Common Development of Theory of Mind and Referent Selection

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Table of Contents

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Abstract

Within a given conversation, children appear to think of labels as mutually exclusive. For instance, if they are presented with a familiar (e.g. shoe) and an unfamiliar object (e.g. whisk) and then are asked to pick the referent of a novel name (e.g. 'Where is the hinkel?'), they choose the novel object. Various theoretical accounts have been proposed to explain this phenomenon and claim that it is a word-learning strategy. The aim of the present thesis is to demonstrate that the difficulty in using multiple labels is the result of the inability to understand perspective. 331 children predominantly between the ages of 3 and 5 years, were tested on a variety of referent selection tasks assessing their metalinguistic awareness, and theory of mind tasks assessing their metacognitive abilities. Results showed that 3- to 4-year-olds resisted applying two labels to the same object and applied the second name to un-named objects. In contrast, 5- to 6-year-olds accepted both labels significantly above chance. The likelihood of a child applying two names to one object was strongly related to theory of mind performance and remained robust even after partialing out age and verbal mental age. Results were extended to two other populations; bilingual and ASD children. The present thesis showed that children overcome the confusion multiple labels bring once they develop an understanding of perspective.

Introduction

It can be an object, a person or an entity. Either of these can have multiple names in everyday life. This realization might sound simple, but to be achieved, striking developmental changes need to take place in early childhood. Until then, children resist applying two names to the same thing. For example, they find it difficult to provide an alternative name (e.g. animal) to an object that has already been a given a name (e.g. dog), even though both names are familiar to children (Doherty & Perner, 1998). This phenomenon occurs because children are not yet able to realize that both words are related to the same thing and to each other. However, around the age of 4, children overcome this restriction and become able to actively use two words for the same thing. This shift co-occurs with other metacognitive developments and most importantly with the development of theory of mind. The understanding of having multiple names for an entity is crucial. This is because recovering from the confusion different labels bring affects both children and adults. The present thesis demonstrates when children develop the ability to recover from this confusion, the strong association with false belief understanding and further shows how a conversation can proceed without complex tracking of common ground. Thus, the focus of this research is to examine relevant dual naming difficulties in relation to theory of mind and accounts for the associated development.

The Disambiguation Effect

The disambiguation effect is the most widely studied phenomenon related to the tendency to consider terms as mutually exclusive (e.g., Markman & Wachtel, 1988; Merriman & Bowman, 1989) and is present not only in children, but also in

adults. In the ‘disambiguation task’, children are presented with a familiar (e.g. shoe) and an unfamiliar object (e.g. whisk) and then are asked to pick the referent of a novel name (e.g. ‘Where is the hinkel?’). Children typically choose the novel object (e.g., Markman & Wachtel, 1988, Expt. 1). In other words, if the reference of the second name is ambiguous, children reduce the ambiguity of novel word meanings; they *disambiguate*.

Before the first study using the standard disambiguation paradigm, children had already been shown to map novel words to novel objects. Carey and Barlett (1978) showed that 3- to 4-year-olds would pick the olive-green tray when their teachers, who were setting up for snack time, pointed at two trays asked them to bring the “chromium one, not the blue one, the chromium one” (see also Carey, 1978 and Dockrell & Campell 1986) and Halberda (2003) has demonstrated that this pattern of fast mapping is present in infants as young as 17 months of age. In a series of studies, Markman and Wachtel (1988) used the standard disambiguation paradigm and showed that 3- and 4-year-old children tended to pick the novel object as the referent of a novel word nearly 80% of the time. Even when no novel object was present, children tended to assign a novel word to a part or a substance of the familiar object. This was one of the earliest demonstrations of disambiguation and Markman and Wachtel dubbed this phenomenon as “mutual exclusivity bias”.

Merriman and Bowman (1989) described various potential effects related to mutual exclusivity. Apart from the disambiguation effect which is the most researched phenomenon, they also described the correction effect. According to this, children might remove a familiar word when presented with a novel word for an item. Another effect is called the rejection effect and according to this, children reject new words for an item they already have a name for. The restriction effect refers to

children's tendency to not generalize new words as additional names for items that is already have an established name. Regarding the onset of mutual exclusivity, the authors argued that the bias develops in early childhood as a heuristic aiding word learning. According to this view, the purpose ME bias serves is to assist infants learn new words and activates right after some vocabulary has been built. This idea was further supported by Golinkoff, Mervis and Hirsh-Pasek (1994).

To define the origins and the scope of disambiguation, various explanations have been proposed. The present thesis focuses on three main accounts: the lexical constraints, the socio-pragmatic, and the perspectival. The first account claims that children make assumptions about the relationship between labels and their referents, specifically that each referent has only one label. According to the second account, children make assumptions about speaker intentions, specifically that use of a novel word probably derives from the intention to refer to an unfamiliar object. Both explanations see disambiguation either as a strategy to learn new words or as a sophisticated way to interpret speakers' referential intents. Thus, they share the notion that children engage in sophisticated thinking about words or mental states to disambiguate. The perspectival account, in contrast, differs in scope and views disambiguation as the result of cognitive immaturity.

Importantly, there is a flip side to disambiguation: almost always an object has two labels as in the case of "rabbit" and "bunny", or "woman" and "lady". As we review below, younger children, those aged 3 and below, typically have trouble applying two words to the same referent in laboratory tasks. Rather, this skill is often not seen until 4 or 5 years of age. In what follows, I discuss how each of the three accounts of disambiguation differ in their explanation of that basic finding and how they suggest the change to more flexible application of two names occurs. In this

thesis, we argue that the perspectival account provides the most unified explanation of both children's disambiguation and co-referential abilities, and test specific predictions made by this account. Also, I examine the possibility that avoiding applying two names to the same object constitutes a word-*using* rather than a word *learning* phenomenon.

Accounts of Co-reference and Potential Issues

Lexical constraints account

As mentioned earlier, Markman and Wachtel (1988) explained the disambiguation effect by arguing that children adhered to a mutual exclusivity bias. According to this principle, children assume by default that each object can have only one name. Thus, only a single referent can be assigned to a single word and children treat words as mutually exclusive. So, in the disambiguation task, for example, children tend to choose the object they do not have a name for (e.g., the whisk) as referent of a novel label, because they assume that the familiar object (e.g., the shoe) cannot have more than one name (Markman & Wachtel 1988). In other words, as children already have a name for one of the objects (e.g. the shoe), they exclude that object as the possible referent of the novel name and come to the conclusion that the speaker is referring to the other object – the one that they do not have a name for yet (see also Merriman & Bowman, 1989). This heuristic reduces the number of possible meanings considered for a novel word and may thereby aid word learning.

There are various other studies on disambiguation addressing the lexical constraints account. In Halberda (2003), monolingual 14- to 17-month-old infants were presented with images of two objects, either a cup and a ball, or a car and a

'dax' (a phototube), and were asked to "look at the [cup/ball/car/dax]". Children's looking time at the novel objects increased in the presence of a familiar object when listening to a novel name. Infants younger than 17 months did not show this effect suggesting the onset of this phenomenon in monolinguals. Since the data showed disambiguation only in the older infants, the author concluded that younger infants build their vocabulary without a word learning strategy.

Overall, most studies agree that children begin to disambiguate around the age of 17 months. In studies where younger children are shown to recognize novelty, this is not found to be connected with word learning and vocabulary consolidation, rather than a preference towards novelty (see also metanalysis by Lewis, Kristiano, Lake, Kwan & Frank, 2019). However, as is clear with regard to the lexical principles account, this hypothesis suggests that children use mutual exclusivity to infer the meaning of new words. When they encounter a novel word, a novel object and a familiar object, they exclude the familiar object as the possible referent of the novel word and come to the conclusion that the novel word refers to the novel object – the one that they do not have a name for yet (see also Merriman & Bowman, 1989). According to the account, the aim of this strategy is to reduce the number of possible meanings considered for a novel word, and thus aid word learning. Young children do learn overlapping terms though and this comes in contrast to the general principle of the bias (Waxman & Hatch, 1992; Clark, 1997; Deák & Maratsos, 1998). Proponents of this account argue, though, that the bias is being relaxed in the presence of adequate information implying to do so (Markman, 1989). A more serious issue with this account might be that these biases, which are argued to aid word learning of basic level categories, are considered to be specific to language (Golinkoff et al., 1992; Merriman & Bowman, 1989). This would mean that they are

specific to word learning, but this is not the case, as later findings demonstrate that the disambiguation effect occurs with idiosyncratic facts, too (Diesendruck & Markson, 2001).

The socio-pragmatic account

A competitor of the lexical constraints explanation is the socio-pragmatic account. Contrary to the former's domain-specific approach to word learning, this account offers a domain-general approach of lexical acquisition that proposes that children rely on general socio-pragmatic understanding about the communicative use of novel labels and the referential intentions of their interlocutors (Tomasello, 2000). Thus, children do not use lexical principles to infer what new words mean. Instead, disambiguation is as a consequence of children reading other people's communicative intentions (Bloom, 2000; Diesendruck & Markson, 2001; Tomasello, 2000). Bloom and Lahey (1973) first underlined the complexity of word learning by proposing the idea of mutual dependency between form, content and use. In 1993, Bloom wrote, "cognitive development bring the infant to the threshold of language only in conjunction with other developments in expression and social connectedness" (p. 52). Bloom highlighted that the driving force that urges children to try to understand the meaning of novel words is their need to communicate and for this purpose, social context and social cues such as sensitivity to eye gaze, pointing, and speaker intention, are of vital importance.

For example, young learners have been shown to attend to the direction of a speaker's eye gaze to establish what the speaker is referring to (Baldwin, 1993). Akhtar, Carpenter and Tomasello (1996) also showed that children assign novel names to novel objects by trying to interpret speakers' referential intentions. In their study, the researchers had 20-month-old children playing with three toys when their

mother and two experimenters were in the room. While the mother and one of the experimenters left the room were absent, a fourth toy was introduced. When they returned, they looked into a box containing the novel objects - including the fourth object - and said "I see a gazzer!" – aiming at no object in particular. In a later object selection task in which the child encountered again all four objects, children consistently assumed that the toy introduced during the mother and experimenter's absence was the referent for the word "gazzer." The authors attributed children's performance to deep understanding of other persons' referential intentions; children must have had apparently inferred that the object the adults had not seen during play must be the one being labelled as "gazzer."

Thus, as children are sensitive to various communicative practices, they can judge speakers' referential intentions in discourse contexts including not only new words, but new facts as well (Bloom, 1998). In order to infer what the speaker has in mind, children employ two principles proposed by Clark (1988, p. 319): (a) the principle of conventionality and (b) the principle of contrast.

According to the *principle of conventionality*, children assume that there are specific forms in a language that speakers commonly use in order to convey certain meanings. For the sake of effective communication, a speaker tends to choose the expressions that most directly help addressees interpret the speaker's communicative intent. Addressees, in turn, expect the speaker to use those expressions when inferring that intent. These expressions are "*conventional* linguistic forms used to express the respective implied meanings" (Diesendruck, 2005). In other words, according to the pragmatic account, the reason why children tend to exclude familiar objects as referents of novel names in the disambiguation effect, is due to their assumption that "if the speaker was referring to the object I have a name for, he/she

would have used the conventional name that we both know, so he/she must be referring to the other one" (Diesendruck, 2005; Grassmann, Stracke, & Tomasello, 2009).

Moreover, whenever there is a conventional form that could be used to convey a certain meaning but a speaker uses a different one instead, children will assume it is because the speaker has a different contrasting meaning in mind. This is according to Clark's (1990) *principle of contrast* and states that any two linguistic forms must contrast in meaning because they must arise from different underlying communicative intentions (Diesendruck & Markson, 2001). This principle is not specific to word learning and it is considered to be a pragmatic assumption about the *use* of words (Clark, 1990).

There is much empirical evidence on disambiguation in relation to socio-pragmatic principles. For instance, in the study of Diesendruck, (2005), 4-year-old children avoided two names for the same object when exposed to a novel word in a puppet's presence but not in the puppet's absence. A puppet was used during the experimental trials of the task to direct questions to children. Children did not avoid lexical overlap only when exposed to a proper noun in the absence of the second speaker – the puppet. The author suggested that children used their theory of mind (ToM) abilities to make assumptions about the puppet's knowledge and her communicative intent (Diesendruck, 2005).

As mentioned earlier, disambiguation has been shown to be not only specific to language. Diesendruck and Markson (2001, Study 2) showed that, contrary to the lexical constraints account, disambiguation does not occur only with novel words, but also with idiosyncratic facts. In this study children were presented with two novel objects. A puppet - either absent or present during the introduction of the objects -

asked for an object that was associated with either a novel name or a novel fact. In the fact condition, at first, children were shown two novel objects and were told a fact about one of them, for instance, “I keep this in the kitchen”. Then, they were asked to give the experimenter “the one that breaks easily”. In the *label condition*, children disambiguated, no matter whether the puppet was present or absent while the experimenter uttered the label of the first object. In the *fact conditions*, though, children only disambiguated when the puppet was present, but not when the puppet was absent during utterance of the fact about the first object.

What seems to have played an important role in children’s inferences is the presence and the absence of the puppet. This becomes obvious in the puppet absent/ fact conditions mentioned earlier, where children did not disambiguate as reliably as they did in the other conditions. The researchers’ interpretations of this are based again on the pragmatic account; if the puppet was absent, it would not be possible to know how the object was previously referred to. Thus, children could not form a definite hypothesis as to why the puppet asked for the object the way he did (Diesendruck & Markson, 2001). As a result, children resorted to guessing.

Scofield and Behrend (2007) investigated the pragmatic account and compared it with the lexical constraints accounts in a study which is one among the few ones that used novel names and novel facts within one study. According to their results, 2-year-olds disambiguated at levels that were above chance in the label condition (81%). They, however, disambiguated at or below chance levels in the fact condition (19%). However, 3- and 4-year-olds disambiguated at or above chance in all conditions, a pattern similar to that of Diesendruck & Markson’s (2001) study for 3- and 4-year-olds. As can be seen, children of different ages disambiguated differentially novel words and facts. Scofield and Behrend (2007) rejected the

hypothesis that the pragmatic hypothesis can account for children's disambiguation effect. According to their arguments, if the pragmatic hypothesis was valid, children would disambiguate novel words and novel facts similarly given that the same underlying process should show the same pattern of disambiguation. In addition, performance of children of different ages should also yield to similar patterns of disambiguation and disambiguation in words and facts should emerge similarly across ages. Because, if disambiguation resulted from children's pragmatic ability to interpret contrasted referential acts, then contrast and not age would predict disambiguation.

In line with this argument, de Marchena, Eigsti, Worek, Ono and Snedeker (2011) present evidence that different biases underlie disambiguation in words and facts. In their study, typically developing and children with Autism Spectrum Disorder (ASD) were tested in an exclusivity paradigm investigating disambiguation for labels and facts. Contrary to Scofield and Behrend (2007), both word and fact conditions were administered to the same participants. According to their results, disambiguation was much stronger for words than for facts. Moreover, the effects were uncorrelated, as disambiguation in words was associated with vocabulary size and disambiguation for facts was associated with social skills. De Marchena and colleagues reached the conclusion that pragmatics do not account for the disambiguation effect, but it might be either a lexical constraint or a domain-general learning function.

No correlation when comparing performances was later confirmed by Kalashnikova, Mattock and Monaghan (2014), who made comparisons between the two effects among typically developing preschool children. They tested 3- to 4-year-olds, 4- to 5-year-olds and 18- to 26-year-olds adults on word and fact

disambiguation. Results showed that younger children exhibited equal levels of word and fact disambiguation, but in older children and adults disambiguation followed different pathways: levels of word disambiguation were increasing, while fact disambiguation was decreasing with age. Both Scofield and Behrend (2007) and Kalashnikova et al (2014) found that word and fact disambiguation follow different paths. With regard to the developmental trajectory, in the age group where the two studies overlap they both find equal proportions of word and fact disambiguation.

To sum up, the argument of the socio-pragmatic account is that pragmatic abilities play an important role in determining reference (see also Grassmann, Stracke & Tomasello, 2009; Grassmann & Tomasello, 2010). However, this does not automatically mean that pragmatic abilities can explain disambiguation. The important role of social cues and context in word learning is undeniable, but Diesendruck and Markson's socio-pragmatic account alone cannot explain the pattern-differences in word and fact disambiguation which imply that disambiguation relies on quite separate principles. Also, it cannot explain why fact disambiguation does not follow a specific pattern throughout age. Lastly, there are populations that disambiguate despite of their impaired socio-pragmatic abilities (e.g. de Marchena et al., 2011; Scofield and Behrend, 2007). These findings might be rather problematic for the socio-pragmatic account.

The perspectival account

Both the lexical principles account and the socio-pragmatic account imply that even very young children can think about the relationship between words and their referents in a sophisticated way. However, there is reason to think they cannot do this. Doherty and Perner (1998) showed by using a vocabulary check that children are in the position to know two familiar names for certain things, such as truck and

lorry. But, after they have been provided with one of the two names, young children are unable to produce the other name (Alternative Naming Task). Most importantly, they demonstrated a close association between performance in the Alternative Naming Task and False Belief task which assesses children's theory of mind.

Theory of mind covers an important aspect in the present thesis. The most common test of children's theory of mind is the "false belief task" and was first used by Wimmer and Perner (1983). In this task, children are required to predict where a character will search for an object while holding a false belief about its location. Data show that children reliably pass the task around the age of 4 (Wellman, Cross & Watson, 2001).

Some theorists support that theory of mind is present since infancy - implicit theory of mind - and does not develop around the age of four (for an overview, see Baillargeon, Scott, & Bian, 2016; Scott & Baillargeon, 2017). Proponents of this account claim that children younger than 4 years of age fail the task not because they do not understand false belief, but due to methodological factors that are not related to theory of mind per se or because the tasks are not "sensitive" enough to capture children's ability. The general format of the studies examining theory of mind in infancy is measuring mainly infants' looking behaviour, rather than using explicit, verbal measures, and also occasionally involves violation of expectation (for example see Onishi & Baillargeon, 2005; Rubio-Fernandez & Geurts, 2013; Schuwerk, Jarvers, Vuori, & Sodian, 2016; Southgate, Senju & Csibra, 2007; Thoermer, Sodian, Vuori, Perst, & Kristen, 2012).

Apart from exploring just looking times, interactive behavioural measures been developed that employ infants' intentional interaction abilities, such as active helping and referential communication (Buttelmann, Carpenter, & Tomasello, 2009;

Knudsen & Liszkowski, 2012; Southgate, Chevallier, & Csibra, 2010). In these tasks, participants are introduced to a scene in which an agent does or does not witness an event. Then, children are given a verbal prompt and researchers then measure children's spontaneous behaviours in response to the prompt. The behaviours might involve helping or pointing and are considered as a proxy for belief understanding. Proponents of implicit theory of mind claim that these behaviours are proof of genuine false belief understanding (Leslie, Friedman, & German, 2004; Scott & Baillargeon, 2017), while empiricists deny that these responses constitute false-belief attributes in the first place; they support that children's behaviour can be attributed to low level processes like preference towards novelty (Heyes, 2014) or simpler behavioural rules (Perner & Roessler, 2012).

Work on implicit theory of mind is currently contentious and faces substantial replication issues. There are many recent studies which used similar or the same looking paradigms, but failed to demonstrate theory of mind abilities in children younger than 4 years old (Burnside, Ruel, Azar & Poulin-Dubois, 2018; Dörrenberga, Rakoczya & Liszkowskib, 2018; Grosse Wiesmann, Friederici, Disla, Steinbeis, & Singer, 2018; Kammermeier & Paulus, 2018; Low & Edwards, 2018; Priewasser, Rafetseder, Gargitter, & Perner, 2018).

In their metanalysis, Wellman and colleagues (2001) examined fifteen years of research on the false belief task and showed that children under the age of 4 cannot reliably pass the task and that there is no way to improve their performance through methodological modifications. The researchers chose data from 178 studies found in papers or reports and more than 4000 children were represented in total. According to the findings, at 2.5 years children were 20% likely to pass, 3 years and

8 months they were 50% likely to pass and at 4 years and 8 months they were 75% likely to pass.

The research carried out below could be seen as a test of the claims for implicit theory of mind. Here, I examine the association between tests of mental perspective taking and linguistic perspective taking. If explicit perspectival understanding emerges around four years, then associations should be revealed between the tests. If it does not emerge then, then associations are unlikely, since the tasks involve very different demands and structure. In that case, explaining the association because of common non-conceptual aspects of the tasks would be challenging. Doherty & Perner (1998) and Gollek & Doherty (2016) already provide support for perspectival understanding arising around four years. The focus of the present thesis is on the more direct issue of different theories of referent selection. It may be noted that the socio-pragmatic account is consistent with theory of mind emerging in infancy, whereas the perspectival account claims it arises around 4 years.

The concepts of representation and meta-representation are fundamental in relation to theory of mind and metalinguistic awareness. Pylyshyn (1978) defined meta-representations as “The process of ´representing the representational relation itself`, or representing a representation as a representation (Perner, 1991).” (Doherty, 2009, p. 214). A representation can constitute a statement, a thought about something or a picture of something (Gollek, 2014). A meta-representation, in turn, can be a statement about a statement, a thought about a thought or a picture of a picture. Meta-representation is closely related to theory of mind, as it is considered to be the critical ability required to pass the standard false belief task.

In the standard false belief task, which is used widely in this thesis, Sally puts her ball into a box and leaves the room. While she is away, her brother Tom, moves the ball from the box to the cupboard and then leaves, too. When Sally comes back children are required to predict where she will look for her ball. In this case, children need to distinguish between Sally's mental state about the location of the ball and reality in order to answer correctly and pass the task. When Sally thinks that the ball is still in the box, she has a misrepresentation of the location of the ball. When children are in the position to understand that Sally can hold a belief different from reality, then they demonstrate meta-representational understanding, as they recognize that this situation can be thought as such and can be evaluated distinct from reality. Thus, the ability to represent someone else's belief in one's own mind and make belief-based judgements requires meta-representational skills.

Representations include not only mental but also public representations (like utterances, pictures, etc.) (Sperber, 2001). Thus, having meta-representational skills includes understanding not only of thoughts, but also understanding of non-mental representations such as language. Metalinguistic awareness refers to the understanding of language as a carrier of meaning (Doherty & Perner, 1998) and according to Doherty (2009, p 82), it differs from theory of mind only in terms of the domain of application: metalinguistic awareness applies in language rather than mind.

