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REVIEW

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A new model of the development of deception: Disentangling the role of false-belief understanding in deceptive ability

Joanna Jakubowska | Marta Białecka-Pikul

Stefan Szuman Department of Developmental and Educational Psychology, Institute of Psychology, Jagiellonian University, Kraków, Poland

Correspondence
Joanna Jakubowska, Stefan Szuman Department of Developmental and Educational Psychology, Institute of Psychology, Jagiellonian University, Ingardena 6, 30-060 Kraków, Poland.
Email: joanna.jakubowska@student.uj.edu.pl

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Abstract

"Deception" is defined predominantly as the intentional attempt to create false-beliefs in others. However, the intentionality behind early acts of deception and its relation to false-belief understanding remain unresolved. In this article, we offer a three-stage theoretical model of the development of deception in human ontogeny. We posit that at any age, human deception is an intentional action, but its form changes according to the level of the deceiver's intentionality. As the primary function of deception is to influence the behaviour of others, we argue that first-stage deceptions-in-action involves only in the analysis of behaviours and perceptual access, not beliefs. In our view, the ability to deceive and false-belief understanding are eventually inter-connected, but false-belief understanding is not essential for the earliest form of deception. Based on empirical findings, which suggest that by observing the results of early deceptions children build their knowledge of mental states as causes of human actions, we claim that the second stage of deception is representational deception. Further, as the understanding of beliefs becomes more advanced, the effectiveness of children's deception increases, and new forms of reflective deception (the third stage) emerge. Future directions for research are outlined, and limitations of the current model are discussed.

KEYWORDS
deception, false-belief understanding, intentionality, lying

1 | INTRODUCTION

Developmental psychology commonly holds that both deception and lying (verbal deception) are intentional actions aimed at creating a false-belief in another person's mind (Chandler, Fritz, & Hala, 1989; Ding, Heyman, Fu, Zhu, & Lee, 2018). This standard definition assumes that deception is a behaviour aimed at inducing a false-belief in the deceived. Deceptive actions are observed frequently in primates (Byrne & Whiten, 1990) and in children prior to their development of false-belief understanding (Newton, Reddy, & Bull, 2000), and thus the standard definition has been questioned as excessively narrow (Reddy, 2007). Following ethological accounts (Reddy, 2007; Whiten & Byrne, 1988), we define "deception" as any intentional action aimed at causing a specific behaviour in another via making his or her view of the situation more similar to a situation in which this particular behaviour usually occurs. Based on the research reviewed, we propose three stages of the development of deception exist: deceptions-in-action, representational deceptions, and reflective deceptions. The main rationale for our model is based on Dennett's (1983) intentional systems theory and Karmiloff-Smith's (1992, 1998, 2012) neuroconstuctivist theory of cognitive development.

1.1 | Towards a new definition of "deception"

According to the standard psychological definition of "deception", only those individuals who understand false-beliefs are able to deceive (Chandler et al., 1989; Ding, Heyman, Fu, et al., 2018). However, behaviours that can be considered deception are well documented in a wide range of species (Mokkonen & Lindstedt, 2016), and no consensus exists as to whether any non-human animals understand false-beliefs (Heyes, 2015). Moreover, human children who do not understand false-beliefs deceive with the same frequency as those who have already acquired the concept of false-beliefs (Newton et al., 2000). Even infants act deceptively. For instance, infants pretend to cry in order to attract their caregiver's attention or move out of their caregiver's field of vision in order to perform an activity without hindrance that he or she has forbidden (Reddy, 2007). Therefore, we agree with Reddy (2007) that a new definition of "deception" and a new theoretical framework that separates deception from false-belief understanding are needed in developmental psychology. Biological studies on animal deception rely on the assumption that deception may occur without insight into the mind of the deceived (see Fallis & Lewis, 2019), so we believe that the new approach should integrate two lines of deception research: human and animal deception.

The first attempt to combine these two frameworks was made by Reddy (2007), who successfully applied the primatologist definition of "tactical deception" to infants' and toddlers' deceptions. Whiten and Byrne (1988) define "tactical deceptions" as actions that constitute part of the typical repertoire of an individual's behaviours but, in particular situations, are performed in a manner that increases the likelihood of the situation being misinterpreted by the deceived individual. In this case, misinterpretation would be understood as a type of activity by the message's recipient that is more appropriate for a typical situation in which a particular message is used than for the situation that is actually occurring. Additionally, this recipient's activity produces a benefit for the deceiver. A variety of tactical deceptions, for example, concealment of an action or episodes of distracting others' attention from something, have been reported both in primates (Byrne & Whiten, 1990) and in human infants (Reddy, 2007). From an ethological point of view, Reddy's decision to compare the deceptions of primates and children seems adequate because in closely related species, similar behaviours usually rely on the same mechanism, but within different lineages, the mechanisms might be quite different (de Waal, 2016). In other words, contrary to involuntary deceptive behaviours (e.g., mimicry in insects), flexible deceptive acts of primates, and young humans might rely on similar mechanisms. For this reason we put aside the current debate on deception in the animal kingdom as a whole and focus our consideration only on the deceptions of humans and their closest relatives (see Artiga & Paternotte, 2018; Birch, 2019; Fallis & Lewis, 2019 for recent broad definitions of "deception" in the animal kingdom). We believe that the definition of "tactical deception" describes humans' deceptions appropriately, with

one exception—older children and adults deceive not only for self-benefit but also for other-oriented purposes (Warneken & Orlins, 2015), even when the deception involves personal cost (Popliger, Talwar, & Crossman, 2011). Therefore, a broader definition that can be applied to all forms of human deception is needed.

From our point of view, there are three essential characteristics of deception in humans and primates. First, deception involves an attempt to cause a specific behaviour in the other, that is, the deceived. Second, the way to achieve this result is to misinform the deceived, that is, by making the deceived view the current situation as more similar to a situation in which the deceiver may expect the specific behaviour of the deceived. Importantly, misinformation may occur via providing misleading information to the deceived or via withholding information—pretending to lack information crucial for the deceived to construct the same view of the situation as that possessed by the deceiver. We must highlight here that manipulations of the view of the situation of the deceived do not necessarily require that the deceiver analyses the beliefs of the deceived. As we will discuss further, at early ages, the manipulation may involve only the behaviour and the perceptual access of the deceived to the situation. Third, this manipulation is always intentional. Hence, each act of deception is goal-directed and taken voluntarily (Dennett, 1983; Grice, 1975), even if it is not always an act aimed at inducing false-beliefs in the deceived. Given these three characteristics, we define "deception" as an intentional action of the deceiver aimed at causing a specific behaviour in another (i.e., deceived) by making his or her view of the situation more congruent with situation in which the intended behaviour of deceived usually occurs, according to the deceiver's knowledge. We believe that this new insight into human deception enables an explanation of the results of studies on deception throughout childhood. Below, we review existing studies and outline critical points that are not explained fully by existing models of the development of deception in human ontogeny (cf., Talwar & Lee, 2008).

