KOÇ UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES & HUMANITIES

DEVELOPING VERBAL AND NONVERBAL REFERENTIAL COMMUNICATION SKILLS IN YOUNG CHILDREN'S NATURALISTIC AND EXPERIMENTAL INTERACTIONS WITH ADULTS

BY

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STATEMENT OF AUTHORSHIP

This dissertation contains no material which has been accepted for any award or any other degree or diploma in any university or other institution. It is affirmed by the candidate that, to the best of her knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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THESIS ABSTRACT

The current dissertation examines toddlers' and preschool children's competency at using and comprehending adults' verbal and nonverbal cues in referential interactions. We report data from one semi-naturalistic study longitudinally investigating children's speech about objects in their physical environment between ages 1;00 and 1;09; and two experimental studies examining 2- to-4 year-old children' comprehension of an adult's communicative intent in referentially ambiguous situations. The results indicated that the children are competent at using verbal cues (prior mention in discourse) in their referential speech as early as age 1;09; but this competency was detected only when we considered nonverbal action (deictic gestures) supplementing the children's speech. The results from the experimental studies also showed that the children solved referential uncertainty at multiple steps and adults' verbal and nonverbal cues differently contributed to this process at different steps. Children's individual cognitive profiles were associated with whether labels or gestures are prioritized in resolving referential uncertainty. This thesis showed that children learn to demonstrate early referential skills during interactive experience with competent adults, and use both verbal and nonverbal cues to develop referential competency across early preschool years.

Keywords: Language development, referential communication, disambiguation strategies, adult scaffolding, verbal and communicative nonverbal cues, child-level socio-cognitive factors, toddlers, preschoolers

TEZ ÖZETİ

Bu tez çalışması, bebeklik ve erken çocukluk dönemindeki çocukların, nesnelerle ilgili olarak yetişkinlerle kurdukları iletişimlerinde, sözlü ve sözsüz iletişimsel ipuçlarını anlama ve kullanma becerilerini incelemektedir. Kullanılan veriler iki farklı çalışmaya dayanmaktadır. İlk çalışmada, 12. ve 21. aylar arasında, çocukların fiziksel çevrelerinde bulunan nesnelere yönelik düzenli bakıcılarıyla olan gün içindeki iletişimleri ve kendiliğinden gelişen konuşmaları (dil bilgisel referans formları) boylamsal olarak incelenmiştir. İkinci çalışmada ise, 2 ile 4 yaşları arasındaki çocukların, iletişim kurdukları bir yetişkinin istediği nesneye yönelik sözlü ve sözsüz ipuçları çeliştiğinde nasıl davrandıkları iki farklı deney aracılığıyla incelenmiştir. İlk çalışmanın sonuçlarına göre; 21. ayda çocukların yetişkinlerle olan iletişimlerindeki sözlü ipuçlarını (önceki konuşmalarda bahis) doğru bir şekilde kullanmaya başladıkları görülmüştür. Fakat, çocukların bu yetisi ancak konuşmalarını destekleyen, kendilerine ait sözsüz iletişimsel ipuçları (jestler) göz önünde bulundurulduğunda ortaya çıkmıştır. İkinci çalışmanın sonuçlarına göre; çocuklar yetişkinlerle, çevrelerindeki nesnelere yönelik olarak, kurdukları iletişimlerinde karmaşık bir durum ortaya çıktığında bu durumu birden fazla aşamada çözmüştür. Yetişkinin kullandığı sözlü ve sözsüz iletişimsel ipuçlarının bu durumu çözme sürecindeki etkisi aşamadan aşamaya farklılık göstermiştir. Ayrıca, bu süreçte çocukların bireysel bilişsel özellikleri hangi ipucu tipine öncelik verdiklerini etkilemiştir.

Her iki çalışmaya dayanarak bu tez, çok erken bir yaştan itibaren, çocukların nesnelere yönelik olan iletişimdeki sözlü ve sözsüz ipuçlarını kullanmada oldukça yetkin bireyler olduklarını göstermektedir. Ayrıca, bu becerilerin kazanılmasında yetişkinlerle kurulan iletişimin önemli bir rol oynadığı görülmektedir.

Anahtar kelimeler: Dil gelişimi, nesneler hakkında iletişim, çözümleme stratejileri, yetişkin rehberliği/mentörlüğü, sözlü ve sözsüz iletişimsel ipuçları, sosyo-bilişsel etkenler, okul öncesi dönem

DEDICATION

To my mother and daughter

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TABLE OF CONTENTS

STATEMENT OF AUTHORSHIP.....iii

THESIS ABSTRACT iiv

TEZ ÖZETİ..... v

DEDICATION vii

ACKNOWLEDGEMENT viii

TABLE OF CONTENTS..... x

THESIS INTRODUCTION 1

CHAPTER 1: CHILDREN'S SENSITIVITY TO CAREGIVER CUES AND THE ROLE OF ADULT FEEDBACK IN THE DEVELOPMENT OF REFERENTIAL COMMUNICATION 6

CHAPTER 2: INTERACTIONS OF TURKISH-LEARNING CHILDREN'S WITH THEIR CAREGIVERS ABOUT NON-ABSENT REFERENTS: INTEGRATION OF NONVERBAL ACTION WITH PRIOR DISCOURSE 33

CHAPTER 3: WHEN SOCIO-PRAGMATIC AND LEXICAL CUES COMPETE: DOES PRESCHOOLERS' REFERENTIAL COMPREHENSION OCCUR AT MULTIPLE PHASES.....72

GENERAL CONCLUSION 111

REFERENCES 117

THESIS INTRODUCTION

Referential communication refers to the ability to interact with other people about external entities such as objects and people. Given Quine's problem of referential indeterminacy (1960), where individual referential expressions could refer in multiple ways, successful referential communication requires young learners to develop two important skills: 1) correctly reading a social partner's verbal and nonverbal referential cues in order to determine the target she/he aims to talk or interact about, and 2) showing appropriate verbal and nonverbal behaviors informing a communicative partner about self's interest or attention about a specific entity. Children's referential communication with social partners begins very early (between 6 and 8 months of age) prior to the development of emergence of verbal skills, usually demonstrated through the use of nonverbal cues including eye gaze and/or gestures (Stephens & Matthews, 2014). As the first signs of an understanding for referential communication, children between 6 and 12 months are capable of following adults' eye gazes towards target objects inside their visual field. Between 12 and 18 months, children are competent at understanding the meanings of adults' eye gazes and pointing gestures towards target objects outside of the children's visual field (Brooks & Meltzoff, 2002; Butler, Caron, & Brooks, 2000; Caron, Butler, & Brooks, 2002; Corkum & Moore, 1995; Liszkowski & Tomasello, 2011; Moll & Tomasello, 2004; Moore & Corkum, 1998) and also sharing their self interest in or attention to an external entity or event with social partners by effectively using pointing gestures (Bates, Camaioni, & Volterra, 1975; Carpenter, Nagell, & Tomasello, 1998; Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Liszkowski, Carpenter, & Tomasello, 2007; 2008). Around 18 months, soon after they get

some mastery in their linguistic comprehension and production skills, children also develop more competent communication skills resulted in a lot of joint attentional frames with adults (Bakeman & Adamson, 1984). A fundamental question is how children use these skills for referential communication. One efficient way to deal with referential indeterminacy and therefore to become successful communicative partners is to employ certain verbal and nonverbal referential strategies (Mastin, 2013; Vogt, 2012). Prior research showed that verbal knowledge such as previously acquired word-referent associations help children to deal with referential indeterminacy and to truly and quickly map a novel label to its target referent. As an example, children hearing a novel word for the first time in the presence of one familiar and one novel object tend to link this word to the unfamiliar rather than the familiar object, using previously built associations between the familiar word and the familiar object (Golinkoff, Hirsh-Pasek, Bailey, & Wenger, 1992; Hansen & Markman, 2009; Markman & Hutchinson, 1984; Markman & Wachtel, 1988; Markman, Wasow, & Hansen, 2003). Moreover, there is much research showing that, beginning from very early ages, children use the extralinguistic or social context including shared experiences or common ground with communicative partners, use of nonverbal or social cues (e.g. eye gaze and gestures), and characteristics of communicative partners (e.g. knowledge status) in reference identification (Baldwin, 1991; 1993; Tomasello, 2001; 2006). For example, infants' ability to successfully follow an adult's eye gaze towards an external object and the amount of time spent in joint attentional episodes with the caregivers predict subsequent success in both verbal and nonverbal communication (Brooks & Meltzoff, 2008; Carpenter et al., 1998; Namy, Acredolo, & Goodwyn, 2000; Tomasello & Farrar, 1986). These findings together put forward one important claim arguing that children's "pure

pragmatic" skills including mostly nonverbal devices of communication emerge at preverbal stages, well before the mastery of language use, and therefore play a key role in becoming effective conversational partners and also in effectively learning verbal referential expressions commonly used in their language (Stephens & Matthews, 2014). Although most researchers agree with this approach, they differ in the level of primacy of verbal and/or nonverbal cues in children's referential development (Grassmann, 2014). The present dissertation adopts a recent perspective arguing that successful referential communication depends on young learners' competency at integrating "linguistic code with non-linguistic action" (Küntay, Nakamura, & Ateş-Şen, 2014) and also suggesting that children's success in use of verbal and nonverbal devices of referential communication depends on both child-level social cognitive abilities and adult-driven interactive context (Ateş-Şen & Küntay, 2015). Therefore, we argue that the level of primacy of linguistic and non-linguistic communicative cues in the development of children's referential skills differ depending on the characteristics of the developing child and the interactive environment.

With such an understanding, the current dissertation presents three chapters examining the role of adults' verbal and nonverbal communicative cues in the development of children's referential skills at ages 1 to 4 years. In Chapter 1, we critically review research about how adult behavior, specifically use of various communicative cues and constructive feedback, affects the development of children's referential skills. Our critical review indicated that children have a relatively early competency in comprehending adults' nonverbal and verbal referential cues, and also using these cues in their self-initiated referential interactions. However, existing studies have not yet agreed about the details of the developmental and task-based timing of

this competency at using these cues, such as which type of cues have more primacy in affecting children's referential skills at different developmental times and under different circumstances. We examined these questions via one semi-naturalistic and one experimental study presented in Chapter 2 and 3, respectively. The semi-naturalistic study in Chapter 2 examined child-caregiver interactions about external entities in their physical environment. Our aim was to investigate how children integrate verbal (discourse status of referents) and nonverbal (deictic gestures and communicative functional acts) referential strategies in their use of referential forms about external entities at a very young age period (between ages of 1;0 and 1;9). Previous studies mostly focusing on children older than 2 years of age showed that there is a considerable amount of cases where children chose inadequate referential forms, such as non-lexical forms for new referents, and attributed this behavior to the children's limited skills in using verbal referential strategies or the caregiver input including ambiguous verbal referential strategies. However, a third possibility is that children might be sensitive to verbal referential strategies; but cannot yet show this sensitivity in their verbal productions. In order to truly examine this possibility, we longitudinally examine children's referential skills in a time period before they show a full mastery of linguistic skills. In Chapter 3, we present two experimental studies with children (and also one follow up study with adults). Our setup depicted a particular kind of communicative situation observed in our semi-naturalistic study investigating daily referential interactions between children and caregivers. More specifically, we examined how young children made use of verbal and nonverbal cues to solve referential uncertainty during an object play where an adult's verbal and nonverbal communicative cues are pitted against each other. As an example representing this situation, in a book-reading interaction, a grandmother

pointed to a kangaroo picture in a book while simultaneously labeling a camel on the same page as a response to a question by the child (Ateş & Küntay, under revision). Previous studies showed contradictory findings about whether children primarily use ostensive pointing or labeling in referentially ambiguous situations (e.g. Grassmann & Tomasello, 2010; Jaswal & Hansen, 2006). In these studies, the researchers examined only final object choices assuming that children solve referential uncertainty via one singular step. However, reference resolution might occur at multiple phases during which verbal (labelling) and nonverbal (pointing) cues might differently contribute. We also argue that, over developmental time, developing cognitive skills and accumulation of experience with competent communicative partners help children to develop an adult like use of verbal referential strategies. Therefore, the current dissertation suggests that we need to assess children's developing referential skills by examining the contribution of both verbal and nonverbal referential tools, in conjunction with children's socio-cognitive skills and the contributions of competent interactive partners.

CHAPTER 1

CHILDREN'S SENSITIVITY TO CAREGIVER CUES AND THE ROLE OF ADULT FEEDBACK IN THE DEVELOPMENT OF REFERENTIAL COMMUNICATION[1]

Footnotes

[1] Ateş-Şen, B. & Küntay, C. A. (2015). Children's sensitivity to caregiver cues and the role of adult feedback in the development of referential communication. In L. Serratrice & A. Shanley (Eds.), *The Acquisition of Reference (TİLAR Series)* (pp. 241-262). Amsterdam: John Benjamins.

ABSTRACT

Many studies examined when children are (in)competent in making appropriate referential choices based on their listeners' requirements. Traditionally, child-level social-cognitive abilities were invoked in explaining the increasing sophistication of referential skills with age. However, recent research has generated interest in the contributions of interactive partners and motivations to the developmental process. This chapter presents and critically evaluates research emphasizing the influence of adult behavior and feedback on the development of children's referential skills. The first section reviews studies examining how children's skills improve by developing sensitivity to adults' verbal and nonverbal communicative cues. The second section reviews training studies that investigate how adult feedback affects children's improvement in referential communication. The third section provides some concluding remarks and future directions.

Keywords: Training studies, adult feedback, nonverbal referential behavior, social-cognitive abilities, epistemic cues, attentional cues, vocal cues, contextual cues, incentives, syntactic-pragmatic priming, conversational interaction, crosslinguistic research, crosscultural research

INTRODUCTION

The communicative effectiveness of children's ways of referring to things and people can only be judged in relation to a certain conversational context. The interlocutors' previous interaction with the child and their contributing turns to the unfolding interaction are important components of that conversational context. The relationship between the child and the interlocutor determines the shared knowledge and practices, making certain referential communicative devices more apt than others. While talking to his mother about a neighbor a four-year-old child can use a proper name to say "*Leyla invited me to her birthday party"*, although using the same name would be inappropriate while mentioning the same person for the first time to his preschool teacher. In the latter situation, a clarification question such as "*Who is Leyla?"* might enable the child to provide a more elaborate referential form such as in "*She lives one floor above us".* Thus, signs of non-comprehension and feedback of adult interlocutors allow children to use more informative choices as the conversation develops. This chapter will review and evaluate research that examines how feedback/training and general interaction with adults have an impact on children's development of referential communication.

Child-level social-cognitive abilities (e.g. visual perspective taking, metalinguistic monitoring, and memory) (see De Cat, 2014) and motives are frequently invoked to explain the developing sophistication of referential communication skills. Crosslinguistic and crosscultural

research in pragmatic development examines whether and under what conditions young children are (in)competent in making appropriate referential choices in accordance with the information needs of their listener in different languages and cultures (Küntay, Nakamura, & Ateş-Şen, 2014). However, recent research has generated interest in the contributions of interactive partners and interactive motivations in the developmental process. Of interest here are how referential communication ability evolves as a function of children's increasing tendency to accommodate to various audience cues and demands, and how this development is scaffolded by caregivers' responses. To pursue this research goal, most studies use ingenious experimental designs. However, as Bishops and Adam (1991) observed, experimental setups do not include the types of actual pragmatic difficulties and facilitations that children encounter in their daily conversations. Therefore, the present chapter presents and critically evaluates both experimental and naturalistic research focusing on how caregivers use verbal and nonverbal devices to complement toddlers' nascent referential attempts in conversational exchanges. The first section reviews studies examining how children improve their referential skills by showing sensitivity to verbal and nonverbal communicative cues in their interactions with adults. The studies in this first section focus on epistemic cues such as conceptual availability and addressee's knowledge state, social or attentional cues such as eye gaze, gestures and facial expressions, vocal cues such as speech disfluencies and vocal affect, and contextual cues such as physical status of referents and discourse context. The second section reviews training studies that investigate how adult feedback plays a role on children's improvement in referential communication. The third section provides concluding remarks and future directions.

1. Referential Adjustment to Communicative Partners: Verbal and nonverbal devices

Caregivers scaffold children's language learning by modifying their child-directed speech (i.e., motherese), actions (motionese) (Zukow-Goldring, 1996), and gestures (gesturese) (Grimminger, Rohlfing, & Stenneken, 2010; Iverson, Capirci, Longobardi, & Caselli, 1999) in accordance with their children's communicative requirements. During referential communication, caregivers use verbal (e.g. referential speech) and often implicit nonverbal signals or cues (e.g. attentional status, eye gaze, referential gestures, speech disfluencies, vocal affect) that direct their children's attention to a new referent or topic. The use of certain devices via child-directed speech, actions and gestures is thought to vary in relation to the developmental stage (i.e. Piaget's sensorimotor intelligence stages, Colas, 1999), developing language skills, and changing conceptual levels of children (Grimminger et al., 2010; Iverson et al., 1999; Namy & Nolan, 2004). For example, Namy and Nolan (2004) observed parent-child interactions in free-play sessions at 1;0, 1;6, and 2;0 years old. Analyses of group and individual patterns yielded different results. For the group data, the frequency of parents' verbal labeling did not change across the three time points; however, the frequency of gestures decreased towards their lowest level when the children reached 2 years of age. However, analyses of individual patterns indicated that parents' use of verbal labeling and gestures did not follow the group trends, but rather parents used verbal and nonverbal tools differently from each other in accordance with their children's distinct communicative needs. Moreover, parental uses of verbal labels and gestures were not related to each other except at the second time point when children usually experienced a vocabulary spurt. The authors interpreted these results as suggesting that parents have distinct communication styles based on their children's needs and

parents' use of verbal and nonverbal tools are usually independent. However, when necessary, parents coordinate the verbal and the nonverbal communication channels to use gestures to facilitate children's vocabulary development.

In a related study, Estigarribia and Clark (2007) asked caregivers to successively introduce six unfamiliar objects to their children between the ages of 1;4 and 3;2. Verbal attention getters were used more frequently for objects presented earlier than objects introduced later as children got familiar with the procedure. For the younger children (around 1;6 years) caregivers used more verbal attention getters, deictics (e.g. *here, look, this*), and interjections (e.g. *hey, wow*) whereas fewer attention getters and anticipatory comments (e.g. *ready for the next one?*) were employed for the older children (around 3 years).

Caregivers also use nonverbal tools, especially pointing gestures related to the target referent to reinforce and disambiguate their spoken message (O'Neill, Bard, Linell, & Fluck, 2005). Grimminger et al. (2010) found that mothers of late talkers used more pointing gestures and were more likely to retain their gestures throughout the whole utterance than mothers of children with typical lexical development.

Through communicative exchanges with adult interactants, children increasingly gain mastery of various communicative devices and, using these tools, they can modify their verbal and nonverbal behaviors depending on the requirements of their communicative partner and the conversational context. The following sub-sections focus on research about how children benefit from 1) epistemic cues (i.e. conceptual availability and interactants' knowledge state), 2) social or attentional cues (i.e. affective expressions, eye gaze, and gestures), 3) vocal cues (i.e.

speech disfluencies and vocal affect), and 4) contextual cues (i.e. physical status of referents and discourse context) in their referential choices.

1.1. Epistemic cues: Conceptual availability and interactants' knowledge state

Some studies have examined whether children's referential communication behaviors are adjusted to interactants' knowledge state or attentional status. For instance, Liszkowski, Carpenter, and Tomasello (2007, 2008) showed that infants adjusted the frequency of their pointing gestures depending on the knowledge state of their communicative partner. 12-month-olds exhibited more pointing gestures for "ignorant" adults (i.e. not yet attending to the target event) than "knowledgeable" adults (i.e. already attending to the target event) to inform them about an interesting event. 12-month-olds' pointing gestures to an interesting event also changed depending on the reactions of their communicative partner. They used more pointing gestures across trials and extended the duration of their pointing gestures when the communicative partner showed attention (i.e. gaze alternation between the event and the child) and interest (i.e. excitement) about the event. On the other hand, they exhibited more repeated (insistent) points within the trial when the interactant only looked at the target event without sharing any excitement with the child or when she looked at the child and emoted to her without showing attention (i.e. no looks) or interest for the event (Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004).

There is also a vast amount of research showing that children show sensitivity to various epistemic cues of adult speakers when learning new words. Some of these word-mapping studies are relevant from the point of view of referential communication, especially when they

consider how shared experiences with (or previous knowledge about) communicative partners contribute to direct children's attention to a specific referent and help them to achieve referential clarity even in ambiguous situations. For example, Krogh-Jespersen and Echols (2012) examined how the credibility of information provided by a speaker affects children's word mappings between the ages of 24 and 25 months. Children listened to a speaker's labeling of an object in one of five "speaker type" conditions. In *the accurate condition*, the experimenter correctly labeled a familiar object ("That's a car") whereas in *the inaccurate condition*, she gave an incorrect label for a familiar object (the experimenter held a cup and said "That's an apple"). In *the knowledgeable condition*, the experimenter used phrases implying that she knew the object ("I know what that is") whereas in *the ignorant condition* she used phrases that implied her lack of knowledge ("I don't know what that is"). In *the uninformative condition*, the experimenter used neutral sentences that did not provide any information about her information status ("Look at that", "See that"). Children in each condition participated in one of two novel label learning trials where the object label was manipulated as a function of object familiarity. In the first label condition, they heard a novel label for an unfamiliar object (e.g. "That's a Danu" for a wooden bell-shaped toy) while in the second label condition they heard a novel label for a familiar object (e.g. "That's a Danu" for a toy dog). After the learning trials, children's novel word learning was tested. Children were more likely to map novel words to familiar objects as a second label when they decided that the informant was reliable (i.e. accurate and knowledgeable) rather than unreliable (i.e. inaccurate and ignorant).