Doherty and Perner (1998) did show that metalinguistic awareness is related to false belief understanding and follows the same developmental path. In their study, performance on the Alternative Naming Task correlated strongly with performance in the False Belief Task. In the case of the False Belief Task, children need to distinguish between their perspective that the object has been moved to a

new location and the character's perspective who is unaware of the transfer. In the Alternative Naming Task, children need to provide a second name for an object they already have been given a name for. Psycholinguists point out that alternative labels put different perspectives on a referent (Clark, 1987; Tomasello, 1999), so in the case of the Alternative Naming Task, children are required to use two perspectives (labels) on the same object at the same time. Perner et al. (2002) have made a distinction between switching and coordinating perspectives. Children can switch between perspectives without noticing and this can be externally induced by other speakers. In the False Belief Task, for instance, changing the location of the object alters the child's perspective. In the Vocabulary Check of the Alternative Naming Task, children switch between verbal perspectives without noticing, as the speaker uses alternate names. But to be able to produce a second name for an object they have just been given a name for, children are required to understand that there are perspectives and that is it possible to make use of both of them.

The alternative naming task and the disambiguation task share a common component: a word is provided for an object for which the children already have a name. For example, the experimenter might say 'This is rabbit. What else can it be?'. At that point, the object has been named (as rabbit) and the child has to provide an alternative name that they likely also know. Thus, in this task children are required to apply two familiar words to the same referent. This is similar to the case of the disambiguation task, when children are asked 'Which is the jintoff?'. It is assumed by all three accounts of behaviour in this task that children supply their own name for the familiar object implicitly; an assumption that fits with the finding that children as young as 18 months implicitly name visually fixated images (Mani & Plunkett, 2010). Having implicitly supplied a name, then, children need to decide whether to

also apply “jintoff” to the same object. In the disambiguation task, applying the novel word to the familiar object would require children to apply two co-referential labels for the same referent, but the task does not require children to do this. In the Alternative Naming Task however, children are explicitly required to produce a second label for a single object. Younger children fail to do so.

An explanation for performances on both tasks is provided by Doherty and Perner (2019). Their theory on mental files assumes that there is a tracking constraint which automatically prevents young children from applying a second label to an object that has been named before. This is motivated by the need to avoid multiple perspectives for a single object. Perspectival understanding allows children to overcome this constraint in situations where it is not appropriate.

To examine the role of understanding perspective in reference, rather than the standard disambiguation task, Gollek and Doherty (2016) used a modified task that does require an understanding of perspective. In the ‘Pragmatic Cue’ task, devised by Haryu (1991), an additional cue is given indicating that the intended referent was the familiar object. Haryu showed children a novel and a familiar object (e.g., a lipstick holder and an apple), and told them that a puppet “is hungry. I would like to give her [the] heku [a nonsense word in Japanese]". This added cue provided a clear indication that the intended referent was edible, i.e., the familiar apple. Despite this cue, 3-year-old children still chose the inedible novel object. These children also chose the novel object in a standard disambiguation task. In contrast, roughly half of a group of 4-year-olds and most 5-year-olds selected the apple. Gollek and Doherty replicated these findings and showed that the tendency to select the familiar object was specifically associated with performance on both the False Belief and Alternative Naming tasks. This suggests that although the disambiguation effect does

not require an understanding of perspective, *resisting* the tendency to select a novel object as referent of a novel word does.

In Haryu (1991) the very different responses of the 3 - and 5-year-olds suggest that the older children were able to use pragmatic information and apply the novel word to the familiar object. Haryu and Imai (1999) suggest that younger children relied on lexical principles, while older children took socio-pragmatics into account. This differs from the standard socio-pragmatic claim that children do not use lexical principles but instead rely on pragmatic cues to speaker intention from the start (Bloom, 2000) and it is consistent with the perspectival account predicting that from around the age of four, children become able to utilise pragmatic information.

According to the Principle of Contrast, "whenever there is a difference in form of a language, there is a difference in meaning" (Clark, 1978, p.1), or more simply "Different words mean different things" (1988, p.317). Diesendruck and Markson (2001) add 'because it is likely that they stem from two different underlying intentions.' (p. 631), making clear that the pragmatic force of the principle derives from considering speaker intentions and results in children assuming that different words refer to different things. One could argue, however, that this assumption does not automatically follow from Clark's principle of contrast, because she construes meaning in broader terms than reference. For Clark, two forms may have the same referent but contrast in meaning: in a hierarchy between dog and animal, for example, but also in terms of dialect, register and connotation; there are no true synonyms (Clark, 1988). However, in contexts similar to the disambiguation task, with two potential referents and no further indication of how the novel and familiar words might be related, the most plausible contrast is in reference rather than meaning.

In the Pragmatic Cue Task, however, an indication is given suggesting the familiar object as the correct referent, and thus any contrasts are alleviated and sameness in reference is promoted. In the task, it is indicated that the novel word still refers to the familiar object even though the familiar object already has a known name. The extra cue suggests that the novel and the known familiar name differ not because they refer to different objects, but because they have a different meaning but still share the same referent. Although this should result in children choosing the familiar object, still they do not do so until they are about four years old.

Arguably, the Pragmatic Cue Task does not provide a totally unambiguous indication of the speaker's intentions. The speaker may actually intend to refer to the inedible novel object, mentioning the puppet is hungry for reasons that will become apparent later (as would be the case if the novel object turned out to be a device for taking out apple cores). Alternatively, children may simply rely heavily on differences in linguistic form when reference is ambiguous; intentions are difficult to determine, whereas differences in words are not. A way to lessen these limitations would be to use a task where only one object was referred to, and two novel names were given. The intention to refer to this object would therefore be unambiguous. Whether or not the two words should be treated as synonymous or in some other relationship (e.g., one superordinate to the other) may not be clear, but their co-reference should be. In such a case, the principle of contrast would predict that children should assume the words contrast but not in terms of reference. Subsequent information should indicate how they contrast in meaning, but not in reference.

The Dual Naming Task

Sameness in reference was clear in a task used by Savage and Au (1996). Their aim was to investigate whether children would suspend or honour the

hypothetical mutual exclusivity bias, when input directly contradicted this assumption. In their study, two different adults named a novel object e.g., the teacher named it as *primate* and later the experimenter named it as *lemur*. The order of the speakers introducing the names was always the same with the teacher always introducing the first name. In the Production task, the experimenter pointed at the target object and asked "What is this?". Then, in the Comprehension task, each child was presented with an array of four objects (e.g. the pink-horned lemur, a purple-horned lemur, a triceratops and a flamingo) and was asked by the experimenter whether a *primate* was there. This occurred for both novel labels, children were always tested by the experimenter and the order that the labels were asked was counterbalanced.

In the Production task, 80% of the children offered a label and they favoured the one introduced by the experimenter. In the Comprehension phase, half of the 3- to 5-year-old children would point to all the primates - label tested first - from an array but when asked to point to all the lemurs, they would pick only distractors. This occurred with the second name tested, regardless of which adult had introduced it. Furthermore, children consistently accepted the label that was tested first. Age effects were not investigated.

Using a lexical principles explanation, the authors claimed that the children who accepted only one label might have used a heuristic; they decided to adhere to the hypothetical mutual exclusivity assumption until or unless more input was provided which would be sufficient for concluding that the two words were synonyms or belonged to other possible overlapping relations (e.g. class inclusion in the same hierarchy). In other words, children kept both labels in mind as equally plausible hypotheses and, as new information came in, they revised these hypotheses

by committing to the name heard first as the label for the target object. Then, because of the bias to assume words are mutually exclusive, children rejected the alternative. However, their data contradict their claim, because if any kind of "commitment" should occur, that would happen in the Production Task, where children were asked to produce a name for the target themselves.

Savage and Au's (1996) findings are difficult for the socio-pragmatic account, as it should predict no issues with the Comprehension task. In the Comprehension task, children witness two speakers using two different novel names to refer to the same target object. Then, one of the speakers makes two requests for the target using the names that children had been taught earlier. Given the fact that the referent of the two names was explicitly taught, children should find no difficulty in choosing the target in both requests. On the contrary, half of the children failed to do so.

It could be argued that when at test, a single speaker using two words is confusing, and thus the findings result from the odd pragmatics of the experiment. Frank and Poulin -Dubois (2002) used a more pragmatically sensible procedure and their findings were comparable to Savage and Au. In a variation of Savage and Au's Comprehension Task, two different adults named a novel object with two nonsense names (e.g., the teacher named a garlic press as mido and later the experimenter named it as gavi). Then, children were tested on whether they accept both labels or not. Also, intervening requests were added between the requests using the novel words.

Unlike Savage and Au (1996) there was no Production Task. In addition, introduction of the objects was also different. In Savage and Au (1996), children saw only the training/target object during the introduction of the two novel labels. In

Frank and Poulin-Dubois (2002) study, though, children were presented with a series of four objects during the introduction phase. Two of the objects in the series were familiar to the children and two of them were unfamiliar. Then, each experimenter named the fourth object (target), which was unfamiliar, using a different nonsense name. Then, each child received two requests for the target object and two requests for the other two familiar objects. Last but not least, in Savage and Au (1996), only the experimenter (not the teacher) asked the requests for the target object. In Frank and Poulin-Dubois (2002), both experimenters asked for the target object using the nonsense name introduced by *that* interlocutor.

Frank's and Poulin-Dubois' (2002) results are consistent with Savage and Au's (1996) finding that half of the children did not accept both names for the same object despite the fact that they had witnessed two different adults naming the target object using different labels. Results were comparable even though age ranges among the two studies differed; Savage and Au tested 3- to 5-year-olds, while Frank and Poulin-Dubois tested 26- to 28- and 34- to 36-month-olds. Savage and Au did not examine age effects, but Frank and Poulin-Dubois found that their older children were more likely to pick the target in the first question and the distractor in the second question.

This apparent increase in showing the effect, however, may have been due to younger children making other kinds of errors and not because they accepted lexical overlap. Frank and Poulin-Dubois only reported the times the distractor was chosen. Since only distractor choices were measured, we have no information on how children who didn't pick the distractor in the 2nd request behaved. For instance, they could have chosen the target in both requests or failed in another way or have chosen randomly. Thus, it is unclear how many children actually succeeded the task.

Kalashnikova, Mattock and Monaghan (2016) and Kalashnikova, Oliveri and Mattock (2018) also used a similar procedure where children were explicitly taught two novel names for the same novel object. The former examined 4- to 5-year-olds and the latter examined children between 26 and 34 months of age. These two studies showed that older children can pass the task (success around 80% of the time), but young children perform poorly (success in around 55% of the trials). Also, a great proportion of toddlers' errors was not just picking the target in the first request and the distractor in the second, but other errors as well, such as picking the distractor in both requests or a familiar item in one of the requests. This adds weight to the speculation that the younger group of children in Frank and Poulin-Dubois' study, also made errors mostly rather than accepted lexical overlap.

In the above studies, different speakers taught two co-referential words, and then each asked for the object using their word. In this case, there are good reasons why different speakers would use different co-referential labels, either because they are expressing different intentions regarding the object, or they simply have a preferred term (Clark, 1997). If children are able to infer and use speaker intentions to disambiguate, they should be able to understand this. Moreover, the experience of different speakers referring to the same object by different labels is likely to be relatively common for children. The same object will be a cat, an animal, a pet, Tiddles, and so on.

The perspectival account makes a distinction between perspective shifts that are induced externally, for example by two different speakers referring to an object, and deliberate perspective shifts on the part of the child (Perner et al. 2002). In particular, external perspective shifts can occur when one updates one's belief (e.g., the marble is no longer in the box) or moves to a different vantage point (the chair is

now behind the table from my new point of view). These result from a change in or input from the environment. Analogous shifts occur with labels. Using a label explicitly or implicitly (e.g., Mani & Plunkett, 2010), or hearing someone else use a label constitutes taking a perspective towards the object (Clark, 1997; Tomasello, 1999). For a conversation to work one needs to stick to a particular perspective. Perspective is considered to determine the way one views an object and the kind of inferences one is likely to make about it. For example, if an animal is individuated as *bird*, one will perceive it as an entity that can fly; however, if it individuated as a *penguin* one infers that it cannot do so (Doherty & Perner, 2019). In a conversation, if a speaker uses a new label – i.e. a new perspective - for an object previously named differently, comprehension is slowed or impaired (Metzing & Brennan, 2003; Kronmuller, & Barr, 2015).

Thus, we assume there is a strong tendency in children, too, not to switch perspectives on an object once one is established. A perspective is established once an adult asserts a label on an object. Then, if the adult asserts another label on the object, usually children will adopt this label without protest[1]. Thus, when a second label is asserted by an adult, children are induced to switch labels, and thus perspectives. We suggest that for young children this is direct and unreflective, and thus an externally induced switch in perspective.

Applied to Savage and Au's task, the perspectival account suggests that an externally induced switch in perspective occurs when the second speaker teaches the child the second name for the object: children are induced to switch label from *lemur* to *primate* and thus can learn the second name. However, in the test phase, the adult

[1] Merriman and Bowman (1989) note that children occasionally reject the other label, but this is rare (see also Matthews, Lieven, Tomasello).

asks for the referent of a label but does not assert the label for any object. The way the first request is expressed (e.g. *Can you give me 'jintoff'?*) leaves open the possibility that the first name can refer to any object. Typically, all children correctly pick the target in the first request following the introduction phase where this mapping was taught. Thus, a perspective has now been applied to the target. In the second request, though, young children tend to avoid applying a second perspective on the same object. Then, since the target already has a perspective on it and since the word in the second request is only weakly associated with the target, as it is recently learnt, they tend to apply the second name to the distractor. The familiar objects are not strong candidates either, as they also have a perspective on them; their actual familiar name which is acquired from experience and is deeply learnt.

In other words, in the Introduction phase, the target receives two perspectives and children can switch from the first one to the second, but this occurs unreflectively because the speakers asserted these perspectives on the object. In the test phase, however, since the speakers ask for the object without asserting the label to any object, children who understand perspective are able to override the tendency not to apply two perspectives at the same time by endogenously switching perspective on the object if context suggests this is appropriate and thus pick the target under both requests.

The present thesis

In the present thesis, I addressed specific predictions the perspectival account affords in relation to this phenomenon. The main task I am using is called the Dual Naming Task and is based on Frank and Poulin-Dubois' design. Experiments 1 and 2 examined the prediction that success on the Dual Naming Task ask associates with performance on other tasks that require understanding perspective, specifically the

False Belief task and the Pragmatic Cue task. Comparing the Dual Naming Task with these two tasks is novel. Results showed a strong association between the tasks and with age was found.

Second, I predicted that children only reject the second label when it is presented in the same conversation as the first label. A question that arose from the previous studies is how children handle the word applied to the distractor later. Do they forget that word mapping? Are they able to use that word correctly in a different conversation? In Experiment 2, I investigated these questions by adding a Retention task. Retention of the novel names was never examined before in the studies using paradigms similar to the Dual Naming Task (e.g. Frank & Poulin-Dubois, 2002; Savage & Au, 1994). In that task children were presented with the target and distractor only and were asked to select the referent of the second label, i.e. the label previously applied to the distractor. The perspectival account makes predictions in relation to children's use of the words in question rather than learning, thus it predicts that there is no reason why they should not correctly choose the target if this second label is subsequently presented on its own. I found that children could pick the target in the Retention Task, although they had chosen the distractor in the Dual Naming Task.

My third prediction was that children's success on the Dual Naming Task would still associate with perspectival understanding even after modifying the procedure such that the target is more pragmatically reasonable to be chosen. In Experiment 3, I used three modified versions of our standard Dual Naming Task that are novel. First, I added back the intervening requests for familiar objects between the requests for the target (similar to Frank and Poulin-Dubois' design) which were not included in Experiments 1 and 2. This was done because hearing two consecutive

requests for the same thing could have felt odd or unusual to children. Further, instead of having an experimenter and a puppet as speakers, I replaced the experimenter by another puppet. The aim was to alleviate the potential pragmatic conflict of having the first name given by a potentially more authoritative source--the experimenter. In the second version of the Dual Naming Task, there was only one difference; the target object (the one that receives two names) was not a novel object, but a familiar one, e.g. an apple. The aim was to see if children would still find it difficult to accept lexical overlap in a particularly realistic scenario: hearing two speakers naming a familiar object with its familiar name and a new name. Lastly, in the third version, additional "bridging" information was provided to indicate such a relation between the two taught labels that applying both names would be appropriate. Results showed that none of these factors influenced children's performance; still performance on the different versions of the tasks associated with false belief understanding. Regarding learning of the names, the Dual Naming Task – Familiar Target showed that children found it difficult to learn the novel name if the target was familiar.

Experiments 4 and 5 examined two different populations; bilingual children and children with Autism Spectrum Disorder. As bilingual children are exposed to more than one language, they might be expected to be more flexible when it comes to accepting and using two words for the same object. The fourth prediction the perspectival account affords is that False Belief and language measures such as the Dual Naming task both tap a common conceptual development, that is understanding of perspective. Arguably, this should be the same within any population regardless of the language background. In Experiment 4, the relationship between alternative naming and false belief remained strong, but contrary to the expectations, bilingual

children's performance on the Dual Naming Task was particularly low. Similarly, in Experiment 5, I predicted that success in the Dual Naming Task for both the ASD and typically developing children will correlate with false belief understanding. Again, the Dual Naming Task proved to be particularly hard for the ASD children. Regarding bilinguals, difficulties with the Dual Naming Task were arguably attributed to low confidence stemming from not being tested in their strong language. In ASD children, I speculate their slower processing of words is the major factor impacting their performance.

Experiment 1 – The Dual Naming Task

The aim of Experiment 1 is to replicate 3- to 5-year-old children's tendency to avoid acceptance of two newly taught names for the same object within the same conversation, and to compare it to False Belief understanding as a measure of perspective taking. I adapted the procedure previously used by Savage and Au and Frank and Poulin-Dubois to be more pragmatically natural. In the learning phase the two co-referential labels were introduced by different speakers, the second of whom was not present when the first label was taught. This avoids the possible impression that the speakers disagree about what the referent should be called. In the test phase, referents were requested by each speaker using the word they had taught. This avoids pragmatic difficulties in interpreting one speaker's use of two labels for one object. Unlike Frank and Poulin-Dubois (2002) we did not include requests for familiar objects between the different requests for novel object. This would be pragmatically more natural, serving to de-emphasise the contrast between the co-referential labels, but makes the procedure longer. We introduce these requests in Experiment 3 to investigate whether they influence the effect. We refer to our adapted task as the 'Dual Naming Task'. We predict that 1) younger children will be less willing to use two names for the same referent within the same conversation, and 2) performance on the Dual Naming Task and the False Belief Task will be strongly associated over and above age and verbal mental age.

Method

Participants.

Sixty-six typically developing children participated, from a single school in Norwich, UK with a primarily working-class intake. The sample comprised 22 3-

year-olds (14 girls; M= 43.2 months; age range = 37-47 months), 24 4-year-olds (15 girls; M= 53.3 months; age range = 48-59 months) and 20 5-year-olds (10 girls; M= 64.0 months; age range = 60-68 months). For this and the three subsequent experiments, inclusion criteria were informed parental consent and child assent immediately prior to testing. The exclusion criterion was teacher or parental indication of a special needs diagnosis. The stopping criterion was that all available children had been tested. Teachers reported that 10 children were bilingual; to assess possible influences of bilingualism we compare performance of bilingual and matched monolingual children for all three studies after the main analyses.

Design.

Children completed the Dual Naming Task, a False Belief Task and the British Picture Vocabulary Scale (BPVS) 3rd Edition (Dunn & Dunn, 2009). They also completed a synonym rejection task (Doherty, 1994; see Perner et al. 2002 for discussion). Performance on this task was comparable to that described in Perner et al., and did not associate with other tasks employed here. For brevity we do not discuss it further here. Task order was counterbalanced across the participants, with the BPVS administered last.

Stimuli.

Fourteen familiar and 4 novel objects were used. The unfamiliar objects were unusual toys and household objects (Appendix A). The presentation of the stimuli was fully counterbalanced. Also, a hand-puppet was used as a second speaker (Appendix D). Puppets have been widely used in studies examining mutual exclusivity, playing an active role throughout the experimental procedure by introducing labels and posing questions to the children (see Diesendruck & Markson, 2001; Diesendruck, 2005). A small cardboard model was used as the puppet's house.

Two Playmobile® figures, a box, a tiny cupboard and a small ball were used for the False Belief Task.

Labels.

The novel words were disyllablic words (*jintoff*, *perner, hinkel, cheedor*) taken from Gollek and Doherty (2016). The familiar words were bunny, rabbit, mug, cup.

Procedure.

Participants were tested individually in a quiet room. The experimenter and the child were sitting at a small table and the child was always sitting opposite the experimenter. At the beginning of the first session, the experimenter initiated small talk to establish rapport.

Dual Naming Task.

The Dual Naming Task included a novel-names condition and a familiar-names condition, administered in counterbalanced order. Each condition comprised two trials yielding four trials in total. In the Novel-Names Condition a puppet named Jimmy was introduced, then sent to sleep in his house. It was made clear that the puppet could not hear anything while in his house. Particularly, the experimenter said while showing the puppet to the child "This is my little helper, Jimmy the Puppet! However, he is so tired, he goes straight to bed to take a nap." At this point, the experimenter put the puppet into the house and made sure the door looked closed. Then said to the child "And remember, when he is in his house and he is sleeping, he can't hear anything!". To establish the child believed the puppet was unaware of the conversation taking place outside the house, the experimenter asked the child directly "Do you think Jimmy can hear us?". If the child's answer was negative, then the experimenter proceeded to the presentation of the objects. Only if the answer was

positive, the experimenter reminded the child that the puppet cannot hear anything. To enhance this knowledge, she pretended she was calling the puppet by its name and was expecting Jimmy to present himself, if he was indeed listening. Specifically, she said "I don't think Jimmy can hear us. Let's try this: Jimmy! Jimmy, can you hear us?". As the puppet would not reply, the child was convinced he could not listen. This act was repeated if needed until the absence of the puppet was fully established and this procedure was repeated at the start of each experimental trial.

After the introduction of the puppet, the experimenter said "Now let's have a look at some cool things" and showed the child two familiar and two unfamiliar objects. The experimenter said "look at this one" for the first three objects. The child was allowed to explore each item in turn for up to 25s to minimise possible novelty effects. The experimenter then labelled the fourth object three times using a novel name, e.g. "Look at the *hinkel*…you have a *hinkel*…you are holding a *hinkel*". Immediately after, the puppet emerged from his house, took the object, handed it back to the child and labelled it using a different novel name (e.g. jintoff), again in three consecutive statements. Thus, the child heard two novel names for the target object (Figure 1).

The naming events were followed by a test phase (Figure 1). All the objects were placed in a row on a tray. The target unfamiliar object appeared in each of the four possible positions across trials, with the distractors randomly distributed. On half the trials the experimenter asked the child to indicate the target object using the label that she had taught. The objects were then placed into a bucket and the puppet asked the child to indicate the target object using the label that he had taught. In the other half of the trials the order of the experimenter and puppet requests was

reversed. Thus, the child received requests for the same object from the experimenter and from the puppet using the novel name each had used in the training phase.

