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# Evaluation of Methods for Testing Early Social Cognition from a Pragmatic Perspective

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## Abstract

In this chapter, I aim to review methods for testing early social cognitive abilities, in particular the assessment of Level 1 perspective-taking (VPT-1) in the visual modality, as it plays a predictive role in understanding the epistemic states of others. To some extent, in the literature, tests of VPT-1 are uncritically reported and replicated without questioning the validity and significance of the results. However, the use of behavioural measures with very young children remains a challenging task, as children draw on many pragmatic resources in a test situation, such as cross-situational interactional experience. In this chapter, I attempt to provide an initial review and interpretation of previous findings from a pragmatic perspective.

**Keywords:** pragmatics, social cognition, perspective-taking, visuo-spatial perspective-taking, assessment, behaviour measurement

## 1. Introduction

Every communication situation is characterised by its own pragmatics. The same applies to test situations—especially when two interactants are involved. From a traditional point of view, pragmatics conglomerates context-dependent meanings that go beyond the meaning of a word or a referent [1]. In dialogue, for example, components such as interlocutors, their interaction history, their gestures and facial expressions, their prosody, and even the location of the conversation, constitute pragmatics [1]. In order to introduce the issue, I outline a fictional word-learning experiment in which a child learns a new word for a novel object from the experimenter while playing with it together. The experimenter repeats the word for the object several times so that she can be sure that the child picked it up. In addition, the child is aware of the experimenter's knowledge of the word because she has repeatedly referred to the object with the word form.

Two variations of a test situation could follow the learning phase, differing in their pragmatic frame or interactional format. The concept of pragmatic frames describes a unit of a sequence consisting of actions and language [2]. Following Bruner [3], pragmatic frames are learning units that are co-constructed by two interactants (child

and caregiver) and occur repeatedly in everyday situations. In the example above, the pragmatic frame of a test is a questioning routine accompanied by a pointing gesture.

The experimenter herself could, after a while, ask the child for the name of the new object by pointing to it, looking at the child and questioning, 'Oh, what is that?' (example 1). In this version, the experimenter is asking a question that she obviously already knows the answer to because she already mentioned the label during the learning phase before. For the child, the experimenter's communicative goal is thus difficult to grasp. In addition, what is expected of her remains vague, and this lack of transparency is likely to influence her subsequent response. Changing the experimental situation could lead to a more obvious pragmatics: a second experimenter, who was not involved in the interaction before, enters the room, looks excitedly at the new object, points to it and asks the child, 'Oh, what is that?' (example 2). From the child's point of view, the aim of the questioner is quite different: she is looking for information about the new object, the name of which she does not know.

Bruner [3] distinguishes between a surface layer and a depth structure that are inherent to pragmatic frames. Observable components of a sequence like actions and language are located on the surface layer. So, focusing solely on the sequence of (a) guiding the child's attention to the new object by means of a pointing gesture and (b) questioning for the name of the object (with the same syntax and semantics), frames (1) and (2) do not differ on its surface layer. However, focusing on the depth structure that comprises the achievement of a goal, both testing variations differ substantially regarding the pragmatic role of the experimenters, their background knowledge, their goals (from the child's interpretation) etc., possibly resulting in a failing of the interactants' goal and finally changing the situation on a pragmatics level. Applied to example (1) the ambiguity or lack of transparency of the depth structure in the experimenter's goal could lead to a child's reaction that does not necessarily mirror her cognitive ability (retrieval of the word form), but rather her pragmatic competence. The point here is that the pragmatic frame in a testing situation needs to be perfectly tailored such as in example (2) so that the child is able to unfold her cognitive competence. Rohlfing and colleagues argued that 'pragmatic frames comprise a link between communicative and cognitive skills, individual differences might emerge in these skills' ([2], p. 10). If a testing situation leaves room for interpretation, the child will construe her own pragmatics (drawn from similar past events) and adapt to it in a way that makes most sense to her. Consequently, less validity can be gathered from a pragmatically not well modelled testing situation. The next section shifts the focus to early social cognitive skills, namely visual perspective-taking, before summarising the VPT-1 test methods with their inherent pragmatic challenges in order to analyse these methods.