1.2 | The development of deception in humans: The state of the art

Since the prominent study of Lewis, Stanger, and Sullivan (1989), deception usually is tested in children using the temptation resistance paradigm (TRP; see Table 1). In the most common version of the TRP, a child is forbidden to take a particular action in a tempting situation. For example, the child is left alone in a room with a toy, which is under a cover and produces an interesting sound, and they are asked not to peek at the toy. After a brief period of time, the experimenter returns and asks the child whether he or she peeked at the toy. The children who have peeked and deny doing so are considered liars, and those who confess are considered truth-tellers. The TRP is used in studies with children of a wide range of ages. Studies have indicated that approximately 30% of 2-and-a-half-year olds lie in the TRP (Evans & Lee, 2013; Talwar & Lee, 2008; Williams, Leduc, Crossman, & Talwar, 2017). The rate of lying increases with age, and thus more than half of 3-year olds and 70% of 4-year olds lie in the TRP (Talwar & Lee, 2002a).

Toddlers' deceptive skills also have been observed in hide-and-seek games (Chandler et al., 1989; see Table 1). In this task, the child must help a puppet to hide a small object under one of the four boxes so that another person cannot find it. However, the puppet leaves visible tracks leading to the particular location, so the place of hiding is clearly visible. To prevent the other person from finding the hidden object—and thus to win the game—the child must wipe up the existing tracks or leave false tracks. Chandler et al., indicated that even 2-year olds destroy or "fabricate evidence" in this task. However, Sodian, Taylor, Harris, and Perner (1991) found that—as opposed to 4-year old children—most 2- and 3-year olds required a clear prompt from the researcher to remove evidence. It should be highlighted that in certain contexts, 3-year olds have difficulties in performing an act of deception. Despite the frustration caused by the failure to achieve a goal, that is, to win the game, their behaviour remains honest (Peskin, 1992). This phenomenon is also well illustrated by the results of a study by Ding and colleagues (2015). In their version of hide-and-seek game, the child must hide a piece of candy under one of two cups in such a way that the experimenter will not find it. Only two out of nearly 60, 3-year olds gave the researcher a false location of the candy during 1of the 10 trials. Moreover, given more opportunities to observe the results of their actions, 3-year olds eventually discovered how to deceive in this kind of hide-and-seek game: over the 10 sessions

TABLE 1 Description of tasks measuring ability to deceive

Task	Procedure description
Temptation resistance paradigm (Lewis et al., 1989)	The child is left alone in the room with the task of refraining from a particular activity. The child's behaviour is considered to be a lie if the child breaks the ban and denies committing the transgression. Further, the child is asked questions about the visual characteristics of the forbidden object—if the child gives correct information, this attests to the lack of semantic leakage control
Hide-and-seek game (Chandler et al., 1989)	The child or the experimenter hides an object from the other person. The child's task is not to reveal the true location of the hidden object or to give false information about its location
Undesirable gift paradigm (Talwar, Murphy, et al., 2007)	The child is promised an attractive gift. However, he or she receives an undesirable item with the information that the giver has chosen this present especially for him or her. The child's behaviour is rated as a case of lie-telling if, when responding to the giver's question about whether or not he or she likes the present, the child praises the giver
Reverse rouge task (Talwar & Lee, 2002b)	An experimenter with a spot of rouge on their nose asks the child if they look well and asks the child to take a photo of them. Then, in the absence of the experimenter, the assistant asks the child if the person in the photo looks well. Behaviour is considered to be deception if the child praises the appearance of the experimenter and informs the assistant that the experimenter does not look well
Art rating task (Fu & Lee, 2007)	The child evaluates a failed drawing in its author's presence. Behaviour is classified as deception when the child puts the bad drawing into the box and informs the author that it is the box with beautiful drawings

of playing the zero-sum game, in which honesty led to losing, the rate of false-informing increased from 12% to 84% (Ding, Heyman, Fu, et al., 2018). This very short review of laboratory studies indicates that children as young as 2- and 3-years old—thus before false-belief understanding emerges—have some ability to deceive. In fact, they deceive to conceal their own transgressions or to win a game and thus for self-serving purposes.

Slightly older children are also tested in more complex tasks that aim to measure their prosocial lie-telling ability, that is, the ability to lie for the benefit of others. Three tasks are usually used to measure the children's ability to tell prosocial lies: the reverse rouge task (Talwar & Lee, 2002b; see Table 1 for a description of the tasks), the undesirable gift task (Talwar, Murphy, & Lee, 2007), and the art rating task (Fu & Lee, 2007). All the tasks concern false praise—deceptions about one's own opinion or one's judgement of an object or person. For example, what is recognised as prosocial lie-telling in the reverse rouge task is giving a person flattering information about their appearance, even though they have a rouge spot painted on their nose. It has been found that the majority of pre-schoolers praise the appearance of the person with the dirty nose whereas in that person's absence, the children say that he or she did not look good (Talwar & Lee, 2002b). Most research has indicated that the rate of prosocial lie-telling increases with age (Talwar, Murphy, et al., 2007; Xu, Bao, Fu, Talwar, & Lee, 2010; but also see Talwar & Lee, 2002b). The analysis of justifications of prosocial deceptions has revealed that at preschool ages, the actual motive may be egoistic. For example, in the reverse rouge task, only one-tenth of the 3- to 7-year old lying children justified concealing the fact that the person had a compromising spot on their nose, with the intention of protecting the person from the experience of distress (Talwar & Lee, 2002b). None of the children who justified their answers altruistically were younger than 5.5-year olds. Xu et al. (2010) indicated that 11-year olds, but not younger children, justified their lies with an other-oriented motive more frequently than providing egoistic justifications for their behaviour, or they gave no justifications at all. Younger children justified their lie-telling with the intention of avoiding negative consequences from the message recipient—for example, they claimed they did not

want the person to be angry with them. Moreover, Popliger et al. (2011) revealed that even though pre-schoolers tell prosocial lies, unlike older children, they avoid doing so at a personal cost. These results allow for the conclusion that as children grow up, their prosocial deception becomes more other-oriented.