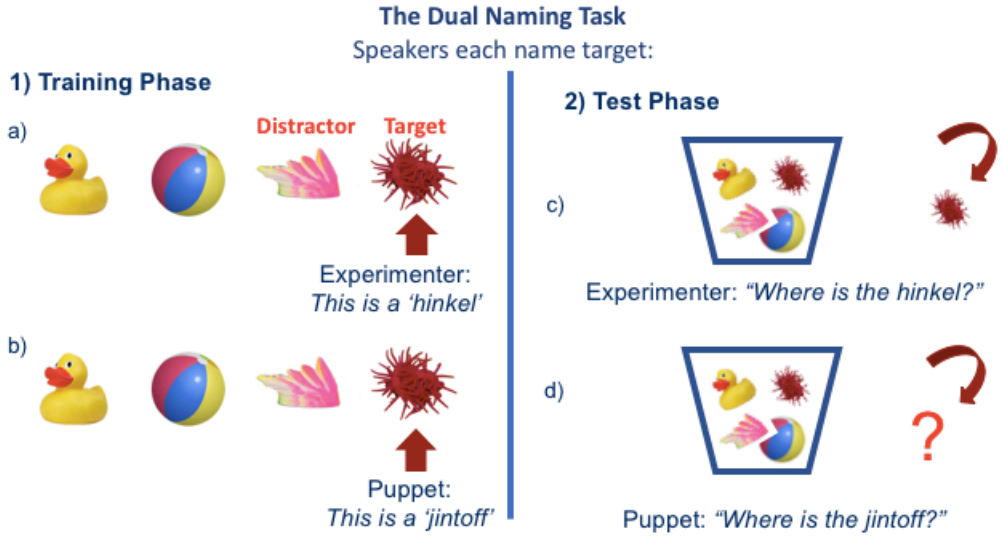

Figure 1. Example of a training and test phase in the Dual Naming Task.

The procedure in the familiar-names condition was identical to the novel-words condition except that all objects were familiar to children and the target object was named using familiar co-referential words.

Each target was assigned two labels that were held constant across children, order of presentation of the two labels counterbalanced. Familiar names trials and novel names trials were alternated in a sequence balanced Latin square design. Identity of the first speaker was varied independently of trial order.

False Belief Task.

This task was the same as used in Gollek and Doherty (2016) (see also Appendix D). The following script was used:

"Now look, this is Sally and this is Tom. They have a box and a cupboard. Sally has a ball. Sally puts her ball into the box and then she goes to play outside. Now, Tom

picks up Sally's ball from the box and puts it in the cupboard. Then Tom goes away. Look, Sally is coming back."

Each child was asked three questions in order:

Belief question (test): Where will Sally look first for her ball?

Reality question (control): Where is the ball really?

Memory question (control): Where did Sally put the ball in the beginning?

Children had to answer all three questions correctly to pass the task.

Standardized measures.

The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was individually administered and is used as a measure of participants' receptive (hearing) vocabulary for Standard English. Each participant was presented with colourful illustrations on a page and will be asked to select the picture that is considered to be the best illustration of the word that will be stated by the experimenter. The reliability and validity of this measure is widely established.

Results

Preliminary analysis indicated there were no effects of task order or gender.

Dual Naming Task.

Children were considered to succeed on a given trial if they picked only the target - the object that received the two novel names - as the referent of both the first and second request. Children's choices of the distractor or a filler object in the second request were coded as a 'non-target responses'. All children selected the target object on the first request in both conditions. On the second request of each trial, choice of target was close to ceiling (95.5%) in the familiar words condition, but close to chance

51% (*SE*= 0.04) in the novel words condition. This difference between the two conditions was statistically significant; $t(65) = 8.4$, $p < .001$. In the novel names condition, 36% of children failed both trials, 26% failed one trial, and 38% passed both trials. The distractor was chosen 99% of the time a non-target response was made and no child refused to pick or point at an object.

Whether the experimenter or puppet made the second request made no significant difference to the likelihood of selecting the target (52% for the experimenter, 48% for the puppet).

False Belief Task.

Forty-one out of 66 children passed the false belief task (62%). Nine children failed one and two children both of the two control questions and were conservatively scored as not passing the task as stated above.

Developmental trajectory.

Performance according to age is shown in Figure 2. The performance of the 3- and 4-year-old children was at or below chance with success in 34% of the trials, $t(20) = 1.5$, $p < .137$, and 48% of the trials, $t(22) = 0.24$, $p < .814$ respectively. The performance of 5-year-olds was significantly above chance, $t(21) = 2.2$, $p < .042$.

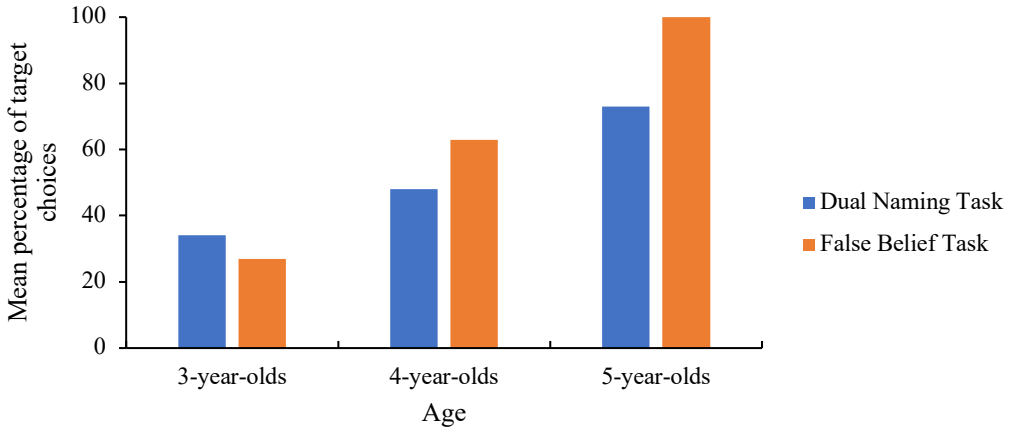

Figure 2. Mean success on the Dual Naming and False Belief Task in relation to age.

Table 1

Correlations between tasks (correlation after partialing out age and VMA)

	BPVS	False Belief Task	Dual Naming Task
Age	.63**	.69**	.42**
BPVS		.51**	.12
False Belief Task			.44**

* $p < 0.05$.
** $p < 0.001$.

Comparison of the tasks.

Dual Naming and the False Belief performance were substantially correlated (Table 1; $r = 0.44$, $n = 66$, $p < .001$) and remained so after age and verbal mental age ($r = 0.34$, $p < .01$) were partialed out (Table 1).

Discussion

Compared to their older peers, young children found it hard to use two names for the same object correctly within the same conversation. Importantly, however, children's ability to pick the target on both requests was strongly associated with their false belief understanding. These results are problematic for the pragmatic account, as although children were provided with an unambiguous indication that the target was the intended referent of both requests, the young children still picked the distractor. The lexical principles account could accommodate these data; the younger children avoid picking the distractor and this behaviour should aid word learning. However, it remains to be shown whether this is indeed a word learning phenomenon. Although Savage and Au supported this claim, they did not test the learning of the words in question. Another important issue with the lexical principles account is that it cannot explain the relation to false belief understanding. The

present results, however, support the perspectival account: the ability to apply two names to a single object is strongly associated with the ability to take someone else's perspective in the false belief task which emerges at four years of age.

However, the procedure does not allow us to make an unambiguous claim about the cases where children failed to apply two names to a single object. In the case that a child selected the distractor when prompted with the second name, we do not know if this is because they remember both names but fail to apply the second, or whether they just do not remember the second name.

In their study, Savage and Au claim that children learn both words, but later delete one; they temporarily keep both labels in mind as equally plausible hypotheses and as new information came in, they revise these hypotheses by committing to the name heard first and rejecting the alternative. Both their prior data and our current data show that children do hold both words in mind, since they always reply correctly to the first request irrespective of which label was used. However, when Savage and Au report that "children seemed to keep both labels in mind for a short while … and then decide on the label that was heard first" (p. 313), they give no information about what happens to the label heard second. What is implied is that by the end of the procedure children should no longer remember the second label, as they have revised their hypotheses. The perspectival account makes no prediction about retention and provides no specific reason why children should delete the second word. Rather, if children's behaviour results from difficulty applying another perspective to the object, younger children, who have more difficulty with perspective taking, should not be able to use the second word correctly in the Dual Naming Task. We examine these possibilities in Experiment 2.

Experiment 2 – Examining Retention

In this experiment we tested whether the young children remembered both words by adding a retention task. We also added the Pragmatic Cue Task by Gollek and Doherty (2016), which has provided the prior evidence for the perspectival account of labelling, as an additional measure of children's referent selection abilities. Adding a retention task to the Dual Naming Task and comparing performances with the False Belief tasks and Pragmatic Cue task is novel. Our first goal, then, was to replicate the results of Experiment 1 and directly test whether both younger and older children retained both of the names initially applied to the target object. My second goal was to examine the prediction of the perspectival account that performance on the Dual Naming Task, Pragmatic Cue Task and False Belief Task is strongly associated over and above age and verbal mental age. My third goal was to test the prediction that, in the Retention Task, children would be able to properly use the name incorrectly applied to the distractor in the Dual Naming Task.

Method

Participants.

Eighty-seven typically developing children from a single school in Norwich, UK with a primarily middle-class intake, participated. Inclusion, exclusion, and stopping criteria were as in Experiment 1. The sample comprised 25 3-year-olds (13 girls; *M*= 40.7 months; age range = 35-47 months), 20 4-year-olds (8 girls; *M*= 54.5 months; age range = 48-59 months), 26 5-year-olds (14 girls; *M*= 66.0 months; age range = 60-71 months), and 16 6-year-olds (8 girls; *M*= 74.4 months; age range = 72-77 months). Teachers reported that 15 children were bilingual.

Design.

Children completed the Dual Naming Task, the Pragmatic Cue Task (Gollek & Doherty, 2016), two False Belief Tasks and a short Retention Task. The experiment comprised two sessions of up to 15 minutes each. Order of tasks was counterbalanced with the constraint that each session had one referent selection task and one False Belief Task. The Retention Task was administered five minutes after the Dual Naming Task. The British Picture Vocabulary Scale III was administered last.

Stimuli.

Twelve unusual toys/household objects and 20 familiar objects were used (See Appendix B).

Labels.

The novel words (bubit, welne, tachte, puhne, blicket, ente, boskot, cheedor, hinkel, flinder, jintoff, momtick) were taken from Gollek (2013).

Other Materials.

A hand-puppet was used as a second speaker (Appendix D). A small cardboard model was used as the puppet's house. Two Playmobile® figures, a box, a tiny cupboard and a small ball were used for the False Belief Task I and two Lego® figures, two carton boxes and a teddy were used for False Belief Task II.

Procedure.

Dual Naming Task.

The design was identical to that of Experiment 1, except there were 4 novel-name trials rather than 2.

Retention Task.

Children were presented with the target and distractor objects from each dual naming task trial, in the original sequence. The experimenter asked the child to point to an object using the label used in the second question of the test phase. So, if for instance, a child had applied the second label used in the Dual Naming Task to the distractor, that would be the label used in the Retention Task.

Pragmatic Cue Task.

The child was presented with a familiar object (e.g., an apple) and an unfamiliar object (e.g., a whisk) and was told ‘‘Jimmy is hungry and would like a *momtick*; please give Jimmy a *momtick*”. Four trials paired novel objects with familiar objects that would satisfy the puppet’s implied need (hungry, sleepy, cold and thirsty). Presentation of objects (left/right) was counterbalanced.

False Belief Tasks.

False Belief Task 1 was the same as in Experiment 1. False belief task 2 followed the same general format, with different characters (Lisa and Tony), object (a teddy) and locations (red and yellow boxes) (Appendix D).

Standardized measures.

The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was again administered and is used as a measure of participants’ receptive (hearing) vocabulary for Standard English.

Results

Preliminary analysis indicated there were no effects of task order or gender.

Dual Naming Task.

Performance both on the first and second request of the familiar names condition approached ceiling; only one child choose a distractor on a single trial on the second request. In the novel words condition two out of 87 children picked a distractor on a single trial on the first request. For the second request, 33% of children picked the target in all four trials. The remaining children showed a spread of performance, as can be seen in Figure 3. On trials on which the target was not chosen, children picked the distractor 97% of the time. Whether the experimenter or puppet made the second request made no significant difference to the likelihood of selecting the target (53% for the experimenter, 51% for the puppet.)

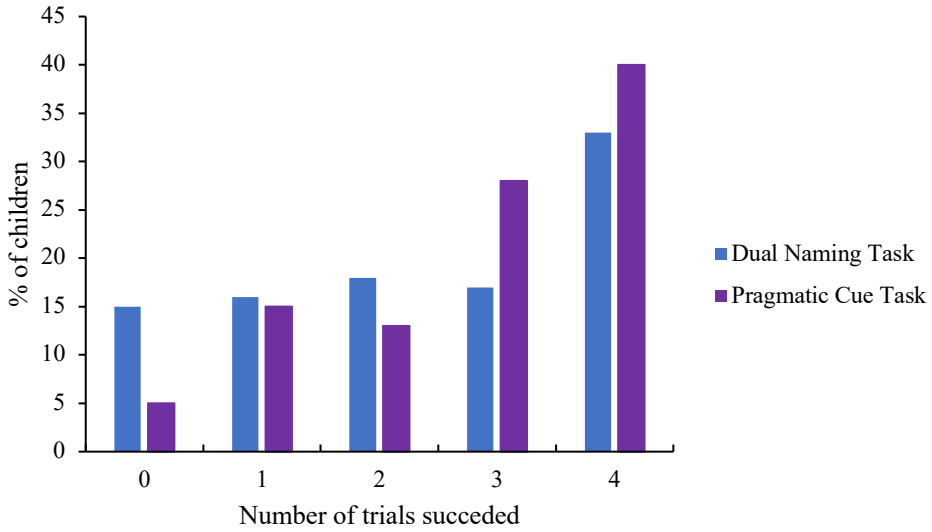

Figure 3. Percentage of children who chose the target (Dual Naming Task) and the familiar object (Pragmatic Cue Task) in one, two, three, four or no trial.

Retention Task.

Children picked the target object on 82% of trials. Performance on the four trials ranged from 79% to 84%. Children who had given non-target responses in the Dual Naming Task picked the target object on 68% of retention trials. This suggests

that although they chose the distractor in the Dual Naming task, they had nevertheless correctly mapped the word to the target object.

Pragmatic Cue Task

Children correctly picked the familiar object on 71% of trials. Sixty-seven percent of the children picked the familiar object on either three or all four trials, 13% of the children succeeded in 2 trials, 15% of the children on only one, and only 5% of children failed all trials of the Pragmatic Cue Task (Figure 3).

Developmental trajectory.

All tasks correlated strongly with chronological age and verbal mental age (see Table 2). Figure 4 shows performance compared to chance. The 5- and 6-year-olds were above chance on both tasks; younger children were at chance.

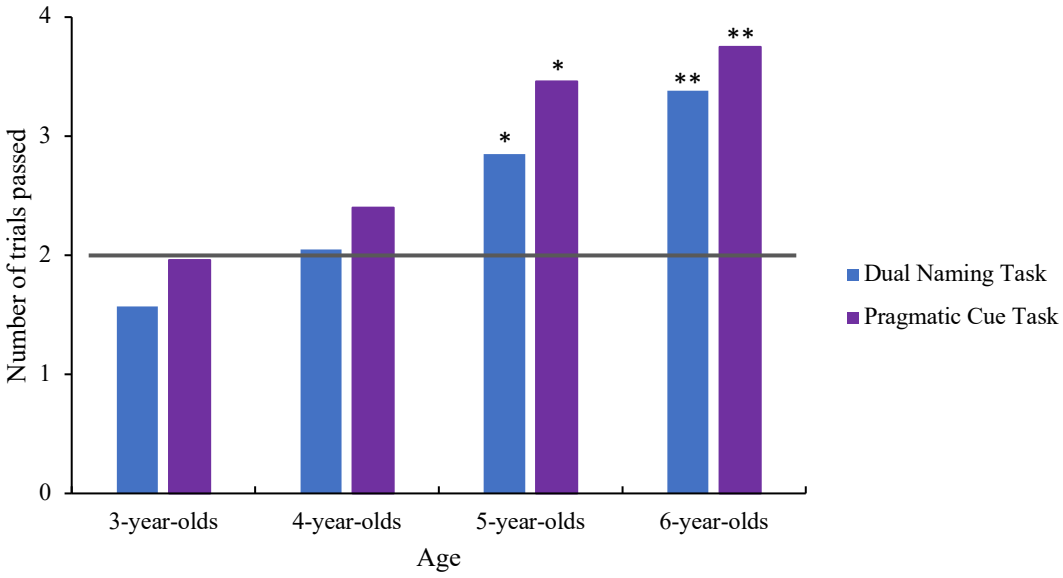

Figure 4. Performance on novel-names condition of the Dual Naming Task and the Pragmatic Cue Task by age. *$p < .05$; **$p = .001$.

Table 2

Correlations between tasks

	BPVS	False Belief	Dual Naming	Pragmatic Cue
Age	.82**	.54**	.47**	.65**
BPVS	__	.60 **	.53**	.70**
False Belief		___	.70**	.82**
Dual Naming		.56**	___	.66**
Pragmatic Cue		.70**	.45**	___

Note: Correlations after partialing out age and verbal mental age are presented below the diagonal.
* $p < 0.05$.
** $p < 0.001$.

False Belief Task.

Children passed 67% of false belief tasks: of 87 children, 57 passed both False Belief tasks, 3 children passed only 1 false belief task and 27 children failed both tasks. Ten children failed one or both control questions on the first false belief task and four children on the second false belief task.

Comparison of the Tasks.

Performance on all three main tasks correlated (see Table 2).

Discussion

As in Experiment 1, younger children were more likely to fail to apply two different novel names to the same object than older children. Also, performance on the Dual Naming Task, False Belief Task and Pragmatic Cue Task were strongly

associated over and above age and verbal mental age. Further, data from the Retention task suggest that all children retained the initial word-object mappings presented by both the experimenter and the puppet – they just failed to use both words correctly within the same particular conversation. However, the Retention task falls short of being a rigorous test of whether children had retained the second label. Children may recognise that a new word was only taught for the target, not the distractor, and choose it when presented with a novel word. Even if this were so, the retention task shows that children recognised that the second label had been taught for this object. Moreover, younger children were prepared to select that object when, but only when, a coreferential word had not previously been used in the conversation.

Experiment 2 lends additional support to the perspectival account by replicating the findings of Experiment 1. It also confirms a strong relationship between the two different types of referent selection tasks, and the false belief tasks. Finally, it suggests, contrary to Savage and Au, that children in this age group were able to retain two alternative names for one object throughout the procedure.

However, it might still be argued that children picked the distractor as the referent on the second request of the Dual Naming task for pragmatic reasons. After children handed the target in the first request, in the second request they encountered two competing cues: 1) the word used by the second speaker was also for the target, 2) but if the second speaker wanted to refer to the target again, it would be more natural to refer to it using the name she had just heard from the first speaker in the first request.

Having two speakers, the second of whom first used his word without awareness of the first speaker's word helped to minimise this possibility, since the

speakers may have a preferred term for the object or want to present the same object from a different perspective. Experiment 3 added two additional measures to minimise pragmatic factors which might lead to selection of the distractor.

We added intervening requests for the familiar objects between requests for the target. These intervening requests de-emphasise the use of different labels, and also make it unlikely that children will assume the second speaker is disagreeing with or challenging the first speaker's label. Secondly, in the first two experiments the first label was given by the experimenter, a potentially more authoritative source. Which speaker used the second label at test made little difference to performance, as analysed above. Nevertheless, in Experiment 3 both speakers are puppets. Our first hypothesis is that the addition of the intervening requests will not change performance. Our second prediction is that having two puppets as speakers will result in performance equivalent to the previous experiments.

In the following experiment, we decided to explore two additional scenarios; firstly, how will children behave if the target is a familiar object and secondly, whether they would pick the target more if they were provided with additional information making it even clearer that both taught names refer to the same target. For this purpose, I constructed two novel tasks; the Dual Naming Task – Familiar Target version and a Dual Naming Task – Bridging information version.

In the Dual Naming Task – Familiar Target version, the target object was a familiar object (e.g. car) and the distractor remained novel. Children received two names for the target; the object's actual familiar name (i.e. car) and another novel name (e.g. lozee). This version of the task simulates real life instances of dual naming, where typically a familiar object will be given an unfamiliar name and assesses whether the dual teaching effect occurs when one name is familiar. I

expected that when familiar name was used, children would always pick the target regardless of whether it was used in the first or second request. With novel names, I expected that young children would be less likely to accept a novel name for the same familiar target, as a well-known word is likely to supplant a weakly-learned word regardless of when it is introduced into the conversation. The perspectival account still predicts a strong association between overall success in this task and the false belief tasks.

In the Dual Naming Task – Bridging information version, we provided children with a clear indication that both taught names refer to the target. In everyday life, it is common that parents tend to avoid multiple labels when talking to children in order to simplify their language efforts and communicate effectively. However, it is also common that when parents do use multiple names, they will also use labelling strategies to mark the occasion. In this way, they usually provide additional information about why two names both refer to the same object (see Callanan & Sabbagh, 2004). The strategy we are going to test in this experiment is called "bridging" and its purpose is to explicitly describe the relation between two novel words such that it is clear that both are appropriate referents for a particular object (e.g. A dog is kind of an animal; see Adams & Bullock, 1986; Callanan,1985).

From a socio-pragmatic point of view, this procedure would help children perform better by accepting both names for the target more frequently. This would be because they would have been given information about how the words relate to each other, which is an even more unambiguous indication that the target is the intended referent of both names. The perspectival account does not predict this, however. In contrast, it predicts that still only children who have developed a false belief

understanding will be able to use this additional information and apply both names to the target.

Summarizing the above points, my predictions for this experiment were the following:

1. In the Dual Naming Task, having two puppets as speakers and adding intervening requests would not alter children's performance.
2. In the Dual Naming Task – Familiar Target, children would choose the target as a referent of a novel name less if this target was a familiar object.
3. In the Dual Naming Task – Bridging information, providing additional bridging information would not alter children's performance.
4. In all three tasks, performances would still correlate strongly with success in the False belief Tasks.

Experiment 3 – Pragmatic Manipulations

Method

Participants.

