The development of non-literal uses of language: Sense conventions and pragmatic competence

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ABSTRACT

A growing body of developmental evidence suggests that the cognitive abilities that enable the expression and comprehension of communicative intentions − so-called *pragmatic abilities* − which underlie language use and understanding, develop early. However, a puzzling feature of pragmatic development is children's difficulties with non-literal uses of language (e.g., 'I love you so much I could *eat you up*!'). I outline a research program that aims to provide input to a novel theoretical account of pragmatic development that resolves this developmental puzzle. Rather than investigating different types of non-literal language use in isolation, we should adopt a global perspective on children's pragmatic difficulties. On the basis of experimental evidence from children's comprehension of metonymy and irony, I hypothesise that children's growing sensitivity to sense conventions impedes their pragmatic reasoning with non-literal uses during the preschool years. According to this hypothesis, children's 'literalism' does not result from poor pragmatic abilities, but arises because attending to conventions − and to *sense conventions* in particular - serves an important function at a particular stage of language and social learning. The aim is to open a new direction for empirical research into the development of non-literal uses of language, and pragmatic development more generally.
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1. Introduction: the puzzle of pragmatic development

Children are born communicators. Human infants detect ostensive communication in the form of eye contact, speech and behaviour (Csibra, 2010), and start engaging in acts of joint attention around 9 months (Scaife and Bruner, 1975). They rely on speakers' intentions when learning their first words around 18 months (Bloom, 2000). This early pragmatic competence also underlies the ability of 2-year-olds to track speakers' knowledge when understanding and using referential expressions (Moll and Tomasello, 2006; O'Neill, 1996), the ability of 3-year-olds to use pronouns for discourse-given referents (Matthews et al., 2006), and the ability of pre-schoolers to distinguish between knowledge that is shared and privileged in assigning contextually-appropriate referents to complex noun phrases (Nadig and Sedivy, 2002). However, a puzzling feature of pragmatic development is the difficulties children face with *non-literal uses of language*, that is, cases where in order to understand the intended meaning they have to go beyond the conventional senses of the words and sentences the speaker has used (Noveck, 2001; Winner, 1988/1997) (e.g., understanding a parent's non-literal intention in saying "I love you so much I could *eat you up*!"). How can children be early experts at a range of pragmatically complex tasks requiring attention to speakers' intentions, but act like 'literal listeners' in other contexts?

Developmental pragmatics investigates the acquisition of the cognitive abilities underlying language use and understanding, which enable children to express their own intentions and infer the intentions of their interlocutors. While the earliest studies appeared in the late 1970s (Bates, 1976; Ochs and Schieffelin, 1979), the field has been rapidly growing over the last couple of decades, extending its focus from how social skills are acquired (Ninio and Snow, 1996) to investigating the development of the cognitive abilities underlying language use and understanding (Bloom, 2000; Clark, 2018; Ifantidou and Matsui, 2013; Matthews, 2014; Tomasello, 2003; Zufferey, 2015). In recent years, as a result of mounting evidence from a range pragmatic tasks — including, as mentioned above, pre-linguistic communication, word learning and referential communication — the general view of children's early pragmatic abilities has changed from an assumption of poor, or even lack of, pragmatic abilities to one of surprisingly well functioning pragmatics. In this light, pre-school children's difficulties with non-literal uses of language are puzzling (Falkum and Köder, 2020).

Despite this significant growth of new evidence and theories on how children acquire their pragmatics (for recent overviews, see Falkum, 2019; Matthews, 2014; Zufferey, 2015), the field does not yet provide a coherent, overall account of how pragmatic abilities develop throughout childhood. First, pre-school children's pragmatic difficulties — as manifested by their tendency toward literal interpretations of non-literal communicative intentions — are not predicted by the main pragmatic theories. Second, research on children's abilities with non-literal uses tends to focus on a narrow set of issues and cases, disregarding potentially clarifying insights from other domains of creative uses of language. Third, children's abilities with non-literal uses have often been investigated using experimental paradigms that are challenging to them, leading to underestimates of their competence. In order to advance the field of pragmatic development research, there is an urgent need to address these issues in a systematic way.