1.3 | The rationale for a new model of the development of deception

A short review of studies concerning deception in childhood reveals that deception is a multifaced phenomenon. Changes in the frequency, context, and motivation of deceiving are observed across childhood. Therefore, a clear need exists for a model explaining the developmental pattern of the ability to deceive. To this day, the only model that describes the developmental sequence of acts of deception has been presented by Talwar and Lee (2008). The authors propose distinguishing three types of verbal deceptions: primary lies (in children before the age of four), secondary lies (in children ages from four to seven), and tertiary lies (in children ages between seven and eight, as well as in older children). It should be noted that Talwar and Lee's model leaves several key questions unanswered, including the question of the intentionality involved in the first acts of deception. According to the model, secondary lies are intentional attempts to induce false-beliefs whereas the intentionality of primary lies remains an unresolved issue (Talwar & Lee, 2008). Furthermore, doubts have emerged as to whether primary lies could be regarded as lies in accordance with the standard definitions of "lie" and "deception" (Talwar & Crossman, 2011). The model proposed by Talwar and Lee (2008) does not provide a clear answer as to whether it is possible for children who do not understand the relationship between beliefs and behaviours to attempt intentional deception.

To overcome the weaknesses of Talwar and Lee's model, we propose a theoretical model that links the development of deception with the development of intentionality. As we have already stated, deception is an intentional action that aims to cause a specific behaviour in the others via making his or her view of the situation more similar to a situation in which this particular behaviour usually occurs. As the notion of intentionality is a central one, we refer to Dennett's intentional systems theory. According to Dennett (1983), intentionality is not a homogenous but rather, a multilevel phenomenon. Dennett (1983) posits that *an intentional system* is an individual whose behaviour could be predicted by mental states attributed to him or her. Importantly, intentional systems differ in terms of experiencing and understanding of mental states. A zero-order intentional system is unable to both understand and experience any mental state—it behaves in a reflexive manner. A first-order system acts on the basis of desires or beliefs. Thus, from the third-party perspective, the system behaves intentionally—has own aims and acts to satisfy them. This system is unable to attribute mental states to other individuals. On the contrary, a second-order system understands the actions of others in terms of their mental states. Consequently, a third-order system not only assigns mental states to other individuals but also reasons on how one's mental states concern the other's mental states, for example, "I wonder what she thinks that he thinks about her". Given different levels of intentionality, we postulate that the way in which the child deceives depends on the development of the child's intentionality. In other words, all children's deceptions are intentional, and—as the level of intentionality increases with age—children's deceptions change accordingly. Hence, below we distinguish the three stages of the development of the ability to deceive.

Besides Dennett's theory, our model of the development of deception is also based on Karmiloff-Smith's neuroconstructivist theory of cognitive development, particularly her idea of the development of a representational system. Karmiloff-Smith (1998, 2012) posits that in infancy, domain-general processing dominates, but specialisation of the functions of the brain increases with time. Thus, even the same behaviours may rely on diverse mechanisms at different developmental periods (Karmiloff-Smith, 2012). The essence of the developmental process lies in the re-description of representations in any domain—changes in the forms or levels of representations (Karmiloff-Smith, 1992). These changes manifest themselves clearly in the implicit versus explicit knowledge dimension and occur in two directions (Cheung & Wong, 2011; Karmiloff-Smith, 1992). First, "explicitation" concerns the acquisition of conceptual knowledge on the basis of previously mastered behavioural abilities. Second,

"proceduralization" concerns the improvement of behavioural abilities on the basis of conceptual insight into a particular process. Based on the Karmiloff-Smith theory, we assume that the development of deception could be described as the transition from simple acts of deception aimed at attaining personal gains by provoking a particular behaviour in the deceived person to fully deliberate and mentalistic lies of school-age children. In other words, reflection on the results of these simple acts of deceptions that might induce a misinformed state in others and, importantly, allow children to acquire the concept of false-beliefs (cf., Reddy, 2007; Sinclair, 1996; Sodian, 1994), which, in turn, provide a foundation for more advanced forms of deception.

Given the above-elaborated theoretical assumptions, we present a new model of the development of deception. First, we provide a new definition of "deception" that detaches deception from false-belief understanding. Second, we distinguish three stages of deception development: deceptions-in-action, representational deceptions, and reflective deceptions. We also define their preconditions and provide a description of the form that is observed at each stage (see Table 2). Finally, as our model is conceptual in nature, in the last section of the article, we suggest how our model should be tested in future research.

1.4 | Stage one: Deceptions-in-action

Darwin (1877) pointed out examples of deceptive actions attempted by children in the third year of life. Stern and Stern (1909/1999) also wrote about young children lying, but they referred to their acts of deception as "pseudo-lies", "impulsive utterances", or "mistaken claims". These expressions are worth citing as some contemporary researchers (e.g., Ahern, Lyon, & Quas, 2011) also believe that the Sterns' terms capture the essence of early deceptions. They are spontaneous utterances made by children that in Dennett's (1983) terms, can be regarded as manifestations of first-order intentionality because the child uses them to bring about another person's particular behaviour that is favourable to the child. For example, the child denies transgressing to avoid parental punishment—she uses a strategy that reduces personal cost. We agree with Ahern et al. (2011) that in early deceptions, or as we refer to them, "deceptions-in action", the child is focused on the realisation of her own desires and does not devote attention to how her behaviour will affect other peoples' beliefs but definitely attends to how her behaviour affects others' behaviour. Two lines of research are important with regard to this line of argumentation.

First, Reddy (2007) claimed that young children's lies are a sign of "intelligence in action" and do not need to be accompanied by an understanding of how an act of deception affects the addressee's beliefs. According to Byrne (2007), many actions engaged in both primates and humans consist of quickly and automatically predicting the behaviours of other individuals whereas reasoning about mental states is developed in the course of evolution, together with language, for the purpose of communicating to others, one's predictions based on the analysis of behavioural patterns. The quick analysis of behaviours enables an individual to notice in what kind of situation a particular behaviour of others occurs. With this in mind, the deceiver might manipulate how the deceived behaves by providing him or her with information that makes a situation that creates a particular behaviour in the deceived more probable. This type of tactical deception committed by animals helps them to satisfy their biological needs. For example, causing a false alarm or diverting a different individual's attention to something distant so that it fails to notice food that may enable the animal to win the competition for limited resources and, as a result, increase its chances of survival (e.g., Byrne, 2010).

In their daily interactions, humans also deceive others for largely egoistic reasons (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996), and in tempting situations, self-serving deception could be an automatic response (Shalvi, Eldar, & Bereby-Meyer, 2012). Given the high usefulness of this type of deception (Ding, Wellman, Wang, Fu, & Lee, 2015; Nyberg, 1993) and its evolutionary basis, deceptions-in-action can be expected to begin to emerge from the early stages of a child's development. According to Reddy (2007), the ability to deceive may appear in ontogenesis as early as the first attempts at intentional communication—at the end of the first year of life—and does not rely on the analysis of others' beliefs.