## **2. Visuo-spatial perspective-taking in toddlers**

Visual-spatial perspective-taking is regarded as one of the first key competencies for understanding others' minds [4], as it forms the embodied foundation for higher mentalistic operations [5, 6]. As such, representing another person's visual perception as contradictory to one's own perception is a pivotal ability for an emerging theory of mind (ToM) and is seen in a continuous developmental line towards false-belief reasoning [7, 8]. Thus, taking another person's perspective in the visual modality requires suppressing one's egocentric view of a scene, an object, or a subject [9] in order to simultaneously and correctly imagine another person's perspective [10].

In the following discussion, after a brief outline of the perceptual and attentional precursors, an introduction to visuo-spatial perspective-taking is given.

## **2.1 Joint attention and understanding of visual perception as precursors**

Prior to the fully developed concept that viewpoints can differ (i.e. partially overlap and partially diverge), infants are already exceptional experts at sharing the same perceptual and attentional focus of their caregivers in dyadic social interactions. Between the ages of 9 and 12 months, infants begin to follow the attentional state of others, cued by nonverbal social cues such as eye contact, pointing and gestures [11], and thus shift their own perceptual focus in favour of someone else's. They reflexively respond to the caregiver's focus of attention by joining in [11]. Although they usually have a slightly different view of an event or object, in joint attention formats the child and parent actually seem to share the same perceptual and mental focus. In terms of behavioural production, at approximately the same time, infants begin to check for another person's attentional focus [12] and to direct it to their own through declarative pointing, showing and alternating gaze, resulting in shared engagement and experience [11, 13]. According to Moll and Meltzoff's stage model of perspectives, this sharing of attentional states forms the basis for an evolving understanding of (different) viewpoints, which is consequently referred to as level 0 perspective-taking [14]. It is only through repeated participation in shared attentional formats that young children are able to infer an existing difference in perspectives and later come to know how a viewpoint might differ from their own [14].

Other authors tend to focus on the understanding of visual perception as a fundamental cognitive achievement of perspectivation [15], overlooking the fact that understanding different perspectives is inherently social and thus learned in social interactions. As a result, this line of research focuses mainly on visual facts. For example, 12- to 18-month-old infants infer that open eyes are an indicator of seeing by looking longer at an adult when the adult faces an object with open eyes rather than closed eyes [16]. Another fact of vision that is more critical for understanding perspectives is the link between the environment and human perception. For example, when an occluder is opaque, the space behind it cannot be perceived, whereas when an occluder is transparent (or non-existent), a person can see the area behind it. Surian and colleagues [17] showed that 13-month-olds can understand others' perception of an object depending on the presence or absence of an occluder. This looking-time experiment provides the first indications of an emerging knowledge of different perspectives in young infants, namely level 1 perspective-taking, which I will elucidate in the next section.

## **2.2 Definition and distinction of level 1 and level 2**

The basic understanding of *what* an interlocutor sees differently from her own perspective is subsumed under the concept of level 1 perspective-taking [18, 19]. However, when referring to the advanced knowledge of *how* another person perceives something differently from her own perspective, it is referred to as level 2 perspective-taking [18, 19]. The distinction between the levels is illustrated below.

An 18-month-old toddler who has not yet reached level 1 would typically behave as follows [20–22]: She and her caregiver are sitting on opposite sides of a table; the child holds a picture book in her hands and discovers a very interesting picture in it, so she starts pointing to a feature in the picture; the caregiver is not able to see it,



but only detects the cover of the book. Despite the caregiver's nonverbal and verbal indications that she is obviously not perceiving the same thing as the child, the toddler continues to point at the picture without turning it around or bringing it closer to the parent. Thus, the child does not understand that the picture she is pointing at is not visible to the parent. At this stage, the representation of another person's different perspective is not yet formed, and the child only takes into account her own egocentric perspective.

