

## Review



# Developing communication through objects: Ostensive gestures as the first gestures in children's development

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## ABSTRACT

The first gestures that children produce intentionally to communicate with others, make sense of the world around them, and control their behavior are ostensive gestures of showing and giving; these are also the first gestures that parents and teachers use to communicate with children and to regulate their behavior in their first months of life. Ostensive gestures are proximal gestures in which the child's hand is occupied by an object. In this sense, objects have a role in shaping children's first communicative acts: They are the first referents children communicate about and the first means they use to share references with others.

Despite their relevance to communicative development, a literature review highlights that there have been few studies investigating ostensive gestures in the first three years of life, while the study of distal gestures, especially pointing gestures, has prevailed. Some authors relate the relative absence of ostensive gestures in the literature to methodological issues that hinder their identification. Others question their nature as "true gestures" because they involve children's contact with objects and therefore there can be doubt about their underlying intentionality.

Increasing evidence has shown that ostensive gestures fulfill early communicative and self-regulatory functions from the end of the first year of life. These functions are very similar to the ones that are later observed in more complex gestures, such as pointing and symbolic gestures. This similarity provides a clear idea of progression in gesture development.

Based on these ideas, this article has two main purposes: to describe ostensive gestures and reaffirm their important part in gesture development, and to explore the hypothesis that ostensive gestures not only precede pointing in development, but that they are one of pointing's precursors, providing clues to the understanding of intentional communication's origin.

## Introduction

Psychological literature has centered on the study of *deictic gestures*, whose function is to direct the attention of an interlocutor to a referent in time or space, as the first gestures produced by children (Capirci & Volterra, 2008; Murillo & Belinchón, 2013). Bates et al. (1975) proposed that the first deictic gestures are *showing*, *giving*, and *pointing* and that they begin to be observed during the second half of the first year of life (between 8 and 12 months). These gestures are considered of great importance because they (1) mark the beginning of intentional communication, (2) allow the child to initiate the first triadic interactions, and (3) lay the foundations for the

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development of symbols and language. Over the years, the literature on gesture development has focused mainly on studying the *pointing gesture* and its relationship to the subsequent development of language. The gestures of *showing* and *giving* objects, also called *ostensive gestures*, have been relegated to the background, with few recent studies taking them as the main objective of their inquiries (Cameron-Faulkner et al., 2015; Choi et al., 2021; Clements & Chawarska, 2010). Even their status as gestures has been implicitly questioned through the claim that the occupation of the hand with objects is more characteristic of actions than gestures (Andrén, 2010; Novack & Goldin-Meadow, 2017; Kita et al., 2017; Rossini, 2012). An alternative to this view can be found in the perspective of the Pragmatics of the Object, which claims that objects have a social dimension because their practical uses are socially constructed through interaction and communication with others (Rodríguez & Moro, 1999). Considering the social dimension of objects enables us to think about them, when appropriate, as a shaping and decisive part of communicative acts and gestures.

This review aims to analyze the nature and relevance of ostensive gestures as the first gestures that allow children to share references with others (Rodríguez et al., 2015). They precede pointing's onset in development and may indeed support the development of pointing through establishing more fundamental communicative abilities (Boundy et al., 2018; Carpenter et al., 1998; Murillo et al., 2021). Considering gestures that develop before pointing and how they relate to later forms of communication broadens the current prevailing focus on the study of mature, already conventional gestures. It includes the analysis of gestures' construction process rather than their "sudden" acquisition or production. This means focusing on the possible precursors to the forms and functions of pointing and on previous transition behaviors that might be the origin of ostensive gestures. Identifying early communicative precursors would allow us to know more about specific gestures and would shed light on the origins, development, and conventionalization process of intentional communication.

It is imperative to introduce a developmental perspective into the study of gesture production, as we know very little about *how* gestures and symbolic communication come to be. A developmental approach provides an alternative to seeing gestures as communicative forms of innate onset. Instead, it assumes the perspective that gestures are "based on action, [and] process-relational" (Carpendale et al., 2021, p. 2): In this view, gestures are constructed progressively and acquire meaning through children's interaction with others (adults and peers) and with objects (Clark, 1978; Mead, 1934).

**Table 1**

Shows and Gives definitions in psychological literature.

Definitions of Showing and Giving gestures in the Literature		
Aspects emphasized	Example definition	Other examples
<b>Showing or Holding up/out</b>		
Accompanying eye contact	"Holding up the object toward the partner while making eye contact" (Zuccarini et al., 2018, p. 95).	Boundy et al., (2016; 2018); Capirci et al., (2005); Choi et al., (2021); Iverson & Goldin-Meadow, (2005); Mishra et al., (2021); Romano & Windsor, (2020); Rodrigo et al., (2006); Schneider & Iverson, (2022).
Absence of object transfer	"The child holds up the object, but it remains in child's possession" (Murillo et al., 2021, p. 1531).	Colgan et al., (2006); Murillo & Casla (2020).
Morphology (arms, hands, or body posture)	"Hand holds out an object, arm is extended toward a person" (Salomo & Liszkowski, 2013, p. 1301).	Deniz et al., (2019); Kuchirko et al., (2018).
Referential nature	"Referential gesture, which included a hand-held object. It was coded if a person held or moved an object to attract the interactional partner's attention" (Abels, 2020, p. 1822).	Cartmill et al., (2014); Dimitrova et al., (2020); Kanto et al., (2015); Kwon et al., (2018); Ye et al., (2021).
Direction of object extension	"Instances when an object was held up in the gesture space and oriented towards the child" (O'Neill et al., 2005, p. 354).	Capirci et al., (2002); Iverson and Thelen (1999); Miller & Gros-Louis, (2013).
Combinations of some or all previous aspects	"The child [...] stretches his or her arm while holding an object in his or her palm and directing his or her gaze from the object toward a partner back and forth to share the attention about a specific event or object" (Orr, 2018, p. 69).	Blake et al., (2005); Cameron-Faulkner et al. (2021); Capobianco et al., (2017); Colonnese et al., (2010); Gillespie-Lynch et al., (2013); Guevara et al., (2020); Sansavini et al., (2019); Lehman et al. (2013).
<b>Giving or Offering</b>		
Object transfer	"Infant hands object to adult and object changes hands" (Murillo & Casla, 2020, p. 110).	Boundy et al. (2016); Cameron-Faulkner et al. (2021); Capirci et al. (2005); Caselli et al. (2012); Choi et al. (2021); Mishra et al., (2021); Romano & Windsor (2020); Ye et al., (2021). Messinger & Fogel (1998); Parladé & Iverson (2010).
Intentionality	[Offer] "Hand holds an object that is brought close to a person, so she can take it" (Salomo & Liszkowski, 2013, p. 1301).	
Placing inclusion	"An object was handed to the child, or placed into his or her gestural space (e.g., placing an object on the table directly in front of the child)" (O'Neill et al., 2005, p. 354).	Guevara et al. (2020); O'Neill et al. (2005).
Morphology (arms, hands, or body posture)	"Extension of the arm with the object in hand and directed toward the hand of another person" (Zuccarini et al., 2018, p. 95).	Sansavini et al. (2019).
Accompanying eye contact	"Hands an object to the mother/baby checking his/her attention to establish the joint reference" (Rodrigo et al., 2006, p. 5).	Johnson et al. (2001).
Combinations of some or all previous aspects	"Infant hands object to another. There is movement of arms, and object changes hands" (Blake et al., 2005, p. 206).	

The article is structured in the following sections:

1. *The nature of ostensive gestures and their place in the psychological literature*: This section will discuss what ostensive gestures are, their relevance for early development, and their status in the literature (through a literature review). It will also present three possible explanations for their limited presence in developmental research: (i) the theoretical trend of excluding objects from communicative acts, (ii) the problem of intentionality underlying ostensive gestures, and (iii) some methodological issues associated with their study.
2. *The functions of ostensive gestures (their purpose)*: The second section is dedicated to summarizing what previous studies have revealed about the functions of ostensive gestures in early communicative interactions, as well as the role of private ostensive gestures in the first manifestations of cognitive self-regulation and executive function.
3. *Ostensive gestures as precursors of the pointing gesture*: In the third section, the assumption in the literature that the pointing gesture is the earliest gesture that is observed in development will be discussed and questioned to explore the hypothesis that ostensive gestures, not only come first, but that they are one of pointing's precursors.

## The nature of ostensive gestures as gestures in psychological literature

### What are ostensive gestures?

Etymologically, “ostensive” comes from the Latin word *ostensio-onis*, which means *showing clearly* (Moro et al., 2015). Research on early communicative interactions has mostly employed this term to indistinctly refer to both distal and proximal forms of interaction, such as the use of referential gaze, gestures, facial expressions, or prosody to show or indicate an object (see, for example, Behne et al., 2005; Bourdais et al., 2013; Colas, 1999; Kachel et al., 2021). However, in this article, based on the theoretical approach of the semiotician Umberto Eco, we understand ostensive gestures as *proximal gestures with objects*.

Eco (1976) defined ostensive gestures as behaviors in which communication occurs *through* an object occupying the hand. In contrast to distal gestures, such as pointing, in which sign (e.g., the extended index finger) and referent (e.g., the object, action, or event indicated) are clearly distanced and differentiated (heteromateric signs), ostensive gestures are proximal gestures in which sign and referent coincide (homomateric signs) (see discussion in Rodríguez, 2006). This means that the object simultaneously plays the role of sign and referent: The child communicates *through* the object by intentionally extending it toward the other (creating a sign that the interlocutor interprets) to share meanings *about* that *same* object (the referent) (Osolsobè, 1971).

In psychology, ostensive gestures have been commonly known as *showing* and *giving*, and they have been related to the classical functions of deictic gestures (Bates et al., 1975). However, these two kinds of gestures have been understood in a number of different ways (see Table 1). In the case of showing gestures, authors have emphasized the need for an accompanying gaze, the absence of object transferring, or the direction of the object extension toward an interlocutor. Scholars have also described showing gesture's morphology (extended arms, elbows bent), its attention-directing function, or a combination of these aspects. As for the giving gesture, most research has focused on transferring the object to an interlocutor's hand or lap or on the underlying intention of the child for the other person to take the object. Some authors also have included placing gestures (Clark, 2003) in this category. Only a few definitions have considered cues about arm extension, eye contact, or referential functions.

Some authors have tried to distinguish ostensive gestures of showing from gestures of giving. For example, Parladé (2007) established criteria for their distinction related to differences in gaze direction, gesture duration, and the reaction of the child to the interlocutor's response: “[...] Shows are usually directed to the face, whereas gives are generally directed to the caregiver's hands or body. Shows are typically brief with the child retracting the proffered object. Gives usually involve maintained gestures until the caregiver retrieves the object.” (p. 70).

A different approach has been to group these gestures together, as they both are considered “object extension gestures” (Olson & Masur, 2015; Wallbridge, 2022) or “proximal communicative behaviors” (Choi et al., 2021). In this article, we follow this last approach and opt for the more general term of *ostensive gestures*. This refers to the relationship between sign and referent and semiotically differentiates ostensive gestures from more complex productions such as distal and representational gestures. Additionally, following Peirce (1987, as cited in Rodríguez & Moro, 1999), we agree that “a sign is because of the function it fulfills” (p.110). In this sense, by using the term *ostensive gestures*, we want to do more than to simply establish that the child shows or gives an object but to consider the purpose of the child's gesture, its pragmatic function (see section 2 for further discussion).

In addition to *showing* and *giving*, it is possible to include the *placing* gesture described by Clark (2003) -mostly in adult communicative exchanges- within the category of ostensive gestures, as it implies communication *through* objects. It refers to instances where an object is placed in the other person's interactive space to share reference. For example, a waiter places a cup of coffee in front of a customer without saying anything but implying that it is what she ordered. While pointing gestures direct the interlocutor's attention toward the object indicated, placing gestures situate the indicated object within the interlocutors' attention and action focus. This distinction between pointing and placing gestures could be extended to all types of ostensive gestures, considering ostensive gestures as one of the many ways human beings can *indicate* a specific referent. Through this article, we will mainly refer to ostensive gestures of showing and giving because placing gestures have mostly been studied in parents or teachers who use them to communicate with children (Contin & Rodríguez, 2021; Guevara et al., 2020; Hamer & Rosenthal, 2006; Salomo & Liszkowski, 2013), but rarely in young children (some exceptions are found in the studies of Puccini et al., 2010; Rodríguez et al., 2021).