Chow, Poulin-Dubois, and Lewis (2008) examined whether infants' prior knowledge about the credibility of interactants affected their referential decisions. 14-month-olds saw an

adult who looked visibly happy while looking inside a container with an interesting toy (i.e. reliable looker condition) or an empty container (i.e. unreliable looker condition). Following this experience, the infants watched the same adult while looking at a target referent placed either in front of or behind a barrier. The infants in the reliable looker condition followed the adult's gaze to a referent behind the barrier more frequently than the infants in the unreliable looker condition. Nilsen, Graham, and Pettigrew (2009) examined how the manner of initiation of a referential interaction and the specificity of information about a referent provided by a speaker affected children's word mappings. An adult presented various pairs of unfamiliar objects together with a specific statement of intent that introduced a novel word (e.g. "Let's find a *fep*"), or by a general statement of intent which that did not include a novel word (e.g. "Are you ready to look at something?"). Following the presentation of the objects, the adult interacted with the target object in the pair while giving either specific information that distinguished the target object from the alternative (e.g. "See this one, you can squeeze this one") or general information about it (e.g. "See this one, it is on the table"). After the presentation of the information, children were asked to choose the referent object corresponding to the novel word (e.g. "Show me a *fep*"). The results indicated that how the interaction was initiated affected children's novel word mappings. Children tended to map a novel word to a target referent when the speaker introduced the novel word first and then gave specific information that disambiguated the object from the alternative(s).

In short, both infants and older word learners use indicators of their interlocutors' epistemic and attention states in relation to a referent, adjusting their referential gesture and form, and word-mapping strategies accordingly.

1.2. Social and attentional tools: Affective expressions, eye gaze, and gestures

Adults display, implicitly or explicitly, various social or attentional cues that help children to figure out their referential intent. For instance, infants between their first and second birthday can use a speaker's gaze direction as a cue to map a novel word to its referent even when the location of the referent is out of view or reach (e.g. the object is placed in an opaque bucket) (Baldwin, 1991; 1993; Carpenter, Nagell, & Tomasello, 1998; Moore, Angelopoulos, & Bennett, 1999). Furthermore, children show sensitivity to an adult's pointing gesture by shifting their attention in the direction of pointing. Dynamic or moving pointing gestures, rather than static ones, are especially helpful to shift children's attention to the target referent (Rohlfing, Longo, & Bertenthal, 2012). Rader and Zukow-Goldring (2012) also examined how the different nature of "show" gesture (dynamic vs. static) and the synchronization of speech and "show" gesture affect children's attention to an unfamiliar referent and learning a novel word (e.g. "gepi", "tano") associated with the referent. Rader and Zukow-Goldring (2012) presented novel object-word pairs in one of three conditions: "synchronous dynamic" (i.e. each syllable of the word is synchronized with each part of the looming gesture), "static" (i.e. no movement of the object), and "asynchronous dynamic" (i.e. the loom gesture is presented when the novel word is introduced). The results indicated that infants looked at the object more during the presentation of the novel word and were more likely to learn the novel word which corresponded to the novel object in the presence of "dynamic" and "synchronous" as compared to "static" or "asynchronous" show gestures.

Although we know that gestures, especially deictics, help communicators to disambiguate a referent, it is an active research area how caregivers' gestures and other

nonverbal cues are primordial for the development of children's referential communication. As an example to experimental work, Grassman and Tomasello (2010) examined the extent of 2- and 4-year-olds' reliance on two different sources of information (i.e. verbal and nonverbal) that were at odds with each other in a referential setting including pairs of familiar and unfamiliar objects. They found that when the experimenter pointed to an unfamiliar object while naming it with a familiar word (e.g. *car*) that conventionally labels the other object in the pair (e.g. a car), in more than 70% of the trials the object selection of children followed the pointing rather than the labeling. The authors argued that pointing is a more fundamental act of reference than conventional lexical reference, and is used as a cue by young children to extend the referential scope of a known word. Using a naturalistic and longitudinal approach, Zukow-Goldring (1996) examined the role of perceptual tools on educating infants' attention and resolving referential ambiguity. She investigated how mothers used verbal information (i.e., increases or decreases in linguistic specificity) and accompanying nonverbal cues (i.e., gestures such as show, demonstration, point, etc.) to direct infants' attention to new referents or events in the presence of multiple alternative choices. She also looked at how mothers resolved referential ambiguity by (re)adjusting their speech and gestures when the infants did not understand the communicative message. The results indicated that caregivers sensitively modified their gestures and became linguistically more specific (such as using a nominal form subsequent to a pronominal form) following a communicative breakdown. However, during the preverbal and the one-word periods, caregivers provided their infants with additional perceptual cues in response to communicative breakdowns. Increases in perceptual cues (but not increases or decreases in linguistic specificity) improved children's achievement of consensus with their

caregivers (i.e. caregivers' judgment of infants' response to a communicative message as adequate). The authors argued that nonverbal (gestures) rather than verbal (words) cues contribute to the establishment of common ground with infants. Both Grassmann and Tomasello (2010) and Zukow-Goldring (1996) showed that young children rely on nonverbal signals to determine referents and to repair communicative breakdowns.

Children also attend to affective cues in their referential interactions. For example, Leekam, Solomon, and Teoh (2009) investigated the effect of adults' facial expressions on children's ability to evaluate various symbols (i.e. an arrow, a pointing sign, and a replica) to find a hidden object. Children were asked to find a hidden object under one of three containers while an adult was producing a symbol that located the referent object in one of the conditions of "engaging face" (i.e. the adult's face with an engaging, smiling expression is visible), "no face" (i.e. the adult's face was hidden), "no face and no hands" (i.e. the adult's face and hands were hidden), and "neutral face" (i.e. the adults' face was visible with a neutral expression). An engaging face increased children's tendency to successfully find a hidden object following an arrow, a pointing sign, and a replica. Moreover, the effect of an engaging expression was more pronounced than the effects of the presence of a neutral adult face with eye contact or the presence of an adult's hands.

1.3. Vocal Cues: Speech disfluencies and vocal affect

Some studies investigated how speech disfluencies, vocal affect cues, and speech rate (Banse & Scherer, 1996) contribute to young children's developing referential skills. For instance, Kidd, White, and Aslin (2011) showed that young children (over the age of 2) benefit

from disfluencies in discourse (e.g. filled pauses “uh” and “thee”) to predict a speaker’s intended referent. Speech disfluencies mostly occur before a novel word or a referent that is not previously mentioned in discourse and help children to make predictions about the likely referent of an upcoming word (Kidd et al., 2011).

Berman and colleagues (Berman, Chambers, & Graham, 2010; Berman, Graham, & Chambers, 2013) also found that young children responded to a speaker’s vocal affect in the identification of a target referent when there was referential ambiguity. For instance, as a response to a speaker’s referentially ambiguous instruction (e.g. “Look at the doll”), 4- and 5-year-olds (but not 3-year-olds) showed implicit referential behavior by looking at the broken doll when the speaker used a negative (sad) sounding voice and by looking at the intact alternative (e.g. the intact doll) when the speaker used a positive (happy) sounding voice. However, only 5-year-olds also exhibited explicit referential behaviors by pointing to the target referent as a response to vocal affect cues (Berman, Graham, & Chambers, 2013). With age, children develop additional competence in using vocal affect cues in their referential decisions.

1.4. Contextual cues: Physical status of referents and discourse context

There are a few studies focusing on the effect of contextual cues on children’s and caregivers’ choices of specific referential forms (Ateş-Şen, 2010; Ateş-Şen, Demir, & Küntay, 2011; Clancy, 1993; Guerriero, Oshima-Takane, & Kuriyama, 2006; Huang, 2012; Hughes & Allen, 2013; 2014; Narasimhan, Budwig, & Murty, 2005; Paradis & Navarro, 2003; Rozendaal & Baker, 2008; 2010; So & Lim, 2012). Caregivers mostly use lexical forms rather than omitted forms (e.g. null or pronominal forms) for new referents (i.e. previously not mentioned in the

discourse) (Guerriero et al., 2006; Huang, 2012; Hughes & Allen, 2013; 2014; Paradis & Navarro, 2003; Rozendaal & Baker, 2008; 2010) and absent referents (i.e. physically not available to the addressee) (Huang, 2012; Hughes & Allen, 2013; 2014; Paradis & Navarro, 2003). They are also more likely to use lexical forms (as compared to zero forms) for referents in contrastive contexts (Huang, 2012; Paradis & Navarro, 2003) or in interrogative contexts (i.e. places within a question or in response to a question) (Huang, 2012; Paradis & Navarro, 2003). However, they are less likely to use overt forms in the presence of joint attention (Ateş-Şen et al., 2011; Hughes & Allen, 2013; 2014). Moreover, caregivers also use more gestures when talking about new referents whereas they produce fewer gestures while talking about given (i.e. previously mentioned) referents (So & Lim, 2012). Importantly, Guerriero and colleagues (2006) found that children's verbal and nonverbal referential choices resembled their caregivers' referential choices. For example, Japanese-speaking children whose parents used either non-lexical or lexical forms for "new" referents and English-speaking children, whose parents basically used lexical forms for "new" referents displayed the same patterns with their parents. These results might suggest two different explanations: 1) The mastery of discourse-pragmatic devices is earlier for children who are exposed to input that consistently includes appropriate use of these devices, and 2) As suggested by Guerriero and colleagues (2006), Japanese children learnt from their mothers a specific communication style that is typical of Japanese speakers. That is, interactions between Japanese adults showed that when the speaker and the listener are familiar to each other (with previous shared experiences/knowledge), the speaker is not expected to explicitly express the intended communicative message. The onus is on the listener to predict the intended message from the contextual information (Clancy, 1986). Therefore,

based on Guerriero et al.'s (2006) argument, we suggest that interactions with adults also play an important role in children's learning of specific communicative cases; for example, using different referential forms to map onto the same discourse function is acceptable. As So and Lim (2012) suggested, this finding supports the claim that regularity and consistency in the mapping between referential expressions and discourse-pragmatic functions are conducive to children's uptake of the relevant strategies.

In our own work, we investigated whether topically continuous discourse dubbed as "referential sets" serve as a model for toddlers with regard to referential communication skills (Ateş-Şen, 2010). Referential sets refer to a sequence of utterances which track a referent across at least three successive utterances in child-directed speech. Turkish allows dropping nouns referring to the same referent across utterances. Ateş-Şen et al. (2011) found a tendency to keep using overt nouns for previously mentioned referents in discourse among 12- to 22-month old children and their caregivers. Caregivers tended to repeat lexically explicit nouns in extended discourse about the same topic and young children tended to repeat the nouns used by their caregivers.

A similar study (Frank, Tenenbaum, & Fernald, 2012) observing the interactions of 6- to 20-month-old children with their mothers during object-centered play also showed that "reference continuity" or "discourse continuity" (i.e. whether the speaker talks about the same referent as in the previous utterance or utterances) can help children to identify a referent. They calculated the probabilistically combined effects of contextual cues (i.e. the presence of toys in the view of the learner), social cues (i.e. mothers' looks, touches, and points to the referent), attentional cues (i.e. children's looks, touches, and points to the referent) and

discourse-related cues or “discourse continuity” (i.e. the repetition of a referent at least three times throughout the discourse) on children’s skills to determine referents. The results indicated that children would make a better (but not perfect) prediction of a speaker’s intended referent in the presence of the aggregated effect of social cues (i.e. mothers’ looks, touches, and points) and of discourse continuity as opposed to when their individual effects were considered.

Although many studies show the sophisticated nature of children’s developing referential strategies in infancy and preschool ages, there are some studies indicating that even for elementary school-age children performance in referential tasks does not reach adult levels (Bahtiyar & Küntay, 2009; Serratrice, 2008). In fact, children’s referential abilities are not target-like up to the adolescence years (Dickson, 1982). As their language skills increase throughout middle childhood, children face the challenge of engaging in a higher number of communicative contexts with different types of partners, and experience linguistically and socially more complex situations that require more advanced levels of referential understanding. For example, across elementary school (with the tasks of reading, writing, and presentations) the nature of necessary referential skills changes. Children’s adaptation of their existing referential skills to the requirements of such novel and challenging situations takes time. Communicative partners might affect and facilitate such adaptations. An important question is how children’s referential speech and behavior change depending on distinct contexts (e.g. dyadic vs. multi-party; formal vs. informal, familiar vs. unfamiliar) with different communicative partners (e.g. siblings, strangers, teachers, peers, etc.). This question has unfortunately not been addressed adequately especially with children older than preschool ages. “Training studies” examining how children benefit from training by adults in developing referential communication skills also

mostly focus on the preschool period. Similar experimental studies should be implemented with school- and older-age children.

In the next section, we will cover a number of training studies that help us to examine how adults provide feedback to young children's referential communication skills and how children benefit from feedback-based interactions.

2. Mentoring Children's Referential Skills: Training Studies

Golinkoff (1986) observed communications of mother-infant dyads during lunch-time and found three types of communicative episodes: negotiations (i.e. mothers did not understand infants' communicative messages immediately and assisted them to correct or clarify these messages), immediate successes (i.e. mothers correctly comprehended infants' communicative messages), and missed attempts (i.e. mothers missed infants' communicative signals). Negotiation episodes were composed of four parts, namely "infant's initial signal", "the mother's comprehension failure", "infant's repair", and "episode outcome". Golinkoff (1986) suggested that observing changes in these components helps us to understand how preverbal infants' communicative skills develop. The present part of this chapter focuses on "children's repairs" and on how adults play a role by giving feedback to children in order to make them notice and repair their communicative failures.

There are contradictory results of earlier training studies that focused on children's ability to adjust their communicative behaviors in response to listener feedback. Experimental studies indicated that preschool children have limited skills to repair their communicative failures based on listener feedback (Glucksberg & Krauss, 1967; Peterson, Danner, & Flavell,

1972). On the other hand, research examining spontaneous interactions between adults and children found that children at pre-school ages are capable of understanding that their messages are ambiguous (Robinson & Robinson, 1981) and are able to reconstruct these messages in view of an adult's response (Gallagher, 1977). However, there are a few studies examining the effect of adult feedback on communicative reconstructions of younger children (Matthews, Butcher, Lieven, & Tomasello, 2012; Matthews, Lieven, & Tomasello, 2007; O'Neill & Topolovec, 2001) and some of these studies demonstrated that toddlers do not sufficiently benefit from feedback to resolve referential ambiguity (O'Neill & Topolovec, 2001). For instance, O'Neill and Topolovec (2001) examined referential repairs of toddlers at the age of 2;8 years in response to clarification questions. A sticker was hidden under one of two boxes while the mother's eyes were closed and children were asked to help their mother to find the sticker. The boxes had different pictures on them (e.g. a boat and a train) and were placed either adjacently or away from one another. In the condition where the boxes were close to each other, labeling the picture on it rather than pointing would help mothers to find the hidden sticker. In the condition where the boxes were located far away from each other, either labeling the picture or pointing worked for directing the mother's attention to the sticker. Following the testing trials, children were also provided with two feedback trials and one subsequent testing trial if they failed to use labels to identify the target box in their initial response. In the feedback trials, the children were provided with a general prompt ("*which one?")* and if necessary with a more specific second prompt ("*the boat?" or "the train?").* 8 out of 16 children (50%) never named the label on the box in the first testing trial. 5 of them (62.5%) used the label after they had been provided with the general prompt while 3 of them (37.5%) of them required the

specific prompt to use a label. However, in the second feedback trial, only one child (12.5%) spontaneously produced a label, transferring knowledge gained through feedback to a new trial. Countering the generalization that toddlers do not benefit from feedback to reconstruct or repair their communicative messages and resolve referential ambiguity, Matthews et al. (2007) suggested that children's failure in O'Neill and Topolovec's (2001) study resulted from insufficient numbers of feedback and testing trials. Comparing children's performance in studies with systematically different numbers and duration of training and testing trials can help us to understand whether children require a certain training regimen to acquire or improve their referential communication skills. Although children's initial communicative attempts are usually not sufficiently informative and often include a communicative failure, some early training studies demonstrated that children can repair their communicative failures by 1) directing their attention to the contrastive features of objects in referential settings (e.g. Asher & Wigfield, 1981; Lefebvre-Pinard & Reid, 1980), 2) observing adult models who are competent in referential communication (Whitehurst, 1976; Whitehurst, Sonnenschein, & Ianfolla, 1981), or 3) experiencing (rather than observing) communicative breakdowns of their own (Deutsch & Pechmann, 1982; Robinson & Robinson, 1985; Sonnenschein & Whitehurst, 1984), and getting explicit feedback about the reason(s) for the inadequacy of their communicative message (Sonnenschein, 1984; Whitehurst, 1976; Whitehurst et al., 1981). A recent study (Matthews et al., 2007) found that the best way to boost children's referential performance was by enabling them to experience communicative breakdown and repair. In fact, even very young children (i.e. 2-year-olds) improved their referential strategies after participating in three 10-minute training sessions that included feedback about their own communicative attempts. Interestingly, the

second best way to facilitate children's referential strategies was by observing modeled communicative breakdowns and repairs between two adults (Matthews et al., 2007). Although we could not find any study that systematically focuses on the effect of referential communication among third parties on children's own referential skills, there is a growing literature demonstrating that children exposed to multi-speaker contexts are able to acquire novel words through overhearing interactions between two communicative partners (Akhtar, 2005; Akhtar, Jipson, & Callanan, 2001; Floor & Akhtar, 2006; Schneidman, Buresh, Shimpi, Knight-Schwarz, & Woodward, 2009). These studies consider the possibility that various communicative contexts bring in different types of challenges and facilitations for the development of children's referential skills. To explore this, Carminol and Vinden (2013) tested three- and four-year olds' judgments about a listener's knowledge of the content of a box. In the pretest trials, an experimenter played a hiding game with the child and two dolls (e.g. Ernie and Bert). She hid an object into a box while the child and the speaker doll (e.g. Bert) were able to see the object, but the listener doll (e.g. Ernie) was not able to see it. After the experimenter hid the toy, children watched a scene where the speaker doll provided the listener doll with either informative (e.g. "Hey Ernie, the plate is in the box") or ambiguous (e.g. "Hey Ernie, it's in the box") verbal messages related to the content of the box. Following the scene, they were asked to predict whether the listener doll (e.g. Ernie) knew the content of the box and also to explain the reasons for their predictions. Between the pre- and post-test trials, the children were exposed to one of the training conditions. In the "general feedback" condition, they were informed about the listener's knowledge state (i.e. whether the listener knew the content of the box or not). In the specific feedback condition, in addition to the listener's knowledge state,

they were also informed about the clarity of the verbal message provided to the listener (i.e. why the listener knew or did not know the content of the box). In the "no feedback" condition, they were not provided with any information related to the listener's knowledge state or the clarity of the verbal messages. Only the specific feedback condition helped children to evaluate the ambiguity of the verbal messages and link this information to the listener's performance in the hiding game. At the end of the experimental trial, there was a transfer task (i.e. a modified version of *the droodles transfer task* developed by Ruffman, Olson, & Astington, 1991). In the task, the children saw restricted views of two object pictures (e.g. a shark and a witch) that had a similar component (e.g. a *triangle* fin, a *triangle* hat). In the informative trials, big windows were used, which enabled children to see the target object from a larger perspective and easily identify whether it was a shark or a witch. In the ambiguous trials, small windows were used, which made the identification of the target referent difficult since children could only see the component common to the two alternative referents (e.g. a triangle). The results indicated that children in both the general and the specific feedback conditions improved their initial evaluation of the quality of verbal communicative messages. However, children in all groups performed poorly in the transfer task which required to judge visual cues in order to identify the target referent. Merely giving feedback helps children to improve their existing referential skills in a specific task, but it does not help them to transfer these skills to a new task even if the overall structure of the two tasks is highly similar. However, as suggested by Carminol & Vinden (2013), the distinct nature of the two tasks (judging verbal quality vs. nonverbal or visual clarity of the messages) can be an alternative explanation for children's failure to transfer their improved skills from the main task to the second task.

Differences in the nature of referential cues or messages can also be observed in children's daily life, when they are in different communicative contexts or with various communicative partners. Moreover, different communicative contexts and partners perhaps provide children with distinct kinds of communicative advantages and disadvantages. For example, Oshima-Takane, Goodz, and Derevensky (1996) investigated first- and second-born English-speaking toddlers' acquisition of personal pronouns (i.e. "me" and "you") at 21 and 24 months of age. Children's spontaneous interactions with their caregiver, their sibling, and the experimenter were examined in a lab environment. A pointing task (i.e. pointing at a body part of the experimenter, the caregiver, or the child and asking the owner of that body part) and a picture task (i.e. showing photos of the experimenter, the caregiver, or the child and asking who the person was in the picture) were also administered. The results showed that second-born-children were better than first-born-children at pronoun production at both ages. The authors attributed this result to the finding that, in triadic interactions, second-borns heard more pronouns in overheard-speech conditions (i.e. the child overheard the conversation between the caregiver and the sibling) than in addressed situations (i.e. the caregiver directly talked to the child).

In addition to sibling interactions, children's interactions with peers are another important source to examine how children's referential interactions change depending on various communicative partners and conditions. Frequently interacting with peers rather than with adults might provide children with more opportunities to experience and repair communicative breakdowns, which is one of the most efficient contexts to improve referential strategies as demonstrated by recent research of Matthews et al. (2007). Alternatively, such

peer interactions might offer fewer opportunities to observe advanced models of referential communication and benefit from adequate feedback, which is another important context for development of children's referential skills (Whitehurst, 1976; Whitehurst et al., 1981). Further research is needed to study the contribution of various types of communicative interactions with distinct features on the development of referential communication.

There are also studies that show that children's strategies to repair their breakdowns change depending on the type of feedback provided (Anselmi, Tomasello, & Acunzo, 1986; Coon, Lipscomb, & Copple, 1982; Fagan, 2008; Nilsen & Mangal, 2012; Wilcox & Webster, 1980). For example, specific feedback elicits more informative repair statements (Coon et al., 1982; Matthews et al., 2012) while vague feedback (e.g. "*huh?" or "what?")* elicits more repetitions of the initial request (Anselmi et al., 1986; Nilsen & Mangal, 2012; Wilcox & Webster, 1980). Similar to specific feedback, goal substitution (i.e selecting an incorrect but plausible referent among the alternatives) leads to repairs with new information (Nilsen & Mangal, 2012).