TABLE 2 Stages of the development of the ability to deceive in childhood

Stage	Deceptions-in-action	Representational deceptions	Reflective deceptions
Age of emergence	1 year	4 years	6 years
Manifestations	• Making a false impression • False denials • False accusations • Concealing information	• Correctly predicting the deceived person's future beliefs • Distinguishing deception from pretence • Selective deception	• Semantic leakage control • Other-oriented prosocial deceptions
Precondition	Capability to engage in intentional communication	First-order false-belief understanding	Second-order false-belief understanding
Intention	To bring about the other person's particular behaviour	To induce a belief in the other person that is different from one's own	To induce a particular belief about one's own beliefs in the other person
Motive	To achieve a situation favourable to oneself	To achieve a situation favourable to oneself	To achieve a situation favourable to oneself and/or the other person

In line with Reddy's ideas, studies in natural environments have revealed that as early as the age of two, children can deceive verbally, for example, by denying that they did what they in fact did or by falsely accusing another person (Wilson, Smith, & Ross, 2003). Three-year olds' deceptions are even more diverse. These children engage in so-called "bravado lies", which involve reporting feelings they are not actually experiencing (Newton et al., 2000). For example, in order to avoid humiliation, the child will say that the punishment imposed by their parent does not bother them or even that it gives them pleasure. Additionally, in natural contexts, children who do not understand that other peoples' beliefs yet may differ from reality deceive other people as often and in a similar way to children who have already attained this understanding (Newton et al., 2000). Therefore, first deceptive actions might rely on different mechanisms than the analysis of beliefs of the deceived person.

The second important reason for earliest deceptions are not intended to manipulate others' beliefs refers to results of laboratory research using the TRP and hide-and-seek games (see short descriptions above and Table 1). Although, it was found that one-third of 2.5-year olds lied in the TRP, the mechanisms of deception remain unclear (cf., Talwar & Crossman, 2011). According to Polak and Harris (1999), it is possible in the TRP to speak of attempts to deliberately mislead because 3- to 5-year olds who had not been forbidden to do a particular thing did not deny having done it, as opposed to children who had been forbidden to engage in that activity. This means false denials were produced only when the child could potentially protect themselves from the negative consequences of having committed the forbidden act. Other researchers, in contrast, stress that a quick denial of transgression only proves that by saying "no", the child is confirming that he or she knows that peeking was a wrong thing to do (Ahern et al., 2011; cf., "yes-bias"; Fritzley & Lee, 2003; Hummer, Wimmer, & Astes, 1993). Although the results of some earlier studies suggest that there is a positive correlation between false-belief understanding and attempts to deceive in order to conceal one's transgression (Polak & Harris, 1999; Talwar & Lee, 2008), the existence of this effect has not been confirmed by more recent studies (Evans, Xu, & Lee, 2011; Ma, Evans, Liu, Luo, & Xu, 2015; Wang, Zhu, & Wang, 2017). Other research has demonstrated that children who understand the relationship between seeing and knowing, which is an important precursor of false-belief understanding (Wellman & Liu, 2004), engage in deception in the TRP more often than children who do not understand this relationship (Leduc, Williams, Gomez-Garibello, & Talwar, 2017; Ma et al., 2015). Given these points, we can say that children under the age of four are able to misinform others to avoid punishment or to gain some benefits, but it is unlikely that they are aware of others' false-beliefs.

Although it is clear that toddlers are able to deceive in some contexts (e.g., Chandler et. al., 1989), in most cases, they tend to behave honestly, even if it is not beneficial for them to do so (Ding et al., 2015; Peskin, 1992). The honest behaviour displayed by young children in zero-sum hide-and-seek games may have its source not only in the limited understanding of false-beliefs (Sodian, 1994) but also in the tendency to actively share knowledge with others (Sinclair, 1996) or in insufficient competence in the field of executive functions (Carlson, Moses, & Hix, 1998). De Villiers and de Villiers (2012) found that children could deceive using methods of reasoning other than those based on belief analysis, that is, based on an understanding of rules governing the relationship between perceptual access and behaviour. The authors did not observe differences in performance level in the hide-and-seek game between deaf children and their nondisabled peers, despite the fact that deaf children exhibited considerable limitations in false-belief understanding. Interestingly, in the TRP and in the undesirable gift paradigm (see Table 1 for a description), children with autism—a developmental disorder connected with false-belief understanding deficits—also engaged in deception (Li, Kelley, Evans, & Lee, 2011). Moreover, Nelson, Adamson, and Bakeman (2012) found that in ontogenesis, engagement in deceptive activities during a hide-and-seek game appears later than the understanding of the other person's access to information but earlier than false-belief understanding. Therefore, the assumption that the analysis of the beliefs of others is essential to deceive seems difficult to maintain.

In sum, concluding that children's early deceptive behaviours serve the purpose of inducing other people to behave in ways favourable to the child is legitimate. This means deceptions-in-action are intentional in the sense of conforming to what is understood by first-order intentionality (Dennett, 1983) because they are aimed at bringing

about a result that is favourable to the child, but they are not intentional in the sense of second-order intentionality—that is, they are not aimed at manipulating another person's beliefs. When committing deceptions-in-action, the child does not analyse the relationship between the attempt to deceive and the deceived person's beliefs. Using Karmiloff-Smith's idea that at early ages, domain-general processes dominate, we believe that first deceptions rely on such abilities as statistical and causal learning that are well documented in various areas of infant development (see Gopnik & Wellman, 2012 for review) and in understanding the relationship between perception and behaviour (Ruffman, 2014). We believe using these skills, the child predicts how the deceived will behave as a consequence of the child's deceptive actions. Statistical learning and awareness of perception–behavioural patterns are also thought to be crucial for infants' performance on the tasks constructed to measure implicit false-belief understanding (Ruffman, 2014; Ruffman, Taumoepeau, & Perkins, 2012). From our point of view, early deceptions and performance in "implicit false-belief tasks" depend on similar mechanisms. However, this mechanism might not be the ability to represent the beliefs of others implicitly, but rather, an expression of keeping an "experiential record" of the other person's goal (see Perner & Roessler, 2012), a kind of sub-mentalising (Heyes, 2018) or a minimal or belief-like state based on encountering something (Butterfill & Apperly, 2013). Given the fact that recent studies fail to either replicate the results of implicit false-belief understanding in children (Burnside, Ruel, Azar, & Poulin-Dubois, 2018; Crivello & Poulin-Dubois, 2018) or to provide evidence on the convergent validity of implicit false-belief tasks (Dörrenberg, Rakoczy, & Liszkowski, 2018), we claim that deceptions-in-actions may not rely on implicit representations of false-beliefs but rather, on the analysis of behavioural patterns. Because, to this day, the mechanism of deception-in-action is an unstudied topic, future research is of special importance here.

