartoon".
Rhetorical question: A question that is obviously false in a given context.''e.g. „Do you know how to compromise?".

Table 5.
Types of utterances viewed as potential forms of irony (Leggit –Gibbs (2000, 5.)

With this, the authors (Leggit-Gibbs 2000, Wilson 2013) aim to demonstrate how the different forms of irony exploit different interpersonal phenomena, different social norms, expectations, intentions and each utterance, although seem to converge in the nature of the

social goals they serve, choose a different form and have somewhat different functions too. The present study's findings on the development of irony comprehension are in line with the cognitive pragmatic, and also with the relevance theoretical approach in that a second-order theory of mind is central in the successful decoding of this pragmatic phenomenon, but the contrastive nature of irony is salient enough to trigger a shortcut, a heuristics relying on ostensive and surface cues. Such cues involve the three basic distinctive features of irony: (a) ironical tone of voice manifesting in salient and typical prosody and intonation patterns of ironic utterances (b) mocking, contemptuous attitude (c) and a normative bias, in that the utterances express criticism about something that fails to live up to the norm (Wilson 2013). This means that genuine forms of irony dispose of all these three can be seen as valid and reliable examples, i.e. prototypes of irony, and thus make fruitful experimental data. The experimental methodology of the present study is based on a classical hyperbolic form of irony in a contextualized form, which entails all three basic distinctive features of irony, thus make reliable testing stimuli, also explaining saliency in interpretation.

The fact that we used contextualized genuine form of irony (Wilson 2013) is due to the overall methodology of the entire study incorporating similes, metaphor, irony, irony with help, humor and maxim infringement tasks, since the other pragmatic tasks too were partly contextualized, and thus confronted with decontextualized items to see contextual effects. In a general comparison of non-compositional phenomena based on polysemy, however, that is, to compare metaphor, irony, humor and maxim infringements (see chapter 8), it was reasonable to use the same type of stimuli in the investigation, in order to be able to draw valid and reliable conclusions. That is, in all aspects of pragmatic competence, we rely on the same type of stimuli: short scenarios containing a target sentence (be it metaphorical, humorous, ironic or one violating the maxims). This homogenous methodology is crucial in experimental studies since similar types of tasks ensure validity of results, so that the nature of the pragmatic phenomenon (metaphor vs. irony, humor vs. irony, etc.) is what causes differences in the results, and not the nature of the tasks themselves.

The testing material used in the present investigation thus builds on a canonical, genuine form of irony (Wilson 2013), displaying all three distinctive features of this figure, making the linguistic stimuli used valid and reliable for scientific purposes and for conclusions on the developmental aspects of irony comprehension. Wilson (2013 p. 52) draws up a whole collection of the forms of irony, ranging from simple to complex forms, involving different approaches to irony, which further prove the diversified nature of this figure in both form and function.

In other words, irony is such a complex phenomenon that it gives fruitful ground for future developmental investigations in itself, in the myriad of forms it takes. Wilson argues for these differences being significant in cognitive developmental research, in explaining how these forms involve different mechanisms, some of them not even displaying the distinctive features of irony, still being listed as forms of irony in some approaches (2013). The different mechanisms they build on may follow different developmental trajectories too (2013, 52.). As she remarks, it would be interesting to investigate possible developmental differences between the different types of ironies (2013, 52). A common form of irony is hyperbole, which is, however, not necessarily ironic in all forms and in all contexts. However, one of the most common and most typical form of irony is rooted in an exaggerated, hyperbolic use of language, just as the short scenarios used in the present study, which are therefore, based on genuine forms of combinations of hyperbole and irony (see Appendix).

In short, although the definition of irony varies depending on the approach of the experimenter scholars, the different types may call for different methodologies, and also yield slightly different results in terms of their developmental routes (Wilson 2013).

Wilson also claims that not all types of understatement, hyperbole and rhetorical question are ironic, and not all demonstrate the three main distinctive features of irony. That is, the fact that we have a lot of figures sometimes functioning as ironies, does not mean each of these are valid and reliable forms of testing material. Wilson emphasizes that these forms that are not inherently ironical, should not be expected to follow the same developmental trajectory as genuine cases for irony (2013, 54). These phenomena exploit a disparate range of mechanisms which are well worth studying in their own right, and new theoretical accounts and experimental paradigms are needed to prise them apart (*ibid.* 52.).

The present study contributes to this research goal, and with its continuum of pragmatic development encompassing different forms of pragmatic phenomena ranging from semantic form to polysemous forms of non-compositionality, aims to make up for the hiatus present in the literature on the development of irony comprehension, for what Wilson (2013, 54) calls for in her conclusion: to provide valuable insights into how the mechanism develop, which are responsible for pragmatic meaning construction abilities in general, and for irony comprehension in particular, so that these findings can further help scholars in constructing even more valid and adequate theories.

Wilson emphasizes, that *because the forms of irony have not been systematically distinguished, possible differences in their developmental trajectories have not been systematically explored.* Some forms of irony are based on genuine basic cognitive

mechanisms like pretence, while others take more complex forms and exploit interpersonal settings based on parody (Wilson 2013). Such simple forms of irony might be understood much earlier, she claims, than more complex forms of irony. These important facts and findings about today's irony research in the cognitive developmental paradigm give us a framework to explain the interesting finding in the present study, that preschoolers are in fact successful in the processing of the type of genuine irony used in the testing material. As outlined above, this may be due to the fact that this type of irony is a common form of spontaneous, genuine contextual conversational irony based on hyperbole, disposing of all three distinguishing, i.e. characteristic features of irony, which makes their interpretation salient enough to trigger a short-cut strategy, leading to early success in comprehension, in relation to the relative difficulty of the other pragmatic constructions investigated.

7.7. The relative place of the different pragmatic phenomena in the trajectory of non-compositionality

In relation to each other, the order of control, simile, metaphor, irony and humor tasks is the following, in view of the cognitive complexity of interpreting strategies involving mentalizing skills in processing, as shown by (Fig 26) below.

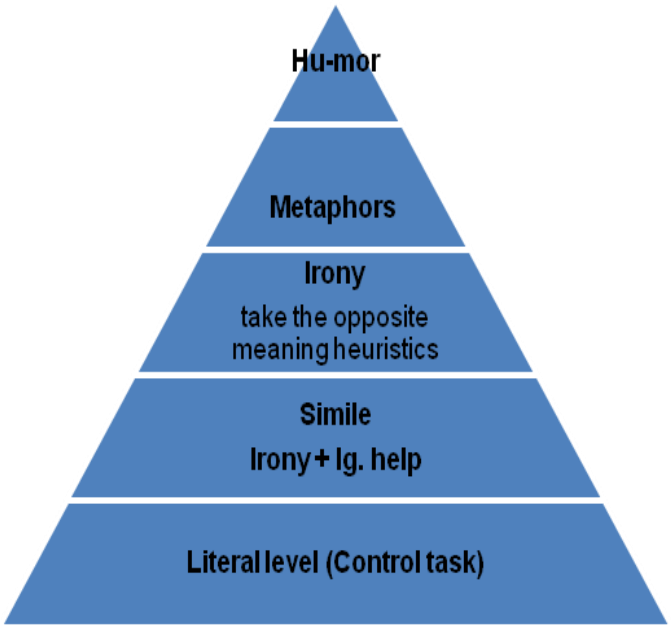


Fig. 26.

Hierarchy of non-compositionality in view of cognitive complexity

Level 1. **Literal utterances**, as the control condition in the irony task.

Level 2: **Similes** are analogies made explicit, therefore, are practically literal constructions, while metaphors are implicit and thus require mental strategies. The equivalent of Simile task was **Irony with linguistic help** condition in the irony task.

Level 3: **Irony**, which, although non literal, probably works by means of a short-cut heuristics: 'take the opposite meaning' triggered by ostensive cues like intonation, and salient distinctive features of irony like mocking attitude and normative bias. This view is in harmony with findings of Győri et al. (2002) where high functioning autistic subjects handled irony surprisingly well, due to a compensatory strategy, and with results from Varga et al. (2011, 2013a, in press), where subjects with schizophrenia demonstrated the same: had way better results in irony tasks than in humor tasks, probably due to different heuristics.

Level 4: **Metaphors**: the difference in the NoToM and the ToM group's performance was the most salient in the metaphor trials: ToM definitely facilitates comprehension and productive use of metaphors, since metaphors are implicit analogies, where the implicature needs to be deciphered on the basis of intention reading (i.e. change of perspectives and mentalization). Inferential strategies in the metaphor condition were confirmed to be based mentalization.

Level 5: Humor: seemed to be the most difficult among all other aspects of pragmatic competence. It is probably due to the fact that it involves social constructivist, culture-specific background knowledge, most of which comes with age and social experience. Thus is not entirely and exclusively dependent on ToM skills, which, however, are central in the resolution of incongruity and successful humor processing.

7.8. Conclusions - Linguistic dichotomies vs. social-cognitive continuums

In linguistics, in the rhetorical tradition, the different categories of non-compositional constructions are treated as fairly distinct: similes are distinct from metaphors, humor and irony are also treated as distinct forms of dichotomies (Nemesi 2013)**.** Nemesi (2009) analyzes the different *rhetorical devices*, and defines them as being a wider category than tropes, the former including irony, hyperbole, tautology, oxymora, and also indirect speech

acts, having a figurative meaning, forming structures, stylistic constructions, and thus functioning at a metalinguistic level. *Tropes*, on the contrary, form a narrower category, and include metaphor, metonymy, which are picturesque formulations of conceptual analogies, and function at the mental level, possibly in relation to imagination.

The results of the present study suggest that at the mental level instead of sharp dichotomies, there is a continuum of social-cognitive and linguistic development, in which the domain-general mentalization skills are the cornerstone of further complex social and pragmatic competence. The levels of indirectness and non-compositionality, therefore, form a continuum, the pyramid chart of which can be seen in Fig. 26. The continuum is in harmony with findings in today's cutting edge social-cognitive research on autism, where mentalizing skills are not viewed as a yes/no dichotomy, but as the name Autism Spectrum Disorder (ASD) suggests, forma spectrum, a continuum of constituents, from severe deficit to high functioning forms. Research indicates (Happé 1993, Győri et al. 2002) that individuals with social-cognitive deficit compensate with different cognitive strategies and can thus handle certain higher-level pragmatic (see also Varga et. al. 2014).

7.8.1. Metaphoricity in a Relevance theorist perspective

In the Relevance framework supporting a continuum of pragmatic development metaphors are seen as a form of polysemy, which in some cases may arise through an inferential process of concept broadening, gaining a derived sense (i.e. the emergent conceptual structure (Fauconnier – Turner 1998) like in the case of "cold" (unfriendly) or "hard" (difficult) being superordinate to a basic sense, conveying information about psychological traits over the primary meanings relating to physical attributes. This narrowing of senses eventually gets lexicalized, over time. Thus, inferential pragmatic processes of lexical narrowing and broadening may give rise to a range of related superordinate or non-overlapping lexicalized senses well known from polysemous constructions (Wilson-Carston 2006). This optimal attributive trait stemming from the emergent structure delegates metaphor to the level of *attributions* in mentalization-based meaning construction.

The continuum of pragmatic competence outlined in (Schnell 2012, Schnell-Varga 2012) and in the present study (Fig. 26) is in line with cognitive pragmatic investigations targeting a variety of non-compositional constructions, aiming to explain their cognitive background of processing strategies (Bucciarelli-Colle-Bara 2003). Bucciarelli and colleagues

claim that there is a gradation of difficulty in the comprehension of the different constructions, and they believe it is because the various pragmatic phenomena (i.e. the different forms of non-compositional constructions they test, namely, direct, indirect, deceitful and ironic communicative acts involve both mental representations of different complexity on the one hand, and different inferential load on the other. The continuum presented in the present investigation (Fig. 26) is therefore, in harmony with such findings, which reinforce the reliability and validity of the outlined developmental trajectory, which also provides us with a framework where metaphor is explained by an attributive level of mentalization, where contextual implicatures are derived so as to match relevant entities in the source- and in the target domain of metaphors (Lakoff – Johnson 1980, Kövecses 2002), building upon *optimal* relevance restricted by the given context. This ground of contextual assumptions that give rise to contextual implications actually drive attributive heuristics, like in the case of the metaphor 'lawyers are sharks', the act of distinguishing physical (having fins) vs. psychological features (aggressive by nature) of the source and the target domain, eventually deriving inferences along the lines of some *optimal* relevance, that stem from *emergent structures* within the conceptual metaphor (Fauconnier – Turner 1998, Wilson-Carston 2006).

As Bucciarelli-Colle-Bara emphasize (2003), a psychologically plausible theory ought to be able to explain the difference in the level of difficulty of the comprehension of the different forms of non-compositional constructions. The continuum in Fig 26. attempts to grab the exact same issue. The present findings on the continuum-based developmental background of metaphor processing are in line with Relevance theory's (Sperber – Wilson 1986) view on metaphorical meaning construction which claims that the cognitive processes responsible for metaphor understanding are based on the same inferential interpreting strategies present in literal interpretation. In this view, at the core of all the interpretative processes there is the same cognitive ability, constituting the cornerstone of all inferences (Schnell 2007, Sperber – Wilson 1986, Reboul – Moeschler 2000), namely, theory of mind. As Wilson – Carston (2006) claim:

"Relevance theorists […], have consistently defended a continuity view, on which there is no clear cut-off point between 'literal' utterances, approximations, hyperboles and metaphors, and they are all interpreted in the same way. The 'emergent property' issue is sometimes raised as a challenge to the continuity view, since metaphorical use is seen as creating emergent properties in a way that non-metaphorical utterances do not. We will argue that the derivation of emergent properties requires no special interpretive mechanisms, and is

compatible with a continuity account such as the one proposed in relevance theory" (Wilson-Carston 2006, 408).

8. Recognition of the infringement of maxims in preschool years in view of mentalization

8.1. Pragmatics and its versatility

Pragmatics, multifaceted and ubiquitous as it is, is very difficult to define (Verschueren 1999). A broad definition may be that it concerns the study of the social uses of language, i.e. those norms that we all follow when engaging in communication and when we coordinate discourse. Its main focus is at least twofold: it aims to clarify interpretation processes in the realm of non-compositionality and invisible meaning, and also intends to describe the strategies we make use of when we find ourselves in a conversation, locally coordinate and organize discourse, and produce and understand lengthy narrative where versatile use of linguistic and cognitive tools of cohesion and coherence is indispensable. This second branch embraces just about everything that belongs to the realm of discourse organization. In sum, pragmatics is the study of meaning and interpretation in a wide variety of interpersonal settings, where the different forms of contextual constraints and situational contextual cues interact in a dynamic multi-level process of interpretation, where intended meanings are deciphered through inferential processes in the course of simultaneous, parallel sessions of interpretation.

The young field of pragmatic inquiry has traditionally been linked to the discipline of linguistics, and it was seen as being a fundamental part of linguistics, dealing with deictic, context dependent linguistic expressions, enriching the field of semantics. As opposed to this, the novel, cognitive approach emerging after the Chomskyan revolutionary views gained ground in psychology, opening the way for psycholinguistic inquiry, which saw pragmatics as a discipline of its own, rooted in cognitive psychology. This view claims that pragmatics is not a sub-field of linguistics, nor of philosophy, but it's rather a comprehensive interdisciplinary field working in the framework of the cognitive science of interpretation. This obviously makes it practically inseparable from the fields studying language processing and language use, thus it has both a linguistic, and a psychological reality.

Its focus on the use of signs and their interpretation makes it further inseparable from the science of communication, sociology, philosophy of language and psychology. According to theories of psychology and sociology, pragmatic competence entails the following abilities:

* the ability to answer a question
* the ability to take turns in conversation (thus coordinate discourse locally and flexibly)
* being able to integrate metacommunicative signals and respond to these adequately, that is, to be able to attend to non-verbal aspects of language use
* awareness of the conversational partner's intentions, expectations and mental states, which give ground to the natural reciprocity of human communication and the crucial cooperative stance participants rely on when coordinating discourse
* ability to see the point in one's utterance, staying relevant
* having an awareness of the topic of the conversation at hand, establishing the common ground and common goals in the conversation
* linguistic knowledge of the words and structures that constitute the utterances in conversation
* ability to stick to the topic (stay relevant) or to change the topic politely if needed; i.e. demonstrate flexibility in cognitive discourse organization strategies
* ability to keep eye contact during communication, in other words, being able to engage in joint attention in a natural manner
* ability to use different registers with different partners of communication, i.e. move flexibly in the natural hierarchy of social relations, demonstrating smooth coordination of informal and formal settings as well
* ability to produce and comprehend indirect utterances (i.e. requests)
* ability to see the purpose and intention behind an utterance (recognize implicatures) and being able to carry out heuristics to decipher these (engage in inferential activity deriving the context dependent, intended meaning of the utterance).

8.1.1. The relevance of a cognitive approach in pragmatic development

The cognitive approach starts out from a basic concept in philosophy and psychology: the concept of intentionality: our human-specific ability to interpret others' mental states, to see others as intentional agents, who have intentions, goals, beliefs and different emotions. Pragmatics is also closely linked to artificial intelligence which aims to create a computer capable of possibly all the human-specific functions of the human brain. By now due to revolutionary findings in artificial intelligence various human specific abilities have been simulated by computers, however, coping with implicatures is still one thing they are

incapable of. The missing link is of pragmatic nature: to identify the cognitive mechanisms that are responsible for pragmatic meaning construction in instances where the intended meaning is not a sum of the components of the utterance.

Information processing thus has important psychological and psycholinguistic implications, and the formal description of non-compositional meaning construction is a long-term goal in both the psychology of language and in cognitive approaches to computational linguistics as well (Alberti 2011). The cognitive view basically claims that inferring information from context demands that we interpret others' utterances and actions in view of their intentions and goals, incorporating interpersonal and contextual factors as well, eventually yielding a holistic meaning, as opposed to the semantic meaning derivable from the syntactic structure of the utterance at hand. Children universally, that is, independent of language become fluent speakers of their mother tongue by around age three. This means, that by that time they have, seemingly without effort and conscious learning, mastered all aspects of language: morphosyntactic and semantic factors, together with basic phonological features, phonotactic rules and their interaction. However, becoming an able and active participant in human conversation requires more than that, as the above list demonstrates: it requires the smooth coordination of a multitude of factors involving situational, contextual, linguistic, social and cultural ones as well. In a conversation generally more things are implied than explicitly stated, that is, semantic meaning construction does not suffice. Beyond the semantic meaning children need to be able to grasp intentions behind utterances, which are based on the conversational partner's mental states: desires, beliefs and intentions, and they need to be able to infer from what is said (sentence meaning), by means of a change of perspectives, the content that is implied (speaker's meaning Grice 1957, 1975). This ability requires the integration of linguistic knowledge and a lot of interpersonal factors. On the basis of this, it is clear how social cognition, defined as a crucial ability in pragmatic meaning construction is believed to be human-specific.

8.2. Social cognition as the cornerstone of non-compositional meaning construction and smooth coordination of discourse

Social interaction is based on interpersonal communication, heavily relying on bidirectional processes. Each participant is an emitter and recipient of social signals. The ability to perceive and process social signals (consciously or unconsciously) is known as social cognition (Frith-Frith 2007, Herold et al. 2002). The outcome of social cognition depends on the successful

interpretation of social signals emitted during the encounter, including not only language (content and tone (the latter including prosody and intonation patterns), but also metacommunicative signals (e.g. facial expression, body gestures). The ability of recognizing implicatures, i.e. utterances that trigger additional cognitive interpreting mechanism in conversation is crucial in the smooth coordination of discourse. Beyond the detection of these, for their interpretation, an inferential ability is indispensable in efficient communication. This process gives ground to the production of adequate responses, for which one needs to be able to decipher implicatures through an inferential process. This eventually generates the non-compositionally derived (not semantic but) pragmatic, holistic, intended meaning. In other words, the ability to process social signals is a prerequisite for consciously or unconsciously generating appropriate responses. Thus, social cognitive skills are indispensable for successful social interaction, as they enable humans to build and maintain interpersonal relationships with each other.

The present investigation sets out to identify how our basic ability of mentalization, as the cornerstone of social cognition contributes to the unfolding to fully-fledged pragmatic competence, delineating the developmental trajectory of the different aspects of pragmatic meaning construction ranging from different types of non compositional language use, idiomaticity through irony and humor to the ability of observing conversational rules. It aims to clarify the existing associations between social cognitive skills and a productive pragmatic competence enabling the smooth coordination of discourse. The present chapter focuses on cognitive developmental issues of the acquisition of conversational skills of preschoolers, and completes the pyramid trajectory of pragmatic development with the discourse abilities to follow the norms and guidelines of conversations.

8.2.1. Pragmatics as cognitive science

Interestingly, the birth of cognitive science and of pragmatics can be traced back to about the same period. Cognitive psychology emerged as an opposition to behaviorism, an approach to the study of human behavior in psychology that discarded all methods that were not empirical and thus were not based on experience and observation. This approach excluded people's mental states, feelings, goals, thoughts, and intentions, which however, are all important components of their manifest behavior. In other words, in behaviorism's narrow scope of investigations the cognitive processes were seen as subjective, even non-scientific. It was

mostly cognitive psychology that gave ground to research in artificial intelligence (AI) which was the first step towards the evolution of an interdisciplinary cognitive science.

This cognitive approach fully accepts the linguistic nature of pragmatics (Németh T 2004), which is, in their definition, the study of interpretation processes, which are most effectively observed through language. Cognitive pragmatics, as outlined above, believes that linguistic interpretation is not a binary process of sheer coding and decoding, but in a natural conversation implicatures and inferring information from context also play a crucial role, and that these occur in all types of interpretation: verbal or symbolic (Sperber-Wilson 1986, Bucciarelli-Colle-Bara 2003).

8.2.1.1. Brief history of pragmatic inquiry

Pragmatics is not identical with pragmatism, a philosophical movement whose representatives are originally American philosophers like John Dewey, R. Rorty, W. James. It is difficult to identify the date when pragmatics emerged, but most probably it can be traced back to 1938, when on a conference Charles Morris, and American philosopher distinguished the sub-disciplines of linguistics, among them he listed pragmatics, which he defined as the science of the relation of signs to their interpreters (Reboul – Moeschler 2000).

This was the precursor to the real birth of pragmatics, in 1955, when a language philosopher, John Austin kept a lecture on the philosophy of language. There he established the field of pragmatics, and delineated his theory of the field, which was based on a twofold distinction of utterances: constatives, being simple sentences expressing thoughts that are not subject to the truth condition traditionally present in language philosophy (e.g. “the cat is on the mat”; “it is raining”); and performatives, sentences that do not describe actual or former states and conditions in the environment, but rather, entail a change in them through the application of a *performative verb* (e.g. “I *name* this ship Mayflower”; “I *promise* to call you tomorrow”). He named these utterances speech-acts, which he further categorized into locutionary-, illocutionary- and perlocutionary forces within utterances. These are endowed with a propositional content, in other words: value of efficiency. As it can be seen, in pragmatic inquiry the focus is not on truth content central in traditional semantics and positivist linguistic traditions. Here the propositional content and the effect of the utterance on the listener, together with felicity conditions (successfulness) are in the center of attention. This novel view incorporating psychological mental phenomena set up the framework for a

new approach in linguistic investigation and set the foundations of a fruitful future inquiry. Austin's disciple, Searle then continued work on speech-act theory, but focused mostly on the illocutionary force of utterances, studying the propositional content given by the performative verb, the device that indicates illocutionary force. He classified speech acts on the basis of their propositional content and distinguished declarations, representatives, expressive, directives, and the like.

The pragmatics based on Searle's speech act theory, is however, far from being a cognitive approach. He does not emphasize the primacy of mental phenomena in interpretation. It is closer to behaviorism, in that the intentions expressed by speech acts are nothing else but mental states (Reboul-Moeschler 2000, Searle 1969, 1979a). Therefore, mental states have become transparent: there is no mental state that could not be explicitly expressed through speech-acts. This however, explains why pragmatics did not break away from linguistics for so long.

8.3. The Gricean turn

Since the present research is embedded in a Gricean framework, building on Grice's basic conversational theories and principles in its methodology, it is important to delineate what Grice's contribution means in the study of the social cognitive and pragmatic aspects of language development.

The first one to take cognitive processes into account was Paul Grice, an English language philosopher, who set up a theory for conversational implicatures. He noticed that most of the information in a conversation is implied, rather than explicitly stated. This observation led him to elaborate on a cognitive theory of cooperative stances between conversations partners, because he supposed, without such cooperative mind-reading we would not be able to understand each other in simple cases of conversational implicatures like:

A: I can't find the car key.
B: Mom went to the store.
or:
A: These home-made strudels look tasty, don't they?
B: I am on a diet.

The two paired sentences in the conversations above almost look like they have nothing to do with each other. As Grice points out (Grice 1957, 1975), what links them together is our inferential heuristics based conviction that the listener responds in view of the speaker's expectations and goals. That is, in the first example, speaker B says what they decide to say because they are cooperative, and with his response intends to inform speaker A where the car keys may be. The same way, A could expect a yes or no answer, not a statement of B's plans about weight loss in the near future, but the cooperative stance of the speakers ensures that each participant, based on their expectation that their partner is cooperative, interprets the responses as related (i.e. relevant) to their utterance. On the basis of this Grice delineated his theory of meaning centering around the Cooperative Principle (CP) (Grice 1957, 1975), which he based on four principles, known as conversational maxims. The maxims are the following (Grice 1975):

Maxims of Quantity	**Maxim of Quality**	**Maxim of Relation**	**Maxims of Manner**
* Provide as much information as required * Do not provide more information than is required	* Be truthful * Only say that for which you have adequate evidence	*Be relevant	* Avoid ambiguity * Avoid obscure expressions * Be logical in order of expression * Avoid superfluous expressions

These maxims are not rules, but rather, guidelines and principles for efficient communication we generally follow in a conversation. Grice's speech act theory (1975) is the first to approach the process of interpretation from a cognitive perspective, operating with mental states, but it still leaves some questions unanswered (Reboul – Moeschler 2000).

A valid theory of cognitive pragmatics needs to have a representationalist approach, to see the computer as the human brain capable of representations in the form of symbols; it has to be able to explain how implicatures are guided in interpretation, in other words, what cognitive processes guide and support our non-compositional interpretation. The present research on the social cognitive and pragmatic aspects of language acquisition aims to clarify at least some of these missing links, by identifying those cognitive processes (i.e.

mentalization based strategies) that provide the basis of effortless inferential meaning construction, and try to shed light on the development of this versatile phenomenon in human communication.

8.3.1. Grice's inheritance in today's cognitive science - Relevance theory

Two contemporary scholars took over the Gricean framework in an attempt to create a truly cognitive pragmatics. They too emphasize the importance of implicatures when inferring meaning. In fact, they believe, all forms of implicatures can be deciphered through the maxim of Relevance, since in conversation the most basic principle is that the partners stick to the topic at hand, hence, everything is interpreted in view of a cooperative stance, which eventually means, that both partners instinctively follow the principle of Relevance in inferencing. In fact, they believe that Relevance is a universal cognitive principle that guides our thinking, heuristics, inferential activity in all types of communication: verbal or symbolic.

In this view, whatever gives ground to the infringement of the maxims, either not adequate quantity of information (when the maxim of Quantity is infringed), that the speaker fails to stay truthful (violation of the maxim of Quality), or that the speaker is not clear and orderly in their utterances (infringement of the maxim of manner: be clear, brief and orderly), eventually the expectation that the utterance produced is created in the framework of mutual cooperation. Therefore, Relevance is the ultimate guideline that triggers efficient heuristics for the inference in all these cases, in order to decipher the intention behind the utterance, and thus the intended meaning. For these reasons, Sperber and Wilson claim (1986) that the three maxims can in fact be integrated into the maxim of Relevance.

Their view is in harmony with basic tenets in cognitive linguistics, namely, that semantic meaning can account for meanings based on the syntactic structure of the utterance, whereas pragmatic meanings entail a holistic, intended meaning derived from several factors incorporating mental states, interpersonal and sociocultural factors. They too, differentiate between a *code-like* semantic processing (see also Surian- Baron-Cohen -Van der Lely 1996), and the pragmatic meaning construction stemming from implicatures (the so-called *inferential processes* of interpretation). With this they place pragmatics outside of sheer linguistic framework, which strictly and exclusively works with linguistic input, and incorporate several social-cognitive factors present in a genuine process of interpretation. This gives pragmatics a larger scale of authority, with which it spreads beyond linguistic boundaries. This approach

calls for the identification of cognitive processes, mental phenomena, like mentalization in explaining pragmatic interpretation, which is the path the present study follows in trying to set up an explanatory framework of the developmental trajectory of the unfolding of pragmatic and especially discourse competence in this chapter.

The pragmatics of Sperber and Wilson (1986) explains all types of implicatures, even the invisible meaning in between the lines; even those that are not explicit or not of linguistic nature. The investigation delineated in the present thesis taps into this line of study in that it aims to explain invisible, implicit and hidden mental processes that are in fact crucial parts of the interpretation in the case of non-compositional constructions such as polysemy and idioms (metaphor, irony), humor, and spontaneous conversations (maxims). As the present experiment reveals, there are important mental phenomena we resort to when trying to deduce meanings in discourse settings.

8.4. The cognitive pragmatic view on discourse skills

As Sperber and Wilson point out (1986), cognitive pragmatics distinguishes two main processes of interpretation, which, however share some basic mechanisms, and have certain mental operations in common. In harmony with this, the present study also claims that theory of mind is a core component of all types of interpretation, since it plays an important role in the narrowing of reference in the stage of word learning in early language acquisition, whereas it is still a key component of higher-order language use, in non compositional, holistic interpretation. In pragmatic meaning construction it enables the listener to represent the speaker's mental states, goals, beliefs, by changing perspectives, which eventually leads to the successful deciphering of the intentions of others, and thus the intended meaning of the utterance (Schnell 2007, 2012).

Therefore, the present research, in line with this tenet of cognitive pragmatics, starts out from the differentiation of code processes and inferential processes of communication. As Sperber and Wilson point out, code processes cannot go very far in explaining human communication, given that, in most communicative situations it is necessary to use inferences to disambiguate lexical items, to interpret deictic terms, to integrate contextual information, thereby, compute a holistic, implicit meaning (Sperber and Wilson 1986, Surian - Baron-Cohen – Van der Lely 1996). For this ability metarepresentation seems to be of key importance (Sperber 2000, Happé 1993). On the basis of Relevance theory (Sperber and

Wilson 1986), as outlined above, all inferential processes are based on the principle of Relevance, since the listener always strives for the detection of optimal relevance of the utterance at hand, be it an infringement of the quantity, quality or manner maxim. The Gricean idea of cooperative stance based views human communication as a rational activity, which are aided by the maxims. The validity of these maxims are not fully and unanimously accepted in today's contemporary pragmatics, since some researchers (Brown and Levinson 1978) propose that another maxim, the maxim of politeness exists (which Grice himself also envisaged), completing the matrix of the maxims, and they even claim that metaphor and irony belong to the infringement of the maxim of Quality, since they both violate "do not say what you believe to be false" norm in conversation (Nemesi 2009). Leech (1983) proposes that irony is a principle of its own, and it can cross over the politeness principle, if one has to express a negative thought. In these cases one can resort to the use of irony, expressing the opposite of what is meant in order to blunt the edge of the remark. He also distinguishes a number of levels of irony, on a scale from negative to positive poles, having different effects on the listener. The detailed description of the different theories on irony is though beyond the scope of the present study, however, it is important to note that from a cognitive developmental perspective, it is worth specifying what type of irony one is working with, and that complex forms of irony exist, that may be accounted for by slightly different mechanisms. The focus of the present research is to give a developmental account of the social cognitive implications of pragmatic competence, and in that the development of irony comprehension, on the basis of short scenarios that contain general conversational forms of spontaneously generated irony in context.