Some recent research (Bahtiyar & Küntay, 2009; Nilsen, 2014) has also indicated that the motivational context plays an important role in young children's learning of appropriate referential behavior. Bahtiyar & Küntay (2009, Study 2) examined how children's referential requests changed when only the target (e.g. a small scissors) was available to both the listener and the speaker and a competitor referent (e.g. big scissors) was exclusively accessible to the speaker (i.e. privileged ground condition), or when both the target and the competitor were in the common view of both the speaker and the listener (i.e. the common ground condition). 5-year-old children were instructed to request the target object from a confederate using either general (i.e. "Tell the listener to pick this up") or polite request forms (i.e. "Ask politely for the

object") of language. Children who were prompted to use polite forms produced more request constructions and discriminating adjectives to identify a referent when there was referential ambiguity (as in the common ground condition). Nilsen (2014) investigated the effect of incentives on children's referential clarity. Preschool (3- and 4-year-olds) and school-age (6- and 7-year olds) children were asked to describe a target referent (i.e. a sticker on a book) to an imaginary listener in another room under either "the incentive" or "the no-incentive" condition. In the incentive condition, children were promised that they would get the sticker they described at the end of the session if their description was correct and it allowed their listener to find it. In the no-incentive condition, children were not given extra information and only asked to describe the sticker to the listener. The results showed that promising an incentive increased school-age children's (but not preschoolers') informative descriptions. However, incentive goals did not reduce children's redundant use of descriptions and pointing gestures that could not be seen by the listener. The author concluded that incentives provided by others trigger behaviors that enable children to reach their goals, but do not help them to notice or upgrade their inefficient communication strategies. This study shows that children can be motivated with incentives to improve the clarity of their referential descriptions in formulating descriptions for others, but it does not consider how caregiver feedback might interact with incentives. It could be that preschoolers would benefit from incentives as well as the school-age children if they were provided with some feedback about their ineffective referential strategies.

Syntactic-pragmatic priming by adults also plays an important role in young children's learning of referential clarity (Sarılar, Matthews, & Küntay, 2015). Children participated in a matching-sticker selection task, where they were asked to choose the target sticker (among an

array of stickers) from a board on the wall in order to complete the missing parts in their own book in comparison with the pictures in the complete adult's version of the book. After a pretest, the children were exposed to another selection task where they were exposed to different kinds of feedback related to their selection. In one of three experimental conditions, the children either heard a relative clause that uniquely identifies the referent, or a demonstrative-noun phrase (i.e. "that sticker"), or just a positive approval statement related (i.e., "you did a nice selection"). The use of uniquely identifying referential forms increased mostly when the children were exposed to relative clauses. Moreover, children's use of naturalistically infrequent relative clause constructions in Turkish (Slobin, 1986) increased when the feedback included a relative clause.

In summary, young children have difficulty performing appropriately in various types of referential communication tasks (Golinkoff, 1986; O'Neill & Topolovec, 2001). However, adult interactive partners can contribute to children's referential skills by supplying sufficient information about children's breakdowns in conversational exchanges and by presenting appropriate models of referential behaviors. However, we do not exactly know how the effect of different types of feedback changes depending on the nature of the referential task (e.g. familiarity of the task), the characteristics of the communicative context (e.g. dyadic, multi-speaker contexts) and the communicative partners (e.g. age, familiarity of the interactants, and the difference in the competence level or knowledge status of partners). We also need to examine whether different kinds of feedback are useful for children who exhibit distinct level of communicative competence and who experience different types of communicative failures. Although the research surveyed in this chapter underlines the importance of the role of adults

in the development of children's referential communication, this is not to say that children are passive learners in communicative exchanges with their caregivers. In a recent study, Morriseau, Davies & Matthews (2013) showed that children seek out interlocutor cues from their conversational partners. Morriseau and colleagues (2013) examined three- and five-year olds' reactions (i.e. requests for clarifications or comments, reaction times to response, and gaze checks to the experimenter) to an adult's under- or over-informative sentences in a referential communication task. Children were asked to fill empty slots in a wooden grid with appropriate picture cards according to the target model in a booklet. The children's task was to choose the target from a set of cards on a table according to the experimenter's instructions. The presence of a modifier (modified vs. non-modified condition) and also whether there were one or two objects from the same category (contrast vs. no contrast condition) were manipulated. There were four different instruction types when these two factors were crossed: 1) under-informative condition (e.g. saying "the banana" in the presence of one peeled and one unpeeled banana), 2) optimal condition without modification (e.g. saying "the train" in the presence of only one train), 3) over-informative condition (e.g. saying "the cat with a tail" in the presence of a stereotyped cat), and 4) optimal condition with modification (e.g. saying "the house with windows" in the presence of one house with windows and one house without any windows). Both three- and four-year olds showed sensitivity to the under-specified instructions and made verbal or nonverbal (i.e. looking at the experimenter) requests for clarification, checking the experimenter's gaze, showing slower responses (only five-year olds). However, only five year-olds showed sensitivity to over-informative instructions by responding more slowly after the instructions, checking the experimenter's gaze, and verbally specifying that the instruction was

unusual. Therefore, it seems that children build up specific hypotheses about which entity or entities will be referred to in a certain communicative context and actively look for information from their caregivers about why certain referring expressions are chosen in that context. If their expectations are not met, they take action to find out why.

CONCLUSION

To explain developmental gradients in referential communication, children's developing social-cognitive abilities have been more readily invoked than caregiver influences. Recent research, though, uses both naturalistic and experimental study designs to show how the interaction between adults (especially caregivers) and children might help young learners to improve their referential skills. Both naturalistic and experimental studies examining the effect of various communicative cues on children's referential skills show that beginning from very early on, children can adapt their referential expressions by tapping into their interlocutors' verbal and nonverbal cues. Further, gestures (especially deictic ones) help speakers to disambiguate a referent, however neither of them exactly show how much gestures and other nonverbal channels of communication are fundamental for the development of children's referential skills.

Experimental training studies also indicate that scaffolding children's communicative attempts with consistent and appropriate feedback helps them to adapt their existing skills to the increasing demands of new communicative situations. However, there are few studies that examine how parents (rather than adult confederates) provide feedback to their children during spontaneous interactions. Moreover, to our knowledge, there are no studies that systematically

investigate the effects of caregivers' own communicative breakdowns and repairs on children's referential communication. Whether interventions in the caregivers' referential strategies will contribute to children's referential skills is also an important question of theoretical and practical relevance for development of referential communication. Although referring is a fundamental linguistic and pragmatic ability, research has barely scratched the surface in terms of determining how child-level social-cognitive factors affect and benefit from child-directed and child-surrounding interactions in development of referential communication.

CHAPTER 2

INTERACTIONS OF TURKISH-LEARNING CHILDREN'S WITH THEIR CAREGIVERS ABOUT NON-ABSENT REFERENTS: INTEGRATION OF NONVERBAL ACTION WITH PRIOR DISCOURSE[2]

Footnotes

[2] Ateş, Ş. B. & Küntay, C. A. (under revision). Interactions of Turkish-learning children's with their caregivers about non-absent referents: Integration of nonverbal action with prior discourse. To be resubmitted to *the Journal of Child Language.*

ABSTRACT

We examined how children at a young age before 22 months integrate nonverbal action with discourse status information in referential interactions with their caregivers about physically available objects. We asked whether children employ different types of nonverbal strategies (i.e. deictic gestures and communicative functional acts) to supplement their referentially insufficient verbal strategies (e.g. non-lexical forms addressing new referents) before they become masterful users of their language. As a secondary aim, we also investigated (dis)similarities of children's verbal and nonverbal strategies to the caregiver input at different age points. The data come from Turkish, where argument omissions and verb-only utterances are common. Semi-naturalistic interactions of four children with their caregivers at ages 1;00, 1;05, and 1;09 were coded. The results showed that although the caregivers consistently took into account prior mention in discourse to choose their referential forms at each age point, the children's sensitivity to discourse status emerged only at age 1;09. The children used deictic gestures accompanying their non-lexical forms about new referents, suggesting that nonverbal

strategies play an important role in verbal child-caregiver referential interactions. There are both similarities and divergences between children's and caregivers' use of verbal and nonverbal referential strategies.

INTRODUCTION

Much of early child-caregiver interaction involves referring to external entities in natural environments of children. Children build up their earliest linguistic knowledge and develop their communicative perspective-taking skills via these referential interactions. Recent research evoked the importance of nonverbal content in these referential interactions (e.g. Baldwin, 1991, 1993; Behne, Carpenter, & Tomasello, 2005; Carpenter, Nagell, & Tomasello, 1998; Liebal, Behne, Carpenter, & Tomasello, 2009; Liszkowski, Brown, Callaghan, Takada, & De Vos, 2012; Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Liszkowski, Carpenter, & Tomasello, 2007, 2008; Moll, & Tomasello, 2004). The present study examines how children younger than age 1;10 integrate different types of nonverbal devices (i.e. deictic gestures and communicative functional acts) with discourse-pragmatic information (i.e. prior mention in discourse) in their referential speech to their caregivers about third-person entities. The data come from Turkish, a pro-drop language that allows nouns to be omitted from speech, and where verb-only utterances are common in early conversations (Furman, Küntay, & Özyürek, 2014). We show how nonverbal devices form the crux of communication early on, before discourse-based referential skills are demonstrated and more complex argument structures are attested by around 2 years of age. It is common for very young children to refer to external entities using gestures to complement what is said (Özçalışkan & Goldin-Meadow, 2005), as in the following example where a boy at age 1;09

suddenly shifts to a new topic about a referent object in the room (radio) while talking to his mother.

Example 1:

(1) Child: Aç ya@i [=! points to the radio]!

Turn on the radio!

(2) Mother: Açamayız.

We cannot turn on the radio.

(3) Mother: Ablanın şeyi takılı oraya.

The girl's thing [= the recorder's camera's plug] is on there.

Development of discourse-pragmatic sensitivity involves learning to judge whether a referent is mentally accessible or clear to an addressee at the moment of interaction (Allen, 2000; Clancy, 1993; Greenfield & Smith, 1976). This sensitivity requires children to evaluate discourse status of referents and, based on this judgment, to choose sufficiently informative linguistic forms from the repertoire of their language. Discourse status of a referent is whether it is newly mentioned or has already been introduced or given in prior discourse (Bloom, 1990; Vallian, 1991; Clancy, 1993). A referent that is new to the discourse is not easily identifiable since the hearer does not yet have a clear mental knowledge of it; thus, the speaker is more likely to use a more informative form (i.e. full lexical forms such as nouns) to introduce such referents to the addressee. However, a referent that has been previously mentioned in discourse is thought to be identifiable by the addressee and the speaker is more likely to use a less informative form (i.e. non-lexical forms such as null forms or pronouns) while talking about this referent. It is well established that from about 2 years of age children learning different

languages show sensitivity to discourse-pragmatic features in the referential speech they produce. Employing language-specific discourse-pragmatic principles, children around and over age 2 tend to use non-lexical forms (either null forms or pronouns) to indicate previously mentioned referents and to use lexical forms (nouns) to indicate new referents in discourse (Allen, 2000; Allen & Schröder, 2003; Campbell, Brooks, & Tomasello, 2000; Clancy, 1993; Huang, 2012; Matthews, Lieven, Theakston, & Tomasello, 2006; Narasimhan, Budwig, & Murty, 2005; Paradis & Navarro, 2003; Rozendaal & Baker, 2008; 2010; Salomo, Graf, & Lieven, 2011; Salomo, Lieven, & Tomasello, 2010; Serratrice, 2005; So, Demir, & Goldin-Meadow, 2010). Early emergence of discourse-pragmatic sensitivity is found in learners of languages that restrict the omission of nominal arguments (i.e. non-pro-drop languages) such as English (Guerriero, Oshima-Takane, & Kuriyama, 2006) or allow nominal arguments to be dropped in conversational discourse (i.e. pro-drop languages) such as Chinese (Wang, Lillo-Martin, Best, & Levitt, 1992), Inuktitut (Allen, 2000), Italian (Serratrice, 2005), Korean (Clancy, 1993), Japanese (Hirawaka, 1993), Spanish (Paradis & Navarro, 2003), and Turkish (Gürcanlı, Nakipoğlu, & Özyürek, 2007; Demir, So, Özyürek, & Goldin-Meadow, 2012). We also know that, children's speech samples still include some violations of discourse-pragmatic principles. For example, 40% of 4-year-old Chinese- and English-speaking children's utterances denoting third-person new referents used non-lexical structures including null forms and pronouns (So, Demir, & Goldin-Meadow, 2010). An explanation for these inadequate referential forms is that children show their sensitivity to discourse-pragmatic features using nonverbal devices because they still have limited linguistic knowledge or immature processing skills (Guerriero et al., 2006; Gürcanlı et al., 2007). For example, in Example 1 above, the child used a pointing gesture to accompany

his utterance with an omitted object in order to introduce this new referent (radio) to his mother.

Starting from 10 to 14 months (often before the onset of speech), children in different language environments such as English, Japanese, Spanish, Tzeltal, Yeli Dnye, and Yucatec begin to communicate with adults about external entities using nonverbal devices, especially deictic gestures such as pointing and showing (Carpenter et al., 1998; Liszkowski et al., 2012; Salomo & Liszkowski, 2013). 10- to 14-month-old infants produce pointing gestures to refer to objects approximately 3 months before they produce lexical words corresponding to these objects (Iverson & Goldin-Meadow, 2005); 12-month-old infants produce action gestures prior to the words representing these actions (Carpenter et al., 1998; Capirci, Contaldo, Caselli, & Volterra, 2005); and 18-month-old children combine a gesture and a word approximately 4 months before they constructed two-word sentences (Özçalışkan & Goldin-Meadow, 2005). After children began to construct sentences, they still use gestures to convey information or thoughts that cannot be fully expressed in their speech. For example, they support the information in their sentences with gestures when they interact with adults (Goldin-Meadow & Butcher, 2003; Iverson & Goldin-Meadow, 2005; Özçalışkan & Goldin-Meadow, 2005), narrate a story (Demir & So, 2006) or solve various problems (Church & Goldin-Meadow, 1986; Garber, Alibali, & Goldin-Meadow, 1998; Goldin-Meadow, 2005; Goldin-Meadow, Alibali, & Church, 1993). Moreover, beginning from 2 years of age, children use more gestures while talking about new rather than previously mentioned referents (Guerriero et al., 2006; So et al., 2010; Demir et al., 2012; So & Lim, 2012; So, Lim, & Tan, 2014) Further, the children's tendency to use gestures accompanying

their speech is higher for new referents expressed by non-lexical forms rather than nouns (So et al., 2010).

Although substantial literature about children's nonverbal communication about referents exists, there are not any studies investigating how children use nonverbal devices in relation to discourse status of referents before age 2 (but see Guerriero et al., 2006). Moreover, in existing research, nonverbal devices usually included deictic (i.e. points and shows) and iconic gestures. Only in Guerriero and colleagues' (2006) study, nonverbal devices included other referent-relevant nonverbal actions such as touching, reaching, and moving objects. However, none of the studies examined children's choices for referential forms in association with different types of nonverbal devices.

There are also a few studies explaining children's inappropriate argument omissions (for example, for new referents) as an effect of caregiver input (Guerriero et al., 2006; Huang, 2012; Narasimhan et al., 2005; Paradis & Navarro, 2003; So & Lim, 2012). In most of these studies, the question was whether discourse status of referents similarly affects children's and caregivers' use of referential forms. The results mainly found that children and caregivers show a similar pattern in their sensitivity to discourse status of referents while deciding to their referential forms (Huang, 2012; Narasimhan et al., 2005; Paradis & Navarro, 2003). In only two of these studies (i.e. Guerriero et al., 2006; So & Lim, 2012), the researchers also asked the question of whether children use nonverbal strategies similarly with their caregivers in their referential speech. The two studies found similar results for child-caregiver dyads speaking English as one of the non-pro-drop languages. That is, English-speaking children consistently used referential gestures accompanying their non-lexical forms about new referents, following a similar pattern

with their caregivers. However, the two studies yielded different results for child-caregiver dyads speaking pro-drop languages. Guerriero and colleagues (2006) found that, Japanese-speaking children and mothers did not consistently supplement their inappropriate argument omissions by non-lexical devices including deictic gestures and actions (e.g. touches, reaches, etc.) towards objects. However, So and Lim (2012) indicated that Chinese-speaking caregivers consistently used nonverbal devices such as deictic and iconic gestures accompanying their questions more often when the referent is new rather than previously introduced in discourse and the children were more likely to identify new referents (i.e. by providing a correct name), in communicative forms accompanied rather than not accompanied by these gestures. There are at least three explanations for contradictory results between the two studies: First, in Guerriero and colleagues' (2006) study, all speech between child-caregiver dyads was coded whereas, in So and Lim's (2012) study, the speech sample was restricted to the caregivers' labeling questions ("What is this?") and the children's answers to these questions. Second, Guerriero and colleagues' (2006) study was longitudinal and examined caregiver-child interactions beginning from an earlier time point (i.e. around age 1;09); but So and Lim's (2012) study was not longitudinal and investigated the children at an older age period, between 2;10 and 5;3 (with a mean age of 4). Third, the type of nonverbal actions differed between the two studies. In Guerriero et al. (2006), nonverbal actions such as touches and reaches in addition to deictic gestures were coded; however in So and Lim (2012), only gestures (both deictics and iconics) were coded. For further understanding of the role of nonverbal devices in child-caregiver interactions we need more studies with languages that allow argument omission.

In sum, most existing studies on children's referential interactions are not longitudinal and do not involve children younger than age 2. The relative absence of research for these younger ages is not surprising considering that many children do not produce much referential speech before the beginning of the third year of life. Existing studies investigating older ages also excluded any forms of referential exchanges between children and caregivers that do not include spoken interactions. However, referential communication starts through the use of nonverbal devices well before much linguistic sophistication is displayed (Stephens & Matthews, 2014). Indeed, especially in the earlier periods of referential communication, children and caregivers initiate and follow an interaction about an external entity through solely vocalization or nonverbal acts including deictic gestures and communicative functional acts (Stephens & Matthews, 2014). Thus, the present study contributes to existing research because we longitudinally investigate children's referential interactions with their caregivers beginning from an earlier period of time where nonverbal communication expected to be more common than that in the existing studies. By including this earlier period, we are able to examine how different types of nonverbal referential actions (i.e. deictic gestures and communicative functional acts) create a foundation for developing verbal referential skills as children become relatively more competent producers of Turkish. Moreover, existing research has not yet reached a consensus on how children (and also caregivers) speaking pro-drop languages use nonverbal actions in relation to discourse status of referents in their referential speech. The present research aims to touch upon this question by examining spontaneous interactions of child-caregiver dyads in Turkish, a language allowing rampant omission of nouns.

Current Study

The main aim of the present study was to examine how children integrate different types of accompanying nonverbal actions (i.e. deictic gestures and communicative functional acts) with discourse status of referents (i.e. prior mention in discourse) in their referential speech about physically available, third-person referents before age 2. One of our motivations was to investigate whether different types of nonverbal strategies (i.e. deictic gestures and communicative functional acts) are employed to supplement children's referentially inadequate verbal strategies (e.g. non-lexical forms about new referents) before they become masterful users of their language. To address this question, we used videotaped spontaneous interactions between children and their regular caregivers when the children were at ages 1;00, 1;05, and 1;09. In order to depict the nature of referential interactions of child-caregiver dyads, we first examined how verbal, vocal, and nonverbal communicative interchanges about an external entity between the dyads, dubbed as "referential acts", differ as children got older. The referential acts were extracted in three distinct subcategories for both children and caregivers: 1) *verbal referential* acts included utterances that refer to a third-person entity with a lexical form (nouns, question forms) or a non-lexical form (demonstrative pronouns, null forms, pronouns), 2) *vocal referential acts* were vocalizations used to address a third-person entity, and 3) *nonverbal referential acts* were mere gestures and communicative functional acts which were not accompanied by any referent-relevant speech or vocalization. Then, to examine our main research questions, we focused only on verbal referential acts including nouns as lexical forms and demonstrative pronouns and null forms as non-lexical forms. As a secondary aim, we examined whether children's use of accompanying nonverbal acts and discourse status show

(dis)similarities to the caregiver input at different age points. We specifically addressed three research questions:

Question 1: Are there different types of referential acts (i.e. verbal, vocal, and nonverbal) in the child's interactions with their caregivers? If there are, how does the pattern of use of different types of referential acts change over developmental time?

Question 2: a) In their verbal referential acts, do children's referential forms change depending on whether they employ nonverbal acts (i.e. deictic gestures and communicative functional acts) accompanying their referential speech?, and b) Do children's use of lexical and non-lexical referential forms associate with different types of accompanying nonverbal acts?

Question 3: In their verbal referential acts, are accompanying nonverbal acts (i.e. deictic gestures and communicative functional acts) and prior mention in discourse differentially associated with children's use of lexical and non-lexical referential forms? If they are, how does this association change as children get older?

Since the secondary aim of the present study was to investigate similarities and differences of children's use of verbal and nonverbal referential strategies with their caregivers' use of these strategies, we also examined the same questions for the caregivers.

METHOD

Participants and corpus

We used videotaped recordings from *the Koç University Longitudinal Language Development Database* (KULLDD) (Ural, Yüret, Ketrez, Koçbaş, & Küntay, 2009). This database includes video recordings of eight children (6 girls and 2 boys) and their regular caregivers at

their homes. The child-caregiver interactions were recorded for 60 minutes in biweekly sessions when the infants were aged 0;8 to 3;0.

The caregivers in the database are regular caregivers that included mothers, fathers, grandparents, and babysitters. The children are typically developing, monolingual Turkish learners, and lived in İstanbul throughout the data collection period as single children. For the present study, we chose four of these children by balancing gender and socio-economic status. We chose 1 girl and 1 boy having parents with a higher education level (college or PhD degree) and 1 girl and 1 boy having parents with a lower education level (5 years of education). In average, both the mothers and the fathers with higher education level had 17.5 years of education (*SD* = 3.54) whereas both the mothers and the fathers with lower education level had 5 years of education (*SD* = 0). The mean age of the mothers in the higher education group was 34.5 (*SD* = .71) and that of the mothers in the lower education group was 22.5 (*SD* = 2.12). The mean age of the fathers in the higher education group was 37 (*SD* = 2.83) and that of the fathers in the lower education group was 26.5 (*SD* = .71).