Therefore, addressing the problem of representation and its role in children's understanding of lie-telling, we insist that engagement in deceptions-in-action is not a sign of having an explicit representation of the other person's mind but deceptions-in-action contribute to building this representation (cf., Karmiloff-Smith, 1992). Like Nelson, Henseler, and Plesa Skwerer (2000), we insist that objective, abstract knowledge about the mind may develop only on the basis of experiences immersed in context-specific activities. This means that as a result of participation in a variety of social situations, including deceptive activities—and particularly as a result of attempts to give meaning to these situations—a child can build a more general concept of beliefs (Nelson et al., 2000) and a concept of deception as intentionally manipulating other people's beliefs. In other words, when engaging in deceptions-in-action, a child does not analyse the other person's potential beliefs but attempts to induce that person to behave in a particular way. Using his or her experience as a deceiving subject and having experienced situations of being deceived or teased by parents, the child develops false-belief understanding immersed in a deceptive context (Reddy, 2007). It is not until the age of four that situational, practice-immersed knowledge about false-beliefs is generalised and detached from its original context, making it possible for an explicit concept of deception to develop (Sinclair, 1996). As a result, the child is able to reason successfully about false-beliefs, even in abstract tasks, which are dissociated from everyday experience and, at the same time—as we argue below—to lie with the intention of inducing a false-belief. In fact, children achieve better results in tasks testing false-belief understanding in which one of the characters commits deception, than in tasks in which the motif of deception does not appear at all (Wellman, Cross, & Watson, 2001).

It should also be noted that what early deceptions-in-action and later representational deceptions have in common is the subject's motivation to commit them. Both the majority of deceptions-in-action and first deceptions aimed at deliberately inducing a false-belief in another person are egoistically motivated (Newton et al., 2000; Wilson et al., 2003). This means that the ultimate goal of children's deceptions is to increase or maintain their own welfare (Batson, 2011).

1.5 | Stage two: Representational deceptions

In the fourth year of life, a clear change occurs in children's understanding of deception (Sodian, 1994). This change manifests itself in the acquisition of the following abilities: selective deception (Sodian et al., 1991), distinguishing

the concept of deception from pretence (Peskin, 1996) and predicting deceived peoples' beliefs (Carlson et al., 1998; Peskin, 1996; Sodian et al., 1991). The increase in children's knowledge about deception and the acquisition of the abilities listed above and in Table 2 are believed to be conditioned by the child's acquisition of mental state understanding (Sodian, 1994). Thus, we believe that the mutual influence of deceptive abilities and false-belief understanding allow children to gain the next step in the development of deception—representational deceptions. Explicit representations (Karmiloff-Smith, 1992) and second-order intentionality (Dennett, 1983) provide a foundation for this stage observed for the first time in 4-year olds who pass false-belief tests (Wellman et al., 2001).

The clear expression of representational deception is using deception in a selective way by adjusting the contents of the message to its recipient. This kind of deception is of great significance for the effectiveness of deception (Sodian, 1994). An act of selective deception is understood as providing false information to the person threatening the child's interests, although at the same time, communicating the truth to the person cooperating with the child. This ability has been found in 4-year old children, which is the time they master belief understanding (Sodian et al., 1991; Wellman et al., 2001). Three-year old children are unable to modify the message depending on the recipient—they engage in deception towards both hostile and cooperative individuals or even exclusively towards the latter (Sodian et al., 1991).

It also can be said that prior to master false-belief understanding, the concept of deception does not seem to be fully distinct and distinguished from the concept of pretence (Peskin, 1996; Sodian, 1994). In the study by Peskin (1996), children interpreted a story about deception as if it were a story concerning an act of pretending. Children were told a story about a dog that disguised itself as a rabbit in order to win the trust of another rabbit and take its food away. A very small group of 3-year olds understood that by seeing the disguised dog, the rabbit would think that it was another rabbit rather than a dog, and that despite the disguise, the dog would attempt to steal the rabbit's food. This means that until the age of four, children do not understand that deception enables them to produce a false-belief in the recipient and that it is thus necessary to consider the intention underlying deception (Carlson et al., 1998; Peskin, 1996; Sodian et al., 1991).

Representational deceptions rely on false-belief understanding. Causal connections between the understanding of mental states and the ability to deceive have been examined in training studies (Ding, Heyman, Sai, et al., 2018; Ding et al., 2015). Evidence exists for the significance of understanding mental states for false communication. Ding et al. (2015) conducted a training with false-belief tasks and appearance-reality tasks with feedback. Trained children were also exposed to stories with a large amount of diverse mental vocabulary, that is, emotion, desire, and cognition, and were asked about the content of the story. Training in mental state understanding led to an improvement on the hide-and-seek game deception task performance. Additionally, children who were more advanced in false-belief understanding learnt how to deceive in the hide-and-seek game faster than their peers did (Ding, Heyman, Fu, et al., 2018). However, teaching children how to deceive in hide-and-seek games also promoted their false-belief understanding. Ding, Heyman, Sai, et al. (2018) explicitly instructed children on how to deceive the opponent during the hide-and-seek game. Children who participated in deception training improved their false-belief understanding over a few days. It then could be argued that the relationship between false-belief understanding and the ability to deceive might be bidirectional.

At this point, Karmiloff-Smith's (1992) theory is worth considering again. As mentioned previously, two directions of re-description of representations exist: “explicitation” and “proceduralization”. When analysing deceptions-in-action, with reference to explicitation, it is possible that children build their knowledge about the influence of deceptive actions on other peoples' beliefs on the basis of the observed consequences caused by their own deceptions-in-action or by other peoples’ deceptive activities towards them. In the context of deception, proceduralization would manifest itself as an increase in the effectiveness and appropriateness of the children's acts of deception as a result of their knowledge about how such acts affect other peoples' mental states rather than merely their behaviours. It seems that representational deceptions are based on explicit representations of the beliefs of others. Thus, children may reflect on the mental states of other people, which paves a way to reflect on how their behaviour influences others' well-being.