The same child at the age of about 36 months would show the following behaviour [23]. Imagining the same situation; now, the older child puts the picture book on the table and moves it closer to the parent. The parent does see it, but upside down. Obviously, the visibility of the pictures is considered by the child, so she places the book in front of the parent for a shared view. However, by the time the subject has reached a level 2 perspective, she would have rotated the book and thus weighted the mode of representation, which is the case at around 48 months [19]. Instead, the child does not yet conceptualise that people represent objects and scenes from different angles and spatial configurations. Consequently, spatial perspective is still lacking: level 1 but not level 2 has been reached.

In classical VPT-1 tasks there are two complementary forms. The picture book example above illustrates the child's understanding that someone else's perception is inferior to his own. The child then demonstrates her VPT-1 by placing the book on the table [21], so that the parent can finally see what's on the picture—so-called percept production—and thus attend to it jointly with the child. Imagine the parent and child in reversed roles: the parent holds the book, and the child cannot see the pictures inside. But at the same time, she knows that the parent's vision is richer by presenting the parent's perspective in her mind. Sodian and colleagues [4] suggest that it is easier for a child to understand when an interactant perceives more than the child. Thus, it is mastered slightly earlier than when an interactant perceives less. As a result, a clear dichotomy can be defined: one person perceives all the components of the target of interest (pictures), while the other person sees none of them. Here, as in the classic experiments used to assess VPT-1 skills, two-dimensional images are printed on one side of a piece of cardboard, or a barrier blocks the view of three-dimensional objects, so that the setting itself determines the binary of perception. It is important to note that perception in everyday situations is often more diverse and different from this dichotomy in experiments, as it depends on various circumstances such as angles, spatial configuration, and mobility of interactants.

Indeed, using a looking-time paradigm, Sodian et al. [4] pointed out that 14-month-olds can already represent the visual perspective of a person who is not interacting directly with the infant. Here, infants are first familiarised with a person's target and later tested, in accordance with their expectation, where a person directs their grasping movement as a function of their perception—a so-called violation-of-expectation paradigm. A longer duration of gaze to an unexpected grasp when an occluder is transparent reveals the infant's awareness of others' perspective. A more recent study from Japan, using a similar experimental design but more precisely measuring infants' gaze directions and shifts with an eye tracker, showed that even 12-month-olds can represent others' visual perspective [24]. Although these tasks do not assess behaviour in interaction, they give a first idea that children younger than 18 months can cognitively represent another person's perspective.

In what follows, I focus on methods for assessing perceptual production and illustrate young children's responses as described in the literature.

### **2.3 Tasks for assessing level 1 perspective-taking in interaction**

Valid experiments for testing VPT-1 abilities require conflicting perspectives of two communication partners, whose representation is measured in experiments or naturalistic interactions.

In an interactive helping paradigm, 18- and 24-month-olds were faced with an experimenter who was searching for a second toy that she was familiar with from a previous play situation [25]. In the test situation, the infants were able to perceive both toys, whereas the experimenter across from them perceived less because one toy was occluded and one toy was visible from her perspective. The authors counted the number of correct infant responses directed to the target item that was not perceptible to the experimenter. In this scenario, 24-month-olds significantly took the perspective of the experimenter, whereas 18-month-olds did not deviate from chance. There are two aspects of the pragmatics of the test situation that deserve further attention. First, the authors admit that 'the ambiguity of the request created a pragmatically odd situation' ([25], p. 611), because the experimenter repeatedly directed her request to the child instead of searching for the second toy herself, even though she said that she could not find the second toy. In a modified replication study, Viertel [26] disambiguated the pragmatics by changing the verb so that the experimenter told the child that she could not see the second toy and by having the experimenter look around, including where the toys were, in a searching manner. Thus, it was clearly communicated to the child that the experimenter did not have visual access to the hidden object. Second, the authors focused only on responses that involved giving the target item to the experimenter, leaving out all other pragmatically correct responses such as informative pointing or showing [25], which has been modified accordingly in Viertel [26].

