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14 Socio-pragmatic skills underlying language development: Boundaries between typical and atypical development

1 Introduction

Human infants develop a unique combination of socio-pragmatic skills enabling them to learn language and effective communication from interactions in social engagement with others in the first two years of life. The scope of linguistic pragmatics includes appropriate use of the linguistic code in the direction of requirements or demands of a communicative context and/or partner (Levinson, 1983). However, pragmatic development also includes knowing community- or culture-specific communication rules (Carminol and Sparks, 2014) and appropriately integrating linguistic code with non-linguistic action (Küntay, Nakamura, and Ateş-Şen, 2014). Therefore, prelinguistic infants' communication with others is especially important since it allows us to understand the developmental course of "pure pragmatic" skills that emerge well before and play a key role in the acquisition of linguistic structures (Matthews, 2014).

With such an understanding, the present section focuses on how infants use nonverbal devices such as looks and gestures in order to achieve a successful communication and how then they translate these early emerging pragmatic skills into more advanced forms such as joint engagement and referential interaction. We will cover crosslinguistic and crosscultural work as we believe in the benefits of conducting more comparative work about the role of pragmatics on typical language acquition generally (Küntay et al., 2014), and on atypical communicative development specifically (Norbury, 2014).

The first two parts review past and recent research about the typical and atypical development of nonverbal communicative devices and focus on how use of these devices gives rise to higher order socio-pragmatic understanding including joint attention and referential communication. The last section critically evaluates the present research and proposes future directions for understanding the criteria of (a)typical development of socio-pragmatic skills.

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2 The importance of nonverbal devices in children's socio-pragmatic development

2.1 Understanding the role of eyes

Eyes serve several functions for human interactions such as collecting information about the physical world (Baron-Cohen, Campbell, Karmiloff-Smith, Grant, and Walker, 1995), establishing an affective bond between the infant and the caregiver (Robson, 1967), inferring others' internal states such as their thoughts, intentions, desires, and goals (Baron-Cohen, 1995; Baron-Cohen et al., 1995), and sharing interests about outside entities such as objects and persons (Bakeman and Adamson, 1984). In accordance with the aim of the present chapter, we focus on communicative and referential functions of eyes, which include three important gaze behaviors: mutual gaze, spontaneous gaze following, and gaze alternation.

Newborns have a preference for facelike features rather than blank stimuli (Easterbrook, Kisilevsky, Muir, and Laplante, 1999) or scrambled faces (Goren, Sarty, and Wu, 1975; Morton and Johnson, 1991) and show sensitivity to faces with opened rather than closed eyes (Batki, Baron-Cohen, Wheelwright, Connellan, and Ahluwalia, 2000) and with direct rather than averted eye gaze (Farroni, Csibra, Simin, and Johnson, 2002). In other words, infants are sensitive to communicative potential of eyes beginning from very early ages. Around 2 months, infants begin to preferentially look at the eye region of a speaker's face (Hainline, 1978; Haith, Bergman, and Moore, 1977; Maurer and Salapatek, 1976). By 4 months, they begin to discriminate different directions of eye gaze (Caron, Caron, Robert, and Brooks, 1997; Hains and Muir, 1996; Vecera and Johnson, 1995). However, as they get older, infants' attention shifts from the eye to the mouth region of a speaker. For example, 6-month-old infants divided their looks equally to the eye and mouth region of a person speaking about unfamiliar objects. By 9 months, the infants dominantly looked at the mouth region of the person under the same conditions (Tenenbaum, Shah, Sobel, Malle, and Morgan, 2013). By the middle of the first year of life, they shift their attention from face-to-face or dyadic interactions to object exploration, but they do not share their interest in objects with other people yet (Bakeman and Adamson, 1984). Around the same time, they start to look in the same direction of other people's looks (Butterworth and Grover, 1990; Butterworth and Jarrett, 1991; D'Entremont, Hains, and Muir, 1997; Moll and Tomasello, 2004). For instance, 73% of 3- to 6-month-old infants' first eye turns were in the direction of an adult's 90-degree head-turn towards a puppet (D'Entremont et al., 1997). 6- to 12-month-old infants were able to localize any object in their visual field by following an adult's communicative cues of head turn or eye gaze. However, their localization of the objects beyond their visual field, such as toys behind various barriers scattered around a room, took longer time and occurred between 12 and 18 months (Moll and Tomasello, 2004).

There is an ongoing debate about when children begin to follow a communicator's eye gaze independently from the distance and the visual accessibility of the target, and whether or when children understand that eye gaze signals information about mental states of a communicative partner. In order to answer these questions, researchers use two main paradigms: the "eye status" and the "barriers" paradigms (Moll and Tomasello, 2004). In the "eye status" paradigm (e.g. Brooks and Meltzoff, 2002; Corkum and Moore, 1995; Moore and Corkum, 1998), researchers measure infants' head turn to a distal object following an adult's eye gaze under various communicative conditions such as head and eye turn in the same direction, head and eye turn in the opposite direction, only head turn with the eyes looking straight ahead, only eye turn with the head facing forward, head turn with closed eyes, head turn with open eyes, etc. In the "barriers" paradigm (e.g. Butler, Caron, and Brooks, 2000; Moll and Tomasello, 2004), the researchers examined infants' head turns to an object hidden behind various barriers such as an opaque screen, a dividing wall, a box, a panel, and a drawer, etc. by following an adult's eye gaze.

Studies examining the timing of children's ability to follow another person's eye gaze showed inconsistent results. For example, using the "eye status" paradigm, Corkum and Moore (Corkum and Moore, 1995; Moore and Corkum, 1998) showed that only 18-month-old infants are able to localize a target object based merely on eye gaze (i.e. only the eyes were moving while the head was stable) rather than head and eye cues together (i.e. head and eyes moved in the same direction) or only head cues (i.e. only head moved while the eyes was looking straight ahead). However, using the same paradigm, Caron, Butler, and Brooks (2002) indicated that 14-month-old infants are sensitive to the eye gaze of a communicative partner, especially in the congruent condition where the person's eyes and head were turned towards the same direction rather than in the incongruent condition where the person' head turned while the eyes were directed straight ahead. Brooks and Meltzoff (2002) showed that the infants' sensitivity to the eye status develops even earlier. 10- and 11-month-old infants were more likely to follow an adult's head turn as long as that person's eyes were open rather than closed. The studies using the "barriers" paradigm also pointed out inconsistent results about the timing of children's ability to follow another person's eye gaze. For instance, Butler and colleagues (2000) examined 14- and 18-month-olds' gaze following in three distinct conditions: the screen condition (i.e. an opaque screen obscured where an adult was looking at), the no-screen condition (i.e. there was not a screen obscuring the adult's view), and the window condition (i.e. the screen had a transparent window, which allowed the child to see the adult's view). Only the older group followed the adult's turn relatively more in the no-screen and the window conditions than the screen condition; but the the younger group behaved similarly in all of the three conditions. Consequently, it was suggested that understanding the intentional nature of looking develops between 14 and 18 months of age, but not before. Moll and Tomasello

(2004) also investigated 12- and 18-month-old infants' gaze following in a task requiring them to find various objects hidden behind different barriers in a room, such as a dividing wall, a box, a panel, and a drawer. To determine the locations of the target objects, the angles of the experimenter's head turns changed between 70 and 80 degrees. Both 12- and 18-month-olds were able to follow the experimenter's eye gaze towards the target objects, often even locomoting a short distance in order to see the targets placed out of their visual field.