### *Relevance of ostensive gestures in psychological research*

Ostensive gestures seem to be one of the first communicative tools that adults use to communicate with children and regulate their behavior. A study by [Jáñez et al. \(2021\)](#) revealed that parents of premature babies preferentially used ostensive gestures to show objects to their children during the first weeks of life (see also [Jáñez, 2019](#)). Likewise, [Rodríguez and Moro \(2008\)](#) and [Moreno-Núñez et al. \(2015\)](#) analyzed early interactions with objects between parents and children from 2 to 6 months old. They found that no adult pointed in the distance when instructed to play with their child as they usually did; however, parents used ostensive gestures to bring the world closer to their child (see also [Moreno-Núñez et al., 2017](#); [Zukow-Goldring & Arbib, 2007](#)). The longitudinal research by [Rodríguez and Moro \(1999, 2008\)](#) and [Moro and Rodríguez \(2005\)](#) showed that parents of 7-month-old children used ostensive gestures to transmit the functional uses of objects to them. In the same line, [Rader and Zukow-Goldring \(2010\)](#) also observed that, when their children were between 9 and 14 months, caregivers usually directed their attention to objects with ostensive gestures of showing (see also [Zukow, 1990](#)).

Later in development, research has shown that these gestures continue to be used by caregivers during problem-solving situations as an orienting strategy. [Valloton et al. \(2015\)](#) observed dyads of parents and children between 18 and 72 months solving a block-puzzle task. Parents usually employed proximal gestures (especially show and tap gestures) with younger children (under 36 months) and distal strategies with older ones. These findings correlate with [Cavalcante and Rodríguez's \(2015\)](#) results for children between 24 and 36 months. They found ostensive gestures to be one of the main gestures used by mothers to transmit the concept of numbers to their children while playing with dice.

In summary, adults use ostensive gestures to show children the world when they are not yet able to explore it on their own in their first months of life. Later in their children's development, parents produce ostensive gestures to reach common agreements with them on the use of objects and instruments, to initiate and maintain episodes of joint action and attention, and to guide children's performance during problem-solving situations. However, seems relevant to clarify that ostensive gestures are not the only gestures used by parents and caregivers. For example, the study by [O'Neill et al. \(2005\)](#) found that caregivers rarely used ostensive gestures with 20-month-old children during free play and structured interactions. On the contrary, they usually employed pointing gestures. Parents often use diverse mediational strategies, including ostensive gestures, to interact with their children during the first years of life. More research is needed to understand the type of situations that promote ostensive gestures during parent-child early interactions, as well as the reasons *why* and the moment *when* parental strategies change from the use of proximal to distal strategies during problem-solving situations with their children.

On the other hand, ostensive gestures are also the first gestures that children produce in development. The foundational studies of [Bates et al. \(1975; 1989\)](#) on intentional communication were the first to report that children between 8 and 9 months old started to extend objects toward others to share attention with them or to make requests. Only later, around 9 to 12 months, did children begin to use pointing gestures with similar functions. Later research corroborated these findings. For example, the studies of [Crais et al. \(2004\)](#) and [Murillo and Belinchón \(2013\)](#) reported that ostensive gestures emerged around 9 months of age and that they predated the emergence of pointing at 10 months old (see also [Dimitrova & Moro, 2012](#); [Murillo et al., 2021](#); [Reddy, 2008](#)).

Further studies have found subtle differences in the onset of ostensive gestures. For example, [Caselli et al. \(2012\)](#) studied children's communicative development from 8 to 18 months old. They found that the onset of ostensive gestures of showing was at 10 months of age, while ostensive gestures of giving and pointing gestures appeared later at 11 months (see also [Carpendale et al., 2015](#) or [Boundy et al., 2018](#)). Despite these differences, studies agree that ostensive gestures are one of the first forms of intentional communication that allow children to establish shared references with others.

### *Ostensive gestures in the developmental literature: A research review*

Despite the relevance of ostensive gestures as one of the first forms of referential communication, some authors have recently pointed out the remarkable lack of research on these gestures ([Boundy et al., 2016](#); [Cameron-Faulkner et al., 2015](#)), especially when compared to the attention that pointing, for example, has received ([Behne et al., 2005](#); [Fusaro et al., 2014](#)).

To illustrate this imbalance's magnitude, we reviewed articles published between 1975 and August 2022 in peer-reviewed journals specializing in language and gestural development. To provide a holistic view of the psychological research in this area, we conducted a comprehensive search for articles in three digital databases previously used in gesture reviews ([Colonnese et al., 2010](#); [Manwaring et al., 2017](#)): PsycINFO, Scopus, and Web of Science. Search strategies were adapted to the characteristics of each database. Using the keywords "Gesture development" and "Infancy," we obtained an average of 897 publications from the three databases consulted (PsycINFO 835, Web of Science 1059, Scopus 799).

Articles were reviewed in two phases: first, we conducted a screening of titles and abstracts and then a full-text screening. In the first phase, the papers had to meet the following criteria to be included in the analysis: (1) contain the word "gesture" in their title, abstract, and/or keywords; (2) be studies of an empirical nature; (3) be written in English or Spanish (both languages mastered by the authors of the review); and (4) have a sample of children, entirely or in part, between 3 and 36 months of age to match the onset of the first triadic interactions and their possible precursors (additionally, the samples could include peers, parents, teachers, or non-human

primates, as long as children's gestures were the main focus of the research). In the full-text screening, we considered whether the article included pointing or ostensive gestures in its research scope (either in the article's methodology or the results). When an article studied pointing or ostensive gestures *and* representational gestures together, this was only counted as a "pointing" or an "ostensive gesture" study, respectively, given that representational gesture studies were beyond the scope of the current review. (The complete record of the gestures included in each publication can be found in the database of reviewed articles available as [supplementary material – S.1.](#)).

During the review, we found great variability in the classifications of gesture types and the names provided to them. To unify criteria, we considered all kinds of pointing gestures as "pointing," including index finger and arm extension toward a referent, open-hand points, touch-pointings or contact pointings, and/or indicatives (if the article specified the inclusion of some pointing in this category). As ostensive gestures, we considered showing or holding out/up gestures, giving or offering gestures, placing gestures, and object extensions. We considered that studies defining giving gestures as a "request" for an object (e.g., the child extending the hand open in the conventional 'give me' gesture or reaching towards the object to ask for it) were out of this review's scope (for example, Özçaliskan et al., 2016 or Schults et al., 2012). We did not include forms of requests because they cannot be considered proximal or ostensive gestures as they happen far from objects in distal interactions and might follow a different developmental path.

A total of 350 articles met the specified criteria and were selected for analysis. For each article, we registered: the journal, authors' names, publication date, title, sample's age, the types of gestures considered by the researchers in each case, and the specificity of the results.

Overall, there was a substantial difference between the number of articles focused specifically on pointing gestures (142–41 %) and those centered on ostensive gestures (12–3%) (see Fig. 1). However, most studies (196–56 %) included both ostensive and pointing gestures in their scope.

Given the high number of investigations that included ostensive and pointing gestures in their methodology, we reviewed whether this was still the case when results were reported. We coded results as *specific* if they had even the slightest mention of each type of gesture. For example, if the article stated, "showing gestures were not considered for analysis due to their low frequency. Pointing, however, was highly frequent," this was still counted as a specific result because it provided some information about each gesture. When gestures were grouped under a broader category, we codified the results as *clustered*.

We found that most articles (124–65 %) clustered pointing and ostensive gestures under umbrella terms such as "gestures", "deictic gestures," "referential gestures," "joint attention gestures," etc. but did not provide independent results for either gesture. Only 32 % (60) of the reviewed articles provided results for each gesture. Some studies only referred to pointing gestures in their results but not to ostensive ones (6–3%); however, we did not find studies that only reported ostensive gestures and left pointing aside (see Fig. 2).

Another interesting fact was that, when ostensive gestures were included, studies did not always refer to showing *and* giving but only to one of them. We decided to review each study's specific types of ostensive gestures (see Fig. 3). Among the studies that included pointing and ostensive gestures, 142 considered both showing and giving. There were 52 studies that only included ostensive gestures of showing, and two others that only considered giving gestures. Regarding specific research on ostensive gestures, six studies centered on showing gestures, three on giving, and three on both.

To sum up, of the 350 articles reviewed, 338 included the pointing gesture among their objectives (either exclusively or accompanied by other gestures), while ostensive gestures were considered in 208 of these publications. In the latter cases, ostensive gestures were not usually the subject of specific analyses and, most of the time, did not seem to have a relevant role in the results of the investigations. These findings highlight the low number of investigations that have specifically studied ostensive gestures produced by

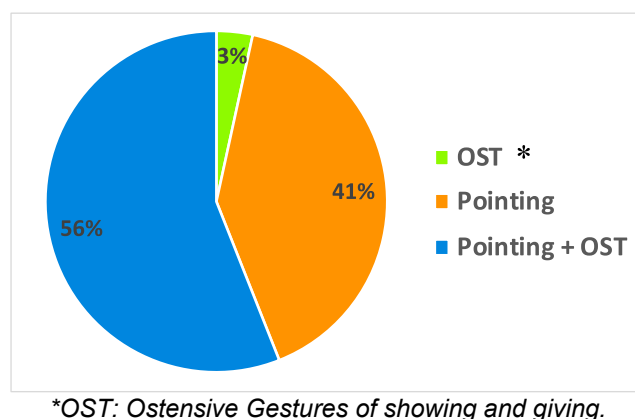


Fig. 1. Gestures studied in the developmental literature.

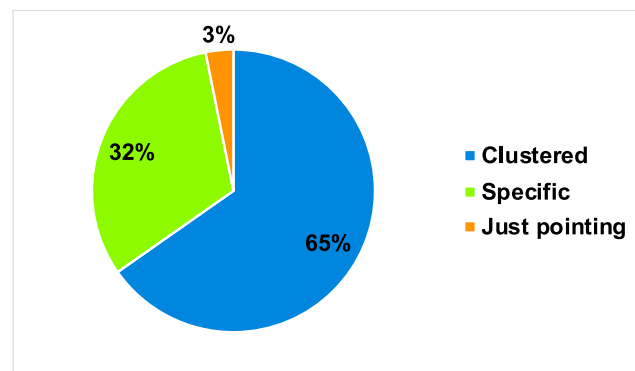


Fig. 2. Report of gestures' results in the literature.

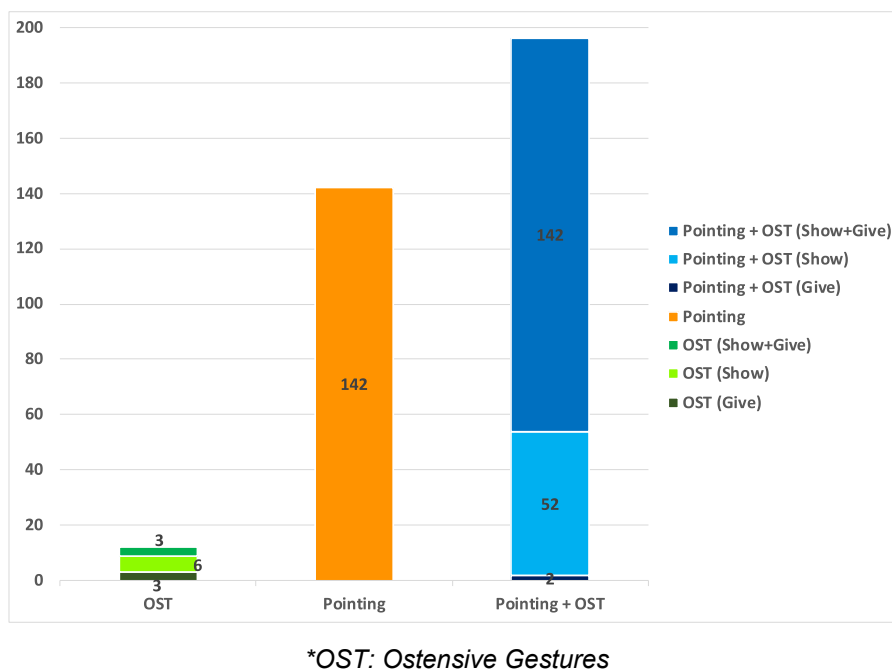


Fig. 3. Types of ostensive gestures considered in the literature.

children from 0 to 3 years old. The ones that have included these gestures usually have studied them together with pointing. In these cases, two scenarios generally have occurred: (1) ostensive and pointing gestures have been studied under the same category, or (2) ostensive gestures of showing have been studied, leaving aside those of giving. Let us look at each case in detail:

(1) *Ostensive and pointing gestures are included in an undifferentiated way in a general category*

The common use of umbrella terms, such as *deictic gestures*, becomes problematic for studying specific types of gestures because it does not allow the study of their specific characteristics and the differentiation of one from the other. Because of the limited research on ostensive gestures, we might not know much about their specific developmental course, but what we do know is that ostensive and pointing gestures do not appear in development at the same time and do not have the same characteristics (morphologically or semiotically), nor do they vary simultaneously with age. Especially in this last aspect, results are still contradictory. While some authors have reported that ostensive gestures' frequency increases with age (Blake & Dolgoy, 1993; Choi et al., 2021), others have claimed that their use remains stable and only pointing gestures' frequency increases (Blake et al., 2005; 2020; Cochet & Byrne, 2016; Kwon et al., 2018).