Interestingly, after this modest but effective modification, it was found that (a) 18- to 20-month-olds used other means of communication, such as showing or pointing to the target item, significantly more often than giving, and (b) temperamentally shy children outperformed their less shy peers on the VPT-1 test, by (c) using significantly more communicative means from a distance [26]. This example highlights that small changes in the pragmatics of a VPT-1 test can have a significant impact on how children interpret the task, that is, what is expected of them, and how they are able to unfold their social-cognitive competencies and perform in the VPT-1 test. Against the background that shy children in particular are reserved in assessment situations and often do not dare to approach a stranger [27], children's pragmatically appropriate reactions (such as lifting the barrier to reveal the view of the object hidden from the experimenter) are also considered much more important in drawing conclusions about their VPT-1 competencies.

In the following discussion, the focus is narrowed to the assessment of VPT-1 in more natural interactions that is less construed, such as showing a picture or an object to an interlocutor, but which nevertheless presents other pragmatic difficulties.

In a longitudinal study, Girouard and colleagues [20] analysed the patterns they observed in children aged between 18 and 36 months while they were confronted with several VPT-1 tasks. In the so-called bear task, which was largely adapted from Lempers and colleagues [21] and Loveland [22], the child and caregiver were seated across from each other at a table and the child was given a teddy bear with its snout facing the child. The child was then told that her mother wanted to see the bear and that she should show it to her. 18-month-olds tended to show the object mostly horizontally (60%), laying the bear flat on the table so that both (child and mother)

could see the snout. 30% presented it egocentrically, with the snout pointing towards themselves. At 18 months, only 10% of the children showed the bear in a perspectival way (only the parent could see the snout), whereas 2 months later, 100% of the same children showed the bear in this correct orientation. Within this short developmental interval, infants learned to take another person's point of view or to demonstrate their cognitive ability for perspectival behaviour.

A very similar VPT-1 task involves a two-dimensional object printed on a card [21]. The setting itself was similar to the bear task described above. The child was given a one-sided card with a picture on it. The child was then asked to show the picture to the caregiver. The children's presentation pattern was strongly related to the modes found in the bear task. Only 25% of the 18-month-olds and 75% of the 24-month-olds succeeded in this task by presenting the picture exclusively to the recipient, whereas 30 months old children were able to show the object in an adult-like manner. The authors concluded that 18-month-olds very rarely show a picture in an egocentric way, that is, with the side of the picture facing them. Instead, the main behaviour at this age was to hold the picture flat, allowing the child and the parent to look at the picture at the same time (**Figure 1**), which is seen as an intermediate stage between egocentric and perspective showing [20, 21]. Lempers et al. emphasised the categorical distinction between egocentric and horizontal showing in that 'children really were showing because in presenting the picture horizontally to O, they often pointed at the picture and looked at O at the same time as if to make sure she was looking at it. This also makes clear that horizontal showing cannot be labelled egocentric' ([21], p. 20).

Gopnik and colleagues [15] found a similar behaviour in 18-month-olds: they turn a picture back and forth so that the adult sees it once and the child sees it once, and call this phenomenon a transitional stage towards visual perspectivity. In the same vein, a 2-year-old girl was observed to check her mother's vision by walking beside her and looking at the picture she had given her earlier. In doing so, she reassured



**Figure 1.**  
*Example of horizontal showing.*



herself that her mother could actually see the picture, whereas the child, from her initial position, could not, as the authors interpreted [15].

From 24 months onwards, toddlers gradually use a conventional way of showing by holding up a picture and turning it towards the communication partner.

Below, I challenge the so-called intermediate level and present an alternative explanation for the described patterns of horizontal showing by focusing on the role of the pragmatic frame.

### *2.3.1 Misinterpretation of the pragmatic frame and proposed modifications*

In this subchapter, I argue that the pattern of horizontal sharing of an image with an actor discussed above might rather be encouraged by the pragmatic context itself. In doing so, I take a closer look at the test situations designed to convey the alternative idea of a misinterpretation of the pragmatic frame. I also make some fruitful suggestions for modifying the test situation.

In the above-mentioned test situations [20, 21], the caregiver and the child sit close together at a table, while an experimenter gives the child a picture and asks the child to show it to the caregiver. There is some similarity here at the surface layer to a shared book-reading situation in which the caregiver and child sit close together, attend to pictures jointly and share their impressions of them. Many parents rely on the repetitive structure of joint picture book reading as a format for facilitating children's learning of novel words, even at such young ages as 18 months and earlier [2, 28]. In such formats, children do not act passively—quite the opposite. They often initiate joint attention episodes to elicit a new label from the parent, to name an object themselves, or to share an experience with the caregiver [29].