We selected three different sessions from each of the child-caregiver dyads when the children were aged 1;00, 1;05, and 1;09. However, one child was aged 0;10 at the first and 1;10 at the third time point since there were no video recordings at ages 1;00 and 1;09 for her. We coded the first 30 minutes of videotaped interactions of children with their caregivers in each session, 6 hours of observation in total. The interactions of child-caregiver dyads usually took place in the living rooms of the children's homes and included various activities such as dressing, eating, playing, and book reading.

Data preparation and analysis

Native speakers of Turkish trained as research assistants transcribed the three sessions for each child from the videotapes using the CHAT transcription format (MacWhinney, 2000). In order to ensure the reliability of the transcriptions, a second set of trained research assistants and the first author checked the accuracy of the transcribed data watching the video recordings after importing the transcription to a coding program called the ELAN annotation tool (Hellwig, 2008). This program allowed the coders watch the video and read through the transcriptions simultaneously. The first author corrected any inconsistencies in the transcriptions based on the principles of the CHAT transcription format.

The unit of analysis for this paper is dubbed as *referential acts,* extracted for the children and the caregivers. Referential acts refer to children's and their caregivers' verbal, vocal, and nonverbal interactions that involve a third-person entity (person or object). Verbal referential acts included children's and their caregivers' utterances that refer to a third-person entity with a lexical form (nouns, question forms) (See 6 in Example 2) or a non-lexical form (demonstrative pronouns, null forms, pronouns) (See 3 & 4 in Example 2). Vocal referential acts were children's and caregivers' mere vocalizations with a clear intention to refer to a third-person entity (See 1 & 5 in Example 2). Verbal and vocal referential acts might include an accompanying nonverbal act (i.e. gestures and communicative functional acts). Nonverbal referential acts were communicative referential actions including gestures and communicative functional acts which were not accompanied by referent-relevant speech or vocalizations (See 2 in Example 2). Nonverbal referential acts might include referent-irrelevant speech (e.g. *Teşekkür ederim*,

'*thank you*') but had to include a relevant action regarding a target referent, such as pointing, showing, and requesting.

Example 2:

(1) Child: a: [=! throws the ball while vocalizing]!

(2) Father: 0 [=! takes the ball]

(3) Father: Al [=! throws the ball back to the child].

Take.

(4) Child: Al [=! reaches the ball on the floor]

Take.

(5) Child: ah@i [=! throws the ball back to the father while vocalizing].

(6) Father: A:@i top!

A: [=! vocalizes] (it is a) ball.

We excluded from the coded data reiterations of songs, poems, and known stories. Reference to first- (I, we) and second-person (you) referents were also not coded. In addition, we did not code locative terms such as *bura* 'here', *ora* 'there', *şura* 'there' when these terms represent a vague location. Consistent with the questions of the present study, our coding was restricted to physically present (or non-absent), third-person referents.

Coding

We coded verbal, vocal, and nonverbal referential acts with regard to prior mention and accompanying nonverbal acts. We also coded the type of linguistic form that constituted the verbal referential acts.

Prior mention in discourse

Following Allen and colleagues (Allen, 2000; Allen, Skarabela, & Hughes, 2008; Hughes, 2011; Hughes & Allen, 2013; 2014; Skarabela & Allen, 2010), each referential act took a binary value considering its accessibility level in discourse context. A referential act was coded as 'previously mentioned' if the referent was mentioned in a lexical or non-lexical form within the preceding five utterances; otherwise it was coded as 'new'.

Nonverbal acts: Gestures and communicative functional actions

We coded the children's and the caregivers' deictic gestures, iconic gestures, and communicative functional acts that accompanied their referential acts. Deictic gestures included speakers' pointing and showing behaviors regarding a third-person referent. There were three distinct categories of pointing gestures. *Index finger pointing* requires a speaker to stretch out her/his arm in the direction of a distal or proximal referent object with an extended index finger. For *whole-hand pointing,* a whole hand rather than an index finger was used to point to a referent object. For *body pointing,* other parts of the body (such as head, legs, and chin) rather than hands were used to point a referent object. Showing gestures requires a person to hold or hold out a referent object with an aim of only showing (but not giving) it to the recipient. Iconic gestures referred to speakers' hand or body movements that resemble a referent object (e.g. keeping forefinger in an upright position to represent a candle or opening a palm upward to represent a glass) or depict actions produced by a referent object (e.g. waving hands to represent a butterfly or bringing a C-shaped hand towards the mouth to represent drinking from a glass). Communicative functional acts consisted of speakers' requesting, reaching, giving, demonstrating, and placing behaviors; all involving the goal of interacting with a recipient

about a third-person entity. Reaches were coded when a speaker's arm was outstretched towards a referent in order to take or touch it. Gives were a person's extension of her/his any body part (e.g. hand, foot) to hand over a referent object to the addressee. Demonstrations included a speaker's acts aiming to show the function of a referent object or an action performed by a referent object to the recipient (e.g. shaking the arm of a toy potato man to show how he says "hello"). Places were coded when a speaker locates a referent object for the recipient.

Referential form of verbal referential acts

The present study treated referential form as a binary variable, i.e. non-lexical vs. lexical forms. Non-lexical forms included null forms and demonstrative pronouns whereas lexical forms included just nouns. We initially coded other forms observed in the verbal referential acts such as adjectives, question forms, and personal pronouns; however we later excluded these cases from logistic regression analyses because they were too few.

Reliability

To determine the reliability of the coding scheme, an additional three-minute interaction in each video recording session (which were not coded before) were randomly chosen and independently coded by the author and a trained research assistant. As estimated by Cohen's Kappa, the interrater agreement was .99 for prior mention, .95 for nonverbal acts, and .99 for referential form.

Overview of analyses

We first characterize three types of referential acts (i.e. verbal, vocal, and nonverbal) between child-caregiver dyads at ages 1;00, 1;05, and 1;09. We examined whether the pattern

of distribution of these acts changes over time by chi-square tests. Then we shift to only verbal referential acts including nouns as lexical forms and demonstrative pronouns and null forms as non-lexical forms to answer the two following research questions. First, we examined via chi-square tests how different types of accompanying nonverbal acts (i.e. deictic gestures and communicative functional acts) are associated with children's (and also caregivers') use of lexical and non-lexical forms at each time point. Second, we conducted a set of binary logistic regressions to investigate whether different types of accompanying nonverbal acts and prior mention in discourse are differentially associated with children's (and also caregivers') referential forms at each time point. We used binary logistic regression because of two reasons. First, consistent with our research question, it allowed us to predict the probability of occurrence of different referential forms (i.e. non-lexical vs. lexical) for a given set of predictors (i.e. type of accompanying nonverbal acts, prior mention in discourse). Second, neither children's (nor caregivers') referential forms were normally distributed at any time points; therefore logistic regression is a good option for non-normally distributed data since it does not require the assumptions of homogeneity of variance and normality of errors. However, there are still some other assumptions of logistic regression. For example, it requires quite large sample sizes and each observation should be independent from each other. The outcome variable in our study was children's or caregivers' referential forms addressing a third-person referent. The data included referential forms of four children at three distinct time points. Although our sample size was large enough to conduct logistic regressions, the data points had some dependency since our observations (i.e. referential forms) were nested within the same units (i.e. child and time). One suggested method to handle such a clustered or

grouped data is multilevel models that allow examining residual components at each level in the hierarchy by separating fixed effects of primary interest from random effects of group variables. However, multilevel modeling was not still appropriate for this data set since it requires a quite large sample size at both individual (i.e. referential forms) and group (i.e. child) level. Therefore, it requires us to be cautious in interpreting results since the data came from only 4 children and the data units included some degree of interdependency.

In logistic regressions, we used two categorical predictor variables. The first predictor variable was the type of accompanying nonverbal acts, coded in three distinct categories: “no accompanying nonverbal act”, “deictic gestures”, and “communicative functional acts”. The second predictor variable was prior mention in discourse with two distinct categories: “new” and “previously mentioned”. Our outcome variable was also categorical including two distinct categories of “non-lexical forms” (i.e. null forms) and “lexical forms” (i.e. nouns and pronouns). In all of the analyses, we compared the likelihood of using a non-lexical form in comparison to the likelihood of using a lexical form depending on the predictor variables. For the first predictor variable (i.e. type of accompanying nonverbal acts), our reference category included the cases where a speaker did not use any accompanying nonverbal acts (i.e. no accompanying nonverbal act). That is, we compared the likelihood of the occurrence of our outcome variable between the cases where a speaker used an accompanying deictic gesture and he/she did not use any accompanying nonverbal acts; and also between the cases where a speaker used an accompanying communicative functional act and he/she did not use any accompanying nonverbal acts. For the second predictor variable (prior mention in discourse), our reference

category was “previously mentioned” referents. That is, we compared the likelihood of the occurrence of our outcome variable for new in comparison to previously mentioned referents.

RESULTS

In each section, we first present the results for the children and then, in order to compare the children’s patterns with the caregiver input, we shift to the results for the caregivers. We address our research questions listed above in succession in our presentation of the results.

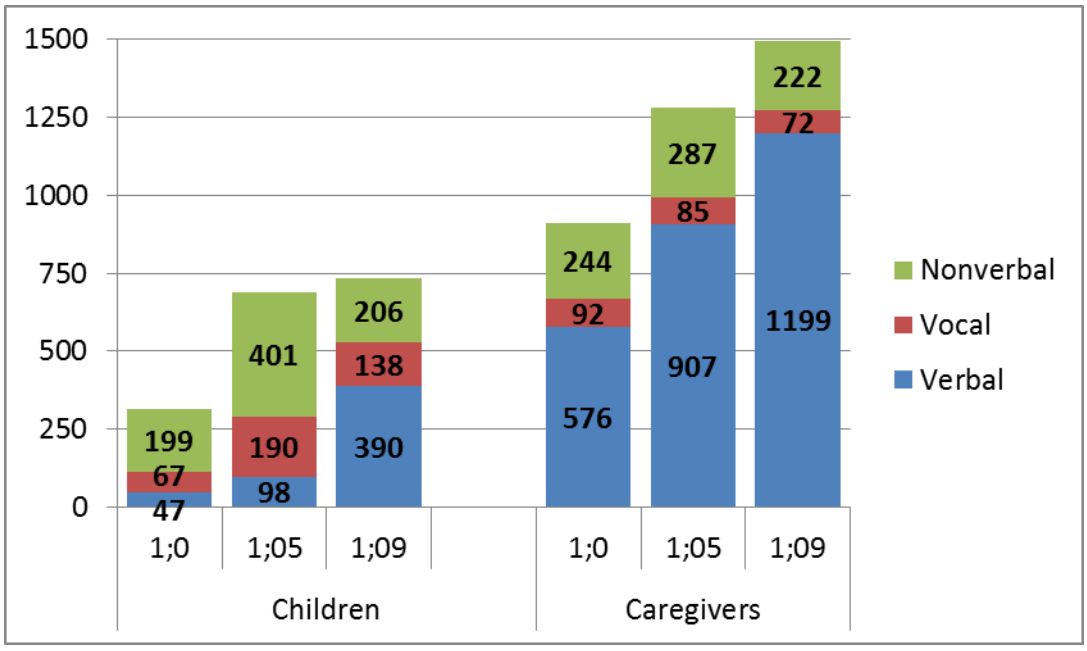
Question 1: Use of referential acts at successive developmental times

We obtained a total of 5,420 referential acts that indicated physically present, third-person entities from the child-caregiver interactions. 3,217 of these referential acts included verbal reference, 644 were mere vocalizations, and 1,559 were purely nonverbal.

Children’s referential acts totaled 1,736 items with 535 verbal, 395 vocal, and 806 nonverbal acts. As seen in Figure 1, the children’s pattern of use of referential acts significantly changed with developing age (χ^2 (4) = 311.57*, p* < .001). At ages 1;00 and 1;05, most referential attempts were nonverbal, which were followed by vocalizations and verbal forms. However, at the age of 1;09, most of children’s referential acts became verbal, followed by nonverbal acts and then vocalizations. The Marascuilo post hoc comparison tests (at *p* = .05) indicated that the children’s verbal acts stayed constant from 1;00 to 1;05 and then significantly increased from both 1;00 and 1;05 to 1;09 (Marascuilo & McSweeney, 1977). Nonverbal attempts stayed constant from 1;00 to 1;05, and decreased from both 1;00 and 1;05 to 1;09. The number of vocal acts remained the same when the children were aged between 1;00 and 1;05, and significantly decreased from the age of 1;05 to 1;09.

Caregivers' referential acts totaled 3,684 referential acts with 2,682 verbal, 249 vocal, and 753 nonverbal acts. At each time point, caregivers' referential moves were mostly verbal, which were followed by nonverbal and vocal acts (see Figure 1). The pattern of distribution of the different types of referential acts was different at distinct age points of the children (χ^2 (4) = 90.05, $p < .001$). Marascuilo post hoc comparison tests ($p = .05$) showed that the caregiver's verbal acts significantly increased from 1;00 to 1;05, from 1;05 to 1;09, and from 1;00 to 1;09. The nonverbal attempts stayed constant from 1;00 to 1;05, but decreased from 1;00 to 1;09 and from 1;05 to 1;09. The vocal acts significantly decreased from 1;00 to 1;09, but did not change from 1;00 to 1;05 and from 1;05 to 1;09.

Figure 1. Frequency of children's and caregivers' verbal, vocal, and nonverbal referential acts at ages 1;00, 1;05, and 1;09.



Question 2: Gestures and communicative functional acts accompanying referential forms

We examined the use of nonverbal acts including deictic gestures, iconic gestures, and communicative functional acts in association with the use of non-lexical and lexical referential

forms for the children and the caregivers at each time point. As pure vocalizations and nonverbal acts had to be excluded from this analysis of linguistic referential forms, the data points amounted to 2,034 items, 407 from the children and 1,627 from the caregivers.

For the children, there was a significant association between nonverbal acts and referential forms only at the age of 1;00 (χ^2 (1) = 21.16, $p < .001$). As Table 1 shows, at age 1;00, the children almost always used nonverbal acts accompanying their non-lexical forms, while not using many nonverbal acts accompanying their lexical forms. 94% of the non-lexical forms, but 18% of the lexical forms were accompanied by a nonverbal act at age 1;00. At the age of 1;05, they used nonverbal acts for 69% of their non-lexical and 53% of their lexical forms. At age 1;09, their use of nonverbal acts accompanying non-lexical (56%) and lexical forms (53%) almost became equal. The children's nonverbal acts basically included communicative functional acts and deictic gestures except for a few iconic gestures.

We further examined the 218 cases where the children used either a deictic gesture or a communicative functional act accompanying their referential speech. As Figure 2 shows, we found a significant relationship between the children's use of nonverbal act and referential form when the children were aged 1;00 (Fisher's exact test, χ^2 (1) = .00, $p < .001$) and 1;05 (Fisher's exact test, χ^2 (1) = .02, $p < .05$). At age 1;00, the children always used communicative functional acts accompanying their non-lexical forms and deictic gestures accompanying their lexical forms. At age 1;05, they mostly used communicative functional acts accompanying their non-lexical forms and deictic gestures accompanying their lexical forms. However, they began to use deictic gestures rather than communicative functional acts for both non-lexical and lexical forms at age 1;09.

As Table 1 presents, there was a significant association between the caregivers' use of nonverbal acts and referential forms when the children were aged 1;00 and 1;05 (χ^2 (1) = 4.28, p < .05; χ^2 (1) = 8.99, p < .01, respectively). At the age of 1;00, 68% of caregivers' non-lexical forms and 58% of their lexical forms, and at age 1;05 57% of caregivers' non-lexical but 43% of their lexical forms were accompanied by nonverbal acts. However, by the age of 1;09, the percentages of caregivers' non-lexical and lexical forms accompanied by nonverbal acts were not different from each other (47%, for both).

We also examined how the type of nonverbal acts changed depending on the caregivers' referential forms. Similar to the children, most of the caregivers' nonverbal acts included either communicative functional acts or deictic gestures; but very few iconic gestures. Thus we examined the 830 cases where the caregivers used either a deictic gesture or a communicative functional act accompanying their referential speech. As Figure 3 shows, there was a significant relationship between the caregivers' type of nonverbal act and referential form at each time point (χ^2 (1) = 41.53, p < .001 at 1;00, χ^2 (1) = 24.86, p < .001 at 1;05, χ^2 (1) = 28.27, p < .001 at 1;09). That is, the caregivers were more likely to use communicative functional acts accompanying their non-lexical forms but deictic gestures accompanying their lexical forms.

Table 1. Number of children's and caregivers' lexical and non-lexical forms with accompanying nonverbal acts at ages 1;00, 1;05, and 1;09.

			Nonverbal acts			
			Absent		Present	
	Age	Referential form	N	%	N	%
Children	1;00	Non-lexical	1	6	15	94
		Lexical	18	82	4	18
	1;05	Non-lexical	17	31	38	69
		Lexical	9	47	10	53
	1;09	Non-lexical	77	44	97	56
		Lexical	57	47	64	53
Caregivers	1;00	Non-lexical	64	32	137	68
		Lexical	71	42	97	58
	1;05	Non-lexical	134	43	179	57
		Lexical	107	57	82	43
	1;09	Non-lexical	218	53	190	47
		Lexical	186	53	162	47

Figure 2. Number of children's referential forms with different types of accompanying nonverbal acts at ages 1;00, 1;05, and 1;09.

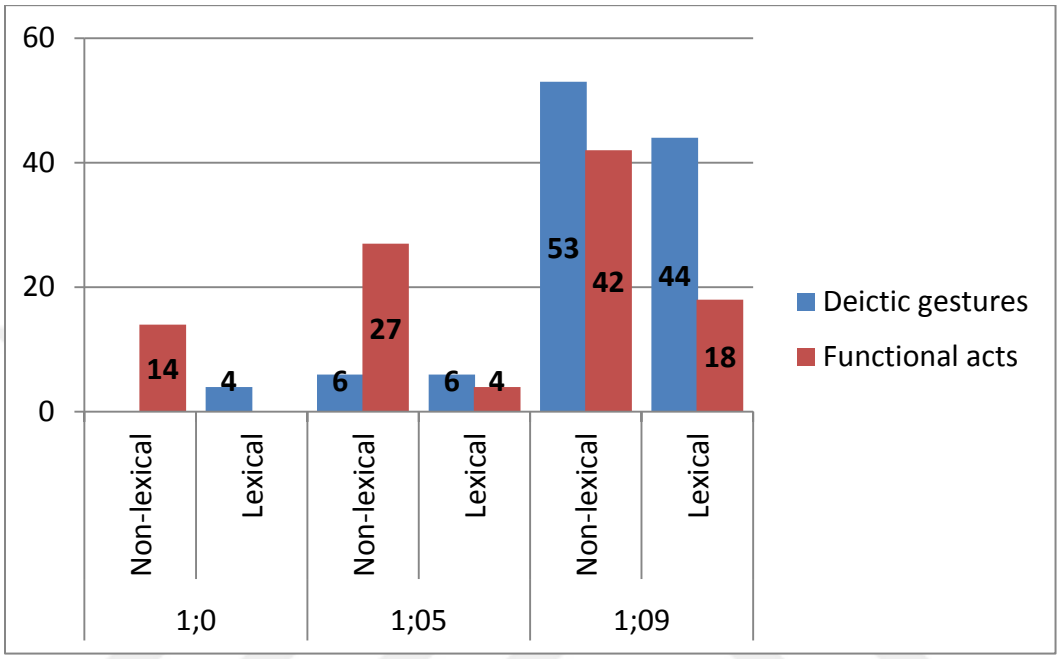
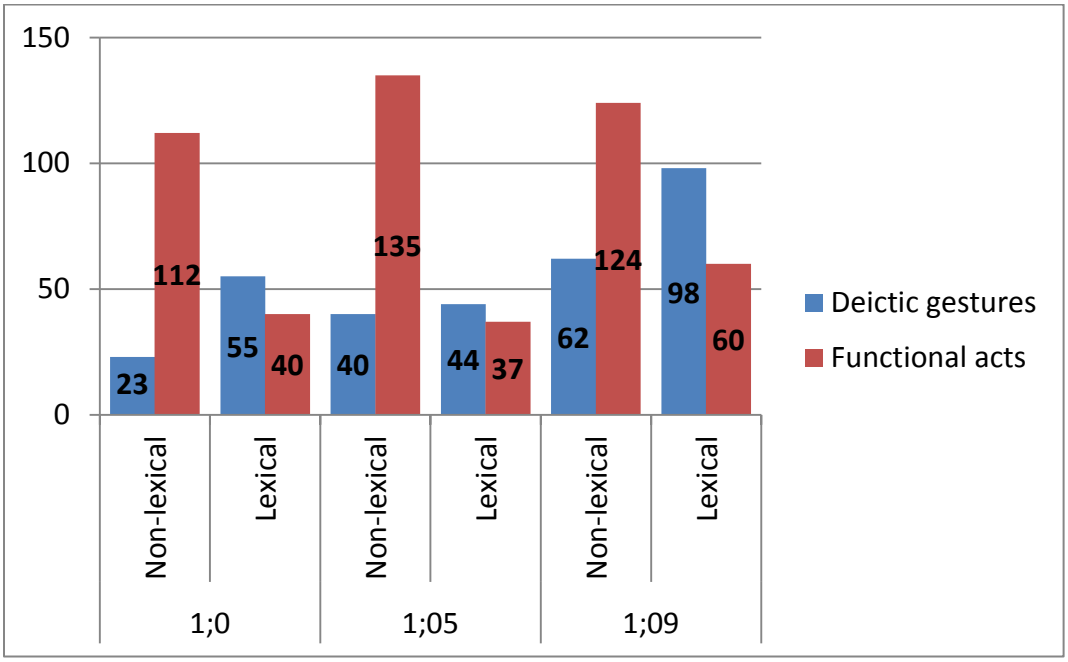


Figure 3. Number of caregivers' referential forms with different types of accompanying nonverbal acts at ages 1;00, 1;05, and 1;09.



Question 3: Role of nonverbal actions and prior mention on linguistic referential forms

Consistent with our research questions, in all of the below analyses, we used only verbal referential acts that included nouns, demonstrative pronouns, and null forms, excluding vocal and nonverbal referential acts. The cases with missing values in any of the predictor or outcome variables were also excluded. After the elimination, we obtained a new data set including a total of 2,002 verbal referential acts, 395 from the children and 1,607 from the caregivers.