Fifty typically developing children participated, from a single school in Norwich, UK with a primarily middle-class intake. The sample comprised 28 2- to 3-year-olds (15 girls; *M*= 40.3 months; age range = 30-47 months) and 22 4- to 5-year-olds (10 girls; *M*= 56.6 months; age range = 48-67 months). Teachers reported that 11 children were bilingual.

General Task Design.

There were two sessions of at most 15 minutes. The first session included the Dual Naming task, one False Belief Task and the Retention task; the second session included a second False Belief Task and two variants of the Dual Naming Task; a Dual Naming Task where the target was a familiar rather an unfamiliar object, and another version where children received additional information about how the names taught relate to each other. Each Dual Naming Task was accompanied by a Retention task administered five minutes after each Dual Naming Task. The order of the main tasks in the second session was counterbalanced. The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was administered last to all participants.

Stimuli.

Sixteen unusual toys/household objects, and 32 familiar objects were used (see Appendix C).

Labels.

The novel words (kern, blicket, boskot, pafe, tever, eder, pabe, coodle, lozee, jintoff, cheedor, ente, montick, hinkel, kuble, delsy) were taken from Hosrt Noun Database and Gollek (2013).

Other Materials.

Two hand-puppets were used as speakers. A small cardboard model was used as the puppets' house. Two Playmobile® figures, a box, a tiny cupboard and a small ball were used for the False Belief Task I and two Lego® figures, two carton boxes and a teddy were used for False Belief Task II.

Procedure.

Dual Naming task.

This task had two modifications: 1) both speakers were puppets, operated by the experimenter; 2) for half of the trials children heard requests for familiar objects between requests for the target. For these two intervening request trials the first puppet asked the child to point out a familiar object, then the target (e.g., "Where is the ball? ... Where is the *hinkel*?"). Then the other puppet asked for the other familiar object, then the target (e.g., "Where is the shoe?... Where is the *jintoff*?"). The other two trials followed the procedure in the previous experiments; children received consecutive requests for the target object from each puppet using different labels. The puppets consistently used the labels they had taught in the training phase. Which puppet spoke first was alternated between trials. Half of the children had the Intervening Request trials first, and half the standard trials first. The Retention Task and the two False Belief Tasks were identical to Experiment 2.

The Dual Naming Task – Familiar Target.

The procedure of this task was identical to the original Dual Naming Task, where children receive two different names by two different speakers for the same object and then each speaker asks for the object using the name each had introduced. The second speaker is absent while the first speaker introduces the first name. The difference in this experiment was that the target object (the one that received two

names) was not a novel object, but a familiar one, e.g. a ball. In the Introduction phase, this familiar object was given two names by the two speakers; the experimenter for example called it by its actual name and the puppet called it by a novel name (e.g. momtick). Speakers introduced the familiar or the novel names interchangeably; in half of the trials the novel name was introduced by the experimenter and the for other half of the trials, the novel name was introduced by the puppet. Then, in the test phase, each speaker asked for the target using the name each had used in the Introduction phase. The order of the speakers making the first and second request was counterbalanced. The third object - distractor - remained unnamed. The task comprised four trials.

The Dual Naming Task – "bridging" information.

The procedure of this task was identical to the original Dual Naming Task, except of one difference; in the Introduction phase, when the puppet named the target object, he also provided additional "bridging" information that indicated a relation between the two taught labels. For example, after the experimenter has labelled the target object using one novel name (e.g. blicket), the puppet would say "Look! A hinkel! That's a kind of blicket!". We also added a familiar names condition, where all labels and objects were familiar. For example, after one speaker would say "Look! An animal!" and the other speaker would say "Look! A cat! That's a kind of animal!". Half of the children had the familiar names condition first, and half of the children the novel names first. The order of the speakers making the first and second request was counterbalanced. Each condition comprised two trials.

False Belief Tasks.

False Belief Task 1 was the same as in Experiment 1. False belief task 2 followed the same general format, with different characters (Lisa and Tony), object (a teddy) and locations (red and yellow boxes).

Standardized measures.

The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was again administered and is used as a measure of participants' receptive (hearing) vocabulary for Standard English.

Results

Preliminary analysis indicated there were no effects of task order or gender.

Dual Naming Task.

In the first request, mean performance almost reached ceiling *M*=95%, while in the second request, children picked the target 41% of the times. Which speaker made the second request, made no difference to the percentage of target choices (41 % each for Puppet 1 asking first and Puppet 2 asking first). Intervening questions for familiar objects also did not make a significant difference. Children were non-significantly less likely to choose the target when there were intervening requests than when there were none (37% versus 45% of trials respectively, $t(49) = 1.3$ $p = 0.2$). Among the non-target responses children gave, 98% of the time the distractor was chosen. Given the lack of differences we summed performances on the intervening requests and standard conditions for subsequent analysis.

To explore whether children were more likely to pick the target because of the two puppets being the speakers, children within the age range of Experiment 3 and children in the same range from Experiments 1 and 2 were examined on the Dual Naming Task and thus three groups of children were created (Table 3). Only these

children were examined from Experiments 1 and 2, because these experiments included a substantial number of older children whose inclusion in the present analysis would hinder direct comparisons. A Kruskal-Wallis test showed no significant differences between the three groups on the Dual Naming Task ($\chi^2(2) = 1.9$, $p = .39$) and a Mann-Whitney test showed that children in Experiment 1 performed better in the False Belief Tasks than children in Experiment 3 ($U = 1245$, $p = 0.02$) (Table 3). In the Dual Naming Task, whether the Puppet 1 or Puppet 2 made the second request made no difference to the likelihood of selecting the target – responses were identical for each of them.

Table 3

Mean success on main tasks in children from Experiments 1, 2 and 3

	Experiment 1	Experiment 2	Experiment 3
N	65 children	59 children	50 children
Mean Age	52.9 months (SD=8.8)	50.6 months (SD=9.8)	48 months (*SD*=9.8)
Age Range	37-67 months	35-67 months	30-67 months
VMA (Raw Score)	53.7	53.3	54
False Belief	62%	54%	40%
Dual Naming	49%	51%	41%[a], 35%[b], 43%[c]

a = Dual Naming - intervening requests
b = Dual Naming - familiar target
c = Dual Naming - bridging information

The Retention Task.

Overall, children picked the correct object 78% time. For the original condition, mean performance was 80% and for the IR condition it was 75%. All target labels were retained with equal success with mean performance ranging from 74% to 82%. A non-parametric Friedman test of differences among repeated

measures rendered a Chi-square value of 1.04 which was non-significant (p = .79). When the distractor had been chosen in the Dual Naming Task, children picked the target object on 71% of trials; when the target had been chosen in the Dual Naming task, children picked the target object 87% of the time (Figure 5). As in the previous experiments, even children who chose the distractor in the Dual Naming task had correctly mapped the word to the target object.

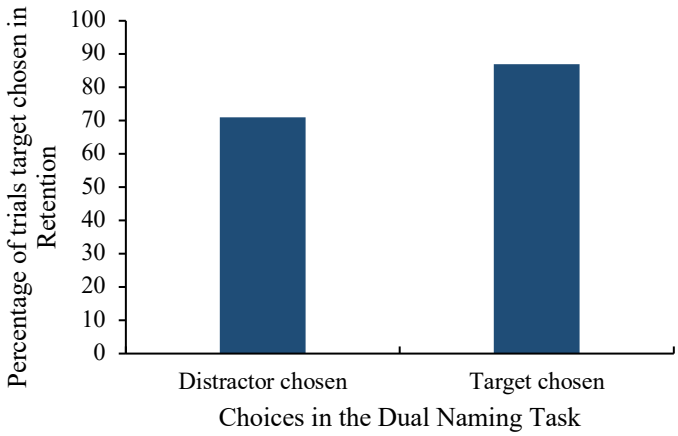

Figure 5. Choices in the Retention Task versus choices in the Dual Naming Task.

The Dual Naming Task – Familiar Target.

When a familiar name was used, children picked the familiar object (target) almost always – 92% to 98% of the time - regardless of whether it was used in the first or second request. When a novel name was used second, children chose the target 35% of the times and when used first, children chose the target 62% of the times. Typically, in Dual Naming Task, target is chosen at ceiling in the first request.

Table 4

Children's responses when a familiar name was used in the 1st or 2nd request.

		Children's responses in Dual Naming	
		1st request	2nd request
Order of names	Familiar name 1st, novel name 2nd	Target: 98%	Target: 35%
		Distractor: 2%	Target: 100%
	Novel name 1st, Familiar name 2nd	Target: 62%	Target: 92%
		Distractor: 38%	Target: 100%

The Retention Task – Familiar Target.

In the Retention Task, children were always asked to pick the referent of the novel name, because we wanted to check if children learned the novel words. Overall, children picked the target object only 39% of times. All target labels were retained with equal success with mean performance ranging from 34% to 44%. A non-parametric Friedman test of differences among repeated measures rendered a Chi-square value of 1.8 which was non-significant ($p = .62$).

Table 5

Choices in the Retention Task in relation to the order of the names used in the requests of the Dual Naming Task

		Choices in the Retention Task	
		Target	Distractor
Order of names in the Dual Naming Task	Familiar name 1st, novel name 2nd	38%	62%
	Novel name 1st, Familiar name 2nd	39%	61%

Table 5 shows that children chose the target at similar rates when the familiar name was used either in the first request or the second request. Children tended to pick the distractor in this Retention task.

The Dual Naming Task – Bridging Information.

In the familiar names condition, children were given two familiar names for a familiar object and were told that these names are related such that both apply to the target which was a familiar object. For example, one speaker would say "This is an animal" and the other would say "This is a cat, a kind of an animal". Then the speakers made requests using the names each had introduced earlier. In the novel names condition, procedure was the same but novel names and novel target were used.

In the familiar names condition, performance reached ceiling as expected. In the novel names condition, children picked the target 43% of the time in the second request. Percentages of target choices in the first Dual Naming Task (41%) and this one were similar. Thus, adding bridging information did not improve children's performance.

In relation to the role of the speaker (Speaker versus Puppet), who made the second request, in the familiar names condition no effect of speaker was found neither for the times the distractor was chosen nor the target. In the novel-names condition (Table 6), there was a statistically significant speaker difference; children were more likely to pick the target if the experimenter made the second request, $\chi^2 = 5.2$, $p < .02$.

Table 6

Number of choices of Distractor/Target in the Dual Naming Task – Bridging information versus speaker in the novel names condition

	Speaker asking the 2nd request	
	Experimenter	Puppet2
Distractor choices	24	33
Target choices	28	15

The Retention Task – Bridging Information.

For the familiar names condition, children picked the target in all trials except one. For the novel names condition, mean performance in the Retention Task was 76% and statistically different to chance, (t (49) = 5.7 p < .001). For the trials in which the distractor was chosen in this Dual Naming Task, children picked the target object on 61% of trials in the Retention Task, showing that even children who chose the distractor in this Dual Naming task had correctly mapped the word to the target object (Figure 6). For the trials that Target was chosen from the beginning in the Dual Naming Task, performance in the Retention Task reached ceiling. All target labels for the novel names condition were retained with equal success with mean performance 76%.

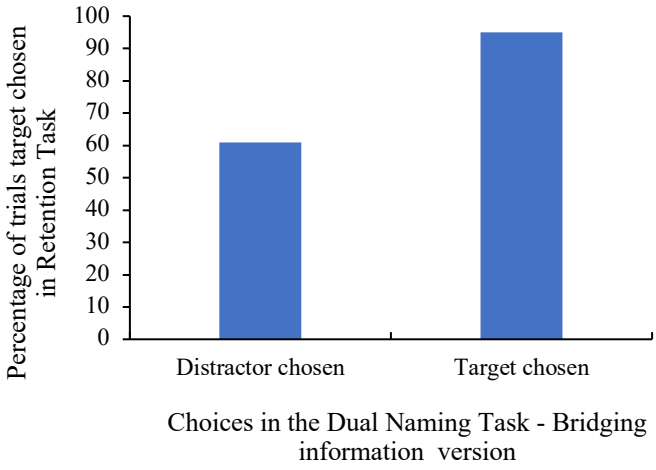

Figure 6. Choices in the Retention Task versus choices in the Dual Naming Task – Bridging information version.

False Belief Tasks.

Children passed 40% of false belief trials: of 50 children, 16 children passed both false belief tasks, 26 children failed both tasks and 8 children passed just one of the tasks. Nine children failed one or both control questions in each task.

Developmental Trajectory.

Age did not correlate strongly with either of the main tasks (Table 7). False Belief Task still correlated strongly with age. However, in the case of Dual Naming Task versus age, there was a tendency to significance, $r = .27$, $p = .058$. Figure 7 shows children's improvement with age in this task.

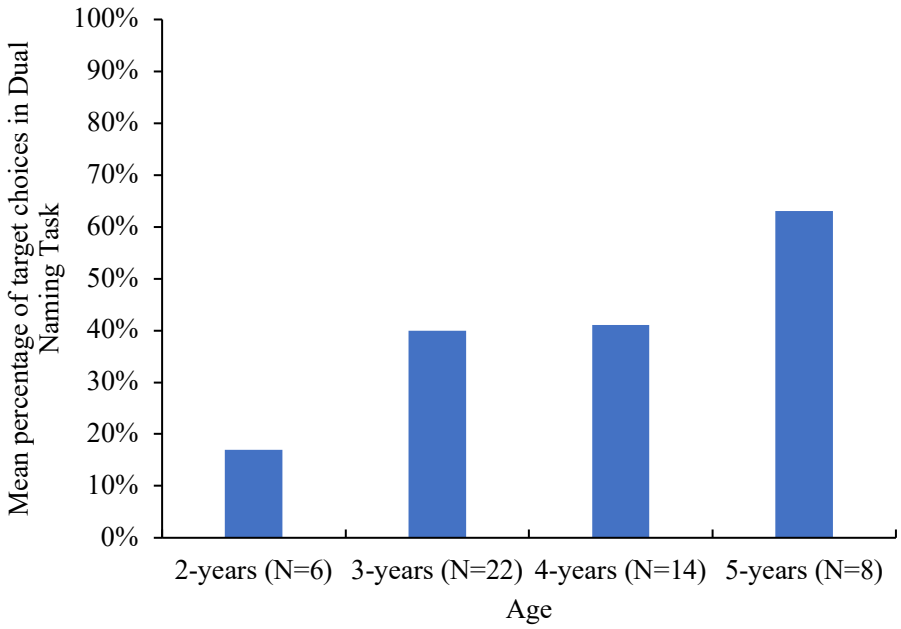

Figure 7. Mean percentage of target choices in the Dual Naming Task in relation to age.

Comparison of the tasks.

All three main tasks correlated strongly with performance in False Belief Tasks (Table 7). The relationships remained robust after partialing out age and verbal mental age. Retention tasks in Experiments 1, 2 and 3 also correlated with the False Beliefs Tasks, $r = .37$, $p = .009$; $r = .37$, $p = .009$; $r = .30$, $p = .04$ respectively (age and verbal mental age partialed out).

Table 7

Correlations between tasks

	VMA	False Belief	DNT	DNT – Familiar Target	DNT – Bridging information
Age	.79**	.74**	.27	.25	.20
VMA	___	.69**	.33*	.04	.30*
False Belief		___	.46**	.43**	.35*
DNT		.36*	___	.38**	.56**
DNT – Familiar Target		.36*	.32*	___	.52**
DNT – Bridging information		.26	.51**	.48**	___

Note: Correlations after partialing out age and verbal mental age are presented below the diagonal.
* $p < 0.05$.
** $p < 0.001$.

Table 8 shows children's choices in the Dual Naming Task – Familiar Target in relation to the number of false belief tasks they passed. As in the previous experiments, the majority of children who picked the target in both requests passed at least one false belief task (62%), while the majority of those who picked the distractor in the second request passed either none or only one false belief task (81%). Regarding those who picked the distractor first and target second, 80% of the children passed either none or only one false belief task. Statistical analysis showed that children who failed the false belief tasks were more likely to pick the distractor in the first request, $r = .36$, $p = .01$ (chronological and verbal mental age partialed out). As mentioned earlier, no child picked the distractor on both requests.

Table 8

Children's choices in the first and second request of the Dual Naming Task – Familiar Target in relation to the number of false belief tasks passed

		Number of False Belief Tasks passed		
		0	1	2
Choices in the Dual Naming Task – Familiar Target	Target – Target	38%	14%	48%
	Target – Distractor	65%	16%	19%
	Distractor – Target	60%	20%	20%
	Distractor - Distractor	0	0	0

Comparison of the Dual Naming Tasks within and between experiments.

Looking at the proportion of target choices across the three DNT's within this experiment (Table 3), percentages are similar, as the target was chosen 41% of the time in the Dual Naming Task, 35% of the times in the "familiar target" version of the DNT and 43% of the times in the "bridging information" version of DNT. Note that for the "familiar target" DNT, the overall percentage of target choices in the second request was higher compared to the other experiments – 65% approximately. This occurred, because children picked the target when the familiar name was used regardless of position. Thus, for the purposes of the present comparison, I only used the performance when the familiar name was used in the first request, as the opposite order created a ceiling effect that might impede conclusions if included.

Between experiment 1, 2 and 3, the proportion of target choices across the Dual Naming tasks were similar – 49% for Experiment 1, 51% for Experiment 2 and around 40% for Experiment 3. Children in Experiment 3 were slightly younger, so this can explain the small differences. Nevertheless, the pragmatic modifications that took place in Experiment 3 did not improve children's performance.

Discussion

The addition of intervening requests and the use of two puppets in the Dual Naming Task did not change 3- and 4-year-olds' performance; younger children still failed to apply two names to one object. Data from our modified task were no different to those of the prior two experiments, further suggesting that children's choice of the distractor previously was not due to the pragmatics of the experimental procedure. Further, the strong relationship between the Dual Naming Task and False Belief Task was replicated again and children again demonstrated retention of the names.

In the Dual Naming Task – Familiar Target, children almost always picked the target in the requests when the familiar name was used. However, when the novel name was used, children picked the target less than half of the time when that was used in the second request and more than just half of the time when that was used in the first request. This is because young children are less likely to accept a novel name for the same familiar target, as a well-established word is likely to supplant a weakly-learned word regardless of when it is introduced into the conversation. As expected there was a strong correlation with performance on the False Belief Tasks; children who cannot not pass the false belief tasks yet, are very likely to implicitly name familiar objects, less so with unfamiliar ones with recently taught names.

In the Dual Naming Task – Bridging information, children's overall performance (43% success) was similar to the first Dual Naming task (41%) of this experiment, indicating that adding bridging information did not make any difference in children's performance. This is problematic for the socio-pragmatic account, as it would predict that children would perform better thanks to the additional information indicating clearly the speaker's referential intent. However, this was not the case and

children's performance was again strongly associated with on their success in the false belief tasks confirming in this way the general pattern found throughout the previous experiments.

Regarding the Retention Tasks, target choices when distractor was chosen in the Dual Naming Tasks were similar for the Dual Naming Task and the Dual Naming Task – Bridging information (71% and 61% respectively). In the Dual Naming Task – Familiar Target, overall target choices - i.e. choices of the familiar target - were particularly low (39%), meaning children did not learn the names that well. However, this finding is not surprising, as this Retention Task differed from the others on the basis that children were presented with a familiar object (familiar target) and a novel object (distractor) instead of two novel objects. This was done to check if children learned the names. Thus, in this retention task, children came across a situation resembling the standard disambiguation; they were presented with a novel and a familiar object and were asked for the referent of the novel name. Typically, in disambiguation children pick the novel object around 80% of the times. In this case, children picked the novel object around 62% of the times. This percentage is slightly lower than the typical performance, as the novel name was not entirely novel; for the remaining 38% of the cases, children still recognized the novel name as having been assigned to the target during the Dual naming procedure and thus, they picked the familiar target in the Retention Task. As expected, this behaviour correlated with success in the False Belief Tasks.

Overall, this experiment showed that having two puppets as speakers and adding intervening requests did not make any difference in children's performance in the dual naming tasks. Adding bridging information also did not improve target choices. In addition, weaker-learned names are likely to be replaced by familiar ones,

but not vice versa. But most importantly, this experiment showed that performances on the dual naming tasks still correlated strongly with success in the False Belief Tasks regardless of the pragmatic manipulations that had been added making the target look like the most pragmatically salient choice.

Bilingual Analysis Experiments 1- 3

In each experiment, a minority of participants were reported by teachers to be bilingual; having at least one parent who spoke a language other than English (Expt. 1: *N*=10; Expt. 2: *N*=15; Expt. 3: *N*=11). To examine the potential differences in the performance of monolingual and bilingual children, I matched each bilingual child from all three experiments (*N*=36) with two monolingual comparison participants from the same experiment; the closest in chronological age and the closest in VMA (Table 9). Dual Naming and False Belief performances were similar across experiments. Because the number of trials differed between experiments I used percentages of correct responses for this analysis. Comparisons were drawn between the main tasks, that is Dual Naming Task and the False Belief Tasks, as these were the common tasks among the three experiments. For the two remaining tasks in Experiment 3, i.e. the Dual Naming Task – Familiar Target and the Dual Naming Task – Bridging Information, preliminary analysis showed that bilingual children did not perform differently than monolinguals - U=210, p=.91; U=142, p=.07 respectively -. In the latter, there was a tendency towards statistical significance with monolinguals being better than bilinguals (mean ranks = 27.4 and 18.9 respectively). Since the number of bilinguals in E3 was small, performance differences on these tasks were not analysed further.

Table 9

Mean success on main tasks in bilingual and monolingual children.

	Bilinguals	Monolinguals / Age-matched	Monolinguals / VMA matched
Age	53 months (*SD*=10.1)	53 months (*SD*=10.2)	50 months (*SD*=12.0)
Age Range	30-71 months	30-71 months	32-76 months
VMA	54 months (*SD*=16.5)	59 months (*SD*=16.6)	53 months (*SD*=15.8)
False Belief	54.1%	63.9%	48.6%
Dual Naming	50.7%	47.9%	47.9%

Kruskal-Wallis tests showed no significant differences between the three groups on the Dual Naming Task, $\chi^2(2) = 0.2$, $p = .93$, or the False Belief task, $\chi^2(2) = 1.7$, $p = .42$. Performance on the Dual Naming Task correlated strongly with false belief understanding for all three groups: bilingual, $r = 0.65$, $p < .001$; age-matched, monolingual $r = 0.539$, $p = .001$; VMA-matched monolingual, $r = 0.43$, $p = .010$, and remained so when controlling for age and VMA (bilingual, $r = 0.46$, $p = .007$; age-matched, monolingual $r = 0.535$, $p = .001$; VMA-matched monolingual, $r = 0.41$, $p = .015$.