The Gricean approach, however, even with such debated issues surrounding it, has proved to be one of the most fruitful theories guiding empirical investigations of inferential processes in communication in adults (Brown and Levinson 1978, 1987), in normally developing children (Surian 1991, Angeleri-Airenti 2014), and in neuropsychiatric disorders such as autism spectrum disorder (Happé 1993, Surian - Baron-Cohen – Van der Lely 1996, Győri-Lukács-Pléh 2004, Frith –Frith 2007, Baron-Cohen – Tager-Flusberg – Lombardo 2013) and schizophrenia (Frith – Corcoran 1996, Herold et al. 2002, Varga et al. 2013a, 2014), the latter of which serve as indirect evidence of theory of mind playing a central role in successful inferential interpretation and thus in the smooth coordination of human discourse. The detailed description of all these associations to atypical cognitive and language development however, are beyond the scope of the present study which aims to give a developmental account of the different aspects of pragmatic competence in a group of

neurologically normal typically developing children, so as to map the stages of the unfolding of pragmatic competence, in order to give an insight into the genuine nature of human communication that may shed light on the basic architecture of human cognition.

Relevance theory was an attempt to overcome such debates on the Gricean paradigm, where optimal relevance is seen as being capable of integrating all these norms observed. The present research is based on the basic Gricean paradigm, as the experimental study delineated below in chapter 9 represents a cognitive developmental approach of which Grice created some main pillars. The study also touches on some parallel theories like the irony principle (IP) (Leech 1983), Relevance as a supermaxim (Sperber-Wilson 1986), and see if these views are supported or rather, defied by the results.

9. Developmental research on the understanding of conversational maxims – A case for experimental pragmatics IV.

Limited research has examined children's understanding of the Gricean maxims and often results are not unanimous, sometimes controversial (Eskritt – Whalen – Lee 2008). Conti and Camras found that children between 6-8 years of age were sensitive to infringements of the maxims in tasks where subjects had to identify which story ending violated a Gricean maxim, and that school-age children of 6-8 years were significantly more successful in this task than 4 year-olds, who did not perform above chance (i.e. above 50% success meaning that results were not due to pure luck and incidence).

Most developmental studies, especially before the last decade, focused on the age when children become sensitive to maxim infringements and conversational principles, and did not look at the mental background of this ability, asking what cognitive milestone may be responsible for the children's performance. The present study aims to answer some o f the remaining questions in the cognitive developmental research of pragmatic competence and not only work with different age groups in a cross-section methodology, but also incorporate mentalization as a factor on the basis of which we compare children's performance. Fernandez (2013) did include theory of mind skills and measured pragmatic competence of preschoolers and school aged children in narrative production. Her findings confirm that children's communicative competence in social contexts, to some extent, requires the development of higher-order social-cognitive reasoning.

Most research on the maxim of Quantity targeting the interpretation of scalar implicatures (on *some* meaning *not all* vs. *perhaps all* (Noveck 2001, Noveck-Reboul 2008);

reveal an ever-present developmental trajectory behind varied responses of the different age groups, in which representations of weak scalar terms tend to be treated super-logically (i.e. strictly, semantically) by young competent participants, but pragmatically by adults and school-aged children between 7-9. Similarly, studies targeting quantifiers and the development of informativeness in child language on *not every*…meaning *some* vs. *none* (Musolino-Lidz 2006, Papafragou-Musolino 2003) have found that preschoolers performed more poorly and in an atypical manner compared to adults and to school-aged children. Some research on children's abilities to resolve verbal ambiguity (Surian 1991) confirm this finding, in that 6-8 year-old children's failures were found to be associated with difficulties in taking account of the given-new distinction for relevant information. This again suggests that such mentally and socially complex abilities necessary for the smooth coordination of discourse are not stabilized before school years.

Some studies, on the contrary, have found that children actually develop an awareness of conversational norms, the Gricean maxims before or in early preschool years (Eskritt-Whalen-Lee 2008), if children were not asked to judge others' utterances (requiring a higher-level, meta-linguistic competence and the ability to reflect on one's language use). Many studies eager to demonstrate that children younger than 4-5 years of age have a full-right fully fledged pragmatic competence have been shown to be based on an unreliable and invalid methodology (Noveck-Sperber 2004, Sperber-Noveck 2004, Markus 2011), like Pellegrini-Brody-Stoneman (1987) who claim to have found that 2-3 and 4 year-olds do not infringe Gricean maxims, on the basis of instable experiments where the tape-recordings analyzed did not include metacommunicative signals which are of basic importance in the reliable interpersonal, pragmatic and inferential communication. Also, (Dunham – Dunham – O'Keefe 2000) have found that two-year-olds' speech conforms to the norms of the Gricean maxims, and that they even show sensitivity to the listener's knowledge, thus abiding by norms stipulated by the maxim of Quantity, but this again, has been strongly defied by an enormous number of research studies from all over the world claiming that even preschoolers use quantifiers in a non-standard way that radically differs from the adult usage. Besides, it is well known from cognitive studies on infant-mother interaction that even babies are in fact sensitive to basic turn-taking rules in conversation (Pléh 2012, Bornstein et al. 2015), in that they coo, and then give the ground to their mothers, wait until she coos back, and then take turns, which suggest babies' inherent ability of reciprocity. The study of Dunham and colleagues actually exploit the nature of babies' responses based on joint attention, which is widely known, and is listed in the present study too, to be a precursor and thus a core

component of theory of mind, but it's far from a fully-fledges mentalizing ability or pragmatic competence. What the authors capitalize on is known in developmental psycholinguistics as primary and secondary intersubjectivity, that is, the ability of the baby to engage with their caregiver in a social encounter either in a binary (primary intersubjectivity) or in a triadic framework (secondary intersubjectivity).

It is just natural that these basic abilities are in harmony with abstract stipulations of the rules that govern both. In other words, reciprocity in mother-infant communication is, not surprisingly, in harmony with conversational norms and abstract rules, higher-level stipulations governing discourse analysis and turn-taking patterns in human communication, but this does not mean that infants actually possess a fully fledged conversational, pragmatic ability. The basic sensitivity is crucial, establishing inclination but it is very far from a versatile mature pragmatic competence that ensures a flexible and productive participation in everyday discourse settings.

The maxim of Quality has also been widely researched in cognitive development in relation to lying. At the same time, lying and white lies have been associated with irony and even with humor processing skills, claiming, that one is associated with the other. Research on children's ability to recognize the intention behind lies is not unanimous, given that, in some cases, links between Theory of Mind, the ability to pass false belief tests has been shown not to be predictive in tasks on the recognition of lying. Studies looking into the ability to discriminate between humor and deceit (Bosco-Bucciarelli 2008, Winner et al. 1998) claim that success in second-order false belief tasks is predictive of irony comprehension, and that children are able to detect irony from deceits when they can determine whether a speaker wants to make overt a belief to the hearer.

This is in line with Wilson's views on both irony and deceit comprehension (Wilson 2009, 2013), claiming that irony and deliberate lies are related in that in deliberate lies, the speaker expresses a proposition she regards as false (or epistemically unsound), intending to conceal from the audience her opinion of its epistemic status. In irony, by contrast, the speaker expresses a proposition she regards as false (or epistemically unsound), intending to share with the audience, via the expression of a mocking, skeptical or contemptuous attitude, her opinion of its epistemic status (Wilson 2009, 219). Thus, an attitude which is intentionally concealed in deliberate lies is intentionally communicated in irony. Relevance theorists see irony as being not only attributive but also dissociative: speaker expresses a dissociative attitude to the attributed thought, indicating that it is false, underinformative or irrelevant. For this elementary ambiguity inherent in irony the epistemic vigilance account of

Mascaro and Sperber (2009) is argued to provide an efficient heuristics, which is a preliminary level also seen as a prerequisite of mentalizing abilities, which enables the child to tell the difference between what is true or false, and to draw conclusions. In the epistemic vigilance account the ability to cope with lies and deliberate deception has both an epistemic and a mindreading component which develop at different rates. The mentalizing component is necessary in order to recognize the given lie as intentionally false, and this ability is not in place until age 6, Mascaro-Sperber claim (2009). All in all, a complex mentalizing ability is seen to be a prerequisite of the smooth handling of lies, deceptive utterances, and a second-order theory of mind is seen as being the cornerstone of such ability.

On the contrary, Sullivan and colleagues (1995) believe that is not second order false belief, but rather, second-order false ignorance judgment which is predictive in the case of lies. The ability to understand whether the speaker knows that the listener knows the truth (second order *ignorance* judgment) was found to play a central role in discriminating lies from jokes. Their results suggest a sharp rise in understanding second order ignorance tasks and lie-joke tasks between the ages of 5 and 6. As Németh (2014) explains, this is apparently because the success of social forms of language use seems to be predicted by the extent to which speakers' and partners' perspectives coincide or differ from each other. If they coincide entirely, that is, share all the knowledge and have a fully overlapping pair of common ground, then in fact, lying, belonging to the category of manipulative intention as described by Németh T. (2014) is not successful, because the cornerstone of successful manipulation is that the speaker's manipulative intention is *not* recognized by the hearer (Németh T. 2004, 2014). Lying is an even more complex issue, and though it has been linked to irony and humor in several aspects, the true investigation of this competence is beyond the scope of the present research, since it would require an entirely different methodology, with an eye not only on informative and communicative intention as outlined by Sperber and Wilson (1986) but also on manipulative intention (Németh T. 2014), which, has its specific framework of investigation.

On the basis of these inconsistencies in terms of developmental research on lies and deceit, it is reasonable to suppose that deceits can be investigated in a triadic context, whereas for irony a dyadic context suffices. This is in line with Bucciarelli and colleagues' (2002) results, who found that the detection of deceits was more successful and thus easier for children in a non verbal setting where an observer plus two characters formed the context of investigation. In this framework communicative gestures like pointing were more salient, and thus it proved to be easier to follow and more useful for inferential heuristics. Interestingly,

irony demonstrated the opposite: it was more successfully handled in the verbal modality, since its characteristic tone of voice, flat intonation and prosody patterns like slower pace are so salient that in the non-verbal modality the same type of ironies of the same cognitive difficulty were actually less successfully detected. Thus suggest that irony's prime modality is linguistic, and its vocal features we exploit in understanding are not only salient but crucial in identifying and handling the phenomenon.

This finding is also central in terms of one of the main results of the present study, namely, that preschoolers actually handle irony well, and earlier than it has been described in literature. The children were demonstrated to rely on the exact same cues listed above: on surface cues, intonation, prosody pattern that trigger the heuristics of taking the opposite meaning, which eventually enables the child to make a shortcut, mitigate the need to build long inferential chains (Sperber-Wilson 1986, Wilson-Sperber 1992) and account for the early success of preschoolers.

Even though several studies investigated children's understanding of deception and lying, there has been little research to date on children's understanding that there are conversational norms that apply to the use of lying (Eskritt-Whalen-Lee 2008, 436). Furthermore, research has rarely examined the developmental corollaries of the conversational maxims, and even less the ability to abide by all the four maxis concurrently, and thus to follow complex matrices of conversational norms.

Some studies have centered around irony (Komlósi 2014) touching on the developmental corollaries of irony processing, but rarely on an experimental basis, while others provide knowledgeable descriptions of the theories of irony and humor, of different types of figures of speech (Nemesi 2009), but not in a developmental and experimental framework. As it is acknowledged in some relevant linguistic and psycholinguistic literature, up to now it has been rather unclear how children learn to handle these aspects of language development (*ibid* 437).

The present study aims to clarify such uncovered issues in the background, make up for these shortcomings, and contribute to having a somewhat clearer picture of the stages and cognitive background mechanisms of pragmatic development.

9.1. Background – Preschoolers' sensitivity to Gricean maxim infringement

The basic tenet of the present research stemming from a Gricean framework is that in order to be able to conform to the maxims, and to exploit them in the course of communication, one needs to be able to ascribe mental states (beliefs, knowledge, intentions) to the participants in the conversation (Sperber-Wilson 1986, Surian – Baron-Cohen – Van der Lely 1996). The unfolding of the ability to ascribe mental states has been widely researched in contemporary studies of cognitive development (Wellmann 1990, Perner 1991, DeVilliers 2000, 2007, Noveck 2001, Gergely-Csibra 2003, Kiss 2005, Csibra 2010, Gergely-Csibra 2013, Kiss-Jakab 2014). The present study aims to clarify the associations between the different levels of mentalization in children and its relations to their pragmatic competence in general, and the order of the different aspects of pragmatic competence in their unfolding, in relation to these levels of mentalization in particular.

The main tenet of the present study is that theory of mind plays a significant role in children's ability to recognize the infringements of the Gricean conversational maxims, which entails that they can follow these norms, detect violations which trigger inferential processes, and are able to search for possible relevant meanings in context. To test this, the study builds on the same methodology as the one in the previous parts of the study, thus the verbal theory of mind tests, yielding the two groups. Then the performance of the children in the groups was compared in pragmatic tasks of maxim infringement recognition. As noted above, the Eyes test did not yield any further groups; its function was mainly to see if verbal performance limitation is significant or present and if it is deterministic concerning the results.

9.2. Objective

In this part of the study children's pragmatic competence is examined in view of their mentalization skills, targeting their abilities of recognizing the infringements of the Gricean conversational maxims. The testing was done using a measure of linguistic tasks, containing 5 short scenarios for each Gricean maxim. The length and syntactic complexity of these stories was harmonized with the rest of the tasks in the study (i.e. irony control task, contextual metaphor/humor/irony task, etc.), in order to have a valid experimental framework, ensuring that the differences in result are not due to any structural differences in the linguistic tasks,

thus excluding syntactic effects in processing. This way the results reflect the cognitive effort needed for the deciphering of the implied pragmatic meaning, for which mentalization based inferential mechanisms are believed to play a key role.

9.3. Hypotheses

The central claim of the present research is that mentalization plays a significant role in inferential, i.e. pragmatic meaning construction, thus children with ToM skills will be significantly more successful in tasks measuring the recognition of the infringements of conversational maxims.

The study also aims to clarify the relation between cognitive processes and the maxims themselves, trying to draw up a continuum of the maxims and the order they may follow in development.

As the research encompasses a number of aspects of pragmatic competence, incorporating metaphor, irony and humor processing, the results found in the maxim tasks are also compared to results in the rest of the pragmatic tasks and conclusions are drawn concerning the relations of metaphor, irony and the maxim if Quality, of Relevance being a super-maxim, and findings are embedded in contemporary research in cognitive development and pragmatics.

9.4. Method

Subjects and procedure was the same as in the humor and irony conditions. After the ToM tasks, stories were read out to children individually in the quiet room used for testing all throughout the experiment. Children's performance is evaluated in the matrix of the four main maxims, where the sub-maxims correspond to the broader category of the main maxim. In other words, when measuring children's ability to recognize infringements of the maxim of Quality, linguistic tasks incorporated the infringement of both sub-maxims, but the scores were generalized as being results of the Quality maxim task. There is no point in dividing results further into sub-maxims in the framework of the present investigation which focuses on several aspects of pragmatic competence, and aims to reveal the associations between the main factors, not within the evolution of abilities to detect competence in the observance of

sub-maxims. This, however, may be a fruitful direction in future research in cognitive developmental approaches to pragmatic competence.

Each maxim condition consisted of 5 short scenarios based on the infringement of conversational maxims, generating conversational implicatures, which call for strategies to infer intended meaning and speaker's intention behind the utterance. Three adult experimenters led the testing procedure, one reading the conversation, the other two providing the responses (speaker A and B). At the end of each story children heard two potential endings, one violating a conversational maxim, the other not. Children were asked to judge if any of the two responses was strange. In some cases shy subjects tended not to speak, but point at the person with the answer of their choice. If needed, some clarifying questions from the side of the experimenter made it clear the child was aware of their answer, and could explain their choice at a basic level. Children were naturally not required to give a full and grammatically adequate explanation that would require a linguist's training and complex meta-linguistic skills with the ability to reflect on one's language use.

As in the humor condition, when children were asked to judge if the utterance or story was funny and were asked to reason why, beyond just laughing (or pretending to laugh) at it, here too, we expected subjects not only to choose one of the answers but also to show awareness of their choice and at least demonstrate a full understanding of the fact that the violation was in fact something we rarely do, possibly avoid, or use with a specific, unspoken purpose and intention.

The responses abiding by the maxims and the ones violating them were presented in a random order at the end of the conversations in order to avoid priming effects of subjects guessing that it was always the first or the second one that was flouted, and thus the expected answer. The utterances violating the maxims are marked with an asterisk (*).

9.5. Tasks

The following examples are prototypes of the short scenarios used in the testing, at the end of which one of the responses violated a Gricean maxim, in the following manner. For full examples see Appendix section 6.

9.5.1. Maxim of Quantity

In the case of the maxim of **Quantity** task, testing children's ability to recognize the infringement of the given maxim, the utterances either gave too much and redundant information, or failed to provide enough information so as to make the utterance informative enough:

1. A: ***What would you like for dinner?***
*B: Food.**
C: I'd like sausages with mustard and some bread.

2. A: ***How do you like your soup?***
B: With a lot of pasta.
C: I like it in a red plate with green napkins.*

9.5.2. Maxim of Quality

In the case of the **Quality** maxim task the utterances failed to abide by the norm of saying only what one believes to be true and of avoiding utterances for which one lacks adequate evidence:

1. A: **Mary, have you seen my doll? I can't find it!**
B: It's in your room, next to your bed.
C: It's next to the Moon in the sky.*

2. A: ***Did your mom buy you the new toy car you wanted?***
*B: She did, I have already driven it too, I'll take you for a ride if you want.**
C: She did, yesterday after school we went to the store to get it.

9.5.3. Maxim of Relevance

The maxim of **Relevance** tasks were based on the infringement of the Relevance maxim, deferring from the topic at hand:

*1. A**: What's your favorite animal?***
B: My favorite is the giraffe!
*C: I don't like rain.**

*2. A: **What do you usually drink for breakfast?***
B: Hot chocolate or tea.
*C: I never wear my green coat.**

9.5.4. Maxim of Manner

The tasks on the maxim of **Manner** concerned the manner of responses, which failed to be clear, orderly and were often obscure, rude and impolite:

*1. A: **Can I borrow your guitar on the weekend?***
B: Sure, of course!
*C: Why would you want it, you have no idea how to play it anyway..!**
*2. A: **Let's go out and play soccer, the weather is so nice and sunny!***
*B: With you…I won't go for sure! You can't tell the difference between your own legs!**
C: Unfortunately I can't go now, I need to see my dentist.

Particular attention was paid to the response utterances in the Manner task in that responses were deliberately designed to ensure that children did not choose on the basis of the utterance being negative or positive, but on the basis of its content and manner, i.e. in several cases both answers were rejections, but differed in manner and style like in example 2 above.

9.6. Results of the Maxim infringement task in view of mentalization skills

Figure 27 shows the differences between the performance of the ToM and the NoToM group in maxim tasks.

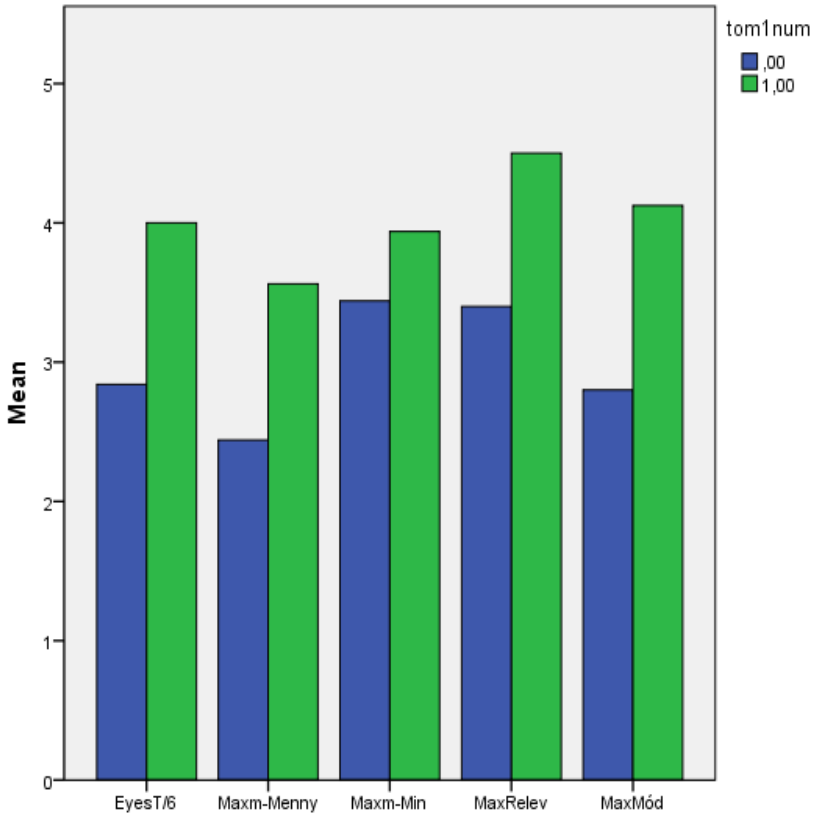


Figure 27.

Results of the Maxim infringement task in view of mentalization

Mann Whitney test indicated that there is significant difference in the performance of the ToM and the NoToM group in some of the maxim infringement recognition trials, indicating that theory of mind is a predictive measure in children's ability to abide by three, out of the four conversational maxims: the ToM group was proved to be significantly more successful in the recognition of the infringement of the maxim of Quantity, Relevance, and Manner, but Quality results did not display significant differences in view of ToM skills.

9.6.1. Maxim of Quantity infringement recognition success of the two groups

In the case of the maxim of **Quantity** infringement recognition, the mean rank of the NoToM group: 17,8 is much lower than that of the ToM group: 26, suggesting that the NoToM group was significantly less successful: p= .028; U=120 r= .34 in rejecting those utterances that violated the maxim of quantity, i.e. the ones that provided less or more information than needed. This confirms the central role of theory of mind in cooperative conversational abilities targeting quantity maxim issues.

9.6.2. Maxim of Quality infringement recognition success of the two groups

In the case of the recognition of the maxim of **Quality**, the NoToM group Mean rank is 18,90, whereas the ToM group's mean rank is not much higher: 24,28, which suggests that the difference in the performance of the two groups in this trial is apparently not significantly different: p= .142; U=147,5 r= .22. This suggests that the success of the recognition of the Quality maxim infringements in not significantly different in the two groups. This may be due to the fact that children's cognition at this age is naturally dominated by the magical thinking period, and those in the ToM group are not exception to this either, being in the prime of their preschool period. Children belonging to the ToM group did reach higher scores on this maxim than the NoToM group, however the difference in scores is not significantly higher. The results, therefore, probably reflect this characteristic feature of preschool cognition, namely, that magical thinking dominates the child's mind, which however, importantly, does not mean that in this period no conceptual changes are involved in their cognitive development. It only suggests that magical thinking makes these children somewhat less sensitive to appearance-reality distinctions, and thus to infringements of Quality maxim issues.

9.6.3. Maxim of Relevance infringement recognition success of the two groups

As for the maxim of **Relevance**, the recognition success of the ToM group was significantly higher. Mean rank of the NoToM group was 16,72; and the ToM group's was almost double: 27,69. The p= .003 r= .46 value suggests that the difference in the performance of the two groups is significant; U=93; i.e. the ToM group was significantly more successful in recognizing Relevance maxim infringements in conversation.

This can be explained by the fact that theory of mind is a central component of pragmatic competence, and within that, of the relevance based cooperative stance. In other words, it is a crucial component of being able to follow the universal guideline of Relevance in interpretation and communication, as suggested by Sperber-Wilson's influential Relevance theory (1986) highlighting the central role of relevance in human inferential processes. The central role ToM in the acquisition of the ability of following the guideline of Relevance in human communication is further demonstrated by the fact that this significance is the strongest in all the maxim infringement results. Thus, ToM apparently plays a significant role in the acquisition of the ability of staying relevant in a conversation: i.e. not deferring from

the topic, keeping ourselves to the common ground we share with our conversational partner, abiding by the guidelines of cooperative attitude in view of the shared goals of the interaction.

9.6.4. Maxim of Manner infringement recognition success of the two groups

The difference in the performance of the two groups is the second most pronounced in the maxim of **Manner** trial: p= .008; U=103,5 r= .41. The mean rank of the NoToM group is 17,14, while it is 27,03 for the ToM group, suggesting that the group relying on theory of mind skills are apparently significantly more successful in recognizing if the speaker violates the maxim of manner in conversation, i.e. fails to stay clear and orderly in their utterances.

9.6.5. General discussion of the results in the maxim infringement tasks

In sum, Theory of Mind proved to be a significant factor in predicting the group's performance and success rates in 3 out of 4 maxim infringement recognition tasks (in Quantity, Relevance and Manner, as opposed to the not significant Quality condition), that is, in 75% of the trials. Thus, we can conclude that the two group's success was dependent on their theory of mind skills to a great extent. In the case of the maxim of Quantity, Relevance and Manner tasks the development and the smooth operation of the cooperative skill of pragmatic competence was heavily based on the skill of theory of mind, since the ToM group's performance was significantly higher in these three cases.

The fact that in the maxim of Quality condition the two group's performance was not significantly different, can be explained by the fact that in preschool years magical thinking predominates, and this is more central than the developing mentalization skills. Apparently children found it difficult to reject responses that failed to abide by the norm of saying only what one believes to be true and for which one has adequate evidence, and they apparently found it hard to tell reality and fairy tale settings apart, and reject fairy tale context as strange or see it as a violation of standard conversational phenomena (for examples of Quality maxim infringement tasks see Appendix). It's important to note that these same children do not infringe the maxim of Quality in their speech, i.e. in production, but the task of rejecting it seemed too strict for them to judge these as incorrect, strange statements. Studies that employ a methodology based on a graded judgment paradigm in evaluating such utterances have found (Katsos-Bishop 2011) that when children get a three-point scale in evaluating, they can

in fact differentiate the infringed and the non-infringed responses. Children in this study did not judge the infringed responses as flawless, and never give 100% to these types of answers. This proved that they in fact have sensitivity to such conversational norms, and actually detect that there is an implicatures generated by these infringements, but seem to be more tolerant in judging these as erroneous (Katsos-Bishop 2008). This suggests that the children who do not readily reject under-informativeness however, in fact fully understand informativeness, but are unable to act according to the pragmatic interpretation of under-informative utterances.

Further investigation is required in order to get a more fine-cut picture of preschoolers exact sensitivity to violations of conversational maxims in general and of the Quality maxims in particular, where evaluation is not done on a binary scale (accept vs. reject, i.e. correct vs. incorrect) but children can choose from at least three options (correct / not entirely correct / incorrect, i.e. accept / accept with corrections / reject). The present methodology obviously requires children to interpret and identify maxim violations (Eskritt – Whalen – Lee 2008), which may constitute a performance limitation in children's results. A more detailed methodology of the kind described above would probably reveal more reliable results.

At the same time, examining children's understanding of appearance/reality distinction in general is radically different from a framework like the one in the present study, where methodology focuses on children's understanding that there are conversational norms that apply to the "be truthful, do not say anything that you believe to be false" guideline. Research has rarely examined the development of children's understanding of all the Gricean maxims concurrently, in a cognitive developmental perspective (Eskritt – Whalen – Lee 2008) with the aim of clarifying as to how children develop an awareness of the different maxims and become able to coordinate these productively in the course of development. The present research aims to make up for this caveat and provide some explanations that can contribute to the clarifying of the picture on how children come to grips with the principles required for a mature and productive pragmatic competence.

Overall, we can conclude that ToM plays a crucial role in the development of pragmatic competence, of the unfolding of smooth conversational and discourse skills of preschool children, which makes ToM a 75% secure, thus quite strong predictor of pragmatic success in conversational maxim issues.

Although the success rates in the maxim infringement recognition task differ according to task, it seems that the principle of cognitive congruence explains why and how the developmental trajectory is present consistently. Apparently there is a graded salience, a continuum within pragmatic competence (from semantic meaning construction, i.e. simile and

irony control task results) to idiomatic meaning construction success rates (from irony via metaphor to humor and infringement recognition rates), and within the individual tasks of pragmatic competence as well: within the ability of following guidelines of the cooperative principle and observing the violation of its maxims, from Quantity through Quality, Relevance and Manner. The performance of the two groups was most pronounced in the case of the Relevance maxim infringement recognition trial, which highlights the central role of relevance in the development of conversational skills, in the basics of the coordination of discourse and in overall pragmatic development.

9.7. Results in view of the difficulty of the maxims in the two groups

Statistical analysis was based on ANOVA and revealed yet another aspect of the results: the differences among maxims within groups. If we add up the Mann Whitney measures belonging to each maxim, or look at the graph of the results in the two groups (Fig. 27) we can identify the order of the maxims in the given group.

9.7.1. The order of the maxims in the NoToM group according to difficulty

In the NoToM group, based on the mean rank values in the Mann Whitney analysis the order of the success of the infringement of the maxims from the most difficult to the easiest is the following (Fig.28):

Figure 28.
Order of maxim infringement recognition in the NoToM group according to the level of difficulty
(from left to right: from difficult to easy)

This suggests that the rejection of answers violating the maxim of Quantity was the hardest, followed by the rejection of utterances violating the maxim of Manner, the 2nd easiest being

the maxim of Relevance, and the responses violating the maxim of Quality was the easiest to reject in the NoToM group, each relative to the other three maxims.

The fact that the maxim of Quantity was the most difficult may be explained by the fact that this type of maxim focuses on form, rather than content, that is, regulates *how* something should be said, and not what is said. This, formal aspect is obviously difficult for preschoolers, since the majority of the norms of how something should be said, in what informative form is adequate and seen as standard, is regulated by social and cultural norms, and this experience apparently comes with the course of socialization based experience and age.

The second most difficult was the maxim of Manner, probably due to similar reasons: Manner maxim stipulates issues of how something is said, not what is said, therefore, focus on form over content. Again, in this case too, interpersonal norms prescribe what is brief, orderly, clear and polite, and this ability is not so much based on children's cognitive abilities but heavily relies on cultural rules and social experience, thus comes with age. Grice himself states that the maxim of Manner is different from the others in that it concerns how an utterance is said, rather than what is said (Eskritt – Whalen – Lee 2008, Grice 1975).

The second easiest is the maxim of Relevance. The violation of the topic at hand was salient enough to be successfully interpreted by 16 out of 25 children.

An unexpected result is that those in the NoToM group handled the infringements of the maxim of Quality the most easily, which is surprising, because one of the standard ToM tests actually exploit the appearance-reality dichotomy when testing children's theory of mind skills. This test builds on kids' appearance-reality distinction abilities, by showing them a sponge painted grey, which makes it look like a stone. Then they ask children (i) what they think it is, (ii) what they thought it was, (iii) what their peers would think it is, etc., as the standard False Belief Test (FBT) methodology goes (Gopnik – Astington 1988, Kiss 2005, Wellman-Cross-Watson 2001), to determine if children have privileged access to the contents of their own minds and mental states (Kiss-Jakab 2014). The answers are believed to reflect children's theory of mind abilities, based on their ability to tell apart reality and appearance, that is, on their knowledge that it looks like a stone but it is a sponge in reality.

The finding based on the relative difficulty of tasks revealing that the maxim of quality infringement was the easiest for the NoToM group, may be explained by the fact that overcoming the appearance-reality dichotomy is a central milestone in the development of pragmatic competence for the coordination and deciphering of implicatures, since all other three maxim infringement tasks follow the maxim of Quality infringement recognition in the

NoToM group, i.e. in kids with no mature mentalization to rely on. This suggests the primacy of the mastering of the distinction of appearance reality in being further able to detect Relevance violations, then Manner, and eventually Quantification issues of not getting a response that is informative enough or contains redundant information.

A possible explanation for the difficulty of the flexible handling of the Manner maxim in the NoToM group may be that to understand the rationale underlying politeness in a conversation one needs to be able to avoid face-threatening acts (Brown and Levinson 1978). The successful coordination of these entails the efficient attribution of beliefs and complex „cognitive" emotions (such as pride, shame) to the conversational partner (Surian – Baron-Cohen – Van de Lely 1996). A deficit in the mindreading system prevents success in politeness, therefore the finding that it is second most difficult in the NoToM group is in line with this heuristics: at this stage, before around 5 years of age, in short of a mentalizing ability, children find it hard to reject utterances that are impolite and flouted primarily in form, over content, concerning brevity, order and clarity of expression.