There is also evidence that ostensive gestures receive different responses from adults compared to pointing gestures. Some studies have suggested that parents of 10-month-old children are more responsive to their children's ostensive gestures than their pointing gestures, but these differences disappear at 14 months (Choi et al., 2021). Other research has reported differences between pointing



and ostensive gestures not only in the frequency but in the specific type of response received from adults. Olson and Masur (2011; 2013) observed that ostensive gestures more commonly received an action response (e.g., opening a bottle) or a verbal response containing a volition label (e.g., want), while pointing was usually answered with object labels (although the authors highlighted that these differences might be mediated by the gestures' functions and the interactive contexts of the study). These differences could be related to pointing gestures' strong correlation with later language acquisition.

Furthermore, different deictic gestures seem to be affected unequally in communicative developmental disorders (see further discussion in section 3.2.7). For example, children with autism spectrum disorders (from here on, ASD) have been reported to have difficulties with declarative pointing and showing gestures, but not with ostensive gestures of giving (Clements & Chawarska, 2010; Heymann et al., 2018; Sansavini et al., 2019).

Some researchers like Murillo et al. (2021) have acknowledged this situation as problematic when they distinguish between proximal (ostensive gestures) and distal deictic gestures (reaching and pointing gestures). Studying ostensive gestures as relevant communicative gestures that have their own characteristics and that predate more complex forms of sharing meanings (such as pointing and symbolic gestures) might be an essential step forward in tracing and understanding the ontogenesis of gestures and their functions, as well as their impairment in neurodevelopmental disorders.

## (2) Only ostensive gestures of showing are studied.

Some investigations have considered only ostensive gestures of showing as truly intentional gestures. These scholars have excluded ostensive gestures of giving from the gestures category, usually considering them instrumental or ritualized actions (Rodríguez & Español, 2016). However, as West and Rheingold (1978, as cited in Hay & Murray, 1982) argued, giving an object cannot be considered only an instrumental achievement. It is an action infused with conventional meaning that implies a history of shared social experiences within cultural traditions. Even in the joint attention literature, offering, giving, and taking objects are considered to be unambiguous examples of coordinated joint attention (Adamson & Chance, 1998; Bigelow, 2003). The study of Carpendale et al. (2021) argues that giving gestures are meaningful signs related to communicative and prosocial development (see also Xu et al., 2016). The observations presented by Carpendale et al. show that parents often interpret their children's giving gestures as communicative and respond to them not only by taking the object offered by the child but also with praise and thanks. Through these early interactions, children begin to anticipate their social partners' responses to their actions and learn that the extension of objects toward others has a social meaning (Clark, 1978).

From a cognitivist framework, it has been argued that parental responses to ostensive gestures of giving are not enough to consider them genuinely intentional gestures (see further discussion in section 1.4.2). As it happens with crying since birth, almost every infant

**Table 2**

The exclusion of referents in some gesture definitions in the psychological literature.

Definition	Main elements	Referent Role
"Movement of the face, hands or other parts of the body, with which affections are expressed or messages are transmitted" (Royal Spanish Academy, 2021)	<ul style="list-style-type: none"> <li>Means of expression</li> <li>Communicative function</li> <li>Gestures as a type of "movement"</li> </ul>	Absent
"Actions produced with the intention of communicating and are typically expressed using the fingers, hands, and arms, but may also include facial features and body movements" (Crais et al., 2004, p. 679)	<ul style="list-style-type: none"> <li>Intentionality or volitional control</li> <li>Communicative function</li> <li>Gestures as a type of "action"</li> </ul>	Absent
"Gestures are a spatial-visual phenomenon influenced by context and psychosocial factors" (Gullberg et al., 2010, p. 3)	<ul style="list-style-type: none"> <li>Manifest character of the gesture</li> <li>Contextual influences</li> </ul>	Moderate
"... gesture as those actions that are (or are perceived to be) performed under volitional control and that have publicly recognizable features marking them as being performed for purposes of expression rather than practical aims" (Kendon, 2004, p. 15)	<ul style="list-style-type: none"> <li>Intentionality or volitional control</li> <li>Conventionality</li> <li>Expressive (communicative) function, as opposed to a practical function</li> <li>Gestures as a type of "action"</li> </ul>	Absent
"... gesture is a form of communication expressed through body language that can strengthen verbal expression and language or which becomes a substitute for spoken language to communicate an opinion that is not conveyed orally" (Noor et al., 2019, p. 219)	<ul style="list-style-type: none"> <li>Communicative function</li> <li>Relationship with spoken language</li> </ul>	Absent
"... gestures are representational actions [...] they are meaningful substitutions and analogical stand-ins for ideas, objects, actions, relations, etc." (Novack & Goldin-Meadow, 2017, p. 652)	<ul style="list-style-type: none"> <li>Capacity for abstraction or representation of the gesture</li> <li>Gestures as a type of action</li> </ul>	Moderate
"... any motor action not reducible to an instrumental action with the object, which has a meaning interpreted by the adult, and which is stable, that is, which has a structure that is maintained over time and in different communicative contexts" (Murillo & Belinchón, 2013, p. 476, author's translation)	<ul style="list-style-type: none"> <li>Distinction between action and gesture</li> <li>Meaning</li> </ul>	Moderate

behavior is potentially a communicative sign because adults extract meaning and interpret them, even if the child did not mean to communicate at the beginning. However, ostensive gestures of giving are social behaviors by definition. They constitute a joint action that requires intentionality and negotiation with the other in order to be carried out. In this sense, they cannot be analyzed as isolated abilities but as interactive communication patterns. As Marcos et al. (2003) pointed out, it is only through early asymmetric processes of negotiation in social routines that gestures get to transmit children's underlying intentions, given that these first signs do not have enough representational power to do so by themselves (for example, giving an object not just to transfer it to someone else but to start an action). Giving gestures require the other's interpretation based on the current context of interaction to acquire meaning. Marcos et al. presented the following observation to illustrate this point:

Arthur (21;25) is with his father, who is sitting on a chair [...] One of the playthings in a basket on the floor is a book. C1 [*the child*]: Takes the book out of the basket, hands it to his father, and sits down / F1 [*the father*]: You want to read? / C2: Yes - In this example, nothing in the child's behavior indicated that his goal was to get the father to 'read' the book with him. However, on the basis of contextual cues (the fact that the object was a book and the no doubt ritualized action of sitting down to read together), the child's intention was recognized [*and acquired meaning*] (p. 230).

If these unspoken agreements with another person who interprets the extension of the object as essentially intentional were absent, the ostensive gestures of giving could not exist. They would remain simple object extensions with no apparent functionality.

As a final remark, it should be considered that even if giving gestures are born as ritualized behaviors (during give-and-take routines like the ones described by Bruner, 1983) and are initially highly dependent on specific interactive situations, they soon become detached from their original context of production and are generalized to all kinds of situations to intentionally transmit different meanings, just as it happens with the development of other gestures (see the process of gesture acquisition described by Iverson et al., 2000 based on Caselli, 1990; Werner & Kaplan, 1963).

Overall, this review shows that the lack of investigation into ostensive gestures is an issue yet to be tackled. Interactions involving other gestures beyond pointing may provide foundational information for the child's socio-cognitive development (Fusaro et al., 2014). Specifically, ostensive gestures may be one of the first ways that children have to acquire and exchange meanings with others, providing us with a better understanding of gestures' origins. This would provide a developmental continuum of meaning-making that reflects the process through which specific actions become gestures during social routines and gestures progressively acquire different meanings and semiotic complexity until symbols and language are reached.

#### *Why have ostensive gestures been only rarely investigated in developmental psychology?*

Ostensive gestures were a main topic of research in the late 1970s when Bates et al.'s (1975) study situated them as one of the first forms of referential communication. However, soon after, they seem to have partially disappeared from the literature. Only recently have ostensive gestures begun to show up again, in part through attempts to locate the pointing gesture's origins, but also as important elements to explain the development of intentional communication. There may be many reasons for the lack of research investigating ostensive gestures in past years, and these reasons may point to obstacles that current investigations must overcome. We present three possible reasons here that, rather than being exclusive, tend to complement each other:

#### *The role of referents and objects in communicative acts*

There is great diversity in definitions of gestures (Colgan et al., 2006). However, a common element in all definitions is *not* including referents as a definitory element of the communicative act (see Table 2). Definitions usually focus on the signs children produce; they tend to leave aside what the gesture is about, not considering the children's interaction with the material world and with other persons. This is fundamental because how gestures are understood reflects how they are investigated. Take pointing studies as an example: Many of them have emphasized the gesture's conventional morphology and the behaviors associated with it (e.g., the accompanying eye contact), and most of them have focused on its relationship to language. However, the indicated objects or events (the referent) are rarely included in research queries (Babaei et al., 2018; Cochet & Vaclair, 2010; Leavens & Hopkins, 1999). Referents are considered in the background, often under the label *context*, and in most cases as interchangeable variables of little relevance.

Probably one of the main causes for doubting that ostensive gestures are, in fact, gestures is that the sign cannot be differentiated from the referent (the hand cannot be separated from the object), and referents are not usually considered part of the gesture or the communicative act. This situation becomes aggravated because ostensive gestures' referents are usually objects, which are often understood as "physical reality" with perceptual but no social dimensions. The recent work of Novack and Goldin-Meadow (2017) helps to illustrate this problem. The authors provided one of the most accepted definitions of gesture in current research (e.g., they understood gestures as representational actions). However, when they intended to differentiate gestures from instrumental actions, they said, "Gestures have a few obvious features that differentiate them from other types of movements. The most obvious is that gestures *happen off objects, in the air...*" (p. 653, *emphasis ours*). In this way, the authors seem to have left objects and ostensive gestures out of gesture studies. Nonetheless, in the discussion of their results, they recognized that there are exceptions to this rule, specifically regarding to ostensive gestures (see also Iverson et al., 2000; Parladé & Iverson, 2010). Thus, they have left the door open to consider that communication *can* occur through objects and that ostensive gestures have a place in gesture development. This leads us to question the utility of this criterion, as it cannot be applied to the whole repertoire of gestures, especially during the first year of life when objects are a pivot around which social interaction and communication take place (Carpendale et al., 2021; Wallbridge, 2022).

Considering the absence of objects to be the factor that differentiates gestures from actions is a common trend in gesture studies of



adults and older children, because communicative interactions between adults entail the production of mature and complex gestures that usually accompany language and that happen far from objects (such as representational gestures or non-referential gestures, also called “beat gestures” or baton gestures). It could be that the reason gestures *far from* objects (such as pointing) have been well studied in children during the first two years of life, while those involving objects (such as ostensive gestures) have been largely overlooked, is that this research has taken the results of adult studies as its starting point, even though this approach prevents us from understanding gestures’ process of construction and conventionalization when language has not been entirely developed yet.

The Pragmatic of the Object (Rodríguez et al., 2015), in line with Clark’s (2003) approach, holds that developmental psychology has considered the “social world”—communication—as parallel to the “physical world”—of objects—without the existence of a link between them. In this sense, while objects have been easy to locate when speaking of individual action, they have often been left aside when dealing with the ideas of “use, convention, communication, and agreement” (Rodríguez, 2009, p. 291). A clear example is Rohlfing et al.’s (2017) claim that the development of communicative purposes requires the child’s disengagement from the object, denying the possibility of studying the use of objects for communicative purposes. In contrast, the Pragmatic of the Object argues that objects have an essential role in communicative acts, especially during the first two years of life when language is not yet configured as the main tool of communication. Objects are considered the product of shared conventions between members of the same culture (Costall & Dreier, 2006; Dimitrova et al., 2015; Moro, 2016). Their uses are not directly accessible to children; on the contrary, they are loaded with shared cultural meanings that need to be transmitted from adults in situations of triadic communication. This means that objects, as signs of their functional uses (Rodríguez, 2006), are not interchangeable variables that have no effect on gestures’ meaning but complex referents that contribute to gesture’s functions and that can shape early interactions between adults and children (Manzi et al., 2020; Moreno-Núñez et al., 2020; Moro, 2012). Essential support for this perspective can be found in Dimitrova and Moro’s (2012) research. The authors found that children’s acquisition of functional uses of objects (between 8 and 16 months of age) provided a shared ground for parental gesture interpretation. Specifically, they reported that parents’ understanding of their children’s gestures was greatly improved by the number of uses of objects that children had acquired during previous triadic interactions. This, in turn, promoted the parent’s responses to children’s gestures, children’s gesture production, and the initiation of more complex parent–child interactions.