In this paper, I outline a research program that aims to provide input to a novel theoretical account of pragmatic development that resolves the developmental puzzle of non-literal uses of language (for some preliminary discussions, see Falkum and Köder, 2020; Köder and Falkum, 2020, 2021; Vicente and Falkum, 2021). I first discuss extant evidence regarding the development of non-literal uses of language (Section 2). Rather than investigating the different types of non-literal language use in isolation, I argue that we should adopt a global perspective on children's pragmatic difficulties with them. I then discuss modern cognitive theories of pragmatic development, focusing on the relevance-theoretic framework (Sperber and Wilson, 1986/1995), arguing that they do not predict children's difficulties with non-literal uses of language (Section 3). I then discuss some recent experimental evidence from children's processing and comprehension of two types of non-literal language use, metonymy and irony, which suggests that there are offline task properties that mask children's understanding and that online data from eye-tracking may be more revealing of their actual pragmatic competence (Section 4).[1] Finally, I present a novel hypothesis regarding children's difficulties, namely that children's growing sensitivity to sense conventions which determine the publicly accepted meaning of words in their language, impedes their pragmatic reasoning with non-literal uses during the pre-school years (Section 5). According to this hypothesis, children's apparent preference for literal interpretations does not result from poor pragmatic abilities, but arises because attending to conventions — and to *sense conventions* in particular - serves an important function at a particular stage of language and social learning. This hypothesis has precise and testable predictions for different domains of non-literal language use, including figurative uses (e.g., metaphor: 'John is a *grasshopper*', communicating 'impatient' or 'impulsive'), lexical modulation (e.g., approximation/hyperbole: 'The kindergarten is *empty*', conveying that there are only a few children left) and lexical innovation (e.g., denominal verbs: 'Emma *houdinied* her way out of the high chair'), each of which highlight the interaction of pragmatic reasoning with sensitivity to sense conventions in a distinct way. I conclude this Section by showing that the hypothesis might also have important implications for research on pragmatic difficulties in Autism Spectrum Disorder (ASD), where the possible role of a sensitivity to sense conventions in this population's persistent difficulties with non-literal uses (Happé, 1993; Matthews et al., 2018) remains to be investigated. The overarching aim of the paper is to open up a new direction for empirical research into the sources of children's difficulties with non-literal uses of language, which might ultimately lead to a more explanatory and coherent account of the development of non-literal uses of language and of children's pragmatic development more generally.

2. The development of non-literal uses of language

What a speaker means by an utterance typically goes beyond the literal meanings of the words and sentences she has used. To become competent communicators, children have to learn how to bridge the gap between literal meanings and speaker meanings in context. How do children do this? Consider the following examples.

(1) Kate found *some* of the marbles. (= not all of the marbles)
(2) John is a *grasshopper*. (= a person who impatiently or impulsively jumps from one task to the next)
(3) [As the children are screaming and shouting]: *It's so nice and quiet in here.*
(4) *The red shirt* wants to talk to you. (= the person wearing the red shirt)

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[1] Online - or real-time - processing of language takes place during the actual perception of an utterance, a process that is typically not consciously available to the individual. Offline processing of language, on the other hand, is taken to be conscious and time independent, involving, for instance, reasoning between alternative interpretations or rational reconstruction of a prior interpretation.

By far most developmental research investigates children's understanding of *scalar implicature*, as in (1), cases where the speaker, through her use of a weak member of a scale, implies that the stronger member of the scale does not hold. For instance, through the use of *some* in the utterance 'Kate found *some* of the marbles', the speaker implies that Kate did not find *all* of the marbles. While adults readily draw such scalar inferences (Breheny et al., 2006; Huang and Snedeker, 2009a), children under the age of five tend to rely on 'literal' readings of *some* in which it is compatible with a scenario in which Kate found all of the marbles (Barner et al., 2011; Guasti et al., 2005; Huang and Snedeker, 2009b; Noveck, 2001; Papafragou and Musolino, 2003, but cf. Kampa and Papafragou, 2019). Several explanations have been proposed for this experimental effect, including gaps in children's lexical knowledge (Barner et al., 2011), processing limitations (Pouscoulous et al., 2007), pragmatic tolerance (Katsos and Bishop, 2011) and relevance considerations (Skordos and Papafragou, 2016). And although this research has yielded a progressively rich and nuanced picture of children's abilities within the particular domain of scalar inferences, it remains very circumscribed: (a) there is currently no consensus regarding the factors underlying children's difficulties with scalars, and (b) it is unclear whether the proposed explanations generalise to (any) other domains of pragmatics; more specifically, the connection with difficulties children experience with other types of non-literal uses has typically not been made.

Another strand of developmental work has focused on children's *metaphor* comprehension, a matter of contention in the literature for several decades (for reviews, see Gibbs, 1994; Pouscoulous, 2011; Vosniadou, 1987; Winner, 1988/1997). An example is (2), 'John is a grasshopper', where the speaker conveys that John is someone who impatiently or impulsively jumps from one task to the next. Early developmental studies of production and comprehension of metaphor hypothesised that children go through a 'literal stage' in figurative language acquisition. This stage involves a decrease in their spontaneous production of figurative language and a tendency for literal interpretations, and it is not until early adolescence that children acquire more sophisticated figurative language abilities (Asch and Nerlove, 1960; Winner, 1988/1997; Winner et al., 1976). Some more recent research suggests that the comprehension difficulties that children had experienced in early studies was linked partly to task complexity. Instead, this research attests to an early ability to understand metaphor, which emerges during the pre-school years (Deamer, 2013; Di Paola et al., 2020; Pouscoulous, 2011; Pouscoulous and Tomasello, 2020; Özçalışkan, 2005). Still, the idea that children go through a literal stage, during which they follow a primitive comprehension strategy where they process language literally — in a word-by-word fashion — even though it does not make sense in the context, also persists in more recent accounts of figurative language development (Levorato and Cacciari, 1995, 2002). However, this assumption is at odds with the picture emerging from the literature on pragmatic development more generally, which emphasises children's early pragmatic sophistication. There is a clear need for integration of insights from children's metaphor and figurative language comprehension into the broader research context of pragmatic development.