The inconsistent results probably stem from differences in experimental manipulations. For example, as pointed out by Moll and Tomasello (2004), the experiments where adults look at an object hidden behind various barriers represent infants' natural communicative environments or interactions better than the experiments that present various communicative cues in an unnatural or uncommon manner such as head turns with closed eyes. Infants might find the latter type of situations as unnatural and might not get the communicative message of "this is for you". The inconsistent results might also occur depending on whether other communicative cues (e.g. body posture, head orientation, vocal behavior, etc.) accompany gaze direction or not (Akhtar and Gernsbacher, 2008). Infants at earlier ages in particular might need multiple or converging communicative cues in order to understand that these cues refer to an external entity beyond their egocentric perspective.

Setting aside task variations, we can conclude that children start to follow others' eye gaze between 6 and 12 months for targets inside the children's visual field, and between 12 and 18 months for targets outside the children's visual field. This discrimination is important since the ability to locate a target out of one's visual field needs understanding that the eyes convey some information about one's mental states including intentions, desires, goals, etc. (Baron-Cohen, 1995). The development of this ability around 18 months corresponds to a time when infants show more mastery in joint attentional skills. In other words, they become capable of sharing their interest in objects with other people by coordinating their attention or shifting their looks back and forth between a communicative partner and a specific entity (Bakeman and Adamson, 1984). Also, infants' behavior can be accepted as joint attention only if they and their communicative partner know together that they have a mutual interest in this entity (Tomasello, 1995). Carpenter and Liebal (2011) described this aspect of joint attention as a kind of "mind reading". In short, a joint attentional episode includes three important behaviors: sharing, following, and directing attention (Carpenter, Nagel, Tomasello, Butterworth, and Moore, 1998).

Until this point, we reviewed studies that focus on the role of eyes in following and sharing attention with others. Another device playing an important role especially in directing others' attention to an external entity as well as following and sharing others' attention is declarative gestures – in particular index finger pointing. In the next section, we review studies about children's comprehension and production of declarative gestures.

2.2 Understanding the role of gestures

Around the first birthdays, infants are capable of following one's point to a distal target (e.g. objects on the wall of a room) (Aureli, Perucchini, and Genco, 2009; Camaioni, Perucchini, Bellagamba, and Colonnesi, 2004; Carpenter et al., 1998) and to a target outside their visual field (e.g. occluded behind a barrier) (Liszkowski and Tomasello, 2011; Moll and Tomasello, 2004). Between the first and second birthdays, infants are able to use previously shared attentional frame with an interactant to interpret this person's intention or motivation for pointing an object. (Behne, Carpenter, and Tomasello, 2005; Liebal, Behne, Carpenter, and Tomasello, 2009). For example, while playing a hiding-finding game, infants at 14 months made use of an adult's ostensive pointing to an opaque container with gaze shifts between the child and the container to inform the child about the location of a hidden toy (Aureli et al., 2009; Behne et al., 2005). 18-month-olds made use of an adult's pointing directed to a toy on the floor in a larger activity context where they were tidying up a room by picking up the toys and putting them into a basket. However, in a control condition, the children did not heed the point of a second person entering the room in the middle of the activity (Liebal et al., 2009).

By the end of the first year of life, infants also begin to point by themselves. There are different motives for infants' pointing. They point imperatively for requesting help to obtain an object (e.g. reaching for an object on a shelf, asking for a toy locked inside a transparent box) or to complete an action (e.g. getting on a swing) (Carpenter et al., 1998). They also point declaratively for calling one's attention and interest to an external entity or event (Bates, Camaioni, and Volterra, 1975; Carpenter et al., 1998; Liszkowski, Carpenter, Henning, Striano, and Tomasello, 2004; Liszkowski, Carpenter, Striano, and Tomasello, 2006; Liszkowski, Carpenter, and Tomasello, 2007a; 2007b; 2008). As an example (Liszkowski, 2007a), following 12-month-olds' index finger pointing to a referent, if an adult correctly attended to the referent and shared her interest about the referent with the infants, the infants continued to share attention and interest with the adult by pointing more across the trials. When the adult showed interest but misidentified the referent, the infants tried to redirect the person's attention to the correct referent by repeating their pointing within the same trial. When the adult correctly identified the referent, but did not show positive emotions such as excitement about it, the infants stopped pointing within the trials, overall pointed in fewer trials, and did not attempt to share their attention and interest with the adult anymore. 12-month-olds also pointed to the location of an absent referent (i.e. a puppet popping out a window of a cloth screen) after it was removed from the display, especially for an adult who had previously missed the display of this referent (Liszkowski et al., 2007b). Moreover, when the interlocutor misunderstood their pointing (i.e. saying "Hmm?", "What?", "What's there?", or "Hmm?" in response to the infants' points), 12- and 18-month-olds tried

to repair the message by repeating their points and by accompanying their points with vocalizations (Liszkowski, Albrecht, Carpenter, and Tomasello, 2008). As a special kind of declarative pointing, infants are also able to use pointing informatively for providing recipients with the information they want to or need to know (Liszkowski et al., 2006). For instance, 12- and 18-month-olds used informative points in order to show the location of an object to an adult who was searching for it. That is, they pointed more often to the target object searched by the adult than to a distractor object (Liszkowski et al., 2006). The last two motives are deemed especially important because they show that infants understand others as psychological agents with intentional and informational states (Liszkowski et al., 2006). In other words, they achieve "shared intentionality" or a "joint attentional frame" (Liszkowski and Tomasello, 2011; Tomasello, 2006; Tomasello, Carpenter, Call, Behne, and Moll, 2005; Tomasello, Carpenter, and Liszkowski, 2007).

Index finger pointing with declarative functions is proposed to be a human-specific form of communication (Bates, 1979; Bruner, 1981; Levinson, 2006; Liszkowski et al., 2012; Salomo and Liszkowski, 2013; Tomasello, 2008). Non-human primates and dogs are cognitively equipped with and motivated to use only the imperative function of index finger pointing (Gomez, 2007; Hopkins and Leavens, 1998; Povinelli, Bering, and Giambrone, 2003; Tomasello, 2006). Moreover, independent from their cultures, infants from Canada-Nova, China-Shanghai, Indonesia-Bali, Japan-Kyota, Mexico-Tzeltal, Mexico-Yucatan, Nethelands-Nijmegen, Papua New Guinea-Rossel Island, Peru-Montaro, and Turkey-İstanbul started pointing with their index finger around 8 to 15 months (Altınok, 2014; Brown, 2011; Callaghan, Moll, Rakoczy, Warneken, Liszkowski, Behne, and Tomasello, 2011; Carpenter et al., 1998; Liszkowski, Brown, Callaghan, Takada, and de Vos, 2012; Liszkowski et al., 2007a, 2007b; Salomo and Liszkowski, 2013; Savaş, 2014). Furthermore, there is some research indicating that the occurrence of prelinguistic pointing is related to some important milestones in language development, such as the emergence of first words, the vocabulary spurt, and the transition to syntax (Capirci, Iverson, Pizzuto, and Volterra, 1996; Carpenter et al., 1998; Iverson, Capirci, and Caselli, 1994; Iverson and Goldin-Meadow, 2005; Özçalışkan and Goldin-Meadow, 2005; Rowe and Goldin-Meadow, 2009a; 2009b; Rowe, Özçalışkan, and Goldin-Meadow, 2008; see also the metanalysis by Colonnesi, Stams, Koster, and Noom, 2010). For example, between 14 and 22 months, infants increasingly used gestures in combination with their speech in order to supplement their first verbal referential attempts (e.g. one-word sentences such as object labels) or their structurally more complex sentences (e.g. two-word sentences) (Özçalışkan and Goldin-Meadow, 2005). Moreover, the delay of index finger pointing is linked to various developmental problems in infants' communication skills (Bates et al., 1997; Sauer, Levine, Rowe, and Goldin-Meadow, 2010). For instance, 15 out of 22 children who failed to show either declarative pointing or declarative pointing in addition to pretend play behaviors at 18 months were diagnosed with developmental delay without the autism component at 42 months. Moreover, 10 out of 12 children who

failed to show all of the three key behaviors of communicative development (i.e. declarative pointing, gaze following, and pretend play) were diagnosed with autism at 42 months (Baron-Cohen et al., 1996). Finally, children diagnosed with autism were less likely to use declarative index finger pointing by themselves and follow another person's pointing to an external entity (Gernsbacher, Stevenson, Khandakar, and Goldsmith, 2008).