9.7.2. The order of the maxims in the ToM group according to difficulty

Based on Mann Whitney mean rank values, in the ToM group the most difficult maxim was that of **Quantity** too. This was followed by the maxim of Quality, then the second easiest being the recognition of the infringement of the maxim of Manner, and eventually the easiest to recognize when violated was the maxim of Relevance (Fig. 29).

Figure 29.
Order of maxim infringement recognition in the ToM group according to the level of difficulty
(from left to right: from difficult to easy)

A fairly interesting finding is that in both groups the hardest of all maxims infringement recognition tasks was that of **Quantity**. This is in line with other studies' findings (Surian - Baron-Cohen - Van-der-Lely 1996, Papafragou-Musolino 2003, Musolino-Lidz 2006,

Noveck-Reboul 2008). A possible explanation for this in the first place, may be that just as in the case of the Manner maxim, Quantity restrictions concern *how* something is said, that is, apply to the *form* of the utterance over its content. In other words, children are fully logical in that they do not think it is something to reject, since they did get a grammatically correct answer (see also Noveck 2001). At this age the fact that the speaker responds in such a form does not seem very unusual for them, because this packaging is not at all mistaken, it is just something that may require additional questions for clarification, or the omission of some extra, unnecessary information heard – but these features are not salient enough at this age to be judged as mistakes, probably because they themselves, as preschoolers, experience conversations and situations when they have to ask clarifying questions. Therefore, preschoolers tend not to reject sentences violating the maxim of Quantity as non adequate. Surian - Baron-Cohen - Van der Lely (1996) actually see this tendency as a performance limitation rather than a competence deficit, as in the case of normally developing children their limitations are due to a lack of access to computational resources, whereas in autistic individuals it is a representational deficit that seems to account for the same problem of pragmatic deficit. This is in line with the finding that although the ToM group has mentalizing skills to rely on, the maxim of Quantity actually stays the most difficult one in the order of the maxims.

Surian - Baron-Cohen - Van der Lely's (1996) performance limitation hypothesis on children's ability to recognize maxim infringements is consistent with the view advocating continuity in development, which is largely in harmony with the present study's findings as suggested by the pyramid form continuum of pragmatic constructions, and the emphasized continuums in both the ToM realm and in humor development (see fig. 8, 13, 26).

This finding is in line with a large amount of research studies addressing the universal tendency for kids to fail pragmatic tasks on informativeness and quantification. This has been widely studied in not only pragmatics, but also in syntactic development both at an international (Papafragou – Musolino 2003, Musolino – Lidz 2006, Noveck – Reboul 2008) and at a Hungarian scale (É. Kiss – Gerőcs – Zétényi 2013). These studies center around the surprising issue how differently children interpret quantifiers, and what this effect has on their developmental trajectory concerning the acquisition of quantors. In general the studies focus on scalar implicatures, that is, terms which by nature, at the semantic level incorporate a certain gradation, representing a narrow meaning by suggesting: „some but not all" (hence the name scalar-). These terms occur in sentences like „I saw some of your friends yesterday" or „Some professors are famous" where the speaker's use of „some" typically indicates that they

had reasons not to use a more informative term, e.g. “all”. Some professors are famous therefore gives rise to the implicature that ‘not all professors are famous’, and that ‘I did not see all of your friends, but only some of them’, etc. Recent studies on the development of pragmatics suggest that preschool children are often insensitive to such implicatures when they interpret scalar terms (Papfragou-Musolino 2003, Noveck 2001, Musolino-Lidz 2006).

This finding evokes two important questions that generally constitute the ground for research in terms of the acquisition of quantifiers and their semantic – pragmatic coordination in today’s developmental pragmatics. One is whether all scalar terms are treated in the same way by young children as by adults; and second, whether the child’s difficulty reflects a genuine inability to derive scalar implicatures or it is due to demands imposed by the experimental task on an otherwise pragmatically competent child (Papafragou – Musolino 2003).

The findings reveal that children use quantifiers in a way significantly different from the way adults use them: children are initially not sensitive to their inherent scalar nature, tend to use them in the sense that ‘some and perhaps all’, whereas adults and older children gradually grow into using the narrow meaning of such scalar terms (Noveck – Reboul 2008). The ‘some but not all’ pragmatic meaning therefore, is seen as requiring additional effort from the side of children, and as their pragmatic skills mature, they eventually learn to use these in the adult scope, in the pragmatic interpretation: ‘some but not all’.

It seems that the semantic interpretation ‘some and perhaps all’ is readily available for preschool children, who do not yet demonstrate a fully-fledged pragmatic competence. Noveck and Reboul (2008) could not separate the improvement from the factor of age, and they underline the importance of getting older in the refinement of this ability.

Papafragou and Musolino demonstrated that while adults overwhelmingly rejected these infelicitous descriptions, children almost never did (2003). Musolino – Lidz (2006) point out that preschoolers do not differ from adults grammatically, rather, their command of the pragmatic principles associated with the use of quantified statements is much more fragile than that of adults. They believe, that children’s immature pragmatic competence is what gives rise to such unanimous findings.

The results in the present study are in harmony with universal research on children’s inability to use scalar terms and quantifiers in their pragmatically motivated, narrow meaning, and support the findings that at this age it is still an unsettled issue, irrespective of mentalization skills: the quantity maxim was the most difficult in both groups, and this maxim

was least affected by the ability of mentalization, which shows that its acquisition heavily relies on cultural norms, interpersonal experience, which come with age and socialization.
The fact that the ToM group also found the Quantity maxim infringement recognition the hardest, even though they have in the meantime, acquired the competence of mentalization, suggests that ToM is not the only factor that plays a role in the mastering pragmatic issues of informativeness, ensuring the smooth coordination of quantifiers, and therefore, the ability to follow the maxims of quantity, which requires that the speakers refrain from giving too much or too little information in their utterance.

Overall, our results revealed that the maxim of Quantity is still not adequately followed in either of the two groups, which is in harmony with international research results of informativeness, being a tough developmental issue. The present findings are also in line with results on the recognition of maxim infringements of typically developing and high functioning autistic individuals (Surian -– Baron-Cohen – Van de Lely 1996), which indicate that typically developing preschoolers were at chance with the utterances violating the maxim of Quantity, but above chance in all the other maxims.

In their explanation, this may be due to the fact that at a certain age children know about some maxims but not all of them. Quantity seems to be a task for early school years when mathematical skills, mental operations become more central in their everyday activities: terms of quantifiers are practiced at school, where in an institutional setting children hear about a variety of interpretations, possible narrow and less definite, unrestricted versions of scalar terms such as some. This issue thus, concerns more general aspects of cognitive development, and seems to involve numerals, early mathematical skills, and the ability of the smooth handling of abstractions in mental operations with abstract symbols as quantors and numerals. This suggests that it is beyond linguistic issues, involving more complex cognitive abilities, which therefore, need to be considered in research and explanation paradigms aiming to clarify this problem. In sum, early school years ensure a framework for more formal mental operations, thus children become more sophisticated in abstract thinking, and in several cognitive factors that contribute to their advancement in terms of quantifiers and informativeness.

The fact that children in the ToM group score higher in Quantity maxim tasks is thus possibly not fully a consequence of their more mature ToM skills, but partly stem from more developed numerical and social skills also dependent on larger working memory. International findings on children being universally unsuccessful in the productive use of

quantifiers in their standard, narrow meanings (Bucciarelli-Colle-Bara 2003, Musolino-Lidz 2006, Eskritt – Whalen – Lee 2008) confirm the present study's findings on this issue.

The second most difficult maxim for the ToM group was that of the maxim of **Quality**, compared to the rest of the maxim violations. Surprising as it is, the children in this group were more accepting in the case of Quality violations, and tended not to reject utterances as „I live on the Moon with my ponies". This result is not easy to explain, given that children in the NoToM group tended to reject these answers more readily. However, the general theory of Pragmatic Tolerance (Katsos-Bishop 2011) may provide and answer to this phenomenon as well, just like in the case of the acquisition of quantifiers, where they have demonstrated that preschoolers in fact, have an ability to differentiate utterances that infringe a maxim from those that conform to it, but methodologies in general use a binary coding, where the child needs to either accept or reject a response. This apparently does not give experimenters enough space to see the stages in between. It turns out, as Katsos and Bishop have found (2011), examining the sensitivity of maxim infringement of 5-year-old children, that when the subjects had a 3-score scale to use for evaluation, they in fact demonstrated a basic sensitivity to recognize maxim infringements, since they never gave 100% to infringed utterances. That is, with a more subtle methodology, it is possible to get a more subtle view of preschoolers' fledging pragmatic competence. The authors demonstrate that these 5-year-olds actually show a certain Pragmatic Tolerance, in that they accept semi-correct versions as well, which, however, does not mean that they see these as being perfect. In other words, an elaborated methodology can show subtle differences in cognitive processes. As for the results in the present study the relevance of the Pragmatic Tolerance Principle is that the ToM group tended to accept such terms because they demonstrate such a tolerance towards the infringed utterances. It is important to note that they did score higher on the Quality maxim task than children in the NoToM group, which means, that they are actually more successful, but as for the order of the maxims, Quality came second. This may be due to the fact that children in the ToM group plainly allow for a broader interpretation and take it as a natural framework of fairy tales which are not at all unusual or erroneous in their everyday conversations, but, all the more, a common form of interactions with parents, peers and preschool teachers. This finding needs further research, detailed methodology with special focus on the mastering of the Quality maxim and on children's ability to handle appearance-reality based distinctions, and its relations to understanding representational change and false belief (Gopnik – Astington 1998, Kiss 2005). Such detailed methodology may be able to clarify the cognitive underpinnings of maxim infringement recognition, and give us a valid and reliable insight into

preschoolers' sensitivity to violations of conversational maxims in general and of the Quality maxims in particular.

Interestingly, cutting edge research on the development of children's understanding of representational change and its relation to other cognitive developments do not defy this outcome, since they too, have found, that preschoolers' performance on the representational change question was poorer than their performance in the false-belief task (Gopnik – Astington 1998). This finding is in line with the performance of ToM group children in Quality maxim tasks, namely, that despite their mentalizing skill to rely on, they tend not to reject utterances infringing the maxim of Quality. The two abilities (appearance-reality distinctions and false belief test success) thus do not necessarily correlate very strictly, and this may justify the validity and reliability of our results concerning the seemingly contradictory issues of ToM and Quality maxim infringement. It is also important to note that these same children do not infringe the maxim of Quality in their speech, i.e. in production, so production vs. perception issues may also need to be separately investigated in future research on this topic.

As for the 2nd easiest maxim, that of **Manner**, a strong correlation of theory of mind skills and success in the Manner maxim task suggests that mentalizing is in fact a core component of mature pragmatic competence responsible for smooth conversational and discourse skills, which entails the understanding of the rationale underlying politeness. As it shows in the comparison of the two group's results, the ToM groups mentalizing ability moves the Manner maxim to the second easiest place, which means mentalizing ability did contribute to a successful handling of violations of the Manner maxim, involving discourse settings based on impoliteness.

Finally, for the children in the ToM group the easiest of all the four maxims was the recognition of the infringement of the **Relevance** maxim. It is obvious that having acquired a theory of mind, these preschoolers can rely on their inferential abilities that all build upon Relevance when deciphering implicatures in conversation, triggered by the violations in the tasks. The salience of Relevance in the ToM group is supported by the principle of Cognitive Congruence (Zigler et al. 1966). At this age the central issue in their thinking, cognition and mental operations is the mastering of Relevance, supported by the fact that false belief understanding emerges at this age as well. For this reason the central role of Relevance is a sign that their mentalizing ability is actively in development and since it is a fairly newly acquired skill, they tend to use it and practice it. This tendency that new items in a child's vocabulary are reiterated a number of times, and frequency of use designates that the item is a

new acquisition, is an axiom in child language development. As the child learns to use it with confidence, frequency of use decreases. This phenomenon is well known from developmental psycholinguistics, and is in line with the theory of cognitive congruence (Zigler et al. 1966), suggesting that relevance-based inferential activity is in the focus of development at this stage. Since all of this eventually boils down to mentalizing skills, as the above view would predict, the ToM group's most successful maxim was indeed that of Relevance.

9.7.3. General discussion of the results in view of the order of the maxims in each group

Overall results: the present study's findings are in harmony with general tendencies in relevant literature on the development of pragmatic competence in that preschool children do recognize the infringement of maxims mostly above chance (Surian – Baron-Cohen – Van de Lely 1996). Apparently those preschoolers who have a theory of mind skill, thus pass ToM tests (see ToM group column) perform way better in maxim tasks, that is, have a fairly productive conversational ability, being able to recognize answers that violate maxims and as a result of this engage in an inferential activity, deciphering the implicatures and eventually retrieve the intended meaning of the utterances. The ToM group scored the lowest in the Quantity tasks, compared to other maxim tasks, but even in that their performance is around 71%, that is, they reject uninformative utterances which contain too much or not adequate information successfully in 71% of the trials. As percentage results (in table 6) show, the performance of the preschoolers who did not pass theory of mind test (see NoToM column) is lower, however, except for the maxim of Quantity (44%), they too, perform above chance in all three maxims, staying slightly above chance in the case of the maxim of Manner (56%).

Maxims	**ToM group success in %**	**NoToM group success in %**
Quantity	71%	44%
Quality	78%	68%
Relevance	90%	67%
Manner	82%	56%

Table 6.
Percentage of successful performance in maxim tasks in view of mentalization

Overall, NoToM group children, who cannot rely on their mentalizing skills in their heuristics trying to decipher intended meaning, perform around chance in maxim tasks, whereas preschoolers who can rely on mentalization (ToM group) reach a success rate of 70-90%, which shows the effect of ToM in successful and productive pragmatic competence. The mentalizing skill of the ToM group members helps these children in detecting violations, that is, in recognizing the purpose behind the infringements, and thus encourages them to engage in an inferential activity in which they try to identify speaker's meaning and intentions, which eventually helps them derive the intended meaning of the utterance over sentence meaning.

The finding that children in the NoToM group with no mature mentalizing skills to rely on probably have an awareness of conversational norms, since they too, perform at chance. But the awareness of such norms does not in itself guarantee smooth coordination and flexible participation in discourse, which will eventually be achieved when they too, will acquire a fully-fledged ToM skill. The tendency of NoToM kids performing around chance in maxim tasks thus signals an important precedence of mature pragmatic competence: a stage of the *awareness* of conversational norms, which is apparently a prerequisite of the ability of *understanding that these norms can be violated* (Eskritt – Whalen – Lee 2008), and that violations actually stand for implicatures that call for inferences to decipher the intentions of the speaker, and eventually intended meaning (Schnell 2007, 2012).

On the basis of the Mann Whitney measures, the ToM group was also significantly more successful in 3 out of 4 maxim tasks (Quantity, Relevance and Manner), whereas the two group's performance was not significantly different in the Quality maxim condition. Quantity, nevertheless, represents the most challenging milestone in the maxim tasks and hence in coping with the maxims in development, as its full development and productive use apparently comes with age , socialization and experience in interpersonal interaction.

The fact that children perform above chance in 75% of the maxim infringement tasks (i.e.in three (Quantity, Relevance and Manner)out of four maxim trial), and that in these three trials there is a significant difference between the NoToM and the ToM group, to the advantage of the ToM group, shows that there is a correlation between theory of mind skills and the ability to recognize maxim infringements, and rejecting such utterances that violate the maxims, carry out inferences based on the implicatures triggered by such violations. Therefore, ToM skills are proved to be a significant factor in the acquisition of a mature pragmatic competence that concerns conversational skills.

However, the finding that in 75% of the cases children were successful in recognizing such violations, does not mean that mastering conversational aspects of pragmatic

competence is not a challenge for them. The „all-in-one" graph (Fig. 24) of pragmatic development shows, together with the continuum pyramid graph (Fig. 26) that the acquisition of the ability of the smooth handling of discourse and flexible coordination of conversational guidelines stemming from the cooperative principle stipulated by the four Gricean maxims are all late phases of pragmatic development, intensively in development during the end of preschool years and continuing in early school years, and in some aspects, even beyond.

Theory of Mind thus seems to have made a crucial difference in terms of two maxims: that of Manner, where mentalization ensures the ability of attributing beliefs, and cognitively complex emotions necessary for the avoidance of face-threatening acts, face saving and politeness, and in the case of the maxim of Relevance, where mentalization is the cornerstone of the inferential ability stemming from being cooperative and staying relevant in conversation.

In the case of the other two maxims, that of Quantity and Quality we can conclude that Quantity and quantification is universally not in place in preschool years, as a vast amount of research addresses this topic in several approaches, unanimously claiming that ageing and social experience contribute to its refinement.

Quality maxim seems to be a challenge in interpretation, but apparently it is the first to be mastered in the NoToM age group, and all others follow, whereas in the ToM group a less restricted interpretation presents itself and it is not among the first ones rejected by children who pass the ToM test. There may be several reasons for this, the resolution of this puzzle perhaps calls for more detailed methodology. All in all, the evolution of the competence to recognize the maxims reflects a fairly unsettled pattern, where the stages may even change places, and seem to mature in a gradual, even spiral-like pattern, where initially the awareness of one or the other maxims stabilizes and eventually matures in a further stage, creating the miscellaneous picture observed in Figure 28 and 29. In other words, the mastering of these maxims does not follow a linear development but rather a series of reiterated circles in a spiral-like manner, in a series of steps, maturing in several turns. As noted above, since research has rarely examined the development of children's understanding of all the Gricean maxims concurrently, in a cognitive developmental perspective (Eskritt – Whalen – Lee 2008) with the aim of clarifying as to how children develop an awareness of the different maxims and become able to coordinate these productively in the course of development, it is hard to compare the present results with findings in literature. Further research is needed to map such little researched issues that pose novel problems in developmental pragmatics.

A interesting core of such a miscellaneous pattern is that Manner and Relevance do not seem to change places: they seem to follow this primary order (Manner first -> Relevance second) in both groups, which may suggest that the two stick together in the course of development, for reasons such as belief - and complex cognitive emotion attribution abilities present in the maxim of Manner, that may constitute the basis for more refined inferential paradigms coming to life in Relevance tasks.

9.8. Correlations among the different maxims

In order to be able to tell if the development of the maxims show parallel development, it is useful to look at the correlations between them. On the basis of ANOVA statistical analysis, the maxims themselves apparently reflect a slight tendentious correlation in development with each other, suggesting that similar cognitive mechanisms lie at the core of the development of this competence. These correlations are rather low and tendentious, which may be due to the relatively small number of subjects tested. This however suggests that with a greater number of experimental subjects the replication of the study could reveal more significant correlations in these and some even more significant results. The slight correlations in the domain of the infringement recognition tasks may also mean, as graph 24 also shows, that this social aspect of pragmatic development targeting the coordination of conversations, aiming to keep discourse coherence and requiring an effort of local management of discourse, is a later phase of development of pragmatic competence. These aspects of pragmatic development apparently mature more-or-less simultaneously, with slight differences.

The maxim of **Quality** and that of **Quantity** are in slight tendentious correlation: r_s= .583, p< .001. **Quantity** maxim scores and **Relevance** scores also demonstrate a slight tendentious correlation: r_s= ,558; p< .001; and the maxim of **Quantity** and maxim of **Manner** also correlate: r_s= .507, p< .001 meaning, that those who handle Quantity maxim infringement flexibly, can also handle Manner infringements well. That is, children rejecting utterances containing too little or too much information are also sensitive to the utterance being obscure, trying to avoid ambiguity, obscurity of expressions, and to be brief and orderly in responses. Their correlation also suggests that these two maxims seem to represent almost equally difficult items to cope with too. As pointed out above, these two maxims actually prescribe and focus more on the form than on the content of utterances. This entails the distinction of form and function in both cases, and thus it is not surprising, that the two sub-abilities (form-

related maxim results) correlate. This is promising as for the validity and for the reliability of the results and of the statistical analysis we relied on.

9.8.1. Testing Relevance as a supermaxim of Sperber and Wilson (1986)

The Maxim of **Relevance** infringement recognition scores show a slight tendentious correlation with the maxim of **Quality** scores: $r_s = .514$; $p < .001$. The correlation between **Relevance** maxim scores and that of **Manner** maxim scores is not very strong, only slightly tendentious, $r_s = .470$, but the results are strongly significant, with a value of $p < .005$, suggesting that the effect of mentalization in these cases is strong in the handling of these two maxims.

In fact, the maxim of Relevance seems to show tendentious correlation with all three other maxims scores, which may support the hypothesis of Sperber and Wilson (1986) on the maxim of Relevance being a super maxim, integrating the other three, given that no matter what exactly triggers an implicature (violations of quantity, quality or manner norms), each is eventually resolved by the guideline of Relevance: what did the speaker intend to say with this „strange", unusual utterance violating our standard expectations? Because the ultimate expectation of the hearer is that the speaker is cooperative, they suppose the speaker will stick to the topic somehow and say what they choose to say deliberately, conforming to the cooperative principle. In this view Relevance is the ultimate guideline that the hearer resorts to in such cases. Thus, the hearer relies on the maxim of Relevance to some extent in all of these cases of implicatures, no matter what type of violation took place (one based on informativeness thus quantity; or truthfulness issues related to the violation of quality maxim, or clarity issues and manner relating to the infringement of the quality of the maxim of manner.

10. Bird's eye view on cognitive development - Correlations among the different aspects of pragmatic competence

In order to be able to position the place and order of the maxims within the trajectory of pragmatic development, it is important to determine the correlations between the maxim tasks (focusing on the ability to identify violations and engage in inferential processes) and the rest

of the linguistic tasks measuring different aspects of pragmatic competence in the present study, namely simile, metaphor, irony, and humor interpretation abilities.

10.1. Relevance and contextual humor processing

A correlation was found between **contextual humor** (i.e. story-based jokes ending with a punch-line) and the recognition of the maxim of **Relevance** scores: a tendentious correlation of $r_s = .620$ with a significance of $p < .001$ demonstrates that similar cognitive processes lie at the core of the comprehension of both. As expected, on the basis of the cognitive pragmatic approach outlined in the present investigation, children rely on relevance when drawing inferences during joke processing.

10.2. Relevance and contextual metaphor comprehension

There is also a slight tendentious correlation between the maxim of **Relevance** scores and that of **contextual metaphor** results, $r_s = .540$; $p < .001$ suggesting that the same cognitive processes, i.e. mentalization based inferential activity is in the background of meaning-construction processes in these two trials. This is not at all surprising, given that we hypothesize a mentalization based inferential activity, the backbone of which is Relevance, to be responsible for pragmatic meaning construction obviously present in idiomaticity, such as metaphor, and ambiguity based utterances exemplified by jokes.

Correlations were not pronounced but around the required 0,6 value only in these 2 cases, which suggests that the ability to follow the Gricean maxims, thus be cooperative in conversation, detect implicatures and to compute inferences actually takes place in the period when these two abilities are also in the process of maturation: that is, during the late phases of the mastering of metaphorical meaning construction (see Fig. 24) when even contextual factors are flexibly coordinated, and due to the above described correlation with contextual humor (jokes), during the late phases of humor development in parallel.

This practically provides us with clues where the period of mastering conversational maxims and the Gricean guidelines of conversations take their place on the continuum of the development of pragmatic competence, bearing in mind, that there is a great variability among the children in achieving the maxim infringement-related cognitive milestones, depending on their social environment, number of siblings, personality traits (extroverted vs. introverted

personality type), etc. That is, the pragmatic competence of children related to the smooth coordination of discourse, to being able to abide by the maxim of the Gricean cooperative principle, is rather scattered within the trajectory pragmatic development, mainly appearing in the realms of late phases of metaphor and late phases of humor comprehension abilities. See Fig. 30. for the pyramid including integrated results of maxim tasks.

Since Relevance scores were most pronounced in having a correlation with the contextual metaphor and contextual humor processing abilities, the closest of the maxims to these two factors is Relevance, and since Relevance is in correlation with all the other 3 maxims, they come along with Relevance and seem to be rather scattered in that part of the pyramid where relevance anchored them.

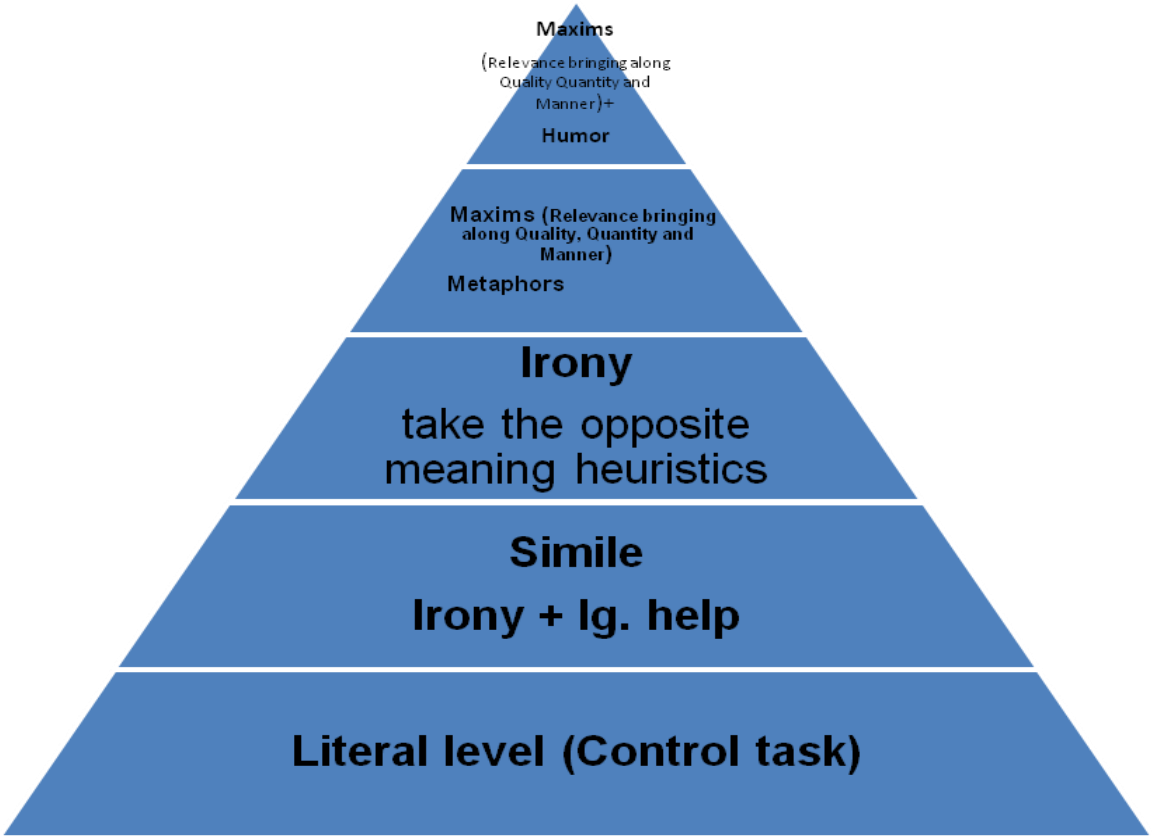


Figure 30.

Entire trajectory of pragmatic development incorporating conversational skills of preschool children

The pyramid of the continuum of pragmatic development in view of the maxim scores below provides a unified framework in which the relative difficulty of one pragmatic phenomenon in respect to the other can be explained. The pyramid below shows the entire continuum of pragmatic development encompassing the developmental trajectory from semantic (Simile,

Irony control) through polysemous (metaphor, irony, humor) and eventually discourse organizational pragmatic abilities entailing conversational skills of preschool children (maxim infringement recognition tasks).

10.3. Completing the continuum with the maxims

To get a more fine-cut picture of the order of the maxims in stabilization, and their order within the range identified on top the above pyramid, it is useful to carry out another calculation relating to the mean values of the orders of the maxims across the two groups. As for the exact order of the stabilization of the maxims in preschool years it is hard to draw unanimous conclusions, given that the change of the order of the maxims does not seem to follow some general cognitive principle, but seems to be varied and diversified in the two groups, as noted above, displaying a rather miscellaneous, gradual, circling developmental pattern. If we score the placement of the maxims, ranging from the most difficult (ranking 4) to the easiest one (ranking 1 in order), then, based on these general values, the ranks are the following integrating the order in both groups:

In the NoToM group Quantity (4), Manner (3), Relevance (2) and Quality (1); in the ToM group Quantity (4) Quality (3) Manner (2) Relevance (1) (see also Figures 28, 29).

This gives us mean scores to work with in trying to determine the order of stabilization of the maxims across groups:

Quantity maxim: ranking (4,4) average: 4
Quality maxim: ranking (1,3) average: 2
Relevance maxim: ranking (2,1) average: 1,5
Manner maxim: ranking (3,2) average: 2,5

This gives us a trajectory of general mean order of the following order, from easiest to most difficult one to master in general, across groups: Relevance > Quality > Manner > Quantity (Fig. 31)

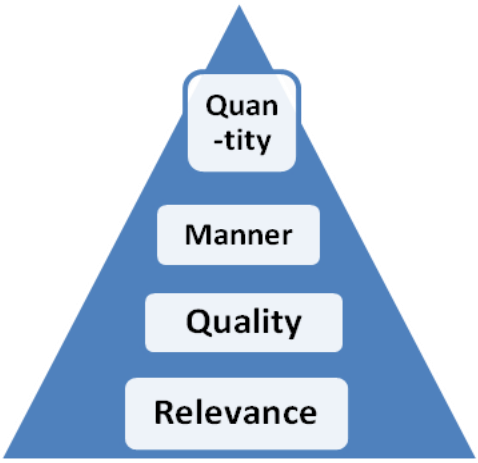


Figure 31.

The developmental trajectory in the mastering of the maxims in preschool years

This order is an approximate generalization integrating the placements of both groups separately, also indicating the cognitive effort children need in order to come to grips with each maxim in development. The above delineated results are in line with the findings on children's universal difficulty in the acquisition of quantifiers (Papafragou-Musolino 2003, Musolino-Lidz 2006, Noveck-Reboul 2008), as this comes last even in this integrated paradigm.

This also means that Fig. 31. completes the general continuum of pragmatic development, where maxims are sporadically placed in their region of acquisition (in the stages of contextual metaphor and of contextual humor respectively) in the order stipulated by Fig. 31. Integrating this order yields the following trajectory below (Fig. 32).

Thus we get a more detailed picture of 'Relevance bringing along the other three maxims" in that the order of these three integrating the results of both groups is Quality as second in acquisition, Manner being third in order and eventually that of Quantity, which has been demonstrated to get stabilized only in school years (Papafragou – Musolino 2003, Musolino-Lidz 2006, Eskritt – Whalen – Lee, 2008 Noveck-Reboul 2008).