Although far fewer than for scalar implicature and metaphor, several studies have empirically investigated the development of irony comprehension (as in (3), *It's so nice and quiet in here!*, uttered as the children are screaming and shouting). Most of this research suggests that before the age of 6, children typically fail to grasp the speaker's ironical intention and interpret such utterances as they would interpret ordinary 'literal' utterances (Creusere, 1999; Filippova and Astington, 2010; Glenwright and Pexman, 2010; Winner, 1988/1997, but cf. Köder and Falkum, 2021). One explanation is that unlike other types of non-literal uses, irony requires second-order theory of mind abilities, in that the listener needs to understand that the speaker is distancing herself from the literal content of her utterance (e.g., Happé, 1993). However, developmental studies have tended not to be linked to theories of how irony is processed in adults (Creusere, 1999; Keenan and Quigley, 1999; Wilson, 2013, but see Keenan and Quigley, 1999), and have often relied on broad definitions of irony where it is taken to include a range of (arguably distinct) phenomena (Reccia et al., 2010) not all of which are likely to follow the same developmental trajectory. Moreover, in irony comprehension tasks children are often tested on difficult comprehension questions such as 'Did X really mean that *p*?' or 'Why did X say that *p*?', which require rather advanced metalinguistic reasoning abilities. Recent research on children's irony comprehension, using more child-friendly tasks and implicit comprehension measures suggests that a sensitivity to certain types or aspects of ironical uses may emerge earlier than previously thought (Climie and Pexman, 2008; Köder and Falkum, 2021).

The comparatively few studies that have investigated children's production and comprehension of metonymy (as in (4) above, where by use of the NP *The red shirt* the speaker refers to the person wearing it) stand out in this context, by all suggesting that the ability to cope with metonymy emerges early (Falkum et al., 2017; Köder and Falkum, 2020; Nerlich et al., 1999; Rundblad and Annaz, 2010a; Van Herwegen et al., 2013). One comprehension study conducted with a small group of pre-school children (Nerlich et al., 1999) used a forced-choice story task: children were told short stories which included metonymic uses. For each metonymy, children had to choose between two pictures, depicting the literal and metonymic interpretations respectively, and were instructed to point to the picture which best fit the story context. The authors found better performance for the 4-5-year-olds than the 2-3-year-olds on this task, and improved performance for both groups when the prior context provided clues to the metonymic reading (e.g., when the text described a woman selling cardigans and she was later referred to as *the cardigan*). Two other studies investigated how metonymy comprehension develops from the age of 5–6 to adulthood (Rundblad and Annaz, 2010a; Van Herwegen et al., 2013). They found comprehension of both lexicalised (Rundblad and Annaz, 2010a) and novel metonymy (Van Herwegen et al., 2013) already in their youngest participants, and that overall performance improved with age. I will discuss another pair of studies of metonymy comprehension in more detail in Section 4 below.

In conclusion, the developmental pragmatics literature presents a mixed and to some extent scattered picture of children's abilities with non-literal language, which is rather narrow in scope. Moreover, several domains of non-literal language use which have received considerable attention in the theoretical literature on adult communication (e.g., Falkum, 2015;

Nunberg, 1995; Recanati, 2004; Wilson and Carston, 2007) figure in only a small number of developmental studies. As I have discussed above, metonymy is one domain which up until recently was largely neglected. Other examples include lexical modulation, such as approximation (e.g., 'I have a *temperature*', used to express a higher-than-normal temperature) and hyperbole (e.g., 'Pia ate *a ton* of pancakes', used to convey 'a lot') (Deamer, 2013). By largely ignoring these domains of non-literal language use which are ubiquitous in everyday communication, developmental research misses potentially clarifying insights into children's pragmatic abilities.

3. Pragmatic development and relevance theory

Most research on figurative language development takes a cognitive pragmatic perspective, focusing on the cognitive principles and mechanisms underlying human communication. While contemporary cognitive pragmatic theories emphasise the foundational role that children's early pragmatic capacity plays in the emergence of pre-linguistic gestures and language (Bloom, 2000; Clark, 2018; Csibra and Gergely, 2011; Matthews, 2014; Sperber, 1994; Tomasello, 2003, 2008), they typically have little to say about the developmental puzzle of non-literal uses.

A prominent example of a cognitive pragmatic framework is relevance theory (Carston, 2002; Sperber and Wilson, 1986/ 1995; Wilson and Sperber, 2004, 2012b). Relevance theory seeks to provide a psychologically realistic explanation for how hearers infer speaker meanings on the basis of the linguistic evidence provided and the available contextual information. The central claim is that utterances − including those that involve non-literal uses − create expectations of relevance, which are precise and predictable enough to guide the addressee toward the speaker's meaning (see Wilson and Sperber, 2004, for more detail). Relevance is assessed in terms of the amount of mental effort invested to process an input and the 'positive cognitive effects' the hearer may derive from it, that is, information which, when combined with existing knowledge allows the hearer to draw inferences that would not have been possible otherwise (Sperber and Wilson, 1986/1995).