Referring back to the VPT-1 task, the child is given a new interesting picture, is asked to show it to her mother and often presents it in a sharing way, that is, horizontally. This mode of presentation does not necessarily reflect an immature ability or an intermediate level of perspective-taking. As 'children are on the lookout for familiar frames that help them interpret an ongoing situation' ([2], p. 9), sharing might rather represent the child's pragmatic competence. Children at this age rely on familiar, recurrent interactional structures [30], such as reading books or looking at pictures together, infer the constituents of the situation and thus construct their role within this format [2, 3]. The setting at the table, the proximity of the adult and her lack of nonverbal cues do not allow for the interpretation of a showing format in the sense of holding an object up for a person who initially has no visual access to it. In terms of the pragmatics of the situation, a child can hardly draw the conclusion that the picture should be shown. Since there is no reason for the child to hold up the picture because the adult is sitting close to her, there is more reason to share and look at it together. In fact, physical proximity in young children is often interpreted as a prerequisite for seeing and knowing the same thing together, even if the interactant has a different perspective [31]—this underlines the importance of refraining from a test situation in which the child and the experimenter sit close together at a table. In contrast, increasing the physical distance between the communication partners so that an adult appears as an observer rather than an interactant is based on the feeling that the adult does not share the child's experience of the picture [32, 33].

Furthermore, talking to a child or, more generally, creating an atmosphere of joint social engagement can lure infants into the deception of joint perception [15, 34]. For these reasons, reducing such signs of general involvement may lead to a correct interpretation of the pragmatic frame. Furthermore, the outcome is also influenced

when a parent takes on the role of a recipient in the test situation. In general, it is recommended that parents be present during the warm-up and testing, as their absence may be disruptive to the child and bias the data. However, their involvement in the test situation is problematic in two ways. First, the physical presence of the parent may reinforce the child's assumption that the parent perceives the same as the child. Secondly, and more problematically, there is a rich history of interaction between the child and the parent, which fundamentally influences the interpretation of the deeper meaning of the situation [2].

The results of the modified experiment mentioned above [26] underline the importance of nonverbal and verbal cues that emphasise the pragmatics of a situation in which a person is looking for something to which he has no visual access. It is therefore necessary to distinguish between two phases in a VPT-1 test situation. First, an infant explores an object with an experimenter, for example, a photograph, while another experimenter is completely disengaged and thus obviously not sharing the experience (an exploration phase). Here, the omission of communication symbols supports the impression that the second adult is not part of the shared experience. Shortly afterwards, the initially disengaged person communicates with the child in a searching way to gain visual access to the object (searching phase). Here, the use of nonverbal communication clarifies the search and makes it appear as if the adult does not have visual access to the item, possibly leading to a showing gesture from the child.

In order to meet pragmatic requirements, I present some enhancements that allow an experimental situation to evoke a pragmatic frame of a search situation and thus distinguish it from shared book reading.

1. The role of the caregiver should be that of a companion or an observer, not an addressee. I therefore propose the integration of a sophisticated experimenter who is better suited to the role of the addressee.
2. I propose to minimise the physical co-presence of the addressee by increasing the spatial distance between her and the child. This is achieved by placing the addressee further away from the child and placing a low occluder in front of the child so that they can see each other's upper bodies. Because of the distance of the addressee and the alienation of the table, the situation is not perceived as in a familiar book-reading frame, but as a novel one. This creates a reason to show an object to the addressee instead of looking at it together.
3. Another suggestion is to reduce the addressee's involvement by increasing the spatial distance and, more importantly, by reducing the interaction with the child. In the beginning, the addressee hides behind a magazine and pretends to read. She thus emphasises that she is not involved in the sharing situation, which reduces the shared experience between the child and the addressee.
4. As outlined above, I propose to involve another experimenter who, first of all, attends to the target object together with the child. Second, she asks the child to show the object to the distant experimenter (addressee), who was not initially involved in the sharing during the exploration phase. The addressee should emphasise nonverbally (by moving her upper body) that she is trying to see something by using social cues during the exploration phase.