Furthermore, analyzing the objects that constitute children’s gestures’ first referents is a way to distinguish gestures from other behaviors during the first years of life. A gesture without its referent is only an empty sign without meaning or function (Peirce, 1978, as cited in Rodríguez & Moro, 1999). An example of this can be found in the pointing literature, where the early index finger extensions children make from the first weeks of life are not usually considered gestures, even if they share a common morphology with later pointing (Kettner & Carpendale, 2018). These actions or movements only become proper gestures when children link them to specific referents (see, for example, the definition of gestures used in Deniz et al., 2019; Lorang et al., 2018; and Orr, 2020). From thereon, referents are constitutive parts of what we consider “gesture.” In the case of ostensive gestures, their referred objects’ cultural and contextual meanings can change the gesture’s meaning and complexity: a child who shows a toy with no apparent reason other than initiating an interaction is producing a very different sign than a child that shows a pillow to initiate the sleeping routine.

This article argues in favor of the idea that the communicative nature of a gesture cannot be found only in the presence or absence of objects but rather in the gesture’s capacity to convey meanings. This can be done in the absence of objects but also *through* them. If one follows the criteria of Murillo and Belinchón (2013), ostensive gestures can be considered intentional gestures insofar as they have a stable morphology that children persistently and flexibly use in different contexts of interaction, with various persons and about different objects (Guevara et al., 2020; Romero et al., 2019). Therefore, it is imperative to broaden what we currently consider to be gestures so that they include: (1) referents as definitory elements and (2) the possibility of sharing references through objects (Rodríguez, 2006).

A path to follow in this redefinition might begin by going back to the studies of Bates et al. (1975), in which objects were at the center of the authors’ definition of gesture’s declarative function: the use of objects by the child to attract and manipulate the attention of others. From there, gesture development could be seen as the progressive distancing and abstraction from specific objects and contexts to more complex representational abilities far from objects (Ramos-Cabo et al., 2019).

#### *The intentionality behind ostensive gestures: Actions or gestures?*

Gestures are a particular type of action or hand movement. Kita et al. (2017) and Novack and Goldin-Meadow (2017) referred to them as ‘representational actions.’ For many researchers, distinguishing actions from gestures has been a main task, although not always an easy one. Zinober and Martlew (1985) have claimed that gestures can be distinguished from actions (1) by their *effect* on the world and (1) by the *intentions* underlying them. The authors explain that gestures and actions have differential effects on the world: While actions achieve non-communicative instrumental goals and result in immediate changes in the world (e.g., holding a bell and making it sound), gestures are intended to signal meaning to another person and change their behavior or representation of the world (e.g., showing a bell to the other person to share an interesting novel object). This idea has been discussed by some authors that claim that actions and uses of objects may also perform communicative purposes in some situations (Rodríguez & Moro, 1999). For example, parents and teachers often act on objects to demonstrate their uses to the children, which is closer to a communicative purpose than to an instrumental one (Estrada, 2021; Novack & Goldin-Meadow, 2017). Regarding the second aspect, determining the intentionality that underlies children’s gestures is still an ongoing debate, especially in the first years of life. In many cases, indicators of intentionality must be inferred from observing the gesture’s form, the context in which it occurs, and the effect it has on the interlocutor. From a cognitive perspective, this has raised concerns about the child’s *initial* intention. Regarding ostensive gestures, Liszkowski (2008) has argued that experimental evidence is needed to assess if ostensive gestures are actually communicative intentional behaviors or just a way of interacting with others in non-referential ways.

Based on this idea, some authors have designed experimental situations to test the referential intent underlying children's ostensive gestures. For example, Boundy et al. (2018; see also Cochet & Byrne, 2016) designed an experimental condition to favor the production of ostensive gestures by controlling the novelty of the object (they presented an object that, apparently, was new to the experimenter) and the adult's reactions to children's ostensive gestures (they established four conditions: one of joint attention, one of attention to the child but not to the object, one of attention to the object but ignoring the child, and another of ignoring both child and object). They found that, between 10 and 11 months old, children produced ostensive gestures in 82 % of the trials. Additionally, they were able to argue in favor of the referential nature of these gestures based on three different indicators: (1) children showed positive emotional expressions during the joint attention condition but negative expressions in the other conditions; (2) children produced a more vocalizations and looks to the caregiver in the joint attention condition than in the other conditions; and (3) in the conditions of non-joint-attention, children tried different means to redirect the experimenter's attention (using "the object as an attention tool"). Given these results, the authors concluded that 10-months-old children produce self-initiated ostensive gestures in order to share attention and interest in objects with a new interlocutor. Thus, ostensive gestures can be seen as referential, not only because they situate specific objects in the attention frame of others but also because they express a motivation to socially engage with others about the world (Liszkowski, 2008).

A second approach to studying ostensive gestures' intentionality has been the observation of behavioral cues. For Bates et al. (1975; 1979) and Tomasello et al. (1984), one of the best indicators of intentionality was the presence of gaze alternation between the object and the partner, as it indicates that the child is aware of the effects that her gestures have on the interlocutor. Based on this idea, Carpenter (1998) described ostensive gestures as *undoubtedly intentional* communicative behaviors because they are inherently accompanied by eye contact and gaze alternation with the interlocutor. Later research has provided empirical evidence of these behaviors in children's ostensive gestures. For example, Marcos et al. (2003) found that 75 % of the ostensive gestures produced by children at 16 and 22 months were accompanied by a look or vocalization directed to the interlocutor. Other behavioral indicators have also been brought to light. For example, Leung and Rheingold (1981) expressed that intentional communication can be assumed when the child directs his/her gestures toward the interlocutor by using not only eye gaze but also body orientation and physical contact (see also Iverson et al., 1994; LeBarton & Iverson, 2016). However, this set of indicators has not been studied in ostensive gestures yet.

A third approach to the intentionality issue can be found in the research on pointing gestures. Authors like Ramos-Cabo et al. (2020) have proposed a coding system based on gesture morphology to distance themselves from categorizing gestures according to their social functions. They consider that while morphology can be objectively identified from observation, functions and communicative intent are hard to operationalize (Bourjade et al., 2020). They must rely on contextual aspects and are often subject to the experimenter's interpretation. The categories in this system are based on two main dimensions: presence or absence of index-finger extension (including both open-hand and index-finger pointing) and distance from objects (including proximal—or touch-pointing—and distal pointing gestures). This approach is grounded in the correlations found between different gestures' morphology and their pragmatic functions. For example, open-hand pointing gestures are usually employed with imperative functions, while index-finger points are mostly related to declarative ones (Cochet & Vauclair, 2010; Liszkowski & Tomasello, 2011; Ramos-Cabo et al., 2022). The author's further research has shown that children with ASD use the less complex forms of pointing gestures, such as touch-pointings and open-hand gestures, but have difficulties with the more complex forms (index-finger pointing gestures at a distance). Despite the potential of this proposal for objectively identifying children's early intentional communicative behaviors, more research is still needed to design a similar system for ostensive gestures. At the least, such a system would require identifying ostensive gesture typical morphology; describing how it changes through typical and atypical development and interactive contexts; and finding evidence that the correlations between form and functions remain for these proximal gestures. An initial approach would be the research of Boundy et al. (2016), which described specific defining micro-behaviors of ostensive gestures. The authors found that showing gestures were significantly associated with a 'palm up' hand position, a raised arm, and an eye gaze directed to the caregiver. Giving gestures were related to a 'straight arm' position and an 'inverted hand' shape.

Authors from the Pragmatic of the Object (Rodríguez & Moro, 1999; Rodríguez, 2006) question the emphasis on gesture morphology as a main tool to understand gesture development. They claim that gestures are eminently pragmatic productions, their meaning is not attached to their form but to their social functions in everyday interactions (Wittgenstein, 1953). The authors consider that to fully understand a gesture, we must consider the child and his/her 'circumstances,' including what the child is communicating about (the referent), the meaning the referent has in the specific interactive context, and the history of previous interactions between the child, the social partner, and the referent (Rodríguez, 2009). This approach highlights that communication is a *process* that happens between two persons and not only in the child's mind. Thus, the communicative intention of a gesture would be progressively built during interaction with others and with objects, and it should not be measured just by children's individual skills but by interactive parameters. In line with this view, Marcos et al.'s (2003) research places the adults' interpretation of children's gestures, as well as children's reactions to these interpretations, as one of the leading indicators of intentionality during communicative exchanges (see also Sarimski, 2002). Based on Greenfield's (1980) research, the authors claim that the main factor for attributing intentionality to a communicative behavior is that the child accepts the interlocutor's interpretation and that an interaction can be built from there.

Other approaches to the issue of intentionality in children's early gestures argue that the problem is not focused exclusively on ostensive gestures but on how intentionality is understood and its role in gesture development studies. For example, for the process-relational worldview, intentions (and mind) are not separated from the child's actions but manifest in them (Carpendale and Lewis, 2004, 2021). It is through the child acting on the world during social interactions that inner intentionality can be born. Therefore, from this perspective, the understanding of gesture development should not focus on establishing *when* a gesture is intentional but on *how* meaning (and communicative intent) is progressively constructed during social interactions. Unpacking this "progression" is a task still

to be undertaken by developmental psychology (Kettner, 2021). For Carpendale et al. (2021), object exchange (ostensive gestures) is an ideal type of interaction to analyze the “gradual transition from action to social acts” (p. 7). This implies not only analyzing gesture production but the types of interaction that allow gestures to be built. In this process, ‘in between productions’ (which fall between actions and gestures) would not be excluded from the analysis. On the contrary, they would be essential clues for understanding gesture origins (Carpendale et al., submitted).

The actions vs gestures debate remains an issue to be tackled and ostensive gestures seem to be in the middle of it as communication through objects is often regarded as a halfway behavior (not an action but not a gesture). Some authors have argued for a developmental perspective that, instead of focusing on distinguishing actions from gestures, emphasizes their existence in a semiotic continuum of communicative and representational potential. As Capirci et al. (2005) pointed out, “actions and gestures produced in a communicative context are not clearly separate categories. Rather they should be considered a continuum and even adults can produce gestures with an object in hand for communicative purposes” (p. 162). This is not to say that gestures and actions are the same, but that grounding gestures in instrumental action and early interaction allow us to consider ostensive gestures as proper gestures and, overall, to understand gesture development as a *process* (Carpendale and Lewis, 2021). In this process, intentionality is transferred from adults to children, who gradually become able to initiate more complex types of interactions. Bakeman and Adamson (1984; see also Adamson et al., 2012) described a similar process for joint attention interactions, going from supported interactions (where adults are primarily in control) to coordinated ones (where children actively initiate and change the course of interactions). A semiotic progression would allow us to understand gestures’ ontogenetic development and provide clues to how actions become gestures, how gestures are combined with speech, how both actions and gestures later support language, and so on.

#### *Some methodological problems in the study of ostensive gestures*

Boundy et al. (2016) attributed the reduced research on ostensive gestures mainly to methodological difficulties. Unlike pointing, ostensive gestures lack an accurately operationalized morphology. This makes them difficult to identify for untrained eyes, such as those of parents who act as observers in many longitudinal investigations, especially in the first years of life (for example, Kettner & Carpendale, 2018 use of parental diaries). Consequently, given the importance of ostensive gestures in communicative development, Boundy et al. (2016) proposed new investigations that enable the operationalization of these gestures and their associated behaviors.