The relevance-theoretic account of the principles and mechanisms underlying adults' comprehension of non-literal uses suggests that such uses exploit features that also occur in many ordinary 'literal' utterances (Wilson and Carston, 2007; Wilson and Sperber, 2012b). This assumption underlies the accounts of metaphor (Sperber and Wilson, 2008), irony (Wilson and Sperber, 2012a) and metonymy (Wilson and Falkum, 2015) in the relevance-theoretic framework. The prediction is that children should possess the pragmatic abilities to cope with non-literal uses, given that these uses are taken to be understood on the basis of the same pragmatic mechanisms as those involved in the comprehension of ordinary 'literal' uses of language. While there is good reason to adopt such an account given the breadth of evidence of children's pragmatic sophistication in other domains of language use and communication, it leaves a set of critical data unexplained.

In an early relevance-theoretic approach (Sperber, 1994), outlined three stages of typical pragmatic development. The first stage is 'naïve optimism', where the child simply looks for an interpretation that makes the utterance relevant to him, and assumes without considering alternative possibilities that this is what the speaker intended to convey. The second stage is 'cautious optimism', where the child, knowing that speakers are sometimes mistaken, looks for an interpretation that the speaker *might have thought* would be relevant to him. The third stage is 'sophisticated understanding', where the child (or adult), knowing that speakers may not only be mistaken but also deceptive, looks for an interpretation that the speaker *might have thought* would *seem* relevant to him. In light of the recent evidence of children's early pragmatic abilities, however, it is doubtful whether the stage of 'naïve optimism' has an empirical counterpart. Research investigating children's sensitivity to speaker reliability shows that 2-year-olds track the mental states of speakers when they learn new words and take into account speakers' prior accuracy in their labelling of familiar objects (Koenig et al., 2004; Koenig and Woodward, 2010). Furthermore, considering children's apparent unawareness of the opportunities for and risks of deception, Mascaro et al. (2017) present compelling evidence that pre-school children may possess the mind-reading and epistemic abilities necessary for deceiving and being vigilant against deception, and thus the prerequisites for being sophisticated understanders. So it may be that 'cautious optimism' − as a developmental *stage* − does not have an empirical counterpart either. What we need to explain, then, is why children often *behave* like cautious (or even naïve) optimists rather than sophisticated understanders even though they may have the requisite conceptual apparatus for the latter.

In the next two sections, I discuss some recent experimental results from children's processing and comprehension of metonymy and irony which shed some light on this puzzle of the development of non-literal uses of language (see also Falkum and Köder, 2020; Köder and Falkum, 2020, 2021). In short, these studies suggest that there might be properties of offline tasks that mask children's understanding and that online data from eye-tracking may be more revealing of their actual pragmatic competence. Based partly on this experimental evidence, and partly on the developmental literature on children's early appreciation of conventions, I outline a novel hypothesis about the source of children's pragmatic difficulties which might help fill this theoretical gap of the development of non-literal uses of language.

4. Masked pragmatic abilities?

To address the comparative lack of studies in the domain of metonymy acquisition, (Falkum et al., 2017) conducted a study of metonymy production and comprehension in children aged 3−5 years. We had two main hypotheses. First, since previous studies had shown that children are able to exploit salient associative relations in their early production of noun−noun compounds and denominal verbs (see, e.g., Clark, 1993) − which is arguably also the mechanism underlying metonymic uses − we expected young children to be able to produce some metonymic expressions. Second, given the evidence of some

early figurative language ability, and the fact that metonymy may be a simpler process than for instance metaphor (Rundblad and Annaz, 2010a) or irony (Happé, 1993), we expected children to be able to understand novel metonymic uses that relied on perceptually available, and contextually primed, associative relations.

The results from two semi-structured elicitation tasks, one in which children were asked to refer to novel games (each having a salient component, e.g., stickers, marbles, etc.) for which they did not have a conventional label, and another in which children were asked to name individuals with salient properties (e.g., man with a long nose), showed that metonyms were prevalent in the productions of all age groups. Metonymy comprehension was tested using a forced-choice picture selection task. Children were introduced to a context picture and told a short story about two people who appeared in the picture (e.g., "This story is about these two girls. They are standing outside talking before going home from work."). One of the two had a salient property (e.g., wearing a bicycle helmet). The target utterance had the salient property as its subject, and was used to make either a metonymic or literal reference (e.g., "*The helmet* gets on her bike and rides home") to one picture out of a set of three pictures: (i) the metonymic referent (e.g., the girl with the bicycle helmet sitting on the bike), (ii) the other character in the story (another girl sitting on the bike), and (iii) the literal referent (a bicycle helmet sitting on a bike seat). Children were asked to select the matching picture and explain their choice. Results showed that by the age of 3, children are already able to grasp some novel metonymic uses in context. However, children seemed to have more difficulty understanding novel metonymy as they got older, with 5-year-olds tending to interpret metonymic uses literally (e.g., choosing the picture of the bicycle helmet sitting on a bike seat instead of the girl on the bike for '*The helmet* gets on her bike and rides home'). This sort of U-shaped development has been found in various other cognitive domains (e.g., morphology acquisition; Berko, 1958). One hypothesis is that it reveals the process of developing the underlying cognitive representational system involved, so that despite their adult-like performance, the youngest children may be using strategies that are different from those of adults (Karmiloff-Smith, 1992). In (Falkum et al., 2017) we suggested that 3-year-olds could be using a strategy of choosing the first appropriate interpretation (cf. Sperber's 1994 strategy of 'naïve optimism'), that is, the first interpretation that makes the utterance relevant, and took this to be intended by the hearer, without considering alternative possibilities. We further suggested that the 4-5-year-olds' focus on literal meanings could be due to their following a 'cautious' interpretation strategy (cf. Sperber, 1994), considering that the speaker might have incorrectly assessed what would be most accessible or relevant to them (on the assumption that the metonymic interpretation would be the most accessible and relevant one in the context provided). This interpretation was supported by the results of the justification task, which showed not only that children became better at explaining their picture choices with age, but that the explanations of 5-year-olds in particular tended to focus on what the speaker had literally said (this amounted to one fourth of the 5-year-olds' explanations; all examples are taken from the dataset of Falkum et al., 2017):