The first step towards lying for other-oriented purposes is the prosocial deceptions of pre-schoolers. Prosocial behaviour is defined as an action that benefits another person without a direct profit for oneself (Paulus, 2018) or an action that is intended to benefit another (Hawley, 2014), and even egoism might lead to prosocial behaviour (Batson, 2011), so we refer to prosocial deception in all cases in which deceptions are intended to benefit another person's good, regardless of the underlying motive. However, we believe that as children age, they begin to deceive for altruistic purposes, thus in line with Batson's (2011) concept of altruism—the welfare of another becomes the ultimate goal of deception. Conducting observations in natural environments, researchers found very few cases of prosocial lie-telling in pre-schoolers and even in older children (Lavoie, Leduc, Arruda, Crossman, & Talwar, 2017; Newton et al., 2000; Wilson et al., 2003). We suggest that there might be three reasons that children tend not to tell prosocial lies in natural contexts: lack of competence, lack of motivation, and the perception of deception as unacceptable in any context.

First, children might not tell prosocial lies simply because they are unable to do so. Previous research has indicated that various prosocial behaviours are observed even in 2-year olds (see Paulus & Moore, 2012 for review). Despite toddlers being able to help, share, and comfort others, these three types of prosocial behaviour are unrelated to one another at early ages and rely on different socio-cognitive skills (see Paulus, 2018 for review). Dunfield (2014) indicated that to help another, the child must be able to detect unrealised goals of this person. To share with another, unmet material desires must be recognized by the child. Finally, to comfort another, the child must be able to discern the negative emotional state of this person. As Paulus (2018) has suggested, the generalisation of the findings on each type of prosocial behaviour in relation to another is unjustified. Therefore, to predict at what ages prosocial behaviour may emerge, the specific competence must be indicated. We believe that similar claims could be made regarding prosocial deceptions—different cognitive skills may underlie each type of prosocial deception. Previous studies have investigated two types of prosocial deception—false praise (measured using the undesirable gift, reverse rouge, or art rating tasks; see section "The Development of Deception in Humans: The State of the Art" and Table 1) and interventional lies (Harvey, Davoodi, & Blake, 2018).

We claim that false praise is a kind of comforting behaviour because it is aimed at improving another's negative emotional state or preventing it from worsening. Thus, to falsely praise another person, the child must predict how their action might affect this person's emotional state. As it has been previously reported, the understanding of external cues of emotions develops over the preschool period (Pons, Harris, & de Rosnay, 2004). This suggests that at the preschool age, children might become able to praise other people falsely. The results of laboratory studies are in line with these predictions. For instance, in the reverse rouge task, most pre-schoolers gave the person with a spotted nose flattering information whereas in that person's absence, the children said that he or she did not look good (Talwar & Lee, 2002b). Moreover, Talwar, Murphy, et al. (2007) indicated that in the undesirable gift paradigm (see Table 1), nearly 70% of 3- to 11-year olds hid their real opinions and praised the gift to the giver falsely without any parental instruction. Across conditions—with or without parental coaching—72% of pre-schoolers (i.e., children aged 3 to 5) gave a gift giver false praise. In view of this, we claim that at the preschool age, children become able to praise other people falsely, even if they do not use this ability frequently in everyday contexts.

Interventional lies are another type of prosocial deception. These kinds of lies are aimed at protecting another person from violence (Harvey et al., 2018). To engage in interventional lies, the child must discriminate the actual intention of someone towards another, that is, friendliness and malevolence, and predict its potential consequences for another's well-being. To assess children's ability to lie in order prevent an act of violence, Harvey and colleagues developed a task in which the child listens to a story of two children playing in a park. One of the story characters (the seeker) is looking for the other (the target) with a friendly or hostile intention. Then, a map of the park is introduced that would be given to the seeker before the search would begin. The child's task is to circle on the map, the location to which she wants to lead the seeker in order to search for the target. Harvey et al. (2018) indicated that children about 5- or 6-years old provide false information about the target location more frequently to the seeker with intention to harm than to the friendly one. It should be noted, however, that 5-year olds, as

opposed to older children, needed a clear emphasis on the seeker's evil intentions and on the harm that the target might suffer from the seeker to commit an interventional lie. Saying whether children as young as five would be capable of engaging in interventional lies in a similar situation in everyday life is thus challenging.

Second, pre-schoolers' tendency not to deceive for others' benefit in natural environments might be due to weak motivation. In fact, children's decisions to tell prosocial lies are influenced by potential consequences for themselves. Talwar, Lee, Bala, and Lindsay (2004) designed an experiment in which a child witnessed a parent's transgression and then either could be one of the suspects of the transgression or was absent while the transgression occurred and informed of it subsequently by the parent. The authors indicated that more children lied to hide their parents' transgressions when they were not present while the parental transgression occurred than when they witnessed the transgression and might then be suspected of committing the transgression. Nevertheless, the overall rate of lie-telling about a parent's transgression was about one-third, which is much lower than for lying to conceal the child's own transgression (cf., Talwar & Lee, 2002a). Moreover, Popliger and colleagues (2011) showed that when false praise involves a cost for the self, children lie less frequently than when the cost is minimal. It could then be argued that during everyday interactions, the child may expect negative consequences of deception which prevent them from lie-telling for the benefit of others.

Third, children might not engage in prosocial lie-telling early in natural environments because they find that in general, deception is not approved by their parents. Parents explicitly teach their children that any acts of deception are unacceptable, and the aversion towards deception is quite strong in pre-schoolers (Bussey, 1999; Lavoie, Leduc, Crossman, & Talwar, 2016). It should be added, however, that specific deceptions aimed at protecting another person are accompanied by ambivalent or even positive moral judgements (Bussey, 1999; Lindskold & Walters, 1983). This type of deception also is the one most often accepted by parents (Lavoie et al., 2016). Thus, with regard to prosocial lies, preschool children are in a very difficult, complex, and even contradictory situation. They are already able to induce false-beliefs for egoistic purposes, and they know that deception is forbidden. However, at the same time, they might observe other people deceiving for altruistic purposes with social acceptance. Similar claims have been made by Lee (2013), who stated that both the understanding of the mental states of others and the knowledge of social conventions influence children's decision to lie or to tell the truth. This argument is in accordance with results that show that school-age children view lying that is intended to help less positively than do adults whereas lying to harm is evaluated more negatively (Xu, Luo, Fu, & Lee, 2009). Children's evaluation of prosocial lies and their actual behaviour in polite settings are consistent (Xu et al., 2010), so they may avoid prosocial lie-telling due to their negative opinion of this kind of behaviour.