Thus, bilingual status of children does not appear to have altered either the level of performance or the pattern of relationships between the main tasks. However, knowledge about bilingual status of the children in 1 to 3 was minimal. In literature about mutual exclusivity, there is a consistent assumption that bilingual referent selection is different, even if the data don't much show this. Thus, in Experiment 4, I decided to examine bilingual children further. I also wanted to test this population on the Alternative Naming Task, since data is limited.

Introduction II - Bilingual children

Bilingualism has frequently been considered in the mutual exclusivity literature. As bilingual children are exposed to more than one language, they gain early experience of objects having two names, where these names come from different languages. Given this fact, there should be the assumption that bilingual or trilingual children are more flexible when it comes to accepting and using two words for the same object. If this is true, it might be due to their metalinguistic awareness being more advanced or because bilingual children might follow a different developmental trajectory. Research around disambiguation in infancy tends to be slightly inconsistent, as in some studies, bilingual infants show slightly less disambiguation than monolinguals, others reveal similar performance between the two language groups and some show that infants show no disambiguation at all. However, in the age between 3 and 5 years, research is more consistent, showing that bilingualism does not make a difference in the hypothetical mutual exclusivity bias. Here, I review previous data.

Disambiguation studies

Lewis, Cristiano, Lake, Kwan and Frank (2019) examined the ME bias in relation to children's development and experience. Initially, they did a large metanalysis which showed that being monolingual or bilingual did not affect disambiguation. Further, their experiments showed that children with larger vocabularies tend to disambiguate more and that greater experience with the familiar word results in stronger disambiguation. Although this metanalysis is particularly recent and covers the main body of the current research in disambiguation, I also present the most representative earlier studies that can be discussed in terms of methodology.

As mentioned earlier in the literature review, Halberda (2003) showed that children's looking time at the novel objects increased in the presence of a familiar object when listening to a novel name, but this was not the case for children younger than 17 months. However, no such phenomenon was found in 17- to 20-month bilinguals when tested on a very similar procedure by Houston-Price, Caloghiris and Raviglione (2010). Monolingual children were found to disambiguate, while bilinguals were not. The researchers' explanation was that bilinguals did not disambiguate as they are more used to looking to familiar and not only novel objects when they hear a novel word.

Byers-Heinlein and Werker (2009) also ran a similar procedure and found differences in three different language groups between the ages of 17-18 months. When a novel object was presented with a novel word, monolinguals showed a disambiguation effect, bilinguals a marginally significant effect, and trilinguals no effect. The researchers interpreted their results on the basis that knowledge of the name of the familiar object is what defines performance rather than knowledge about the novel object. Multilingual children might disambiguate less, as they might not be aware of the names of the familiar object in all languages they speak, thus they consider the familiar object as a possible referent. In 2013, they ran a study using the same procedure, replicated their (and Halberda's, 2003) findings and further found that the bilinguals who disambiguated less were those who knew more translation equivalents. Infants who knew less translation equivalents showed disambiguation in the same rate as same-aged monolinguals do.

By measuring looking times, Bion, Borovsky and Fernald (2012) used the standard disambiguation paradigm and found that 18-month-old bilingual children did not disambiguate as reliably as 24- and 30-month-olds. They also examined retention

of the novel word mappings, which they found to be poor, as 18- and 24-month-olds did not retain the names for the novel objects and 30-month-olds showed some faint signs of retention. However, as mentioned earlier, scoring criteria were different to previous studies (e.g. Byers-Heinlein & Werker, 2009; Halberda, 2003); they did not take into account the looking baseline. The authors note that that if they do so, they get a marginally significant effect, indicating similar findings to previous studies.

In their eye-tracking study, Kalashnikova, Escudero and Kidd (2018) tested children on disambiguation and retention at 18 months of age (Experiment 1) and a subgroup of them was tested again on retention at 24 months (Experiment 2). Measuring fixation times, they found no differences in disambiguation at 18 and 24 months and also low retention levels in bilinguals.

Au and Glusman (1990), the first to examine the ME bias in bilingual participants, tested monolingual and bilingual children between the ages of 4 and 6 years. After providing children with two novel words for the same object, they found no differences in disambiguation between the two groups. Monolingual children showed disambiguation within their language and avoided applying two different names on the same object. However, they assigned names randomly if told that a novel word would be in a foreign language and they accepted word overlap if they were directly asked whether a previously named object could have another name in the other language. The researchers proposed that clear task instructions bring about equal performance in monolingual and bilingual children of this age.

Testing bilinguals and monolinguals of similar age, Davidson, Jergovic, Imami and Theodos (1997) tested 3- to 4-year-olds and 5- to 6-year-olds and found no significant differences within the younger groups. By an unusual division of younger children into halves, they found that half of the younger bilinguals and all younger

monolinguals avoided lexical overlap significantly above chance (69% and 65% of trials). The other half of the younger bilinguals were close to chance (60%), too. Older monolinguals' disambiguation performance reached ceiling (92%) and was reported significantly more often compared to older bilinguals (69%). Thus, bilingual children from the age of three did disambiguate, but the effect did not increase at the same rate as in monolingual children; having to learn two language has a cost.

Davidson and Tell (2005) found that, compared to monolingual 3- to 4-year-olds, 5- to 6 years old bilinguals were slightly less likely to avoid lexical overlap. They used a procedure first introduced by Markman and Wachtel (1988) according to which, children were required to decide whether a novel name could be assigned to a whole object or just a salient part of it. In that study, it was found that children would look for a part of the object when hearing a second label rather than accept it as an alternative name. Davidson and Tell (2005) found that bilingual children did accept lexical overlap for a whole object. In contrast, monolingual children did not accept both names as much. Three and 4-year-old monolinguals picked a part of a familiar object as referent at ceiling (90% of the times) and bilinguals performed so in 82% of the times.

Diesendruck (2005, Expt. 3) reported no disambiguation effect in 12 bilingual pre-schoolers in a Hebrew-only when the puppet speaker was absent during the introduction of the first name. The author interpreted this finding by underlining the importance of speaker knowledge in children's interpretation of referential intent. If bilingual children know that a speaker speaks more than one language they show less disambiguation.

Merriman and Kutlesic (1993) tested even older children between the ages of 5 and 8 on the correction effect. Bilingual and monolingual children were first taught a

novel name for a novel object. Then, they were presented with an array of objects and were asked to help a puppet choose more referents of this label. These objects were similar and either shared a special feature or not. After that, a new puppet speaking either the child's or a foreign language, taught children another novel name for one of the objects. Children were then asked to choose all referents of the second novel name. After objects were put back, the experimenter reminded children of the first label and asked them to choose the corresponding objects. Within language, older children – equally bilinguals and monolinguals - were significantly more likely to correct the first name and avoid objects with corrected names in the last phase. Across languages, bilingual children were more likely to accept lexical overlap. The authors attributed this behaviour to their constant exposure to multiple labels across languages.

Dual Naming studies

The standard disambiguation task and our Dual Naming task differ in one important aspect; the Dual Naming Task makes it clear that the referent of each word is the same. What follows now is a review of recent studies examining bilingual differences while using procedures similar to the Dual Naming Task.

Frank and Poulin-Dubois (2002) gave monolingual and bilingual children aged 26-28 months and 34-36 months a version of Savage and Au's task. They also had an additional condition where Experimenter 1 administered the task in the child's dominant language and Experimenter 2 did so in the child's non-dominant language. In the test phase, each experimenter asked for the target using the name each had introduced previously. Thus, children received two requests in English (one for the familiar object and one for the target) and two requests in French (one for the remaining familiar object and one for the target). In the monolingual condition, bilinguals avoided lexical overlap as much as monolinguals (39% at 27 months, 58%

at 35 months), but also showed an equivalent behaviour across languages (38% and 57%, respectively). Thus, no differences were found between the two populations.

Kalashnikova, Mattock and Monaghan (2015) examined bilingual and monolingual 3- to 5-year-olds. Their procedure included a disambiguation task and a dual naming task. All children performed above chance in both tasks. Regarding differences between language groups, results showed that among younger children, performances were roughly equal. In older children however, monolinguals were slightly better in the exclusivity condition, while bilinguals were slightly better in the overlap.

Overall, the studies using measures similar to the Dual Naming Task have shown equal performances between monolingual and bilingual children. Experiments 1 to 3 of this thesis have already shown a strong relationship between theory of mind and flexible use of co-referential words. Assuming that bilingual children might develop false belief understanding slightly earlier than monolingual children, they are also expected to pass tasks requiring lexical overlap earlier, too.

Theory of mind development

Tare and Gelman (2010) had earlier examined children's ability to differentiate between languages alongside their meta-linguistic awareness and theory of mind development. Three- to 4-year-old children were tested on various language tasks and metacognitive measures. They were presented with objects and were asked to name them. This procedure was run one time in English and one time in Marathi with the order being counterbalanced. Children's metalinguistic awareness was tested by a language check on how experimenters would name certain objects depending on their language. Spontaneous use of each language during play time was also recorded. Both groups were using mostly the speaker's language and their ability to switch languages

was significantly associated with their metalinguistic awareness. There was also a strong correlation between switching and theory of mind, even after partialing out chronological age. The researchers concluded that theory of mind underlies the ability to reflect on the speaker's language abilities. They further suggested that metalinguistic awareness is associated closely to theory of mind development, children's responsiveness to a language was predicted by metalinguistic abilities, but only when this was connected with metacognitive ability.

Theory of mind is reported to develop slightly earlier in bilinguals (Kovács, 2009; Nguyen & Astington, 2014). In a longitudinal study, Diaz and Farrar (2018) examined whether metalinguistic awareness underlies the small bilingual advantage. They tested 38- to 66-month-olds on a variety of tasks measuring theory of mind, language, memory, executive function - mainly inhibitory control and cognitive flexibility – and metalinguistic awareness which included the judgment version of the Alternative Naming Task (Doherty & Perner, 1998). Children were tested again in one year's time. At time 1, bilinguals outperformed monolinguals in false belief understanding after controlling for verbal mental age. Bilinguals were also stronger in the metalinguistic awareness composite and the executive function composite. In time 2, false belief performance in bilinguals was predicted only by metalinguistic awareness and this relationship was mainly driven by the association between performances on alternative naming and false belief tasks. Thus, it can be concluded that bilingual children might eventually be able to demonstrate better theory of mind performance compared to monolingual children, as a result of better metalinguistic awareness. In turn, better metalinguistic awareness may result from their language history that differs substantially to monolinguals.

Perspectival account's predictions

As can be concluded, bilingual research in infancy varies between findings suggesting that bilingual infants show slightly less disambiguation than monolinguals, findings suggesting similar performance between the two language groups and findings that infants show no disambiguation at all. However, Lewis and colleagues (2019) provide evidence for no difference at any age. In relation to the 3- to 5-year-old age range I examine in this thesis, most of the studies clearly show equal disambiguation between monolinguals and bilinguals, indicating that language status does not have an effect in disambiguation. Results in school-age children are mixed again, but there seems to be a tendency towards no differences in development between the two groups. Regarding differences in theory of mind, bilingual children seem to show a later advantage which is closely related to early metalinguistic awareness. Also, Diaz and Farrar's (2018) study clearly showed that common factors in alternative naming and theory of mind are responsible for bilingual's early metalinguistic awareness.

In relation to language status, the perspectival account predicts that both monolinguals and bilinguals will avoid lexical overlap equally and success for both would depend on success in theory of mind tasks. The same should apply in the case of the Dual Naming Task, too. Both monolingual and bilingual preschool children should avoid picking the target in the second request until they pass the false belief task. Since there is evidence that bilingual children might develop perspectival understanding slightly earlier than monolinguals, bilingual children might be expected to start succeeding the Dual Naming Task earlier, too. However, it should be noted that this success should be in connection with success in theory of mind tasks.

These predictions will be tested in the following experiment. In this fourth experiment, Greek- English bilingual and English monolingual children will be tested on the Dual Naming Task, plus the Retention Task, and two False Belief Tasks. Additionally, both groups will be tested on the Alternative Naming Task by Doherty and Perner (1998) which examines children's flexibility in producing two known names for the same thing. As discussed in the Introduction, this task has also been found to correlate strongly with the False Belief Task. The combination of all these tasks is bilinguals is novel.

Also, in this experiment we introduced another version of the Alternative Naming Task; the Alternative Naming task - Across Languages version. This task is almost identical to the standard Alternative Naming Task, with the difference that children were required to produce two names – one from each language - for the same thing. Administering the Alternative Naming Task across languages is novel. Tare and Gelman (2010) tested children's ability to name the same object in different languages. However, they did this in two sessions, one for English and one for Marathi. In contrast, a defining feature of the Alternative Naming Task is that children are required to produce alternative names consecutively, within one session.

The perspectival account would predict that switching between two languages in a single session requires the ability to distinguish between words and their referents, part of the ability to understand perspective. A proviso comes from the fact that children can clearly tailor their language to the typical contexts in which they use them (e.g., at home, at school, with mummy, or with daddy). This is presumed to be exogenous; children's language behaviour being determined by context. However, there may be context cues within the experimental procedure, given it took place in an English school, and explicitly referred to languages by their context of typical use ('at

home', 'at school'; see below). Children may also have developed strategies to help them switch languages that do not require perspectival understanding. Thus, performance on this task may not conform to the strict predictions of the perspectival account, as other factors may play a role.

Experiment 4 – Bilingual Children

Method

Participants.

Eighty-six typically developing children participated, from four English schools in Athens, Greece with a primarily upper-class intake and one school in Norwich, UK with a primarily middle-class intake. Forty-five children were Greek-English bilinguals and this group comprised 18 3-year-olds (12 girls; *M*= 41.8 months; age range = 37-46 months), 12 4-year-olds (7 girls; *M*= 53.2 months; age range = 48-57 months) and 15 5-year-olds (9 girls; *M*= 63.9 months; age range = 60-69 months). According to the parents' reports, children were considered to have a weekly exposure to English at a mean rate of 16% and to Greek at a mean rate of 84%. Language exposure data were provided for 34 of the bilingual children. Forty-one children were English monolinguals and this group comprised 10 3-year-olds (8 girls; *M*= 42.2 months; age range = 39-45 months), 16 4-year-olds (6 girls; *M*= 54.1 months; age range = 48-58 months) and 15 5-year-olds (8 girls; *M*= 64.1 months; age range = 60-68 months).

Design.

There were three sessions of at most 15 minutes. Bilingual children completed the Dual Naming Task, the Retention Task, the Alternative Naming Task (ANT), the Alternative Naming Task - Across Languages version and two False Belief Tasks. Monolingual children were tested on all the above except Alternative Naming Task – Across Languages version. The order of the main tasks was counterbalanced with the constraint that for bilingual children, the Alternative Naming Task was administered always in the first session and Alternative Naming Task – Across Languages version always in the second session. This was done to avoid a carry-over effect of children being tempted to produce words of the other language in the Alternative Naming Task

if that was administered second. Children received the Retention Task right after the Dual Naming Task. The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was administered last. The Language Exposure Assessment Tool was completed by the parents.

Stimuli.

Eight unusual toys/household objects, 16 familiar objects and 10 pictures depicting familiar objects were used (Appendix E).

Labels.

The novel words (bubit, welne, tachte, puhne, blicket, ente, boskot, cheedor) were taken from Gollek (2013). The familiar word-pairs for Alternative Naming Task I were *dog-animal, carrot-vegetable, owl-bird, milk-drink and apple-fruit.* For the Alternative Naming Task II, 6 English words were used (flower, fish, plate, ice-cream, tree, house) and 6 Greek words used each being a direct translation to each of the English words (λουλούδι, ψάρι, πιάτο, παγωτό, δέντρο, σπίτι).

Other Materials.

A hand-puppet was used as a second speaker. A small cardboard model was used as the puppet's house. Two Playmobile® figures, a box, a tiny cupboard and a small ball were used for the False Belief Task I and False Belief Task II was presented on a portable computer with Microsoft Power-point.

Procedure.

Participants were tested individually in a quiet room. The experimenter and the child were sitting at a small table and the child was always sitting opposite the experimenter. At the beginning of the first session, the experimenter initiated small talk to establish rapport. The tasks were administered in English with the exception of

the Alternative Naming Task – Across Languages version, where half of the names were requested in Greek.

Dual Naming Task.

The procedure was identical to Experiments 1 and 2.

Retention Task.

The procedure was identical to Experiments 1 and 2.

Alternative Naming Task.

Vocabulary check. Four sheets of paper were presented individually, each displaying six pictures. The child was asked to point to each experimental item twice on different sheets: once under the basic label (e.g., ‘‘Show me the dog”) and once under the superordinate label (‘‘Show me the animal”).

Alternative Naming phase. The child was presented with an individual picture and told, ‘‘Now, here are some more pictures. Each picture has two names. I am going to tell you one name for it, and you can then tell me another name for it. Let’s try that. This is fruit. What else is it?”. If a child just repeated the experimenter’s word, the experimenter would say “Well, this is what *I* have said… Any other word for fruit?”. After this practice trial, the procedure continued with four pictures (dog, vegetable, owl, drink) and then a second time using the alternative labels (animal, carrot, bird, milk). The child was asked to provide both superordinate and basic labels to pass a particular item. The apple-fruit item was used as a familiarisation trial.

Alternative Naming Task – Across languages version.

The procedure was the same as the English version of the Alternative Naming Task (please see above) with the difference that children were asked to produce/recognize only basic labels and half of the labels were in Greek. The pairs used

were: house-σπίτι, tree-δέντρο, ice-cream-παγωτό, fish-ψάρι, plate-πιάτο, flower-λουλούδι. In the Vocabulary check, half of the children were tested on the Greek words first in Greek and half of the children were tested on the English words first (e.g. "Show me the fish", then "Δείξε μου το ψάρι" or the other way around). In the Alternative Naming Phase, in one trial the English name was requested first and in the other trial the Greek name was requested first in a counterbalanced order. Older children were already familiarized with the distinction between the English and Greek language, so the questions were delivered as following: "Now, here are some more pictures. Each picture has two names; one in Greek and one in English. I am going to tell you one name for it in one language, and then you can then tell me the other name for it in the other language. Let's try that. This is house. How do we call that in Greek?". The first two items were used as familiarisation trials. For younger children who might not be able to make this distinction just yet, questions were delivered as following: "Now, here are some more pictures. Each picture has two names; one in Greek, which is how we speak at home and one in English which is how we speak at school. I am going to tell you one name for it in one way, and then you can then tell me the other name for it in the other way. Let's try that. This is fish. How do we call that at home?" or "This is ψάρι. How do we call that at school?".

False Belief Tasks.

False Belief Tasks were identical as in Experiments 1-3.

Standardized measures.

The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was again administered and is used as a measure of participants' receptive (hearing) vocabulary for Standard English.

Language Exposure Assessment Tool (LEAT).

This is a parent-report scoring tool that has been used in previous studies to measure young children's language exposure (De Anda, Bosch, Poulin-Dubois, Zesiger & Friend, 2016). It aims to record who communicates with the child on a weekly basis, what languages are spoken to the child, and for how long. The data are entered into an electronic form, and an estimate of the proportion of time that the child is exposed to each language is calculated.

Results

Preliminary analysis indicated there were no effects of task order or gender.

Bilinguals

Dual Naming Task.

All children selected the target object on the first request in the familiar words condition. In the second request, performance on the familiar names condition almost reached ceiling, with only 4 children choosing the distractor on a single trial. In the novel words condition, children succeeded 33% of the time. 43 out of 45 children chose the target as the referent of the first request on all four trials, with two children each picking a distractor on three trials. For the second request, 36% of the children picked the target in no trial, 18% in 1 trial, 29% in 2 trials and 13% in 3 trials. Only 4% of the children chose the target all times (Figure 8).

Figure 8. Percentage of children who succeeded in one, two, three, four trials or in no trial in the 2nd request of the Dual Naming Task – novel words condition.

Whether the experimenter or puppet made the second request made no statistical difference to which object was selected (see Table 10).

Table 10

Overall number of choices of Distractor/Target in the Dual Naming Task versus speaker

	Speaker asking the 2nd request	
	Experimenter	Puppet
Distractor choices	50	62
Target choices	31	29

Retention Task.

Children picked the target object on 73% of times. All target labels were retained with equal success with mean performance ranging from 67% to 78%. A non-parametric Friedman test of differences among repeated measures rendered a Chi-square value of 4.15 which was non-significant (p = .24). When children had

chosen the distractor in the Dual Naming Task, they picked the target object on 66% of trials, meaning even children who chose the distractor in the Dual Naming task had correctly mapped the word to the target object (Figure 9).

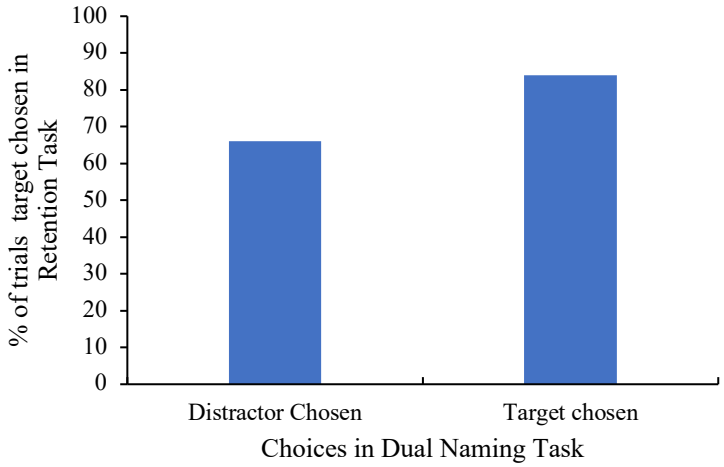

Figure 9. Choices in the Retention Task versus choices in the Dual Naming Task.

Alternative Naming Task.

Mean performance on the vocabulary check reached ceiling with 98%. In the alternative naming phase, children were considered to succeed on a given trial, if they provided both names for an item. Also, the training trial used to familiarise children with the task is not included in the analysis. Children succeed 50% of the trials. From this total performance, mean performance when children were asked to provide the basic term (e.g. dog) was much higher 93% compared to when the superordinate term (e.g. animal) was required 53%. This difference was statistically significant, $t(43)= 7.1$, $p < .001$. Figure 10 shows the percentage of children who succeeded in one, two, three, four trials or in no trial in Alternative Naming Task.