(5) Boy (5;2): "Cause the giant ears are going to drive. That's what you *said*".
(6) Girl (5;3): "Cause this one [picture] has the helmet, you didn't *say* the person with the helmet"
(7) Boy (5;1): "Cause you *said* just the yellow hat not the person"
(8) Boy (5;9): "Cause you *said* that the yellow hat is riding the horse to another place"

However, this study left many unanswered questions. First, the results only suggested what might be the first half of a U-curve; we needed more data from children of a wider age range to show when children start improving their performance on metonymy comprehension before they reach adult-like comprehension. Second, it is possible that there are properties of the behavioural task used that might have influenced older children's picture choices. For instance, the unlimited time they were given to choose the appropriate picture could have made them reflect more on interpretive possibilities than they would normally do in more naturalistic language comprehension settings; this could have led to a higher proportion of literal interpretations. Would including an online measure, which might to a lesser degree be influenced by children's expectations and reasoning about word choices, illuminate any differences in comprehension strategies used by children at different ages?

We replicated this study using a methodology which combined a forced-choice picture selection task (offline), with an eye-tracking measure (online). Children were presented with a combination of a visual display of four pictures and a short story, presented orally. The target utterance contained either a metonymically or a literally used expression (e.g., *the* beard), which referred either to one of the persons (metonymic interpretation: e.g, "Here are two men who are telling a story" (context). *The beard* is funny" (target).) or objects (literal interpretation: e.g., "Here are two things with hair (context). *The beard* is big" (target)) displayed on the screen. We measured children's eye gaze to the pictures on the screen while the target utterance unfolded. After the presentation of the target utterance, we asked children to point to the picture that best matched the story they had heard.

Our results revealed the same U-shape in children aged 3–8 years in the picture selection task, where 3-year-olds performed better than 4-5-year-olds who more often selected literal interpretations of metonymic uses, with children's performance starting to improve at age 6 (Köder and Falkum, 2020). However, in contrast to the behavioural results, the gaze data showed a continuous development of metonymy comprehension with age, and a clear sensitivity to metonymic uses in the online eye tracking data of *all* the participants, including those 4-5-year-olds who selected literal interpretations in the offline picture selection task. So even if children in this age group tend to end up with a wrong, literal interpretation, the gaze data show that the contextually appropriate metonymic interpretation remains highly activated while the target metonymic utterance unfolds. We interpreted this result as speaking against accounts that take non-literal language processing in

children to follow a 'primitive' strategy of "piece-by-piece elaboration of the linguistic input" where "children process language literally even when it does not make sense in the context" (Levorato and Cacciari, 2002: 129). Interestingly, the gaze data also show that in 4-8-year-old children, there was an increased number of looks to the literal picture in the metonymy condition during a certain time window, which suggests that children in this age range experience a stronger competition from the literal interpretation than 3-year-olds and adults do. So, while it does not seem correct to assume that children are simply naïve, literal interpreters up until the ages of 6–7 years, they do seem to have a higher sensitivity to the literal (or conventional) side of language use, which may pose a challenge to their acquisition, and of which we need an explanation. I will suggest one possible direction for such an explanation in Section 5.

Recently we extended use of this methodology which combined picture selection and eye-tracking to a study of children's irony comprehension. As I discussed in Section 2, this domain of non-literal language use is seen as particularly challenging to children, with comprehension difficulties extending well into the school years (Creusere, 1999; Glenwright and Pexman, 2010; Winner, 1988/1997). The lower age limit for irony comprehension in experimental setting appears to be around age 6 (Dews et al., 1996; Glenwright and Pexman, 2010), but the factors that impede or facilitate children's comprehension of irony are not well understood.