Although a vast amount of studies have shown that the appearance of pointing in early childhood is universal, there is also some research showing some important differences in the dominance, form, and emergence of pointing gestures. (Callaghan et al., 2011; Liszkowski et al., 2012; Liszkowski and Tomasello, 2011; Salomo and Liszkowski, 2013; Wilkins, 2003). For example, other forms of pointing such as chin-pointing and lip-pointing are more common than index finger pointing in Barai, Yimas, and Watam of Papua New Guinea (Wilkins, 2003). Age of emergence and frequency of infants' pointing might change depending on maternal education and social-interactional experiences of cultural groups (Callaghan et al., 2011; Liszkowski et al., 2012; Liszkowski and Tomasello, 2011; Salomo and Liszkowski, 2013). For instance, Chinese, Dutch, and Mayan infants' frequency and emergence of pointing diverged from each other depending on the amount of time they spent in triadic joint actions and the amount of pointing in the input provided to them. The Chinese infants were exposed to triadic joint activities and gestural input more frequently than the Dutch infants, and the Dutch infants had more frequent exposure to triadic activities and gestural input than the Mayan infants. In turn, the Chinese infants pointed more than the Dutch infants, and the Dutch infants pointed more than the Mayan infants. Moreover, emergence of index finger pointing by the Mayan infants occurred at a later age than for the Chinese and Dutch infants (Salomo and Liszkowski, 2013). Furthermore, Tzeltan infants in a Mayan community pointed less frequently and the duration of their pointing was shorter than Rossel infants in Papua New Guinea (Brown, 2011). Infants' pointing also showed within-culture differences depending on activity context (Puccini, Hassemer, Salomo, and Liszkowski, 2010) or socio-economic conditions (SES) (Rowe and Goldin-Meadow, 2009a). For example, 12-month-olds pointed significantly more in a situation where they looked at different objects displayed on the walls of a room together with their caregivers than a situation where they and their caregivers played freely with various toys (Puccini et al., 2010). As another example, 14-month-old infants with high SES backgrounds pointed more often in comparison to their peers with low SES backgrounds; this difference was explained by the variation in the frequency of the caregivers' pointing gestures (Rowe and Goldin-Meadow, 2009a).

In sum, by the middle of the second year of life, children become competent users and interpreters of various socio-pragmatic cues such as looks and gestures and start able to coordinate their attention in accordance with others' attention. These newly emerging capacities open the way for successful referential communication. As infants get older, they move from dyadic to triadic interactions. In other words, they spend more time to share their interest in outside entities with a communicative

partner rather than just engaging in face-to-face play with an adult or manipulating a toy non-communicatively (Bakeman and Adamson, 1984; Trevarthen and Hubley, 1978). Around 18 months, children have a more active role (rather than just be passive learners) in building coordinated attentional segments with their social partners in referential interaction contexts (Bakeman and Adamson, 1984). Infants' increasing competency in correctly reading various communicative or socio-pragmatic cues and effectively using joint attentional or referential skills is closely related to their competency in understanding a social partner's intentions about external entities and adjusting their behaviors according to the requirements of their communicative partner and conversational context. For instance, following eye gazes and/or pointing gestures of a communicative partner will possibly help infants to find an object hidden within an opaque box or behind a barrier. However, natural conditions are somehow different from the conditions in the experimental studies and children's actual task is beyond matching a novel label with a single referent by following only one modality of communication. In the following section, we present experimental studies that represent the more complex and dynamic nature of referential situations in spontaneous interactions between children and adults.

2.3 Experimental studies representing natural referential interactions

There are two important characteristics of child-parent referential interactions in a natural communicative context. First, there are multiple potential referents in a communicative environment and, in some cases, the infants' focus is on incorrect or non-target referent while the adult is introducing or providing a label for a target object (Harris, Jones, and Grant, 1983; Tomasello and Farrar, 1986). With regard to this point, Baldwin (1991) conducted a study using a "discrepant labeling" paradigm. Children were exposed to one of the two conditions. In the follow-in labeling condition, the experimenter was looking at the referent under the focus of the infant while producing a novel label. In the discrepant labeling condition, the experimenter's and the child's focus was on different referents while the experimenter was producing a label. 16- to 19-month-olds achieved to correctly match the label and the target object under the attention of the experimenter in the discrepant as well as in the follow-in labeling condition. Second, there are multiple communicative cues occurring simultaneously and in some situations, the adults' communicative cues might be vague or might contradict with each other. For example, an adult can suddenly begin to talk about a new referent while still pointing to a previously attended referent (Ateş and Küntay, 2014; 2017). Children seem to solve such ambiguous situations by using various socio-pragmatic cues: For example, Grassmann and Tomasello (2010) examined young 2- and 4-year-old children's responses to an adult's ambiguous verbal and nonverbal referential cues during a playful task where children are allowed to slide various objects through a chute attached into a box. In the novel-familiar condition,

the adult verbally asked for a familiar object (e.g. "Give me the **car**") while ostensively pointing to a novel object such as an unusual **yoyo**. In the familiar-familiar condition, the adult asked for a familiar object (i.e. "Give me the **cup**") while ostensively pointing to an incorrect familiar object such as a **car**. The results indicated that both groups of children heavily relied on ostensive pointing rather than object labels in both conditions. Ateş, Kaya, and Küntay (2014) replicated Grassmann and Tomasello's experimental procedure with some modifications. For example, there were two experimenters in two separate rooms. The experimenter in the first room asked the children to play the chute-game after carrying the chosen object to a second experimenter in a separate room. The experimenter in the second room asked the children for the name of the object before allowing them to start playing with the object. Asking for the name of the object after the children's choices allowed us to understand whether the children's verbal responses are consistent with their behavioral responses in referentially ambiguous situations. We confirmed, as in Grassmann and Tomasello (2010), that although the children mostly relied on ostensive pointing rather than verbal labeling in the novel-familiar condition, they followed the two kinds of cues at equal rates in the familiar-familiar condition. Unlike Grassmann and Tomasello's study, in both conditions, the children basically took both objects to the experimenter although they mostly reached the pointed-to object first. Moreover, especially in the novel-familiar condition, there were significant amount of cases where the children produced the novel label heard from the experimenter for the familiar object they had chosen. In other words, for a familiar object, the children produced a novel label (e.g. mota) rather than the real name of the object (i.e. bird), possibly thinking that the familiar object has a second name, such as "mota" as the proper name of the bird. These results altogether suggest that the children seem to solve the ambiguity in both conditions by integrating the cues from verbal and nonverbal modalities of communication. As another example for children's success in overcoming pragmatically ambiguous situations, 12-month-olds correctly identified a target referent (i.e. a toy introduced in the absence of an adult) from an array of objects in response to the adult's ambiguous request (e.g. "Wow! Cool! Can you give me that?") by considering their previous play with that adult (Tomasello and Haberl, 2003). Based on their previous experiences, they were also more likely to map novel words to familiar objects if they decided that the informant was knowledgeable and accurate rather than ignorant and inaccurate (Krogh-Jespersen and Echols, 2012). In other words, if the experimenter's verbal statements implied that she knew the object and if she produced correct labels for the objects presented before the target object, the children were more likely to rely on the information provided by the experimenter. However, 3-year-olds tended to map a novel word to an unfamiliar referent when the speaker gave specific (e.g. the function of the object) rather than general information about the target object (Nilsen, Graham, and Pettigrew, 2009). Therefore, by preschool years, children seem to have capability of using different strategies in order to map a novel label with a specific object by taking some important socio-pragmatic factors into account. By the same age period, between 2 and 5 years,