Salo et al. (2018) pointed out some related methodological deficiencies. The authors referred to the significant variability in the literature that has reported the onset of ostensive gestures and pointing and their frequency of use. Salo et al. related this variability to the different measurement methods used in the investigations by comparing a study that employed parental reports (Fenson et al., 1994) with another that utilized laboratory tasks (Cameron-Faulkner et al., 2015). In the first study, it was found that 50 % of the sample produced ostensive gestures from 8 months and pointing gestures from 10 months of age; however, the second study reported that by 10 months, 60 % of the sample made ostensive gestures, but even at 12 months old only 40 % of the children made the pointing gestures (see also Behne et al., 2012). A similar variability can be seen in reported frequencies. For example, while Fasolo and D’Odorico (2012) and Murillo and Belinchón (2013) reported that ostensive gestures were produced in low frequency, McGregor and Capone (2004) argued that ostensive gestures are more common than pointing between 14 and 18 months of age, and Choi et al. (2021) found that ostensive gestures are more frequent than pointing at 10 and 12 months of age, but not at 14. This issue is not specific to research environments. Bean and Weismer (2014) applied three standardized instruments (the Early Social Communication Scale - ESCS by Mundy et al., 1996; the Autism Diagnostic Observation Schedule - ADOS by Lord et al., 2000; and the MacArthur-Bates Communicative Development Inventory: Words and Gestures - CDI-WG by Fenson et al., 2007) commonly used in clinical environments for early communicative development evaluation to 78 children with ASD from 23 to 37 months. Specifically, they assessed their use of ostensive and pointing gestures. The authors found that no measure was significantly correlated with the others across the three gestures. Correlations varied depending on the vocabulary level and the assessment methodology, as some instruments provided more opportunities for certain gestures’ production than others.

On the other hand, Carpendale and Carpendale (2010) drew attention to the problem that arises from conducting investigations in laboratory contexts when studying potentially communicative behaviors that predate pointing gestures. First, since studies have mostly assumed that gestures are not produced until 9 months old (with the onset of the pointing gesture), most of them have not considered samples below this age (for example, Blake et al., 2005; Jones & Zimmerman, 2003; Rütter & Liszkowski, 2020). In our review, only 23 % of the investigations (82 studies) considered samples below 9 months old. Secondly, laboratory studies frequently use structured experimental situations designed to promote the production of distal gestures, specifically pointing. An example is “the decorated room” paradigm (Ger et al., 2018; Kishimoto, 2017; Liszkowski et al., 2012), where there are many attractive objects at a distance, meant for contemplation but not for use. Research has shown that these situations modulate the types and functions of the gestures children and adults produce during interactions. Olson and Masur (2011) found that in two different communicative contexts, one designed to promote declarative interactions and the other imperative exchanges, children of 13 months of age used a significant number of ostensive gestures in the imperative context (92 % of the time) but did not produce any of them in the declarative context, as objects were placed in the distance. While these strategies are great for studying distal gestures, placing objects in the distance makes proximal communication (with objects) nearly impossible. This effect was further demonstrated in the study of Puccini et al. (2010) with 12-month-old children and their caregivers. The authors showed that, in situations where it was possible to manipulate objects, children and adults mainly produced ostensive gestures to communicate, not pointing ones. However, when they were placed in situations where the interaction centered on contemplating objects at a distance, pointing gestures prevailed, and ostensive gestures disappeared.

A further point to highlight is that gestures are eminently pragmatic by nature, they have functions. Structured experimental designs are artificial situations in which the researcher decides what the child should do, when, and how. These characteristics are far

from the child–adult–object interactions that happen in everyday life (Ramos-Cabo et al., 2020). In daily contexts, children self-initiate gestures meaningful to them (that are useful and have a purpose), and their gestures are interpreted and responded by the adults around them (Guevara et al., 2020). Differences in the interactive contexts used to assess early gesture development in research might account for the mixed results about gestures' onset and frequency.

### The functions of the ostensive gestures

Gestures acquire meaning and significance when they are considered from the perspective of their role in communicative acts (Dimitrova et al., 2015; Moro and Rodríguez, 1991). Ostensive gestures' functions are *why* a child shows or gives an object and with what purpose. Eco (1992) referred to ostensive gestures as tools of intentional communication with others characterized by their polysemy, that is, by their ability to have multiple meanings or perform various functions. In this sense, the literature has identified different functions in children's early ostensive gestures, either when they direct them toward others to communicate or when they self-direct them to control their attention and behavior.

#### *The communicative functions of the ostensive gestures*

Despite the many functions that have been described for language (for example, the six functions of language postulated by Jakobson, 1960), the functions of children's gestures have been restricted in many cases to two main types: the declarative and the imperative (Cameron-Faulkner, 2020).

In terms of ostensive gestures, it has been stated that *showing gestures* have a declarative function, as their objective is to direct the adult's attention to something specific in the environment. On the other hand, *giving gestures* have been understood as imperatives, as they are produced to request or ask something from the adult or to get them to change the environment (examples can be found in Beuker et al., 2013; Boundy et al., 2018). However, critical voices have emphasized that children constantly show and give objects with different functions, including declarative and imperative (Basilio & Rodríguez, 2017; Crais et al., 2004; Hay & Murray, 1982; Rheingold, 1973), and that the distinction between these functions might be more of a continuum than either–or. Parisi and Antinucci (1973; cp. Cameron-Faulkner, 2020) already highlighted that both imperative and declarative functions share standard features that can make them hard to tell apart during everyday interactions: “A prototypical declarative such as *What a beautiful sunset!* gently demands that the hearer attends to the scene, therefore, giving the utterance an imperative undertone” (p. 178). The authors call for considering these functions more on a functional line than as discrete categories.

Even though the distinction between declarative and imperative functions is not always clear, out of these two main functions, the declarative is the one that has had the most relevance in research, not only for its proven relationship to the subsequent development of language but also for being considered eminently communicative (Colonnese et al., 2010). As Camaioni (1997) explained, when a child produces a declarative ostensive gesture, they intend to communicate with the other—in many cases, to get the adult to attend to or to look at what the child is showing or giving. On the other hand, imperative ostensive gestures have the final goal of achieving a change in the world—an action. In imperative gestures, communication is a means to achieve an instrumental end. Furthermore, pointing studies have revealed that only pointing's declarative function is usually impaired in communicative developmental disorders (for example Baron-Cohen, 1989). Recent studies have also shown that ostensive gestures of showing seem to be diminished in ASD, but that gestures of giving are not (Clements & Chawarska, 2010; Heymann et al., 2018; Sansavini et al., 2019). However, it would be necessary to delve into the research on ostensive gestures to discern if this is a matter of the functions of these gestures (in which case both imperative showing and giving gestures would be altered) or of the gesture's types (which would confirm current findings about only showing gestures being affected in communicative disorders).

Recent research also has shown that gestures' functions are not all or nothing. Children do not have an adult-like understanding of the gesture and its social uses from the beginning. This understanding is built progressively and changes as the child acquires more complex meanings of the social practices in which he/she participates (Caprendale & Lewis, 2004). A good example is the developmental pathways of the ostensive gesture of giving that Carpendale et al. (2021) show in their study through naturalistic observation of interactions between parents and children (from 7 to 30 months). Initial giving and taking interactions (between 11 and 12 months) are usually scaffolded by parents and may require little understanding from the child. Parents try to take objects the child is already holding, maybe assuming their child is trying to show or give. By doing this, parents progressively introduce the child into the give-and-take social routine as she becomes able to anticipate these action routines, respond to them, and eventually initiate them (similar to the handover principle described by Bruner, 1983). The authors describe that children initially give objects in play-like situations for the simple pleasure of attracting attention and interacting with adults (see also Reddy, 2003), understanding giving as something temporal. The understanding of the concept of possession and the consequences of giving is further constructed through the child's participation in social routines. Children become reluctant to give objects when adults ask for them and start to discriminate which objects to give and which to keep. This understanding allows children to initiate more complex interactions, resulting in the diversification of their gestures' functions. They give objects to share attention with others, as invitations to play or ways to start actions, or as imperative requests for help (see also Carpendale & Ten Eycke, 2020). Gestures' functions are also mediated by cultural traditions when children learn how to participate in these cultural routines, for example, by giving objects as gifts. Finally, the authors describe that between 18- and 30-months of age children begin to give objects selectively, first only to their owners and later, as they learn the emotional consequences of giving, to make the other person happy or comfort them. Overall, this research explores an exciting approach to studying ostensive gestures' development, as it considers communicative intent is built progressively in interaction. Similarly, McGregor and Capone (2004) use a more general approach to describe showing ostensive gestures' development. The



authors explain that infants begin to extend their arms to share objects while already playing with the object (at this moment, showing gestures can only be distinguished from actions by the infants' gaze toward others.) Later in development, ostensive gestures evolve to the child actively looking around for objects, without previously having manipulated them, to show them to adults for sharing attention, initiating specific activities, or asking questions (see also Reddy, 2003).

On the other hand, some authors have suggested that there are more functions in children's ostensive gestures than imperative and declarative, as has been previously shown with pointing gestures. For example, Rodríguez's (2009) research analyzed the *interrogative function* (commonly associated with pointing, for example in Southgate et al., 2007) of the ostensive gestures of a 13-month-old girl when she tried to carry out the functional use of an object in a free-play situation with her mother. The girl was sitting on the floor using a shape-sorting truck in which each piece could only be inserted into one hole. When her mother asked her what the correct placement of a piece was, the girl stopped her action, held up one block in the air, looked at her mother, and vocalized. The authors interpreted the function of this ostensive gesture as interrogative since it constituted a "question in action" requesting external regulation from the adult (see also examples of ostensive gestures with interrogative function in Moro & Rodríguez, 1991; Rodríguez, 2006).

Moreno-Llanos et al. (2021) also observed an *evaluative function* in the ostensive gesture that a 12-month-old child performed toward his teacher after accomplishing a goal. The authors described a free-play situation in the classroom in which the child intended to place one building block on top of another. When he finally reached his goal, the child applauded to himself (symbolic gesture), without any other interlocutor, and then, he took one of the blocks, looked at his teacher, and extended the object toward her (an ostensive gesture of showing). The teacher applauded and congratulated him verbally. Through this gesture, the child not only made the teacher aware of his achievement but also sought a positive evaluation of his performance. (see also Basilio & Rodríguez, 2017; Guevara et al., 2022).

The results of Moreno-Núñez et al.'s (2020) study indicated that the ostensive gesture of giving can also have a *phatic function* (analogous to the function or language described by Jakobson, 1960), consisting of the child giving the object with the sole intention of maintaining and prolonging the interaction with the other. They described how a 13-month-old girl, during a free-play situation with her mother, pulled various objects out of a box. Every time she took out an object, she did not stop to explore it but extended her hand and gave it to her mother, ignoring the adult's attempts to initiate some use. The authors suggested that children not only give objects to adults to act on the referent. Sometimes the referent directly becomes a means of communication, and the ostensive gesture of giving allows the interaction to be sustained (see also Messinger & Fogel, 1998).

### *The self-regulation function of ostensive gestures*

Numerous research has shown that besides communicative functions, gestures have cognitive and problem-solving functions. Studies with adults have provided evidence that gestures facilitate the organization of ideas during discourse, lessen the load on working memory, promote the exploration of new concepts and ideas, enable inhibition of inappropriate behaviors, and have a helping role in acquiring second languages (Cook et al., 2012; Eielts et al., 2018; Lin, 2020; Ping & Goldin-Meadow, 2010). Similarly, studies with school-age children (Goldin-Meadow, 2003; Goldin-Meadow et al. 2012; Rhoads et al., 2018) have shown that gestures have a facilitating role in learning, not only when teachers use them, but also when children produce them towards themselves, enabling the representation of the most abstract aspects of an idea. Gestures would facilitate cognitive processes by allowing the child to evoke a referent in her mind (Novack & Goldin-Meadow, 2015). These gestures would all be intentional productions towards the self without intending to communicate with others.

The first studies that account for self-directed gestures in early development are found in the work of Bates et al. (1975) on the pointing gesture. In a longitudinal study, they found that children pointed in the absence of interlocutors before being able to point to others. Some authors proposed that these self-directed gestures could be precursors of other-directed gestures; however, this idea was further questioned by observations of children still performing self-directed gestures *after* having mastered other-directed gestures (authors claimed that self-directed gestures might follow a different developmental path than other-directed gestures). Later studies have shown that these self-directed pointing gestures might have their own functions, relating them to a basic system of orientation and attention control (Carpendale & Carpendale, 2010). Delgado et al. (2009; 2010) even proposed a self-declarative function for private gestures that allow children to share attention with themselves. Current theories defend that both communicative directions of children's gestures (self- and other-directed) can coexist and have specific functions according to the children's goals and the context's demands.