Our irony comprehension task had the following design (Köder and Falkum, 2021): Norwegian-speaking participants in the age range of 3-8-years listened to 12 stories accompanied by matching pictures, ending with either an ironical utterance (e.g., "That's great! You have really tidied up", in response to the child failing to meet his parent's expectation and leaving his room in a messy state), a literal criticism ("That's bad! You didn't tidy up"), or a literal praise (identical to the ironical utterance, but with a "regular", declarative intonation, in response to the child having met his parent's expectation and tidied up his messy room). We measured participants' eye gaze to a happy or angry emoticon while the target utterance unfolded, and asked participants to point to the emoticon which represented the speaker's (i.e., the mother or father of the child protagonist in the story) inner feelings best ("Is mum/dad happy or angry?"). The accuracy data from picture selection showed an improvement of irony understanding with age: 3-year-olds were below chance in their interpretation of irony (i.e., they selected the happy emoticon more often than the angry one in response to ironical utterances), while 4-5-year-olds were at chance level: they did not show a preference for either the angry or happy emoticon when hearing ironical utterances. However, from the age of 6 years and onwards, children were well above chance in their choice of the angry emoticon in response to ironical utterances, already showing a good understanding of irony which develops further with age.

The inclusion of an online measure of eye-tracking allowed us to investigate what happens when children fail to understand irony. Do they interpret ironical utterances as if they were literal, positive utterances? Based on previous studies of irony comprehension in children, our expectation that the youngest children in our task would select mainly literal interpretations in the offline picture selection task was confirmed. In fact, these results showed that 3-year-olds seem to interpret ironical utterances similar to how they understand instances of literal praise. The gaze data of 3-5- year-olds, however, showed that they looked significantly more at the angry compared to the happy emoticon during the processing of the ironical utterances, suggesting that these children — even though they may not yet be able to grasp ironical intentions — are not simply mistaking irony for ordinary 'literal' utterances, but are sensitive to contextual cues to the speaker's negative attitude. But at the point where these children have processes and analysed the whole utterance, there was little difference between their gaze patterns ironical and literal praise utterances. So, it seems that at this age (at least in this particular task), the semantic content of the utterance may be given more weight than other cues to the speaker's intention, such as contextual information and tone of voice. But what does this mean in terms of children's pragmatic abilities?

The results I have discussed in this Section have implications for the claim that there should be a 'literal stage' in pragmatic development. Once more, they speak against the hypothesis that children process utterances literally, word-by-word, even if it is does not with the context (cf. Levorato and Cacciari, 2002). On this view, we should have seen a stable below chance performance on the picture selection measure in our irony comprehension task. Although we did find this for the 3-year-olds in our study (but not for the 4-5-year-olds), there was a clear difference in their gaze behaviour when they were processing ironical vs. literal utterances. We interpreted this as indicating that the young children were sensitive to contextual information when interpreting the ironical utterances in our task, even though they eventually drew a 'wrong' conclusion about the speaker's intention. Second, our results back up the evidence from our metonymy comprehension task, using a similar methodology (Köder and Falkum, 2020). They suggests that there are properties of offline tasks that mask children's understanding, and that we may have to do with a distinction between implicit and explicit understanding in non-literal uses of language, as evidenced in other domains (cf. the theory of mind literature; see Low and Perner, 2012). Taken together, these studies of children's metonymy and irony comprehension show that the literal preference that young children tend to show on offline measures such as picture selection might be discontinuous with their more 'pragmatically appropriate' gaze behaviour on eye-tracking measures, and suggest that the latter might be more revealing not only of their actual pragmatic processing of the utterance, but of their pragmatic competence more generally. What then, might be the cause of this attention to literal meanings that we typically find in (pre-school) children?

5. Sense conventions and pragmatic competence

An interesting body of work has built up in recent years focusing on *children's sensitivity to conventions* (see Kalish and Sabbagh, 2007). Conventions are regularities in social behaviour on the basis of which we coordinate our actions (Lewis, 1969). Recent work in this domain shows that children have a strong disposition for attending to conventions across

several different domains, including language (Clark, 2007a), artefact use (German et al., 2007), categorization (Kalish, 2007), social behaviour (Schmidt et al., 2016) and pretence games (Rakoczy, 2007), to the extent that they have been hypothesized to share a common structure (Kalish and Sabbagh, 2007). One example is the study by Schmidt et al. (2016) which showed that pre-schoolers are able to spontaneously infer – and later enforce – a social norm from the observation of a single adult behaviour, despite the fact that there was nothing in the adult's behaviour or use of language that suggested that such a norm was in play. This attested sensitivity to convention in children has been suggested to play an crucial role in learning, and according to Pedagogy Theory (Csibra and Gergely, 2009, 2011), it reflects a specific human adaptation for acquiring generic cultural knowledge from ostensive communication.