Children

The children's data respectively included 37, 69, and 289 third-person referents that were verbally referred to when the children were aged 1;00, 1;05, and 1;09.

At age 1;00, the main effect model with two predictor variables (i.e. type of accompanying nonverbal acts and prior mention in discourse) fitted the data significantly better than the null model (χ^2 (3) = 42.35, $p < .001$). The model explained 92% of the variance in the children's referential forms (Nagelkerke $R^2 = .92$). Overall, the suggested model correctly classified 97.3% whereas the null model correctly classified only 59.5% of referential forms. As Table 2 shows, neither type of accompanying nonverbal acts nor prior mention in discourse was significantly associated with the children's referential forms.

At age 1;05, the interaction-effect model with two predictor variables (i.e. type of accompanying nonverbal acts and prior mention in discourse) and the interaction between these variables was significantly better than the null model (χ^2 (5) = 14.07, $p = .01$). Overall, the classification power of the suggested model (78.3%) was higher than that of the null model (72.5%). The results showed that only type of accompanying nonverbal acts was significantly associated with children's referential forms ($p = .01$). However, when deictic gestures and

communicative functional acts were considered separately, this effect became insignificant (See Table 2).

At age 1;09, the interaction effect model including two predictor variables (i.e. type of accompanying nonverbal act and prior mention in discourse) and the interaction between them fitted the data significantly better than the null model (χ^2 (5) = 18.67, $p < .01$). The model explained 8% of the variance in the children's referential forms (Nagelkerke $R^2 = .08$). Overall, the model correctly classified 63%; but the null model correctly predicted 58.8% of referential choices. As the results in Table 2 shows, the interaction between use of deictic gestures and newness in discourse was significant ($p < .05$). That is, the children were approximately 6 times more likely to use non-lexical forms for new referents when they used a deictic gesture accompanying their speech ($e^B = 6.08$, $p = .05$).

Table 2. Binary logistic regressions for the effects of prior mention and accompanying nonverbal acts on the children's referential forms at ages 1;00, 1;05, and 1;09.

Age	Predictors	B	S.E.	Wald	df	Sig.	Exp (B)
1;00 (main effect model)	Nonverbal act			.00	2	1	
	Deictic gestures	-18.43	20096.49	.00	1	1	.00
	Communicative funcitonal acts	38.42	13424.63	.00	1	1	4.87E+16
	Prior mention (new)	-16.26	9586.95	.00	1	1	.00
1;05 (interaction effect model)	Nonverbal act			8.5	2	.014	
	Deictic gestures	-1.52	.84	3.27	1	.070	.22
	Communicative funcitonal acts	1.21	.76	2.52	1	.113	3.35
	Prior mention (new)	-1.52	1.31	1.35	1	.244	.22
	Nonverbal act X Prior mention (New)			.23	2	.893	
	Deictic X Prior mention (New)	23.42	23205.42	.00	1	1	1.48E+10
	Communicative functional X Prior mention (New)	.87	1.83	.23	1	.634	2.39
1;09 (interaction effect model)	Nonverbal act			3.28	2	.194	
	Deictic gestures	-.18	.30	.35	1	.553	.84
	Communicative funcitonal acts	.56	.39	2.09	1	.148	1.75
	Prior mention (new)	-2.28	.79	8.36	1	.004	.10
	Nonverbal act X Prior mention (New)			3.93	2	.140	
	Deictic X Prior mention (New)	1.8	.92	3.86	1	.049	6.08
	Communicative functional X Prior mention (New)	1.52	1.01	2.26	1	.133	4.58

Caregivers

Caregivers' data respectively included 363, 496, and 748 verbal referential acts when the children were aged 1;00, 1;05, and 1;09.

At age 1;00, the main effect model with two predictor variables (i.e. type of accompanying nonverbal acts and prior mention in discourse) was significantly more reliable than the null model (χ^2 (3)= 89.55, $p < .001$), explaining 29% of the variance in the caregivers' referential forms (Nagelkerke $R^2 = .29$). Overall, the model successfully predicted 70.2 % of referential choices, at a higher rate than the null model's classification success (54.5%). As Table 3 presents, the results showed that both types of accompanying nonverbal acts ($p < .001$) and prior mention in discourse ($p < .001$) significantly contributed to the model. The caregivers were more likely to use non-lexical forms if a communicative functional act accompanied their referential speech ($p < .001$). That is, a referent was approximately 4 times more likely to be expressed by a non-lexical form in the presence of an accompanying communicative functional act ($e^B = 3.83$, $p < .001$). However, they were less likely to use non-lexical forms if they used a deictic gesture accompanying their speech ($p < .05$) or when the interaction was about a new entity ($p < .001$). Use of an accompanying deictic gesture decreased the odds of the caregivers' use of non-lexical forms by 61% ($e^B = .49$, $p < .05$) and talking about a new referent decreased the odds of their use of non-lexical forms by 83% ($e^B = .17$, $p < .001$). The Wald statistics indicated that the effect of prior mention on the caregivers' referential forms (Wald $\chi^2 = 37.05$) was stronger than either the effect of deictic gestures (Wald $\chi^2 = 5.10$) or communicative functional acts (Wald $\chi^2 = 23.34$).

At age 1;05, the main effect model with two predictor variables (i.e. type of accompanying nonverbal acts and prior mention in discourse) fitted the data significantly better than the null model (χ^2 (3) = 80.22, $p < .001$) and explained 20% of variance in the caregivers' referential forms (Nagelkerke R^2 = .20). Overall, the model correctly classified 70.8% whereas the null model correctly classified 62.3% of referential choices. As Table 3 shows, only accompanying communicative functional acts ($p < .001$) and prior mention in discourse ($p < .001$) were significantly associated with the caregivers' referential forms. The caregivers' likelihood of using non-lexical forms was significantly higher when the caregiver's speech was accompanied by a communicative functional act, that is, the odds of use of non-lexical forms 2.5 times higher in the presence of a communicative functional act (e^B = 2.51, $p < .001$). However, the caregivers' likelihood for using non-lexical forms was lower when they talked about a new referent ($p < .001$). In other words, talking about a new referent decreased the caregiver's probability of using a non-lexical form by 79% (e^B = .21, $p < .001$). The Wald statistics showed that prior mention in discourse played a more important role than accompanying communicative functional acts in the caregivers' referential choices (Wald χ^2 = 44.62 and Wald χ^2 = 15, respectively).

At age 1;09, the main effect model with two predictor variables (i.e. type of accompanying nonverbal acts and prior mention in discourse) was significantly more reliable than the null model (χ^2 (3) = 56.17, $p < .001$). The model explained almost 10% of the variance in the caregivers' referential forms (Nagelkerke R^2 = .097). Overall, the model correctly classified 61.9%; but the null model correctly predicted 54% of the caregivers' referential choices. The results showed that both types of accompanying nonverbal acts ($p < .01$) and also prior mention

in discourse ($p < .001$) significantly predicted the caregivers' referential forms. That is, accompanying communicative functional acts increased the caregivers' likelihood of using a non-lexical form by almost 2 times ($e^B = 1.75$, $p < .01$). However, using a deictic gesture ($e^B = .56$, $p < .01$) or talking about a new referent ($e^B = .38$, $p < .001$) dropped the caregivers' probability of using a non-lexical form by respectively 44% and 62%. The Wald statistics showed that prior mention in discourse (Wald $\chi^2 = 26.48$) had a stronger effect than either communicative functional acts (Wald $\chi^2 = 8.74$) or deictic gestures (Wald $\chi^2 = 9.13$) on the caregivers' choices of referential forms (see Table 3).

Table 3. Binary logistic regressions for the effects of prior mention and accompanying nonverbal acts on the caregivers' referential forms at chilren's ages of 1;00, 1;05, and 1;09.

Age	Predictors	B	S.E.	Wald	df	Sig.	Exp (B)
1;00 (main effect model)	Nonverbal act			42.6	2	.000	
	Deictic gestures	-.72	.32	5.1	1	.024	.49
	Communicative functional acts	1.34	.28	23.34	1	.000	3.83
	Prior mention (new)	-1.79	.29	37.05	1	.000	.17
1;05 (main effect model)	Nonverbal act			21.98	2	.000	
	Deictic gestures	-.37	.27	1.85	1	.174	.69
	Communicative functional acts	.92	.24	15	1	.000	2.51
	Prior mention (new)	-1.56	.23	44.62	1	.000	.21
1;09 (main effect model)	Nonverbal act			24.86	2	.000	
	Deictic gestures	-.59	.19	9.13	1	.003	.56
	Communicative functional acts	.56	.19	8.74	1	.003	1.75
	Prior mention (new)	-.96	.19	26.48	1	.000	.38

Summary of results

At ages 1;00 and 1;05, most of the children's referential interactions were nonverbal, which were followed by vocal and verbal referential attempts. However, at the age of 1;09, most of children's referential interactions became verbal, followed by nonverbal acts and then vocalizations. Unlike the children, at each time point, the caregivers' referential interactions were mostly verbal, which were followed by nonverbal and vocal attempts. In both the child and the caregiver data, as the children got older, the number of vocal and nonverbal referential interactions decreased and gave room to verbal ones. In a considerable amount of verbal interactions in both the child and the caregiver data, referential forms were accompanied by various nonverbal acts. These acts mostly included deictic gestures and communicative functional acts; but a few iconic gestures.

At the ages of 1;00 and 1;05, the children were more likely to use communicative functional acts accompanying their non-lexical forms but deictic gestures accompanying their lexical forms; however, at age 1;09, they began to use deictic gestures rather than communicative functional acts accompanying either non-lexical or lexical forms. At each time point, the caregivers consistently tended to use communicative functional acts accompanying their non-lexical forms but deictic gestures accompanying their lexical forms.

We also conducted a set of logistic regressions to examine the contribution of different types of accompanying nonverbal acts in comparison to prior mention in discourse to both the children's and caregivers' choices of referential forms. It is important to note that, in both the child and the caregiver data, the predictive power of null models was very high. Indeed, in the child data it differed between 58.8% and 72.5% and, in the caregiver data, it varied between

54% and 62.3%. This situation might have resulted from the pro-drop structure of Turkish. Indeed, a similar phenomenon was encountered in other pro-drop languages as well. For example, Allen's (2000) research in Inuktitut showed that the model with no predictors already explained 66% of the third-person argument forms. The results showed that, at the earlier time points (ages 1;00 and 1;05), the children's referential forms did not show sensitivity to either accompanying nonverbal acts or prior mention in discourse. As they became more competent users of language by age 1;09, the children began to show sensitivity to discourse-pragmatic knowledge by showing a tendency of using non-lexical forms for new referents especially when they employed a deictic gesture accompanying their referential speech. Unlike the children, the caregivers' referential choices were sensitive to both nonverbal acts accompanying their referential speech and prior mention in discourse beginning from the early ages of the children. At each time point, prior mention consistently played a more important role in comparison to accompanying nonverbal acts on the caregivers' referential forms.

DISCUSSION

Children learn to develop their referential skills and vocabulary knowledge in interactions with their caregivers in everyday contexts. Early period of referential communication include a lot of vocalizations and/or nonverbal actions and relatively fewer verbal productions about external entities (Stephens & Matthews, 2014). Representing this early period, we tapped into semi-naturalistic interactions of very young Turkish learners with their caregivers before age 2. The main aim of the present study was to investigate how different types of nonverbal acts (i.e. deictic gestures and communicative functional acts) and prior mention in discourse are integrated in children's verbal interactions with their caregivers

about referents in their external environments between age 1;00 and 1;09. As a secondary aim, we examined the patterns of verbal and nonverbal strategies in the caregiver input as one potential source for children to learn discourse-pragmatic principles. Specifically, we examined (dis)similarities between the children's and the caregivers' use of verbal and nonverbal referential strategies.

The results showed that, when we consider both verbal and nonverbal behaviors, the children began to show sensitivity to discourse status of referents at the age of 1;09. That is, they tended to use non-lexical forms for new referents especially in the presence of deictic gestures accompanying their referential speech. A closer look at the data showed that respectively 19%, 16%, and 13% of the children's non-lexical forms referred to new referents at ages 1;00, 1;05, and 1;09. The use of non-lexical forms for new referents was documented in previous research as well (e.g. Guerriero et al., 2006; Skarabela & Allen, 2010; Skarabela, Allen, & Scott-Philips, 2013). We found here that 91% of the non-lexical forms referring to new referents occurred in the presence of a nonverbal act. When we investigated the types of nonverbal acts accompanying non-lexical forms for new referents, we found that, the children used deictic gestures in most (58%) of these situations. These findings suggested that, before age 2, children have some nonverbal social-pragmatic knowledge; but they are not yet competent in demonstrating this knowledge in their use of linguistic devices. In other words, at early ages, children's inappropriate argument omissions for new referents seem to result from their limited linguistic skills rather than their limited understanding of discourse-pragmatic principles (Guerriero et al., 2006; Gürcanlı et al., 2007). A closer look at the data supported this argument. At age 1;05 (as opposed to the earlier examined time point of 1;00), the children

began to build sentences with some inflections (e.g. *Ø gel-di* '(my mother) came'); but still did not yet include noun and verb combinations. Only at the age of 1;09, fully formed argument structures that include nouns and verbs were attested such as *Ø park-a git-ti-k* '(we) went to the playground' or *Ø sabah gel-ecek* '(the turtle) will come the next morning.' This structure in the children's data set strengthened the possibility that children might be aware of prior mention in discourse beginning from age 1;05; but they did not have higher level of linguistic knowledge (and even appropriate use of deictic gestures) until the age of 1;09 for displaying this knowledge. In fact, at the ages 1;00 and 1;05, the children were more likely to use communicative functional acts accompanying their non-lexical forms and deictic gestures accompanying their lexical forms. However, at age 1;09, they began to mainly use deictic gestures accompanying both their non-lexical and lexical forms. Deictic gestures accompanying non-lexical forms might take place of argument structures (e.g. nouns) children are not able to produce yet. Deictic gestures accompanying lexical forms, as previous research showed as well, might be used to convey information or thoughts that cannot be yet fully expressed in children's speech lacking of complex structures referring to detailed information (Church & Goldin-Meadow, 1986; Demir & So, 2006; Garber et al., 1998; Goldin-Meadow, 2005; Goldin-Meadow et al., 1993; Goldin-Meadow & Butcher, 2003; Iverson & Goldin-Meadow, 2005; Özçalışkan & Goldin-Meadow, 2005). Thus, these findings altogether supported the proposal that children use nonverbal strategies (especially deictic gestures) early on in order to supplement their limited linguistic knowledge (Goldin-Meadow & Butcher, 2003; Iverson & Goldin-Meadow, 2005; Özçalışkan & Goldin-Meadow, 2005; see also Furman et al., 2014 for Turkish learners).

Unlike the children, the caregivers consistently chose their referential forms in accordance with discourse status of referents. That is, at all age points in the present study, the caregivers were less likely to use non-lexical forms while talking about new referents. At each age point, the caregivers also tended to use communicative functional acts accompanying their non-lexical forms and deictic gestures accompanying their lexical forms. Indeed, logistic regressions showed that the caregivers' likelihood of using non-lexical forms increased in the presence of communicative functional acts; but decreased in the presence of deictic gestures. To examine whether the caregivers use nonverbal strategies as supplementary to their referential speech we examined the cases where the caregivers used inadequately informative forms. Respectively 13%, 12%, and 14% of the caregivers' non-lexical forms referred to new referents at ages 1;00, 1;05, and 1;09. Similar to the children, the caregivers used non-lexical forms for new referents mostly in the presence of nonverbal acts. That is, 72%, 45%, and 51% of the caregivers' non-lexical forms referring to new referents occurred in the presence of a nonverbal act respectively at the ages of 1;00; 1;05, and 1;09. However, unlike the children, they mostly used communicative functional acts (ranging at rates from 70% to 83%) in these situations. When we closely looked at the dataset, these cases mostly occurred when the children and the caregivers interacted about an object, mostly during a play with toys. For example, one caregiver took a new toy from the floor and tried to show how the toy works by saying *buraya bas* 'Press here (a button on the toy).' Another caregiver said *bunu çevir* 'Turn this.' while showing how the arm of a potato man was turned in order to make him say 'hello'. As another example, one mother tried to teach to her child how they can play with a toy truck by sending it towards the father saying *Ha(y)di bunu Süleyman'a gönderelim* 'Let's send this to

Süleyman [= the father's name].' In such interactions, the caregivers mostly focused on the activity itself by using communicative functional acts depicting the verbs in their utterances and therefore dropped the lexical forms from their utterances, which is consistent with previous research showing that interactive contexts such as toy play increased the caregivers' focus on verbs in their speech to their 1- to 2-year-old children (Choi, 2000; Ogura, Dale, Yamashita, Murase, & Mahieu, 2006). The cases where the caregivers used deictic gestures accompanying their nouns (from 50% to 71% for new and from 49% to 66% for mentioned referents between the ages of 1;00 and 1;09) mostly represented their active attempts to teach new words or to direct children's attention to an entity and mostly occurred during book-reading. Therefore, it seems that caregivers use different types of nonverbal acts accompanying their referential forms in accordance with their changing communicative intentions in different interactive situations.

Taken together these results are consistent with previous studies showing that, beginning from 2 years of age, children's speech samples (e.g. Campbell et al., 2000; Huang, 2011; Matthews et al., 2006; Rozendaal & Baker, 2008; Salomo et al., 2010; Salomo, et al., 2011) and also caregivers' child-directed speech (e.g. Clancy, 1993; Guerriero et al., 2006; Huang, 2012; Rozendaal & Baker, 2008) show sensitivity to discourse status of referents. Moreover, our results are consistent with So and Lim's (2012) study showing that, children (and also caregivers) speaking pro-drop languages employ nonverbal strategies sensitively to discourse status of referents. In spite of some similarities, at each time point, we also found some important divergences in the patterns of the children's and the caregivers' verbal and nonverbal

referential interactions; which suggests that we cannot explain the development of children's use of discourse-pragmatic principles simply by emulation of the features in caregiver input.

Our results also supported Skarabela and colleagues' (Skarabela, 2007; Skarabela & Allen, 2010; Skarabelai et al., 2013) argument suggesting that there might be multiple ways in making a new referent cognitively accessible to a listener. Although newness in discourse context is potentially informative for listeners in achieving referential clarity, novice learners of referential communication do not yet verbally use discourse-based cues in building their referential interactions. By 1;09 years of age, though, children gain competency at taking into account prior mention in previous linguistic contexts as they become more masterful users of their language. On the other hand, nonverbal acts are devices that are used by children to complement their referential forms from early on, being integrated into referential interactions as early as the first year of life. Therefore, our study added to a growing body of literature showing that before children develop referential skills of linguistic nature, children and caregivers work together by employing nonverbal pragmatic strategies to make referents accessible to one another and buttress their referential interactions.

In spite of the stated contributions, the present study has some important limitations. First, our sample size was restricted to four children and our data set was not normally distributed. To deal with the non-normally distributed data set, we used logistic regression not requiring the assumptions of normality of errors and homogenity of variance. However, the results still should be cautiously interpreted considering the nested structure of the data set (i.e. referential forms of the same children at three different time points). Second, some researchers claimed that discourse-pragmatic features work together rather than in isolation

from each other, supporting this claim, they found that children omitted arguments for new entities in communicative situations where children and their caregivers jointly attended to a target entity (Skarabela & Allen, 2010; Skarabela et al., 2013). Therefore, one possibility is that both children and the caregivers used non-lexical forms for new referents particularly in joint attentional episodes, but our data did not allow coding these episodes since there were a lot of cases where the whole body parts (especially faces) of the children and/or the caregivers are not visually available to the coders.

The present study also suggests new directions for future research. Future studies would examine how children and caregivers use linguistic and non-linguistic pragmatic strategies within an extended interaction with a lot of communicative breakdowns and/or repairs (Ateş-Şen & Küntay, 2015) and continued/sustained interactions referring to third-person entities, which is called as 'referential sets' (Ateş-Şen, 2010). Rohde and Frank (2014) showed that caregivers' social cues (hand and eye position) and referential forms used to address an object while interacting with their children changed over the course of a sequence of topically related utterances. Early on in discourse, the caregivers were more likely to refer to an object at the end of their utterance and with accompanying social cues. However, later on in discourse, they were less likely to state a referent in the final position of their sentences and more likely to use pronominal forms for these referents. They were also less likely to use social cues accompanying these referents. Therefore, the position of referents within an extended discourse (discourse position) and within a sentence (sentential position) might change caregivers' and children's use of linguistic and non-linguistic pragmatic strategies. Future research would also investigate how

other types of nonverbal actions (e.g. looks and touches to target referent) work together with linguistic discourse-pragmatic principles in children's and caregivers' referential decisions.

CHAPTER 3

WHEN SOCIO-PRAGMATIC AND LEXICAL CUES COMPETE: DOES PRESCHOOLERS' REFERENTIAL COMPREHENSION HAVE MULTIPLE PHASES[3]

Footnotes

[3] Ateş, Ş. B., Grassmann, S., & Küntay, C. A. (submitted). When socio-pragmatic and lexical cues compete: Does preschoolers' referential comprehension have multiple-phases. Submitted to *the Journal of Experimental Child Psychology.*

ABSTRACT

Previous research showed that children integrate ostensive pointing and labeling in reference resolution. We examined whether reference resolution is a multi-step process during which pointing and labeling are weighted differently. Specifically, we examined children's object selection when an adult's ostensive pointing contradicted with her labeling. To tap multiple steps in reference resolution, we coded which object(s) the children touched first (i.e. first-touches) as well as which object(s) they took away to give it another adult (i.e. take-aways). The results demonstrated that ostensive pointing is a more primordial cue than labeling in both phases of young children's reference resolution. The current findings extended earlier studies showing that the children often demonstrated instability in their object choices – e.g. by touching the pointed object first but taking away both objects. The effect of ostensive pointing was pronounced more in first-touches in initial steps and the effect of lexical cues became stronger in take-aways in later phases. In addition we found that the children's age, their individual cognitive profiles (expressive vocabulary and selective attention), and the pre-

activation of labels all affected how much the children relied on socio-pragmatic or lexical cues at different phases during the reference resolution process. These results suggest that children's reference resolution is a multi-step process comprising an active monitoring and updating of initial interpretations to which social-pragmatic and lexical cues contribute differently at distinct phases.