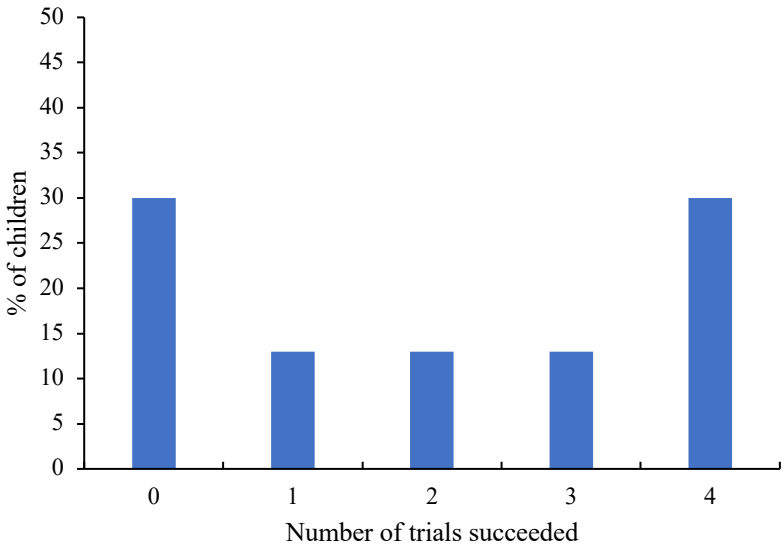

Figure 10. Percentage of children who succeeded in one, two, three, four trials or in no trial in Alternative Naming Task.

Alternative Naming Task – Across Languages.

Mean performance on the vocabulary check was with ceiling performance for Greek words – 100%- and 90% for English words. In the alternative naming phase, children were considered to succeed on a given trial, if they provided both names for an item. Also, the two training trials used to familiarise children with the task are not included in the analysis. Children succeeded in 78% of the trials on average with a mean of 93% for Greek words and 80% for English words. This difference was statistically significant, $t(43)= 3.1$, $p = .004$. Figure 11 shows that the majority of the children (64%) provided both names for all 4 items.

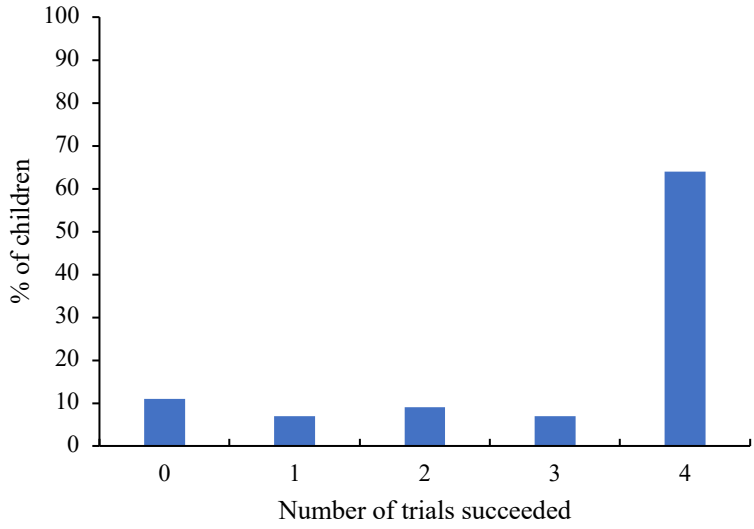

Figure 11. Percentage of children who succeeded in one, two, three, four trials or in no trial in Alternative Naming Task.

False Belief Tasks.

Children passed 55% of false belief tasks: of 45 children 22 children passed both false belief tasks, 4 children passed only 1 false belief task and 19 children failed both tasks. Five children failed one or both control questions on the first false belief task and one child failed one control question on the second false belief task. Performance in the False Belief Task was strongly correlated with age (Table 11).

Developmental Trajectory.

The False Belief Tasks and the two Alternative Naming Tasks correlated strongly with chronological age and verbal mental age (see Table 11). For further analysis, children were split in three age groups: 3-year-olds (N= 18), 4-year-olds (N= 12) and 5-year-olds (N= 15). In the Alternative Naming Task, 5-year-olds and 4-year-olds performed significantly better than 3-year-olds; $t(30)= 4.83$, $p < .001$ and $t(27)= 3.03$, $p = .005$ respectively. There was no difference in performance between 5-olds and 4-year-olds; $t(25)= 1.34$, $p = .19$. With regard to the cross-language version of the Alternative Naming

Task there was a strong correlation with age, too. Since performance reached ceiling, though, correlations should be treated with caution. Developmental trajectory for both tasks is depicted in Figure 12.

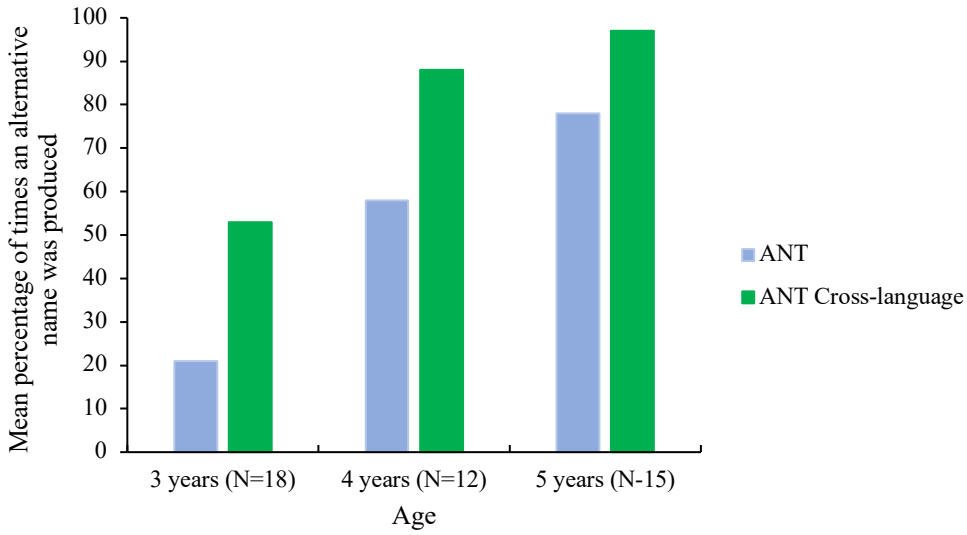

Figure 12. Mean percentage of target choices in the Alternative Naming Task and the Alternative Naming Task – Cross language version in relation to age.

Comparison of the tasks.

Both the ANT and the Cross-language ANT correlated strongly with performance in False Belief Tasks (Table 11). The Alternative Naming Task correlated with false belief understanding even when age and verbal mental age were partialed out. Also, the two Alternative Naming Tasks correlated strongly with each other even after age and verbal mental age were partialed out.

Table 11

Correlations between tasks in bilingual children

	BPVS	False Belief	Dual Naming	ANT	ANT Cross-language
Age	.76**	.53**	.04	.62**	.59**
BPVS	_	.44*	.10	.44**	.60**
False Belief		_	.10	.47**	.43**
Dual Naming		.16	_	.08	.10
ANT		.35*	.10	_	.48**
ANT Cross-language		.25	.18	.30*	_
Retention		.18	.35*	.34*	28

Note: Correlations after partialing out age and verbal mental age are presented below the diagonal.
* $p < 0.05$.
** $p < 0.001$.

Monolinguals.

The Dual Naming Task.

For monolingual children, performance on the familiar names condition almost reached ceiling, with only 2 children choosing the distractor on a single trial. In the novel words condition, 99% of the children chose the target as the referent of the first request on all four trials, with one child picking the distractor on a single trial. For the second request, monolingual children succeeded 60% of the trials. More than half of the children (58%) picked the target in either 3 or all four trials. Performance for one, two or none of the trials was spread as shown in Figure 13.

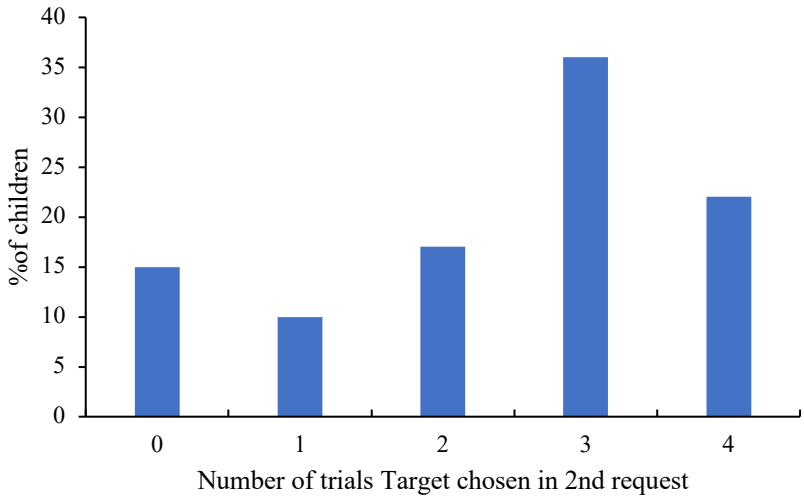

Figure 13. Percentage of monolingual who succeeded in one, two, three, four trials or in no trial in the 2nd request of the Dual Naming Task.

Whether the Puppet 1 or Puppet 2 made the second request made no difference to the likelihood of selecting the target – responses were identical for each of them.

The Retention Task.

The target object was the one for which a novel name had been taught in the Dual Naming task. Overall, children picked the target object on 82% of times. All target labels were retained with equal success with mean performance ranging from 76% to 88%. A non-parametric Friedman test of differences among repeated measures rendered a Chi-square value of 4.9 which was non-significant (p = .18). When children had chosen the distractor in the Dual Naming Task, they picked the target object on 66% of trials, meaning even children who chose the distractor in the Dual Naming task had correctly mapped the word to the target object (Figure 14).

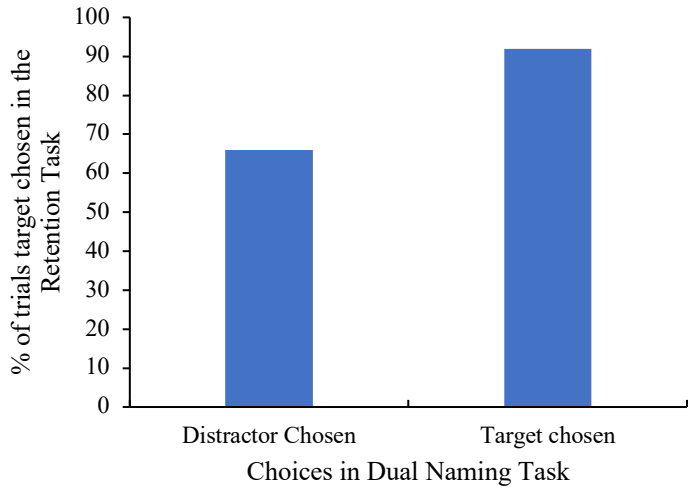

Figure 14. Choices in the Retention Task versus choices in the Dual Naming Task in monolingual children.

Alternative Naming Task.

Mean performance on the vocabulary check reached ceiling with 100% success. In the alternative naming phase, children were considered to succeed on a given trial, if they provided both names for an item. Also, the training trials used to familiarise children with the task is not included in the analysis. Children succeed in 60% of the trials. From this total performance, mean performance when children were asked to provide the basic term (e.g. dog) was much higher - 93% - compared to when the superordinate term (e.g. animal) was required 60%. This difference was statistically significant, $t(40)= -5.5$, $p < .001$. More than half of the monolingual children (62%) picked the target in either 3 or all four trials (Figure 15).

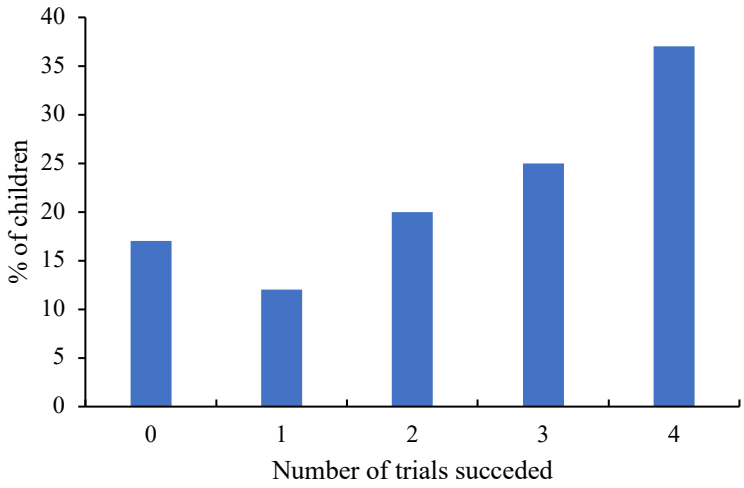

Figure 15. Percentage of monolingual children who succeeded in one, two, three, four trials or in no trial in Alternative Naming Task.

False Belief Tasks.

Children passed 65% of false belief tasks: 26 children passed both false belief tasks, 3 children passed only 1 false belief task and 12 children failed both tasks. Three children failed one or both control questions on the first false belief task and two children failed one control question on the second false belief task.

Developmental trajectory.

All tasks, apart from the Dual Naming Task, correlated strongly with chronological age and verbal mental age (see Table 12).

Comparison of the tasks.

All tasks correlated strongly with performance in False Belief Tasks (Table 12), indicating that monolingual children are more likely to succeed in these tasks and this correlation remained strong even after partialing out age and verbal mental age.

Table 12

Correlations between tasks in monolingual children

	BPVS	False Belief	Dual Naming	ANT	Retention
Age	.75**	.37*	.25	.48**	.31*
BPVS	_	.41*	.40*	.40*	.39*
False Belief		_	.41*	.66**	.51*
Dual Naming		.32*	_	.59**	.61**
ANT		.59**	.56**	_	.48*
Retention		.42*	.54**	.39*	_

Note: Correlations after partialing out age and verbal mental age are presented below the diagonal.
* $p < 0.05$.
** $p < 0.001$.

Comparisons between bilinguals and monolinguals.

In the Dual Naming Task, monolinguals performed significantly better than bilinguals; $t(84)= -3.9$, $p < .001$ (Table 13). Both language groups performed similarly in the Alternative Naming Task and the False Belief Tasks - $t(83)= -1.2$, $p = .23$ and $U = 784$, $p = .195$ respectively - and correlations between these tasks was significantly strong in both groups. In Retention, no differences were found between monolinguals and bilinguals, $t(84)= -1.6$, $p = .11$. Analysis showed that monolinguals performed better than bilinguals on the BPVS and this difference was statistically significant, $t(84)= 7.5$, $p = .02$ (mean raw score=47 for bilinguals; mean raw score=54 for monolinguals).

Table 13

Mean success in the main tasks among the two language groups

	Bilinguals	Monolinguals
Dual Naming Task	33%	60%
Alternative Naming Task	50%	60%
False Belief Task	55%	65%
Retention Task	73%	82%

Discussion

Experiment 4 tested bilingual children and compared their performance to monolingual children. The perspectival account predicted that that both monolinguals and bilinguals will avoid lexical overlap equally and success for both would associate with success in theory of mind tasks. This prediction was confirmed, as success in referent selection tasks, such as the Alternative Naming Task, was associated with false belief understanding and was independent of language status. That was not the case for the Dual Naming Task, though, where bilinguals' performance was low. Also, when tested across languages, bilingual children produced alternative names with relevant ease.

Bilinguals' performance in the Dual Naming Task was lower compared to our previous experiments; bilingual children succeeded 33% of the time, while in Experiments 1 to 3, success rates ranged between 49-51%. A possible reason for that is arguably children's lack of confidence regarding the language they were tested in. In particular, there were cases that this was explicitly expressed without prompting using statements such as "I 'm not that good at English, so I might not do well in the games". The nature of the statements led to the speculation that children's performance might have indeed been affected by the degree they believed they will perform well on the task. Children encounter this difficulty with the Dual Naming Task in particular, as this task is considered to be more demanding compared to the other tasks, since it involves quite a few newly learnt labels. Given the low performance in the Dual Naming Task, correlation with false belief understanding could not be replicated.

As to the other tasks, both groups performed similarly on the Retention Task, the Alternative Naming Task and the False Belief Tasks. Most importantly, the

predicted relationship between the Alternative Naming Task and false belief understanding was replicated in bilingual children and remained strong even after chronological and verbal mental age were partialed out. A strong correlation was also found between the Alternative Naming Task – Across Languages and the False Belief Tasks, and the two Alternative Naming Tasks; within and across languages. However, since performance in the Alternative Naming Task – Across Languages version reached ceiling, associations should be interpreted with caution.

Bilingual children found the Alternative Naming Task - Across Languages version particularly easy; they had minimal difficulty producing an alternative label when it was explicitly requested that the name should be in the other language. Children are experienced in switching languages in school or even between parents at home, if they speak a different language. Given this fact, when tested across languages and in the presence of primed context, it is possible they recruit different mechanisms from monolinguals to solve this kind of task. Exploring the strategies that bilingual children might employ here falls outside the scope of the present thesis, but these data form the basis of potential further investigation.

In the monolingual group, success on the tasks was similar to previous experiments and the associations between the Dual Naming Task, the Alternative Naming Task and the False Belief Tasks remained strong even after partialing out age and verbal mental age.

Overall, this experiment showed that performance of bilingual children was no better than monolinguals, which is consistent to the analysis of bilingual children in Experiments 1 to 3. In the case of the Dual Naming Task in bilinguals, the fact that children were tested on their weaker language seems to have influenced performance

which appeared to be lower compared to monolingual children. The next experiment examines a different kind of population; children with Autism spectrum Disorders.

Introduction III - ASD children

Autism Spectrum Disorder (ASD) is a complex neuro-developmental condition which involves persistent challenges in social interaction, nonverbal communication and speech, and repetitive/restricted behaviours (APA, 2018). With regard to word learning and language acquisition, ASD children demonstrate a heterogeneity of linguistic abilities ranging from profoundly impaired to very advanced. Although for a large proportion of this population communication and language challenges are life-long, there are children who might show typical or even superior vocabulary development and linguistic skills (de Marchena, Eigsti, Worek, Ono, & Snedeker, 2011; Henderson, Powell, Gaskell, & Norbury, 2014; Kjelgaard & Tager-Flusberg, 2001; Lyster, Lopez & Lord, 2007; Tager-Flusberg, 2006).

Despite the fact that ASD children are quite strong in the area of vocabulary development (Tager-Flusberg, Paul, & Lord, 2005), they are still notably impaired in their ability to interpret speakers' referential intent (Baron-Cohen, Leslie, & Frith, 1986; Baron-Cohen, 1995; Sabbagh, 1999) and this is tendency shown even by individuals who develop average or above average verbal skills (Tager-Flusberg, Paul, & Lord, 2005). Even in this case though, most of the ASD children are able to learn words by middle childhood (de Marchena et al., 2011). Regarding disambiguation, a common assumption that could be made by proponents of the socio-pragmatic account could be that children with ASD cannot disambiguate, as their impaired pragmatic abilities might hinder inferences for speakers' referential intent. However, recent studies show that ASD children can demonstrate disambiguation attributing novel words to novel objects over familiar objects (de Marchena et al., 2011; Hartley, Trainer & Allen, 2019; Preissler & Carey, 2005).

Here, we present the small number of studies that have examined disambiguation in ASD children. In a recent study, Hartley et al. (2019) presented ASD and TD children (mean ages: 8.79 years and 5.57 years respectively) with two familiar and one novel object and asked for the referent of a novel name. They also included requests for familiar objects in order to prevent children from learning to always pick the novel object. Both populations picked the novel objects as the referents of the novel words with proportion of success being 100% for TD's and 90% for ASD's, meaning that ASD children can disambiguate regardless of their impaired pragmatic abilities. This is consistent with earlier findings reported by Preissler and Carey (2005) who examined disambiguation in 5- to 9-year-old ASD's. Their disambiguation paradigm comprised two trials. In the first trial, children were presented with a familiar and a novel drawing, and, in the second trial, they were presented with a familiar and novel object. Children consistently chose the novel stimuli (75% success for pictures; 89% success for objects) despite their impaired ability to use speaker's gaze direction as a strategy for matching words to objects. Also, no performance differences were found between ASD and TD children. According to the authors, this indicated ASD children can still disambiguate without needing to interpret speaker's referential intent.

De Marchena et al. (2011) also examined disambiguation in both ASD and typically developing (TD) children. In this study, 68 TD and 48 ASD children were tested in the disambiguation paradigm used by Diesendruck and Markson (2001, Study 1). The paradigm was given both using labels and facts. ASD and typically developing children were found to disambiguate equally. However, the effect was stronger for words rather than facts. Also, the two effects were uncorrelated, as better communication in children predicted stronger disambiguation in facts, indicating that

that pragmatic skills might underlie the phenomenon. In contrast, children with better vocabulary development were more likely to disambiguate in labels, indicating that there might be a connection to lexical skills. Thus, the authors concluded that distinct mechanisms underlie label and fact disambiguation. Children did disambiguate despite their impaired pragmatic abilities. This confirms Preissler and Carey's (2005) conclusion that children do not need to interpret speakers's referential intent to pick the novel object after hearing a novel name. Various explanations have been proposed to explain this finding. De Marchena and collegues have rejected the possibility that children with ASD use different mechanisms than typically developing children. They explain that it is very unclear how two distinct mechanisms for disambiguation would emerge over evolution. Instead, they proposed that disambiguation is not a result of children's pragmatic abilities, but it is either a lexical constraint or a reflection of domain-general learning processes.

As mentioned earlier, the socio-pragmatic account cannot explain disambiguation in ASD children. In this experiment, I wanted to examine how ASD children perform in referent selection and investigate the potential association their theory of mind abilities.

Theory of mind in children with autism is an ability often acquired with a delay compared to typically developing children and ASD children tend to fail preschool false belief tasks throughout childhood - even teens in some occasions. Baron-Cohen et al. (1985) provided one of the first demonstrations by testing ASD children (mean age= 11 years, SD=3) and TD children (mean age= 4,5 years, SD=0.7) on Perner and Wimmer's false belief task. Their results showed that the two groups performed significantly differently with 80% of the ASD children failing the false belief task compared to TD children where only 15% failed. The authors

concluded that impaired theory of mind constitutes a specific deficit that is largely independent of general intellectual level. These findings were very much consistent to those of later studies (Baron-Cohen, 1995, 2001; Girli & Tekin, 2010; Hoogenhout & Malcolm-Smith, 2014; Peterson, 2009; Siegal & Peterson, 2008).

In this experiment, I compared the performance of ASD children and typically developing children on a series of referent selection tasks - the Dual Naming Task, the standard Disambiguation Task, the Pragmatic Cue Task, the Alternative Naming Task – and the two False Belief Tasks used throughout this thesis. Administering the Dual Naming Task in ASD children is completely novel, as well as testing this population on the particular combination of tasks. The perspectival account predicts that children who cannot pass the False Belief Tasks will also not be able to pass the referent selection tasks were understanding of perspective is required, that is the Dual Naming Task, the Pragmatic Cue Task and the Alternative Naming Task. Thus, my predictions were:

1. Performance between the two groups would be similar on the basis that success in the referent selection tasks would also correlate with success in the false belief tasks.
2. Previous findings showing that ASD children disambiguate equally to TD children would be replicated.