Since these foundational studies, some researchers have explored the functions of the pointing and symbolic gestures that children self-direct in their everyday contexts. (see review in Kuvalja et al., 2013) The idea that ostensive gestures can also be self-directed is relatively recent. Still, some authors have proposed that these gestures have a function of *self-regulation*, helping young children to control their attention and action to reach significant goals during the first years of life.

Self-directed ostensive gestures with a self-regulation function are called *private ostensive gestures*, since their function is analogous to that of the private speech described by Vygotsky (1978; see also Winsler et al., 2000) and of private pointing (Carpendale & Carpendale, 2010). Private ostensive gestures are pauses in children's actions with objects in order to *show* or *present* the object to themselves and contemplate it (Carpenter et al., 1998). Empirical studies have evidenced that children produce private ostensive gestures from around 8 months old, usually when children explore novel objects or when they have difficulties achieving the functional use of an already known object (Guevara et al., 2022; Moro et al., 2015), and that these gestures increase in frequency around 11 to 15 months (Basilio & Rodríguez, 2011). For example, in a study about the origin of Executive Function, Rodríguez and Moreno-Llanos (2020) described longitudinally how a child between 8 and 17 months produced private ostensive gestures to achieve different goals of increasing complexity. In their earliest observation, the child posed himself with the goal of using a bell conventionally. He

alternated between different uses and private ostensive gestures to accomplish this. Every time, after pausing his action to show himself the bell (sometimes rotating it or changing it from one hand to the other), the child was able to inhibit irrelevant previous uses (such as sucking the bell) and flexibly correct his grip on the bell (changing the type of use he made) until achieving his goal (see other examples in [Basilio & Rodríguez, 2017](#)). These pauses in action that we understand as private ostensive gestures can also be found in Piaget's (1936/1952) observations, although he did not refer to gesture development in his work. He suggested that questions such as: "what is this?" or "how can I use it?" seem to underlie these pauses during the child's exploration of objects and denominated them as "definitions through action."

An ongoing debate questions the nature of private ostensive gestures as gestures and looks for ways to distinguish them from instrumental actions. [Rodríguez and Palacios \(2007\)](#) state that children's private gestures (including ostensive gestures) can be considered gestures because these are the same strategies used by adults to convey the use of objects to children and to regulate their behavior. This also means that private ostensive gestures, even being self-directed to the child's own action, seem to have a social origin in joint attention interactions, just as other-directed gestures do. On the other hand, [Dupertuis and Moro \(2016\)](#) state that while actions directly produce changes in the object being used, ostensive gestures imply a diminishing of instrumentality in favor of attention and reflection on the object that causes changes in the child's understanding of the world (see also [Moreno-Núñez et al., 2017; Moro et al., 2015](#)). Based on this idea, [Guevara et al. \(2020\)](#) pointed out that actions and private gestures maintain a recursive relationship, as they are mutually affected. The authors present the example of a 9-month-old girl who was using a maraca. Every use she undertook was followed by a pause in which the child presented the object to herself (a private ostensive gesture). The authors argue that the presentation of the object was more than just "looking at the object" or "moving the hands" because every time the girl paused, a change in her use could be observed (she changed her grip on the maraca, she stopped banging it against the floor in order to shake it, etc.). Hence, Guevara et al. proposed that private ostensive gestures might transform the child's course of action into a coming and going of upstream and downstream control, of top-down and bottom-up processes, which the child progressively consolidates by acting on the world (see also [Rodríguez, 2022](#)).

Recent research in family and school contexts has described that private ostensive gestures help children focus their attention on the object ([Moreno-Núñez et al., 2020](#)), name objects ([Dupertuis & Moro, 2016](#)), and acquire the functional and symbolic use of objects and instruments ([Moro et al., 2015; Rodríguez et al., 2017b; Guevara et al., 2022](#)). The latter studies also specify that private ostensive gestures are semiotic instruments that allow children to organize their following immediate action with the object ([Basilio & Rodríguez, 2011; 2017](#)), to alternate solution strategies when using objects ([Rodríguez & Moreno-Llanos, 2020](#)), to practice uses before carrying them out ([Rodríguez et al., 2017a](#)), to detect errors in their performance ([Rodríguez & Palacios, 2007](#)), and even to "understand" their own uses of the objects ([Inhelder & Caprona, 1992/1994; Rodríguez, 2022](#)). More research is needed to consolidate these findings and contrast them with the development of other-directed gestures. Also, future research could provide answers to relevant questions such as the prevalence of these gestures, their specific uses in self-regulation and executive function processes, their presence and characteristics in different populations, or their course of development in children with developmental disorders.

Finally, it is important to highlight that private ostensive gestures have often been considered "object exploration" in previous research. [Rodríguez et al. \(2017b\)](#) claim that *exploration* is a broad term that groups together very different behaviors (e.g., gazes, actions, uses of objects, private gestures) without referring to any of them in particular. Besides, the term does not refer to specific pragmatic functions (e.g., getting to know a novel object, carrying out its functional use, sharing it with others, etc.). Hence, analyzing children's actions as *object exploration* does not allow a fine-grained analysis of children's actions or an understanding of how early communication develops. Even if research on early uses of objects and private gestures is beginning to find a relation between early uses, actions, and gestures in the first year of life ([Orr, 2020](#)), they might follow different developmental paths yet to be analyzed.

### Can ostensive gestures be Pointing's Precursors?

There is no denial of the importance of the research that highlights the pointing gesture as a fundamental communicative tool that allows the sharing of meanings with others from an early age. However, evidence suggests that children respond to and perform ostensive gestures in their everyday activities *before* responding to and producing the pointing gesture (either for themselves or others). Ostensive gestures' early use and development might carry essential clues about how more complex signs (such as pointing) come to be and the onset of intentional communication. As [Puccini et al. \(2010\)](#) stated, "... one intriguing possibility is that distal reference via pointing may build on an understanding of reference underlying proximal gestures..." (p. 293; see also [Carpenter et al., 1998](#)).

#### *Why does the pointing gesture have so much importance in the literature?*

Overall, the pointing gesture is considered the deictic gesture par excellence ([Cyrulnik, 2002; Liszkowski et al., 2006](#)). Studies have suggested that it is the first gesture children produce intentionally, allowing them to share references with others, communicate their intentions, and even regulate their attention. Its appearance marks a dramatic change in how the child interacts with the world ([Butterworth, 2003](#)). [Trevvarthen \(2003\); Trevvarthen & Hubley \(1978\)](#) referred to this change as the beginning of "secondary intersubjectivity." [Tomasello \(2004\)](#) called it "the 9-month revolution." [Bates et al. \(1975\)](#) linked it to the origin of intentional communication. The general idea is that, through pointing, children go from establishing dyadic interactions (child-adult and then child-object around 4 months) to initiating and participating in triadic interactions (child-adult-object), which give them access to culturally mediated social exchanges.

Additionally, numerous studies have shown that pointing is a powerful predictor of language, possibly due to its ability to promote and maintain joint attention episodes (see the literature review in [Colonnese et al., 2010](#)). Its onset, frequency, functions, and



combination with other communicative behaviors—such as gaze-following and first vocalizations—all have a crucial role in acquiring the first words. They are also essential precursors of lexical development at 15 months (Murillo & Belinchón, 2013), verbal complexity at 24 months (Capobianco et al., 2017), and even subsequent grammatical development (Cartmill et al., 2014). Werner and Kaplan (1963) considered pointing acquisition as the first step toward symbolic use and understanding, and a fundamental piece in language development. These characteristics of pointing gestures make them one of the most important red flags for the early identification of ASD, as pointing is usually absent or impaired in these children's early development (especially in its declarative function).

In any case, the pointing gesture is a semiotically complex behavior (see discussion in Rodríguez et al., 2015). Besides mastering the execution of its morphology intentionally, in order to produce a conventional pointing gesture, children must connect their sign to a specific referent located in the distance, singling it out from many competing distractors (Clark, 2003). Children also need to monitor and coordinate with the other's focus of attention, and flexibly alternate their attention between the other and the referent (achieving episodes of joint attention); they must correctly transmit their intentions, persist in their attempts when the message is not received or is wrongly interpreted by the interlocutor, correctly orient their body toward the object (sometimes even combining their gestures with vocalizations), and adjust all of these behaviors when dealing with objects at different distances.

Furthermore, responding and following pointing gestures is not an easy task either because the children need to make a set of intersubjective inferences. For example, they need to understand that what should be looked at is not the finger that points but what is indicated by it in the distance. Butterworth's (2003) investigation showed that children younger than 7/8 months old fail at this task. Moreover, knowing *what* is indicated and especially *why* it is being indicated requires knowledge about the context, previous history of interaction with the interlocutor (Tomasello et al., 2007) or, at least, it requires the parallel interpretation of other behaviors occurring at the same time, such as eye contact, body movements, facial expressions, the content of spoken language that may accompany the gesture, and the rules of the context, among others.

It isn't easy to understand how this form of complex distal communication is achieved unless previous, more basic forms of intentional communication have been acquired that allow the child to share references in more straightforward ways (Rodríguez et al., 2015). It is more likely that the first intersubjective agreements that the child manages to establish do not occur in the distance, empty-handed, but rather in proximity, by actively involving objects through ostensive gestures (Moreno-Núñez et al., 2020). These first interactions, in which the indicated referent matches what is being shown or given, are semiotically less complex (see section 3.2.5). It is possible that the repeated use of ostensive gestures in early interactions could help build the foundations of subsequent distal communication (Werner & Kaplan, 1963). The research focused on the development of joint attention supports this idea by indicating that the ability to share references is progressively built and that many of its elements (directing gaze and intended smiles, gaze alternation, following other's attention behaviors, etc.) are present *before* the child is able to point at things in the distance (Adamson et al., 2012; Bakeman & Adamson, 1984; Mundy et al., 2007).

#### *Can ostensive gestures be precursors of the pointing gesture?*

Grounded on what has been described in the previous section about the nature and complexity of the pointing gesture, an attractive hypothesis is that ostensive gestures could be precursors of pointing. Liszkowski (2008) already gave some hints on this idea by stating, "It is possible that pointing is based on earlier interactive routines and play formats which involve objects and in which infants actively participate with gestures such as showing and give-take exchanges" (p. 192). The author also referred to Werner and Kaplan's (1963) ideas to suggest that ostensive gestures might support the production and comprehension of referential communication by enhancing interpersonal contexts with objects where social scaffolding has the leading role.

Here are nine arguments that support this hypothesis (some of which have already been discussed in previous sections and will only be mentioned):

#### *Parents preferentially use ostensive gestures to communicate with their children in the first months of life.*

As stated previously in this article (see section 1.2), research has shown that ostensive gestures are one of the first mediators adults use to communicate with children and regulate their behavior. During the first months of life, adults select a part of the world and show it or give it to the child (who is not yet able to take the initiative for themselves) for them to attend to and use (Jáñez et al., 2021; Moreno-Núñez et al., 2017). Later in development, adults use ostensive gestures not only to direct the child's attention to objects (Rodríguez et al., 2015), but also to include children in the intentional and functional uses of objects that adults make (Basilio et al., 2017; Rodríguez & Moro, 1999), and to help them map words with objects (Rader & Zukow-Goldring, 2010; 2012; 2015). Additionally, investigations in educative contexts with children from 0 to 3 years old have shown that teachers frequently use ostensive gestures in the classroom, especially giving and placing, to invite children into new activities and action proposals with objects (Estrada, 2021).

Research on the role of caregiver's actions in gesture development cannot report a one-on-one relation between the frequency of parents and children's gestures, however, there seems to exist a "many-to-many" relation (Salomo & Liszkowski, 2013): Parental use of gestures during joint attention activities is a crucial factor that promotes early gesture development (Tamis-LeMonda et al., 2001). If ostensive gestures are indeed one of the first semiotic mediators used by parents and caregivers during early triadic interactions (those where adults have all the control), it would mean that children have many opportunities to become acquainted with them. It would be appropriate then to suggest that ostensive gestures could also be the first gestures that children develop and use intentionally to share meanings with others and to regulate their own behavior.

#### *The onset of ostensive gestures precedes the pointing gesture's onset in development.*

Empirical evidence has revealed that children use ostensive gestures *before* pointing in development (see section 1.2 for further

references). Children perform private and other-directed ostensive gestures from 8/9 months (Dimitrova & Moro, 2012; Guevara et al., 2020; Iverson & Wozniak, 2007; Reddy, 2008). In contrast, the first self-directed pointing gestures are observed between 9 and 10 months of age (Bates et al., 1975; Delgado et al., 2010; Kettner & Carpendale, 2018), and those directed toward others most commonly between 10 and 12 months (Behne et al., 2012; Butterworth, 2003). Choi et al.'s (2021) research has also shown that children continue to use ostensive gestures at similar rates, even after having mastered pointing at around 14 months. This suggests that ostensive gestures are not replaced by pointing in development but rather supplemented as pointing gestures have greater semiotic and representational power.