children are also able to detect referentially inappropriate or unexpected situations as long as the infelicity of the situation is apparent to them (Davis and Katsos, 2010; Morisseau, Davies, and Matthews, 2013). For example, 5-year-olds showed sensitivity to both under-informative (e.g. "find the orange" in the presence of more than one orange entities) or over-informative (e.g. "find the cat with a tail" in the presence of only one cat) sentences. In such cases, they demanded clarification, checked the experimenter by verbally reacting or intently looking at the experimenter until she provided a clarification for the situation, and gave late responses to the experimenter's questions (Morisseau et al., 2013). They also rated a speaker's under-informative, but not over-informative, utterances as bad and silly rather than good and sensible in a binary-judgment task, and gave fewer rewards to the speakers who used either over- or under-informative in comparison to optimal utterances. However, as speakers, preschool children are optimally informative as long as there is only one instance of a certain entity. When there is more than one instance, they are usually under-informative (Davis and Katsos, 2010). Moreover, even they reacted to the situations violating their socio-pragmatic expectations, preschool children rarely correct inappropriately informative sentences when they were given a chance to do so in a production task (Morisseau et al., 2013).

Thus, by preschool years, children seem to be capable of detecting pragmatically ambiguous or violated situations and developing various strategies in order to find logical solutions for these situations. However, we do not know yet whether toddlers and preschoolers use similar strategies with adults when they face with or experience relatively more ambiguous communicative situations. In order to answer this question, we need some studies that systematically compare the performance of children with adults under situations with distinct levels of ambiguity.

In the next section, in order to understand underlying factors behind the problems in the development of higher order socio-pragmatic skills such as joint attention and referential communication, we present some studies focusing on the development of basic socio-pragmatic skills including gaze behavior and gestures in children with atypical development.

3 Problems in socio-pragmatic skills of atypical populations

We cover here research about autism spectrum disorder (ASD), taking into account the proposal that children with ASD represents the least favorable example of pragmatic development and social communication (Norbury, 2014). We also present some studies comparing the development of socio-pragmatic skills between the children with ASD and with other disorders such as Specific Language Impairment, William's syndrome, and Down syndrome.

For children with ASD, impairment in joint attentional skills has been explored quite closely (Baron-Cohen et al., 1996; Leekam, Baron-Cohen, Perrett, Milders, and Brown, 1997; Leekam, Hunnisett, and Moore, 1998; Lord, 1995; Loveland and Landry, 1986; Mundy and Newell, 2007; Mundy, Sigman, and Kasari, 1994; Mundy, Sigman, Ungerer, and Sherman, 1986; Sigman, Ruskin, Mervis, and Robinson, 1999). Recent research has attempted to understand these children's problems in joint attentional interactions by separately examining problems in spontaneous gaze following, mutual engagement, and declarative gestures.

One of the markers of atypical development is abnormalities in eye contact. Children with ASD tend to look at their communicative partner's eyes less than typically developing children (Dalton et al., 2005; Klin, Jones, Schultz, Volkmar, and Cohen, 2002). However, there are also studies showing that the overall amount of eye contact of these children does not differ from their typically developing peers (Sigman, Mundy, Ungerer, and Sherman, 1986; Volkmar and Mayers, 1990). Therefore, there is a lot of research dedicated to understanding what the basic problem of autistic-spectrum children is with regard to eye contact (e.g. Baron-Cohen et al., 1995; Dawson, Meltzoff, Osterling, Rinaldi, and Brown, 1998; Senju, Yaguchi, Tojo, and Hasegawa, 2003). Although some researchers suggest that the problem is related to face-processing abilities such as face discrimination and face recognition (Dawson, Webb, and McPartland, 2005; Klin, Sparrow, de Bildt, Cicchetti, Cohen, and Volkmar, 1991), there is other research indicating that these children have intact face-processing skills. For instance, they are able to recognize the identity of a person from upside down photographs (Hobson, Ouston, and Lee, 1988). Moreover, they can correctly identify which direction a person is looking at (Baron-Cohen et al., 1995; Leekam et al., 1997). For instance, school-aged children with autism were able to detect where a person is looking at from the photographs that include either matched or mismatched head and eye direction (Leekam et al., 1997). Moreover, when they were presented a pair of cartoon faces that either was looking away or directly looking at the child and were asked the question of "Which one is looking at you?", they were able to correctly answer this question (Baron et al., 1995). However, these children still performed poorly on tasks that required them to spontaneously follow an adult's eye gaze towards an external entity (Leekam et al., 1997; 1998; Leekam, Lopez, and Moore, 2000).

There are various explanations for these children's problems in spontaneous-gaze following (for extended discussion, see Nation and Penny, 2008). Baron-Cohen and colleagues (1995) proposed that the children with ASD have problems in understanding the fact that eyes convey some information about various mental states such as others' desires, intentions, goals, and thoughts. In a series of experiments that included three groups of children with the same verbal mental age (i.e. children with autism, with mental handicap resulted from an unknown etiology or William's syndrome, and with typical development), Baron and colleagues (1995) found that the children with ASD failed to infer the desire or goal of a character placed at the

center of a cardboard from her/his looks at one of the sweets placed at each corner of the same cardboard. Rather, they predicted the character's choice of candy in accordance with their own preferences. The children's impaired performance in these tasks seems not to be resulting from their limitations in understanding graphical representations, since a third experiment showed that these children's egocentric choices were lower when an arrow was used as a cue, in comparison to a face with eyes directed to the target candy. An alternative explanation argues that these children have problems in attention allocation skills (Leekam et al., 2000), in directing their attention to a particular stimulus that is under the focus of their communicative partner. In other words, they have problems in rapidly shifting their attention from one stimulus to another (Courchesne, Chisum, and Townsend, 1994; Courchesne et al., 1994; Pascualvaca, Fantie, Papageorgion, and Mirsky, 1998). For instance, they have difficulty in diverting their attention from an auditory to a visual (Courchesne et al., 1994) or from a central to a peripheral stimulus (Casey, Gordon, Mannheim, and Rumsey, 1993). However, there are other studies showing that the children with autism have intact attention allocation skills (e.g. Kylliainen and Hietanen, 2004; Swettenham, Condie, Campbell, Milne, and Coleman, 2003).