These suggestions for improvement have been incorporated into Viertel's study [35] and can be found in **Figure 2**.

### *2.3.2 Results of the modified experiment*

In Viertel's study [35], 18- to 20-month-olds were tested for their ability of percept production by administering a picture task (according to [21]) and a bear task (cf. [20–22]) one directly after the other, with the modifications described in Section 2.3.1. In this way, the high proportion of responses previously described as 'inter-mediate' [20, 21] should be reduced, as the pragmatic frame for the children clearly deviated from a shared book-reading situation.

The children's reactions in relation to VPT-1 were classified into five categories:

- a. The child showed no intentional response to orient the target towards the correct addressee (the experimenter) – no target reaction.
- b. The child oriented the target non-specifically, that is, neither the child nor the addressee could see the side of the picture or the bear's snout (because the picture was rotated or presented at an unfavourable angle) – non-specific.
- c. The target was oriented so that only the child could see the side of the picture or the bear's snout – egocentric (**Figure 3**).
- d. The orientation of the target object was such that it was visible to both participants at the same time, either horizontally or by presenting it in an ambiguous way, for example, by rapidly changing the mode of presentation of the picture by turning it back and forth [15] – ambivalent (**Figure 1**).
- e. The object was oriented towards the addressee, so that she could perceive it only by herself – perspectively (**Figure 4**).



**Figure 2.**  
*Modifications of the pragmatic frame in the VPT-1 experimental set-up (at the end of the exploration phase).*



**Figure 3.**  
*Example of egocentric pointing.*



**Figure 4.**  
*Example of perspective showing.*

The findings of the study were as follows: In the picture task, the children most often showed a clearly egocentric response (almost 40%), but very rarely oriented the picture perspectively towards the addressee (6%). The proportions were similar in the bear task, where about 36% of the children demonstrated an egocentric orientation and 11% displayed a perspective orientation towards the addressee. This distribution pattern is quite identical to that of Girouard et al. [20].

Interestingly, however, compared to the original studies, ambivalent reactions were not as frequent, with 16% in the bear task (cf. 60% in [20]) and 18% in the picture task (cf. ‘main behaviour’ instead of egocentric in [21]). In this case, the behavioural components of the modified pragmatic frame probably allowed for a



better insight into the deeper meaning of the format; for example, children could infer that an object should be shown to the addressee rather than shared with her.

The fact that there was also relatively often no target reaction to the addressee (pictures: almost 33%, bear: almost 38%) was a rather surprising result, whereas only two children showed an unspecific orientation in the picture task. These children probably relied on familiar interaction protocols and communicated with their caregivers or with the experimenter sitting next to the child instead of trying to show the target object to the addressee. In these cases, VPT-1 could not be measured because the children and the 'false addressee' had the same perspective on the target item, resulting in the high proportion of no target responses. A possible reason for this could be the novelty of the frame, which contained many new elements that made the whole situation unfamiliar, and which involved three possible addressees, so that the children were not sure with whom they should communicate. Future studies using this method can improve the interaction by including a trial in which the child is familiarised with this specific new frame.

### 3. Conclusions

In this chapter, I addressed the question of whether a more pragmatic modification of the classical test situations of VPT-1 could better account for children's cognitive abilities of level 1 perspective-taking. The criticism related to the pragmatics of the test format, which, for example, resembled shared book reading. Accordingly, I argued that this form of interaction tended to capture children's specific pragmatic competencies rather than validly assessing their cognitive abilities. Focusing on the concept of pragmatic frames highlights the inter-individual history of interactions that each child brings to the test situations. This means that existing similarities to familiar frames are likely to activate interactional protocols, but also that perceived similarities of an interaction at a surface level can trigger a particular interpretation of the pragmatics of the situation, such as the discussed misinterpretation of a joint book reading format leading to linked behavioural patterns, or in other cases to a confused, inhibited or uncooperative child. When designing VPT-1 experiments, choosing the components very carefully in terms of the interactants involved and their roles, the spatial configurations, the type of interactions, the nonverbal communication signals, and the choice of words can make a big difference in how transparent the depth structure is to the children and which interactional protocols are being invoked.