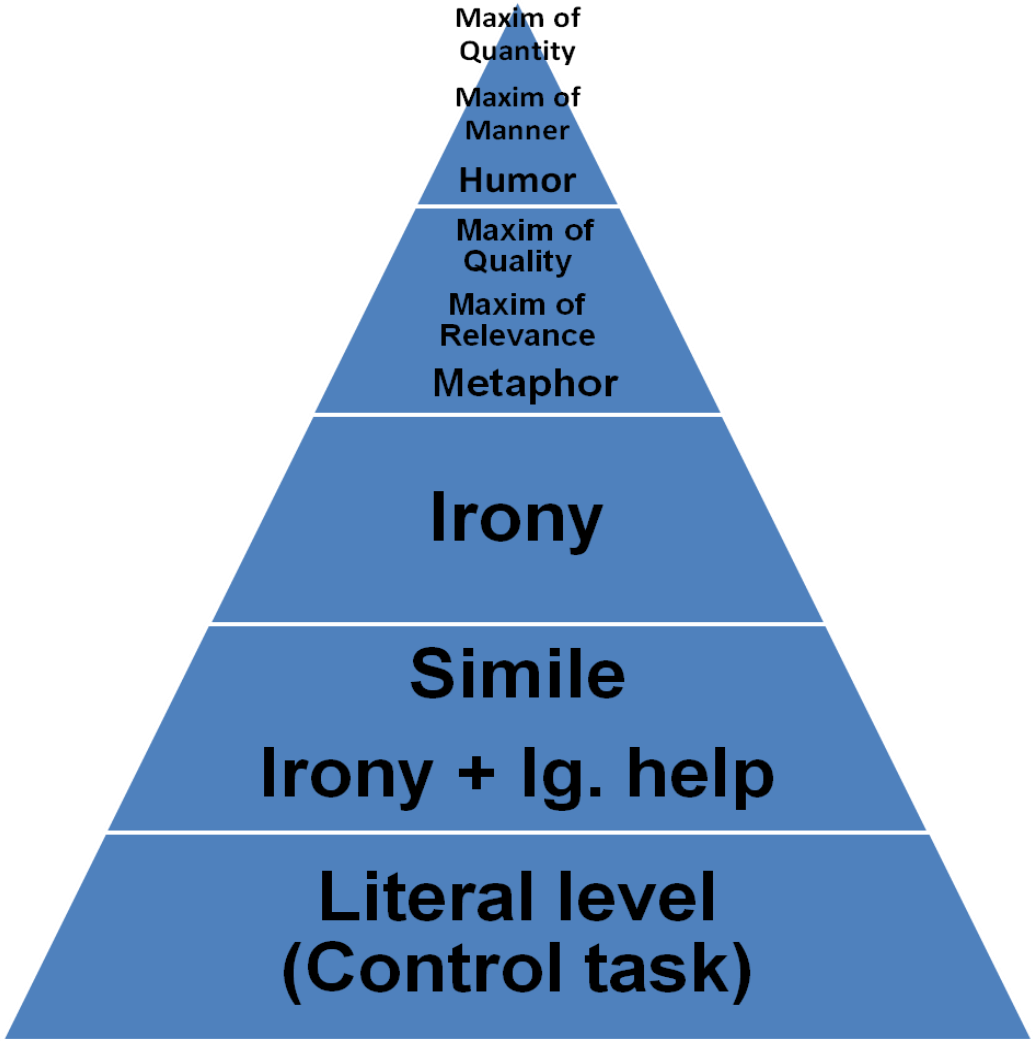


Fig 32.

The entire continuum of the development of pragmatic competence incorporating the suggested order of acquisition of the maxims

This may also suggest that factors important in metaphor understanding like binary mappings, entailments between the components of the source- and the target domain (Lakoff-Johnson 1980, Kövecses 2002), drawing analogies and striving for optimal relevance in identifying the true nature of entailments are in association with cognitive factors playing a central role in coming to grips with infringements of the maxims of Quality and Relevance; and cognitive factors crucial in the flexible and productive handling of humor, its processing and its productive use are in association with abilities responsible for the recognition of the infringement of maxims of Manner and eventually Quantity.

This is all the more probable because verbal humor too, as demonstrated in the present research, is well known to be stabilized in school years, when, children eventually become

productive in generating, handling and processing humorous utterances in the course of interactive and dynamic interaction. This is largely in harmony with the stabilization of quantifiers and thus the recognition of the infringement of the Quantity maxim in school years, after the preschool period. The delineation and detailed description of this process is however, beyond the scope of the present paper, which set out to examine and explain the different social-cognitive and pragmatic aspects of language acquisition in preschool years. Further research is needed to clarify the exact course of development of these aspects of pragmatic competence.

11. The case of irony, metaphor and the maxims - Testing the Brown and Levinson principle: Irony and metaphor as a case for the infringement of the maxim of Quality

There are some correlations in the present research that were expected but not found, and these concern the issue of irony and metaphor as a sub-category of the infringement of the maxim of quality, and that of quantity. The influential theory of Brown and Levinson (1978) claim that metaphor and irony are violations of the maxim of quality, given that in these we fail to conform to the following guidelines prescribed by the maxim of quality:

'Do not say what you believe to be false' and 'Do not say that for which you lack adequate evidence'. In the case of metaphor it is clear how this may happen: when we say „Theresa is an icicle" we obviously say something that is literally false, and this triggers an inferential process in the listener, to find the intended meaning (Theresa is too cold and reserved as for personality, i.e. she is obviously not a great company).

Irony violates the maxim of quality with its controversial nature: it states the opposite of what the speaker means (see our irony tasks in Appendix). By saying „you are a great friend" with an ironic intonation, after a conflict with our friend, we obviously mean the opposite, and we fall back on irony so as to blunt the edge of the utterance, thus make it socially more acceptable, and to save face in conversation. Therefore, the sentence meaning (Grice 1975) „You are a great friend" conveys the speaker's meaning „You are not a great friend" obviously poses a striking ambiguity, where the intended meaning is exactly the opposite of what is said, therefore, it may be seen as one violating the maxim of Quality.

However, according to the results in the present thesis, no significant correlation was found between the results of the irony and metaphor tasks and the scores of the maxim of Quality infringement. This suggests that, although linguistically and in logical terms they may share certain features, they do not exactly overlap in development, at least in cognitive and

acquisition terms, although the found correlations between contextual metaphor and Relevance obviously bring metaphor and Quality maxim acquisition to more-or-less the same stage. But these two specifically do not seem to correlate.

By testing the Quality maxim infringement abilities separately from the development of metaphor and irony, we can test Bown and Levinson's theory on this interrelatedness, which is most reasonable and logical, but has been challenged by views that do not agree with their categories (Ruth-Kempson 1975, Harnish 1976, Gazdar 1979), who claim that metaphor and irony are both (among other tropes and figures) infringements of the maxim of Quantity (Lausberg 1973/1998, Nemesi 2009, 2010, 2013) rather than that of Quality as claimed by Brown -Levinson (1978). In the results however, no significant correlations were found between the scores of the Quantity maxim tasks and the irony and metaphor task results either, so in this sense their theory is not supported either experimentally.

Brown and Levinson themselves state that several open metaphors violate the maxim of Quantity *or* Quality (Brown – Levinson 1978: 230, 1987: 225, Nemesi 2009). Others suggest a different matrix of maxims (Kempson 1975, Gazdar 1979), just like the also widely known and by now canonical theory of Sperber and Wilson (1986) claiming that all maxims can be integrated into the maxim of Relevance, therefore there is no point in selecting one or the other maxim. The present investigation and its methodology is guided by the Gricean framework, therefore, the four maxims of the cooperative principle (1975) are tested in an attempt to clarify the picture in the Gricean paradigm, keeping an eye on contemporary theories of post- and neo-Gricean pragmatics and Sperber and Wilson's revolutionary thoughts as well.

Levinson himself claims that "*the recognition of the flouting of the maxim of quality is not sufficient for the identification of the rhetoric figures"* (Levinson 1983: 157); that is, to identify if we have an irony, *or* a metaphor, *or* a tautology *or* an oxymoron at hand. Furthermore, Grice further clarifies the concept of irony in his Further Notes (the continuation of his work entitled Logic and Conversation, Grice 1978), and points out that irony involves an ever present negative (critical, despising, offending, often hostile) affective, evaluative attitude expressing intention. It remains a question how we distinguish all the figures of speech that are believed to belong to the infringement of the maxim of Quality, that is, how we distinguish and identify metaphor from irony, from hyperbole, from litotes, etc, if (and given, that) all of these stem from some form of the infringement of the maxim of Quality. For this reason, Levinson claims, large-scale, broad-category investigations are not sufficient for the clarification of issues of processing, cognition and understanding of conversational

pragmatic phenomena. As he points out: a more fine-cut, detailed view is necessary for the understanding of the complex nature of non-compositional interpretation (Levinson 1983), and others also share this view (Leezenberg 1995), as discussed by Nemesi (2009, 2010, 2013).

The present study tried to contribute to this goal and enrich this line of research with an aim to create a fine-cut picture of the development of cognitive pragmatic strategies.

The processes involved in pragmatic meaning construction, and the different realms of pragmatic competence whether polysemy based-, idiomaticity- or discourse coherence motivated, of course may overlap, since there may be a number of different cases where we fail to observe the maxims. The investigation of irony in the present study focused on the most common type of infringements of particular conversational implicatures, since they represent a fruitful ground for the investigation of inferential activity and its cognitive developmental corollaries.

11.1. Irony results and their corollaries: in support of Leech's irony principle

One of the central figures of irony research, Leech (1983) has completed the paradigm of the Gricean cooperative principle and elaborated on the pragmatics of politeness, within which he hypothesizes a principle of irony not as a subordinate entity but as a principle on its own. This approach sees figures of speech, among them irony, as having a pro-social function, coordinating discourse in a way so that it can be smooth and cooperative, enabling speakers to avoid or diminish conflicts. In this sense irony is a tool to convey thoughts that would be offensive or unpleasant regarding the listener. Politeness allows us to avoid such utterances, while irony is needed when these remarks or thoughts are inevitable, and thus enables the speaker to convey these in a form that is polite on the surface, making it more acceptable for the listener.

Therefore, the use of irony makes utterances less insulting, more cooperative and respectful towards the listener, blunting the edge of unpleasant remarks, functioning as a kind of face-saving strategy. It is a tool to avoid direct and explicit confrontation, where intended meaning is conveyed indirectly in implicatures, honest opinion is expressed in a fancy packaging, leaving it up to the listener to unwrap the message, thus placing the responsibility of anchoring the meaning on the other person. In Leech's view irony represents a higher order discourse strategy, in that it is characterized by a higher level of indirectness, and a weaker

illocutionary force. Honest (impolite) opinion is conveyed indirectly in implicatures (false honesty), manifesting itself at a higher, metarepresentational level for which metarepresentation, also known as mentalization (ToM) is needed.

This double-wrapped, overtly indirect nature makes irony a specific cognitive strategy, and thus a relevant point of investigation in terms of mental abilities, language use and cognition. The present research therefore, in line with this approach, investigates irony *together with, but separately from* the Gricean maxims, and next to, but not within the category of the infringement of the maxim of Quality. The results of the present study back up this view on the pragmatics of irony: it does not seem to be connected to any of the maxims in particular, all the more, it stands out as a separate principle of its own, and does not seem to be a subordinate entity in the continuum of non-compositionality, as reflected by irony results (see Fig. 23, 24, 25).

12. Odd one outs in the overall pattern of pragmatic development

12.1. Breaking the pattern – Relevance and Riddles

On the graph showing the overall results of all the 16 linguistic tasks measuring pragmatic competence (Figure 24, but presented here again as Figure 33 for convenience), the maxim of **Relevance** (number 15) result does not follow the overall pattern as closely as in the rest of the tasks in the graph, thus breaking the alignment which characterizes the parallel development of the two groups in pragmatic development.

This is possibly due to the fact that Relevance, as we detailed it in the Mann Whitney result analysis, is a focused cognitive achievement for those in the theory of mind group, since it is under development at that stage, and thus promoted in use and in thinking. Therefore, their Relevance scores actually spur out of the pattern, which may designate intensity of development, as hypothesized by the cognitive congruence principle underlining salience of novel cognitive representations in children's mental operations and cognitive performance.

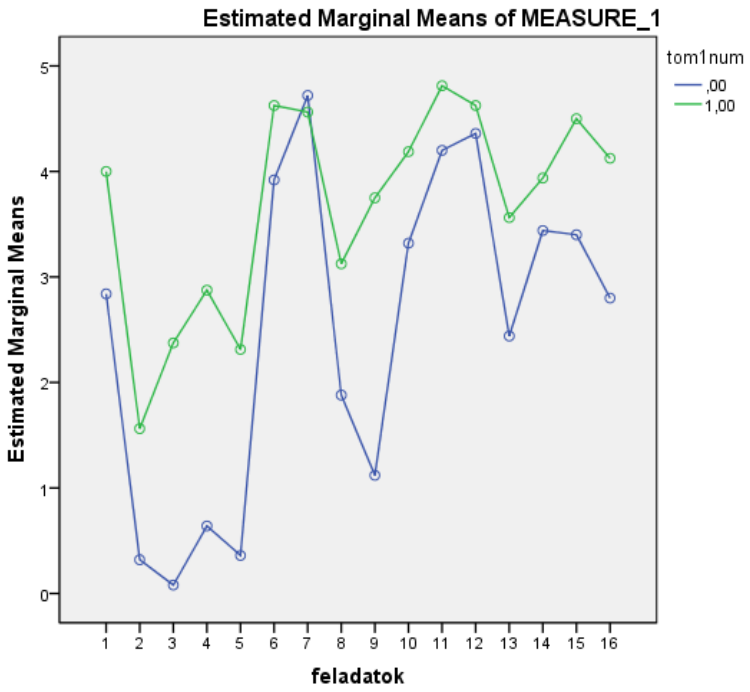


Figure 24/33

Synopsis of results in one chart – Bird's eye view on pragmatic development

Lower line: NoToM group, Upper line: ToM group.

1 - Eyes test	**9. Contextual METAPHOR**
2. Decontextualized HUMOUR (One-liners)	**10. IRONY**
3. Decontextualized HUMOUR (Riddles)	**11. IRONY with linguistic help**
4. Contextual HUMOUR (jokes ending in punch line)	**12. CONTROL task in irony condition**
5. Non verbal HUMOUR (visual) (NV)	**13. MAXIM of Quantity**
6. Decontextualized SIMILE	**14. MAXIM of Quality**
7. Contextual SIMILE	**15. MAXIM of Relevance**
8. Decontextualized METAPHOR	**16. MAXIM of Manner**

12.2. Riddles breaking the pattern of overall cognitive development

In the graph, number 3, the Riddles task in the Humor condition also seem to break the otherwise fairly parallel pattern of pragmatic development. The overall chart shows that the performance of the NoToM and the ToM group significantly differs in the Riddle condition, as supported by the Mann Whitney analysis: U=3, p< .001; r=0,91. In the discussion of the

results the decontextualized humor tasks, namely, the one-liners and the riddles were put together for efficient analysis of the effect of context in pragmatic meaning construction. Looking at them closely, however, it seems that while the ToM group is better at riddles than at one-liners, the NoToM group shows the opposite: their one-liner scores are higher than the riddle scores.

Mean rank of the NoToM group for Riddles is 13,12, while for the ToM group it is 33,31; $p < .001$; suggesting that there is a significant difference in the performance of the two groups in this task. Theory of mind apparently aids the children in the ToM group when interpreting riddles, but those in short of a reliable ToM skill as the children in the NoToM group fall short in interpretation, and are considerably less successful in this trial.

Looking at the two forms of decontextualized humor tasks separately, it seems reasonable to suppose that riddles, being questions, and therefore even more indirect in presenting the content of the utterance, are harder for the NoToM group because beside being ambiguous, they also have a salient form of presentation, the question form, where not only idiomaticity and ambiguity based inferences are necessary, but also a degree of indirectness is involved in interpretation. The form-function contrast needs to be handled by the interpreting child: this is not only not a real question to be answered, but it actually entails an incongruity based implicature that needs to be deciphered inferentially. Hence the fact that the inference is served in the form of a question further enhances cognitive load and diminishes chances of success in interpretation without theory of mind to rely on. Questions also call to life the conversational and Gricean strategies of indirectness.

Riddles, a type of non conventional indirect question (that is, not as easily interpreted as a basic conventional indirect question like ‘could you hand me the salt?’), represent a complex (non-conventional) indirect utterance where its inherent ambiguity further complicates interpreting processes. The ToM group, already able to rely on mentalization skills, handle non conventional, indirect requests i.e. not frequently heard questions better, and it takes less effort from their side to interpret riddles, since they can, due to efficient mentalization skills, focus on the resolution of incongruity which eventually results in laughter. The indirect nature and the inherent question form in riddles call for a more complex coordination of discourse which delegates the question of their interpretation to a late phase of pragmatic development where in the framework of the Cooperative Principle (CP, Grice 1975) inferences are drawn not only in content (instance of humor where incongruity needs to be deciphered) but also in form (a question with an unusual function: not expecting a conventional answer).

13. Effect of age in the successful recognition of maxim infringements

The maxim of **Quantity** shows a slight tendentious correlation with age, $r_s = .431$; $p < .005$, suggesting that the skills of rejecting utterances that are too long or not informative enough slightly develop with age; and the significance value shows that the results are significant, that is, highly reliable, as supported by several studies on the same phenomenon (Papfragou-Musolino 2003, Noveck 2001, Musolino-Lidz 2006, Noveck-Reboul 2008).

As the results in the graphs on maxim infringement (Fig. 27) also show, the maxim of **Quality** infringement recognition does not strongly follow age: that is, getting older does not necessarily mean they get better in the recognition of Quality maxim infringements: $r_s = .398$, $p < .001$. As we have shown the ToM group was not the most successful in the Quality maxim task, compared to the other maxim tasks.

The recognition of the infringement of the maxim of **Relevance** also shows a tendentious correlation with age, somewhat bigger than in the case of the maxim of Quantity: $r_s = .587$, $p < .001$, suggesting that the results are significant and strong, and that the ability to handle Relevance maxim infringements, i.e. reject unrelated answers and stick to the topic at hand increases as children get older.

Finally, the infringement of the maxim of **Manner** shows the biggest correlation with age: $r_s = .635$, $p < .001$, suggesting that the results are strong and significant, and that the maxim of Manner is the most affected by age: the ability to reject unclear, ambiguous responses, to compute an inference in order to resolve the infringement generated implicature, to stay brief and orderly in a conversation are most strongly based on factors that come with age: social experience based acquisition of interpersonal rules of language, politeness, being required with adults whereas with peers a more informal tone is adequate, etc. These pragmatic skills seem to correlate with the amount of children's social experience, and socialization. In other words, as children get older, they master formal, stylistic and social norms and increasingly abide by the norms that are most pronounced in the case of the maxim of Manner, where infringement actually concerns the form of the utterance, i.e. *how* something is said, rather than its content: *what* is said exactly.

14. Neuropragmatics and Development: basic pillars of investigation

As Bucciarelli-Colle-Bara point out (2003) in their experimental pragmatic investigation of the different forms of non-compositional constructions ranging from direct to different forms of indirect, deceitful and ironic utterances, beyond the theoretical goals to explain the cognitive background of such linguistic phenomena, the need to study the pragmatic aspects of meaning construction is enhanced by our ignorance about both the emergence of communicative abilities in atypically developing children, and by the decay of communicative performance under *pathological* conditions (i.e. in schizophrenia, autism, to mention just the most researched neuropsychological disorders and their apparent difficulty in pragmatic abilities, see Varga et al. 2010, 2011, 2013a,b, 2014, Schnell et al. in press). Atypically developing children show different deficits in the comprehension and production of communicative acts, depending on their type of cerebral pathology. The same is true for the decay due to traumatic impairments (children with head injury), and for cases of autism (Bara et al. 1999, Surian-Baron-Cohen-Van der Lely 1996).

As the authors point out, it is hard to understand the deficits when one does not know the normal development. Therefore, the investigation of typically developing children and the understanding of the unfolding of the different levels of pragmatic competence enables us to see the gradation of this skill in typical conditions, giving a point of reference to work with when identifying the severity of the disorders and their correlated pragmatic dysfunctions.

It is important to note, however, as Annette Karmiloff-Smith (Karmiloff-Smith – Karmiloff 2002) points out, that we shall not treat the pathological brain and its cognitive - linguistic operation as clear evidence of some aspects of pragmatic competence being dependent on the brain area or function affected by the neuropsychiatric disorder or the damage itself, since in the view of progressive modularization, atypical neurocognitive development may result in a brain organization different from normal, like in the typical case of Williams syndrome (Tager-Flusberg – Sullivan 2000, Babarczy-Szamarasz 2006), where language is not localized in the conventional Broca area, due to some compensatory route during brain development. Therefore, the issue of using one or the other perspective, as evidential background, is a rather over-generalized attempt, which should be cautiously treated. This, however does not defy the importance of developmental approaches centering on typically developing children in providing specific patterns of cognitive and linguistic competencies not present in pathological cases like Autism Spectrum Disorder (ASD) or schizophrenia (Varga et al, 2013a,b, 2014) and vice-versa.

14.1. Tradition in innovation: parallelism in development and pathology

The parallel investigation of language disorders and language development is not a novel idea: one of the very first scholars to call the attention to the potential connection between child language development and language pathology errors was Jakobson (1941) in his work entitled Child language, aphasia and phonological universals (partly published in Hungarian in Jakobson 1969, see Bánréti 2014). In this he pointed out the striking similarities between child language errors (which being temporal, are not considered disorders, but natural occurrences in development), and partial language loss in aphasia (the features of which are however, considered a deficiency, since they are acquired, and not emerge due to the natural course of language development).

In this work Jakobson delineates the similarities among child language errors and aphasic patients' language errors, and underlines the supposed hierarchy of phonologically distinguishing traits: in aphasia the first features of language that are lost are the most salient features (e.g. inflections), while the child acquires these in one of the latest phases of language acquisition; in other words, the order of attrition is the reverse of the order of acquisition. This view is known as the regression hypothesis (Keijzer 2010).

Although Jakobson introduces this idea in terms of the phonological system of language, he also extended it to apply to other components and layers of language: namely that of syntax and semantics: if any component is secondary (any part of the sentence, verb class, case or word class) to another component of a language in the same category (another word class, case or verb class, part of sentence), then it appears later in child language acquisition, and (dis)appears earlier in aphasia i.e. language pathology, than the primary component. This inversely proportional relationship applies to all language components, he claims. He also names a universal feature of this phenomenon: in no language can we find the secondary components without their primary counterparts.

After its appearance this hypothesis received little attention, but today we see the renaissance of research on language and cognition, especially due to high-tech neuroimaging methods, making it a timely issue, although far from being undisputed. So far neither aphasia research, nor language development studies managed to provide evidence fully in support of this Jakobsonian view on the regression hypothesis, although there are in fact studies that tried to test the gist of the idea: (Keijzer 2010) and found some evidence, though mostly in the morphological domain.

The hypothesis indisputably enriches research approaches with something very important: it truthfully mirrors the role of language in the quest to understand and map human cognition and in identifying the working mechanisms of the human mind. With this, it also shows the real task of linguistics in this challenge, which goes beyond the mere description of symptoms in language pathology and aphasia, and clearly points out the importance of mapping the mental background of such symptoms in explaining them, involving factors of human behavior where such symptoms are manifested. This makes Jakobson one of the founding figures of modern neurolinguistic inquiry, since he laid the foundations of an empirical explanatory framework, where research starts out from the cognitive mechanisms in the background of the linguistic system (Bánréti 2014).

The Jakobsonian thought has now grown into a tradition since its introduction in the 1940-ies. This approach sees language as a central pillar of human cognition, explains linguistic phenomena on the basis of underlying cognitive processes and mechanisms that concern both *developmental* issues (through what stages it evolves, and what the order and time of appearance of the stages are), and *pathology* (what consequences are there to a certain brain damage, what function is lost due to the lesion of that particular cortical area), that is, what function do these distinct brain regions correspond to in cognition and language use. These two approaches are still major pillars in today's cognitive linguistic research, and each has important paradigms, views and findings to offer for the other. In order to emphasize the advantages of the complementary nature of these two fields, the following section will delineate some neural evidence from psychiatric research on the relationship of mentalization and pragmatic competence in schizophrenia in general, and on irony, metaphor, humor comprehension and conversational maxim infringement skills in schizophrenia in particular.

14.2. Mentalization and social cognition as key factors in pragmatic processing

It is now well established that in communication, partners attend to each others' thoughts and thus interpret others' mental states through their mentalizing ability called theory of mind. The Gricean tradition therefore, due to novel technologies and technological advances in research have been proved at the neural level, showing that in fact, there are cortical regions that are responsible for the social-cognitive processes we rely on in discourse interpretation. The interrelated nature of mentalization and language use is critical in that linguistic code underdetermines speaker's meaning. That is, the structures, rules and frames create occasions

when some maxims are deliberately or accidentally infringed, hence possibly undermine the successful interpretation of the given utterance. In these cases theory of mind plays a crucial role in filling the gap (Spotorno et al. 2012), in identifying the intended meaning over the sentence meaning, and in choosing between competing meanings.

In the neuroscience of social cognition, understanding others' intentions has been demonstrated to activate a neural ToM network including the right and left temporal parietal junction (rTPJ, lTPJ), the medial prefrontal cortex (MPFC), and the precuneus (PC) (Varga et al. 2013a, Schnell et al. in press (Fig. 34, 35, 36, 37).

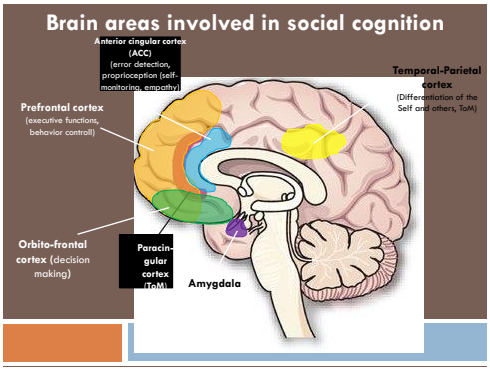


Figure 34.
Brain areas involved in social cognition

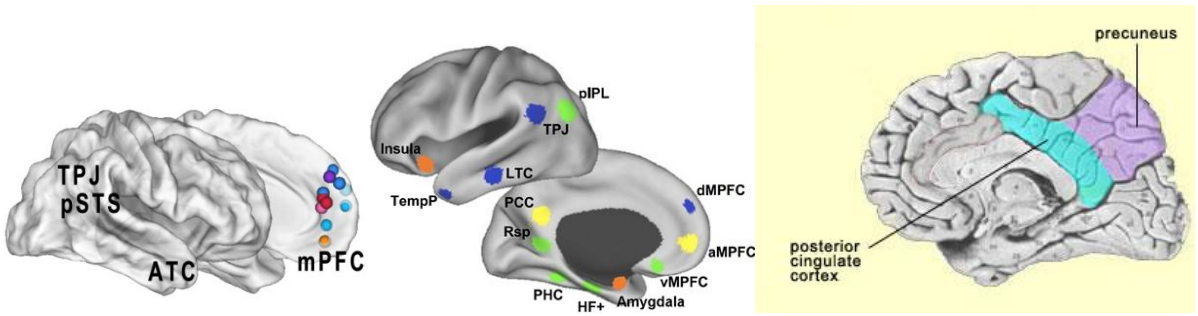


Fig. 35 36 and 37.
Main areas involved in mentalization
35. (MPFC, TPJ), 36. (MPFC, TPJ), and 37. precuneus

14.3. Irony processing in schizophrenia

Schizophrenic patients are known to be diagnosed with atypical Theory of Mind (ToM) mechanisms even during remission, which is believed to be responsible, or at least, to contribute to their deficit in discourse skills and thus pragmatic competence. Several studies reveal a connection between irony comprehension and ToM capacities in patients who have

difficulty in irony processing, which has been associated with their deficient mentalization skills. The crucial role of mentalization in irony processing has been shown in studies with healthy, normal adults as well (Spotorno et al. 2012).

Irony involves an implicit communicative intent, where the intended meaning is the opposite of what is explicitly expressed. In fact, irony is said to have only a pragmatic meaning, and no semantic one, that is, it cannot be interpreted in a semantic framework, only in pragmatic terms, through the deciphering of intentions behind the utterance. Thus its comprehension is not based on sheer linguistic input and on semantic and syntactic decoding, but heavily builds on the decoding of the speaker's non-linguistic *implicatures* through *inference* (Sperber - Wilson 1986, Sperber 2000, Sperber - Wilson 2002). The integration of social context (Sperber - Wilson 1986) is essential for irony comprehension so as to be able to represent the speaker's mind and to recognize that the actual intention expressed by the speaker is contrary to the literal meaning of the utterance at hand. This process yields the ironic (intended, i.e. pragmatic) meaning of the statement. Thus, irony understanding requires not only the correct interpretation of communicative intentions, but also the ability to construct a coherent narrative based on contradictory information.

15. Psychiatric evidence for mentalization-based pragmatic competence – A case for experimental neuropragmatics I.

Several studies claim that there is a strong and causal relationship between irony comprehension and Theory of Mind abilities in cognitive neuroscience (Frith- Frith 2007), in linguistic literature on pragmatics (Sperber-Wilson 1986, Happé, 1993), in schizophrenia (Varga et al. 2013a,b, 2014), and in healthy adult subjects (Spotorno et al. 2012). We investigated schizophrenic patients' pragmatic skills through their understanding of irony tasks, in view of their mentalization skills (Varga et al. 2013a).

15.1 Objective and hypotheses

Our study's purpose (Varga et al. 2013a) was to examine irony comprehension and the underlying brain activity in patients with schizophrenia during remission. We examined the neural correlates of irony understanding and its relations to their social-cognitive skills

(ToM), and we tested if surface cues (linguistic help inserted into the context phase) significantly enhanced irony comprehension.

15.2. Method and tasks

The subjects consisted of schizophrenic patients in remission and healthy controls. The subjects were subjected to event-related functional MRI scanning while performing a ToM task based on false belief test and three irony tasks: (1) irony (I) (2) irony with linguistic help (IH), and (3) control (C) tasks (the same as in the developmental study, see App. section 8.).

15.3. Results and discussion

15.3.1. Schizophrenic patients with mentalization deficit demonstrate difficulty in irony processing

Patients were significantly less successful in ToM tasks, confirming mentalization deficit views present in schizophrenia (for details on results see Varga et al. 2013a). As for the linguistic performance in pragmatic tasks, patients were significantly less successful in irony comprehension, as they performed significantly less accurately in the irony (I) condition, compared to healthy subjects. Schizophrenic patients showed considerably greater activity during the processing of the context phase of the irony task, than healthy subjects (see Fig. 38. panel A). In the processing of the ironic statement of the irony task brain areas show significantly greater activity in healthy subjects than in patients (Fig. 38. panel B).

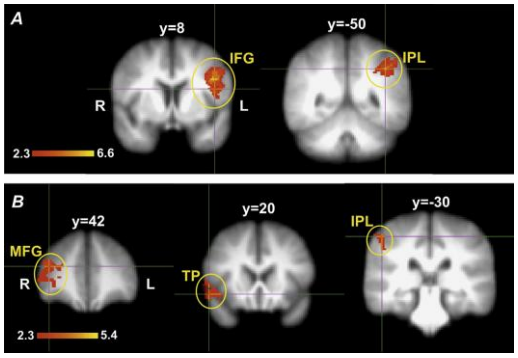


Fig. 38.

Re-presentation of results from (Varga et al. 2013a).

Panel A: Between-group comparison of the context phase of the irony task. Brain areas show significantly greater activity in schizophrenic patients than in healthy control subjects.
Panel B: Between-group comparison of the ironic statement phase of the irony task. Brain areas show significantly greater activity in healthy control subjects than in schizophrenic patients. L *left*, R right, IFG *inferior frontal gyrus*, IPL *inferior parietal lobule*, MFG *middle frontal gyrus*, TP *temporal pole*.

Source: Varga et al. (2013a)

Another important finding is that the control group and the patient group activated different brain regions during the processing of the irony tasks. The control group presented activations mainly in Theory of Mind related brain areas and in regions associated with non-literal language processing, while patients activated regions associated with semantic and auditory processing. The fMRI data analysis revealed that the two groups had markedly different brain activation patterns.

As we pointed out earlier, the integration of social context (Sperber - Wilson 1986) is essential for irony comprehension so as to be able to represent the speaker's mind and to recognize that the actual intention expressed by the speaker is contrary to the literal meaning of the utterance at hand. Our results show, that during processing of the social context of the irony tasks, the control group activated the TPJ (reaching also the precuneus) (see Fig. 39), while schizophrenic patients activated a more widespread brain network including not only the TPJ/precuneus, but also several frontal, temporal, as well as parietal brain regions (Fig 40).

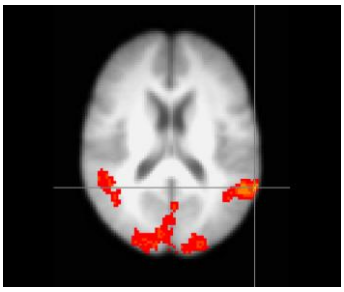


Figure 39.