The contradictory findings might be explained by Dawson and colleagues' argument suggesting that the level of impairment in these children's attention allocation skills changes depending on the nature of the stimuli (i.e. social vs. non-social; static vs. moving) (Dawson, 1991; Dawson and Levy, 1989). The problems in their attention allocation skills are more apparent in the presence of social stimuli (e.g. gestures, facial expressions, eye gaze) rather than non-social stimuli because of relatively more complex and unpredictable nature of social stimuli (Dawson, Meltzoff, Osterling, Rinaldi, and Brown, 1998). Social stimuli include information about various mental states such as goals, desires, and thoughts, so that similar social cues might have different meanings depending on distinct communicative situations. Moreover, communicative cues from multiple modalities, which could be consistent or contradictory with each other, possibly create some difficulty for children in processing such multidimensional information. Dawson and colleagues (1998) tested three groups of children (i.e. children with ASD, down syndrome, and typical development) to determine whether they turned towards to either social (i.e. clapping hands, calling children's name) or non-social stimuli (i.e. playing a musical jack-in-the-box, shaking a rattle) and whether they were able to follow an experimenter's looks or points to a toy placed in front or back of them. The results indicated that the orientation error of the children with ASD was greater than the other two groups of children, and the group differences were even greater when the stimuli were social rather than non-social. Moreover, the children with ASD made more errors than the children with Down syndrome or typical development when they needed to follow the attentional flow of another person. There was a significant correlation between these children's performance in following others' attentional shifts and orienting to

social stimuli, but not to non-social stimuli. Therefore, the authors concluded that these children's incompetent joint attentional skills such as following gaze shifts of and building mutual engagement with a communicative partner, might be resulting from their failure in visually orientating to social stimuli. However, contradictory findings based on a large amount of research focusing on reflexive attentional cuing have questioned the credibility of Dawson and colleagues' argument. Some studies pointed out that the children with ASD showed the same reflexive orienting response to social (e.g. eye gaze, head turn) and non-social (e.g. arrows) cues, while the others showed that their reflexive orienting response was valid only for non-social cues (for a review, see Nation and Penny, 2008). Based on these findings, Nation and Penny (2008) underscored the fact that the people with ASD show normal reflexive orienting response to social cues in cued-attention tasks, which measure the differences in a participant's reaction time to expected versus unexpected location of a stimulus presented on a computer screen (Posner, 1980) but not in tasks representing naturalistic or spontaneous interactions. Leekam and colleagues (2000, 2006) argue that if the children's performance is affected by the orientation of social stimuli in both situations including natural dyadic and triadic interactions, then Hobson's (1993) I-thou intersubjectivity model suggesting that children's problems in joint attention skills result from difficulties in interpersonal engagement is supported. According to this model, children have problems in neural processes that function in one's understanding the fact that he/she is a separate entity and other people are entities that have a relation with her/him. In fact, these children's incompetencies in creating joint attentional bids with a communicative partner and referring to external entities are based on problems in dyadic interactions. Leekam, Lopez, and Moore (2000) examined both dyadic and triadic interactions of two groups of preschool children: the children with ASD and the ones with developmental delays without an ASD component (e.g. organic disorders, global or specific developmental delays). In order to observe dyadic interactions, the experimenter tried to make eye contact with the child by either merely looking at the child or also verbally calling the child's attention in addition to looking at her. In order to observe triadic interactions, they adapted Corkum and Moore's (1995) "gaze-following" paradigm, which was originally designed to measure typically developing 6- to 12-month-old infants' responses to an experimenter's head turns. This paradigm includes three phases: baseline, training, and testing. In the baseline phase, the children's responses to an experimenter's head turn were measured in the absence of a target object, where the target object was hidden within an opaque box. In the training phase, following the experimenter's head-turn, the target object in the direction of the head turn was activated through a remote control by a second experimenter and became visible to the child. In the testing phase, the target object was activated and became visible depending on the child's correct head turn requiring the child to follow the direction of the first experimenter's head turn. Leekam and colleagues

(2000) suggested that Corkum and Moore's paradigm also works with the same principle of attentional cuing paradigm by Posner (1980), since the appearance of the target object stimulates the peripheral visual field and the children have a chance to predict the location of the target object based on a cue (i.e. the experimenter's head turn). Yet, in comparison to the cued attention tasks, this task represents naturalistic interactions better. In the trials assessing dyadic interactions, overall, the children with autism were less responsive to the experimenter's attempts to make eye contact in comparison to the children with developmental delay. In the gaze-following trials as well, the children with ASD were less responsive to the communicative cues of the experimenter. Only 20% of the children with autism (4 out of 20), but 65% of the children with developmental delay spontaneously followed the gaze direction of the experimenter. From the remaining 80% of the children with autism (16 out of 20), only half of them followed the experimenter's head turn as long as the target object became visible. However, the other half of 80% did not follow the experimenter's head turn at all. They concluded that the problems in both dyadic and triadic interactions might be responsible for impairment in joint attentional skills of children with autism. Moreover, when the same procedure was replicated with a non-human, non-communicating cue such as a toy train that informed the children about the direction of an upcoming target object, both the children with ASD and developmental delay showed worse performance compared to their performance in turning towards the right direction following the human social cue. Therefore, children with ASD seem to have problems in both dyadic and triadic interactions and these problems seem to go beyond the nature of stimuli. Although these findings seem to indirectly support Hobson's argument suggesting that the problems in joint attentional tasks based on difficulties in interpersonal or dyadic interactions, they did not explicitly test whether interpersonal interactions are directly responsible for problems in joint attentional skills.

Leekam and Ramsden's (2006) study focused on this question by investigating whether difficulties of children with ASD in dyadic interactions are specifically associated with impairments in joint attentional skills, but not other communicative skills that do not require joint attentional skills (i.e. behavior regulation). Representing dyadic interactions, they examined how these children responded to an experimenter's vocal (e.g. "Hey! Look at me!" or "Jamie, Look at me!"), and non-vocal (e.g. touching child's hands or waving hand) attempts for building eye contact with the child. In the study, behavior regulation was measured though children's responses to the experimenter's either gestural or verbal requests whereas joint attention skills were measured children's deictic gestures referring to a third-person entity or their responses to the experimenter's communicative attempts about a third person entity. The results showed that the children with ASD responded to the experimenter's referential attempts less than their peers with developmental delays, particularly with regard to vocal attempts. Moreover, the low ability group of children with ASD performed especially lower than the children with developmental delays on the tasks

requiring children to use joint attentional skills. Only ASD children's performance indicated an association between dyadic attention and joint attentional skills.

Based on Atkinson, Hood, Wattam-Bell, and Braddick's (1992) research with typically developing 1- and 3-month-old infants, Leekam and colleagues (2000) also argued that the children with ASD might have some problems in pairing their partners' communicative cues with a target in a specific location, especially in the presence of a distractor. In other words, similar to 1-month-olds in Atkinson and colleagues' study, the children with autism might suffer from disengaging from a central stimulus and shifting their attention to a peripheral stimulus when the presentation of the two kinds of stimuli are overlapping. This argument was tested by manipulating the presence of a central stimulus via two different kinds of trials. In the overlap trials, the central stimulus was kept present during the first appearance of the target peripheral object and also during its whole presentation. In the non-overlap trials, the target peripheral object replaced the central stimulus, that is, the central stimulus was unavailable as long as the peripheral object was visible to the child. The results pointed out that the accuracy of the children with autism was the same as that of the children with developmental delays. In fact, low-IQ children with autism were even significantly faster than their peers with developmental delay in disengaging from a central stimulus and shifting their attention to a peripheral one.