In the domain of language, we can distinguish between two types of convention: *lawlike* conventions, which are expected to always, or almost always, be observed, and *enabling* conventions, whose purpose is to enable us to solve coordination problems (Geurts, 2018). While grammatical conventions are often lawlike, sense conventions – that is, regularities in the uses of words to convey particular senses that have become stored elements in the public lexicon – are typically enabling. They enable interlocutors to coordinate on content, but there may be other ways of coordinating on that same content. Children's attention to sense conventions plays an important role in language acquisition (Clark, 1993, 2007a; Sabbagh and Henderson, 2007). In learning the senses of words and constructions, children are guided by an assumption that for specific meanings, there is a word form that speakers expect to be used in a language community (the principle of conventionality; Clark, 1993). Children's appreciation of sense conventions aids their language acquisition in at least three ways. First, it encourages them to assume that newly acquired word senses are shared by all members of a linguistic community (Diesendruck and Markson, 2001; Henderson and Graham, 2005). Second, it leads them to assess particular word forms as being 'right' or 'wrong', on the basis of how likely the word meaning is to be shared by other language users in their linguistic community (Koenig et al., 2004; Sabbagh and Baldwin, 2001).[2] Third, it explains children's assumption that when a speaker uses a word or construction that is unfamiliar to them it has a meaning that is distinct from other word forms children are already familiar with (the principle of contrast; Clark, 1993). Children's sensitivity to the sense conventions of the language in their environment is apparent in their early requests for words for things (using, e.g., "What's that?" questions) (Clark, 1983), their immediate repetitions of unfamiliar words offered to them by adults (Clark, 2007b), their spontaneous corrections of their own word pronunciations (Käsermann and Foppa, 1981), their replacements of their own non-conventional forms with conventional ones (e.g., *ladder* instead of *climber*, *went* instead of *goed*) (Clark, 1987), and their adjustments in response to adults' reformulations and embedded corrections of any errors that they make (Chouinard and Clark, 2003).

However, while such sensitivity to sense conventions clearly has an enabling function in lexical acquisition, it may give rise to interpretive inflexibility when familiar word forms are used with non-conventional meanings, which is precisely the case for non-literal uses of language. If children have a natural inclination for attending to the conventional senses of the words and constructions used – not because they lack the pragmatic abilities to go beyond these in inferring speakers' meanings, but because it serves an important function at a particular stage of language learning – it may result in the tendency toward literal interpretations that is well evidenced in the developmental literature. With increased knowledge of language, the pre-school years may be a period in children's development in which they are particularly fixated on sense conventions (e.g., during the developmental period from 36 to 60 months, children learn an average of 3.6 new words per day, and 5-year-olds have a receptive vocabulary of 6000 words on average; Saxton, 2010). This in turn may impede their pragmatic reasoning with non-literal, i.e., non-conventional, uses. The suggestion, then, is that children's difficulties with non-literal uses of language is not the result of poor pragmatic abilities, but arises because attending to conventional senses serves an important function at a particular stage of language learning. However, to the best of my knowledge, the consequences for pragmatic development of children's appreciation of conventions have not been investigated at all, nor has the question of whether it could be a common factor underlying children's tendency toward literal interpretations of non-literal uses of language. For instance, in the metonymy comprehension study by Köder and Falkum (2020), it is possible that children's sensitivity to sense conventions could have made them think that the experimenter – who was an unfamiliar adult and more experienced language user than themselves – somehow expected them to select the picture of the conventional referent of the target metonymic expression in the offline task, even if it did not fit with the context. The reason why this effect was stronger in the older children could have been their overall greater knowledge of sense conventions. However, the gaze data from eye-tracking, showing that all participants preferred looking at the contextually appropriate metonymic referent, could be more revealing of their actual pragmatic processing of the utterance. A general prediction, then, is that children's performance on explicit measures such as picture selection – where children may consciously reflect on interpretive possibilities, and where their expectations of conventional word uses, and perhaps also related to the experimental setting, could play out more explicitly – are liable to be affected by a growing sensitivity to sense conventions, and that implicit measures[3] such as eye-tracking could be more revealing of children's actual pragmatic competence.

Despite their early appreciation of sense conventions, young children show remarkable lexical creativity in communication, in spite of relatively small vocabularies and limited resources (Clark, 2016; Falkum, 2019). In a series of pioneering studies, Eve Clark and her colleagues established the important communicative function of lexical innovation in

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[2] Cf. The 'cautious' interpretation strategy discussed in Sections 3 and 4.

[3] A measurement outcome can be described as *implicit* if "the impact of the to-be-measured psychological attribute on participants' responses is un-intentional, resource-independent, unconscious or uncontrollable" (Gawronski and De Houwer, 2014: 284).

development, as a means to fill chronic vocabulary gaps (e.g., *to gun* for 'to shoot') (Clark, 1982, 1993; Clark et al., 1985). In production, children may resort to lexical innovation when they have not yet acquired the conventional expression for a referent. In interpreting lexical innovations, children must take the grammatical form of the new word and the conventional senses of its component parts as clues to the intended meaning, but there is no sense convention or literal meaning for them to fall back on (Carston, 2016). Interestingly, in contrast to other types of non-literal uses, lexical innovation is a domain where children seem quite able to go beyond sense conventions both in production and comprehension (e.g., Clark et al., 1985). This raises the question of what it is about lexical innovation that may pose less of a challenge to children than other types of non-literal uses.