Regarding children's responses to both gestures, the study by Moreno-Núñez et al. (2017) showed that, from 2 months old, children react to the ostensive gestures produced by their parents. They begin to treat these gestures as something to attend to, showing greater periods of eye contact, smiles, and body movements when their parents show them objects (see also Jáñez et al., 2021 with premature babies). This very elemental "understanding" evolves progressively. By 3 months, the ostensive gestures of adults become something to reach toward while maintaining eye contact. By 7 months, the study by Rodríguez and Moro (1999) showed that children respond consistently to adults' ostensive gestures of showing during shared use of objects. By 9 months old, Juvrud et al. (2019) provided evidence that children have some understanding of basic giving gestures, showing greater pupil dilatation in response to inappropriate giving gestures. On the other hand, the authors state that, at 7 months old, children still have difficulties following their parents' pointing gestures to new objects. Most studies have suggested that the first responses to pointing gestures at near objects are observed between 9 and 10 months of age (Pfandler et al., 2013). It is not until 14–15 months that children consistently respond to pointing gestures that refer to objects in the distance and outside their visual field (Butterworth, 1991; 2003; Desrochers et al., 1995). This evolution is plotted in Fig. 4.

Overall, most children seem to produce ostensive gestures before pointing. This observation supports the idea that ostensive gestures are less complex semiotic behaviors. However, study results have emphasized a great number of individual differences in gestures' early development. More research would be needed in order to know if there are other developmental trajectories related to ostensive and pointing gestures, either in typical or atypical development, where pointing gestures might appear first (this would be a similar situation to those where language appears before pointing gestures).

#### *Ostensive gestures are related to more complex semiotic productions: Pointing gestures and language.*

Research analyzing the role of ostensive gestures as possible predictors of language development is particularly sparse. The few studies providing evidence of this relation have reported contradictory findings. While some authors have said that ostensive gestures are strongly correlated with productive vocabulary (Blake et al., 2005; Donellan et al., 2019; Folven et al., 1985), others have found no such relation, in contrast to pointing's predictive role (Cochet & Byrne, 2016).

Despite these ambiguous findings, recent investigations seem to have agreed on the strong relationship between ostensive gestures at 10 months and the onset and frequency of later pointing gestures (Cameron-Faulkner et al., 2015; Manwaring et al., 2017). Choi et al. (2021) also found children's ostensive gestures at 10 and 12 months of age to be good predictors of later pointing gestures. They also reported that ostensive gestures at 10 months old were better predictors of language development at 18 months than pointing gestures at this same age. However, once pointing gestures began to predict language outcomes around 14 months, ostensive gestures no longer did so. The authors concluded that, in the first year of life, pointings may not always be the best predictor of language; but that the predictive value of different deictic gestures would change with timing (Donellan et al., 2019; McGillion et al., 2017). This conclusion provides some clarity to the somewhat ambiguous findings reported in previous investigations and ratifies ostensive gestures' relation to more complex forms of referential communication in the distance.

In summary, ostensive gestures are related to pointing gestures' onset and later use. This data supports the idea that ostensive gestures appear first in development and have a role in building foundational social skills, which might facilitate pointing gesture development as a more complex communicative and symbolic behavior. Ostensive gestures might also be related to the development of language. However, there might be a "time" for this relation after which pointing gestures take over the role of main language predictors. More research would be needed to evaluate this hypothesis.

#### *Ostensive gestures allow children to share references with others and regulate their own behavior from an early age.*

An undoubted relationship has been found between language and pointing gestures, to the extent that pointing can perform, in a

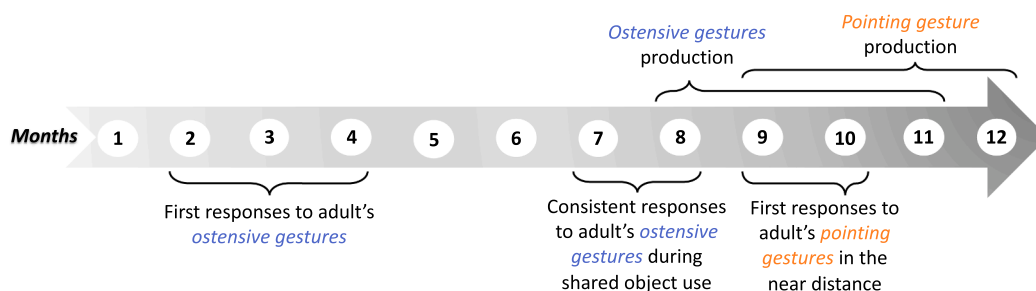


Fig. 4. The differential onset of the ostensive and pointing gestures in development.

less complex way, functions often attributed to spoken language (Jakobson, 1960). Similarly, some of the functions identified in pointing gestures are already found in the ostensive gestures that children direct to others and themselves (Dimitrova et al., 2020; Kanto et al., 2015; Parladé & Iverson, 2010).

Cameron-Faulkner et al. (2015) studied the gestures of giving and showing produced by children between 10 and 12 months old, concluding that they are the base of the emergence of declarative behaviors. This ratified the findings of Bates et al. (1975). Tomasello (2006, as cited in Gillespie-Lynch et al., 2013) also considered that ostensive gestures of showing are “perhaps the most unambiguous example of social sharing for its own sake” (p. 3). More recently, research by Boundy et al. (2018; see description in section 1.4.2) provided empirical evidence that supported these ideas. Likewise, the study by Rodríguez (2009) described above, demonstrated that the interrogative function identified by Southgate et al. (2007) in the pointing gestures of children of 16 months old is also present in children’s ostensive gestures from 13 months of age.

Additionally, research studying private pointing gestures has found that they have functions of attention control (Carpendale & Carpendale, 2010; Delgado et al., 2009; 2010) and action regulation (Rodríguez & Palacios, 2007). These findings have strengthened pointing’s ties with language and its private functions. As stated in the second section of this article, these functions of self-regulation have also been observed in the private ostensive gestures of children from 8 months old, especially in situations where it is difficult for them to carry out functional uses of objects and instruments. As the evidence on this issue has begun to show, children use ostensive gestures as means of behavior regulation first, and only later in development do they progressively incorporate more complex private gestures into their repertoires, such as private pointing and private representational gestures (Guevara et al., 2022).

In synthesis, ostensive gestures seem to perform, in a simpler way, some of the functions that are typically attributed to pointing gestures. However, more research would be needed in order to prove this relation and to establish whether there are specific developmental trajectories in these gesture functions (for example, *declarative* ostensive gestures appearing in development before *declarative* pointing).

#### *Ostensive gestures are “easier” than pointing gestures.*

Carpenter et al. (1998) suggested that ostensive gestures could be understood as less complex declarative behaviors than pointing (see also Camaioni, 1997; Ramos-Cabo et al., 2022). Ostensive gestures involve contact with the object, while pointing requires directing the interlocutor’s attention to an object out of the child’s reach (Donellan et al., 2019). In this situation, identifying the referent is challenging in both pointing production and understanding. This problem does not occur with ostensive gestures since sign and referent coincide and children do not require to perform as many inferences and attention shifts. Vallotton et al. (2015) referred to this problem by stating that distal indexes require the interlocutor to follow the trajectory of the point and shift their gaze and attention from the gesturer’s hand to the referent, while ostensive gestures of showing require the interlocutor to gaze only in a single location. Rodríguez (2009), based on a semiotic analysis (Eco, 1992), has added to this idea by arguing that there is an order in gesture production in the early ages. This order is given by the semiotic complexity of the gestures, which refers to the distance between sign and referent. The first gestures that children have access to are the less semiotically complex ones, ostensive gestures. Then, the distal pointing gesture appears, and finally, there are symbolic gestures in which the referent is absent in time or space and is replaced or represented by the sign (Guevara et al., 2020). Werner and Kaplan (1963; cp. Crais et al., 2004) suggested a similar idea with their “distancing hypothesis,” which states that children use contact before distal gestures.

Situating children’s gesture production in this continuum of semiotic complexity suggests that pointing gestures are closer to language in terms of their abstraction capacities and their level of representation. In comparison, ostensive gestures are closer to instrumental actions, especially in the first months. However, this fact, far from detracting from the importance of either of the two types of gestures, provides a necessary vision of progression in gesture development as the child’s representational capacities gradually increase.

#### *The first pointing gestures happen in contact with objects.*

Before pointing in the distance, children point proximally, touching the referent object with the extended index finger or the open hand, both for themselves and others (Butterworth, 2003; Delgado et al., 2010; Kettner & Carpendale, 2018). These gestures have been called *touch-pointing* and are halfway between an ostensive gesture and conventional pointing: they are indicative empty-handed gestures that remain in contact with the object (Moreno-Núñez et al., 2020). In this sense, touch-pointing is less complex than conventional pointing because it reduces distance ambiguity but more complex than ostensive gestures because it assumes differentiation between sign and referent (which gives pointing greater representational capacity). Similarly, studies on the educative action of parents and teachers have shown that touch-pointing is a strategy frequently used by adults to reduce ambiguity when presenting novel objects and transmitting their conventional uses to children in their first years of life (Contín & Rodríguez, 2021; Rodríguez & Moro, 1999; Moro & Rodríguez, 2005). These mid-way gestures support the idea of progression in gesture development from the ostensive and proximal to the indicial and distal. Ramos-Cabo et al. (2020) referred to it as a progressive distancing from concrete objects to more abstracted referents. In addition, it highlights the importance of understanding gesture production in a continuum of semiotic complexity.

#### *Both ostensive and pointing gestures are impaired in children with autism spectrum disorders (ASD)*

Early identification of communication impairments in the first year of life partially relies on assessing preverbal communicative behaviors. Researchers and clinicians have especially considered impairments in declarative pointing as one of the leading risk indicators for ASD, along with alterations in gaze monitoring and symbolic play (Baron-Cohen et al., 1996). Additionally, the recent study by Ramos-Cabo et al. (2020) has found qualitative differences in the pointing gestures performed by children with ASD when

comparing them to a typically developing group. The authors report that children with ASD produced significantly more open-hand pointing and touch-pointing gestures than their peers, whereas the typically developing group used index-finger distal pointing gestures more often. Even though pointing is a crucial early indicator of social interest, investigators have wondered if ostensive gestures' development, which reflects an earlier form of social skill, could also be altered in children with ASD.

Mishra et al. (2021) compared the gesture production of children with ASD with children of typical development between 24 and 48 months. They found that children with ASD produced not only fewer pointing gestures but also fewer ostensive gestures. Similarly, Heymann et al. (2018) observed that children with ASD had more infrequent initiating joint attention behavior (these included ostensive gestures of showing and pointing) than other high-risk and low-risk children. They also found that the high-risk group tended to use more imperative behaviors, such as ostensive gestures of giving and reaching, than the low-risk group. Furthermore, LeBarton and Iverson (2016) found that fewer children with ASD produced ostensive gestures of showing between 24 and 36 months compared to children with language delays and typical development. However, the authors did not find significant differences between groups in these gestures' frequency of use, only for pointing gestures.

Research on older children with autism has also shown deficits in ostensive gestures. For example, Leekman and Ramsden (2006) found that, at 52 months of age, children with ASD were less likely to give and show objects in response to adult cues than children with developmental delays. The study by Mundy et al. (2007) also showed that children with ASD had fewer joint attention skills (including pointing and ostensive gestures of showing) than children with cognitive impairments.

Furthermore, studies have argued that alterations in ostensive gestures, but not in pointing gestures, might differentiate children with ASD from children with other developmental delays (Wetherby & Prizant, 2002; Baron-Cohen et al., 1996). Clements and Chawarska (2010) studied the development of pointing and ostensive gestures in children with ASD, language delay, and typical development at 9 and 12 months. They found that children with ASD pointed less frequently than typically developing children but similarly to children with language delay. In contrast, ostensive gestures of showing differed significantly between ASD and language-delayed children (and also between ASD and typical development children), with ASD children producing fewer showing gestures. Deficiencies in ostensive gestures of showing at 12 months of age were a stronger predictor of ASD diagnosis at 24 months than deficiencies in pointing. The authors did not find significant differences between groups for ostensive gestures of giving.