On the whole, it could be argued that the preschool period is a time during which prosocial deception emerges for the first time. However, this competence is used unfrequently by children in the context of everyday interactions. As we mentioned above, whether the child would tell prosocial lies depends on the analysis of potential costs and benefits for the child. The analysis of justifications of prosocial deceptions reveals that early prosocial deceptions are motivated egoistically, but as the children grow up, they also deceive to increase the well-being of others (Broomfield, Robinson, & Robinson, 2002; Talwar & Lee, 2002b; Xu et al., 2010), or in other words, their prosocial deceptions become more altruistic.

It should be added that regardless of the motivation that accompanies deceptions committed by children ages from four to six, in many situations, their representational deceptions may turn out to be ineffective. At this age, children are capable of denying the transgressions they have committed, but they are incapable of semantic leakage control—that is, of maintaining the consistency of information given in the process of deception. In other words, they are unable to feign ignorance consistently by not giving information that could expose their earlier deception (Polak & Harris, 1999). The limited effectiveness of pre-schoolers' deceptions stems from the fact that the children do not understand that the deceiver's messages may help the deceived person to develop a belief about what the deceiver's actual beliefs are about a particular issue (Talwar & Lee, 2002a). This type of deception appears in the next stage.

1.6 | Stage three: Reflective deceptions

Between 6 and 7 years of age, the next serious change occurs in a child's understanding of mental states. The child becomes capable not only of reflecting on other peoples' beliefs but also of thinking about one person's beliefs concerning another person's beliefs, which means the child understands second-order false-beliefs (Hogrefe, Wimmer, & Perner, 1986). On the one hand, considered in terms of Dennett's (1983) intentionality levels, this period is when children become capable of planning actions based on third-order intentionality. On the other hand, considered in terms of Karmiloff-Smith's (1992) representational re-description, the explicit representations are re-represented, and thus more complex reasoning about one's own representation is possible. For instance, children could reflect on whether or not their mother will determine that they saw a scary movie she had forbidden them to watch if they woke up at night and told her that they were afraid of a monster whom they could only have known about from the movie. The ability to engage in this type of reflection contributes to the emergence of two additional deception-related phenomena: the already mentioned semantic leakage control (Polak & Harris, 1999; Talwar & Lee, 2008) and the growing tendency to praise a person falsely in order to improve that person's mood (Warneken & Orlins, 2015).

In order to prevent semantic leakage—that is, to give only consistent pieces of information, the message sender should monitor the contents that he or she already has transferred to the recipient. Making predictions concerning what the recipient may infer about the sender's state of knowledge or beliefs on the basis of various pieces of information that the sender provides also is necessary (Polak & Harris, 1999). The deceiver should thus be aware that based on the content of the message, the recipient develops his or her beliefs not only about reality but also about how the message sender sees that reality. Consequently, it has been demonstrated that semantic leakage control emerges in roughly the same developmental period as second-order belief understanding (Talwar & Lee, 2002a), and the existence of a relationship between these variables has been confirmed in studies using the temptation resistance procedure (Li et al., 2011; Talwar, Gordon, & Lee, 2007; Talwar & Lee, 2008). Thus, we believe that it is reasonable to distinguish a new stage in the development of deceptive ability, and we call this stage "reflective deceptions".

The second important change occurring at the stage of reflective deceptions concerns the motivation of lies. Not until children reach the age of seven or eight does false praise begin to stem from an altruistic motivation—from the intention to protect another person's well-being. As we discussed above, at the preschool age, children begin to be able to praise other people falsely mostly for egoistic purposes, and in everyday contexts, prosocial deceptions in pre-schoolers are very rare. It also has been indicated that children begin to lie about their own opinions in order to improve another person's mood around the age of seven (Warneken & Orlins, 2015). In the art rating task, whereby the child is supposed to voice an opinion about a drawing by another person, 7-year old children, but not 5-year olds, falsely praised the person when she expressed sadness more often when she was neutral. Warneken and Orlins (2015) suggested that to give false praise with other-oriented intention, the ability to reason about second-order beliefs is necessary. In other words, to give false praise, the child must understand that her belief is not visible to the deceived and choose the behaviour that creates in the deceived misbelief about the child's belief. However, in light of pre-schoolers' egoistic false praise, this interpretation seems unlikely. We agree with Warneken and Orlins (2015) that second-order false-belief understanding is essential for other-oriented false praise, but from our point of view, the mechanism is different. We claim that second-order representation enables school-age children to see lie-telling in polite settings from the third-party perspective. The pre-schoolers have negative opinions about deception, and their parents teach them that they are not allowed to deceive in any case, so that children avoid lie-telling if it is not beneficial for themselves. However, being able to reflect on second-order beliefs, children can imagine that the audience could see their other-oriented motivation, which makes a lie justified. A similar suggestion is made by Broomfield et al. (2002), who suggest that in the case of other-oriented lies, the imagined approval of the authority is needed.

The results of the research conducted to date are ambiguous and provide only little insight into this problem because the motivation for false praise in applied tasks may be diverse. Some studies have confirmed that the relation between second-order representation and the ability to tell or understand false praise. For example, Broomfield and colleagues (2002) found that children who predicted that the protagonist of a story about an unwanted present will praise the gift gave better answers to questions about the internal states of the characters in the story and were more often able to reason about another person's second-order beliefs than children who suggested that the protagonist would criticize the gift truthfully in the benefactor's presence. Moreover, children telling lies exclusively in prosocial settings achieve higher results in the composite measure of first- and second-order false-belief understanding than those who lie exclusively in order to conceal their own transgression, although they do not differ from the children who lie in both contexts or who do not lie at all (Lavoie, Yachison, Crossman, & Talwar, 2017). It should be added that the relations between second-order belief understanding and engaging in (Williams, Moore, Crossman, & Talwar, 2016) or understanding prosocial lies (Hsu & Cheung, 2013) have not been confirmed in some studies. Hsu and Cheung (2013) argued that engaging in deceptions concerning opinions does not necessarily require second-order belief understanding but rather, understanding the interpretative nature of the mind—perceiving the possibility of people drawing different conclusions or having different beliefs with regard to the same facts (Carpendale & Chandler, 1996). In their study, Hsu and Cheung (2013) demonstrated that children who understood that one object could be interpreted in different ways by different people displayed a better understanding of the use of false praises in social situations than their peers. It should be noted that only a few studies on the cognitive determinants of the ability to engage in prosocial lie-telling exist, and the measurement is often performed by means of stories that test children's understanding, but not their behaviour, in a particular situation; no agreement exists as to whether or not the tasks administered actually measure other-oriented deception (Warneken & Orlins, 2015).