As suggested by Luyster and Lord (2009), the inconsistent results in the literature might be due to the differences in the experimental procedures such as display of real objects vs. representations of them (via a computer screen), number of cues affecting the level of the saliency of the target object, or linguistic structure of verbal stimuli. Aketchi and colleagues' (2011) research might provide an answer to this argument: Based on Baldwin's (1991) paradigm, they presented a situation through a computer screen that requires a responder to associate an object to a novel label in accordance with the gaze direction of the speaker in the presence of a distractor. There were two experimental conditions. In the follow-in condition, the speaker looked at the object that the child was looking at and produced a novel label for this object. In the discrepant condition, the speaker looked at and produced a novel label for the other object rather than the one that the child was looking at. The results showed that the children with ASD were more likely to select the object under the speaker's rather than their own focus. Moreover, they looked at the target (i.e. under the focus of the speaker) and the distractor (i.e. under the focus of the child) objects for an equal amount of time, but the children with typical development preferred to look at the target object longer. However, in a second experiment, when the researchers increased the saliency of the target object by jiggling its representation on the screen, the frequency of both groups' selection of the target object and the duration of their looking time at the target object increased in comparison to the first experiment. Therefore, the authors concluded that the failure of the children with ASD results from their inability to discriminate the target object under the focus of the speaker from the competitors. In a more recent experiment, Akechi, Kikuchi, Tojo, Osanai, and

Hasegawa (2013) applied exactly the same procedure but, to represent natural interactions, they added index finger pointing accompanying eye gaze. They found that the performance of the children with ASD was improved in the discrepant learning condition in comparison to their performance in the prior study where the experimenter solely used eye gaze as a communicative cue (See Study 1 in Akechi et al., 2011). Furthermore, parental reports of the children with ASD (Leekam et al., 1998) showed that additional cues accompanying eye gaze such as pointing gestures and attention getters (e.g. "Look!") increased their children's performance in spontaneous gaze following. Therefore, both experimental studies (Aketchi et al., 2000; Akechi et al., 2013; Leekam et al., 2000) and parental reports (Leekam et al., 1998) supported the proposal that the children's performance in the presence of distractors might be enhanced by using multiple communicative cues that signal the target entity.

It is also important to note that the level of impairment in joint engagement and attentional orientation changes depending on the children's chronological and mental age, suggesting that the problems in these skills probably lessen as children get older (Leekam et al., 1998; Leekam et al., 2000; Leekam and Ramsden, 2006; Mundy et al., 1994). Then, one possibility is that the core skills that are necessary for a healthy communication such as gaze following and deictic gestures could be delayed rather than impaired in these populations of children (Camaioni, 1997; Leekam et al., 2000). For example, children with ASD were able to understand and to produce declarative pointing between 3 and 5 years of age (Camaioni et al., 1997) and to follow a recipient's eye gaze between 4 and 5 years of age (Leekam et al., 2000). Moreover, children with ASD spontaneously followed one's head-turn and eye gaze better if they had a relatively higher mental age (over 48 months) (Leekam et al., 1998). However, as the studies reviewed in the previous section have shown, these behaviors develop by the middle of the second year of life in typically developing children. Parental reports also showed that gaze following of children with ASD appeared approximately three years later than their typically developing peers even their performance in the cases where other cues accompanying parents' gaze direction such as head turn and pointing were included (Leekam et al., 1998). Although there are no any longitudinal studies beginning from the preverbal period until the adolescence years, based on the results of the existing studies, one can argue that the gap between the socio-communicative skills of children with ASD and their typically developing peers do not entirely disappear over years. An important question we need to address is why these children show a delay in the development of the core socio-pragmatic skills needed for a healthy and effective communication.

The most empirically defendable reason for this delay seems to us is that the children with atypical development have problems appreciating their partners' communicative cues such as their eye gaze, pointing gesture, mostly in terms of understanding the communicative intention behind these behaviors (Baron-Cohen et al., 1995; Gliga, Elsabbagh, Hudry, Charman, Johnson, and Team, 2012; Leekam et al., 2000; Leekam and Ramsden, 2006). Supporting this argument, Gliga and colleagues (2012) found that children at risk for the development of ASD did not acquire a novel

label successfully although they effectively followed the eye gazes of their communicative partner. Therefore, word-learning requires more than solely associating a novel label with a target object via the help of various informative cues. In other words, through paying attention to multiple and salient socio-pragmatic cues, these children need to understand that both they and their communicative partners are intentional agents whose behaviors represent various mental states (Tomasello, 1999).

Another issue we should consider is whether the suggested definitions and measurement methods of the target socio-pragmatic skills are appropriate for different populations with distinct socialization histories. This point brings us to question the validity of suggested definitions and measurement protocols of pragmatic skills accepted as "typical".

4 Boundaries between the definitions of typical and atypical socio-pragmatic skills

Most researchers use gaze alternation as an indicator for the occurrence of higher order socio-pragmatic skills such as joint attention and ignore other channels of communication such as the auditory or tactile modalities. Although observing the visual component of attention is easier or more reliable, there are some cultural communities or communicative situations within the same cultural community where using only visual channel of communication might be misleading or actually might not be a valid measure to examine the development of target socio-pragmatic skills. Therefore, in order to objectively understand which skills or behaviors are predictors or indicators of higher-level socio-pragmatic understanding, we need to adopt a cross-culturally sensitive perspective, which emphasizes the importance of various ethnographic or semi-natural studies bringing up different practices in diverse groups or populations.

An important amount of ethnographic studies has shown that the structure of children's communicative environment and interactions are more variable than the ones in the experimental studies that have been mostly conducted with European samples. For instance, children from different cultures or various communities within the same culture are exposed to different interactional practices (e.g. dyadic vs. polyadic interactions), activity types (e.g. formal, school-like or informal contexts), and communicative partners with changing or different expectations and communicative goals (Akhtar and Gernsbacher, 2008). In some cultures, at least until a certain age, infants are not treated as conversational partners in the European fashion – for example they are not exposed to face-to-face or dyadic interaction as much as their peers in European cultures (Brown, 2011; De Leon, 1999). Infants in the Tzeltal Mayan community are mostly carried in a shawl and rarely set down until the end of the first year of life. They have relatively fewer interlocutors in comparison to their peers in European countries and those interlocutors are mostly unresponsive to their

preverbal utterances. The caregivers avoid initiating interactions and eye contact with their babies until the babies are mature enough to initiate interactions with their caregivers by themselves. In fact, they use bodily interactions in order to sooth their infants or keep them calm, only point to external entities such as animals in order to distract their infants from uncomforting internal states. Tzeltal infants do not often attend to others' points, exhibit accompanying eye gaze to their own points, or use eye gaze with a different purpose, to check an interlocutor's attention or interest (Brown, 2011). De Leon's (1999) study also indicated that Zinacantec infants in the Tzotzil Mayan community are wrapped in a skirt and carried on the caregivers' back 70% of the time from birth until 8 months, leaving little opportunity for children to engage in face-to-face, dyadic interactions with others at earlier time points. However, as opposed to European or Western infants, they have more chance to physically contact with their caregivers, which creates a communicative context allowing them to benefit from other nonverbal channels of communication. In fact, caregivers understand the babies' needs from their body movements and specific vocalizations. As an example, infants' deep guttural vocalization is inferred as their desire to urinate. Moreover, there are specific routines that allow Zinacantec children to participate in interactions between adults as proto-speakers or proto-addressees. For instance, beginning from the age of 4 months, caregivers attend to and interpret their babies' gestures and vocalizations and translate these communicative acts to others via "elicitation routines", also called as "elema routines" by Schieffelin (1990). In these interactions, the caregiver formulates what the child tries to say using "say X" frame (e.g. "She said she wanted to pee") while the child actively follows or participates in this interaction. In a sense, the caregivers have a mediator role in order to help their preverbal, nonspeaking youngsters to communicate with others. At the same age period, the caregivers also attempt to build joint attention with their babies through various communicative devices such as rhetorical questions (e.g. "Do you see it?", "Where did you go?"), interactional routines (e.g. greetings, games such as peekaboo, rhymes), and motherese register (i.e. special vocabulary used for only young children) rather than a specific kind of triadic interaction with gaze shifts between the communicative partner and an outside entity. The caregivers and their children in this society share the same visual field by synchronic eye or head movements. For example, when a passerby greeted a caregiver carrying the baby on her lap, the caregiver and the baby synchronically turned their heads and eyes towards that person while the baby was listening the dialogue between the two adults. Therefore, in this interaction, the infant as a "side participant" shared her caregiver's engagement to an outside entity (the passerby). By eight months, these infants are embedded to the interactions between adults by synchronically producing vocalizations and changing their gaze directions and/or body position. By 10 months, when the children become physically more active, close physical interactions between caregiver-child dyads are replaced by long-distance verbal monitoring that mostly includes imperatives, questions, and declaratives. By 2-years-old, when

the spoken language emerges, children are accepted as a communicative partner and actively involved in dyadic conversations. If we evaluate from the common (Western) perspective, we might think that the children living in these societies possibly develop delayed or impaired skills in socio-pragmatic aspect of language since they are exposed to prototypical joint attentional frames relatively later (i.e. around the age of 2) than children in Western societies. However, from a cross-culturally comparative perspective, behaviors generally accepted as universal or functional in adult-child interaction such as early joint attentional interactions might reflect a cultural bias of European researchers (Rogoff, 1990).