Healthy subjects' within group activations during the processing of the (social) context of the irony task

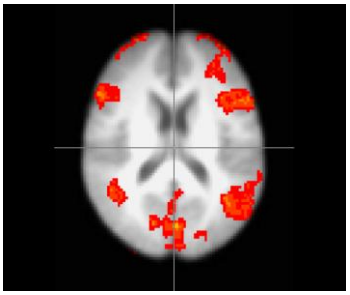


Figure 40.

Patients' within group activations during the processing of the (social) context of the irony task

Moreover, during the context phase of the irony task the activations of the patients group differed significantly from the activations of the control group (Fig 38. panel A), proving the existing alteration/impairment of the processing of the social context by schizophrenic patients.

A further important finding is that of linguistic surface cues and their effect on pragmatic, holistic meaning construction: as a results of the insertion of a short linguistic help, which rendered the speaker's mental state explicit (hence unfolding implicatures), patients responded significantly more accurately in the irony trials, which enhanced their irony comprehension, and the statistically significant differences between the patients' and the healthy controls' groups disappeared.

Moreover, due to the linguistic help, there were no significant differences in the functional MRI data between the groups, and surface cues evoked similar activation pattern in the schizophrenic group to healthy controls in both the context phase and in the ironic statement phase. Fig. 41. below shows activations in the schizophrenic group during the ironic statement phase of the irony with linguistic help tasks, while Fig. 42. shows brain activations in the control group during the ironic statement phase of the irony with linguistic help task.

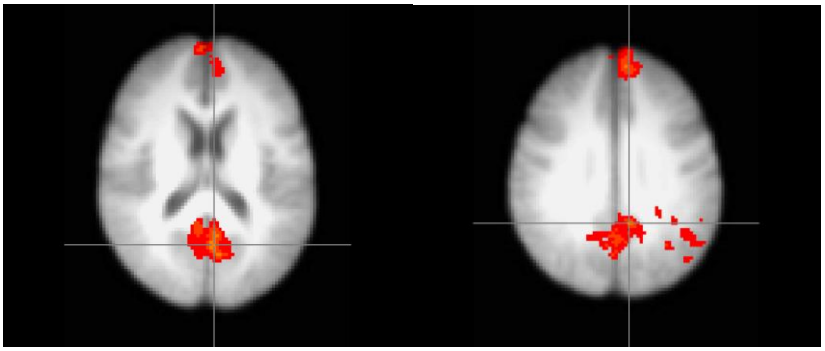


Fig. 41 and Fig. 42.

Within-group activations of schizophrenic patients during the ironic statement phase of the irony with linguistic help tasks (Fig.41), and within-group activations of the control subjects during the ironic statement phase of the irony with linguistic help task (Fig. 42).

Also, due to the insertion of the linguistic help, patients' activation patterns became similar to that of healthy subjects, activating the ToM network, including the precuneus. When using such surface cues in the social context, patients engaged two key regions of the ToM network: the anterior MPFC (BA 10) and the PCC/precuneus, which activations reflect an actual mentalizing function (see Fig. 41).

The study therefore, also calls the attention to some interesting implications on the facilitating effects of linguistic help. This surface cue actually activated mentalizing circuits of patients and enhanced successful decoding, since the implicit content, i.e. the speaker's mental state and intention was made explicit, in comparison to the control task, which did not involve interpersonal settings and thus genuine mentalization in interpretation.

16. Compensatory effect of general cognitive skills in holistic meaning construction – A case for experimental neuropragmatics II.

As the above study (Varga et al. 2013a) showed the importance of general cognitive mechanisms in a holistic interpretation in that linguistic cues enhance successful interpretation of ironic utterances, a further study (Varga et al. 2014) on the compensatory effect of general cognitive skills on non-literal language processing in schizophrenia examined the effect of good general intelligence on non-literal language comprehension.

16.1. Objective and hypotheses

Studies show that patients with schizophrenia have problems understanding non-literal language, presumably due to theory of mind (ToM) dysfunction, while literal language processing apparently remains intact in these patients. Furthermore, studies about the influence of general intelligence on non-literal language processing show incongruent results in schizophrenia. In the present study, our aim was to identify the influence of good intellectual skills (i.e. good neurocognitive skills in general) on non-literal language comprehension in schizophrenia.

16.2. Method and tasks

19 patients with schizophrenia and 19 healthy controls completed linguistics tasks measuring the different aspects of pragmatic competence in the form of an interview, including conventional and unconventional metaphor, irony, Gricean implicatures, control implicatures and semantic tasks as control tasks (see App. section 8.). In the case of the Gricean implicatures, the comprehension of the linguistic incongruity of the utterance and also the comprehension of the intended meaning of the speaker was examined separately. To explore the effect of IQ on non-literal language comprehension, we divided the schizophrenia group into a lower-IQ (IQ≤106) and a higher-IQ (IQ>106) subgroup by making a median split (median IQ=106).

The answers were scored from 0 to 2. Zero (0) point was given when the answer was incorrect or when there was no answer. One point was given when the answer was correct after asking the experimenter for some help, in the form of clarifying questions. 2 points were given when the answer was correct without any help.

After each task, questions were asked about the figurative meaning of the non-compositional construction (metaphor, irony, etc.), serving as the target in the stories, focusing on the subject's reflections on the cognitive and interpretative mechanisms relied on.

In the maxim infringement condition, after each task the first question concerned the identification of the linguistic inappropriateness of the answers (called the linguistic part of the implicatures: e.g. 'Is this a strange utterance? Why is it strange to say something like this?'). This was followed by a ToM question related to the implicature: subjects were asked about the understanding of the intended meaning of the speaker's answer (called the ToM part of the implicatures: e.g. 'What did the speaker really mean by the utterance?').

The maxim infringement condition also contained control tasks based on simple dialogues, which did not include any violations of the maxims, thus did not require long chains of inferences to decipher implicatures.

The semantic control tasks were the same as in the developmental study, based on physical causality of non-living entities, contained no human agents and interpersonal, mental state-based implicatures, therefore, as hypothesized, for their interpretation, semantic processing suffices.

16.3. Results and discussion

Comparing patient group and control group, the results revealed that schizophrenic patients performed significantly less accurately than control subjects in the unconventional metaphor tasks, but no significant between group differences were observed in the conventional metaphor tasks and in the irony task. As expected, there were no significant differences found between the two examined groups in the control implicature tasks and in the semantic control tasks either.

As for the effect of general cognitive skills in non-compositional interpretation, our results showed that schizophrenics with lower-IQ were able to understand conventional metaphors presumably relying on their good semantic processing, while they were impaired in the comprehension of unconventional metaphors and irony. However, the higher-IQ schizophrenia subgroup was able to comprehend not only conventional metaphors, but also unconventional metaphors and irony, supposedly using IQ-dependent compensatory mechanisms (Győri et al. 2002).

Interestingly, both the lower- and the higher-IQ schizophrenia subgroups showed significant impairment in the comprehension of the question testing their mentalization skills (the ToM questions in the maxim condition) in the Gricean implicatures task; and the patients' IQ had no significant impact on the comprehension of such ToM questions.

In conclusion, the findings assume a possible compensatory effect of general cognitive skills on non-literal language processing in schizophrenia. We also argue for the importance of using more complex ToM tasks (like faux-pas tasks, which involve emotional factors and thus the activation of not only the cognitive but the affective aspects of theory of mind (Stone et al. 1998, Baron-Cohen et al. 1999) in order to detect the existing ToM deficit in schizophrenic patients with good cognitive skills.

Faux pas tasks are well suited to be used as complex tests on mentalization skills, since they are based on a situation in which the shared knowledge of the two conversational partners is crucial, in fact, the knowledge about what the other does not know seems to play a central role, similarly to the higher-level ability to detect lies and deception is context. In faux pas recognition tasks, after reading a story containing a faux pas, subjects are generally asked whether anyone from the story said anything that was awkward or that they shouldn't have said. An example of faux pas as taken from Baron-Cohen et al. (1999, 416.) is the following:

> James bought Richard a toy airplane for his birthday. A few months later, they were playing with it, and James accidentally dropped it. "Don't worry" said Richard, **I never liked it anyway. Someone gave it to me for my birthday.**
>
> *Question: What did James give Richard for his birthday? Did Richard remember James had given him the toy airplane for his birthday?*

Faux pas have been found to be more difficult in that those patients with schizophrenia who pass standard ToM tests actually fail faux pas recognition tasks (Varga et al 2008, Scherzer et al. 2012). This confirms the complexity of this task, where successful resolution may be due to compensatory effects of higher IQ scores or maybe higher emotional mentalizing abilities.

Further research is needed to see the exact nature of the interaction of these cognitive and affective aspects of mentalization is social-cognitive situations involved in pragmatic tasks that build on both cognitive and emotional factors in the coordination of linguistic behavior subserving social goals.

16.4. General discussion on the parallel nature of developmental and neuropragmatic investigations

When compared, the developmental and the pathological investigations in fact reveal results that seem to correlate and run in parallel, supporting the central role of theory of mind in non-compositional, pragmatic meaning construction, as in the case of irony processing in schizophrenia (Varga et al. 2013a), and in the effect of general cognitive skills on successful and effortless non-compositional interpretation (Varga et al. 2014).

16.4.1. Parallel findings in developmental and pathological approaches

In the first neuropragmatic study (based on Varga et al. 2013a), schizophrenic patients have been found to be impaired in the smooth handling and efficient processing of irony due to their mentalization deficit, while linguistic cues that make the speaker's mental state explicit, thus unfold the implicatures, were found to significantly improve patients' performance in irony comprehension tasks, and even modify brain activation patterns, making them similar to normal circuits. This proves the central role of ToM in irony comprehension.

The results of the second neuropragmatic study (Varga et al. 2014) are in line with the developmental studies' results and the emerging trajectory in that Gricean implicatures in fact constitute a more complex level of pragmatic competence, and performance in irony and metaphor is better than performance in implicatures tasks. Linguistic surface cues and their facilitating effect in pragmatic meaning construction also back up findings on the central role of general cognitive skills in interpretation, thus support the mentalizing model in which several factors contribute to the efficient and flexible process of pragmatic decoding.

In line with the developmental findings outlined in the present study, some studies in the neuropsychology of metaphor and irony processing (Langdon-Davies-Coltheart 2002, Langdon – Coltheart 2004) have found that metaphor understanding is easier than that of irony for schizophrenic patients. This may be due to the several types of ironies and metaphors existing, and due to methodological issues in testing material The study outlined above made use of not only conventional but also unconventional metaphors, the latter of which are known to be a core component of our long-term memory and of our mental lexicon (Lakoff-Johnson 1980). This may explain why their processing is largely supported by working memory, social conventions, familiarity effects in processing, as demonstrated in part 1 and 2 of the present dissertation. Familiarity and conventionality have long been known to be important factors in psycholinguistics, since they facilitate the retrieval of meanings in the mental lexicon. This effect has been demonstrated to play a significant role in the above study as well (Varga et al. 2014), suggesting that besides ToM, a number of cognitive skills play a role in the successful decoding of intended meanings in the course of communication. This finding is in harmony with observations in the developmental study highlighting the effect of social background, cultural norms and individuals' working memory capacity as emphasized in the case of the successful decoding of at least three pragmatic phenomena, namely, in humor processing and in the successful recognition of the maxims of manner and quantity.

These aspects, as it has been demonstrated in both the developmental and in the neuropragmatic findings, and as I pointed out in the discussion part of the humor processing- and of the maxim tasks, are not in place until the early school years, due to social, cultural factors that also play a role in the interactive process of interpretation, and due to general cognitive skills, like working memory capacity (Bucciarelli-Colle-Bara 2003, Musolino-Lidz 2006, Eskritt – Whalen – Lee 2008, Musolino-Lidz 2006). Therefore, in developmental studies it is reasonable to expect comparable results between children and older subjects only in school years, around ages 7-13. The same effect of social, cultural and general cognitive skills has been found in our 2014 study (Varga et al. 2014), confirming our developmental findings above.

This is also in line with the mentalistic model outlined in section 1 and experimentally backed up in section 2 of the present study, where a number of factors are believed to contribute to the fast and intuitive retrieval of intended meanings in the course communication, in which ToM is demonstrated to play a central role, and is thus seen as a core cognitive ability in the complex process of non-compositional meaning construction.

Furthermore, the findings related to the different results in conventional and non-conventional metaphor processing, and the disparities in results concerning the difficulty of irony compared to metaphor (Schnell-Varga 2012, Langdon-Davies-Coltheart 2002, Langdon-Coltheart 2004) may suggest that the continuum outlined in the present study in Figure 30 and 32 reflecting a gradation at an inter-modal level, namely, between literal (semantic) and non-literal (pragmatic) realms of meaning also applies to an intra-modal context: there is apparently a continuum within the realms of metaphor and irony too, just as outlined in the case of the maxims (see Fig. 30.), in line with Sperber and Wilson's idea (1986, Wilson 2013, Reboul-Moeschler 2000), and Giora's graded salience hypothesis (Giora 1997, 2002), where she argues for a salient/non-salient continuum in non-literal (also metaphor) interpretation. She claims that the salient (conventional, more frequent, more familiar) meaning of an utterance is activated faster and easier, and not necessarily the literal meaning. In the case of highly conventional metaphors whose salient meaning is figurative (such as the ones we used, e.g. *John is an elephant in a china store*), the salient meaning is activated prior to any other meaning (Blasko-Connine 1993, Gibbs 1990, McGlone-Glucksberg-Cacciari 1994).

In a study (Giora - Fein, 1999) researchers observed that in the processing of less familiar metaphors, which have only one salient meaning: the literal one, only this salient, literal meaning was activated in both the literally and the metaphorically biased context. This

confirms the priority of salience in interpretation (Giora 1997), in that not necessarily the literal but the more salient meaning is easier to access. Thus, the interpretation of the salient figurative meaning of highly conventional metaphors as the ones we used, is less demanding in cognitive terms. On the other hand, the interpretation of an unconventional metaphor, since its decoding is not facilitated by social and cultural factors and working memory advantages due to its familiarity, is more difficult, thus it seems to require more cognitive effort from the side of the interpreter (Giora - Fein 1999). In view of all this, it is clear that understanding an unconventional metaphor is more demanding than understanding a conventional metaphor, since its comprehension requires distinct processes of selection between competing meanings, a selective coordination of implicatures and a construction of ad hoc concepts more strongly (as in the blending theory of Fauconnier–Turner 1998, Coulson-Oakley 2000, Wilson-Carston 2006) than in the case of conventional, or even dead metaphors, or ultimately, of irony based on contradictory frames. On the other hand, according to the classical pragmatic theories (Sperber-Wilson 1986, Happé 1993, Wilson-Carston 2006) when interpreting metaphors the intention of the speaker has to be recognized in all cases in order to be able to decode the implied meaning.

16.5. Some corollaries of the neuropsychiatric findings, and their implications to developmental- and neuropragmatic findings

The continuum outlined in the present study, as already pointed out, gives a relative framework of cognitive complexity within pragmatic aspects of language use, in view of the effort required in mentalization for their successful processing. In other words, the stages in the continuum (see Fig. 30, 32) mirror the cognitive effort based on mentalization which is needed for the deciphering of the given type of construction, thus revealing that one is easier than the other, and a more basic form of mentalization may suffice for one type of construction than for the other (irony vs. metaphor; metaphor vs. humor, etc.)

The continuum thus also provides us with a model of the *components of ToM* in linguistic terms, since the difficulty of these aspects of pragmatic competence is portrayed in view of the level of mentalization required for the decoding of each pragmatic phenomenon. This ensures that the model outlined in the present study in the form of the continuum is actually a viable *model of the mentalization abilities* as well, in line with neuroanatomical and neuropsychiatric studies on ToM (Abu-Akel – Shamay-Tsoory 2011, 2971), which claim, that a valid and reliable model of ToM needs to explain component parts of ToM, and minimally

explain three basic mentalizing processes, which include: the ability to (1) *represent* cognitive and affective mental states, (2) to *attribute* these mental states to the self and to others, and (3) to *apply* these mental states in a manner that allows one to correctly understand and predict behavior. Therefore, Theory of Mind, often referred to as the ability to ascribe mental states to the self and others (Perner 1991, DeVilliers 2000, 2007, Kiss 2005, Csibra 2010, Gergely-Csibra 2013), thus, is demonstrated to be an at least threefold ability, where ascribing can actually be broken down to these three sub-components.

In view of this, we can juxtapose the continuum of the pragmatic dimensions with the continuum of the mentalizing abilities, and conclude that for some of the pragmatic phenomena certain basic mentalization processes suffice, while for others more complex forms of mentalization are required.

Applying this parallelism to the results of the present study, then, this would form the following mappings between ToM skills and pragmatic phenomena: As already pointed out above, representing others' mental states is necessary in the early phases of language acquisition as well, for the narrowing of potential meanings in the anchoring of referents in word learning (Tomasello 1999). The role of a basic mentalizing ability of the representation level is, thus, undisputed in literal language use. For this reason, the *representation* of mental states is necessary and apparently sufficient in literal language use, exploited in simile and control tasks.

The *attribution* of mental states, being the following stage of mentalization is probably required in more complex forms of pragmatic phenomena, such as in irony and metaphor understanding, where one needs to judge the truth content of the given utterance, to see if it is true or false, and to what extent (hence making judgments in the relevant mappings and emergent structures). Therefore these two types of non-compositional constructions potentially rely on this higher-order mentalizing ability, on the ability to attribute mental states. Both cases are known to involve some kind of a comparison: metaphor being based on similarity while irony on contrast. As argued above, contrast is salient enough to trigger a shortcut strategy, but for the interpretation of both forms of polysemy a set of cognitive entailments is necessary.

Finally, the most complex mentalizing process seems to be that of *applying* and executing mental states in order to efficiently predict and coordinate behavior. The social and behavioral aspect of this ability is salient, and is obviously present in linguistic forms of communication as humor and in the coordination of discourse. Therefore, it is most probable that the ability of applying mental states corresponds to the stage of humor comprehension

and to the recognition of the infringement of maxims, in other words, to successful discourse organizational and conversational abilities.

This third level of mentalization apparently involves more social and affective aspects of mindreading as well, in that one needs to judge emotional aspects in proper and optimally relevant interpretation when selecting between competing meanings in ambiguities or choosing from several grammatically correct versions of requests. Correctness as such is often based on interpersonal, social and situational context (e.g. politeness, style, manner), thus incorporating emotional factors (e.g. informal requests are fine with peers, but in formal settings it is impolite, i.e. hurts the feelings of someone else to use direct requests instead of indirect ones). Similarly, the higher-order mentalization test of Baron-Cohen et al. (1999) based on faux-pas (see section 16.3) also builds on the hearer's competence to judge the correctness of the answer on the basis of its social effect. Thus, faux-pas are known as a higher-order mentalization task incorporating this emotional component based on social judgment. The authors claim that only older normally developing children are skilled at detecting such faux-pas and pass these tests successfully only around ages 9-11.

The difficulty of faux pas lies in that the response may be correct in cognitive terms, i.e. linguistically and grammatically, but it involves a shared knowledge component, which, rather similarly to the results on lies and deception, is based on a shared ignorance belief (Bucciarelli-Colle-Bara 2003) dependent on the ability to read the other person's mental states (ignorance, intentions etc) correctly, and to deduce important information from context.

In sum, the continuum of the different pragmatic phenomena outlined in the present investigation actually provides us a model of the different components of mentalization, where the levels correspond not only to the pragmatic complexity i.e. cognitive difficulty of the linguistic phenomena, but also represent the three corresponding processes of mentalization: the ability to *represent* mental states, corresponding to literal language use, simile and control tasks, the *attribution* of mental states probably used for irony and more standard forms of metaphor, and finally, the ability to *apply* and execute mental states being the most complex one, endowed with some affective sensations, integrating social-cognitive and affective aspects of discourse where language use is largely determined by the interpersonal goals it serves: like in instances of *humor* and the following of maxims in *conversations*. This level may possibly also include non-standard, more complex forms of metaphors too, like non-conventional metaphors (Varga et al. 2014), all the more because such ad-hoc implicatures represent a more complex level of discourse organization, and that

in the maxim infringement tasks success of Relevance maxims were in correlation with contextual metaphor results.

This intra-modal complexity within metaphor confirm current views on this trope (Fauconnier-Turner 1998, Coulson-Oakley 2000, Wilson-Carston 2006) suggesting that metaphor is a truly multifaceted, complex cognitive phenomenon, and its range may be even richer in sub-divisions than previously thought: "The interpretation of metaphorical utterances often results in the attribution of emergent properties, which are neither standardly associated with the individual constituents in isolation nor derivable by standard rules of semantic composition. An adequate pragmatic account of metaphor interpretation must explain how these properties are derived" (Wilson-Carston 2006, 404).

All in all, the integrated continuum of mentalization and pragmatic phenomena on the basis of the above outlined findings shall look like the continuum in Figure 43. below, where the three colors correspond to the three components of the mentalization continuum, and the various aspects of pragmatic phenomena are scattered throughout the trajectory according to their cognitive complexity and the effort required for successful processing.

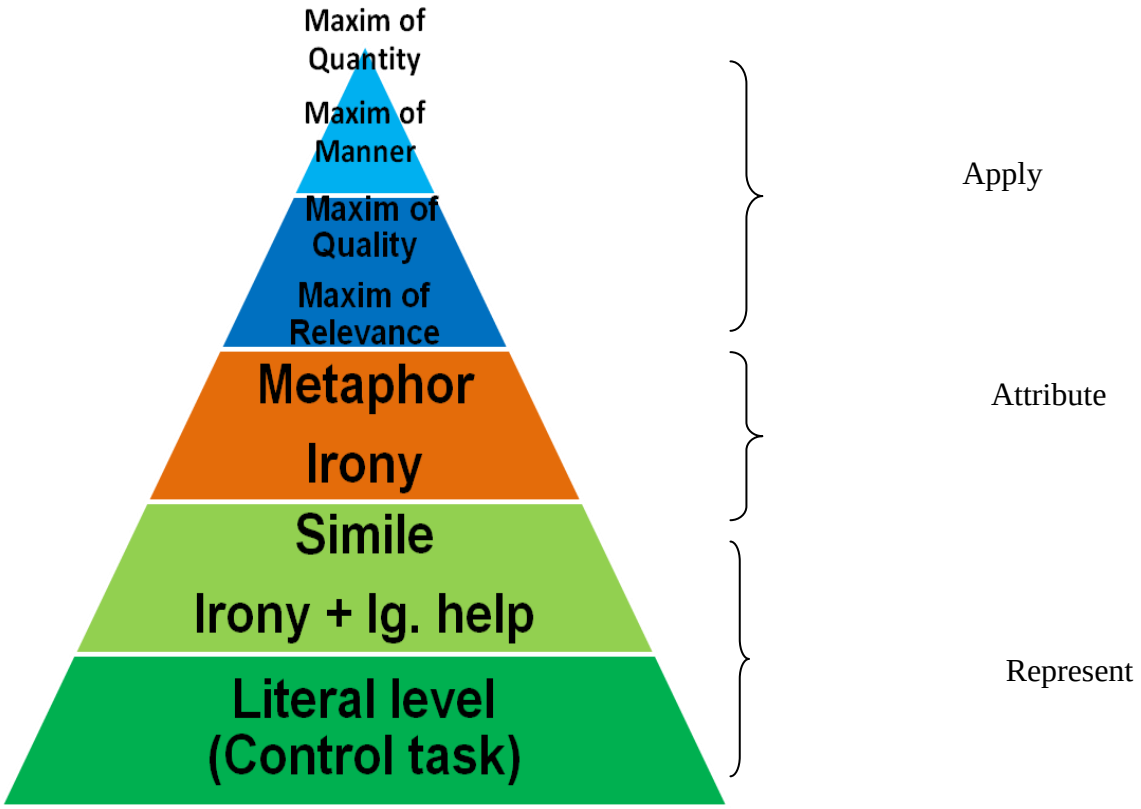


Fig 43.

The entire continuum of the development of pragmatic competence incorporating the suggested order of acquisition of the maxims

Further research is needed to identify the exact sub-divisions within the particular modalities. This inquiry gives fruitful ground for future research, however, the detailed discussion of this matter and drawing final conclusions in this question is beyond the scope of the present dissertation, as its aim was primarily to clarify the associations between the different levels of mentalizing competence of children and its relations to their pragmatic competence in general, and the order of the unfolding of the different forms of pragmatic phenomena in relation to these levels of mentalization in particular.

17. Conclusions

The experimental investigation in the present dissertation aimed to give a bird's eye view of the unfolding of pragmatic competence and identify the cognitive background mechanisms of this process, among these the cognitive ability that is essential in non-compositional, holistic meaning construction, i.e. in pragmatic competence.

Overall, the crucial role of mentalization was supported in trials measuring metaphor, humor, irony processing and conversational abilities. In the case of humor and the conversational maxims the mindreading ability is further completed by complex social and cultural knowledge, together with memory skills improving in school years.

17.1. The psycholinguistics of non-compositional meaning construction

The first chapter reviews some of the theoretical issues surrounding metaphor, delineating the major models of metaphor processing, their strong claims and their weaknesses. Pragmatic competence is defined as the ability to understand non-compositional constructions, where the central component of the interactive process of interpretation is based on theory of mind, stemming from intentionality, which enables the hearer to decipher speaker's intention, and thus to decipher intended meaning. The cognitive developmental background of the unfolding of this competence is sketched, and an empirical test of the model is outlined, targeting the role of mentalization in metaphor processing.

In the mentalistic model proposed in the present study, mentalization plays a central role, as this is a basic skill crucial in both the semantic and the pragmatic aspects of language acquisition that may account for the ease and the equal reaction times in current psycholinguistic findings.

17.1.1. Empirical study on idiomaticity in view of social-cognition

The empirical findings confirmed that theory of mind is a core component of metaphor processing. The ToM group was significantly more successful in the metaphor condition where due to its implicit nature, the deciphering of intended meaning required inferential strategies, i.e. ToM. In the simile (control) condition, where semantic interpretation suffices, there was no significant difference in the performance of the two groups, suggesting that pragmatic competence is largely dependent on the ability to mentalize, which enables the efficient decoding of intended, figurative meanings.

17.1.2. Mentalization and the development of humor comprehension

The next chapter targeted cognitive interpretative processes of non-literal meaning in general, and of humorous utterances in particular. The continuum of mentalization and humor is outlined in identifying the cognitive, linguistic and psycholinguistic background of humor research. The same empirical test used in the idiomaticity chapter was extended with 3 verbal humor trials and 1 non verbal humor task, together with a second-order ToM test and an Eyes test of semi-verbal nature, in order to see if verbal performance limitation is significant in the classical false belief tests of mentalization, and to see the interaction of verbal- and non-verbal results in the pragmatic tasks. The Eyes test was not designed to break down the sample into further groups of ToM competence, rather, it was included to see if the non-verbal variety can be predictive and passed earlier, ensuring the avoidance of performance limitation. The results seem to back up the expectations, supporting a moderate performance limitation of verbalization.

The empirical investigation aimed to identify if mentalization is an important factor in humor processing, since ToM subjects performed better in humor tasks, however, ToM in this particular case does not seem to be sufficient, since the ToM group's performance was weaker in the humor trials than in the metaphor trial. This suggests that beyond ToM, social and cultural factors also contribute to the acquisition of productive discourse skills in terms of humor (Pexman et al. 2005).

Non verbal results support the Cognitive Congruence principle in that those in the NoToM group preferred non verbal humor trials, and performed weaker in both verbal humor

conditions, while the ToM group performed better in both verbal humor tasks, and was least successful in the non verbal trial.

Contextual effects support the basic psycholinguistic axiom that contextual cues facilitate comprehension, since in contextual tasks context enhanced subjects' performance.

The Eyes test maintains the possibility of a wide range of further investigations. Future methodologies building on the Eyes test can give even more insight into the interaction of non-verbal mentalizing skills and non-verbal inferential processes, and possibly clarify issues surrounding the levels of pragmatic competence and its associations to performance limitation.

The results of the secondary ToM test almost fully overlapped with those of the first order ToM test, suggesting that those who can think with one other head can also think with two heads. This suggests that mentalization is not quantitatively determined but rather in a qualitative aspect: a basic level of *representation* forms the basis for a higher level *attributional* ability, followed by the ability to *apply* and execute mental states, enabling the person to integrate behavior and social cognitive aspects of human communication (see Fig. 43).

17.1.3. The development of irony comprehension in view of mentalization

The chapter on social cognitive abilities and irony briefly summarized the psycholinguistics background of irony, touching on some definitional problems in theory and research, discussing its distinctive features which make it salient in interpretation, and outlined its differences compared to humor. The empirical test aims to contribute to the resolution of long standing debates on irony processing. Its methodology is based on the previous chapters' procedure, extended with three irony tasks: genuine contextual ironies based on hyperbole, an irony with linguistic task, and a control task. The findings indicate that irony in fact is processed fairly early in preschool years, as it was the easiest of all the non-compositional constructions tested. Since in the case of irony the comparison to be drawn is based on conflict of meanings, a shortcut strategy seems to be employed by subjects, which also explains early success in comprehension. The Linguistic cue condition significantly facilitated interpretation, since the significant difference in the two groups' performance disappeared. The control conditions required only semantic processing, and as expected, there was no significant different in the performance of the two groups.

Irony is apparently easier for preschoolers than metaphor, due to its distinctive features like salient prosody and intonation pattern, conflicting meanings, which function as ostensive cues and trigger the shortcut strategy based on a heuristics of taking the opposite meaning. Metaphor is more complex, probably due to the emergent properties involved in metaphors, where comparison is based on an optimal relevance based traits of similarity, making it a more graded conceptual phenomenon.

Irony also proved to be easier to process than humor, which is again indicated to be a more complex competence where incongruity is not purely linguistic but often broader, rather contextual, based on social-constructions and cultural patterns that come with socialization and with age, thus delegating productivity in humor comprehension to early school years.

The Irony with linguistic help trial also confirmed findings of the facilitating effect of contextual cues in interpretation.

Eventually a continuum of pragmatic phenomena is drawn up reflecting the levels of cognitive difficulty and mentalization based inferential activity required in each pragmatic phenomenon. The pyramid thus formed reveals the order of the emergence of the examined non-compositional constructions in development, from similes, through metaphor, irony, to humor.

17.1.4. Mentalization and the recognition of the infringement of the Gricean maxims

The findings on preschoolers' conversational skills in view of their mentalization abilities, testing success in the recognition of the infringement of the Gricean maxims indicated that children have an awareness of the maxims before they fully understand that these maxims can in fact also be infringed on purpose, creating implicatures deliberately with the intention to convey implicit meaning.

A brief history of pragmatics is described, together with an introduction of the cognitive approach giving ground to the Gricean turn, framing the present investigation. The findings of the experimental pragmatic investigation suggest that the order of the ability to follow the maxims is very varied in development, emerging and reinforcing in several stages, where after awareness children actually develop an ability to apply such knowledge and understand the principles of intentionality based infringements in conversation. The maxims are not in place until early school years, hence forming the ultimate two levels of the trajectory of the development of pragmatic competence, together with contextual metaphor

and contextual humor. The maxim of Relevance seems to play a key role, bringing along the rest of maxims. The pyramid, completed with the maxims yields a detailed continuum of pragmatic development in view of mentalization skills.

The recognition of the infringement of the quantity maxim is the last to finally be in place, in line with the findings of a number of studies on why children are universally unsuccessful in the productive use of quantifiers. In the Quantity maxim's case preschoolers seem to follow the principle of pragmatic tolerance, in that they tend to accept utterances that are infringed, and do not reject these instantly.

There was a significant difference in the performance of the two groups in 3 maxim tasks, i.e. in 75% of the trials: in the Quantity, Relevance and Manner tasks. In the Quality maxim task the difference was not significant, which may be explained by the predominant magical thinking at this age. The 75% predictive force of ToM in the recognition of maxim infringement proves that ToM plays a significant role in this conversational ability.