2 | CONCLUSIONS

We presented a three-stage developmental model of deception in human ontogeny (see Table 2 for overview). We provided not only detailed descriptions of each stage but also proposed how deception development intertwines with the development of false-belief understanding. According to our model, children move from deceptions-in-action through representational deception to reflective deception. Deceptions-in-action are not intended to manipulate the beliefs of others but rather, to cause a particular behaviour in the other party in line with the deceiver's interest. Engagement in these kinds of deceptions, together with attention to their behavioural consequences, helps children to construct the concept of false-beliefs. This concept is initially immersed in deceptive contexts and then is gradually derived from them. As the ability to predict the beliefs of others is acquired, that is, at the stage of representational deceptions, children become able to deceive in selective ways, distinguish deceptions from acts of pretending, and begin to deceive for others' benefit. Moreover, knowledge of the external causes of emotions enables them to praise other people falsely. However, they are still not effective deceivers due to the lack of the ability to maintain semantic leakage control. Progress in this area may occur because children become able to reflect on second-order false-beliefs—at the stage of reflective deceptions. At this stage, children also begin to manifest opinions that are different than their real opinions in order to make others feel better, and thus altruistic deceptions are possible.

Our model not only stresses the developmental sequence of the stages—as in the model proposed by Talwar and Lee (2008)—but also juxtaposes behaviours characteristic of each stage of deception, as well as the intentions and motivations underlying them. The first step towards the empirical verification of the model discussed in this article is to test whether the forms of deceptions attributed to a particular stage are interrelated. Reddy (2007) has noted that no systematic studies on early deceptions have been conducted, and most data concerning this issue come from studies that were not directly devoted to deception. Therefore, a clear need exists for observations

conducted in natural environments in order to determine the developmental line of deceptions-in-action and for designing experimental procedures appropriate for the investigation of deception in toddlers. Interestingly, even before the first deceptions-in-action emerge, other "misinforming" phenomena, such as teasing that surprises others, are observed in child–adult interactions (Reddy & Mireault, 2015). Toddlers are able to take part in such communicative exchanges for their own pleasure or benefit without manipulating an adult's beliefs and without understanding adults' false-beliefs. We expect that their experience with such exchanges creates an opportunity to learn about the minds of others. For instance, being teased or observing the unexpected consequences of teasing on the behaviour of others, the child becomes aware of misinformative signals (Reddy, 2007).

To this day, no studies have been devoted simultaneously to the abilities of making up the stage of representational deception—on the distinction between deception and pretence and on the correct prediction of the deceived person's beliefs. The transition from second- to third-order intentionality—when children gain explicit insight into how other people represent the representations of others—should be investigated in the future. We are aware of the only one study in which researchers simultaneously assessed the abilities characteristic of reflective deception, namely semantic leakage control and other-oriented lie-telling concerning one's opinion (Lavoie, Yachison, et al., 2017). The greatest semantic leakage control was observed in children who told both prosocial lies and concealed their own transgression. Those who told only prosocial lies or only to conceal the transgression did not differ in leakage control. However, these results do not allow for drawing unambiguous conclusions because prosocial lie-telling was measured by means of the undesirable gift paradigm, which has been called into question not only by the authors of the study themselves but also by other researchers (cf., Popliger et al., 2011; Warneken & Orlins, 2015). Additionally, in other studies (Popliger et al., 2011; Williams et al., 2016), researchers measured semantic leakage control, but due to the fact that they investigated only prosocial deception, the semantic leakage control ability could be measured only in children who engaged in prosocial lie-telling.

It should be stressed that the psychological model of the development of deception we have presented is based, to a great extent, on the results of cross-sectional studies. To test the hypotheses referring to the developmental changes postulated in the model—transitions from deceptions-in-action to representational deception and to reflective deception—conducting at least two studies with a longitudinal design would be necessary. Each study should have at least two measurement points of the same variables, namely the ability to deceive and understanding first- or second-order beliefs. Only this type of research design will make determining the direction of the developmental relationships possible. The first study should measure false-belief understanding and the skills characteristic of the representational deception stage. In the second study, it would be necessary to investigate the developmental relationships between second-order false-belief understanding and the tendency to use false praise for altruistic purposes, as well as semantic leakage control.

In our model, we also postulate that one of the contexts of the development of false-belief understanding is situations involving engagement in deceptions-in-action, combined with observing the outcomes of these deceptions or episodes of being deceived by other people (see also Reddy, 2007; Sinclair, 1996 for similar suggestions). The role of deception as a context for the acquisition of knowledge about false-beliefs could be established in the course of microgenetic research (see Ding, Heyman, Fu, et al., 2018 for an example of a microgenetic study) that compares the speed of the acquisition of false-belief understanding in deceptive and non-deceptive contexts. Another type of research that could serve to verify the predictions included in the model consists of observing the spontaneous interactions in which children engage. Based on the presented model, it can be predicted that children who often take part in situations involving deceptions-in-action and/or teasing, that is, those who are more experienced with these kinds of communicative exchanges that involve misinformation, will not only present false-belief understanding before the age of four but will also display representational deception earlier than their peers who are not as experienced with such interactions.

The presented model has several important limitations. One is the omission of variables, such as executive functions, whose relationship with the ability to deceive has been demonstrated (Evans & Lee, 2011; Leduc et al., 2017; Talwar & Lee, 2008; Williams et al., 2017). We also did not refer in our model to such important phenomena

as reputation management, which may influence cheating behaviour (Zhao, Heyman, Chen, & Lee, 2017a, 2017b). Moreover, the model does not include certain forms of deception perpetrated by older children, such as so-called "blue lies", which serve the interest of the group the child belongs to (Fu, Evans, Wang, & Lee, 2008). It should be noted, however, that the evaluation of blue lies differs considerably across cultures (Fu, Xu, Cameron, Heyman, & Lee, 2007), and research on this type of deception has thus far been conducted mainly in Chinese culture. Additionally, even Chinese children engage in this type of deception rather seldomly (Fu et al., 2008).

Despite the above limitations, our model provides a broad developmental framework on the ability to deceive in human ontogeny. The model outlines the developmental changes in intentionality (Dennett, 1983) that accompany children's deceptions and covers the transitions between implicit and explicit representations (Karmiloff-Smith, 1992). Moreover, it is based on the broadened definition of "deception" that allows tactical deception or, as we call it, "deception-in-action"—the first important stage in the development of human deception. Furthermore, the model explains the reason for altruistic deception, observed only in humans, is so late to a developmental phenomenon. We believe that our model presents a comprehensive review of the dispersed individual studies on the ability to deceive, and it may be the foundation for future, more in-depth studies aimed at determining the mechanism for the development of deception.

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CONFLICT OF INTEREST

The authors of the manuscript declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ORCID


Joanna Jakubowska https://orcid.org/0000-0003-3963-0918

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