Experiment 5 – ASD children

Method

Participants.

Forty-two children participated from five special schools in Sheffield and two mainstream/inclusive school in Norwich; 21 ASD children (2 girls; mean age 128 months, range = 73 – 218, *SD* = 45 months); 21 typically developing children (10 girls; mean age 60 months, range = 52 – 68, *SD* = 5 months. Among the typically developing children tested for this study, the selected 21 were the most closely matching the ASD children in verbal mental age. ASD's mean verbal mental age was 5 years (BPVS mean raw score: 71.88, range = 23 – 140, *SD* = 31) and TD's mean verbal mental age was 4 years and 8 months (BPVS mean raw score: 62.90, range = 58 – 70, *SD* = 3.4). Mean performance on the Raven's Coloured Progressive Matrices for the ASD children was 20.27 (range = 2 – 32, SD = 9.5). Verbal mental age data for five ASD children and chronological age data for two ASD children was not available at the time of testing. The selection criterion for the ASD children was head-teachers' confirmation that they had an ASD diagnosis and that they were in the position to follow a short story and respond to low-demand instructions, such as requests to point at objects. Inclusion criteria were informed parental consent and child assent immediately prior to testing. The exclusion criterion was children's reluctance to participate or poor understanding of the instructions.

Design.

Children completed the Dual Naming Task, the Disambiguation Task (Gollek & Doherty, 2016), the Pragmatic Cue Task (Gollek & Doherty, 2016), the Alternative Naming Task (Doherty & Perner, 1998) and two False Belief Tasks. The experiment was completed in four sessions and each session lasted 10 minutes maximum. The

order of the tasks was counterbalanced across participants. The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) and the Raven's Coloured Progressive Matrices (Raven, 1962) were administered last.

Stimuli.

Sixteen pictures depicting unusual toys and household objects and 21 pictures depicting familiar objects were used (Appendix G).

Labels.

The novel words (wiso, colat, pizer, gake, hinkel, flinder, colat, momtick, kern, blicket, pafe, boskot, kita, ente, coodle, puhne) were taken from The Novel Object and Unusual Name (NOUN) Database (Horst & Hout, in press) and Gollek (2013). The familiar word-pairs were *dog-animal, carrot-vegetable, owl-bird, milk-drink and apple-fruit*.

Other Materials.

A hand-puppet was used as a second speaker to address direct questions to the children. A small cardboard model was used as the puppet's house. False Belief Task II was presented on a portable computer with Microsoft Power-point.

Procedure.

Dual Naming Task.

The procedure was identical to previous experiments in this thesis except stimuli were pictures instead of objects.

Disambiguation Task.

This task is based on Gollek and Doherty's (2016) disambiguation task. Each child was introduced to Jimmy the puppet and then was presented with a familiar picture (e.g., a banana) and an unfamiliar picture (e.g., a whisk). The child was asked to choose the referent of a novel word through pointing to a picture. There were four

trials, each of four trials presented a new set of one unfamiliar and one familiar picture and a novel word, and presentation of pictures (left/right) was counterbalanced. The wording of the request was as follows:

‘‘Jimmy would like a hinkle; please give Jimmy a hinkle.”

Pragmatic Cue Task.

Each child was introduced again to the Puppet. Then, the child was presented with a familiar picture (e.g., an apple) and an unfamiliar picture (e.g., a bottle stopper) and was told, ‘‘Jimmy is hungry and would like a momtick; please give Jimmy a momtick.”. Three additional trials paired novel pictures with familiar objects that would satisfy the puppet’s implied need (sleepy, cold, thirsty). There were four trials in total and presentation of picures (left/right) was counterbalanced.

The Alternative Naming Task.

Vocabulary check. Four sheets of paper were presented individually, each displaying six pictures. The child was asked to point to each experimental item twice on different sheets: once under the basic label (e.g., ‘‘Show me the cat”) and once under the superordinate label (‘‘Show me the animal”).

Alternative Naming phase. The child was presented with an individual picture and told, ‘‘Now, here are some more pictures. Each picture has two names. I am going to tell you one name for it, and you can then tell me another name for it. Let’s try that. This is fruit. What else is it?”. If a child just repeated the experimenter’s word, the experimenter would say “Well, this is what *I* have said… Any other word for fruit?”. After this practice trial, the procedure continued with four pictures (cat, food, owl, drink) and then a second time using the alternative labels (animal, burger, bird, milk).

The child was asked to provide both superordinate and basic labels to pass a particular item.

False Belief Task I.

False Belief Task 1 was identical two the previous experiments.

False Belief Task II.

The second False belief task was identical to False Belief Task II from previous experiments with the difference that this one was in the form of PowerPoint presentation. Characters, names and objects depicted were equivalent to those used in this task in the previous experiments.

Standardized measures.

The British Picture Vocabulary Scale III (Dunn & Dunn, 2009) was individually administered according to the manual.

The Raven's Coloured Progressive Matrices (CPM) (Raven, 1962) was also used to measure non-verbal, clear-thinking ability and is designed for both typically and atypically developing children from 5 to 11 years of age. In the test, each child was presented with matrices and was asked to identify the missing item that completes a certain pattern. The CPM items were arranged to assess cognitive development up to the stage when a child is sufficiently able to reason by analogy and adopt this way of thinking as a consistent method of inference.

Results

Preliminary analysis of the data indicated there were no effects of task order.

ASD children.

Dual Naming Task.

For three children, data was not collected for this task, as they refused to answer the test questions. Table 14 shows children's choices in the 1st and 2nd request and the number of times each type of behaviour was observed.

Table 14

Children's choices in the 1st and 2nd request of the Dual Naming Task

Children's choices in the two requests.

1st request	2nd request	Times choices occurred
Target	Target	22
Target	Distractor	38
Distractor	Target	5
Distractor	Distractor	4
Target	Familiar object	3

Children picked the target in both requests 33% of the times. 15 out of 18 children chose the target as the referent of the first request on all four trials, with three children each picking a distractor on one, two or three trials each. For the second request, 67% of the children picked the target either in one or two trials (Figure 16). Only 1 child chose the target at all times.

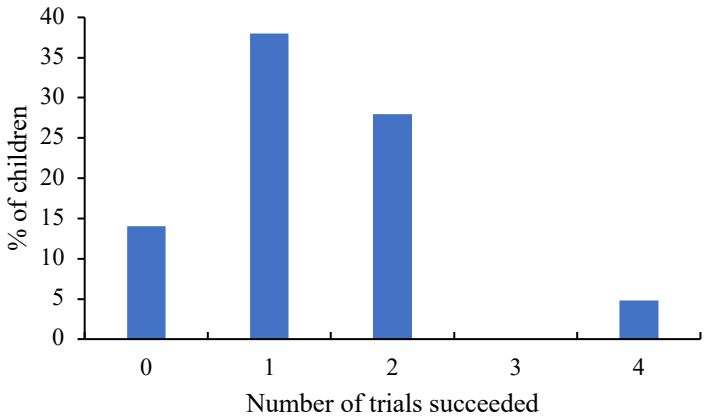

Figure 16. Percentage of children who picked the target in one, two, three, four trials or in no trial in the 2nd request of the Dual Naming Task.

Whether the puppet or the experimenter made the second request made no statistical difference to the times target was chosen (Table 15).

Table 15

Overall number of choices of Distractor/Target in the Dual Naming Task versus speaker in typically developing children

	Speaker asking the 2nd request	
	Experimenter	Puppet
Distractor choices	14	12
Target choices	28	30

Alternative Naming Task.

Mean performance on the vocabulary check reached ceiling with 99%. In the alternative naming phase, children were considered to succeed on a given trial, if they provided both names for an item. Also, the training trial used to familiarise children with the task is not included in the analysis. Children succeed on 43% of the trials. From this total performance, mean performance when children were asked to provide the superordinate term (e.g. animal) was much lower - 60% - compared to when the term

(e.g. dog) was required - 78%. This difference was statistically significant, $t(20)= 1.6$, $p = .013$. Figure 16 shows that nearly 40% of the children failed all trials and the second biggest proportion of the children provided both names in three trials.

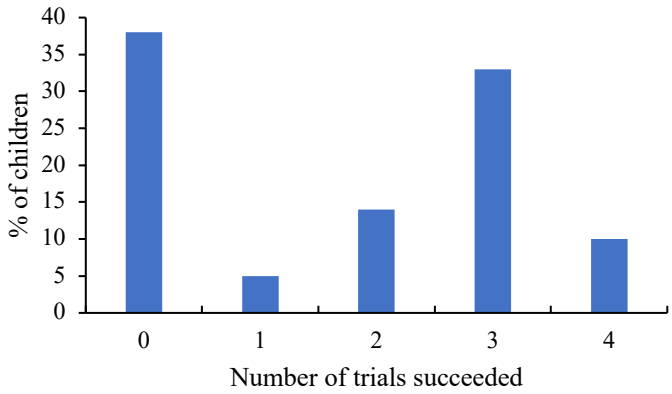

Figure 16. Percentage of children who succeeded in one, two, three, four trials or in no trial in Alternative Naming Task.

Disambiguation Task.

Children picked the familiar picture 18% of the times on average. 62% of the children never picked the familiar picture and 33% did so only in one or two trials (Figure 17).

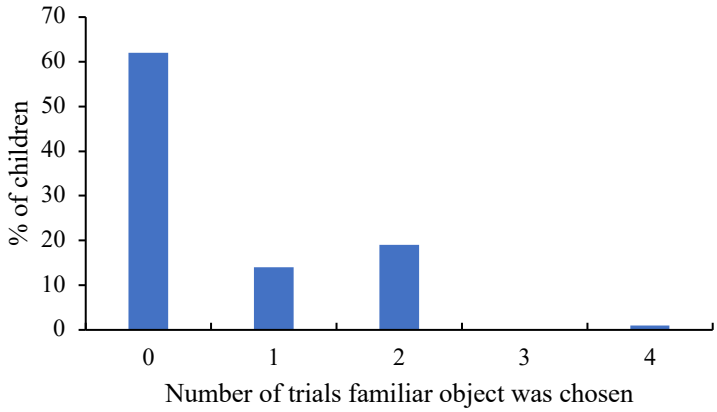

Figure 17. Percentage of children who chose the familiar picture in one, two, three, four trials or in no trial in the Disambiguation Task.

Pragmatic Cue Trask.

Children picked the familiar picture 75% of the times on average. More than half of the children picked the familiar picture in all four trials and the rest of the percentages were split in one, two or three trials as shown in Figure 18. At this point it has to be noted that many of the ASD children exhibited an unusual kind of behaviour when given the Pragmatic Cue Task, explicitly suggesting that they were not taking the novel word into account. For example, when the experimenter said ‘‘Jimmy is hungry and would like a momtick; please give Jimmy a momtick.”, children grabbed and handed the familiar picture after hearing “hungry” before they heard the novel word. The experimenter started taking notes on this behaviour after Participant 4. This behaviour was recorded for 10 out of the 17 remaining participants in at least 3 out of 4 trials.

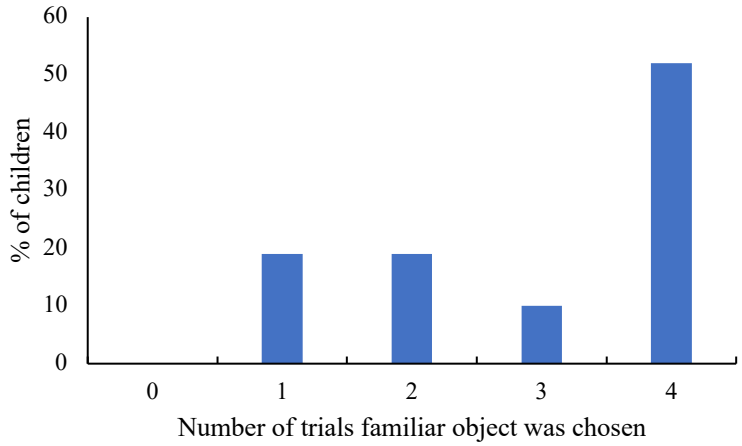

Figure 18. Percentage of children who chose the familiar picture in one, two, three, four trials or in no trial in the Pragmatic Cue Task.

False Belief Tasks.

ASD children passed 40% of false belief trials on average: of 21 children, 7 passed both False Belief trials (33%), 5 children passed only 1 false belief trials and 9 children failed both tasks. Seven children on the first false belief task and five children

on the second false belief task failed one or both control questions. Among these, one child got the belief question correct. Overall, only children who had all three questions correct were considered to pass a given False Belief trial. Performance in the False Belief Task was strongly correlated with the Alternative Naming Task (Table 16).

Table 16

Correlations between tasks in ASD children

	BPVS	False Belief	Dual Naming	Disam-biguation	Alterna-tive Naming	Pragmatic Cue
Age	.15	.19	.42	.14	.25	.34
BPVS	-	.61*	.12	.30	.69**	.02
False Belief		-	.02	.20	.77**	.08
Dual Naming		(.01)	-	.08	.21	.20
Disambiguation		(.26)	(.05)	-	.20	.06
Alternative Naming		(.61*)	(.23)	(.35)	-	.05
Pragmatic Cue		(.08)	(.06)	(.11)	(.16)	-

Note: Correlations after partialing out verbal mental age are presented below the diagonal.
* $p < 0.05$.
** $p < 0.001$.

Developmental Trajectory.

Age did not correlate with any of the tasks (Table 16).

Comparison of the tasks.

The Alternative Naming Task and False Belief Task correlated strongly even when verbal mental age was partialed out (Table 16). It may be noted that performances in the False Belief Task I and II were not equal (mean success at 48% and 33% respectively), but this difference did not reach statistical significance, $t(20)= 1.8$, $p = 0.83$. ASD children might have found the PowerPoint version of the False

Belief Task less engaging and this factor might have caused lower performance. Performance on False Belief Task I correlated highly with performance in the Alternative Naming Task, $r = .70$, $p = .004$ (VMA partialed out). Also the two False Belief Tasks correlated highly with each other, $r = .66$, $p = .007$ (VMA partialed out).

Typically developing children.

Dual Naming Task.

In the first request, typically developing children picked the target at all times. In the second request they chose the target 65% of the times, Figure 19 shows how many TD children picked the target in one, two, three, four or none of the trials. 62% of the children picked the target either on three or all four trials.

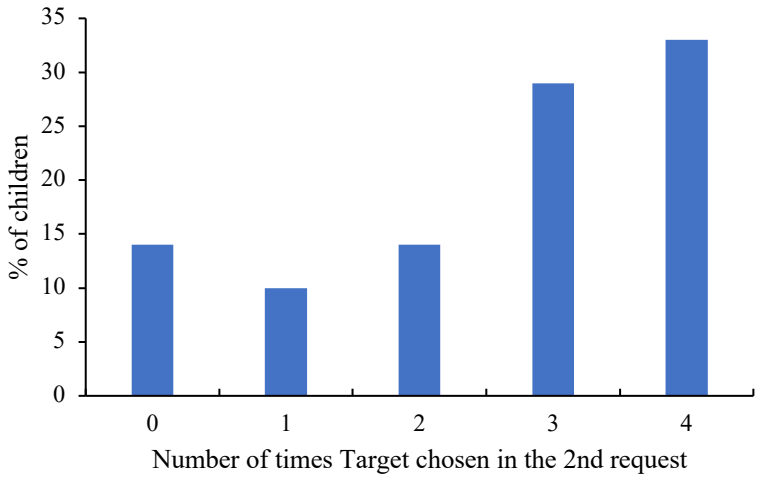

Figure 19. Percentage of TD children who picked the target in one, two, three, four trials or in no trial in the 2nd request of the Dual Naming Task.

Whether the experimenter or puppet made the second request made no statistical difference to which picture was selected by typically developing children (see Table 17).

Table 17

Overall number of choices of Distractor/Target in the Dual Naming Task versus speaker in typically developing children

	Speaker asking the 2nd request	
	Experimenter	Puppet
Distractor choices	16	14
Target choices	26	28

Alternative Naming Task.

Mean performance on the vocabulary check reached ceiling with 100%. Children succeeded in 70% of trials. From this total performance, mean performance when children were asked to provide the basic term (e.g. dog) was higher - *M*=88% - compared to when the superordinate term (e.g. animal) was required, *M*=73%. This difference was statistically significant, $t(20)= -2.4$, $p < .029$. Nearly half of the typically developing children (48%) provided both names in all four trials. Figure 20 shows success by number of trials in TD children.

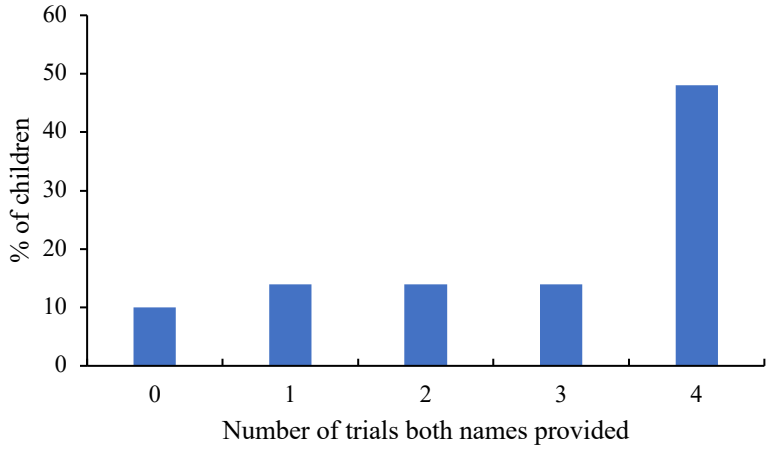

Figure 20. Percentage of TD children who succeeded in one, two, three, four trials or in no trial in Alternative Naming Task.

Disambiguation Task.

Typically developing children picked the familiar picture 10% of the times on average. Figure 21 shows that the majority of the children never picked the familiar picture.

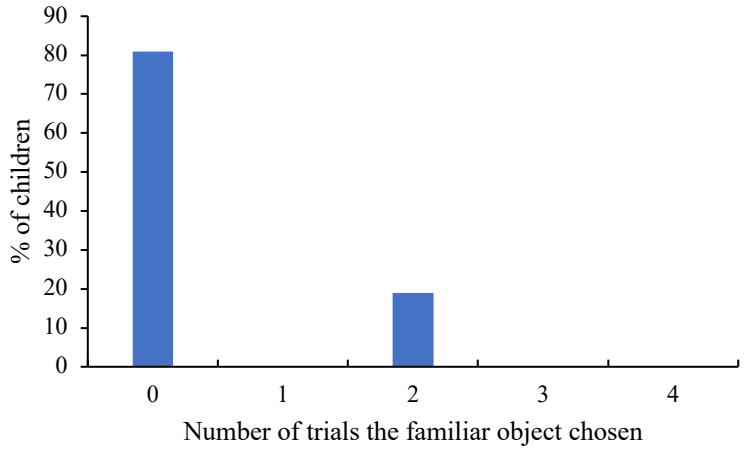

Figure 21. Percentage of TD children who chose the familiar picture in one, two, three, four trials or in no trial in the Disambiguation Task.

Pragmatic Cue Task.

Children picked the familiar picture 90% of the time. Figure 22 shows that in both groups the majority of the children was consistently choosing the familiar picture in all four trials.

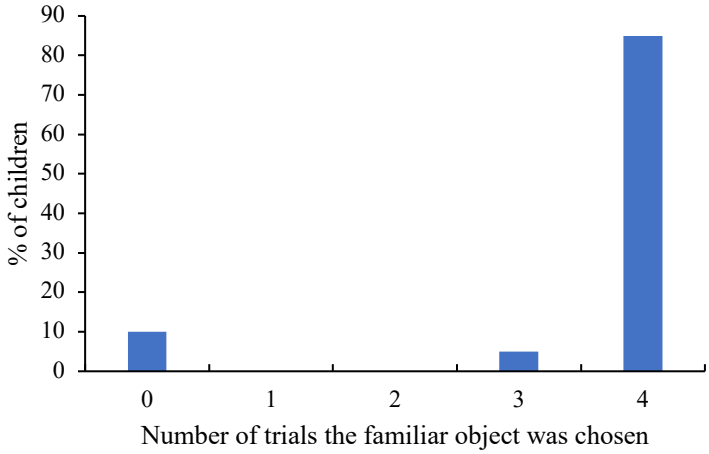

Figure 22. Percentage of children who chose the familiar object in one, two, three, four trials or in no trial in the Pragmatic Cue Task.

Table 18

Correlations between tasks in TD children

	BPVS	False Belief	Dual Naming	Disambi-guation	Alternative Naming	Pragmatic Cue
Age	.82**	.18	.30	.01	.53*	.38
BPVS	-	.39	.49*	.12	.55*	.69*
False Belief		-	.20	.07	.35	.65*
Dual Naming		(.05)	-	.25	.50*	61*
Disambiguation		(.01)	(.07)	-	.08	.24
Alternative Naming		(.23)	(.36)	(.16)	-	51*
Pragmatic Cue		(.52*)	(.39)	(.16)	(.33)	-

Note: Correlations after partialing out age and verbal mental age are presented below the diagonal.
* $p < 0.05$.
** $p < 0.001$.

False Belief Tasks.

Typically developing children passed 80% of false belief trials on average: of 21 children, 17 passed both False Belief trials (81%), 2 children failed both tasks and there was no child who passed only one false belief trial. One child on the first false belief task and one child on the second false belief task failed both control questions. None of these children passed the belief question.

Comparison of the Tasks.

Contrary to ASD children, in TD children there was a correlation between age and the Alternative Naming Task (Table 18). Also, false belief understanding was related to children's performance on the Pragmatic Cue Task and this was the only relationship that remained robust after partialing out chronological and verbal mental age. There was no correlation between false belief and the Alternative Naming Task as found in ASD's, which was expected as TD children were quite old. Dual Naming

Task correlated with Alternative Naming Task and the Pragmatic Cue Task, unlike in ASD children.

Comparisons between ASD's and TD's.

In comparison to TD children, ASD children seem to find the Dual Naming Task harder (Table 19); $t(35)= -3.2$, $p < .003$. In the Alternative Naming Task, the difference in performance between the two groups was again statistically significant; $t(40)= 2.3$, $p = .01$ (Table 19). In the Disambiguation task and the Pragmatic Cue task, performances were similar. In the False Belief Tasks, typically developing children were better than ASD's ($U = 121$, $p = .004$).