The NoToM group was around chance in the recognition of the infringement of the maxims, which suggests their awareness, while the ToM group was significantly more successful in the maxim tasks, approaching productive conversational skills which stem from productive mindreading abilities.

17.1.5. Neuropragmatic investigations

In line with the developmental study, the neuropragmatic investigations also target a form of polysemy with high pragmatic relevance: irony comprehension, and its relations to the mentalization deficit in schizophrenia. The findings indicate that schizophrenic patients performed significantly worse in the irony comprehension task than healthy controls.

The fMRI data analysis also revealed that the two groups had markedly different brain activation patterns. The control group presented activations mainly in Theory of Mind related brain areas and in regions associated with non-literal language processing, while patients activated regions associated with semantic and auditory processing.

Linguistic cues enhanced comprehension significantly in the patient group. After the insertion of a short linguistic help, which rendered information embedded in the linguistic context more explicit, revealing the speaker's implicit mental state (thus unfolding implicatures), patients responded significantly more accurately in the irony trials, which enhanced their irony comprehension, and the statistically significant differences between the

patients' and the healthy controls' groups disappeared. Due to the insertion of the linguistic help, patients' activation patterns also became similar to that of healthy subjects, activating the ToM network, including the precuneus.

The linguistic cue condition also supports the facilitating effect of context in interpretation, and highlights the crucial role of mentalization in deciphering speaker's intentions as a basis of successful pragmatic meaning construction.

All in all, irony comprehension and deficient mentalization were supported in the neuropragmatic study.

The second neuropsychiatric investigation centered on the compensatory effect of good neurocognitive skills, where patients with higher IQ proved to be more successful in some pragmatic phenomena due to their compensatory strategies stemming from general cognitive skills. The activation of such strategies is necessary to compensate for the insufficient or lacking ToM competence. The compensatory strategies were efficient in some instances of pragmatic comprehension, like in the case of certain types of metaphors, but proved to be insufficient in the maxim recognition trial. This again proves that a certain level of mentalization suffices for the comprehension and productive use of certain pragmatic phenomena, but not in cases requiring the application level of mentalization, i.e. a higher level pragmatic competence like the recognition of the infringement of conversational maxims. This proved to be difficult for both the low, and even for the high IQ patient groups, despite the latter's activated compensatory strategies.

This backs up the main tenet of the present study that there are components of mentalization in line with levels of linguistic, pragmatic complexity: *representation*, *attribution*, and eventually *application* of mental states as higher-order mentalization ability, each corresponding to a certain level of pragmatic phenomenon. Both the developmental and the neuropragmatic study indicates that application of mental states is a more complex ability, appearing later in development, just like its linguistic counterparts that are in place later in development. The 'application' based pragmatic comprehension tasks (i.e. humor processing and maxim infringement trials) are significantly more difficult for schizophrenic patients, where even high IQ patients with compensatory strategies fell short in performance. In line with this, in the developmental dimension, these are aspects of pragmatic competence that are in place later in development, beyond preschool, in early school years. All in all, these findings of the neuropragmatic studies are in line with results of the developmental studies, enhancing the validity and the reliability of the investigations and reciprocally supporting each other in several aspects.

17.1.6. Language and mentalization: a bidirectional relationship

On the relationship of language and ToM the findings indicate that there is ToM before language, since basic mindreading abilities are crucial in identifying and narrowing down meaning in word acquisition. After that, symbolic abilities enable the child to rely on language, which functions as a representational medium, thus gains an important role in cognitive development. In the language acquisition up to two years of age apparently cognitive development sets the stage for language development, in which basic mentalization skills (i.e. the precursors and components of a fully fledged ToM) help us find the mappings between the physical world and language. In this stage gaze following, shared attention help the anchoring of referents, thus give us words with which to identify events and entities in the physical world. These words then function as labels, and language practically provides a medium for representations, further catalyzing cognitive development. Word learning facilitates the building of categories, a detailed mental lexicon, hence our autobiographic memory crucial in the creation of narratives and complex pragmatic settings. The results of the present study are therefore, in harmony with De Villiers's (2007) concept on a bidirectional relationship of ToM and language: first it's ToM that provides basis for an elementary level of language use where the child becomes able to represent thoughts, mental events and thus get around in the social world. Then ToM abilities are necessary for a productive pragmatic competence, and efficient discourse organization. In other words, 'there is ToM before language, (a basic level semantic language use), and there is pragmatic competence beyond ToM'.

As outlined above, higher order language use, namely, pragmatic competence requires higher order mentalization skills, since in a discourse setting rich in context-dependent meanings and interpersonal relations several factors play an important role in the interactive process of meaning construction. For this the ability to change perspectives, identify subtle differences in others' minds and the content of their minds is crucial: the interpretation of utterances is based on the successful deciphering of the intention behind the given utterance. In this process we rely on our inferential skills, for which a mature ToM seems to be indispensable.

In sum, ToM in the beginning furthers language development, which in turn at some point (with complex syntactic abilities in preschool years) furthers ToM development, which in turn furthers (at around age 5) a higher-level language use, namely pragmatic competence, in which some aspects are fully ensured by ToM (basic and conventional types of metaphor,

contextual conversational irony), some still need further cognitive development (quantifiers, conversational maxims on quantity, manner, complex discourse organization skills, humor), which mature in early preschool years (Schnell in press).

17.2. Contributions of the study to research in cognitive science

The present investigation aimed to contribute to the resolution of a number of long-standing debates in cognitive linguistics and developmental psycholinguistics, as outlined below.

17.2.1 Contributions to research methodology: Novel approaches

The study intended to make up for cavities in current trends in humor and cognitive pragmatic research and relies on a novel approach in a number of aspects: (i) not many studies focused on the distinction of humor and irony, however, the two are rather seen as overlapping categories in humor research, whereas in linguistics they are seen as markedly distinct (Nemesi 1999, Attardo 2001b). The findings contribute to the clarifying of the two categories, suggesting that although they serve similar social goals, and thus may be used in a similar manner in social interactions, still, in cognitive terms they are distinct, relying on different processing strategies.

(ii) Not many studies centered on spontaneous humor in everyday interaction. The present framework looks at different types of humor, not only pre-fabricated jokes but short instances of humorous utterances, like one-liners and riddles, together with spontaneous forms of humor like non verbal, visual humor. This enables the examination of random interpreting strategies in discourse settings similar to genuine conversational frameworks, and the identification of contextual effects on processing.

(iii) The testing materials include both verbal (V) and non verbal (NV) ToM and humor tests to check if non verbal skills correlate with verbal abilities, or only verbal ToM scores do; and to see if verbal performance limitation induces false results in the emergence of mentalization. The NV mentalization test used is a re-structured, novel version of Baron-Cohen – Wheelwright – Joliffe (1997) test designed for adults, adapted to the needs of the preschool age group.

(iv) Research has rarely examined the development of children's understanding of all the Gricean maxims concurrently, in a cognitive developmental perspective (Eskritt – Whalen

– Lee 2008) with the aim of clarifying as to how children develop an awareness of the different maxims and become able to coordinate these productively in the course of development. The present research aims to make up for this caveat and provide some explanations that can contribute to the clarifying of the picture on how children come to grips with the principles required for a mature and productive pragmatic competence.

17.2.2. Feasible methodology for research on child language and cognition

The findings of the developmental study have been backed up by neuroimaging studies in that the findings support a paradigm advocating age-related neural changes that support conceptual changes (representation-> attribution -> application), and in that the continuum observable in neuroanatomical and neuropsychological studies (Abu-Akel – Shamay-Tsoory 2011) is similar in nature to the continuum drawn on the basis of mentalization and its effect on pragmatic abilities (Schnell 2007, 2012, Schnell-Varga 2012). Therefore, it is reasonable to conclude that the investigation of cognitive phenomena through language use seems to be a valid method, both in terms of creating a viable model of mentalization, and also in terms of the correspondences between mentalization and linguistic/pragmatic phenomena.

The advantages of the overlap are at least twofold: As psychological and linguistic approaches to cognitive science have held for long, language is indeed a central component of the study of human cognition, which also means that the study of language shall be one of the main pillars of the investigation of the mechanisms of the human mind.

Also, the investigation of children is difficult for a number of reasons (see Schnell 2014): methodology needs to align to preschoolers' needs, must not require lengthy periods of sitting, it has to align to children's memory and habituation patterns, tasks need to be really playful and interesting to be applicable, etc., but mostly because of ethical reasons: neuroimaging is rarely used with children, because of the potential harmful effects of the techniques available, and parents are often discouraged to join experiments based on neuroimaging. The fact that the findings in the present investigation are in line with neuropsychiatric findings based on neuroimaging also confirm the validity of linguistic investigations especially in child populations, where other invasive, neuropsychological methods are avoided or not easily used. This gives the research community a fruitful methodology and approach in investigating children's cognitive linguistic and

psycholinguistic abilities without ethical issues on potential harmful effects, and in a linguistic framework.

17.2.3. An aid for therapeutic training material in neurocognitive disorders

Practical implications of our neuropragmatic research outlined above (Varga et al. 2013a, Varga et al. 2014), on the effect of atypical mentalization and its relations to pragmatic comprehension difficulties in the case of schizophrenic patients, targeting irony processing (2013a, see App. section 8) and several forms of non-compositionality, involving conventional metaphor, unconventional metaphor, irony, infringement of maxims (2014, see App. section 9) include the potential of creating a linguistic training material centering on pragmatic interpretation and discourse participation norms. A training of this kind can improve the performance of patients in social-cognitive settings requiring the smooth coordination of discourse and the flexible ability to take part in conversations. The findings that surface cues improved irony processing (Varga et al. 2013a), and the significance of general cognitive skills in creating efficient compensatory strategies (Varga et al. 2014) suggest that with practice and conscious effort to make implicit information explicit, communication can in fact become more efficient, and applying such cues and strategies can help patients understand implied content, without long inferential chains for which they lack mature mentalization skills. It is possible to create training programs where patients are taught to follow the norms in decoding meanings, like learning to read from linguistic surface cues (including prosody and intonation pattern of irony, beside the adverbs of feelings as used in our study), and looking for implicit mappings between the different conceptual domains represented in the utterance (shortcut strategy in the case of irony, of taking the opposite meaning, or parallel mappings and emerging structures in cognitive metaphors). Relatives of such patients can be taught to use surface cues and make implicit content as explicit as possible.

The examination of the mental mechanisms of pragmatic meaning construction in the developmental dimension can aid the creation of such training programs and possibly some kind of software that may in turn help the reintegration of the affected populations into society by at least normalizing their communication skills and discourse competence. The understanding of the neural underpinnings of ToM development and its relations to pragmatic competence can effectively aid the establishing of therapeutic training materials, autogenic training programs targeting discourse skills, ensuring an efficient intervention strategy in the

improvement of the quality of life of patients and their environment. An attempt has already been made in the form of computer software aiming to provide a complex framework to measure social-cognitive skills in schizophrenia with Linux-based software (Varga, manuscript).

17.2.4. Clinical measure potentials in atypical cognitive and language development

As it has been pointed out in studies targeting pragmatic competence in atypical language development like SLI (Specific Language Impairment) (Ryder-Leinonen-Shulz 2008), methodologies that attempt to identify sub-types of the disorder currently lack testing materials. Within SLI there is a sub-group of children who demonstrate difficulty in pragmatic competence, known as having PLI (Pragmatic language impairment). As Ryder Leinonen and Shulz put it: „Pragmatic language impairment (PLI) in children with specific language impairment (SLI) has proved difficult to assess, and the nature of their abilities to comprehend pragmatic meaning has not been fully investigated (2008, 429.)". The authors' aim is to develop a cognitive approach to pragmatic language assessment based on Relevance Theory (Sperber and Wilson 1986) and an assessment tool for identifying a group of children with PLI from within an SLI group. As they point out, the currently available Children's Communication Checklist version 2 (CCC-2) no longer has a pragmatic composite score due to problems with reliability. Currently two remaining composite scores of general communicative competence (GCC: syntactic and semantic knowledge), and social interests deviance composite (SIDC) are suggested to "give optimal discrimination between children with typical SLI and those with evidence of disproportionate pragmatic difficulties" (Ryder-Leinonen-Shulz 2008, 436., Bishop 2003, 27.). The pragmatic testing material in the present investigation encompasses several aspects of pragmatic competence, and with its control tasks also gives a frame of reference for semantic vs. pragmatic abilities. It stems from the same cognitive pragmatic background, and provides a relative framework in which it is possible to assess the different aspects of pragmatic competence (metaphor/irony/humor/ability to follow the Gricean maxims), in view of mentalization skills. It has proved to be a viable and valid model as it has been backed up by the findings of neural investigations as well.

The well-known measure of language development currently in use in Hungarian methodology, known as PPL method (Pléh-Palotás-Lőrik 2002) does not include specific measures for pragmatic competence. Therefore, currently there is no valid screening test with

such a focus in the study of language development in Hungarian testing materials, and apparently at an international scale either (Ryder-Leinonen-Shulz 2008).

Since the present measure of pragmatic competence was used with a typically developing normal population, the results provide a frame of reference in determining other populations' pragmatic competence relative to the scores and patterns of the normal sample. Besides, the testing material can be used as a differential diagnostic measure which can be used with diverse populations, normal or atypical, and in assessing pragmatic competence in the different syndromes (Down Syndrome (DS), Autism Spectrum Disorder (ASD), Schizophrenia, Williams Syndrome (WS), Specific Language Impairment (SLI), even childhood aphasia.

Since there is currently no definitive assessment tool for pragmatic impairment, the testing material used in the present study may be useful in creating a standardized one.

17.2.5. Studies on typically developing populations as a frame of reference in pathological investigations

As Bucciarelli-Colle-Bara (2003) claim in their experimental pragmatic investigation of the different forms of non-compositional constructions ranging from direct to different forms of indirect, deceitful and ironic utterances, beyond the theoretical goals to explain the cognitive background of such linguistic phenomena, the need to study pragmatic aspects of meaning construction is enhanced by our ignorance about both the emergence of communicative abilities in atypically developing children, and by the decay of communicative performance under *pathological* conditions. The authors point out, that it is hard to understand the deficits when one does not know the normal development. Therefore, the investigation of typically developing children and the understanding of the unfolding of the different levels of pragmatic competence enables us to see the gradation of this skill in typical conditions, giving us a point of reference to work with when identifying the severity of the disorders and their correlated pragmatic dysfunctions.

17.3. Limitations of the study

In some aspects the investigation needs refinement and the shortcomings observed may give ground to future research with a more sophisticated methodology.

17.3.1. Limitations in the sample

Since the sample size of experimental subject was rather small, correlations were a number of times only tendentious. A larger sample would probably give more clear-cut correlations regarding both interactions between the maxims themselves and the conversational norms and the rest of the pragmatic aspects like metaphor, irony and humor understanding.

17.3.2. Pragmatic tolerance and the maxim of quality

As pointed out above, the finding that in the maxim of Quality condition the two group's performance was not significantly different may suggest that in preschool years magical thinking predominates irrespective of mentalization skills, therefore children demonstrated a larger degree of tolerance in the case of this infringement, since they did not in fact see it as erroneous. This is supported by the principle of pragmatic tolerance (Katsos-Bishop 2011), stating that children are in fact aware of the infringements, but do not reject it as unacceptable. This, however, is due to methodological factors: children tend to accept such utterances not because they are not sensitive to the infringements, but because they are more tolerant in pragmatic terms. This proves that their pragmatic competence is not fully in place, and as they get older, their rejection patterns too will get more similar to adults, and they will take an attitude expected on binary scales.

The present methodology obviously requires children to judge, thus interpret and identify others' maxim violations (Eskritt – Whalen – Lee 2008), which may constitute a performance limitation in children's results, since this complex skill requires the ability to reflect on one's language use.

At the same time, examining children's understanding of appearance/reality distinction in general is radically different from a framework like the one in the present study, where methodology focuses on children's understanding that there are conversational norms that apply to the "be truthful, do not say anything that you believe to be false" guideline.

In sum, a more detailed methodology of the kind described above, working with a three-scale measure instead of the binary dichotomy would probably reveal more reliable results in this matter.

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Appendix

Mentalization trials and linguistic tasks measuring the different aspects of pragmatic competence

I. Inventory of mentalization trials

1. Theory of mind tests

1.1. Unseen displacement task in the study of 2005 (puppets)
1.2. Unseen displacement task in the study of 2010/11 (puppets) incorporating both first- and second order ToM questions
1.3. Eyes test (2010/11 study)

II. Inventory of linguistic trials

2. Simile trial

2.1. Decontextualized simile task
2.2. Contextual simile task

3. Metaphor trial

3.1. Decontextualized metaphor task
3.2. Contextual metaphor task

4. Humor trial:

4.1. Decontextualized humor test (One-liners)
4.2. Decontextualized humor test (Riddles)
4.3. Contextual Humor (Jokes ending in punch-line)
4.4. Non-verbal Humor test (Visuals)

5. Irony trial

5.1. Irony task
5.2. Irony with linguistic surface cue task
5.3. Control task in the irony condition

6. Maxim infringement trial

6.1. Maxim of Quantity task
6.2. Maxim of Quality task
6.3. Maxim of Relevance task
6.4. Maxim of Manner task

7. Original Humor trial material in Hungarian

7.1. Decontextualized humor test (One-liners)
7.2. Decontextualized humor test (Riddles)
7.3. Contextual Humor (Jokes ending in punch-line)

Neuropragmatic investigations

8. Irony processing in schizophrenia

8.1. Irony task
8.2. Irony with linguistic surface cue task
8.3. Control task

9. Neuropragmatic investigation – effect of general cognitive skills in holistic processing in schizophrenia

9.1. Conventional metaphor
9.2. Unconventional metaphor
9.3. Irony
9.4. Quality maxim infringement generated implicature
9.5. Quantity maxim infringement generated implicature
9.6. Manner maxim infringement generated implicature
9.7. Relevance maxim infringement generated implicature
9.8. Control task (no infringement)
9.9. Semantic task

10. Statistics

10. Statistical analysis and tables

I. Mentalization trials

1. Theory of mind measuring false belief task – unseen displacement (2005 study)

1.1. ToM tests: unseen displacement task with puppets

Plot: teddy bear and his honey
Brown teddy bear has a jar of honey he wants to eat for breakfast. But before doing so, he wants to go to wash his hands. He puts the jar of honey into a basket, and leaves.
White bear comes in and seeing the honey, decides to put it in a box and have it later for dinner.
At this point Brown bear comes in and the child is asked:

Verbal – First-order ToM question:
ToM question: **Where will the Brown Bear look for the honey?**

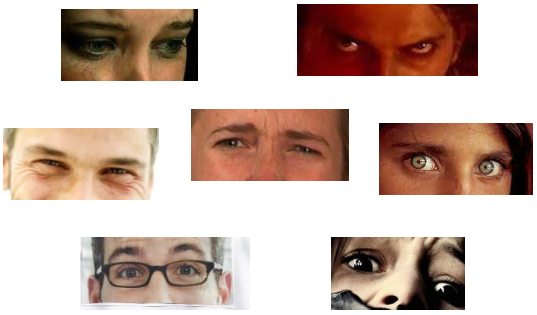
Memory question: **Where did the Brown Bear put the honey in the beginning**?
Reality question: **Where is the honey now**?

1.2. Second order ToM question added to the first-order ToM test (2010/11)

Verbal second-order ToM question:
Where does the White Bear think that the Brown Bear thinks the honey is?

1.3. Eyes test

Eyes Test (Schnell 2011)
6 basic emotions



Based on Ekman's theory of basic emotions:
Sadness, Joy, Surprise, Anger, Disgust, Fear (Ortony – Turner 1990).

1. **Sadness** - Peter
Peter and Dorothy got a puppy for Christmas. They walked the puppy each afternoon, and even slept with their dog, they loved it so much. One morning when Peter woke up, the dog was not in the room. It disappeared….. – It may have got lost! – Peter thought.
How did Peter feel? Which picture shows his eyes?

2. **Joy** – Dorothy
Dorothy got very sad, and jumped out of the bed to find the dog. She looked under the bed, behind the wardrobe, in the basement, even in the cupboard! But she didn't find it anywhere. Dorothy felt so lonely; she didn't eat breakfast at all. As she was dressing up, she heard some snuffle from behind the bookshelf. She moved the shelf, and there she found her little puppy!
How did Dorothy feel? Which picture shows her eyes?

3. **Surprise** – Peter
When Peter learned that Dorothy found the dog, he was so happy, that he decided to put it in his dad's drawers, where he usually keeps his socks, so that it won't get lost again! So he put the little dog into the drawer and closed it, to keep him safe.
His dad was just about to get his socks in the morning, so he went to the chest of drawers, opened it, and then the puppy jumped out!
How did his dad feel? Which picture shows dad's eyes?

4. **Anger** – Peter's mom
Peter's mom was cleaning the house all day. She cleaned the floors, the shelves, and the carpets in each room. Peter was out in the yard, having fun in the puddles after the rain, where his boots got all muddy. Just when his mom was done with the cleaning, he ran into the house with his muddy boots on! When his mom looked around, she saw that the floor was all muddy!
How did his mom feel? Which picture shows mom's eyes?

5. **Disgust** – Dorothy
After lunch, Dorothy wanted to have something sweet and tasty, so she decided to eat from her birthday cake in the fridge. As she was taking it out from there, the cake fell off the plate, right into the mud on the floor! Dorothy picked up the cake, but it was all muddy and stinky.
How did Dorothy feel? Which picture shows Dorothy's eyes?

6. **Fear** – Dorothy
Now that I can't eat the cake – she thought – I'll take the puppy for a walk, the weather is so nice and sunny. The puppy was all happy, jumping around as they got going. It ran off, chasing butterflies down the road. All of a sudden, a big black dog jumped out of a bush, and started chasing the puppy! Dorothy lifted it up, and kept it close to herself, backing off from the big dog, to keep her puppy safe…
How did Dorothy feel? Which picture shows her eyes?

II. Linguistic trials

2. Simile trial

2.1. Decontextualized condition (Happé 1993)

Multiple choice test
1) The dog was so wet. It was like…(*a walking puddle*)……..
2) Carol glared at Nicola. She was so cross. Her eyes were like……(*daggers*)……
3) The night sky was so clear. The stars were like……(*diamonds*)…….
4) Simon just couldn't make Lucy understand. She was like……(*a brick wall*)…….
5) Caroline was so embarrassed. Her face was like……(*beetroot*)……
Choose one item from the following list to complete each sentence:
a brick wall
dresses
daggers
a beetroot
a walking puddle
diamonds

2.2. Contextual condition (Gibbs 1994).

1. Johnny's grandpa was a very nice old man. He loved his family, and always took little Johnny fishing to the lake and helped him catch fish for dinner. Johnny always ran ahead, he was so happy to go, but grandpa could not be jumping with joy, but he walked very slowly because he was **old *as* the hills.**
Q: What was Johnny's grandpa like? Why couldn't he run? Why is he like the hills?

2. Dan and his friends went to the hills one day to pick flowers. They went on a big hike and got back home late in the evening. Dan's mom cooked a tasty dinner, and the family talked for long about the wonderful day spent in the forest. Dan had a big dinner, and it made him so sleepy that he **yawned *like* a lion**.
Q: How did Dan yawn? Why was his yawn like a lion's?

3. The daughter of the king of Sunland was the most beautiful princess on earth. Many princes and kings wanted to marry her, and they all fought with the dragon who wanted to steal the princess. She had golden hair, bright, happy eyes, and her **cheeks were *like* red roses**.
Q: Why were her cheeks like roses? What was the same between the cheeks and the roses?

4. Grandma was working all day in her garden. She started watering her flowers in the morning. She went color by color, starting first with the yellow ones, then with the blue ones, the white ones, the red ones, and it was already late evening by the time she finished. Grandma got really tired, so she went to bed early to have a good night's sleep. Then, next morning she got up **fresh *as* a daisy**!
Q: Why was grandma like a daisy in the morning?

5. Grumpy the dragon was a very ugly animal. He was not cruel, but he looked so frightening that everyone ran away when they saw him. He liked cakes and cookies very much. He also ate healthy things, such as fruit, broccoli, even milk and cereals, but when he found some cookies, he could not control himself and **ate like a pig**.
Q: Why did Grumpy eat cookies like a pig? Did he eat fruits and broccoli like a pig too?

3. Metaphor trial

3.1. Decontextualized condition (Multiple choice, based on Happé 1993)

6) The dancer was so graceful. She really was……(*a swan*)……
7) Father was very very angry. He really was……(*a volcano*)……..
8) Michael was so cold. His nose really was……(*an icicle*)……
9) John was very clever and tricky. He really was……(*a fox*)……..
10) Ann always felt safe with Tom. He really was.…(*a safe harbor*)……...

Choose one item from the following list to complete each sentence:
an icicle
a fox
a safe harbor
a hat
a swan
a volcano

3.2. Contextualized condition (Gibbs 1994)

1. Johnny is helping his mother make a cake. She leaves him to add the eggs to the flour and sugar. But silly Johnny doesn't break the eggs first – he just puts them into a bowl, shells and all! What a silly thing to do! When mother comes back and sees what Johnny has done, she says:
"Your head is **made out of wood**!"
Q: What does Johnny's mother mean? Does she mean Johnny is clever or silly?

2. Judy was a very shy girl. She was afraid of meeting people she had never seen before, but, loved playing in the garden. She went out to run around and play with her puppet, chase butterflies and sing with the birds no matter if it rained or snowed. She had no friends because she was too shy to talk to new children. One spring she went to the mountains with her parents. They stayed at a hotel, near a lake. Her mother told her that there were children in the hotel, and that she should try to meet them. She went out to play with them, and she managed to make friends. Her parents were very happy that Judy **broke the ice**.
Q: Why were Judy's parents happy? What did she do when she broke the ice?

3.
Sarah did not like to help her mom do the housework. She preferred watching TV, playing with her dolls, or playing puzzle. One day her mom got home very late from work, and she had no time to cook dinner. She asked Sarah to help her with the preparation. Sarah did not do it, she sneaked into her room to back out from her task. Then her mom got very angry, came into her room and said very strictly: Sarah, now you help me lay the table or you will get no dinner! Sarah could not do anything else, but **swallow the bitter pill**.
Q: What did Sarah need to do? Was she happy to do it?

4. Danny's grandma loves gardening. She spends her mornings, her afternoons, and her evenings in the garden, planting colorful, happy little flowers, adoring butterflies, bugs, picking strawberries, blueberries, watering apple trees. She only goes in from the garden at lunchtime to prepare lunch for little Danny who goes to visit her every day after school. The

garden has tens of thousands of roses, many types of daisies, violets and all sorts of flowers that have a wonderful scent in the spring breeze. Danny really enjoys picking berries and playing among the old fruit trees. One day he went to visit his grandma and he spent such a wonderful afternoon there that he cried out in happiness: "Grandma, I am so glad you **have a green thumb!**"
Q: What did Danny mean by saying this to her grandma? Were her fingers dirty?

5.Cindy liked being with people. She always wanted to know what happened to whom, how and why. But not only did she want to know it, she always told it to others. One day her best friend, Sandy came to tell her great news, and she said: Cindy, you can't imagine what happened to me! I am so happy! It is a secret; I do not want others to know it. My grandpa bought me a white horse for my birthday! But now promise me you **button your lip**!
Q: What does Sandy mean? What does she want Cindy to do?

4. Humor trial samples in English

For reasons of translation techniques the exact test cannot be translated. There are prototypical samples below that illustrate the type and difficulty of the testing material in English. For the original test see the Hungarian version at the end of the Appendix.

4.1. One-liners

Jean (chamberer) and his Landlord:

Landlord: Jean, could you plug in the cow, please?
Jean: Why, Sir?
Landlord: Because I want to drink boiled milk.

4.2. Riddles (example)

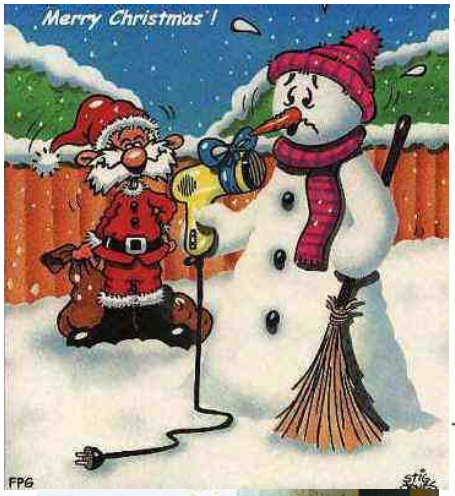
1. - Why didn't the skeleton cross the road?
– It didn't have the guts……

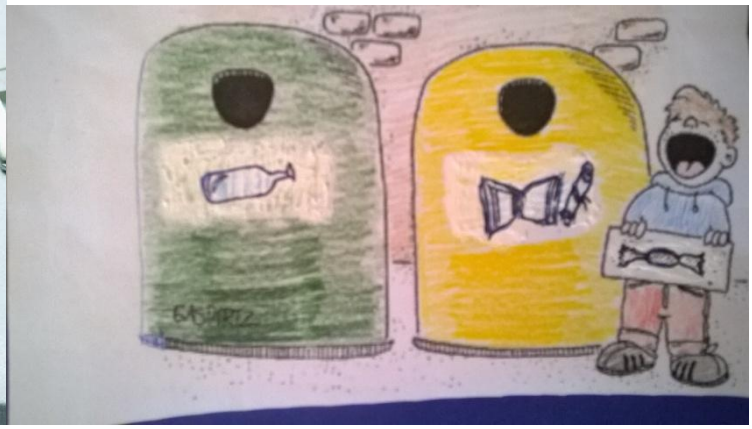
2. – Why do some birds fly south in the winter?
– Because it's too far on foot…

4.3. Jokes (samples, see original test in Hungarian in section 7 of Appendix)

A guy is sitting at home when he hears a knock at the door. He opens the door and sees a snail on the porch. He picks up the snail and throws it as far as he can. Three years later, there is a knock on the door. He opens it and sees the same snail. The snail says, "*What the hell was that all about*?"

4.4. Non verbal humor trial – visuals





5. Irony trial

5.1. Irony tasks

1. Peter helps his mother bake a cake. He accidentally puts salt in the batter instead of sugar! His mom says: **I am so glad you help!**
Q: Do you think his mother is happy that Peter helps her? (Why does she say this? What does she mean by this?)

2. Dorothy and Peter put the books back on the shelf before going to sleep. Dorothy accidentally puts a book back so that the whole line falls off. Peter says: **You did a great job putting it back!**
Q: Does Peter think Dorothy did not do a good job putting it back?

3. Terry's mother prepares some breakfast in the morning, but Terry does not eat any of it. Her mom says: **You really are hungry**!
Q: Does Terry's mom think she is hungry?

4. Dorothy and Peter are picking apples. Dorothy accidentally tumbles in the basket full of apples and the apples all fall out on the ground. Peter says: **You are really talented**!
Q: Does Peter think Dorothy is not talented?

5. Peter is mowing the lawn at home. He accidentally cuts off his mom's favorite roses in the grass. When his mother sees this, she says: **It's wonderful how you mowed the lawn!**
Q.: Does the mother think it is wonderful the way Peter mowed the lawn?

5.2. Irony with linguistic help tasks

1. Dan and James are reorganizing their room. James tries to lift a heavy wardrobe but he cannot even move it one bit. Dan *angrily* says: **You really are strong**!
Q: Does Dan think James is not strong?

2. Mary asks John to help her do the washing. John accidentally leaves a red shirt among the white clothes, so all the clothes come out pink! Mary *disappointedly* says: **These clothes are really bright white!**
Q: Does Mary think the clothes are not bright white?

3. Henry invites Bob over for dinner. Before this, in the afternoon Henry painted the entrance door. When Bob arrives, the whole apartment smells of paint. Bob *fiercely* says: **I love the smell in your house.**
Q: Does Bob like the smell in the house?

4. Peter and Kate go to a dance party. Peter asks Kate for a dance, but he constantly steps on her toes. Kate sharply says: **You are a great dancer!**
Q: What does Kate mean by this? Does she think Peter does not dance well?