European researchers have mostly not investigated communicative cases where children's gaze shift from an object to a person is not resulted from sharing intentionality, but rather from their relatively automatic response to the person's specific behavior (Carpenter et al., 1998). Furthermore, most European-based research has not examined the cases where children attend to an entity by using other modalities (e.g. auditory or tactile) rather than the visual modality. For instance, the sound of a bus travelling outside (and remaining outside of the visual field) can draw a child's attention and lead to a conversation between the child and his caregiver about buses, passengers on the bus (Ateş and Küntay, 2014; 2017). Alternatively, children can simultaneously attend to two or more events by using distinct modalities of communication for each event. As an example, they might auditorily attend to an entity (e.g. the sound of a cartoon on tv) while simultaneously visually attend to another entity (e.g. looking at the pictures of a book with their parent). Supporting this argument, there are some empirical studies showing that children are able to learn new skills from an ongoing event not directly addressed to them. For instance, they are able to learn to build new origami figures by watching an adult demonstration addressing their sibling (Correa-Chavez and Rogoff, 2009; Correa-Chavez, Rogoff, and Arauz, 2005) and to learn novel words by overhearing the speech between two adults (Akhtar, 2005; Akhtar, Jipson, and Callanan, 2001; Floor and Akhtar, 2006; Gampe, Liebal, and Tomasello, 2012; Schneidman et al., 2009). Moreover, their learning from overheard situations is robust in the presence of a competing event, such as an unrelated talk between the same-aged peers or a distractor toy (Akhtar, 2005; Correa-Chavez and Rogoff, 2009). Some research showed that children's success in learning from non-addressed, overheard situations was associated with their distinct attentional strategies. For instance, children who are able to follow two or more events at the same time without interrupting their attention for one event for the sake of the other event(s) were more successful in learning new origami figures by watching the interaction between an adult and her addressee (Correa-Chavez and Rogoff, 2009). These differences in attentional strategies are basically attributed to the differences between cultures with regard to child-raring practices and/or goals. For example, in some (usually traditional) cultures, the responsibility to learn belongs to the children, that is, children are expected to learn by themselves through observing and participating in family and community activities and caregivers support their learning only when the children ask for help. In some other

(usually European) cultures, adults take the main responsibility to teach their children via structured, child-focused activities that mostly require dyadic or face-to-face interactions (Chavajay and Rogoff, 1999; Correa-Chavez and Rogoff, 2009; Correa-Chavez et al., 2005; Lopez, Correa-Chavez, Rogoff, and Gutierrez, 2010; Rogoff, Correa-Chavez, and Silva, 2011; Silva, Correa-Chavez, and Rogoff, 2010).

Some cross-cultural studies have also indicated that caregivers' responses to their children's socio-communicative cues such as eye gazes, smiles, touches, and vocalizations vary from culture to culture (Fogel, Toda, and Kawai, 1988; Kärtner et al., 2008). For example, Kärtner and colleagues (2008) examined semi-naturalistic interactions between caregiver-child dyads from six cultural communities (i.e. Los Angeles-USA, Berlin-Germany, Beijing-China, Delhi-India, urban and rural Nso-Cameroon) when the infants were 3 months old. They showed that the mothers from Berlin and Los Angeles more frequently responded to their infants' vocalizations using the visual channel of communication (e.g. eye gaze, smile or facial expression with raised eyebrows) than the mothers in other communities. Moreover, the caregivers from rural Nso more often responded to their infants' touches than the ones from other cultural communities except for Los Angeles. The caregivers in Los Angeles were also more responsive to their infants' touches than the caregivers in urban Nso and Berlin. The authors explained these differences by Keller's (2007) proposal that in interdependent cultures, proximal components of parenting (i.e. body contact and body stimulation) have a more significant value while in independent cultures, distal components of parenting (e.g. face-to-face interaction and object play) play a more important role in child raring practices. Murase, Dale, Ogura, Yamashita, and Mahieu (2005) also indicated that typically developing children follow different routes in their referential interactions during a shared book-reading session with their mothers. For example, American children more often labeled the pictures (e.g. "elephant") on the book following their mothers' elaborative questions (e.g. "What is its color?") about these pictures than Japanese children did. However, Japanese children more often labeled the pictures following their mothers' labels for these pictures than American children did. In other words, Japanese children basically used imitation in order to talk about external entities. Moreover, American mothers more frequently followed their children's labeling with elaborative questions than Japanese mothers did. However, Japanese mothers more frequently their children's labels with confirmative utterances showing that they share the fact or idea provided by the children (e.g. "That's right!") than American mothers did. The authors explained the distinct structure of these parent-child interactions through Azuma's (1994) socialization models: American learning basically relies on the instruction model with predefined roles suggesting that adults are mentors while children are learners. However, Japanese learning mostly relies on the osmosis model suggesting that children are responsible to learn new skills through modelling and incidental learning.

Even if we accept that the visual channel of communication is the only or the main route for the establishment of joint attention, according to Carpenter and Liebal's (2011) proposal, people might enter into joint attentional episodes at different levels

and therefore use distinct cognitive processes requiring different kinds and combinations of communicative cues or behaviors. For instance, the communicative path for the establishment of a joint attentional episode is quite different from each other in a situation where an adult consciously wants to introduce a referent to a child and in a situation where a referent in a mutual environment simultaneously draws both the adult's and the child's attention by itself because of its salience. In the first situation, at least three types of communicative cues are required in order to get the attention of a communicative partner: "initiation looks", "reference looks", and "sharing looks". Initiation looks signal the initiator's communicative intent and aim to draw the recipient's attention to an entity. These looks are usually accompanied by attention getters and ostensive cues. Reference looks show the initiator's referential intent and are usually accompanied by deictic gestures. Therefore, the first two kinds of looks are one-sided and function to begin a joint attentional episode. However, sharing looks are bidirectional, usually accompanied by a smile and comments and show that two communicative partners finally achive to jointly attend to an external entity. In other words, they occur when the two partners equally participate in the event and mutually share their attention. Thus, in the second situation, sharing looks meaning, "Hey, did you see that?" are sufficient in order to complete the episode automatically initiated by a mutual context (e.g. a loud noise). Accumulated research is mostly about the cases like in the former example where one of the communicative partners has a more dominant role; but mostly ignores the situations like in the second example where both communicative partners have a more equal role in the establishment of a joint attentional episode.