Further investigation of ostensive gestures' development in early communicative impairments is needed to describe their deficiencies and alterations in children with ASD and other developmental disorders. Results have seemed to indicate that alterations in ostensive gestures and pointing gestures might be fundamental predictors of early communicative impairments (especially in ASD) and could favor their early identification. Considering other gestures beyond pointing, especially ostensive gestures, might also serve to discriminate between ASD and other early developmental impairments (such as language delays or other mild social impairments), which is one of the main concerns when diagnosing children at high risk for ASD in the first years of life (Stone et al., 1997; Wetherby et al., 2007). Studies like Toth et al. (2007) have shown that pointing alone is not helpful for this purpose because deficits in pointing are usually present in children with ASD and language delays.

#### *Ostensive gestures are present in different cultures*

Some cross-cultural studies have reported that not only are pointing gestures present in diverse cultures, but ostensive gestures also seem to be used in different social groups (Fernández-Feña et al., 2021; Lieven & Stoll, 2013). Variations in their frequency of use, however, have been reported.

Salomo and Liszkowski (2013) studied the gestures used by children and caregivers in Chinese, Mayan, and Dutch cultures, between 8 and 15 months of age. They found that caregivers' use of gestures varied significantly between cultures. Chinese caregivers used pointing and ostensive gestures more frequently than the other groups (and the Dutch group more than the Mayan). However, while Chinese caregivers used pointing gestures more regularly than ostensive gestures, Dutch caregivers used ostensive gestures of showing more often than any other gesture. Regarding children's gestures, the authors found that children differed only in ostensive gestures of showing and pointing gestures. Dutch children used showing gestures more frequently than Mayans, and Chinese even more than both of them. However, Chinese and Dutch children used pointing gestures more often than ostensive gestures.

Kwon et al. (2018) compared English-speaking children from the USA with Taiwanese- and German-speaking children (from 6 to 36 months). They found significant differences in the use of ostensive gestures between groups. English and German children were likelier to produce ostensive gestures than Taiwanese children. The probability of ostensive gestures increasing with age also differed across cultures. While ostensive gestures' production increased for German-speaking children, it decreased for Taiwanese children (they did not find variations for English-speaking children.).

A more recent study by Cameron-Faulkner et al. (2021) compared the gestures used by an English and Chinese sample at 10 and 12 months. They found that both groups produced ostensive and pointing gestures, and their frequency increased over time. However, ostensive gestures were only found to predict pointing gestures in the English sample. Additionally, the combined frequency of both pointing and ostensive gestures was found to be related to vocabulary comprehension in the Chinese group only.

More cross-cultural research would be needed to vouch for ostensive gestures as a universal form of communication, just as pointing seems to be. However, the evidence collected until now seems to indicate the presence of ostensive gestures in both Eastern and Western cultures, although they differ in their frequency of use and their relation to later and more complex productions such as pointing and language.

#### *The hypothesis is consonant with other theories of pointing's origin.*

Some widely spread proposals hold that pointing is an innate behavior in the child and that its production and understanding arise simultaneously in development (Butterworth, 2003). Tomasello (2008) stated that "Infants do not acquire their pointing gesture by



imitating others; rather it comes naturally to them in some way..." (p. 112). These perspectives have been supported by the almost universality of the gesture and by evidence from observational studies that report pointings in the first weeks of life, which has led to the assumption that there may be an innate component in the gesture. These proposals have been losing support in favor of those that suggest that, even if there could be some natural tendency in the extension of the index finger from an early age, the conventional pointing gesture, *with referential meaning*, is progressively built through interaction. The actions observed in the first weeks of life are nothing more than extended index fingers that will still take a few months to be intentionally used as semiotic mediators (Blake et al., 1994).

In line with these ideas, different authors have proposed that pointing comes from behaviors that the child initially performs in a non-communicative way, whether it be in their attempts to reach objects (Vygotsky, 1978, based on Wundt, 1973), to tactilely explore objects (Shinn, 1975; Lock et al., 1990), or as part of their orientation toward the environment (Bates et al., 1975), all of which are interpreted and answered by adults as communicative actions (Mead, 1934). The child progressively learns how the adult reacts to her actions and adjusts her activity to achieve her ends. Recently, Kettner and Carpendale (2018) have taken up this approach. They have provided evidence supporting the idea that pointing develops from children progressively learning how others respond to their initially non-communicative uses of the extended index finger. Later, Carpendale et al. (2021) extended this approach from an interaction-based perspective to account for the origin of the ostensive gesture of giving (see also Clark, 1978). Moreover, comparative studies have suggested similar processes in non-human primates learning conventional communicative behaviors (Liebal & Call, 2012).

When the complexity of child–adult–object daily interactions is considered, these proposals, which support the progressive construction of gestures in interaction and question their biological origin, open the doors to the possibility that there might be several ways, not necessarily exclusive, for gestures to become conventionalized. Specifically, in the pointing gesture, the early non-communicative uses of the index finger would explain its morphology and subsequent conventionalization; however, the existence of ostensive gestures as functional mediators in communicative contexts acquired earlier in development might also play a fundamental role. They would allow the child to initiate early episodes of joint attention and develop new communicative skills that can be later extended to other forms of distal communication involving more semiotic complexity. This idea would undoubtedly be supported by the common functional aspects of both ostensive and pointing gestures, previously presented in this section.

## Conclusion

This review had two primary purposes: the first, presented in sections one and two, was to describe ostensive gestures and their communicative functions and to argue in favor of their nature as *gestures*. The second, developed in section three, was to explore the hypothesis that ostensive gestures not only precede pointing in development but also are its precursors.

Regarding the first objective, it has been stated that ostensive gestures are gestures that occur *with* the object in hand (Eco, 1992). In this sense, they are gestures of less semiotic complexity: Their understanding does not require inferences to determine the sign and the referent, as both coincide in a single referential act (Rodríguez et al., 2015). This difference in complexity, when compared to other gestures, is probably the reason why parents use them preferentially with their children in their first months of life (Jáñez et al., 2021; Moreno-Núñez et al., 2015; 2017; Hamer & Rosenthal, 2006). It would also explain the fact that they are effective educational mediation strategies teachers constantly use in early-years-schools (Cárdenas et al., 2020; Estrada, 2021; Guevara et al., 2020). And, of course, it would be in line with these gestures being the first ones children can respond to and produce intentionally (Bates et al., 1975; Carpenter et al., 1998).

Despite their undeniable relevance in children's development, a literature review has highlighted the relatively few studies investigating ostensive gestures' nature and functions in the first three years of life. Some authors have related this to the methodological difficulties inherent in their research (Boundy et al., 2018; Olson & Masur, 2011; Salo et al., 2018), while others have totally or partially excluded them by questioning their character as true gestures (Andrén, 2010; Deák et al. 2017, Guidetti, 2003) or the intentionality underlying them (Liszkowski, 2008). This situation leads us to reflect on whether the criterion currently used to distinguish gestures from instrumental actions, which is the presence or absence of objects in the hand, is the most appropriate (Kita et al., 2017; Novack & Goldin-Meadow, 2017). Recently, critical voices have claimed that objects are a shaping part of communicative acts and that their separation from gestures into a parallel world is a theoretical rather than a pragmatic matter. In ostensive gestures, objects have a fundamental role because communication not only occurs *about* them (as referents) but also occurs *through* them (Clark, 2003; Dimitrova & Moro, 2012; Dupertuis & Moro, 2016; Rodríguez, 2006; Manzi et al., 2020). The relevance of objects is more than that they occupy the child's hand; they are fundamental for understanding ostensive gestures' functions or why children show or give objects in specific contexts. In Moreno-Núñez et al. (2020), ostensive gestures are gestures of full right, as they are intentional behaviors of a referential nature that allow the subject, the object, and the other to be brought together in authentic triadic interactions.

Understanding ostensive gestures as gestures means going beyond including a specific type of gesture in a pre-existing category system. It requires restructuring the way gestures, communication, objects, and context have been understood and studied in developmental psychology. A new perspective is needed, one that considers the material world part of the communication process between subjects and admits that the material world can shape that communication. A first step would be to broaden the definition of gesture so that it accommodates not only complex gestures closer to language, such as pointing or symbolic gestures, but also those at the lower limit of complexity and that are closer to actions, like ostensive gestures.

Within this review's first objective, the functions different authors have observed in children's ostensive gestures from an early age were also described. These functions stand out for their similarity with those observed later in pointing gestures. This provides a clear idea of progression in gesture development. Specifically, there is evidence of how children show and give objects to communicate with others, not only to share referents (declarative function) and make requests (imperative function) but also as a means to formulate

questions (interrogative function), prolong interaction with others (phatic function), and elicit another person's positive evaluation of their own performance (evaluative function). Likewise, a new and promising line of research suggests that ostensive gestures can also be private. They have a function of self-directed communication related to the control of the child's own behavior and attention while the child is pursuing goals. These private functions in ostensive gestures stand out, as they could be one of the children's first manifestations of cognitive self-regulation and executive function. They appear before other gestures (pointing or symbolic) are privately used and before language develops. This turns them into a crucial research target yet to be explored that could increase the understanding of early executive function development (Rodríguez, 2022; Rodríguez et al., 2017a; Rodríguez & Moreno-Llanos, 2020).

Regarding the second objective, some compelling arguments have been put forward in favor of the hypothesis that ostensive gestures are one of the main precursors of pointing. This means that the relationship between ostensive gestures and pointing would go beyond a matter of one appearing earlier in development than the other. Instead, it is possible that, through ostensive gestures, children put into practice several skills of communication and reflection that form the base on which pointing is built as a gesture of greater semiotic complexity and referential power. After having both gestures in their communicative repertoire, children adjust the use of one or the other (ostensive or pointing gestures) according to the demands of the interactive context, as has been seen in the studies of Puccini et al. (2010), Olson and Masur (2011), and Guevara et al. (2020). This hypothesis is an essential contribution to the debate on the origin of the pointing gesture and is an alternative to the idea of pointing as a "natural" behavior (Butterworth, 2003; Tomasello, 2008). It understands pointing as a construction resulting from interaction with others and the world. It also provides a necessary order to the understanding of gesture development and posits that children develop gestures over time, moving from lower to greater semiotic complexity, and from proximal to more distant situations. A promising task for future research would be to investigate this hypothesis further, describing in detail the already-stated relationship between ostensive and pointing gestures (Cameron-Faulkner et al., 2015; 2021). Further research could also seek to provide answers about the existence of a direct relationship between these early gestures and more complex communicative behaviors, such as symbols and language (Choi et al., 2021), and less complex semiotic behaviours, such as uses of objects and instruments (Dimitrova & Moro, 2012).

Although the relatively few investigations that have studied children's ostensive gestures have done so mainly from a pragmatic perspective, focusing on their functions in situations of joint attention, this is still an area that needs to be explored more deeply in future research. Studying ostensive gestures and their functions is a potentially fruitful research area for typical development, on which this work has mostly focused, but also for atypical development. In this regard, Clements and Chawarska (2010) emphasized that studying ostensive gestures might offer parents, educators, and clinicians an alternative to pointing gestures as early red flags for ASD, complementing each other. Contributions in this area could benefit the early identification of communicative developmental impairments and the realization of differential diagnoses. Ostensive gestures also stand out as a relevant and facilitating element that may have a role in the development of the communicative skills of children with sensory impairments, such as blindness or deaf-blindness, that restricts their distal communication. Authors such as Bigelow (1988; 2003) have already stated that giving objects is one of the primary ways for blind children to show and share objects with others.

In addition, among the pending tasks for psychology in ostensive gestures research, there is the study of behaviors co-occurring with the gesture and the operationalization of its morphology (An initial approach to this topic can be found in the articles of Boundy et al., 2016; Messinger & Fogel, 1998.) Morphological classifications of ostensive gestures and their different manifestations (showing, giving, and placing) will provide some coherence to how they are understood in different studies and evaluation tasks. These classifications will also help establish objective indicators of ostensive gestures' use to easily identify and study their production in early interactions (see Ramos-Cabo et al., 2020 with pointing gestures).

Finally, if ostensive gestures are progressively built through interaction, it is essential to devote efforts to the study of their origin (Carpendale et al., submitted). This would call for the interactive analysis of early social routines instead of the isolated study of the child's gestures, as well as the inclusion of half-way behaviors (already not actions but not gestures yet) in category systems focusing on gesture development. Further evidence and theoretical contributions in this area would help to understand how an important semiotic mediator comes to be in the first years of life and would also provide relevant information about the origin of intentional communication and how it relates to interaction with objects and others, especially with adults, in the first months.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.



## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.dr.2023.101076>.

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