5. Melissa and her mom are on their way home driving. Just after they depart, her mom runs over a stone and they get a puncture. Her mom sees it and *disappointedly* says: **We are very lucky!**
Q: Does mother think they are lucky?

5.3. Control tasks in the irony condition

1. There is an apple tree and a plum tree in the garden. A strong wind comes and it blows so hard, all the fruits end up on the ground, none stays on the trees.
Q: Does any fruit stay on the fruit trees after the storm?

2. A red and a yellow balloon are blown in the wind. The red balloon flies up high in the air, but the yellow balloon hits a bush and bursts.
Q: Does the yellow balloon hit the bush so hard it bursts?

3. The sunny summer weather is suddenly disturbed by big dark clouds which eventually turn into storm and it starts raining. After the rain when the clouds are gone, the sun comes out again and shines.
Q: After the clouds are gone does it still rain?

4. There is a cherry tree and an apple tree in the garden. As fall approaches, the cherry's leaves turn yellow and fall, and in a few days the apple tree's leaves turn yellow and fall too.
Q: Do the apple tree's leaves fall after the cherry tree has lost its leaves too?

5. There are two pine trees in the yard. One of the tree's trunk is so weak that when the wind blows hard, it bends over to the ground. There is such a strong wind in the afternoon that the trunk cannot support it and it breaks.
Q: Does the pine tree with the weak trunk break in the wind?

6. Maxim infringement recognition trial

6.1 Maxim of Quantity (Make your contribution as informative as is required; avoid giving redundant information).

1.
A: **What would you like for dinner?**
B: Food.*
C: I'd like sausages with mustard and some bread.

2.
A: **How do you like your soup?**
B: With a lot of pasta.
C: I like it in a red plate with green napkins*.

3.
A: **What is your favorite animal?**
B: My favorites are rabbits which are animals.*
C: My favorites are dogs.

4.
A: **What would you like for Christmas?**
B: The same as you.*
C: A nice book of fairy tales and a lot of chocolate.

5.
A: **What time is it?**
B: It's eleven in the morning.
C: It's morning.*

6.2. Maxim of Quality (Do not say what you believe to be false; do not say that for which you lack adequate evidence)

1.
A: **Where do you live?**
B: I live in the inner city of Pécs.
C: I live on the Moon with my little pony.*

2.
A: **Did your mom buy you the new toy car you wanted?**
B: She did, I have already driven it too, I'll take you for a ride if you want.*
C: She did, yesterday after school we went to the store to get it.

3.
A: **Will you play with me?**
B: No, my mom is here to take me to my swimming class.
C: No, I am playing with the clouds.*

4.
A: **Can I get some more chocolate?**
B: No, I did not cook any more of it today.*
C: Sure, help yourself.

5.
A: **Did you see my doll? I can't find it!**
B: I did, it's in your room, next to your bed.
C: I did, it's in the sky next to the Moon.*

6.3. Maxim of Relevance (Be relevant)

1.
A: **Shall we go for a walk in this wonderful weather?**
B: You should wear red shoes instead.*
C: Lovely idea, let's go!

2.
A: **What's your favorite animal?**
B: My favorite is a giraffe!
C: I don't like rain.*

3.
A: **What do you do when you don't have to go to preschool?**
B: Tomorrow we'll have nice weather.*
C: I sleep in and play soccer with dad.

4
A: **What do you like best in the playground?**
B: I don't like raisins.*
C: I like the slide best.

5.
A: **What do you usually drink for breakfast?**
B: Hot chocolate or tea.
C: I never put on my green coat.*

6.4. Maxim of Manner (Avoid obscurity of expression, be brief, be orderly, avoid ambiguity)

1.
A: **Go ahead and take some of the cake, help yourself!**
B: its color is disgusting…*
C: Thank you, I don't want any now.

2.
A: **May I borrow your guitar at the weekend?**
B: Sure, of course!
C: Why would you want it, you have no idea how to play it anyway…!*

3.
A: **Let's go out and play soccer the weather is so nice and sunny!**
B: With you I won't go for sure…you can't tell the difference between your own legs!*
C: Unfortunately I can't go now, I need to see my dentist.

4.
A: **Can you help me put these books back on the shelf?**
B: You brought them here, you put them back.*
C: I can't help now, because the teacher called us to stand in line, but after that I will help you.

5.
A: **Can I use your crayons?**
B: No, you can't draw.*
C: I can't give them now because I am using them but I'll give you my pen.

7. Original humor trial

7.1. One liners / Jean viccek

1. Jani, kifutott a tej!
- Az lehetetlen, uram. Hiszen csukva van az ajtó.

2. - Jani, vidd le az ágyamat a pincébe!
- De miért? – kérdezte Jani.
- Mélyen akarok aludni.

3. - Jani, add a puskámat! Célba akarok lõni.
- De uram, az egész ház alszik.
- Nem baj, Jani. Majd lábujjhegyen lövök.

4. - Jani, dugja be a tehén farkát a konnektorba.
- Minek, uram?
- Mert forralt tejet akarok inni.

5. Jani, miért szorít ez a cipõ?
- Mert bent maradt a nyelve, uram.
- Ugyan, Jani! Ha kidugom a nyelvemet, akkor is szorít.

7.2. Riddles / Találós kérdések

1. Miért repülnek délre a madarak? Mert gyalog túl messze van.

2. Hogy hívják a sült nyulat?
Tepsifüles.

3. Melyik a legerősebb állat?
A csiga, mert elbírja a házát.

4. Hova ne vigyél soha kutyát?
A bolhapiacra!

5. Mit fűrészel a macska?
A kutya fáját!

7.3. Cotextual humor trial: jokes / Kontextuális humor: viccek

1. Léggömb
- Bácsi, kérek léggömböt!
- Elfogyott, kisfiam. Az előbb egy néni mindet megvette az unokájának.
- Hol van az a gyerek?
- Ott száll a templom felett.

2. Én húzzam fel?
Torna-öltözőben a tanár néni megszidja Gabit:
- Nagyon lassú vagy Gabikám az öltözéssel, igyekezz már egy kicsit, vagy talán én húzzam fel a cipődet?
- Hát, szerintem szorítani fogja a tanárnéni lábát.

3. Papás-mamás
Gyerekek játszanak a homokozóban.
- Gyere Annuska – mondja Pistike -, játsszunk papás-mamást!
- Jól van, Pistike, de ne üss nagyot!

4. Horgászok
A horgászbarátok először egy teáskannát, utána egy fazekat, aztán egy cipőt horgásznak ki a kedvenc tavukból. Az egyik így szól: - Te, menjünk el innen gyorsan, azt hiszem, itt lakik valaki.

5. Móricka
Móricka forró vizet akar adni a csibéknek itatásnál.
- Miért forró vizet viszel nekik? - kérdi tőle az édesanyja riadtan.
- Hogy főtt tojást tojjanak!

8. Neuropragmatic investigation – irony processing in schizophrenia

8.1. Irony task samples

1. Irony: Joe went home from school and told his father that he had failed his math test. His father said: **Oh boy, you just made my day!**
Q: Did Joe's father really think that Joe made his day?

2. Tom and Ben are having an argument. Ben does not listen to Tom's opinion at all. Tom says: **I am so glad you always listen to my opinion.**
Q: Does Tom think that Ben listens to his opinion?

3. John suggests Steven that they should go to the movie theatre. Steve brings the decision to go rather late, and they eventually arrive late for the film. John says: **Steve, you really are good at bringing decisions…**
Q: Does John think that Steve is not good at bringing decisions?

8.2. Irony with linguistic help task samples

1. Peter helps Tom repair his car. Peter takes out a screw and it incidentally falls into the service tank. Tom ***angrily*** remarks*:* **You really are a great help!**
Q: Does Tom think that Peter isn't much help?

2. Rose orders a cup of coffee in a restaurant. The waiter brings out her coffee, but near the table he accidentally stumbles, and pours it in Rose. Rose *disappointedly* remarks*:* **I am grateful for the coffee!**
Q: Does Rose think she is grateful for the coffee?

3. Sarah asks Paul to cut her hair. Paul cuts it too short on one side. Sarah *furiously* remarks: **I love my new haircut!**
Q: Does Sarah think that Paul did not do a pretty haircut?

8.3. Control task samples

1. It's been raining all day. There is so much water flowing down the water-spout that it floods the whole yard. The huge amount of water renders the entire yard heavily muddy.
Q: Does the yard stay dry after the day-long rain?

2. There are peaches and apricots on the fruit trees in the garden. Suddenly a hail comes, so strong that it makes all the fruits fall on the ground. By the time it stops, there are hardly any fruit left on the trees.
Q: Is there a lot of fruit on the trees after the storm?

3. As the wind blows, a yellow and a red balloon float in the air. The red flies way up high, but the yellow hits a thorny bush. It falls on the bush so hard that it bursts.
Q: Does the yellow balloon fall on the thorny bush so hard that it bursts?

9. Compensatory effect of general cognitive skills (task samples)

9.1. Conventional metaphor

Peter is a good runner. One day, as he races with Leslie, Peter wins. After the race Leslie says**: Peter, you are a real rabbit!**
Q.: Does he mean Peter is a real rabbit?

9.2. Unconventional metaphor

Steven finds it hard to bring a decision in his everyday life. One day John and Judy invite him to the movies, but he can not make up his mind, whether to join them or not. Finally, he brings a decision too late, and they miss the movie. Judy says:
Steven, you are a ship without a captain!
Q.:What does the speaker mean by thiss? Does he mean….?

9.3. Irony

Joe and Mike are moving to a new apartment. When Joe tries to pick up the wardrobe, he cannot move it one bit. Mike says: **Hey, you are strong!**
Q.: Does he mean…?

9.4. Quality maxim infringement generated implicature

Jane and Peter are having a conversation about Peter's dinner the previous night. Jane asks Peter about the food he had in the restaurant. Peter answers:
I ordered two big pigs and I ate them all.
Q1:Is this response strange or unusual to you? Why?
Q2.: (ToM question part) What did the speaker mean by this?

9.5. Quantity maxim infringement generated implicature

Judy asks Michael what he would like for dinner. Michael says: **Something to eat.**
Q1:Is this response strange or unusual to you? Why?
Q2.: (ToM question part) What did the speaker mean by this?

9.6. Manner maxim infringement generated implicature

Sarah asks Joe to help her put the books away. Joe says:
You brought them here, you go and put them away!
Q1:Is this response strange or unusual to you? Why?
Q2.: (ToM question part) What did the speaker mean by this?

9.7. Relevance maxim infringement generated implicature

Some students are asked how they feel about their teacher. A student says:
He is very young.
Q1:Is this response strange or unusual to you? Why?
Q2.: (ToM question part) What did the speaker mean by this?

9.8. Control task (no infringement)

Mary asked for Peter's guitar for the weekend. Peter says:
All right, you can take it.
Q: Does Peter mean he can/cannot take it?

9.9. Semantic task

There is a piano and a bookshelf in the room. Due to a strong earthquake the bookshelf collapses and falls upon the piano, and **the piano's leg breaks**.
Q: Does the earthquake break the piano's leg?

10. Statistical analysis and tables

Logistic Regression
[DataSet1]

Dependent Variable Encoding

Original Value	Internal Value
,00	0
1,00	1

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	17,233	1	,000
	Block	17,233	1	,000
	Model	17,233	1	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	37,614[a]	,343	,465

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			tom1num		Percentage
	Observed		,00	1,00	Correct
Step 1	tom1num	,00	19	6	76,0
		1,00	7	9	56,3
	Overall Percentage				68,3

a. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	honap	,210	,071	8,779	1	,003	1,234
	Constant	-14,048	4,642	9,158	1	,002	,000

a. Variable(s) entered on step 1: honap.

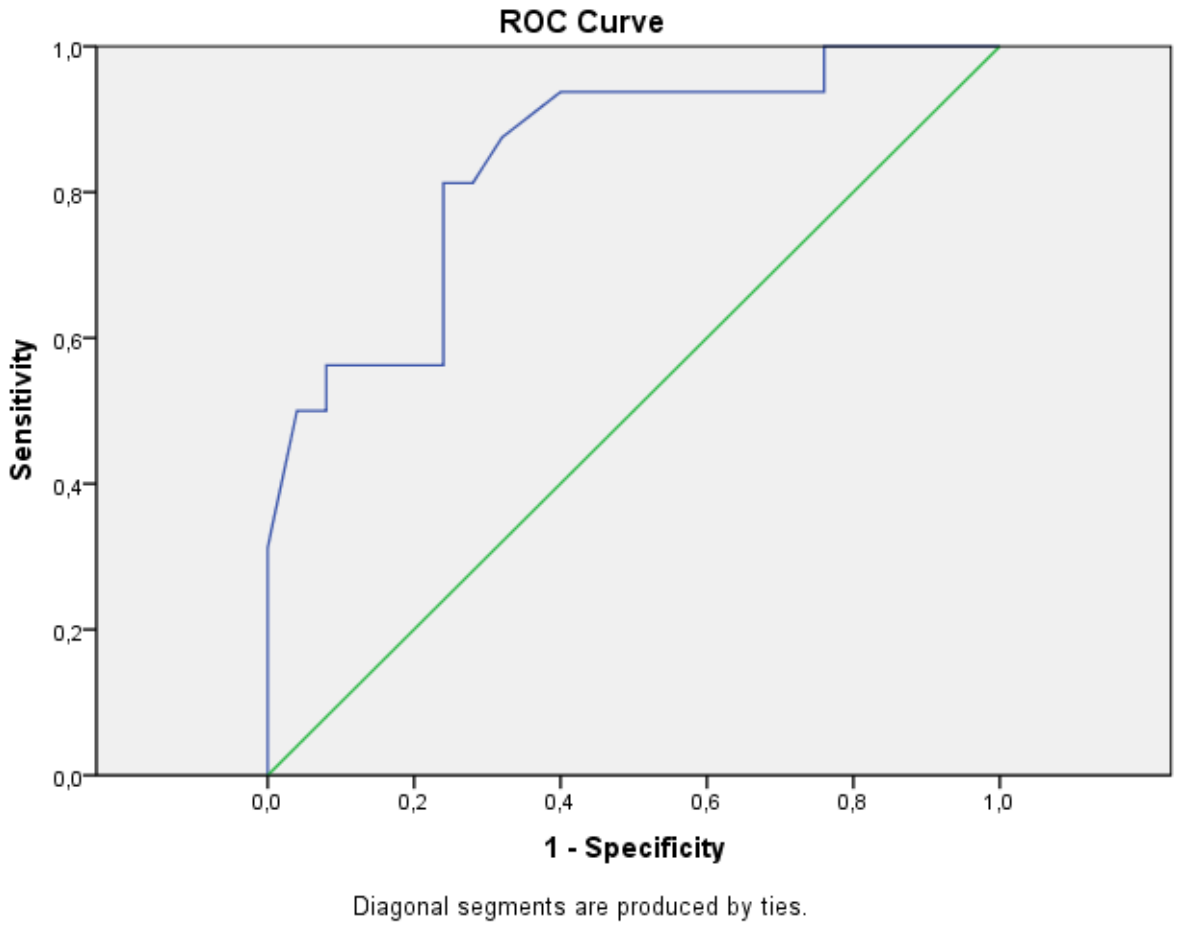
ROC Curve
[DataSet1]

Case Processing Summary

tom1num	Valid N (listwise)
Positive[a]	16
Negative	25
Missing	9

Larger values of the test result variable(s) indicate stronger evidence for a positive actual state.

a. The positive actual state is 1,00.



Diagonal segments are produced by ties.

Area Under the Curve

Test Result Variable(s):honap

Area
,843

Area Under the Curve

Test Result Variable(s):honap

Area
,843

The test result variable(s): honap has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

Coordinates of the Curve

Test Result Variable(s):honap

Positive if Greater Than or Equal To[a]	Sensitivity	1 - Specificity
42,00	1,000	1,000
45,50	1,000	,960
50,00	1,000	,880
53,50	1,000	,760
55,50	,938	,760
56,50	,938	,720
57,50	,938	,680
58,50	,938	,600
59,50	,938	,480
60,50	,938	,440
61,50	,938	,400
62,50	,875	,320
63,50	,813	,280
64,50	,813	,240
65,50	,688	,240
66,50	,563	,240
68,50	,563	,080
70,50	,500	,080
71,50	,500	,040
72,50	,313	,000
73,50	,250	,000

78,00	,188	,000
83,00	,125	,000
85,50	,063	,000
88,00	,000	,000

The test result variable(s): honap has at least one tie between the positive actual state group and the negative actual state group.

a. The smallest cutoff value is the minimum observed test value minus 1, and the largest cutoff value is the maximum observed test value plus 1. All the other cutoff values are the averages of two consecutive ordered observed test values.

Nonparametric Correlations

[DataSet1]

Correlations

			honap	EyesT/6	H-Jean	H-tal.kérd.	H - Hosszu
Spearman's rho	honap	Correlation Coefficient	1,000	,314*	,575**	,614**	,659**
		Sig. (2-tailed)	.	,045	,000	,000	,000
		N	41	41	41	41	41
	EyesT/6	Correlation Coefficient	,314*	1,000	,364*	,459**	,424**
		Sig. (2-tailed)	,045	.	,019	,003	,006
		N	41	41	41	41	41
	H-Jean	Correlation Coefficient	,575**	,364*	1,000	,607**	,664**
		Sig. (2-tailed)	,000	,019	.	,000	,000
		N	41	41	41	41	41
	H-tal.kérd.	Correlation Coefficient	,614**	,459**	,607**	1,000	,784**
		Sig. (2-tailed)	,000	,003	,000	.	,000
		N	41	41	41	41	41
	H - Hosszu	Correlation Coefficient	,659**	,424**	,664**	,784**	1,000
		Sig. (2-tailed)	,000	,006	,000	,000	.
		N	41	41	41	41	41

H-képi	Correlation Coefficient	,561**	,381*	,642**	,786**	,741**
	Sig. (2-tailed)	,000	,014	,000	,000	,000
	N	41	41	41	41	41
Has-FV	Correlation Coefficient	,327*	,255	,359*	,601**	,589**
	Sig. (2-tailed)	,037	,107	,021	,000	,000
	N	41	41	41	41	41
Has-Szöv	Correlation Coefficient	-,028	-,379*	-,041	-,108	,019
	Sig. (2-tailed)	,861	,014	,801	,500	,907
	N	41	41	41	41	41
Met-FV	Correlation Coefficient	,265	,055	,345*	,494**	,552**
	Sig. (2-tailed)	,094	,732	,027	,001	,000
	N	41	41	41	41	41
Met-Szöv	Correlation Coefficient	,478**	,418**	,481**	,731**	,714**
	Sig. (2-tailed)	,002	,007	,001	,000	,000
	N	41	41	41	41	41
Irónia	Correlation Coefficient	,446**	,479**	,419**	,424**	,518**
	Sig. (2-tailed)	,003	,002	,006	,006	,001
	N	41	41	41	41	41
Iron+segit	Correlation Coefficient	,165	,105	,215	,314*	,412**
	Sig. (2-tailed)	,303	,514	,177	,046	,007
	N	41	41	41	41	41
Iron-Kontroll	Correlation Coefficient	-,021	,042	,120	,014	,064
	Sig. (2-tailed)	,896	,795	,453	,929	,691
	N	41	41	41	41	41
Maxm-Menny	Correlation Coefficient	,431**	,168	,379*	,342*	,422**
	Sig. (2-tailed)	,005	,294	,015	,029	,006
	N	41	41	41	41	41
Maxm-Min	Correlation Coefficient	,398*	,086	,422**	,300	,491**
	Sig. (2-tailed)	,010	,592	,006	,057	,001

		N	41	41	41	41	41
	MaxRelev	Correlation Coefficient	,587**	,155	,481**	,530**	,620**
		Sig. (2-tailed)	,000	,334	,001	,000	,000
		N	41	41	41	41	41
	MaxMód	Correlation Coefficient	,635*	,169	,394*	,458**	,357*
		Sig. (2-tailed)	,000	,290	,011	,003	,022
		N	41	41	41	41	41

Correlations

			H-képi	Has-FV	Has-Szöv	Met-FV	Met-Szöv	Irónia
Spearman's rho	honap	Correlation Coefficient	,561**	,327*	-,028	,265	,478**	,446**
		Sig. (2-tailed)	,000	,037	,861	,094	,002	,003
		N	41	41	41	41	41	41
	EyesT/6	Correlation Coefficient	,381*	,255	-,379*	,055	,418**	,479**
		Sig. (2-tailed)	,014	,107	,014	,732	,007	,002
		N	41	41	41	41	41	41
	H-Jean	Correlation Coefficient	,642**	,359*	-,041	,345*	,481**	,419**
		Sig. (2-tailed)	,000	,021	,801	,027	,001	,006
		N	41	41	41	41	41	41
	H-tal.kérd.	Correlation Coefficient	,786**	,601**	-,108	,494**	,731**	,424**
		Sig. (2-tailed)	,000	,000	,500	,001	,000	,006
		N	41	41	41	41	41	41
	H - Hosszu	Correlation Coefficient	,741**	,589**	,019	,552**	,714**	,518**
		Sig. (2-tailed)	,000	,000	,907	,000	,000	,001
		N	41	41	41	41	41	41
	H-képi	Correlation Coefficient	1,000	,532**	,091	,625**	,666**	,398**
		Sig. (2-tailed)	.	,000	,572	,000	,000	,010
		N	41	41	41	41	41	41
	Has-FV	Correlation Coefficient	,532**	1,000	,271	,529**	,595**	,417**
		Sig. (2-tailed)	,000	.	,086	,000	,000	,007

	N	41	41	41	41	41	41
Has-Szöv	Correlation Coefficient	,091	,271	1,000	,280	-,083	-,205
	Sig. (2-tailed)	,572	,086	.	,076	,607	,198
	N	41	41	41	41	41	41
Met-FV	Correlation Coefficient	,625**	,529**	,280	1,000	,523**	,248
	Sig. (2-tailed)	,000	,000	,076	.	,000	,119
	N	41	41	41	41	41	41
Met-Szöv	Correlation Coefficient	,666**	,595**	-,083	,523**	1,000	,171
	Sig. (2-tailed)	,000	,000	,607	,000	.	,285
	N	41	41	41	41	41	41
Irónia	Correlation Coefficient	,398**	,417**	-,205	,248	,171	1,000
	Sig. (2-tailed)	,010	,007	,198	,119	,285	.
	N	41	41	41	41	41	41
Iron+segit	Correlation Coefficient	,368*	,500**	,177	,498**	,277	,415**
	Sig. (2-tailed)	,018	,001	,267	,001	,080	,007
	N	41	41	41	41	41	41
Iron-Kontroll	Correlation Coefficient	,031	-,019	-,029	-,017	-,107	,266
	Sig. (2-tailed)	,848	,908	,855	,916	,505	,093
	N	41	41	41	41	41	41
Maxm-Menny	Correlation Coefficient	,481**	,250	,232	,509**	,248	,121
	Sig. (2-tailed)	,001	,115	,144	,001	,118	,451
	N	41	41	41	41	41	41
Maxm-Min	Correlation Coefficient	,410**	,188	,240	,517**	,246	,118
	Sig. (2-tailed)	,008	,238	,130	,001	,120	,464
	N	41	41	41	41	41	41
MaxRelev	Correlation Coefficient	,482**	,509**	,214	,518**	,540**	,224
	Sig. (2-tailed)	,001	,001	,179	,001	,000	,158
	N	41	41	41	41	41	41
MaxMód	Correlation Coefficient	,464**	,311*	,103	,302	,229	,460**

	Sig. (2-tailed)	,002	,048	,521	,055	,150	,003
	N	41	41	41	41	41	41

Correlations

			Iron+segit	Iron-Kontroll	Maxm-Menny	Maxm-Min
Spearman's rho	honap	Correlation Coefficient	,165	-,021	,431**	,398*
		Sig. (2-tailed)	,303	,896	,005	,010
		N	41	41	41	41
	EyesT/6	Correlation Coefficient	,105	,042	,168	,086
		Sig. (2-tailed)	,514	,795	,294	,592
		N	41	41	41	41
	H-Jean	Correlation Coefficient	,215	,120	,379*	,422**
		Sig. (2-tailed)	,177	,453	,015	,006
		N	41	41	41	41
	H-tal.kérd.	Correlation Coefficient	,314*	,014	,342*	,300
		Sig. (2-tailed)	,046	,929	,029	,057
		N	41	41	41	41
	H - Hosszu	Correlation Coefficient	,412**	,064	,422**	,491**
		Sig. (2-tailed)	,007	,691	,006	,001
		N	41	41	41	41
	H-képi	Correlation Coefficient	,368*	,031	,481**	,410**
		Sig. (2-tailed)	,018	,848	,001	,008
		N	41	41	41	41
	Has-FV	Correlation Coefficient	,500**	-,019	,250	,188
		Sig. (2-tailed)	,001	,908	,115	,238
		N	41	41	41	41
	Has-Szöv	Correlation Coefficient	,177	-,029	,232	,240
		Sig. (2-tailed)	,267	,855	,144	,130
		N	41	41	41	41
	Met-FV	Correlation Coefficient	,498**	-,017	,509**	,517**

		Sig. (2-tailed)	,001	,916	,001	,001
		N	41	41	41	41
	Met-Szöv	Correlation Coefficient	,277	-,107	,248	,246
		Sig. (2-tailed)	,080	,505	,118	,120
		N	41	41	41	41
	Irónia	Correlation Coefficient	,415**	,266	,121	,118
		Sig. (2-tailed)	,007	,093	,451	,464
		N	41	41	41	41
	Iron+segit	Correlation Coefficient	1,000	,120	,208	,316*
		Sig. (2-tailed)	.	,454	,192	,044
		N	41	41	41	41
	Iron-Kontroll	Correlation Coefficient	,120	1,000	,101	,075
		Sig. (2-tailed)	,454	.	,529	,643
		N	41	41	41	41
	Maxm-Menny	Correlation Coefficient	,208	,101	1,000	,583**
		Sig. (2-tailed)	,192	,529	.	,000
		N	41	41	41	41
	Maxm-Min	Correlation Coefficient	,316*	,075	,583**	1,000
		Sig. (2-tailed)	,044	,643	,000	.
		N	41	41	41	41
	MaxRelev	Correlation Coefficient	,313*	,011	,558**	,514**
		Sig. (2-tailed)	,046	,948	,000	,001
		N	41	41	41	41
	MaxMód	Correlation Coefficient	,348*	,213	,507*	,340*
		Sig. (2-tailed)	,026	,181	,001	,030
		N	41	41	41	41

Correlations

			MaxRelev	MaxMód
Spearman's rho	honap	Correlation Coefficient	,587**	,635**
		Sig. (2-tailed)	,000	,000

	N	41	41
EyesT/6	Correlation Coefficient	,155	,169
	Sig. (2-tailed)	,334	,290
	N	41	41
H-Jean	Correlation Coefficient	,481**	,394*
	Sig. (2-tailed)	,001	,011
	N	41	41
H-tal.kérd.	Correlation Coefficient	,530**	,458**
	Sig. (2-tailed)	,000	,003
	N	41	41
H - Hosszu	Correlation Coefficient	,620**	,357*
	Sig. (2-tailed)	,000	,022
	N	41	41
H-képi	Correlation Coefficient	,482**	,464**
	Sig. (2-tailed)	,001	,002
	N	41	41
Has-FV	Correlation Coefficient	,509**	,311*
	Sig. (2-tailed)	,001	,048
	N	41	41
Has-Szöv	Correlation Coefficient	,214	,103
	Sig. (2-tailed)	,179	,521
	N	41	41
Met-FV	Correlation Coefficient	,518**	,302
	Sig. (2-tailed)	,001	,055
	N	41	41
Met-Szöv	Correlation Coefficient	,540**	,229
	Sig. (2-tailed)	,000	,150
	N	41	41
Irónia	Correlation Coefficient	,224	,460**
	Sig. (2-tailed)	,158	,003
	N	41	41
Iron+segit	Correlation Coefficient	,313*	,348*
	Sig. (2-tailed)	,046	,026
	N	41	41
Iron-Kontroll	Correlation Coefficient	,011	,213
	Sig. (2-tailed)	,948	,181
	N	41	41

	Maxm-Menny	Correlation Coefficient	,558**	,507**
		Sig. (2-tailed)	,000	,001
		N	41	41
	Maxm-Min	Correlation Coefficient	,514**	,340*
		Sig. (2-tailed)	,001	,030
		N	41	41
	MaxRelev	Correlation Coefficient	1,000	,470*
		Sig. (2-tailed)	.	,002
		N	41	41
	MaxMód	Correlation Coefficient	,470**	1,000
		Sig. (2-tailed)	,002	.
		N	41	41

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Logistic Regression

[DataSet1]

Dependent Variable Encoding

Original Value	Internal Value
,00	0
1,00	1

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	11,654	1	,001
	Block	11,654	1	,001
	Model	11,654	1	,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	43,193[a]	,247	,335

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted		
			tom1num		Percentage Correct
			,00	1,00	
Step 1	tom1num	,00	20	5	80,0
		1,00	5	11	68,8
	Overall Percentage				75,6

a. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	EyesT6	1,143	,389	8,633	1	,003	3,136
	Constant	-4,346	1,407	9,543	1	,002	,013

a. Variable(s) entered on step 1: EyesT6.

ROC Curve

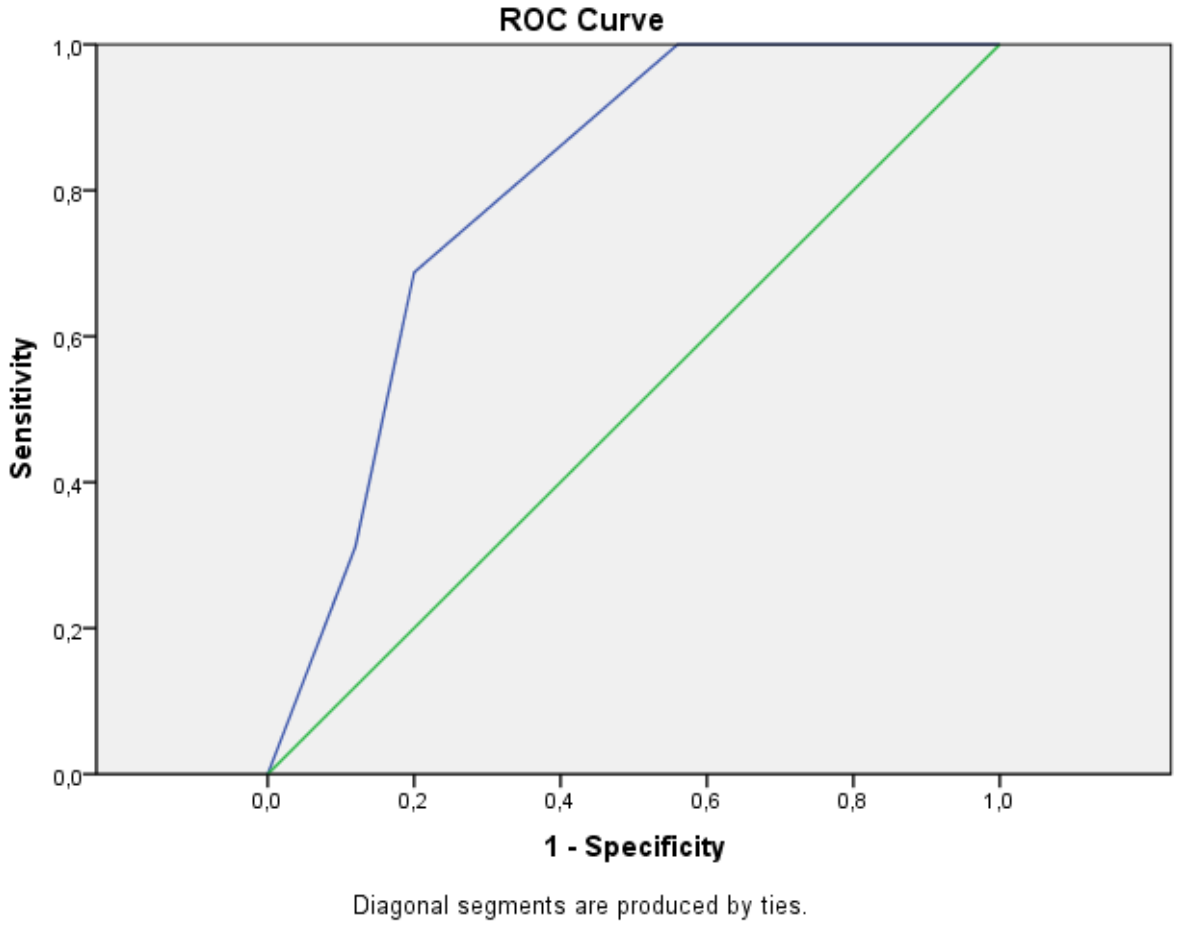
[DataSet1]

Case Processing Summary

tom1num	Valid N (listwise)
Positive[a]	16
Negative	25
Missing	9

Larger values of the test result variable(s) indicate stronger evidence for a positive actual state.

a. The positive actual state is 1,00.