Keywords: Reference resolution, disambiguation strategies, ostensive pointing, labeling, cognitive factors, referential context

INTRODUCTION

Identifying the referents of novel words could be a challenge in real time communication and lies at the core of vocabulary learning in everyday life. Children often face complex situations of potentially many-to-many mappings between referents and communicative cues when learning words. A novel word often arrives in the presence of many potential referents, or the same word is heard for distinct referents.

It is widely accepted that a variety of cues provided by interactive partners play a role to facilitate children's reference resolution (Baldwin, 1991; 1993; Baldwin, Markman, Bill, Desjardins, Irwin, & Tidball, 1996; Golinkoff, Hirsh-Pasek, Bailey, & Wenger, 1992; Hansen & Markman, 2009; Markman & Wachtel, 1988; Markman, Wasow, & Hansen, 2003; Tomasello, 2001; 2006). For example, from about 18 months on, children assign labels to the object that a speaker is pointing at (Hollich, Hirsh-Pasek, & Golinkoff, 2000) and from the same age on, children exclude familiar objects as referents of novel labels and assign novel labels to objects that they do not yet know a label for (Graham, Poulin-Dubois, & Baker, 1998).

In most word learning studies it is assumed that reference resolution takes place in one singular step. Indeed, in adult psycholinguistic research, it is widely accepted that reference resolution is a multi-step process (Brown & Dell, 1987; Dell & Brown, 1991; Horton & Keysar, 1996; Keysar, Barr, & Balin, 1998; Keysar, Barr, Balin, & Brauner, 2000; Keysar, Barr, & Horton, 1998; Keysar & Horton, 1998). Merriman (1999) adopted this view and applied it to children's word learning in the CALLED model- which stands for "competition, attention, and learned lexical descriptions". According to this model, referent resolution requires a person to;

1) phonologically represent a novel word in their working memory,
2) retrieve the lexical labels of candidate familiar objects from long-term to working memory,
3) compare these representations with that of novel word, and
4) judge the (mis)match between them and to exclude the object(s) that mismatch with the representation of the novel word (Merriman, 1999; Merriman & Marazita, 1995).

For example, when a child is asked to match a novel word (i.e. *pilson*) to one of the two alternative referents (e.g. a car or a gyroscope), she/he needs to;

1) establish a phonological representation of "*pilson*" in her/his working memory
2) retrieve the phonological representations of "*car*" and "*gyroscope*" from the long term to working memory,
3) compare the representation of car and that of gyroscope with pilson, and
4) judge the mismatch between the different pairs of these representations (i.e. pilson-car and pilson-gyroscope).

Another model of multi-step referential comprehension is the Monitoring and Adjustment Model, originally developed for adult's use of common ground knowledge in referential comprehension process (Horton & Keysar, 1996; Keysar et al., 1998; Keysar & Horton, 1998). According to this model, referential communication is an effortful process requiring to continuously monitor quickly accessed initial interpretations about the intent of a communicative partner and update these interpretations when it is necessary (e.g. in the presence of initial errors). Higher level knowledge such as pragmatic knowledge of common ground plays a role in this process (Horton & Keysar, 1996; Keysar et al., 1998). This model is easily applicable to children's referential comprehension process. For instance, a child plays with a doll in her room, putting on shoes on the doll. From a distance the parent asks her to put (the) shoes into the closet. She might egocentrically think that the parent refers to the doll's shoes; but after a while she might realize that the parent is away and does not see the doll play. A quick search in her memory might be resulted in realizing the information in common ground with her mother, which might lead to a new interpretation: the parent must have been referring to the shoes left in front of the apartment door a few minutes ago.

It is apparent, that in both examples – the first one about a child's interpretation of a novel word and the second one about a child's interpretation of a familiar word comprise at least two steps in which the reference made by the speaker is interpreted in different ways. The current study is taking a closer look at the reference resolution process in order to determine whether the reference resolution proceeds in a single-step or is a multi-step process. One way to approach this question is to examine whether children change their minds and adjust an initial interpretation when reference resolution is difficult.

A paradigm that seems well suited to address this question is one in which different referential cues conflict with one another, because it allows tackling the question whether these two cues are weighed at different degrees at different times during reference resolution. So far, a recent line of research has been using conflicting cues to establish the relative contribution of linguistic (e.g. verbal labels) and nonverbal cues (e.g. gestures and eye-gaze) to reference resolution (Grassmann & Tomasello, 2010; Jaswal & Hansen, 2006). The results of these studies indicate that children use both types of cues; however which type of cue has more primacy depends on the nature of the cues. For example, 3- to 4-year-old children followed novel labels rather than pointing (or looking) when an adult used a novel label (i.e. *blicket*) while simultaneously pointing to or looking at a familiar object (Jaswal & Hansen, 2006). In contrast, children's preference shifts to pointing when pointing was performed ostensively and with gaze alternation (Grassmann & Tomasello, 2010). One way to interpret these different outcomes is that there might be several steps in the reference resolution process during which an initial interpretation is updated in one of the experimental situations but not in the other. In Jaswal & Hansen (2006) and Grassmann & Tomasello (2010), the toy picked up or given to the experimenter was coded as the outcome of the reference resolution process. In addition, when both toys were picked up, Grassmann and Tomasello (2010) accepted the one touched first as the outcome of the reference resolution process; but when a child simultaneously touched both toys, they coded these cases as "no choice". Thus, these experiments focused on the children's ultimate decisions but disregarded the fact that children sometimes changed their initial choice. In the current study we pay particular attention to these latter cases, because they provide an opportunity to examine the multi-step process in children's reference resolution.

To investigate multi-step process in reference resolution, we examined children's distinct object selection behaviors (i.e. first-touches and take-aways) in a reference resolution task in which pointing and labeling conflicted with one another. We also examined whether certain properties of the behavior elicitation context (namely the novel-familiar and the familiar-familiar conditions) might affect children's reference resolution process. Since previous disambiguation experiments showed that children's tendency of relying on ostensive pointing decreased when the verbal label is familiar rather than novel to children (Grassmann & Tomasello, 2010), we ran two conditions in Study 1: one in which a pointing gesture was pitted against a novel label (novel-familiar condition) and one in which the pointing gesture was pitted against a familiar label (familiar-familiar condition). In addition, in Study 2, we examined whether recently activated lexical knowledge affects children's reliance on it relative to the pointing cue.

As a secondary aim in Study 1 and 2, we aim to investigate individual differences in children's reference resolution. Specifically, since Grassmann and Tomasello (2010) report that the children's disambiguation strategies showed variability for children in the same age group (Half of the 4-year-olds followed pointing whereas the other half followed labeling either when the two objects were familiar or only the pointed object was familiar), we examined whether individual-level cognitive skills, specifically a) vocabulary knowledge and b) selective attention, play a role in how children resolve referential ambiguity. Vocabulary knowledge (a) is likely to play a role in reference resolution as it determines how strongly children may or may not trust their interpretation of a verbal cue. Indeed, Verhagen, Grassmann, and Küntay (submitted) found that monolingual children with lower vocabulary knowledge were more likely to follow

pointing in referentially ambiguous situations than children with larger vocabulary knowledge, and – in addition – bilinguals relied on pointing more in their weaker than in their stronger language. Selective attention (b) is likely to play a role in reference resolution as only selective attention to the appropriate referent or relevant properties of a referent for a given label also leads to successful word learning (Smith, 2000; Smith, Jones, & Landau, 1996). Specifically, in a novel word learning situation, the activation of previously learnt associations between the familiar object and a corresponding familiar word must direct a child's attention to the novel object, which requires good attentional control skills (Yoshida & Hanania, 2007). Consistent with this expectation, Yoshida, Tran, Benitez, & Kuwabara (2011) found a relationship between three-year-old children's adjective learning and inhibitory control skills in a task comparing bilingual and monolingual children's performance in a novel adjective learning task.

STUDY 1

In the current study we used a modified procedure of Grassmann and Tomasello (2010). In their study, the children were requested to give one of two objects on a table to an experimenter once the experimenter labeled one object while ostensively pointing to the other object. Once the children made a selection, they were immediately allowed to play with the toy by sliding it through a chute together with the experimenter. We modified this procedure in two ways: 1) We used two experimenters in two separate rooms. Experimenter 1 replicated the procedures of Grassmann and Tomasello (2010), but asked children to take the selected object(s) to Experimenter 2 in another room to play with this object by sliding it through a chute, and 2) Experimenter 2 asked the children to name the object they brought before starting to play with it. These modifications were deemed important since preventing

immediate play with the selected toy and a chute after making a selection might lessen the tendency of children to make hasty choices, and increase chances of showing evidence of referential uncertainty in their behavior. In order to identify cases of referential uncertainty in the children, we examined;

(1) whether the children's preference for following labels or points differ when their first-touches and take-aways are examined separately, or whether their preferences are consistent across these different criteria of object selection,

(2) whether children exhibit any verbal behaviors showing an explicit awareness of the ambiguity and whether their object selection was affected by these behaviors,

(3) in addition, whether children's reliance on labeling or ostensive pointing to determine their first-touches and take-aways shows variability depending on their age, expressive vocabulary knowledge, and selective attention skills.

METHOD

Participants

Forty-four 2- to 4-year-old (*M* = 34.05, *SD* = 8.4) typically developing, native learners of Turkish participated in the current study. They were randomly assigned to one of two object choice conditions. In the *novel-familiar* condition, there were 23 children (8 females and 15 males) with a mean age of 33.39 (*SD* = 8.24), ranging between 21 and 56 months. In the *familiar-familiar* condition, there were 21 children (9 females, 12 males) with a mean age of 34.76 (*SD* = 8.71), ranging between 21 and 49 months. The mothers' education ranged between 5 to 26 years (*M* = 15.28, *SD* = 3.96) whereas the fathers' education ranged between 5 to 24 years (*M* = 15, *SD* = 4.18).

Referential object choice experiment

The experiment was conducted in two separate rooms. In Room 1, children were asked to sit on a child-sized chair across a child-sized table from Experimenter 1. They were then given the referential object choice task. In the novel-familiar condition, one novel and one familiar object, and in the familiar-familiar condition, two familiar objects were presented in each trial. There were four trials in each condition. The children were shown two objects for each trial and were asked to pick and take one of these objects over to Experimenter 2, who was in Room 2 across the corridor, to play with the toy by sliding it through a chute in a standing position. In all the sessions the first author served as Experimenter 1 and two senior psychology students were trained to serve as Experimenter 2.

Materials

There were eleven familiar and four non-familiar objects in the experiment. The familiar objects were chosen to match vocabulary items from four different semantic categories (i.e. animals, furniture, household items, and toys) in the *Turkish Communicative Development Inventory-II* (TIGE-II) (Acarlar et al., 2009), the Turkish adaptation of Bates-MacArthur Communicative Development Inventory (BM-CDI) for 18- to 36-months (Fenson et al., 1993). Thus, all items used were objects and words typically produced by 2-year-old Turkish-speaking children. The objects used in the warm-up trials were a toy car, a fish figure, and a toy bag. The object pairs used in the testing trials were a bird and a dog figure (from the category of animals), a toy table and a toy bed (from the category of furniture), a toy glass and a toy spoon (from the category of household items), and a doll and a ball (from the category of toys). The

four non-familiar objects used in the testing trials were a dropper, a cookie cutter, a cork stopper, and a water filter.

The four novel labels used in the testing trials were all two-syllable words that abide by Turkish phonotactical constraints: *mota*, *leti*, *fike*, and *tomu*. The order of object pairs, the order of novel labels, and the left-right positioning of the novel and familiar objects on the table were counterbalanced across participants.

Other measures

Turkish Communicative Development Inventory-II (TIGE-II) (Acarlar et. al., 2009): We measured the children's expressive vocabulary skills using the Turkish adaptation of Bates-MacArthur Communicative Development Inventory (TIGE-II), a parental report designed for measuring 18- to 36-month-old children's early language and communication skills including first nonverbal gestures, receptive vocabulary, expressive vocabulary, and the beginnings of grammar. In the present study, the primary caregivers (i.e. usually the mothers) filled the inventory before the experimental session began. For subsequent analyses we only used the children's age-standardized percentile scores obtained from the expressive vocabulary section of this inventory. However, because of the age restriction of TİGE-II inventory no expressive vocabulary scores were available for the children older than 36 months.

PreCOOL Selective Attention Test (Mulder, Hoofs, Verhagen, van der Veen, & Leseman, 2014): We measured the children's selective attention using a computerized visual search task that measures children's ability to focus on relevant information while ignoring distracting stimuli. The test requires children find a target animal figure (i.e. always an elephant) as quickly as possible among three types of similarly drawn and colored alternatives (i.e., elephant,

donkey, and bear). When the children locate an animal by pointing to or touching the screen, the assessor crosses off the animal with a line. We used distinct versions of the same task for the 2-, 3-, and 4-year olds. In each version, the children are given three 40-second testing trials after three practice trials. For the 2-year-olds, each testing trial includes a total of 48 animals in a 6x8 grid and the target to distractor ratio was 1:5. For the 3- and 4-year-olds, the test similarly includes three testing trials, but the third trial includes a total of 72 animals in a 8x9 grid and the target to distractor ratio was 1:8. For the 4-year-olds, there is also a fourth testing trial that includes a total of 204 animals in a 12x17 grid with the target to distractor ratio of 1:11. The children's performance on the task was evaluated based on the mean accuracy score defined as the sum of the number of correctly located targets in each trial. The range of this accuracy score is between 0 and 8 for 2- and 3-year-olds and between 0 and 10.25 for 4-year-olds. Children were excluded when they did not find any targets, pointed to 20 or more animals during a testing trial, looked away from the screen for the whole duration of a testing trial, or when the referents of their points were not clear.

Procedure

The children were tested individually by the first author (Experimenter 1) and one of two research assistants (Experimenter 2) in *the Language and Communication Development Lab at* Koç University. Before the experimental session began, the parents were shown the experimental objects used in the warm-up and testing sessions and were asked to report whether their child knows the labels for the familiar objects, and not for the novel objects. Although we had a second set of familiar and novel objects, we did not need to use any of these

objects since the participants were reported to be familiar with the familiar objects and unfamiliar with the novel objects.

Each child was familiarized with the experimental setting and the procedures of the activity through a warm-up session including three trials with different toys (i.e. a toy car, a fish figure, and a toy bag). In the warm-up trials, Experimenter 1 put one object at a time onto the table and requested the child to take this object to Experimenter 2 by saying '*Take/give this to [the name of Experimenter 2].'* without using any labels for the object. Once the child brought the object to Experimenter 2, she encouraged the child to play with the toy by sliding it through the chute. During this play, the instructions (i.e. *'Oh, Welcome! This is such as a beautiful thing! Let's play with it!'*) did not include any labels for the toy.

The testing sessions included four trials with different pairs of objects. In the novel-familiar object condition, the experimenter placed one familiar (e.g. a bird) and one novel object (e.g. a water filter) on the table and used a novel label representing the novel object (e.g. '*Let's take/give the mota to [the name of Experimenter 2].')* while ostensively pointing to the familiar object (e.g. bird). In the familiar-familiar condition, she placed two familiar objects (e.g. a bird and a dog) on the table and labeled one (e.g. dog) while simultaneously pointing to the other (e.g. bird). In both conditions, the verbal instructions were repeated twice at most. The experimenter pointed ostensively, extending the gesture at the onset of the verbal instruction and ending it when the utterance was over.

Once the child passed an object to Experimenter 2 in the other room, Experimenter 2 warmly welcomed the child and asked the child for the name of the object, repeating the question three times at most, until the child produced an actual name for the selected object.

The first two questions (*'What have you brought to me?',* and *'What is this?')* were posed to the child before the experimenter and the child began to slide the object through the chute and the last one ('*What is this called?')* was asked at the end of the play with the chute. Once the experimental procedure was over, the Pre-COOL Selective Attention Task was administered in a separate room.

Coding and reliability

Object selection

We coded two different object selection behaviors produced by the children: 1) the object(s) touched first (first-touches), and 2) the object(s) taken away to be given to Experimenter 2 (take-aways). The coding categories were one of three types for both object selection behaviors: 1) selecting the labeled object (i.e. touching or taking away the labeled object), 2) selecting the pointed object (i.e. touching or taking away the pointed object), and 3) selecting both objects (i.e. simultaneously touching or taking away both the labeled and the pointed object).

Requests for clarification

We also coded each trial with regard to whether the children made any clarification requests about the contradiction between the experimenter's labeling and pointing. We accepted a behavior as a clarification request if the children verbally mentioned the contradiction between the two cues. In most cases, there was at least one nonverbal behavior (e.g. pointing, showing, etc.) accompanying these verbal reactions. Each trial took a binary value: request-absent vs. request-present. If the children showed at least one verbal request, we coded this trial as request-present, otherwise as request-absent. The children's reactions

included asking clarification questions (e.g. '*Is this the one?*' or '*What is this*?') while showing one of the objects to the experimenter, correcting the name of the object(s) ('*This is a bed and this is a table*.' or *'This is not a bird, but a dog.'*), repeating the novel label (e.g. *'Leti'*, or *'This is leti, it is for eating meals.'*) while showing the familiar object (e.g. a table), correcting which object should be taken to Experimenter 2 (e.g. *'Take this one.'*) while moving Experimenter 1's index finger's pointing direction from the familiar towards the novel object.

A trained research assistant coded the children's object selection behaviors in a randomly selected sample of 11 videos (6 from the novel-familiar and 5 from the familiar-familiar condition). As estimated by Cohen's Kappa, the interrater reliability values for first-touches and take-aways were respectively .90 and .96.

Overview of analyses

To examine whether the children's preference for following labels or points changed in the two distinct behaviors of object selection (i.e. first-touches and take-aways), we calculated three frequency scores for both types of object selection behaviors: following label, following point, and following both label and point. We compared the pattern of distribution of these three types of object selection (i.e. label, point, both) for the two types of behaviors (i.e. first-touches vs. take-aways) using chi-square tests. In order to examine whether the children's attention to different cues changes at different points of reference resolution we compared the cases where the children selected the labeled object, pointed object, or both objects between their first-touches and take-aways by using a set of Stuart-Maxwell tests.

We also examined whether the children behaved consistently across first-touches and take-aways in their object selection by calculating the percentage of the trials where the

children take away the same or different object from the one they touched first. Furthermore, we examined whether the (in)consistency in their object selection changed depending on individual child characteristics (i.e. age, vocabulary knowledge, and selective attention). To address this question, in each condition, we compared the number of trials where they showed (in)consistency in object choices across different groups, formed based on a median split of the children's age in days, expressive vocabulary scores, and selective attention scores. In these analyses, the younger age group included 22 children with a mean age of 28.18 months (*SD* = 4.75) whereas the older age group included 22 children with a mean age of 39.91 (*SD* = 7.06). There were 17 children in the lower vocabulary group with a mean age of 30.41 (*SD* = 5.96) while there were 18 children in the higher vocabulary group with a mean age of 31.50 (*SD* = 3.92). The lower selective attention group included 21 children with a mean age of 33.62 (*SD* = 8.81) whereas the higher selective attention group included 16 children with a mean age of 37.69 (*SD* = 6.94). To examine whether the children made their choices in explicitly stated awareness of this ambiguity, we compared the frequency of the three object selection patterns between the trials where the children made at least one clarification request and the trials where they did not make any clarification requests at all. We also compared the number of cases where the children changed their initial object choice between the the trials with and without clarification requests.

To investigate the relative effect of age, vocabulary knowledge, and selective attention on children's first-touches and take-aways, we conducted a set of multinominal logistic regressions. In these analyses we used a subsample of 28 children who had both vocabulary and selective attention scores. We entered age in days, expressive vocabulary knowledge scores,

and selective attention scores into regression as continuous predictors and experimental condition as a categorical predictor, and children's first-touches and take-aways were outcome variables.

RESULTS

Object selections: First-touches and take-aways

Table 1 shows the frequencies of children's following of labels, points, and both labels and points in the novel-familiar and the familiar-familiar conditions, calculated separately for first-touches and take-aways. The children touched the pointed object first in respectively 76% and 58% of the trials in the novel-familiar and the familiar-familiar condition. Which object they touched first differed depending on condition, χ^2 (2) = 6.77, $p < .05$. Marascuilo post hoc comparison tests ($p = .05$) indicated that the children touched the pointed object first significantly more often in the novel-familiar (76%) than in the familiar-familiar condition (58%); however first-touches to the labelled object or simultaneous touches to both objects did not differ between the two conditions. Their touching behavior did not also differ depending on their age group in either of the conditions.

The object selection pattern looks somewhat differently for the children's eventual choice of object which they took away to give it to another experimenter. Specifically, the children took away the pointed object in most of the trials in the novel-familiar condition (62%); however in the familiar-familiar condition the children took away the pointed object or both objects equally often (39%). A Chi-square test revealed that the children's take-aways differed depending on condition, χ^2 (2) = 19.66, $p < .001$. Marascuilo post hoc tests at $p = .05$ indicated that the frequency of taking away the pointed object was significantly higher in the novel-

familiar (62%) than in the familiar-familiar condition (39%). In addition, the frequency of taking away the labeled object was significantly higher in the familiar-familiar (23%) than in the novel-familiar condition (2%). We also found that the children's choices varied depending on their age group in both the novel-familiar (Fisher's exact test, χ^2 (2) = 11.45*, p* = .001) and the familiar-familiar condition (χ^2 (2) = 9.78*, p* < .01). Marascuilo post hoc comparisons (*p* = .05) showed that in the novel-familiar condition the older children took away the pointed object in a significantly higher number of trials (82%) than the younger children did (49%). Furthermore, in both conditions the younger children took away both objects significantly more often than the older ones (novel-familiar condition: 49% vs. 15%; familiar-familiar condition: 59% vs. 25%).

(In)consistency across object selection behaviors

As Table 1 shows, there were a considerable number of trials in both the novel-familiar (34%) and the familiar-familiar conditions (27%) where the children changed their mind by taking another object other than the one they touched first.