Table 19

Mean success in the main tasks among the two groups

	ASD children	TD children
Dual Naming Task	33%	64%
Alternative Naming Task	43%	69%
Disambiguation Task	82%	90%
Pragmatic Cue Task	73%	89%
False Belief Task	40%	80%

Discussion

This experiment examined referent selection in relation to theory of mind abilities in children with Autism Spectrum Disorder and also compared performances with typically developing children. The predictions for this study were t that success in the referent selection tasks would also require success in the false belief tasks, and that ASD children would be able to disambiguate replicating in this way previous findings. ASD children did disambiguate similarly to TD children. Regarding associations, ASD's performance in the Alternative Naming Task was strongly correlated with

success in the False Belief Tasks, replicating previous research (Doherty & Perner, 1998). ASD's low performance in the Dual Naming Task and TD's high performance in all of the tasks will now be discussed in relation to their chronological and verbal mental age.

Success in the Dual Naming Task was particularly low – 33% compared to approximately 50% found in previous experiments -, meaning that these children had greater difficulties in applying two names to the same target. Data showed that there were times children did not even pick the target in the first request or the distractor was picked in both requests or they would even choose familiar objects. Although the percentage of these choices was less than 20%, it still constitutes a relatively high percentage given TD children in the previous experiments made these kinds of choices at a rate less than 1%. This means that ASD children might have not fully understood the basics of the task or found it particularly difficult to learn the names.

This can explain why there was not a relationship between the Dual Naming Task in ASD's and the False Belief Task. To be able to compare performances, children need to make two types of choices in the Dual Naming Task; either pick the target on both requests, indicating success, or pick the target in the first request and the distractor in the second, indicating they learned the first name, but found it difficult to apply the second on the same target, as they were unable thus to coordinate both perspectives. Since there were other factors contributing to failure, relationship with false belief understanding could not stay unaffected.

ASD children scored high on the Disambiguation Task and the Pragmatic Cue Task. The fact that the Disambiguation Task and False Belief Task did not correlate was expected, as passing the Disambiguation Task does not require an understanding of perspective. In contrast, the Pragmatic Cue Task was expected to correlate with the False

Belief task, but that was not the case. ASD children scored high in the Pragmatic Cue Task – 75% success- but not in the False Belief Task - 40% success -. However, as mentioned in the results, at least 10 out of 21 children exhibited impulsive behaviour showing that they ignored the novel names when choosing. Thus, although children showed success in the Pragmatic Cue Task, this does not mean they understood the task and were able to apply two names on the same familiar object. This shows aspects of the way ASD children filter information when being part of a discourse.

No understanding problems seem to have occurred in the Alternative Naming Task, where no atypical behaviour was observed and ASD children scored as expected relatively to their verbal mental age. In this case, there was a strong correlation with the False Belief Tasks even after partialing out age and verbal mental age, suggesting that ASD children need to understand perspective to be able to apply two names to the same thing within the same particular conversation, like typically developing children do.

Compared to ASD children, TD children scored highly in all tasks. As noted in Methods, TD children were matched with ASD's in terms of verbal mental age. This resulted in a sample comprising particularly old ASD children (mean age 128 months) compared to TD's whose mean age was 60 months, but also particularly old TD children compared to the age ranges I had in the previous experiments (3- to 5-year-olds). So, consistent both to literature and the experiments of this thesis, TD's of this experiment found passing the tasks easy. Given the high performances, it was hard to detect developmental change and this explains why correlations among the tasks were weak.

Overall, this experiment showed that similarly to TD children, an understanding of perspective is required for ASD children, too, in order to pass the Alternative Naming Task. ASD children find the Dual Naming Task particularly difficult and interpret differently the Pragmatic Cue Task. Lastly, previous findings showing that ASD

children are able to disambiguate despite their impaired pragmatic abilities were replicated.

General Discussion

General Findings

The present thesis examined the development of preschool children's ability to correctly use two newly taught labels for the same object within the same conversation. Among five substantial and novel experiments, 331 children from three different populations were tested on a variety of metalinguistic and metacognitive tasks, while complete verbal mental age data was also recorded. Throughout the experiments, it was found that 3- to 4-year-olds resisted applying both labels to the same object and applied the second name to different objects. In contrast, 5- to 6-year-olds accepted both labels significantly above chance. The likelihood of a child applying two names to one object was strongly related to false belief performance and remained robust even after partialing out age and verbal mental age. Results were extended to two other populations; bilingual and ASD children. The present thesis showed that children overcome the confusion multiple labels bring once they develop an understanding of perspective.

To rule out the possibility that children avoided applying the two names to the same object for pragmatic reasons specific to this experiment, I adapted the procedure in Experiment 3 to include speakers of equal status and deemphasised the contrast between the two labels by including intervening requests for familiar objects. These manipulations did not alter the findings. Providing children with additional bridging information indicating the target as the appropriate choice for both requests did not alter performance either. Experiment 3 also showed that weaker-learned names are likely to be replaced by familiar ones, but not vice versa.

Experiments 4 and 5 examined two different populations; bilingual children and ASD children. Experiment 1 to 4 showed that success on the multiple labelling

tasks requiring understanding of perspective (such as the Alternative Naming Task) is associated with success in false belief tasks and is independent of whether a child is monolingual or bilingual. Performance was equal between the two groups in Experiments 1 to 3. That analysis showed that bilinguals performed similarly to monolinguals in the Dual Naming Task and the same pattern of results was found. In Experiment 4, in the Greek-English group, Dual Naming Task performance was low, arguably due to low confidence. Evidently, whether children are tested in their stronger versus weaker language has an impact on their confidence and consequently on their success in referent selection tasks involving newly taught names. If children were tested on their strong language, I would expect that result patterns would replicate and children would have a higher performance in the Dual Naming Task.

Experiment 5 showed that similarly to TD children, perspectival understanding correlates strongly with success in the Alternative Naming Task for ASD children, too. Findings for the Disambiguation Task were replicated, as ASD children almost always picked the novel object. However, in the Pragmatic Cue Task; although children were picking the familiar object, they were doing so before even hearing the novel word. Observations suggested they interpreted the task differently and success does not imply metalinguistic understanding. Consequently, a potential weakness of the Pragmatic Cue Task is that it can be passed by selectively ignoring task information.

Regarding Experiments 4 and 5, another factor that would be of special interest to have examined is inhibitory control. This is because bilinguals have been proposed to show better inhibitory control (Bialystok & Martin, 2004) and ASD children have been shown to face impairments in this domain (e.g. Robinson, Goddard, Dritschel, Wisley & Howling, 2009). Inhibition is plausibly involved in performance of many of the current tasks, such as the Dual Naming Task and Alternative Naming Task in both

language populations, and the Pragmatic Cue Task in monolinguals. In the Dual Naming Task, successful application of both novel labels to the same target potentially involves inhibiting assigning the second novel label to another novel object where no name has been assigned, and in the Alternative Naming Task, success could hypothetically require children inhibiting the name provided by the experimenter in order to produce the alternative. As to the Pragmatic Cue Task, successful use of the pragmatic cue potentially involves inhibiting a tendency to apply novel names to novel objects. The development of inhibition is also thought to be very much related to theory of mind as well. Gollek and Doherty (2016) did examine inhibition in relation to performance on the Pragmatic Cue and False Belief Task and found no relation between performances on a test of executive inhibition (Day–Night Stroop after Gerstadt, Hong, & Diamond, 1994) and the Pragmatic Cue Task. Performance on the inhibition task was unrelated to the False Belief task, too; a finding not that uncommon (see Montgomery & Koeltzow, 2010, for a review). Thus, given the similarity of the tasks between Gollek and Doherty's study and the current thesis, I speculate that I also would not find strong relations between performance on the current referent selection tasks, theory of mind and inhibition in monolinguals and bilinguals. This might not have been the case though in Experiment 5 with ASD children.

As mentioned earlier, many of the ASD children who were picking the familiar object in the Pragmatic Cue task were doing so before even hearing the novel word. Successful use of the pragmatic cue, in this case, potentially involves inhibiting the tendency to directly pick the familiar object as soon as children hear the pragmatic cue. Thus, it would be interesting to investigate whether these children would also

show decreased inhibitory control, which would explain their impulse to pick the familiar object before even listening to the novel name.

With regard to the developmental trajectory, results are consistent with prior work examining children's ability to assign a second name to an object they already know another name for. In the Pragmatic Cue Task, Gollek and Doherty (2016) and Haryu (1991) found that roughly half the 4-year-olds and most 5-year-olds were able to choose a familiar object as a referent of a novel label, contrary to 3-year-olds who persistently chose the novel object.

The most important finding of this study is the strong association between performance on the Dual Naming Task and theory of mind development. Children who passed the False belief tasks were significantly more likely to accept both names within the same conversation regardless of common associations with age and verbal mental age. Thus, we conclude that Dual Naming, Pragmatic Cue and False Belief tasks all involve a common conceptual development, the understanding of perspective.

Theoretical considerations

The basic claim of the lexical constraints account is that children assume words are mutually exclusive and avoid lexical overlap acts as a word learning strategy (Markman & Wachtel, 1988). Savage and Au used a modified version of the lexical constraints account to account for performance on the dual naming task. Children hold both words in mind as equally plausible hypotheses, but as new information comes in, they commit to one label. If the other label is deleted, it should be treated as a completely novel word, and thus would be subject to typical disambiguation effects. Thus, when the label is rejected in the Dual Naming task and then presented in the presence of the target and the unnamed distractor, children should select the distractor. However, we found in the Retention task that the majority of even the youngest

children selected the target. This strongly suggests children do not delete one of the two names. They are not treating the names as mutually exclusive.

It is likewise difficult to apply the socio-pragmatic account to our findings. According to this theory, children learn words by making inferences about other people's communicative intentions. The Dual Naming Task was adopted to make communicative intentions clear. In the training phase, speakers used co-referential novel names for an object. Only one object was named in this way and it was named explicitly. Clark's principles allow for identical reference and contrast in other types of meaning, and even very young children are supposed to be aware of this. It appears that children make the inference that the labels are co-referential at this stage because they almost always chose correctly for whichever label is used in the test phase. What needs to be explained is why when the second label is used children might conclude the speaker intends to *refer* to something else rather than pick out the same object from a different perspective.

When there is only one speaker, as in Savage and Au's study, it would certainly be unusual for a speaker to refer to the same object in two ways without further elaboration. However, two speakers may plausibly use different names for several reasons: they each only know one label, they each have a preferred label, or each intend to present the object under differing perspectives. Consistent with these interpretations, each speaker uses the same label throughout. Speakers might be interpreted as disagreeing about which label should be used. However, this interpretation is only plausible if they refer to the same object consecutively. As shown in Experiment 3, when objects were labelled consecutively children were in fact slightly less likely to choose a distractor.

Further data from Experiment 3 can also not be explained by the socio-pragmatic account. Apart from adding intervening requests, I also had two puppets naming the objects, rather than a puppet and the experimenter like in the previous experiments. This was done in order to completely exclude the possibility that children might prefer the experimenter's label because she potentially is a more authoritative source. Results showed that this manipulation had no effect on performance; children performed equally either with two puppets or one puppet and the experimenter.

The socio-pragmatic account cannot explain the data from the "bridging information" version of the task either. In that task, children were given additional information on how the two novel words relate, which was an unambiguous indication that the target was the intendent referent for both requests. Since that was clear, the pragmatic account would expect that children would utilize this information and pick the target at both times. Still, young children avoided lexical overlap and success in the Dual Naming Task was still predicted by success in the false belief task - similarly to previous experiments.

Experiment 5 tested a population that is known for their impaired pragmatic abilities; ASD children. Since the socio-pragmatic account claims typically developing children disambiguate thanks to their ability to make use of two basic pragmatic principles – conventionality and contrast -, this account would also predict that ASD children will not be able to disambiguate. Our data replicated previous findings showing that ASDs disambiguated as much as TDs. Most importantly, it showed that success in False Belief Tasks predicted success in the Alternative Naming Task, which also requires an understanding of perspective.

However, although the lexical constraints and the pragmatic account cannot readily explain this data, the three accounts we have been considering could potentially be

compatible, but with some modifications. The lexical principles account is essentially behavioural: children behave as if word extensions are mutually exclusive. Researchers have questioned whether this behaviour results from an implicit or a metalinguistic assumption (e.g., Merriman & Bowman, 1991); Markman (1989) speculated on whether it reflects a specifically linguistic principle or a belief that objects have only one identity; other researchers have suggested that the hypothetical bias is an emergent property of the lexicon (e.g., Merriman & Stevenson, 1997; Frank, Goodman, & Tenenbaum (2009). However, these speculations have not progressed beyond matters of conjecture.

The perspectival account advanced here provides a potential theoretical underpinning for the behaviour. Failure to consider perspective differences will lead to treating any novel word as referring to something not already named in a given conversation. This would account for most or all of the evidence taken to support the bias. This claim differs in nuance from the typical descriptions of the bias in two main ways: It is restricted to a specific conversation. Thus, it does not necessarily create any difficulties learning overlapping labels. As long as a potential referent has not been named, explicitly or implicitly, it can take a novel label. In early debate around the bias, the many overlapping terms in children's lexicons was argued to be an insuperable problem for the ME bias theory (e.g., Nelson, 1988). The perspectival account provides a ready explanation for the apparent contradiction.

The second difference to standard descriptions of the bias is that it does not exist to aid word learning. Nevertheless, it constrains the number of hypotheses children can entertain for the meaning of a novel word, and would thus serendipitously confer the word-learning benefits hypothesised for the bias. Other than these two differences, the perspectival account is consistent with the lexical principles account, and provides a potential theoretical underpinning for it.

The socio-pragmatic account is similar to the perspectival account to the extent that both posit an association between theory of mind abilities, disambiguation and related effects. The most salient difference regards the age at which these abilities are taken to develop. The socio-pragmatic account takes understanding of perspective in both labelling and theory of mind to develop in infancy. Present data call this into question: they demonstrate that the two abilities *are* associated developmentally, but find that children begin to understand perspective in labelling at four years, rather than in infancy.
This claim relates to the age from which theory of mind develops. This is currently a matter of vigorous debate (see Dörrenberg, Rakoczy, & Liszkowski, 2018, and Baillargeon, Buttelmann, & Southgate, 2018, for recent discussion of the empirical status of infant theory of mind). However, this is beyond the direct scope of the current study, since our data on theory of mind are restricted to explicit false belief understanding in preschool. For present purposes it is sufficient to note that the distinction between the perspectival and socio-pragmatic accounts is primarily empirical.

To recap the basic claim of the perspectival account is that young children are conceptually unable to think about perspective. This means that once having taken a perspective on an object or situation, they are unable to switch perspective of their own volition. Children's perspective can be switched externally. In the case of naming, this can involve an adult asserting a label for an object different from the one the child has used. The Dual Naming task involves different teachers asserting words on the same object, then examines the ability of the child to endogenously switch between the words. The prediction was that the ability to do this will arise between the ages of 3 to 5 years and be specifically associated with the false belief understanding, as a well-established measure of conceptual perspective taking. This prediction was confirmed in each experiment. The Retention task suggests that

children maintained the mappings of both words to the object throughout the task. In addition, performance on the Pragmatic Cue task (Gollek & Doherty, 2016) also correlated with performance on both the Dual naming and False Belief tasks, beyond common associations with age and verbal mental age.

Bilingual data from Experiments 1 to 3 further showed that performance was not influenced by bilingual status. When compared to monolinguals, bilinguals from the first three experiments performed equally in the main tasks and associations with false belief understanding were maintained. Experiment 4 yielded similar results, but not for the Dual Naming Task, since Greek bilinguals' performance was particularly low arguably due to the confidence factor. The absence of bilingual differences in referent selection performance is consistent with the big corpus of studies showing no such differences in preschool age (see metanalysis by Lewis et al., 2019).

The perspectival account predicts no qualitative differences in the development of monolinguals and bilinguals in relation to dual naming performance. Here, this prediction is confirmed by the bilingual data in Experiments 1 to 3 and bilingual data from both Alternative Naming Tasks and the False Belief Tasks in the Experiment 4. Caution is needed though when interpreting data from bilinguals tested across languages; it is possible that children may have developed strategies to help them switch between languages that do not require perspectival understanding.

Conclusions

The present thesis found that children between the ages of 3 and 5 find it difficult to apply two newly taught names to the same novel object within the same particular conversation. However, they were able to remember the names when these were presented separately. Success in the Dual Naming Task improved with age and

was strongly associated with false belief understanding even after controlling for chronological age and verbal mental age. Bilingual status affects neither overall performance nor the strong association between the tasks requiring an understanding of perspective. Regarding ASD children, for the tasks that were appropriate for this population, the above association remained strong. Thus, typically developing monolingual, bilingual and ASD children need to reach metacognitive developments such as the understanding of perspective in order to be able to apply two names on the same thing within the same particular situation.

These findings may have various practical implications, as understanding the way children process novel names might prove to be important for employing the appropriate practices both in educational settings and at home. This can lead to activities targeting children's language development that are tailored-made with regard to their age, vocabulary and perspective-taking abilities. Further, our results from the Pragmatic Cue Task, showed that ASD children process pragmatic information about objects and names in a unique way compared to typically developing children. This finding could be taken into account and utilised by applied psychologists when developing intervention tools aiming at improving ASD's language comprehension and communication.

These findings have also important theoretical implications, as they add to the understanding of the mutual exclusivity bias and redirect the focus of its scope. Until so far, the ME bias was seen as a test case for theories of word learning aided either by lexical principles or theory of mind. In fact, the present thesis indicates that the ME bias data do not support either position. Rather than being a strategy aiding word learning, the ME bias is in fact a result of cognitive immaturity; children do not avoid lexical overlap by choice, they are just not able yet to realize that two names can apply

to the same entity at the same time. Children overcome this restriction around the age of 4. The perspectival account supports a general metacognitive development occurring at that time – not just in theory of mind, but also in metalinguistic awareness. This thesis confirms this claim and shows conversations can proceed without complex tracking of common ground.

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Appendices

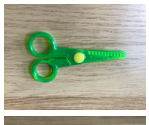
Appendix A

Novel words, novel objects and familiar objects used for the Dual Naming Task, Experiment 1

Novel words	Novel objects	Familiar objects
jintoff		
punhe		
hinkel		
cheedor		
		
		
		
		
		
		
		
		

Appendix B

Novel words, novel objects and familiar objects for the Dual Naming Task, Experiment 2

Novel words	Novel objects	Familiar objects
bubit		
welne		
tachte		
puhne		
blicket		
ente		
boskot		
slider		
		
		
		
		
		
		
		
		

Novel words, pragmatic cues, novel objects and familiar objects used for Pragmatic Cue Task, Experiment 2

Novel words	Pragmatic Cues	Familiar objects	Novel Objects
cheedor	hungry		
hinkel	sleepy		
jintoff	thirsty		
momtick	cold		

Appendix C

Novel words, novel objects and familiar objects used for Dual Naming Task, Experiment 3

Novel words	Novel objects	Familiar objects
kern		
blicket		
boskot		
pafe		
tever		
eder		
pabe		
coodle		

Novel words, novel objects and familiar objects for Dual Naming Task – Familiar Target, Experiment 3

Novel words	Novel objects	Familiar objects
lozee		
jintoff		
cheedor		
ente		
		
		
		
		
		
		
		
		

Novel words, novel objects and familiar objects used for Dual Naming Task – Bridging information, Experiment 3

Novel words	Novel objects	Familiar objects
Montick		
hinkel		
kuble		
Delsy		
		
		
		
		
		
		
		
		

Appendix D

False Belief Task I

False Belief Task II

Puppets and House

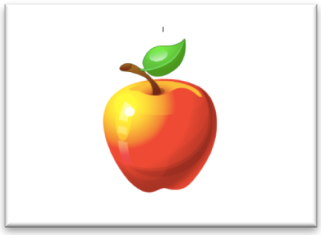
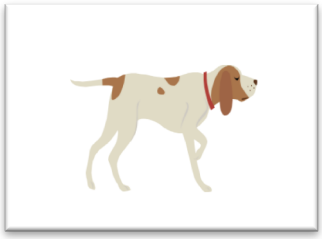
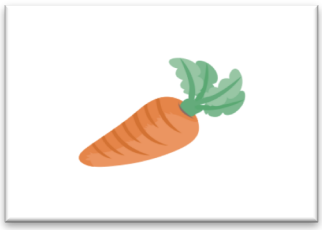
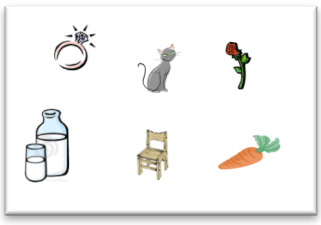
Appendix E

Novel words, novel objects and familiar objects used for Dual Naming Task, Experiment 4

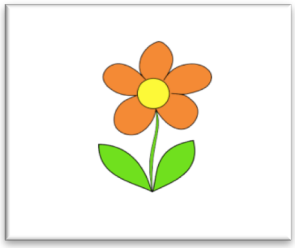
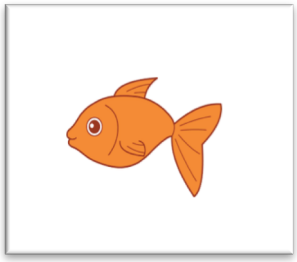
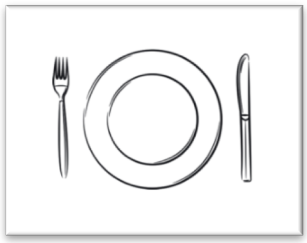
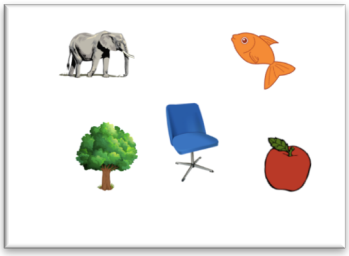
Novel words	Novel objects	Familiar objects
bubit		
welne		
tachte		
puhne		
blicket		
ente		
boskot		
cheedor		
		
		
		
		
		
		
		

Appendix F

Pictures used for the Alternative Naming Task, Experiment 4 and 5

Vocabulary check cards	Test Phase cards
	
	
	
	
	

Pictures used for the Alternative Naming Task – Cross language version, Experiment 4

Vocabulary check cards	Test Phase cards
	
	
	
	
	
	

Appendix G

Novel words, novel pictures and familiar pictures used for Dual Naming Task, Experiment 5

Novel words	Novel pictures	Familiar pictures
kern		
blicket		
boskot		
pafe		
kita		
ente		
puhne		
coodle		

Novel words, pragmatic cues, novel pictures and familiar pictures used for Pragmatic Cue Task, Experiment 5

Novel words	Pragmatic Cues	Familiar pictures	Novel Pictures
flinder	hungry		
hinkel	sleepy		
jintoff	thirsty		
momtick	cold		

Novel words, novel pictures and familiar pictures used for Pragmatic Cue Task, Experiment 5

Novel words	Familiar pictures	Novel pictures
gake		
wiso		
colat		
pizer