Diagonal segments are produced by ties.

Area Under the Curve

Test Result Variable(s):EyesT/6

Area
,803

The test result variable(s): EyesT/6 has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

Coordinates of the Curve

Test Result Variable(s):EyesT/6

Positive if Greater Than or Equal To[a]	Sensitivity	1 - Specificity
,00	1,000	1,000
1,50	1,000	,960
2,50	1,000	,560
3,50	,688	,200
4,50	,313	,120
6,00	,000	,000

The test result variable(s): EyesT/6 has at least one tie between the positive actual state group and the negative actual state group.

a. The smallest cutoff value is the minimum observed test value minus 1, and the largest cutoff value is the maximum observed test value plus 1. All the other cutoff values are the averages of two consecutive ordered observed test values.

NPar Tests

[DataSet1]

Mann-Whitney

Ranks

	tom1num	N	Mean Rank	Sum of Ranks
EyesT/6	,00	25	16,16	404,00
	1,00	16	28,56	457,00
	Total	41		
H-Jean	,00	25	15,42	385,50
	1,00	16	29,72	475,50
	Total	41		
H-tal.kérd.	,00	25	13,12	328,00
	1,00	16	33,31	533,00
	Total	41		
H - Hosszu	,00	25	14,02	350,50
	1,00	16	31,91	510,50
	Total	41		
H-képi	,00	25	13,54	338,50
	1,00	16	32,66	522,50
	Total	41		
Has-FV	,00	25	16,36	409,00
	1,00	16	28,25	452,00

	Total	41		
Has-Szöv	,00	25	21,54	538,50
	1,00	16	20,16	322,50
	Total	41		
Met-FV	,00	25	16,52	413,00
	1,00	16	28,00	448,00
	Total	41		
Met-Szöv	,00	25	13,86	346,50
	1,00	16	32,16	514,50
	Total	41		
Irónia	,00	25	17,62	440,50
	1,00	16	26,28	420,50
	Total	41		
Iron+segit	,00	25	19,00	475,00
	1,00	16	24,13	386,00
	Total	41		
Iron-Kontroll	,00	25	20,44	511,00
	1,00	16	21,88	350,00
	Total	41		
Maxm-Menny	,00	25	17,80	445,00
	1,00	16	26,00	416,00
	Total	41		
Maxm-Min	,00	25	18,90	472,50
	1,00			388,50
	Total	41	24,28	
MaxRelev	,00	25	16,72	418,00
	1,00	16	27,69	443,00
	Total	41		
MaxMód	,00	25	17,14	428,50
	1,00	16	27,03	432,50
	Total	41		

Test Statistics[b]

	EyesT/6	H-Jean	H-tal.kérd.	H - Hosszu	H-képi	Has-FV
Mann-Whitney U	79,000	60,500	3,000	25,500	13,500	84,000
Wilcoxon W	404,000	385,500	328,000	350,500	338,500	409,000

Z	-3,351	-4,101	-5,827	-4,805	-5,226	-3,487
Asymp. Sig. (2-tailed)	,001	,000	,000	,000	,000	,000
Exact Sig. [2*(1-tailed Sig.)]	,001[a]	,000[a]	,000[a]	,000[a]	,000[a]	,001[a]

Test Statistics[b]

	Has-Szöv	Met-FV	Met-Szöv	Irónia	Iron+segit	Iron-Kontroll
Mann-Whitney U	186,500	88,000	21,500	115,500	150,000	186,000
Wilcoxon W	322,500	413,000	346,500	440,500	475,000	511,000
Z	-,454	-3,078	-4,861	-2,347	-1,628	-,434
Asymp. Sig. (2-tailed)	,650	,002	,000	,019	,104	,664
Exact Sig. [2*(1-tailed Sig.)]	,721[a]	,002[a]	,000[a]	,023[a]	,188[a]	,721[a]

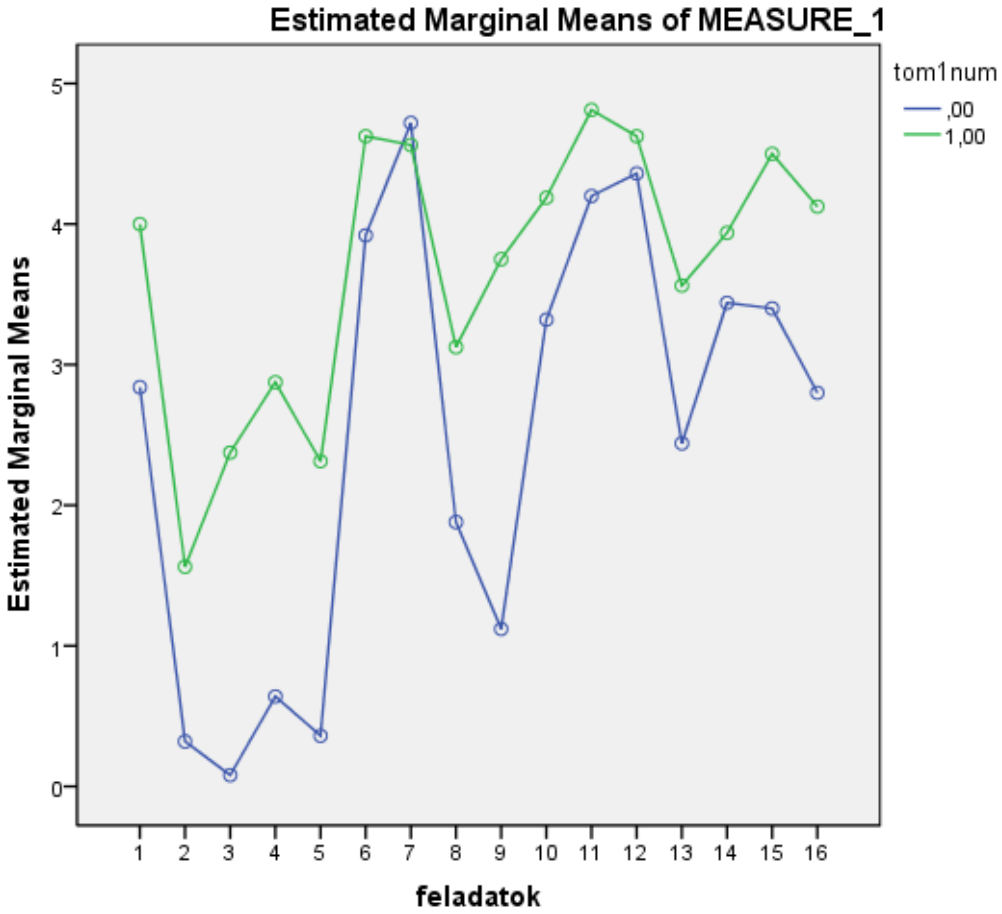
Test Statistics[b]

	Maxm-Menny	Maxm-Min	MaxRelev	MaxMód
Mann-Whitney U	120,000	147,500	93,000	103,500
Wilcoxon W	445,000	472,500	418,000	428,500
Z	-2,192	-1,470	-2,982	-2,658
Asymp. Sig. (2-tailed)	,028	,142	,003	,008
Exact Sig. [2*(1-tailed Sig.)]	,032[a]	,162[a]	,004[a]	,009[a]

a. Not corrected for ties.

b. Grouping Variable: tom1num

General Linear Model
[DataSet1]
Profile Plots



Synopsis of results in one chart

Lower line: NoToM group, Upper line: ToM group.

1 - Eyes Test
2 - Humour – One-liners (Jean) (Dectx)
3 - Humour - Riddles (Dectx)
4 - Humour-Jokes (Contx)
5- Humour-Visual (NV)
6- Simile (Dectx)
7- Simile (Ctx)
8- Metaphor (Dectx)
9 - Metaphor (Ctx)
10 - Irony
11 - Irony + Lg help
12 - (Irony) Controll
13 - Maxims - Quantity
14 - Maxims-Quality
15 -Maxims-Relevance
16 -Maxims-Manner

```
NPAR TESTS
  /M-W= HJean Htal.kérd HHosszu Hképi HasFV HasSzöv MetFV MetSzöv Irónia Ironsegit IronKontroll
MaxmMenny MaxmMin MaxRelev MaxMód BY tom1num(0 1)
  /MISSING ANALYSIS.
```

NPar Tests

Notes

Output Created	30-AUG-2013 10:45:11

Comments		
Input	Data	c:\Documents and Settings\rob\Dokumentumok\zsuzsinakadatok.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	41
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each test are based on all cases with valid data for the variable(s) used in that test.
Syntax		NPAR TESTS /M-W= HJean Htal.kérd HHosszu Hképi HasFV HasSzöv MetFV MetSzöv Irónia Ironsegit IronKontroll MaxmMenny MaxmMin MaxRelev MaxMód BY tom1num(0 1) /MISSING ANALYSIS.
Resources	Processor Time	00:00:00,03
	Elapsed Time	00:00:00,03
	Number of Cases Allowed[a]	37449

a. Based on availability of workspace memory.

[DataSet1] c:\Documents and Settings\rob\Dokumentumok\zsuzsinakadatok.sav

Mann-Whitney Test

Ranks

	tom1num	N	Mean Rank	Sum of Ranks
H-Jean	,00	25	15,42	385,50
	1,00	16	29,72	475,50
	Total	41		
H-tal.kérd.	,00	25	13,12	328,00
	1,00	16	33,31	533,00
	Total	41		
H - Hosszu	,00	25	14,02	350,50
	1,00	16	31,91	510,50
	Total	41		
H-képi	,00	25	13,54	338,50
	1,00	16	32,66	522,50

	Total	41		
	,00	25	16,36	409,00
Has-FV	1,00	16	28,25	452,00
	Total	41		
	,00	25	21,54	538,50
Has-Szöv	1,00	16	20,16	322,50
	Total	41		
	,00	25	16,52	413,00
Met-FV	1,00	16	28,00	448,00
	Total	41		
	,00	25	13,86	346,50
Met-Szöv	1,00	16	32,16	514,50
	Total	41		
	,00	25	17,62	440,50
Irónia	1,00	16	26,28	420,50
	Total	41		
	,00	25	19,00	475,00
Iron+segit	1,00	16	24,13	386,00
	Total	41		
	,00	25	20,44	511,00
Iron-Kontroll	1,00	16	21,88	350,00
	Total	41		
	,00	25	17,80	445,00
Maxm-Menny	1,00	16	26,00	416,00
	Total	41		
	,00	25	18,90	472,50
Maxm-Min	1,00	16	24,28	388,50
	Total	41		
	,00	25	16,72	418,00
MaxRelev	1,00	16	27,69	443,00
	Total	41		
	,00	25	17,14	428,50
MaxMód	1,00	16	27,03	432,50
	Total	41		

Test Statistics[a]

	H-Jean	H-tal.kérd.	H - Hosszu	H-képi	Has-FV
Mann-Whitney U	60,500	3,000	25,500	13,500	84,000
Wilcoxon W	385,500	328,000	350,500	338,500	409,000
Z	-4,101	-5,827	-4,805	-5,226	-3,487
Asymp. Sig. (2-tailed)	,000	,000	,000	,000	,000
Exact Sig. [2*(1-tailed Sig.)]	,000[b]	,000[b]	,000[b]	,000[b]	,001[b]

Test Statistics[a]

	Has-Szöv	Met-FV	Met-Szöv	Irónia	Iron+segit
Mann-Whitney U	186,500	88,000	21,500	115,500	150,000
Wilcoxon W	322,500	413,000	346,500	440,500	475,000
Z	-,454	-3,078	-4,861	-2,347	-1,628
Asymp. Sig. (2-tailed)	,650	,002	,000	,019	,104
Exact Sig. [2*(1-tailed Sig.)]	,721[b]	,002[b]	,000[b]	,023[b]	,188[b]

Test Statistics[a]

	Iron-Kontroll	Maxm-Menny	Maxm-Min	MaxRelev	MaxMód
Mann-Whitney U	186,000	120,000	147,500	93,000	103,500
Wilcoxon W	511,000	445,000	472,500	418,000	428,500
Z	-,434	-2,192	-1,470	-2,982	-2,658
Asymp. Sig. (2-tailed)	,664	,028	,142	,003	,008
Exact Sig. [2*(1-tailed Sig.)]	,721[b]	,032[b]	,162[b]	,004[b]	,009[b]

a. Grouping Variable: tom1num

b. Not corrected for ties.

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
tom1num * EyesT/6	41	100,0%	0	0,0%	41	100,0%

*tom1num * EyesT/6 Crosstabulation*

Count

		EyesT/6					Total
		1	2	3	4	5	
tom1num	,00	1	10	9	2	3	25
	1,00	0	0	5	6	5	16
Total		1	10	14	8	8	41

Directional Measures

			Value	Asymp. Std. Error[a]
Ordinal by Ordinal	Somers' d	Symmetric	,471	,100
		tom1num Dependent	,385	,085
		EyesT/6 Dependent	,605	,127

Nominal by Interval	Eta	tom1num Dependent	,570
		EyesT/6 Dependent	,510

Directional Measures

			Approx. T	Approx. Sig.[a]
Ordinal by Ordinal	Somers' d	Symmetric	4,503	,000
		tom1num Dependent	4,503	,000
		EyesT/6 Dependent	4,503	,000
Nominal by Interval	Eta	tom1num Dependent		
		EyesT/6 Dependent		

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Nonparametric Correlations

Correlations

			EyesT/6	H-Jean	H-tal.kérd.	H - Hosszu	H-képi	Has-FV	Has-Szöv
Spearman's rho	EyesT/6	Correlation Coefficient	1,000	,364*	,459**	,424**	,381*	,255	-,379*
		Sig. (2-tailed)	.	,019	,003	,006	,014	,107	,014
		N	41	41	41	41	41	41	41
	H-Jean	Correlation Coefficient	,364*	1,000	,607**	,664**	,642**	,359*	-,041
		Sig. (2-tailed)	,019	.	,000	,000	,000	,021	,801
		N	41	41	41	41	41	41	41
	H-tal.kérd.	Correlation Coefficient	,459**	,607**	1,000	,784**	,786**	,601**	-,108
		Sig. (2-tailed)	,003	,000	.	,000	,000	,000	,500
		N	41	41	41	41	41	41	41
	H - Hosszu	Correlation Coefficient	,424**	,664**	,784**	1,000	,741**	,589**	,019
		Sig. (2-tailed)	,006	,000	,000	.	,000	,000	,907
		N	41	41	41	41	41	41	41
	H-képi	Correlation Coefficient	,381*	,642**	,786**	,741**	1,000	,532**	,091
		Sig. (2-tailed)	,014	,000	,000	,000	.	,000	,572
		N	41	41	41	41	41	41	41
	Has-FV	Correlation Coefficient	,255	,359*	,601**	,589**	,532**	1,000	,271
		Sig. (2-tailed)	,107	,021	,000	,000	,000	.	,086

		N	41	41	41	41	41	41	41
	Has-Szöv	Correlation Coefficient	-,379*	-,041	-,108	,019	,091	,271	1,000
		Sig. (2-tailed)	,014	,801	,500	,907	,572	,086	.
		N	41	41	41	41	41	41	41
	Met-FV	Correlation Coefficient	,055	,345*	,494**	,552**	,625**	,529**	,280
		Sig. (2-tailed)	,732	,027	,001	,000	,000	,000	,076
		N	41	41	41	41	41	41	41
	Met-Szöv	Correlation Coefficient	,418**	,481**	,731**	,714**	,666**	,595**	-,083
		Sig. (2-tailed)	,007	,001	,000	,000	,000	,000	,607
		N	41	41	41	41	41	41	41
	Irónia	Correlation Coefficient	,479**	,419**	,424**	,518**	,398**	,417**	-,205
		Sig. (2-tailed)	,002	,006	,006	,001	,010	,007	,198
		N	41	41	41	41	41	41	41
	Iron+segit	Correlation Coefficient	,105	,215	,314*	,412**	,368*	,500**	,177
		Sig. (2-tailed)	,514	,177	,046	,007	,018	,001	,267
		N	41	41	41	41	41	41	41
	Iron-Kontroll	Correlation Coefficient	,042	,120	,014	,064	,031	-,019	-,029
		Sig. (2-tailed)	,795	,453	,929	,691	,848	,908	,855
		N	41	41	41	41	41	41	41
	Maxm-Menny	Correlation Coefficient	,168	,379*	,342*	,422**	,481**	,250	,232
		Sig. (2-tailed)	,294	,015	,029	,006	,001	,115	,144
		N	41	41	41	41	41	41	41
	Maxm-Min	Correlation Coefficient	,086	,422**	,300	,491**	,410**	,188	,240
		Sig. (2-tailed)	,592	,006	,057	,001	,008	,238	,130
		N	41	41	41	41	41	41	41
	MaxRelev	Correlation Coefficient	,155	,481**	,530**	,620**	,482**	,509**	,214
		Sig. (2-tailed)	,334	,001	,000	,000	,001	,001	,179
		N	41	41	41	41	41	41	41
	MaxMód	Correlation Coefficient	,169	,394*	,458**	,357*	,464**	,311*	,103
		Sig. (2-tailed)	,290	,011	,003	,022	,002	,048	,521
		N	41	41	41	41	41	41	41

Correlations

			Met-FV	Met-Szöv	Irónia	Iron+segit	Iron-Kontroll	Maxm-Menny	Maxm-Min
Spearman's rho	EyesT/6	Correlation Coefficient	,055	,418*	,479**	,105**	,042*	,168	,086*
		Sig. (2-tailed)	,732	,007	,002	,514	,795	,294	,592
		N	41	41	41	41	41	41	41
	H-Jean	Correlation Coefficient	,345*	,481	,419**	,215**	,120**	,379*	,422
		Sig. (2-tailed)	,027	,001	,006	,177	,453	,015	,006
		N	41	41	41	41	41	41	41
	H-tal.kérd.	Correlation Coefficient	,494**	,731**	,424	,314**	,014**	,342**	,300
		Sig. (2-tailed)	,001	,000	,006	,046	,929	,029	,057
		N	41	41	41	41	41	41	41
	H - Hosszu	Correlation Coefficient	,552**	,714**	,518**	,412	,064**	,422**	,491
		Sig. (2-tailed)	,000	,000	,001	,007	,691	,006	,001
		N	41	41	41	41	41	41	41
	H-képi	Correlation Coefficient	,625*	,666**	,398**	,368**	,031	,481**	,410
		Sig. (2-tailed)	,000	,000	,010	,018	,848	,001	,008
		N	41	41	41	41	41	41	41
	Has-FV	Correlation Coefficient	,529	,595*	,417**	,500**	-,019**	,250	,188
		Sig. (2-tailed)	,000	,000	,007	,001	,908	,115	,238
		N	41	41	41	41	41	41	41
	Has-Szöv	Correlation Coefficient	,280*	-,083	-,205	,177	-,029	,232	,240
		Sig. (2-tailed)	,076	,607	,198	,267	,855	,144	,130
		N	41	41	41	41	41	41	41
	Met-FV	Correlation Coefficient	1,000	,523*	,248**	,498**	-,017**	,509**	,517
		Sig. (2-tailed)	.	,000	,119	,001	,916	,001	,001
		N	41	41	41	41	41	41	41
	Met-Szöv	Correlation Coefficient	,523**	1,000**	,171**	,277**	-,107**	,248**	,246
		Sig. (2-tailed)	,000	.	,285	,080	,505	,118	,120
		N	41	41	41	41	41	41	41
	Irónia	Correlation Coefficient	,248**	,171**	1,000**	,415**	,266**	,121**	,118

		Sig. (2-tailed)	,119	,285	.	,007	,093	,451	,464
		N	41	41	41	41	41	41	41
	Iron+segit	Correlation Coefficient	,498	,277	,415*	1,000**	,120*	,208**	,316
		Sig. (2-tailed)	,001	,080	,007	.	,454	,192	,044
		N	41	41	41	41	41	41	41
	Iron-Kontroll	Correlation Coefficient	-,017	-,107	,266	,120	1,000	,101	,075
		Sig. (2-tailed)	,916	,505	,093	,454	.	,529	,643
		N	41	41	41	41	41	41	41
	Maxm-Menny	Correlation Coefficient	,509	,248*	,121*	,208**	,101**	1,000	,583
		Sig. (2-tailed)	,001	,118	,451	,192	,529	.	,000
		N	41	41	41	41	41	41	41
	Maxm-Min	Correlation Coefficient	,517	,246**	,118	,316**	,075**	,583	1,000
		Sig. (2-tailed)	,001	,120	,464	,044	,643	,000	.
		N	41	41	41	41	41	41	41
	MaxRelev	Correlation Coefficient	,518	,540**	,224**	,313**	,011**	,558**	,514
		Sig. (2-tailed)	,001	,000	,158	,046	,948	,000	,001
		N	41	41	41	41	41	41	41
	MaxMód	Correlation Coefficient	,302	,229*	,460**	,348*	,213**	,507*	,340
		Sig. (2-tailed)	,055	,150	,003	,026	,181	,001	,030
		N	41	41	41	41	41	41	41

Correlations

			MaxRelev	MaxMód
Spearman's rho	EyesT/6	Correlation Coefficient	,155	,169*
		Sig. (2-tailed)	,334	,290
		N	41	41
	H-Jean	Correlation Coefficient	,481*	,394
		Sig. (2-tailed)	,001	,011
		N	41	41
	H-tal.kérd.	Correlation Coefficient	,530**	,458**
		Sig. (2-tailed)	,000	,003
		N	41	41
	H - Hosszu	Correlation Coefficient	,620**	,357**
		Sig. (2-tailed)	,000	,022
		N	41	41

	Correlation Coefficient	,482*	,464**
H-képi	Sig. (2-tailed)	,001	,002
	N	41	41
	Correlation Coefficient	,509	,311*
Has-FV	Sig. (2-tailed)	,001	,048
	N	41	41
	Correlation Coefficient	,214*	,103
Has-Szöv	Sig. (2-tailed)	,179	,521
	N	41	41
	Correlation Coefficient	,518	,302*
Met-FV	Sig. (2-tailed)	,001	,055
	N	41	41
	Correlation Coefficient	,540**	,229**
Met-Szöv	Sig. (2-tailed)	,000	,150
	N	41	41
	Correlation Coefficient	,224**	,460**
Irónia	Sig. (2-tailed)	,158	,003
	N	41	41
	Correlation Coefficient	,313	,348
Iron+segit	Sig. (2-tailed)	,046	,026
	N	41	41
	Correlation Coefficient	,011	,213
Iron-Kontroll	Sig. (2-tailed)	,948	,181
	N	41	41
	Correlation Coefficient	,558	,507*
Maxm-Menny	Sig. (2-tailed)	,000	,001
	N	41	41
	Correlation Coefficient	,514	,340**
Maxm-Min	Sig. (2-tailed)	,001	,030
	N	41	41
	Correlation Coefficient	1,000	,470**
MaxRelev	Sig. (2-tailed)	.	,002
	N	41	41
	Correlation Coefficient	,470	1,000*
MaxMód	Sig. (2-tailed)	,002	.
	N	41	41

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

```
NPAR TESTS
  /M-W= Irónia Ironsegit IronKontroll BY tom1num(0 1)
  /MISSING ANALYSIS.
```

NPar Tests

[DataSet1] c:\Documents and Settings\rob\Dokumentumok\zsuzsinakadatok.sav

Mann-Whitney Test

Ranks

	tom1num	N	Mean Rank	Sum of Ranks
Irónia	,00	25	17,62	440,50
	1,00	16	26,28	420,50
	Total	41		
Iron+segit	,00	25	19,00	475,00
	1,00	16	24,13	386,00
	Total	41		
Iron-Kontroll	,00	25	20,44	511,00
	1,00	16	21,88	350,00
	Total	41		

Test Statistics[a]

	Irónia	Iron+segit	Iron-Kontroll
Mann-Whitney U	115,500	150,000	186,000
Wilcoxon W	440,500	475,000	511,000
Z	-2,347	-1,628	-,434
Asymp. Sig. (2-tailed)	,019	,104	,664
Exact Sig. [2*(1-tailed Sig.)]	,023[b]	,188[b]	,721[b]

a. Grouping Variable: tom1num

b. Not corrected for ties.

```
GLM MetFV MetSzöv Irónia Ironsegit IronKontroll BY tom1num
  /WSFACTOR=metairon 5 Polynomial
  /METHOD=SSTYPE(3)
  /PLOT=PROFILE(metairon*tom1num)
  /EMMEANS=TABLES(metairon) COMPARE ADJ(SIDAK)
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=metairon
  /DESIGN=tom1num.
```

General Linear Model

[DataSet1] c:\Documents and Settings\rob\Dokumentumok\zsuzsinakadatok.sav

Within-Subjects Factors

Measure: MEASURE_1

metairon	Dependent Variable
1	MetFV
2	MetSzöv

3	Irónia
4	Ironsegit
5	IronKontroll

Between-Subjects Factors

		N
tom1num	,00	25
	1,00	16

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square
metairon	Sphericity Assumed	163,278	4	40,819
	Greenhouse-Geisser	163,278	3,130	52,163
	Huynh-Feldt	163,278	3,522	46,358
	Lower-bound	163,278	1,000	163,278
metairon * tom1num	Sphericity Assumed	32,663	4	8,166
	Greenhouse-Geisser	32,663	3,130	10,435
	Huynh-Feldt	32,663	3,522	9,274
	Lower-bound	32,663	1,000	32,663
Error(metairon)	Sphericity Assumed	143,727	156	,921
	Greenhouse-Geisser	143,727	122,076	1,177
	Huynh-Feldt	143,727	137,361	1,046
	Lower-bound	143,727	39,000	3,685

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		F	Sig.
metairon	Sphericity Assumed	44,305	,000
	Greenhouse-Geisser	44,305	,000
	Huynh-Feldt	44,305	,000
	Lower-bound	44,305	,000
metairon * tom1num	Sphericity Assumed	8,863	,000
	Greenhouse-Geisser	8,863	,000
	Huynh-Feldt	8,863	,000
	Lower-bound	8,863	,005
Error(metairon)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2442,428	1	2442,428	1398,172	,000
tom1num	61,628	1	61,628	35,279	,000
Error	68,128	39	1,747		

Estimated Marginal Means
metairon

Estimates

Measure: MEASURE_1

metairon	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2,503	,175	2,149	2,856
2	2,435	,169	2,092	2,778
3	3,754	,181	3,388	4,120
4	4,506	,159	4,185	4,828
5	4,493	,148	4,192	4,793

Pairwise Comparisons

Measure: MEASURE_1

(I) metairon	(J) metairon	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]
					Lower Bound
1	2	,068	,209	1,000	-,552
	3	-1,251*	,242	,000	-1,969
	4	-2,004*	,200	,000	-2,597
	5	-1,990*	,235	,000	-2,688
2	1	-,068	,209	1,000	-,687
	3	-1,319*	,271	,000	-2,123
	4	-2,071*	,230	,000	-2,755
	5	-2,058*	,233	,000	-2,747
3	1	1,251*	,242	,000	,533
	2	1,319*	,271	,000	,514
	4	-,753*	,182	,002	-1,292
	5	-,739*	,176	,001	-1,260
4	1	2,004*	,200	,000	1,410
	2	2,071*	,230	,000	1,388

	3	,753*	,182	,002	,213
	5	,014	,173	1,000	-,501
	1	1,990*	,235	,000	1,292
	2	2,058*	,233	,000	1,368
5	3	,739*	,176	,001	,218
	4	-,014	,173	1,000	-,528

Pairwise Comparisons

Measure: MEASURE_1

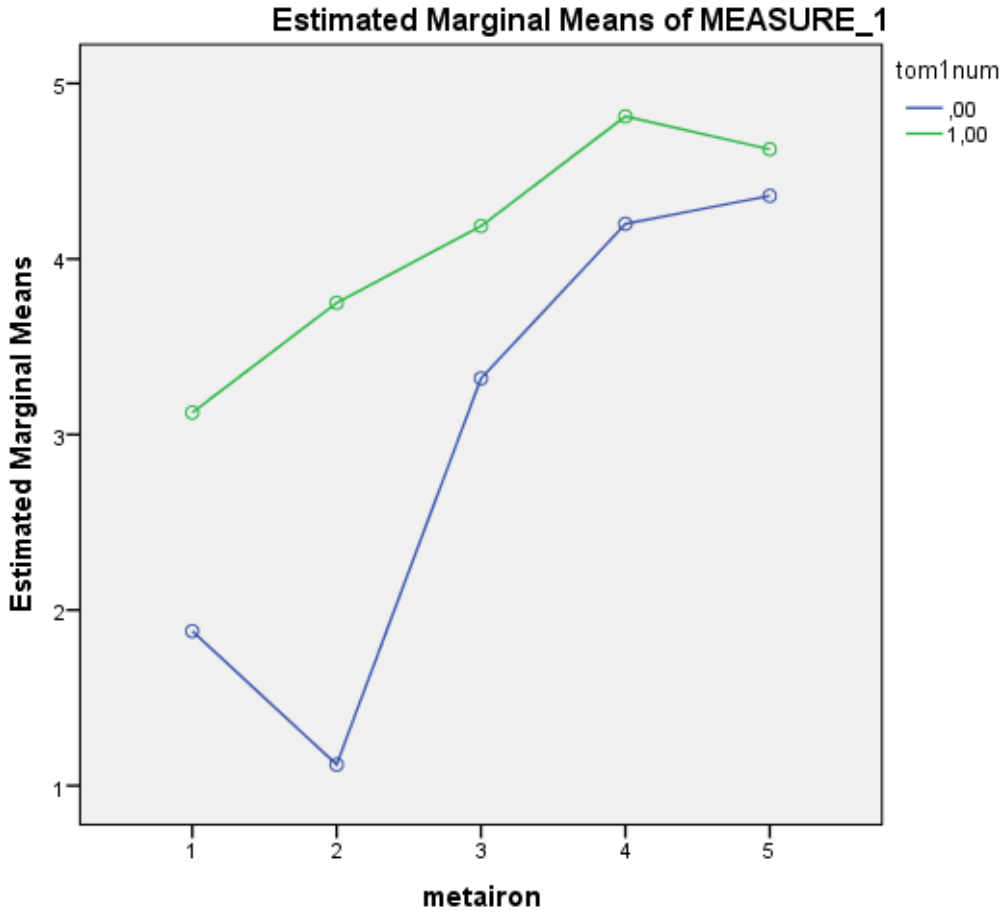
(I) metairon	(J) metairon	95% Confidence Interval for Difference
		Upper Bound
	2	,687
	3	-,533*
1	4	-1,410*
	5	-1,292*
	1	,552
	3	-,514*
2	4	-1,388*
	5	-1,368*
	1	1,969*
	2	2,123*
3	4	-,213*
	5	-,218*
	1	2,597*
	2	2,755*
4	3	1,292*
	5	,528
	1	2,688*
	2	2,747*
5	3	1,260*
	4	,501

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Sidak.

Profile Plots


Estimated Marginal Means of MEASURE_1
tom1num
,00
1,00
Estimated Marginal Means
5
4
3
2
1
1
2
3
4
5
metairon

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