The hypothesis outlined in this section regarding the source of children's difficulties with non-literal uses of language – namely that their growing sensitivity to sense conventions impedes their pragmatic reasoning with non-literal uses of language – has precise and testable predictions for different domains of non-literal language use. First, the hypothesis predicts that children would cope better with lexical innovation (e.g., 'Mary *holed* the ball', where a new verb is created from the noun 'hole') than with other types of non-literal language use where there is competition from the conventional meaning. In these cases, there are no pre-existing sense conventions and children might succeed in understanding, relying mainly on their pragmatic reasoning abilities. Second, figurative uses, as in metaphors such as 'John is a *grasshopper*' or ironical uses such as 'Nice weather today', uttered as the rain is pouring down, involve large departures from sense conventions, and this might lead to serious interpretation difficulties. Third, lexical modulation, as in a case where there is a tiny bit of milk left and I say, speaking loosely, 'The glass is *empty*', this involves a small departure from sense conventions. Children might be more accepting of these than of larger departures, or they might show a literal preference in modulated uses quite generally. Investigating and comparing children's performance across these different domains of non-literal uses which have not previously been studied together, and which highlight the interaction of pragmatic reasoning with sensitivity to sense conventions in distinct ways, would provide novel insights into the factors underlying the developmental puzzle of non-literal uses of language.

The hypothesis regarding the source of children's difficulties with non-literal uses of language also has possible implications for atypical pragmatic development. The growing body of research on pragmatic development reveals substantial individual differences (Matthews et al., 2018). In particular, impairments in pragmatic reasoning abilities, that is, difficulties with appropriate use and interpretation of language – particularly in the domain of non-literal language – are considered a key characteristic of the neurodevelopmental disorder known as Autism Spectrum Disorder (ASD), (Tager-Flusberg et al., 2005). There is currently little agreement as to what the underlying causes of these difficulties may be (Norbury, 2014; Vicente and Falkum, 2021), and despite significant research attention, the pragmatic difficulties with non-literal uses in ASD are still poorly understood. One explanation links them to deficits in 'theory of mind' abilities (Baron-Cohen et al., 1985), leading to difficulties in understanding the speaker's intention (Happé, 1993; Rundblad and Annaz, 2010b). Another explanation links ASD individuals' pragmatic difficulties to 'weak central coherence' in their information processing, leading them to prioritise details and being less attentive to the global context. This may cause these individuals to process utterances word-by-word, and make the integration of contextual information difficult (Happé, 1999). A third explanation relates the pragmatic difficulties to executive dysfunction (Hill, 2004), suggesting that problems with inhibiting the literal meaning or inflexibility in going beyond rigid, literal interpretations could be what is causing difficulties interpreting non-literal uses of language. However, to the best of my knowledge, no studies have explicitly investigated whether ASD individuals' pragmatic difficulties could be linked to the same source – namely an appreciation of conventions and a tendency for rule-following behaviour across different domains – as those that typically developing children experience at a certain stage of development (see Vicente and Falkum, 2021) for a more detailed discussion of this hypothesis). Given the evidence that shows that strict adherence to rules is a widespread feature in ASD (Nason, 2014; Shulman et al., 2012), this could make ASD individuals' reliance on sense conventions in the interpretation of non-literal uses particularly strong (Vicente and Falkum, 2021). If so, we should expect to find difficulties in all domains of non-literal uses, including lexical innovation where there are no sense conventions to rely on. More specifically, this might result in rigid, literal interpretations of uses of lexical modulation and novel figurative language and difficulties in providing adequate interpretations of lexical innovations, due to the absence of pre-existing sense conventions.

Recently, some studies have suggested that, given how heterogenous the population of ASD individuals is, it cannot be characterised in terms of global pragmatic impairments (Hochstein et al., 2018). Importantly, it is argued, their persistent difficulties with non-literal uses of language are in fact associated with impairments in other domains, such as 'structural language abilities' rather than with ASD-specific limitations in pragmatics and social cognition (Norbury, 2005). While this hypothesis is associated with a lot of unresolved questions (importantly, it is unclear what is meant by 'structural language abilities': is it syntax, vocabulary, or something else?), it lends itself well to empirical testing using the paradigm combining online and offline measures as outlined in this paper. An important question is whether, when matched for age and language abilities, we would find similar patterns in the online and offline processing of non-literal uses in individuals with ASD and typically developing children, which would cast new light on the controversy regarding the pragmatic abilities of this group.

6. Conclusion

In this paper, I have outlined a research programme that aims to provide input to a novel theoretical account of pragmatic development that can resolve the developmental puzzle of non-literal uses of language. A crucial component of this programme is a global perspective on children's difficulties with non-literal uses, which assumes that they can be linked to a

single source: namely, that children's growing sensitivity to the sense conventions of their language environments impedes their pragmatic reasoning with non-literal uses. According to this hypothesis, which has precise and testable predictions for different domains of non-literal language use as well as implications for atypical populations, children's apparent preference for literal interpretations does not result from poor pragmatic abilities, but arises because attending to conventions — and *sense conventions* in particular - serves an important function at a particular stage of language and social learning. I hope this may open up a new direction for empirical research into the sources of children's difficulties with non-literal uses of language, and that the outcome will be a more explanatory and coherent account of the development of non-literal uses of language and of children's pragmatic development more generally.

Declaration of competing interest

The author declares no conflict of interest.

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