In order to examine whether the children's heeding of different cues changes at different points of reference resolution, we compared their first-touches and take-aways using a set of Stuart-Maxwell tests. We found that, both in the familiar-familiar condition and the novel-familiar condition, the distribution of first-touches and take-aways were significantly different from each other (familiar-familiar: χ^2 (2) = 18.00*, p* < .001; novel-familiar: χ^2 (2) = 27.62*, p* < .001. That is, in both conditions, the children changed their object choices from their first-touches to take-aways. In most of these trials, they touched the pointed object first but took away both objects.

For further analyses, in each experimental condition, we separately examined whether the number of inconsistent trials differ depending on the children's age, vocabulary, or selective attention group. As we stated earlier, we used two different sub-datasets to examine the effect of vocabulary and selective attention since not all children had both vocabulary and selective attention scores. The results showed that, in the familiar-familiar condition, the younger children (in 12 out of 22 trials) changed their initial object choice more often than older children did (in 10 out of 22 trials); but this difference wasn't significant, χ^2 (1) = 3.23, p = .07. When we combined the trials coming from the novel-familiar and the familiar-familiar condition, this difference became significant, χ^2 (1) = 4.95, p < .05. That is, the younger children changed their initial object choice in 33 out of 52 trials whereas the older ones changed their initial object choice in 19 out of 52 trials. Moreover, in the familiar-familiar condition, the children with lower selective attention score (in 14 out of 19 trials) changed their initial object choice significantly more often than the ones with higher selective attention score (in 5 out of 19 trials), χ^2 (1) = 3.74, p = .05.

Table 1. Number of trials where labeled, pointed, or both objects were touched first and taken away in the Novel-familiar and Familiar-familiar conditions.

		Take-away					
		Novel-familiar			Familiar-familiar		
		Point	Label	Both	Point	Label	Both
First-touch	Point	49	0	19	30	2	16
	Label	6	2	5	2	17	2
	Both	0	0	8	0	0	14

Note1. Novel-Familiar condition: *N* = 23, Familiar-Familiar condition, *N*= 21

Note2. Missing cases in both the novel-familiar (N= 3) and the familiar-familiar condition (N= 1) are due to experimenter errors.

Requests for clarification

The children verbally reacted to the contradiction between labeling and pointing in a considerable number of the trials in both the novel-familiar and familiar-familiar conditions. There was at least one clarification request in 37% of the trials (34 out of 92) in the novel-familiar and 40% of the trials (34 out of 84) in the familiar-familiar condition. The frequency of clarification requests did not differ across the two conditions.

We first compared children's object choices in each condition between the trials with and without clarification requests. We found that, only in the novel-familiar condition, the children's choice for take-aways but not first-touches differed between the trials with and without clarification requests, Fisher's exact test, χ^2 (2) = 12.35, p = .001. Marascuilo post hoc comparisons (at p = .05) showed that the children were less likely to take away the pointed

object in the presence (41%) rather than in the absence of clarification requests (75%). However, they were more likely to take both objects in the presence (59%) rather than in the absence of clarification requests (22%).

We next compared the children's change of choices in each condition between the trials with and without clarification requests. Only in the-novel-familiar condition, the children were more likely to change their object choice between first-touches and take-aways in the trials with clarification requests (18 out of 34 trials) than in the trials without clarification requests (12 out of 55 trials) (χ^2 (1) = 9.11, $p < .01$). In most of these trials (11 out of 18), the children touched the pointed object first (19 out of 30); but took away both objects to the experimenter in the adjascent room.

Relationship of child's age, vocabulary and selective attention to object choice

As we stated earlier, there were 28 children having both vocabulary and selective attention score. Using this subsample of children between the ages of 21 and 36 months, we investigated the relative contribution of age, expressive vocabulary knowledge, and selective attention on children's object selection through multinominal logistic regression. We used a stepwise procedure including four predictor variables (i.e. age in days, experimental condition, expressive vocabulary score, and selective attention score) and the interaction terms between all the variable pairs. With regard to first-touch, a model including four predictors and the interactions between age and vocabulary score, between condition and vocabulary score, and between selective attention and vocabulary score significantly improved in comparison to the null model, χ^2 (14) = 39.61, $p < .001$. The overall classification power of the suggested model was 71.2%, and 37% of the variance in the children's first-touch behavior was explained (Nagelkerke

R^2 = .372). The results revealed a significant interaction between vocabulary and selective attention score (e^B = .924, *p* = .01) and also between vocabulary score and age (e^B = .999, *p* = .05). As Figure 1 shows, the probability of simultaneously touching both objects (rather than the pointed object) decreased as the children's vocabulary knowledge increased, but this effect occurred for the children with a higher selective attention score. To put in another way, the children with higher vocabulary knowledge and selective attention skills were more likely to touch the pointed object rather than to simultaneously touch both objects. Moreover, as Figure 2 presents, the probability of touching first the labeled (rather than the pointed object) increased as the children's vocabulary knowledge increased, but this effect occurred for younger children.

Figure 1. Predicted probabilities as a function of the interaction between expressive vocabulary and selective attention.

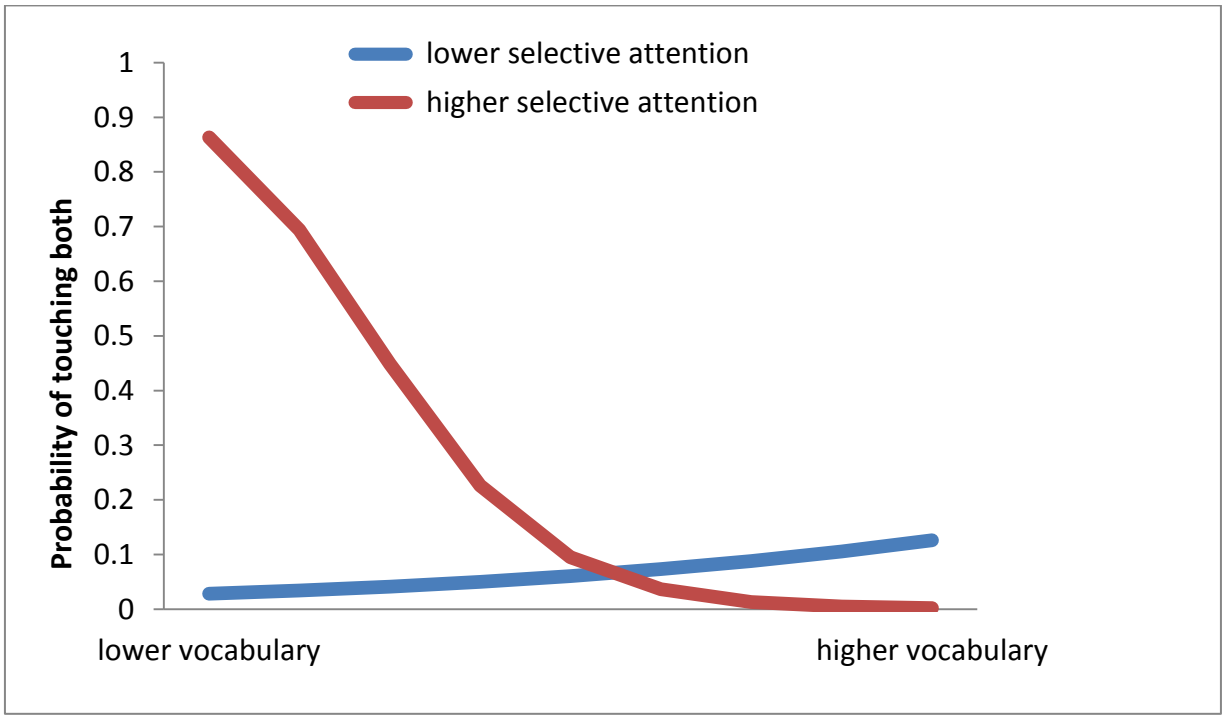
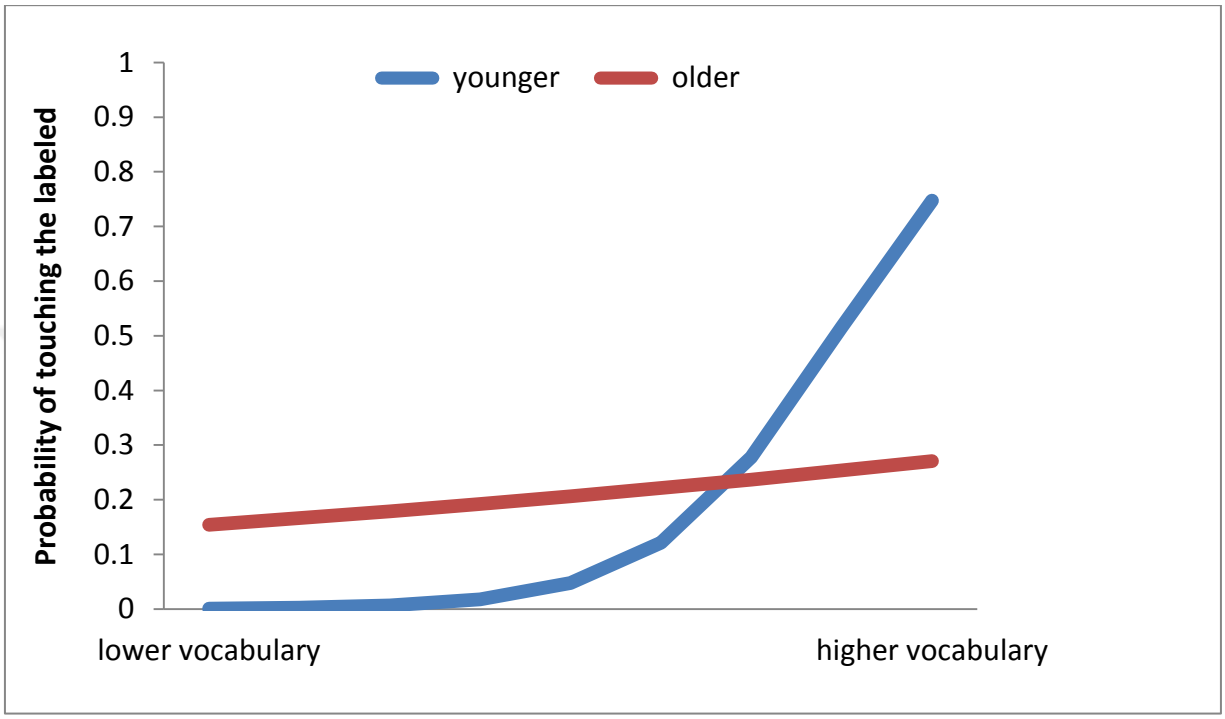


Figure 2. Predicted probabilities as a function of the interaction between age and expressive vocabulary.



With regard to take-aways, a model including four predictors and the interaction between condition and expressive vocabulary score and between age and selective attention score showed a significant improvement in comparison to the null model, χ^2 (12) = 51.81, $p <$ .001. The overall classification power of the suggested model was 64.9%, explaining 44% of the variance in the children's take-away behavior (Nagelkerke R^2 = .44). The results showed a significant interaction between condition and vocabulary score (e^B = 1.046, $p <$ .05) and also between age and selective attention score (e^B = 1.01, $p <$ .05). As the children's vocabulary knowledge increased, their likelihood of taking away both objects decreased in the novel-familiar condition; however it increased in the familiar-familiar condition. Moreover, older children were less likely to take away both objects as their selective attention score increased.

DISCUSSION

Study 1 examined 2- to 4-year-old children's reference resolution in a communicative situation where an adult's simultaneous labeling and ostensive pointing were providing contradictory information about which object the adult referred to. The purpose of the study was two-folded: 1) to examine whether children's reference resolution is a process proceeding through multiple steps, in which socio-pragmatic and lexical cues are weighted differently – leading to distinct object selection behaviors in first-touches and take-aways, and 2) to examine the effect of individual cognitive factors (i.e. age, expressive vocabulary knowledge, and selective attention skills) on object selection in these different steps of reference resolution.

The findings were generally in line with Grassmann and Tomasello (2010), demonstrating that pointing is a more powerful cue to reference resolution. However, the current study demonstrates that this is so particularly in first-touch behavior – but less in take-aways. The current study replicates Grassmann & Tomasello's finding that labeling is as a strong clue to reference as pointing when the label is familiar – and when reference resolution is measured in terms of which object the children take away. Importantly, we found that, there were a considerable number of trials where the children changed their mind about how to resolve the adult's ambiguous reference by taking away a different object from the one they touched first. In most of these trials, the children initially touched the pointed-at object but carried both objects to the second experimenter in the adjacent room. Interestingly, this behavior was associated with their age, that is, the younger children changed their object choice significantly more often than the older ones. There were also a considerable number of trials where the children requested a clarification from the experimenter for her contradictory behavior,

indicating that the children were aware of and attending to both of the contradictory clues. Indeed, when clarification was requested, although the children initially were cued by Experimenter 1's pointing to direct their first-touches towards the pointed object, they later decided to take both objects to Experimenter 2. This result suggests that at least in some trials the children tried to find a reasonable compromise for the experimenter's contradictory behaviors to determine their object selection. The change from touching the pointed object to both means that the children showed more attention to the label in the later step of the reference resolution than in the initial step. This finding supports the process accounts of reference resolution (Horton & Keysar, 1996; Merriman & Marazita, 1995), proposing that children's reference resolution includes multiple steps.

However, we did indeed found that the children's strategies for object selection varied depending on their individual cognitive profiles. The likelihood of simultaneously touching both objects decreased when the children had higher vocabulary knowledge and selective attention skills. In other words, advanced cognitive skills increased the children's likelihood of heeding the experimenter's cues in one specific (usually nonverbal) channel of communication. However, in both conditions, the younger children took away both objects in a significantly higher number of trials than the older children did. Indeed, older children's probability of taking both objects increased when they had a lower selective attention score. Touching the labeled rather than the pointed object was more likely for the younger children with better vocabulary knowledge. This finding is consistent with Verhagen et al.'s (submitted) study showing that previously acquired word knowledge decreased young children's reliance on nonverbal cues; suggesting that lexical information is a stronger clue for children with better lexical knowledge.

Based on these findings, we suggest that, with developing cognitive skills (e.g. word knowledge and attentional skills) and increasing experience in referential communication, 1) children become faster in reference resolution and one might not be able to observe different tendencies at different times in the reference resolution process, 2) they tend to focus on a partner's cues in one specific channel of communication, and 3) the role of lexical rather than gestural cues on reference resolution become more primordial. Indeed, the findings by Thompson and Massaro (1994) support this suggestion. They showed that 5- and 9-year-old children (all older than our child participants) mostly followed a familiar word rather than pointing when verbal and gestural cues were presented in contradiction. However, to our knowledge, there are not any studies examining adults' disambiguation strategies in similar referentially ambiguous situations. In a supplementary study, we therefore examined adults' object choices in a similar situation where labeling and ostensive pointing contradicted with each other.

SUPPLEMENTARY STUDY WITH ADULTS

We applied the familiar-familiar condition to 14 adults (9 females and 5 males). Their ages ranged between 17 and 78 years (*M* = 50.36*, SD* = 15.3*)* and their education changed between 0 to 23 years (*M* = 14.04*, SD* = 5.75*).* We applied exactly the same procedure in Room 1 by using exactly the same instructions and the same set of familiar objects that we used with the children in Study 1. The participants were told that the aim of the experiment to pilot an experimental setup which will later be implemented for preschool children. They were also instructed to behave as if there is another experimenter in another room and select one of the objects to be given to her. In all of the trials, the adults unhesitatingly selected the object they

touched first to be given to the experimenter. In 82% of the trials (46 out of 56) they selected the labeled object; but in 18% of the trials (10 out of 56) they selected the pointed object. Moreover, they did not ask for a clarification request or react to the situation in 87% of the trials (49 out of 56). When they reacted to the situation, they used mostly nonverbal means of communication including gestures and facial expressions (86%) rather than using a verbal statement (14%); however they did not insist on getting an explanation from the experimenter for her contradictory behavior.

The adults in our study thus behaved consistently with the older children between nine and ten years old (*M* = 9.6) in Thompson and Massaro's (1994) study. This finding thus supports our suggestion that, with age, children become faster in reference resolution and they tend to focus on a partner's cues in lexical channel of communication.

STUDY 2

An important further question is why ostensive pointing rather than labeling has more primacy especially during early years of referential development. One possible answer to this question could be that nonverbal cues are more reliable for young children whereas verbal cues are more reliable for adults in understanding a social partner's communicative intent especially in conflicting situations (cf. Brojde, Ahmed, & Colunga, 2012; Yow & Markman, 2011). Indeed, the adults in our supplementary study reported that they selected the labeled object since labeling gives more reliable information about the aim of the experimenter. In a few cases where they selected the pointed object, they reported that they made this specific selection since they liked that object more, tried to deceive the experimenter, or made a mistake. Thus, one explanation for why young children heavily trust nonverbal cues might be their limited

vocabulary knowledge. This argument is consistent with the findings about the influence of increased vocabulary skills in Study 1 and Verhagen and colleagues' (submitted) findings showing that increased vocabulary knowledge decreased children's reliance on an adult's ostensive pointing over labeling when resolving ambiguous reference. Another explanation might be nonverbal cues are inherently more reliable or informative for young children especially when lexical cues are not very clear. In Study 2, we tested this argument by increasing the prominence of labels. We did this by activating the children's existing vocabulary knowledge about the experimental objects immediately before testing their object choice in the same conflictual label-point situations as in Study 1. Namely, we presented a new group of children with pictures of the experimental objects in each trial and asked them to select the picture corresponding to the label in our instruction (e.g. *'Which one is the bird?'*). We had two specific aims: to examine whether the activation of existing vocabulary knowledge would change the children's reference resolution strategies. As in Study 1 we investigated how individual-level cognitive factors (i.e. age, expressive vocabulary knowledge, and selective attention) contribute to the children's reference resolution in Study 2.

We expected that our manipulation would increase the effect of lexical cues on especially older children's resolution of the adult's conflicting reference since these children possibly had more opportunities to learn that lexical in comparison to non-lexical cues are a more reliable source of information in referential communication. We also expected that activation of existing vocabulary knowledge makes the verbal cue to reference more prominent especially for children with better selective attention skills, since Study 1 showed that previous

vocabulary knowledge affected children's object choice behavior more when they had higher selective attention scores.

METHOD

Participants

The participants were 33 normally developing 2- to 3-year-old Turkish learners (*M* = 30.24, *SD* = 3.46, range = 23 and 38 months). In the *novel-familiar* condition, there were 17 children (11 females and 6 males) between the ages of 23 and 38 months (*M* = 30.06, *SD* = 3.82). In the *familiar-familiar* condition, there were 16 children (10 females, 6 males) between the ages of 26 and 37 months (*M* = 30.44, *SD* = 3.16). The mother's education varied between 3 to 19 years (*M* = 11.8, *SD* = 4.47) whereas the father's education varied between 5 to 20 years (*M* = 12.16, *SD* = 4.66). In the younger age group, there were 17 children (10 females and 7 males) with a mean age of 27.76 (*SD* = 2.14), ranging between 23 and 30 months. In the older age group, there were 16 children (11 females and 5 males) with a mean age of 32.88 (*SD* = 2.53), ranging between 30 and 38 months. In the novel-familiar condition, 15 children (9 females and 6 males) with a mean age of 29.67 months (*SD* = 3.42, range = 23 and 35 months) and in the familiar-familiar condition, 13 children (9 females and 4 males) with a mean age of 29.92 months (*SD* = 2.87, range = 26 and 35 months) had both expressive vocabulary and selective attention scores.

Procedure

We used exactly the same experimental materials, setup, and almost the same experimental procedure as in Study 1. The only difference was that, in each trial, we first presented photographs of the two objects used in the object selection to the children. In the

familiar-familiar condition, we presented the pictures of the two familiar objects (e.g. a dog and a bird) and asked the children to show the picture of each object following our instructions (i.e. *'Which one is the dog?'* and *'Which one is the bird?'*). In the novel-familiar condition, we presented the pictures of the familiar (e.g. bird) and the novel object (e.g. water filter) and asked the children to show the familiar object (i.e. *'Which one is the bird?'*) to the experimenter. The locations of the pictures and the order of questions were counterbalanced. In each trial, testing began after the children correctly answered the questions.

Coding and reliability

Our coding protocol was exactly the same as Study 1. A trained research assistant coded first-touches and take-aways in a randomly selected sample of 4 participants in the novel-familiar and 4 in the familiar-familiar condition. As estimated by Cohen's Kappa, the interrater agreement was perfect (i.e. 1) in coding both first-touches and take-aways.

RESULTS

Table 2 shows that the children frequently touched the pointed object first in both the novel-familiar (74%) and the familiar-familiar (47%) condition. However, especially in the familiar-familiar condition, there were a considerable number of trials (36%) where the children simultaneously touched both objects. Statistical analyses revealed that which object the children touched first differed depending on condition, χ^2 (2) = 10.48*, p* < .01. Marascuilo post hoc tests showed (at *p* = .05) that the number of trials where they touched the pointed object first was significantly higher in the novel-familiar (74%) than in the familiar-familiar (47%) condition. Further, the number of trials where they simultaneously touched both objects was significantly higher in the familiar-familiar (36%) than in the novel-familiar (15%) condition. The

children's touching behavior was also significantly associated with their age groups, but only in the novel-familiar condition, Fisher's exact test, χ^2 (2) = 9.06, p = .01. Marascuilo post hoc comparisons (p = .05) showed that the older age group touched the pointed object significantly more often (89%) than the younger age group (56%).

In the novel-familiar condition, the number of trials where the children took away the pointed object (51%) and both objects (47%) were very close to each other. In the familiar-familiar condition, the number of trials where the children took away both objects (48%) exceeded the number of trials where they took away the pointed object (38%). Which object the children took away differed depending on condition, Fisher's exact test, χ^2 (2) = 8.44, p = .01. Marascuilo post hoc tests at p = .05 indicated that, the number of trials where they took away the labeled object was significantly higher in the familiar-familiar (14%) than in the novel-familiar condition (1%). The children's take-away behavior also differed across the age groups, but only in the novel-familiar condition, Fisher's exact test, χ^2 (2) = 19.37, p < .001. Marascuilo post hoc comparisons (p = .05) showed that the older children took away the pointed object in a significantly higher number of trials (75%) than the younger children did (25%). In contrast, the younger children took away both objects (75%) significantly more often than the older children did (22%).