Therefore, it seems better to avoid evaluating the development of children's socio-pragmatic skills as "typical" or "atypical" merely based on a certain combination of a limited range of behaviors. In other words, "shared intentionality" or "knowing something together" might be achieved through distinct combinations and order of verbal/linguistic structures and nonverbal strategies depending on different socio-cultural characteristics of a certain group and distinct levels or types of interaction even within the same group. Based on this argument, one possibility is that children identified as having "atypical" development might follow different routes than their peers identified as having "typical" development about higher-order socio-pragmatic skills. Carpenter and colleagues' (2002) study might be accepted as indirect evidence for this argument: 3- to 4-year-old children with autism produced referential behaviors before developing joint attentional skills. This is a reversed pattern when compared to the typically developing children who achieved joint attentional engagement before the production of their first referential behaviors (Carpenter et al., 1998). That is, when attentional and behavioral skills were examined separately, the order of the occurrence of attentional (i.e. sharing, following, directing attention) and behavioral (i.e. following, directing behavior) skills was the same for both the children with atypical or typical development. However, when attentional and behavioral skills were examined together, 83% of typically developing children in the study of Carpenter and colleagues (1998) showed the following pattern: share

attention- follow attention- follow behavior- direct attention- direct behavior. However, 67% of the children with autism exhibited the following pattern: follow behavior- share attention- direct behavior- follow attention- direct attention. They were also less successful in comparison to their peers with developmental delays in the tasks such as "gaze following" and "declarative gestures". However, they were equally successful as their peers having developmental delays in the tasks such as imitative learning, which required children to reproduce a target action modelled by the experimenter. At this point, it is important to touch upon a body of work investigating different intervention methods to close the gaps in socio-pragmatic skills of the children with developmental delays and their typically developing peers. In these intervention studies, teaching joint attentional skills is accepted as a key component for the efficiency of an intervention program since it is accepted as foundational for other social and language skills such as functional and symbolic play and spontaneous speech (Whalen, Schreibman, and Ingersoll, 2006; White et al., 2011). White and colleagues' (2011) systematic review of 27 intervention studies including participants between the ages of 22 months and 10 years old showed that there are at least two groups of intervention studies aiming to improve children's joint attentional skills. In the first group of studies, joint attention is accepted as a collateral variable, meaning that the target skills in the intervention are not basic components of joint attentional skills; but still they are expected to contribute to the development of children's joint attentional skills (e.g. Baker, 2000; Ingersoll and Schreibman, 2006; Vismara and Lyons, 2007; Zercher, Hunt, Schuler, &Webster, 2001). As an example, these studies aimed to change some communicative conditions by incorporating ritualistic themes, reinforcement, and physical prompts into a game or to teach some skills such as liberty to make a selection and imitation. The second group of studies aimed to teach core components of joint attention such as pointing and gaze alternations (e.g. Gulsrud, Kasari, and Paparella, 2007; Jones, 2009; Kasari, Freeman, and Paparella, 2006). White and colleagues showed that, in both types of studies, (at least some) children's joint attentional skills showed improvement at the end of the intervention program (White et al., 2011). These findings suggest that a wider range of skills including imitation rather than only behaviors including looks and points might help children to gain joint attentional skills. However, in these studies the definition of joint attention as the outcome variable is somehow different from each other as well as the behaviors targeted in the intervention. The outcome variables in these interventions included different definitions of joint attention such as coordinated joint attention (i.e. children's active engagement with both an adult and an object) and supported joint attention (i.e. children's passive attention to an adult and an object, usually as a result of parental attempt). Alternatively, they included different sets of joint attentional skills including responses to or initiation of some joint attention behaviors such as pointing, showing, and/or coordinated looks between a person and object. Moreover, intervention studies differed from each other in some other important aspects such as the age of focus group, the cognitive functioning level of participants (e.g. low-, medium-, or high-functioning children), the delivery agent of intervention

(e.g. video, parent, or peer), the total number of participants (e.g. single subject or group studies), the density of intervention (e.g. the duration of one session, the number of sessions in a week, and the total length of intervention), the setting of intervention (e.g. clinic, school, or home), and some methodological characteristics (e.g. single subject design, group design, or randomized design) (for a detailed review, see Reichow and Volkmar, 2010). Therefore, we need more systematic studies in order to examine some unanswered questions including 1) Which behaviors or skills should be targeted in order to improve children's joint attentional skills in an intervention study?; 2) Do we need interventions targeting distinct behaviors or skills depending on distinct characteristics of focus groups (e.g. age, cognitive functioning level, family characteristics, etc.)?; and 3) What kind of interventions are more effective for the development of what kind of joint attentional skills?

Some recent studies examining the interactions between child-caregiver dyads showed that the caregiver input provided to children and responses of children to the input have some distinct features for children with developmental delays and their peers with typical development. For instance, in spite of the same amount of speech, the mothers of typically developing children produced more wh- questions in general, and more subject wh- questions than the mothers of children with autism (Goodwin, Fein, and Naigles, 2015). Bedford and colleagues (2013) also indicated that 2-year-old toddlers at a high risk for autism used the adult input differently than their typically developing peers. For instance, they failed to benefit from adult feedback in a word learning task; but their same-age peers efficiently used adult feedback and improved their performance.

These findings altogether seem to support our argument suggesting that the children with atypical development and their parents might give primacy to different mechanisms or modalities of communication.

5 Conclusion

The present review shows that, by the middle of the second year of life, children are competent users of various socio-pragmatic cues (e.g. looks, gestures), which enable them to understand their communicative partner's mental states such as intentions, goals, desires, and thoughts. These newly emerging capacities serve the development of higher-order socio-pragmatic skills such as joint attention and referential communication and help children to adjust their behaviors according to the requirements of a social partner and/or a communicative context. By preschool years, children are also capable of detecting pragmatically inappropriate situations and to find functional solutions to these situations. Research focusing on children with developmental delays, especially with ASD, has shown that these children have the core skills (e.g. spontaneous gaze following, deictic gestures) that are necessary for a healthy communication; but the emergence of these skills is rather delayed when compared with typically developing peers. In spite of different explanations with regard to the

reasons for this delay, we think that children with atypical developmental profile have problems in appreciating relevant socio-pragmatic cues regarding their social partners' mental states. Therefore, it seems that they are lacking basic skills of "intention understanding" or "mind reading". However, even research examining typically developing children has important limitations. First, we need more comprehensive research that investigates the role of various communicative cues from different modalities on the establishment of joint attentional episodes between children and their communicative partners. Second, we need to understand whether different communicative cues such as looks, touches, verbal statements are more beneficial at distinct types and/or levels of joint attentional episodes. Third, we need to understand whether there are different routes for the establishment and maintenance of joint attentional episodes during various types of interactions and across different cultural communities or sub-communities within the same culture. Addressing these issues will help us understand whether common and well-established definition and research methods in examining socio-pragmatic skills of children reflect solely Western criteria or are valid to generalize to different groups of children.

The current review also shows that we need more research in order to fill in the gaps in the literature targeting children with atypical development. For instance, to our knowledge, there has not been any research focusing on early periods (before the age of 2) considering the effect of verbal and nonverbal mechanisms and co-speech gestures on the establishment of joint attention in child-parent interactions of atypical populations. Before evaluating socio-pragmatic language development of children with atypical profiles, we also need to consider 1) whether the quantity and quality of the input provided to the children with atypical development are the same as their typically developing peers; 2) If they are not the same, whether the differences in the input provided to the children with atypical development explain between- and within- group differences in the skills previously reviewed; and 3) Even when they are the same, whether children with atypical development benefit to a different extent from the verbal and nonverbal mechanisms in adult input; and 4) Whether these children follow distinct routes in order to develop an understanding that other people have distinct mental and informational states, and therefore to achieve "shared intentionality."

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