However, all of the reported findings stem from studies in Western cultures, where joint book reading with young children is a socially highly valued activity and often occurs on a daily basis in Western families, which is not always the case in non-Western countries and communities [36]. For example, in some cultures, early reading with young children is underrepresented compared to non-reading activities [37, 38] or begins about a year later than in typical Western countries [39]. In addition, in more indigenous cultures, general access to books is very limited and other community activities take priority [40]. This means that at an early age children from other cultures sometimes have little or no experience of joint book reading with their caregivers, so it seems unlikely that this pragmatic frame would be activated. With this in mind, it is problematic to generalise the findings to non-Western cultures. In this respect, a vital question that would enrich the research landscape in this area is how children from other cultures who have little or no access to books in their early



development would behave in the classic VPT-1 tasks that resemble joint book reading, and whether there would also be a change in their responses if the pragmatic frame were modified as described in Section 2.3.1. It would also be interesting to explore how children's responses might alter over time as they gain experience of shared book reading in terms of a developmental trajectory.

In addition, I will focus on another possible pragmatic frame emerging from gesture development research: an intercultural study examined the emergence of prelinguistic deictic gestures in 8- to 15-month-olds [41]. Video analysis revealed that, apart from pointing, the nonverbal behaviours of offering and showing were common and coded as separate categories, even though they appear very similar on the surface. While offering is defined as '[h]and holds an object that is brought close to a person, so she can take it', showing can be defined as '[h]and holds out an object, arm is extended toward a person' ([41], p. 1301). Furthermore, the offering gesture was used two to three times per hour in daily activities by Dutch children who are culturally close to the children in Viertel's study [35]. In fact, the modified experiment created a framework that could have prompted the offering of an object to the addressee. Here, a social partner signals non-verbally (often very subtly) that she is interested in an activity or an object. Thus, an offering frame is less demanding than a giving frame, in which an interlocutor directs a 'Give it to me' instruction to the child. Although in the modified experiment the experimenter asked the children to show the object to the addressee rather than offer it to her, the setting itself could have encouraged them to help the social partner and reach over the barrier, not only to provide visual access but also to make the object more physically accessible to her. Some children stretched to lift the object over the barrier, while others stood up from the parent's lap, approached the addressee with an outstretched hand and tried to offer the object to her. Often in these cases, the object wasn't turned around properly to allow adequate visual access. Thus, the modified frame could have been misinterpreted as an invitation to offer the item.

In the same study, the authors also showed that early gestural communication is shaped in social-interactional experiences and differs between indigenous, typically Western, and Far Eastern cultures in 8- to 15-month-olds [41]. For example, Yucatec-Mayan parents used the showing gesture in social interaction with their infants less often than Dutch parents, who in turn used it less frequently than Shanghai-Chinese parents. Exactly the same rank pattern was found for their infants. This finding could inspire the design of future VPT-1 tests in non-Western cultures, insofar as a differently developed repertoire of key gestures (e.g. showing) would set the threshold for demonstrating their social-cognitive abilities.

Finally, this chapter has only examined behavioural measures of VPT-1 abilities, but it is worth looking more closely at methods that assess implicit perspective-taking (e.g. [4, 24]). However, Ruffman and Perner [42] question the results of violation-of-expectation tasks, albeit in the context of testing others' false beliefs, suggesting that infants' longer gaze durations do not necessarily indicate a representation of others' beliefs, but can also be interpreted as the perception of different subject-object-location associations. Furthermore, infants may be guided by simple behavioural rules that allow them to predict the behaviour of others—even without attributing a different perception to them. In summary, the reasons why infants mostly look at the unexpected event can be manifold, and it remains speculative whether a so-called implicit ability of VPT-1 is being assessed. Although current research uses electrophysiological methods in adults [43, 44], this has not yet been done in children. Future research in this area would certainly be informative to find out whether brain

areas associated with perspective-taking are active in infants or very young children or whether other processing is involved instead of implicit perspective-taking.

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