In most of the trials in both the novel-familiar (66%) and the familiar-familiar condition (83%), the children behaved consistently in their object selection by taking away the object they touched first. When they behaved consistently, in the novel-familiar condition, they selected the pointed object in 51% of the trials and both objects in 15% of the trials. In the familiar-familiar condition, they selected the pointed object, both objects, or the labeled object

respectively in 38%, 36%, and 9% of the trials. However, they behaved inconsistently by taking away a different object from the one they touched first respectively in 34% of the trials in the novel-familiar and in 17% of the trials in the familiar-familiar condition. We also examined whether the children follow different cues in their first-touches and take-aways using a set of Stuart-Maxwell tests. We found that, in both the novel-familiar and in the familiar-familiar condition, the distribution of first-touches and take-aways were significantly different from each other (novel-familiar condition: χ^2 (2) = 22.16, $p < .01$; familiar-familiar condition: χ^2 (2) = 9.85, $p < .01$), meaning that the children changed their attention to the different cues during the different points of reference resolution.

The number of trials where they behaved inconsistently was significantly higher in the novel-familiar (23 out of 34) than in the familiar-familiar condition (11 out of 34), χ^2 (1) = 4.77, $p < .05$. In these trials in the novel-familiar condition, the children basically touched the pointed object (21%) or the labeled object (12%) first but took away both objects to the experimenter. In the familiar-familiar condition, the children's behavior in inconsistent trials showed more variability. They touched the labeled object but took away both objects at 8% of the trials. Alternatively, they touched the pointed object first but took away the labeled object or both objects at an equal amount of the trials (5%).

Table 2. Number of trials where labeled, pointed, or both objects were touched first and taken away in the Novel-familiar and Familiar-familiar conditions.

		Take-away					
		Novel-familiar			Familiar-familiar		
		Point	Label	Both	Point	Label	Both
First-touch	Point	35	1	14	24	3	3
	Label	0	0	8	0	6	5
	Both	0	0	10	0	0	23

Comparison between Study 1 and Study 2

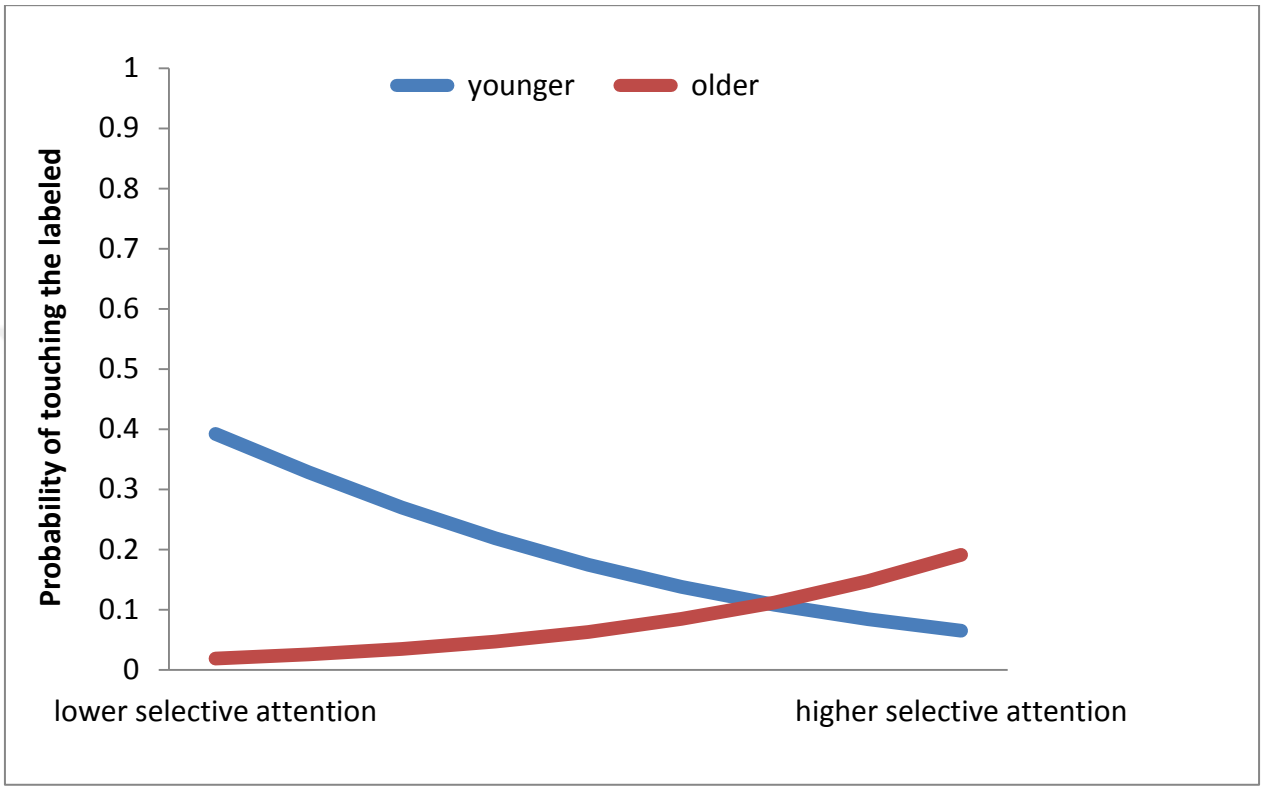
We also examined whether our manipulation in Study 2 changed the children's disambiguation strategies. First, we examined whether the number of trials where the children behaved consistently or inconsistently varied from Study 1 to Study 2. The number of trials where the children behaved consistently or inconsistently in the novel-familiar or the familiar-familiar conditions were not significantly different between the two studies. Further, we compared the number of trials where the children followed the pointed, the labeled, or both objects in their first-touches and take-aways between Study 1 and Study 2. We found that, in the familiar-familiar condition, which object the children touched first significantly differed from Study 1 to Study 2, χ^2 (2) = 7.13, $p < .05$. Marascuilo post hoc comparison tests (at $p = .05$) showed that the number of trials they simultaneously touched both objects was significantly higher in Study 2 (36%) than in Study 1 (17%). However, which object they took away did not differ between the two studies. In other words, our manipulation of the label activation in Study

2 affected the initial steps of the children's reference resolution and their touching rather than later steps and their taking away behavior. However, this was the case only in the familiar-familiar condition.

Effect of vocabulary activation depending on age, vocabulary, and selective attention

The effect of age, vocabulary knowledge, and selective attention on the children's touching behavior was examined by using a subset of the data with 28 2- to 3-year-old children having both an expressive vocabulary and a selective attention score, through a multinominal logistic regression. We compared the children's likelihood of touching either the labeled object or both objects with their likelihood of touching the pointed object. We used a stepwise procedure including four predictor variables (i.e. age in days, experimental condition, expressive vocabulary score, and selective attention score) and the interaction terms between any pairs of variables. A model including the interaction between age and selective attention score showed a significant improvement in comparison to the null model (χ^2 (10) = 49.75, $p < .001$) for explaining the first-touches. The overall classification power of the suggested model was 75%, explaining 43% of the variance in the children's first-touch behavior (Nagelkerke $R^2 = .429$). As Figure 3 shows, as their selective attention scores increased, younger children were less likely but older children were more likely to touch the labeled rather than the pointed object first ($e^B = 1.009$, $p < .001$). In other words, advanced selective attention skills played a different role in affecting the first-touches of the younger and the older children.

Figure 3. Predicted probabilities as a function of the interaction between age and selective attention.



DISCUSSION

Study 2 examined whether the effect of ostensive pointing is still robust to direct children to a referent object when we activated vocabulary knowledge about the experimental objects immediately before testing. Similar to Study 1 and Grassmann and Tomasello (2010), we found that ostensive pointing still has a more primordial role on children's reference resolution. Moreover, replicating Study 1, there were a considerable number of trials where the children took away a different object than the one they touched first, which strengthened our argument suggesting that lexical and social-pragmatic cues play different roles at different times of reference resolution process.

Importantly, our modified experimental protocol revealed a significant increase in the number of simultaneous touches to both objects in the familiar-familiar condition where the contradiction between labeling and ostensive pointing is more apparent. This suggests that our manipulation increased the children's attention to the label in the initial phase of the reference resolution. An important question is why lexical activation affected only the first-touches but not the take-aways. One explanation is that the children attended to and integrated the label in the later steps of reference resolution (i.e. the take-aways) already to a large extent in Study 1; and the effect of preactivation of the label in Study 2 only shifted the attention to the label towards the first-touches. Another point is that why our manipulation affected the children's choices in only the familiar-familiar condition. In the novel-familiar condition, we asked the children to identify the familiar object; but did not ask any questions referring to the novel object since they did not yet have the novel word in their lexicon. This application might lead to non-effect in the novel-familiar condition.

Our manipulation affected the reference resolution strategies of the children differently depending on their age and level of selective attention. Better selective attention skills increased the older children's probability of following labeling rather than ostensive pointing; but worked in an opposite way for younger children by increasing their probability of relying on ostensive pointing rather than labeling. This finding suggested that better selective attention skills help children to track a social partner's cues in one specific communicative channel; but which cue children predominantly follow changes depended on their age and the properties of the referential communication context such as whether or not vocabulary knowledge was explicitly activated.

GENERAL DISCUSSION

Building up on Grassmann and Tomasello (2010), we investigated whether children's reference resolution is a multi-step process and whether lexical and social-pragmatic cues play different roles at different times during this process. In addition we investigated whether children's reference resolution varies depending on the preactivation of labels and individual cognitive factors (i.e. expressive vocabulary knowledge and selective attention skills).

We found that ostensive pointing has a more primordial role than lexical labeling to guide preschool children's reference resolution. This replicates the findings by Grassmann and Tomasello (2010). We also extended this finding by showing that pointing is even more powerful in the initial phase of reference resolution and that the label has a stronger impact on later phases. Namely, we found that in 17-34% of the trials the children changed their interpretation of the experimenter's contradictory use of pointing and labeling by taking away a different object than the one they touched first. In most of these cases, the children touched the pointed object first; but then mostly took away both objects. To put differently, when the lexical information was not in itself meaningful for children, pragmatic cues achieve more priority in the initial steps of referential resolution. However, following the pointing might result in detecting the mismatch between the novel label and the familiar label of the pointed-at object. The current findings suggest that at least sometime the detection of the mismatch leads children to update their reference interpretation. Interestingly a reference resolution study with two dogs trained for fetching objects by names found a similar tendency in how the dogs resolved an ambiguous reference when pointing and labeling conflicted. The dogs appeared to first follow pointing by walking in the indicated direction but then they relied on the label

(Grassmann, Kaminski, & Tomasello, 2012). Thus, children and dogs might interpret pointing as a cue helpfully provided by the speaker to find the referent of the label.

One way to explain our findings (and the dogs' behavior as well) is provided by the process accounts suggesting that children's reference resolution is a multi-step process (Horton & Keysar, 1996; Keysar & Horton, 1998; Merriman, 1999; Merriman & Marazita, 1995). Based on these models we suggest that the children updated their fastly driven initial interpretations (based on pointing) as a result of active monitoring (realizing the mismatch between the label and the referent of the gesture). However, the effect of lexical cues was more pronounced from the initial phases of reference resolution when we activated lexical knowledge immediately prior to object selection; which is also in line with process accounts (Horton & Keysar, 1996; Keysar & Horton, 1998): A person hearing a label from a speaker needs to retrieve the phonological representations of the names of the objects in the physical environment from the long term to working memory, and next he/she needs to compare these representations with the label he/she heard. Pre-activation of lexical labels might make the children to make these associations faster and make the effect of verbal cues more prominent at an earlier step.

Finally, individual cognitive factors also seem to influence how much children devote their attention to pragmatic and lexical cues when they were confronted with referential uncertainty. We found higher vocabulary knowledge and better attentional skills decreased the children's tendency of touching simultaneously or taking away both objects rather than one specific object. This suggests that advanced cognitive skills help children attend to a social partner's cues in one specific channel of communication. We also found that good selective attention skills affect younger and older children's reference resolution strategies differently:

Better selective attention skills increased younger children's likelihood of touching the pointed object first but older children's likelihood of touching the labeled object first. Moreover, the different tendencies of object-choices between first-touches and take-aways were more common among younger than older children.

The question is why children more readily rely on ostensive pointing rather than labeling until a specific age point, even though they have demonstrated knowledge of vocabulary for the relevant objects. In other words, what makes older children and adults fastly rely on lexical rather than gestural cues, even without showing their hesitation? One important hallmark of effortful processes is that they can become more automatic as a result of accumulated knowledge and/or experience (Epley, Morewedge, & Keysar, 2004). Therefore, nonverbal referential cues are potentially more informative than lexical cues at earlier ages in understanding a social partner's communicative intent since, in comparison to their older peers and adults, young children have restricted word knowledge and relatively less experience in referential communication (Brojde et al., 2012; Yow & Markman, 2011). Over development, as a result of development of efficient processing and accumulated experience in referential tasks, the children possibly learn using lexical cues as a reliable source from very early moments in referential communication.

The current findings provide new evidence of a multi-step process in children's reference resolution. Specifically these findings suggest, in especially ambiguous interactive situations, social-pragmatic cues play an important role at the very initial phase of reference resolution and set the ground for subsequent linguistic communication that includes word learning situations. These findings also suggest that initial interpretations are kept in the memory and (if necessary)

they are updated after an active monitoring process. In this updating process, children's individual profiles including vocabulary knowledge and selective attention skills seem to play a role.

For further understanding of reference resolution, future studies would examine children's eye gaze behavior at different phases of this process. Further, since indicators of referential uncertainty and communicative breakdown would be compensated by caregiver feedback in naturalistic contexts, future experimental work should manipulate adult's input (Ateş-Şen & Küntay, 2015).

GENERAL CONCLUSION

Our critical review in Chapter 1 indicated that researchers agree that children's developing competency at understanding and also using nonverbal and verbal referential cues is one important marker for their success in referential communication. However, there is not a well-grounded agreement in 1) the actual timing of competency at using these cues: whether children's competency at using verbal and nonverbal referential cues occur at an earlier time point than the one reported in existing studies, and also 2) the contribution of verbal and nonverbal cues in children's referential development: which type of cue has more primacy in the development of children's referential skills? The present dissertation examined these two questions by conducting a semi-naturalistic study and a set of experimental studies.

The semi-naturalistic study examined the integration of verbal (prior mention in discourse) and nonverbal cues (deictic gestures and communicative functional acts) in children's speech samples (use of referential forms) about objects in physical environment before age 2. The results extended the previous findings by showing that the children began to show sensitivity to discourse status of referents before age 2 (at age 1;09); but only when we considered their nonverbal acts accompanying their referential speech. Moreover, we found that the caregivers' speech is sensitive to discourse status of referents at each age point in our study. These findings contradicted with previous studies showing that children's inadequately informative referential forms occur as a result of the patterns in the caregiver input (e.g. Guerriero et al., 2006) and supported the argument that children took into account verbal cues (discourse status of referents) in their referential productions; but they do not yet verbally show

this competency because of their limited linguistic skills (Guerriero et al., 2006; Gürcanlı et al., 2007).

One question is that whether language-specific features such as the pro-drop structure of Turkish affect children's tendency to use nonverbal strategies supplementing their inadequate referential forms. Although our study design did not allow us to answer this question, a few studies touching upon this question showed contradictory findings (e.g. Demir et al., 2012; Guerriero et al., 2006; So & Lim, 2012). The contradictory results potentially resulted from the differences in samples, study designs, and coding protocols, which points to a need for further comparative studies targeting this question.

The experimental studies in the present dissertation also contributed to the existing literature by proposing that children's reference resolution might occur at multiple steps where verbal (lexical labels) and nonverbal (ostensive pointing) cues are weighted differently. This new approach also allowed us to investigate a question on which researchers did not yet reach a consensus: Which type of cue has more primacy in children's reference resolution (Grassmann, 2014)? To tap multiple steps in reference resolution, we coded children's two different object selection behaviors (i.e. first-touches and take-aways) in two different referentially ambiguous situations where an adult's ostensive pointing contradicted with her labeling in the presence of one familiar and one novel object (i.e. novel-familiar condition) or in the presence of two familiar objects (i.e. familiar-familiar condition). The results are in line with previous findings showing that ostensive pointing is a more primordial cue than linguistic labels in children's reference resolution (Grassmann & Tomasello, 2010); but also extended previous results showing that 1) there is a considerable amount of cases where children changed their selection

by mostly taking away both objects although they touched the pointed object first, and 2) pointing is more powerful in first-touches in initial steps and labeling has a stronger impact on take-aways in later steps. These results altogether supported the multi-step approach proposed by the process accounts in a child sample (Horton & Keysar, 1996; Keysar & Horton, 1998; Merriman, 1999; Merriman & Marazita, 1995). Our subsequent study with adults also pointed out that adults consistently use lexical cues (labeling) without hesitation, suggesting that increasing cognitive skills (attentional and vocabulary skills) and referential experience are resulted in smooth and fast progress through the distinct steps of reference resolution.

The current dissertation also adopts a perspective suggesting that children's success in use of verbal and nonverbal devices of referential communication depends on both child-level social-cognitive abilities and adult-driven interactive context (Ateş-Şen & Küntay, 2015). Supporting this proposal, in the first study we found both similarities but also important divergences between the children's and the caregivers' use of verbal and nonverbal strategies. For example, at each age point, the caregivers consistently considered prior mention in discourse in determining their referential forms; but this sensitivity occurred relatively later in children's referential forms. Moreover, in the second study we indicated that children's use of verbal and nonverbal strategies under referential uncertainty change depending to their individual cognitive profiles (selective attention and expressive vocabulary skills). For instance, the children with better selective attention and expressive vocabulary skills showed more similar strategies with the adults, showing a tendency to focus on a partner's cues in one specific channel of communication. In both studies, potentially as a result of developing cognitive skills and accumulated referential experience, children's behaviors approached to the

adult behavior at older ages. As an example, the semi-naturalistic interactions of children showed that, by age 1;09 (the latest age point in the data set), children did not use referential forms in accordance with discourse status of referents. As another example, our experimental studies showed that older rather than younger children behaved similarly with adults by showing a tendency to follow labeling rather than ostensive pointing.

Turning back to the main questions of the present dissertation, our first aim is to examine whether children's competency at using verbal and nonverbal referential cues occur at an earlier time point than the one reported in existing studies. Our second aim to investigate whether verbal or nonverbal cues have more primacy in children's continuously developing referential skills. The present dissertation contributed to the literature showing that 1) children's use of verbal referential cues occurs earlier than that reported by previous studies missing early (preverbal) periods of referential development, 2) Nonverbal cues (ostensive pointing) seem to have more primacy in children's reference resolution, especially in the presence of uncertainty. However, this is not to deny the importance of lexical cues relatively occurring at later phases of reference resolution, as a result of active monitoring. Which cues is more primordial in these interactions also seem to depend on several factors including the complexity of referential interactions, children's age and individual cognitive profiles, and also the use of these cues by competent interactive partners in daily interactions with children, and 3) although children have more competent referential skills than the estimated by the previous studies, they still need further time to reach an adult level of competency at using these skills.

The present dissertation has some important implications. Early referential skills especially in preschool years are found to be associated with the development of more

advanced communication skills (Carpenter, Nagel, & Tomasello, 1998; Kristen, Sodian, Thoermer, & Perst, 2011) and also higher order socio-cognitive skills such as perspective taking and theory of mind (Astington, 2003; Moore & Dunham, 1995). For this reason, an important amount of investment is dedicated to develop training studies or educational materials designed for children with typical or atypical referential development. To design more effective interventions and/or educational materials, we require more trusted criteria reflecting children's real (in)capabilities. Moreover, one common method in evaluating whether children show a (a)typical communicative development is to check timing of several indicators, usually including competency at understanding and also using verbal and nonverbal communicative cues in referential interactions with competent social partners (Ateş-Şen & Küntay, in press). An appropriate evaluation is only possible when timing of the occurrence of these skills is correctly identified. Furthermore, the present dissertation has some implications with regard to early word learning. Children's gains from nonverbal or verbal strategies in daily interactions with adults seem to differ depending on several factors including children's existing cognitive skills and level of previous experience with competent communicative partners. Using dominantly verbal cues such as object labels might work for children at older ages, with more advanced cognitive skills, and with a lot of opportunities for spending time with adults. However, nonverbal cues such as ostensive pointing might be more useful for children at younger ages, with relatively less advanced cognitive and linguistic skills, and with restricted opportunities for having interactions with competent interactive partners.

The present dissertation contributes to existing research by examining children's verbal and nonverbal referential strategies at an early age period (between 1 and 4 years) from a

broader perspective, examining how child-level social-cognitive factors and child-surrounding interactions together play a role in the development of referential communication. Moreover, it is the first detailed study depicting verbal and nonverbal referential interactions between Turkish-speaking child-caregiver dyads.

The current dissertation suggests new directions for future research as well. Future studies would examine the effect of language-specific characteristics on children's verbal and nonverbal referential behavior. Turkish has some distinct properties making it interesting to study referential communication comparatively to Indo-European and some other non-Indo-European languages (Ateş, Küntay, & Demir, in press). In this dissertation, we focused on pro-drop structure of Turkish. Further studies might examine how other characteristics of Turkish (e.g. a flexible word order, an optional determiner system, a three-way demonstrative pronoun system, common use of variation and referential sets, and different structures of relative clauses) contribute to the development of children's verbal and nonverbal referential skills. Future studies should also investigate children's referential interactions in distinct communicative contexts (e.g. dyadic vs. multi-party; formal vs. informal, familiar vs. unfamiliar) with different interactive partners (e.g. siblings, strangers, teachers, peers, etc.). It is also an unanswered question how children's use of verbal and nonverbal referential strategies under referential uncertainty changes in an extended interaction with their caregivers. In these interactions, how parents' feedback contributes to children's referential skills is open to further research. Another question for future studies could be whether different types of feedback are useful for children with different individual cognitive profiles and distinct level of communicative competence.

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